

FISHERIES

Newsletter

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IN THIS ISSUE

SPC ACTIVITIES	Page 2
NEWS FROM IN AND AROUND THE REGION	Page 22
PACIFIC ISLAND COUNTRIES AND THE AQUARIUM MARKET <i>by V. Dufour</i>	Page 30

DOUBLE ISSUE



Ken Harada (Sydney Fish Market) demonstrating
the on-board handling of sashimi tuna



South Pacific Commission
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SPC ACTIVITIES

RESOURCE ASSESSMENT SECTION

The main field project for the Resource Assessment Section during the first quarter of 1997 was the ICFMaP (Integrated Coastal Fisheries Management Project) Aitutaki lagoon fishery management sub-project, Phase II. This extended the survey to invertebrate fisheries and discussed fisheries management options with the Island Council and people in the community.

The draft report of this work was submitted before departure from the Cook Islands in the first week of February, and will be consolidated with the draft reports of previous work into a final report before the end of the ICFMaP project.

This final document, after consultation with sub-project collaborators, particularly the Cook Islands Ministry of Marine Resources, will be published for the benefit of other SPC member countries and territories.

We are currently searching for appropriate sources of funding to finance the most important of the management measures being implemented by the Island Council, particularly the gillnet measures, but also the additional survey work that will be required to provide an accurate baseline on the current status of fish and invertebrates in the new marine reserve areas.

Some additional fieldwork under the ICFMaP Macuata gillnet fishery management sub-project also took place during the quarter, with financial support from the FAO Regional Aquaculture Development Project.

It was designed to investigate the possibilities of developing alternative income-generating opportunities from coastal fisheries in the area through the potential supply of milkfish fry to grow-out facilities, to provide live bait for the Fiji small-scale tuna longline fishery.

The last fieldwork part of the Macuata gillnet fishery management sub-project will be the production of a video that illustrates the benefits that were gained in this area.

These included the local initiative to restrict the use of gillnets, coupled with the fishermen's (and women's) initiative to improve post-harvest utilisation in the remaining handline fishery (particularly long-distance marketing), and thus to actually improve prospects for both sustainability and overall income.



CAPTURE SECTION

Masterfisherman assignment commences in the Cook Islands

Masterfisherman, Steve Beverly was in Rarotonga, Cook Islands from 26 January to the end of March assisting the fledgling tuna longline fleet. When the Masterfisherman first visited Rarotonga (one week in October 1996) there were three boats in the fleet and some fish were being exported to foreign markets (Japan, Hawaii, and New Zealand).

However, upon his return in January he found that the largest of the vessels, *F/V Edna Kate*, had left for the broadbill swordfish fishery in Australia. The remaining vessels, *F/V*

Farquest and *F/V Peka-Anne* were not catching enough fish to justify exports, so all fresh fish exporting had ceased by November 1996.

F/V Peka-Anne is small by industry standards (8.8 m) and could not become a serious contender in the sashimi export trade. *F/V Peka-Anne* does have potential, however, for supplying fish to the domestic markets in Rarotonga and could possibly piggyback onto an export operation if that ever starts up again. Brent Fisher, owner/operator of *F/V Peka-Anne*, sells his fish either whole or proc-

essed into loins and chunks to local restaurants. The main catch of *F/V Peka-Anne* is yellowfin tuna, albacore tuna, bigeye tuna, blue marlin, wahoo, and the occasional broadbill swordfish. The Masterfisherman made a total of eight longline sets from *F/V Peka-Anne*, setting approximately 200–220 hooks each time in baskets of 12 hooks each. A total of 1,740 hooks were set and 685 kg of all species were caught, including ten yellowfin tuna.

Unfortunately the longline reel broke down during hauling on the last longline trip. In order to

continue fishing for the balance of the Masterfisherman's time with F/V *Peka-Anne*, three vertical longlines were made up with tarred 6.4 mm *Kuralon*.

Each vertical longline had 15 branchlines made from braided 1.5 mm monofilament. Two *palu ahi* lines were also made up. Fishing continued, but closer to shore (around the FADs at Black Rock and Ngatangia).

Vertical longline and *palu ahi* fishing were not nearly as successful as horizontal longline fishing on F/V *Peka-Anne*. Six fishing trips were made, setting two or three vertical longlines each time. *Palu ahi* fishing was done near the FADs while the vertical longlines soaked. Only four yellowfin and one albacore were caught during these six trips. Two of the yellowfin were caught on the *palu ahi* lines. (F/V *Peka-Anne* was visited in *Fisheries Newsletter* #79.)

The main vessel that the Masterfisherman was assisting in Rarotonga was SeaQuest Ltd's F/V *Farquest*. SeaQuest Ltd is a wholly owned local seafood and fishing company owned and operated by the husband/wife team of Lucky and Adrienne Matapuku.

Besides owning SeaQuest, Lucky Matapuku is in a joint venture with several other Cook Islanders (Michael Burns, Tuaine Rata, Royden Mitchell and Rima Tuarae) called Cook Islands Sealords Ltd (Sealords). Sealords is in a further joint venture with a New Zealand company.

Sealords and Tulagi Group are each 50 per cent shareholders in Cook Islands Seafoods Ltd, which runs a packing house and retail fish shop opposite Avatiu Harbour in Rarotonga.

The Cook Islands Seafoods Ltd partnership is for five years, during which time Sealords will be responsible for obtaining fishing licences, export permits, fuel, bait, and other agent functions, while Tulagi Group will bring in vessels either of their own or under charter. This arrangement has been going on since March 1994 with limited success.

All of the boats brought in by Tulagi (F/V *Southern Progress* and F/V *Kona Wind*, which fished in 1994–95, and F/V *Suzanne M* and F/V *Edna Kate*, which fished in 1996) have left Cook Islands to fish elsewhere and Cook Islands Seafoods Ltd is being supported solely by SeaQuest and the catches of their vessel, F/V *Farquest*.

There have been no exports by Cook Islands Seafoods Ltd since November 1996 so they have been busy selling fish on the domestic market, either whole or processed into loins. Besides wholesaling to restaurants and grocery stores, Cook Islands Seafoods Ltd has its own retail fish shop (in the same building as the packhouse), where local customers can buy fresh loins and steaks of yellowfin tuna, bigeye tuna, albacore tuna, marlin, mahi mahi, broadbill swordfish, and wahoo. As it is, the packhouse and retail shop are operating under serious cash-flow problems.

In the near future the Matapukus expect more boats to arrive from New Zealand and business may pick up. The



The F/V *Farquest*

season for good tuna catches is from June to August and then the broadbill swordfish season begins in September. If things go as planned, SeaQuest Ltd may be in the market for a new boat.

In the meantime, however, the Matapukus were in need of technical assistance with *F/V Farquest*. The vessel was not catching enough fish, especially tunas, to keep the operation viable.

The Matapukus and Brent Fisher sought assistance from Cook Islands Ministry of Marine Resources which, in turn, asked the South Pacific Commission for help in the form of a Masterfisherman attachment to Cook Islands for a three-month period.

In October 1996 Masterfisherman, Steve Beverly visited Rarotonga and together with the Ministry of Marine Resources Secretary, Ray Newnham and Fisheries Consultant, Colin Brown, submitted a draft proposal to the Forum Fisheries

Agency seeking funding for a project to assist the longline fleet.

Subsequently, funding was approved through UNDP's joint SPC/FFA Regional Fisheries Support and National Capacity Building Programme. The budget of US\$40,000 called for US\$10,000 to be spent on new fishing gear, US\$10,000 on sanma bait, and the balance on other expenses.

When the Masterfisherman arrived in Rarotonga in January it became immediately obvious why SeaQuest Ltd was having troubles with *F/V Farquest* (he had not had a chance to view the vessel during his brief visit in October 1996).

F/V Farquest is a 27-year old former cray fishing boat from Chatham Islands in New Zealand. She is made from steel and is 54.5 ft (16.8 m) long with a beam of 14.9 ft (4.58 m), and a draft of just 7 ft (2.1 m). The fish

hold will hold 7 t of fish in refrigerated sea water (RSW) but will only hold about 2 t of iced fish.

Upon delivery to Rarotonga in April 1996, *F/V Farquest* had a working RSW system but it has since been removed and all fish are iced. The fuel tanks hold only 9,000 l of fuel and the fresh water tank only 1,200 l. Most of the below-deck space that could be fish hold is taken up with a very roomy but unnecessary crew's quarters (this should be above deck).

The vessel came with a New Zealand-made monofilament longline reel with 40 km of line, 800 branchlines and all of the other gear to go with the fishing system.

F/V Farquest was found to be a fairly well maintained and seaworthy vessel. All of the safety gear was current and in good condition. Lucky and Adrienne and the crew of *F/V Farquest* were working hard, against dif-



Hauling longline on *F/V Farquest*

difficult odds, to make F/V *Farquest* a viable longline vessel.

The main problem with F/V *Farquest*, however, is not that it is not able to catch fish, but rather that it does not have the range or the fish-holding capacity to make it a viable commercial longline vessel in the South Pacific (see SPC *Fisheries Newsletter* #79, pp. 22–35). The best fishing grounds in Cook Islands are in the north above 10°S, but F/V *Farquest* is unable to venture out of sight of Rarotonga—the small fish hold only holds enough ice for two to three sets.

Notwithstanding these difficulties the Masterfisherman made an attempt to improve the situation for SeaQuest Ltd. First, the fishing gear was modified somewhat. F/V *Farquest* had been using 5–7 fa (10 to 14 m) floatlines all made from floating polypropylene rope.

The Masterfisherman, with the help of MMR staff, made up additional floatlines using 15 fa (30 m) lengths of 6.4 mm tarred Kuralon (sinking rope). New branchlines were also made up: 200 2.0 mm monofilament 6 fa (12 m) branchlines and 200 3.0 mm tarred red polyester 5 fa (10 m) branchlines 0.5 m of 1.0 mm stainless steel leader wire and a 60 g leaded swivel. All branchlines had 3.6 Japan tuna hooks with ring.

F/V *Farquest* had a line-setter but it was not functioning and was in need of spare parts (none available in Rarotonga). Formerly the crew had been setting baskets of just 15 hooks, each using the short, floating floatlines and partly decomposed squid bait (Cook Islands Seafoods Ltd freezer broke down for several weeks in late 1996). The short floating rope float-lines would tend to keep the mainline near

the surface. With the new gear and new bait the sets were changed so that each basket had 20 hooks and the longer Kuralon floatlines were used on about half the set.

The results of the brief fishing trials were not conclusive (only six trips were made), but on the trip of 6 March 1,000 hooks were set using all sanma bait. Half of the set used the old floatlines and half used the new, longer Kuralon floatlines.

Over 500 kg of fish were caught on this set, including a 75 kg bigeye tuna, five yellowfin tuna, and five blue marlin. All but one of the fish was caught on the baskets using the new, longer floatlines. It was obvious that F/V *Farquest* had been fishing too shallow. This was reflected in their past catches, which often consisted of mostly by-catch species and not the target species of yellowfin tuna and bigeye tuna.

One other thing that was corrected by the Masterfisherman on F/V *Farquest* was the way that the hydraulic valve was set up to operate the reel. The former owners in New Zealand had installed a solenoid by-pass on the valve that was controlled by a switch on deck. The actual control valve (hydraulic) was below the rail and out of reach of the man operating the reel.

This created a dangerous situation and made hauling very inconvenient for the operator. The Masterfisherman removed the solenoid valve and shifted the hydraulic valve to a higher position. The result was a much smoother, safer operation during hauling.

Instructions were also given to the crew in setting strategies to enhance catch, and in proper

on-board handling and icing of fish.

However, the small amount of ice taken on each trip made it difficult even for a trained fisherman to ice the fish properly.

Another point which was a definite problem at SeaQuest Ltd was that F/V *Farquest* did not have a captain. The crew were each given separate areas of responsibility, but no one person was actually in charge of the vessel's operation and of fishing operations.

On the first trip taken by the Masterfisherman (11 February), enough bait was taken for five sets, but only enough ice for one set, and the freshwater tank was not topped off. F/V *Farquest* had to return to port after just one set and water had to be strictly rationed while the boat was at sea. As there was no captain, nobody was accountable.

Aside from problems with fishing, because of her age and situation, F/V *Farquest* was plagued by maintenance problems. For example, the 12 VDC system never worked properly and as a result the autopilot was usually out; the fish hold had to be hand-bailed as the 12 VDC pump was out; on one trip a hydraulic line burst and the boat had no spares, so had to return to port and leave the line in the water; the SSB radio was not working (F/V *Farquest* was subsequently not able to respond to a *Mayday* call on 22 February); and the line-setter did not work so the line could not be set deep.

Unfortunately, even if all of the management, fishing, and maintenance problems being experienced by SeaQuest Ltd could somehow be resolved, F/V *Farquest* will never be a viable commercial longline vessel

in the sashimi export trade because of its limited capabilities.

The Masterfisherman's time might be better spent in the

Activities at headquarters

Activities in Noumea have focused on the backlog of outstanding reports. The Fisheries Development Adviser, Lindsay Chapman, and Project Assistant, Marie-Ange Roberts, have been working on two types of reports, published and unpublished.

Published reports will be completed for all country assignments that have been undertaken since 1992. The first of these Capture Section Reports, 'Tuna Fisheries Development, East New Britain, Papua New Guinea', was published and distributed in early April. Several other reports in this published series have been progressed and should be printed and distributed in the next quarter.

Unpublished reports, as agreed to by the Commission, will allow the backlog of Deep Sea Fisheries Development Project country reports, with their valuable information, to be released into the public arena without going through the detailed SPC publication process. This will enable valuable information to be released to member countries and territories.

These reports will be produced to a high technical standard by the Capture Section, and will still require clearance from individual countries before their release. Only limited numbers will be produced and distributed. The first two reports in the unpublished series should be released in the next quarter.

future if he is called upon to give advice **before** a vessel and gear are purchased and not after costly mistakes have been made. If SeaQuest Ltd does

purchase or charter another longline vessel, it is hoped that it will call upon the South Pacific Commission for advice.



The good news for the Capture Section is that its funding proposal to AusAID for a second Masterfisherman position has been accepted and funded for a three-year period. This funding includes the employment of

a Project Assistant for the same period, and most of the operational costs for the Masterfisherman. A separate advertisement for the Masterfisherman position is included in this Newsletter (see below).



RECRUITMENT OF A SECOND MASTERFISHERMAN

The Capture section of the South Pacific Commission is seeking to employ a qualified Masterfisherman for three years. The successful applicant will be required to have experience in: all aspects of tuna longline fishing operations; fish aggregating device (FAD) site surveying, construction and deployment procedures; fishing methods associated with FADs; report writing and accurate data collection and record keeping. The successful applicant will also require good liaison skills and have the ability to work with a wide range of people from different cultures and with different educational backgrounds.

Qualifications for this position include: five years professional experience in a commercial capture fishery (preferably in the South Pacific); demonstrated ability in appropriate fish handling and icing procedures for sashimi-grade fish; report-writing and record-keeping skills; a recognised seagoing certificate for offshore fishing operations would be an advantage; and fluency in English (a knowledge of French would be an advantage).

This position is a permanent field position with a salary of 398,837 CFP per month (100 CFP = approx US\$ 1.00) plus free housing in the country of assignment. An establishment grant of 40,000 CFP will be paid for each assignment over one month's duration. It is anticipated that 2-4 assignments would be conducted each year. Leave is accrued at 2.5 working days per month with 30 sick days per year. Six per cent of salary will be paid into the Commission's Provident Fund, with a matching contribution by the Commission, and 1.5 per cent of salary is deducted for medical cover. Moving expenses will be covered for personal effects up to 150 kg for a single person, and up to 250 kg for a couple, to each assignment station. Project equipment will be additional to the appointee's personal effects.

For more information and a copy of the full position specifications, qualifications and terms and conditions, please contact the Fisheries Development Adviser, Lindsay Chapman on, phone 687 260168, fax 687 263818 or e-mail <LindsayC@spc.orgnc>, or at the Commission's address.

APPLICATIONS CLOSE 30 AUGUST 1997.

■ TRAINING SECTION

Developing pre-sea fishing and safety training

In March this year the Fisheries Training Section started working with the Vanuatu Fisheries Training Centre in Santo and the Vanuatu Fishermen's Association to develop a course outline, training materials and lesson plans for a course which would help first-time Ni-Vanuatu fishermen get a job on Taiwanese longliners.

The president of the Vanuatu Fisherman's Association, Kalorano Kalo, was quite sure on what was needed. This was a short, two-week training course on all aspects of safety, as the record of injury and death on these boats was bad. He indicated it should be non-academic in nature, as many of the participants might be unable to read.

Further enquiries of the Taiwanese employers and their local representatives, the South Pacific Fishing Company, showed that recruitment of new Ni-Vanuatu crews was falling, because some inappropriate choices were giving the wrong message about the suitability of Ni-Vanuatu crew. In view of this it was

agreed that a secondary objective of the course would be to act as a screening process that might weed out those who were unsuitable for the rigours of life on an oceanic longliner.

All aspects of the course have now been completed; 20 videos covering safety, fire fighting and longlining have been collected; lesson plans for each session have been written along, with visual aids and photographs; and the first course will be run in July–August this year with assistance from a tutor from the New Zealand School of Fisheries. The course will be live-in, with the participants following a continuous, intensive work programme over 14 days.

Little emphasis will be given to written learning or exercises. Learning will be accomplished through spoken explanations accompanied by drawings, diagrams and hands-on practice.

Videos will be used wherever possible. Evaluation will be made by the continuous use of check-lists which will monitor each participant's attitude and competency during each daily lesson throughout the course.

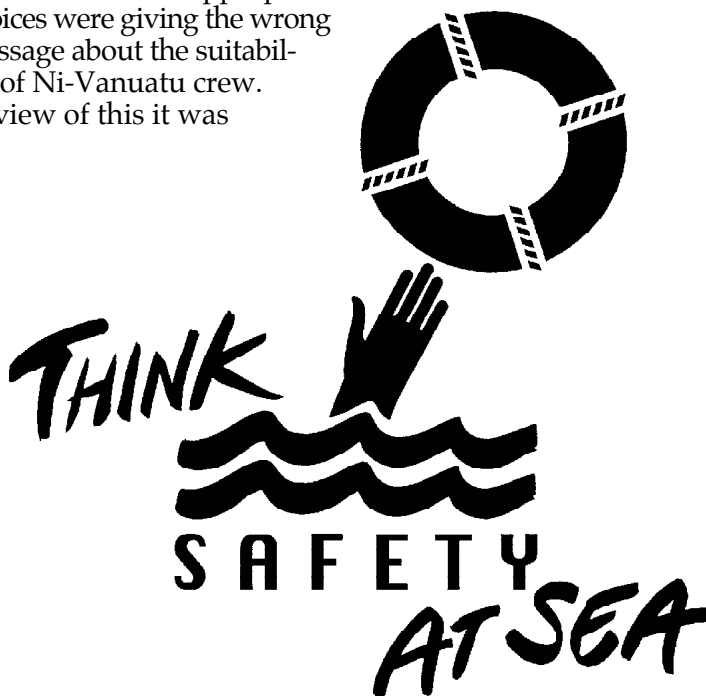
This regime will help to meet the course objectives, which are:

- to give participants basic safety skills and fishing knowledge that will make them more capable of safely undertaking a career on-board a foreign fishing vessel; and
- to create a working environment and ethic which will allow tutors to identify those participants who do not have either the work ethic or the personality for life on board.

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

The second meeting of the Association of Pacific Island Maritime Training Institutions and Maritime Authorities, held in Suva last April, recommended that attendance at a pre-sea safety programme, incorporating survival, first aid, basic fire fighting and occupational safety and health, be made a statutory requirement for all fishermen on Pacific Island vessels.

The Fisheries Training Section endorses this recommendation and believes that the course materials which have been developed for Vanuatu will be



suitable as a basic course for most Pacific Island countries and territories, with the fishing contents (the Taiwanese longlining methods in the case of Vanuatu) changed where necessary to reflect the type of fishing the particular students will undertake on course completion.

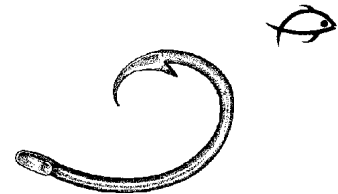
To better explain the methodology and content of the course, a short non-professional video will be made during the operation of the Vanuatu course in July. This will be circulated to all interested countries and territories along with a complete

description of the teaching aids and course outline. The Training Section will work with those which decide that this course and materials are appropriate to their fishery.

This, along with the safety materials already developed, will give them all that is needed for operating their own in-country pre-sea course. If it is wished, and finances permitting, the assistance of a tutor can be supplied for the first course.

The distribution of these materials, along with the course notes

for the Pacific Island Qualified Fishing Deck-hand Course, will give institutions around the Pacific the capability of running those lower-level courses which may be required for manning fishing vessels. The South Pacific Commission has been financially assisted in this project by the Government of the Republic of China/Taiwan.



National workshops on sashimi-tuna handling in Western Samoa

The development of a tuna longline industry in Western Samoa started early in 1996 when a few fishermen installed a hand-driven longline reel on their 28-footer Alia catamaran. Today, more than one hundred Alia catamarans are longlining in Western Samoa's EEZ. Most of these boats operate from the capital, Apia, doing daily trips up to 45 miles off-shore. They use a monofilament longline and deploy up to 550 hooks per set.

In 1996, 1,200 tons of albacore tuna (*Thunnus alalunga*) were exported frozen to canneries in American Samoa. Exports of chilled tunas (yellowfin and bigeye) were also started last year, mainly to the sashimi markets of the United States.

The main bottleneck to the future development of this young tuna fishing industry is the poor quality of the landed catches.

An alia catamaran set up for tuna longlining: the longline reel, one branchline bin, some floats and a couple of flag-poles



The problem is serious, as in 1996, 20 per cent of the exported albacore tunas were rejected by US canneries. The lack of ice-boxes on the Alia catamarans and the rough on-board handling of the catch are the main causes of this poor quality.

In March 1997, the Western Samoa Fisheries Division requested the assistance of the South Pacific Commission's Fisheries Training Section to run a series of short workshops to train local fishermen and tuna exporters on the on-board handling and grading of sashimi tuna. With funding assistance from the Republic of China/Taiwan, the South Pacific Commission implemented two one-day workshops in Apia on 26 and 28 May 1997.

The first workshop (26 May) was attended by 22 participants (boat-owners and fishermen), while 17 persons, including 4 tuna exporters, participated in

the second training session on 28 May. The resource persons were Ken Harada, Sydney Fish Market Quality Control Officer and Michel Blanc, SPC Fisheries Education and Training Adviser.

Morning sessions were held at the Fisheries Division classroom and covered tuna biology, tuna physiology, the deterioration process of tuna flesh, the sashimi concept, the factors affecting tuna prices on the sashimi markets (tuna grading) and the on-board handling of sashimi-grade tuna.

Resource materials for these sessions included Mr Harada's slide collection, some transparencies and the SPC video and manual 'On-board handling of sashimi-grade tuna'.

Afternoon sessions were held at Apia Export Fish Packers Ltd's processing plant, where participants practised the on-board

handling of tuna (simulation on dead fish). The tutors showed the position of the tuna's brain and main blood vessels. The grading of several yellowfin and bigeye tunas was also carried out.

The workshops were a success, with 39 persons trained in the proper handling procedures for sashimi-grade tuna. The facilities used during the workshops (Fisheries Division classroom and Apia Export Fish Packers Ltd's processing plant) were excellent for this training and the trainers had access to an appropriate supply of fish for the practical demonstrations and 'hands-on' work.

The trainers feel that follow-up workshops will be required in the near future. Several staff of the Western Samoa Fisheries Division have attended the workshops and should be able to run their own training programmes when necessary. To



The new extended Alia catamaran: more deck space, front wheel house, twin outboards.

that end, the trainers left some resource materials with the Fisheries Division (SPC video, manuals and transparencies on the on-board handling of sashimi-grade tunas).

Although the workshops will certainly improve the way Samoan fishermen handle their

catch, the problem of the unsuitability of the local boats for carrying ice-boxes still needs to be solved. The 28 ft Alia catamaran does not have enough deck space for a suitable ice-box, so the trainers suggested the use of slurry-bags that could be fitted in the boat's pontoons.

The best-quality fish for export (big yellowfin and bigeye tuna) could be chilled in the slurry bags, while the cannery fish (albacore) would be stored on the deck and covered with wet bags. All tunas should be spiked and bled immediately after their capture.



Commercial business practices: regional course for managers of Pacific Island fisheries enterprises

Fisheries enterprises in the Pacific are rapidly developing to fully commercial operations. Many of these enterprises, lacking a commercially-oriented work force in-country, recruit persons who, although skilled in other areas, do not have a background in commercial management.

In response to concerns on this matter and to a recommendation from the 25th Regional Technical Meeting on Fisheries (1994), the SPC Fisheries Training Section obtained funding from UNDP to operate a regional training programme on the management of Pacific Island fisheries enterprises.

A workshop on business management for trainers of small-boat operators was run at Santo, Vanuatu, in March 1996, with 14 participants from 11 member countries and territories. The participants in this training have since run follow-up workshops for small-boat operators in Papua New Guinea, Solomon Islands, Tuvalu, Niue, Federated States of Micronesia and Tonga.

In March this year, a regional course on commercial practices for managers of Pacific Island fisheries enterprises was organised by SPC. It was attended by 12 participants from 10 coun-

tries and territories, and was designed to address those skills which would give the most immediate benefit to participants.

These included the principles of management, the commercial ethic, accounting practices, personnel management, quality control and marketing principles. The course was organised and hosted by the New Zealand School of Fisheries in Nelson, New Zealand.

The advantages of using the NZ School of Fisheries to run the course were the historical links between SPC and the School (a six-month Pacific Islands Fisheries Officers course has been run there annually since 1979) and the presence, in Nelson, of the biggest fishing port in New Zealand, with its associated pool of expertise, fish factories of all sizes, and on-shore support industries.

After assessing the needs of participants, it was decided to include five general topics. These topics and the sessions offered under each topic were:

- *Business planning:* Eight sessions on business planning, using the computer software 'How to plan your business' (a copy of the software was given to each participant).
- *Quality for profit and marketing:* Twelve sessions covering seafood handling and quality control, HACCP principles, production systems, site visits, value adding, marketing and trading practice.
- *Management practices:* Four sessions covering Pacific problems, problem solving, people management and leadership.
- *Seafood and fisheries business:* Twelve sessions covering the Nelson port infrastructure (site visits), vessel operations, vessel economics, vessel electronics, perspectives in Pacific fisheries, seafood business appraisal and charters and joint ventures.
- *Business accounting and computers:* Six sessions covering accounting and financial statements (profit and loss, balance sheet, and cash flow statements), overheads, and the use of computers (spreadsheets).

The course was run in a participatory manner, with formal lectures kept to a minimum. The lectures on business accounting and business planning were delivered by the School of Administration in a practical way ('hands-on' work with computers, use of videos, practical exercises).

Most of the other sessions were conducted by guest speakers and learning was achieved

through the sharing of experiences and small-group discussions. Several site visits were

organised to the Nelson fishing port facilities: Sealord fish and mussel factory plants, Nalder &



Participants visiting Nalder & Biddle company to view the building of a longliner for the Marshall Islands



***Rehua*: a new stern trawler worth NZ\$ 22 million, the jewel of Sealord company fishing fleet**

Biddle (a diversified marine engineering company), and MacCure Seafood (a small-scale value-adding company specialising in smoked seafood).

One session took place at the New Zealand School of Fisheries, with an overview of vessel electronic systems, computer-based navigation and an introduction to Internet for fisheries businesses.

All the participants felt they had benefited from the course, gaining a good understanding of ways to manage their business and widening their exposure to fisheries enterprise operations and people. Interestingly, the participants said they would recommend that other people attend this course. They identified 13 staff members of their own companies and 18 from similar enterprises as potential participants in future courses.

The SPC Fisheries Training Section is keen to continue training programmes targeting commercial fisheries enterprises in the Pacific, with the aim of assisting an emerging regional fishing industry and as a means of creating job opportunities.

If funding can be made available, the SPC will conduct short courses for company managers using a similar approach and training methodology to those of the present course. In addition to training managers, programmes will be implemented at all levels of the commercial fishing sector. Some needs already identified and underlined by the participants in their course evaluation are the training of skippers and engineers.

Although the statutory training of vessel crews can be met locally in most countries, there is a need for short technical

courses for fishing skippers to upgrade their navigation skills (use of electronic aids) and to inculcate a business ethic and practice. The present shortage of competent marine engineers has been identified as a bottleneck to the future growth of the fishing industry in the Pacific, so a recruitment and training apprenticeship scheme will be implemented as a priority.

The South Pacific Commission takes this opportunity to thank the United Nations Development Programme, the Nelson Polytechnic and the Nelson-based fishing industry for their invaluable inputs into this course. We wish the participants every success in the management of their fisheries enterprises and hope that, in the near future, similar courses will be implemented to help meet the management training needs of the fisheries industry in the Pacific.

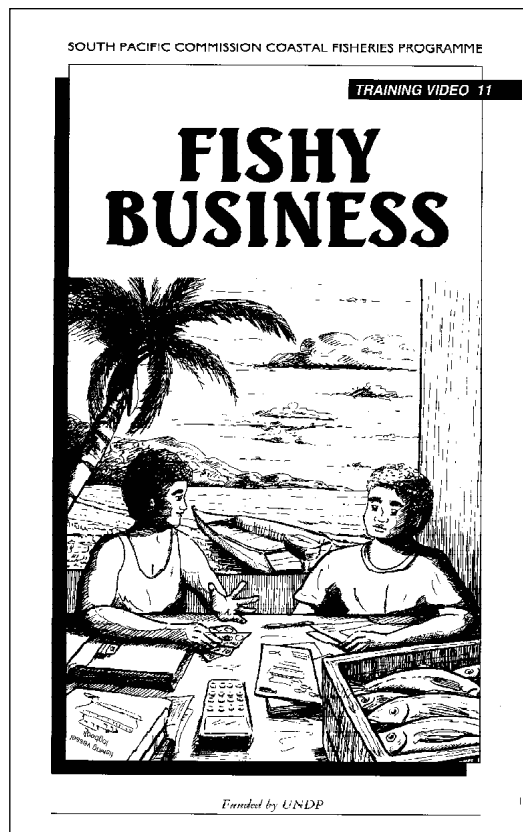


Update on video production

Since its inception, the Fisheries Training Section has been active in the area of video production. The most recent programmes produced by the Section include 'On-board Handling of Sashimi Grade Tuna', 'Better Safe than Sorry' and 'Survival at Sea — A Kiribati Tale'.

In to order to complement a teaching manual on the financial management of a small fishing business, the Section has recently undertaken the production of a training video on this topic.

Based on a script written by Alastair Robertson, the film 'Fishy Business' relates the story of a fisherman called Pauli who has his business threatened by a letter from the local bank notifying that his boat will be repossessed unless the outstand-



ing loan repayments are received within seven days.

The video shows how Pauli and his wife Mere learn good business management practices from Luka, another fisherman who manages his business very carefully.

The key points demonstrated in the video are the importance of the feasibility study, the description of fixed and variable costs, and the use of the SPC logbook. The primary purpose of the video will be to assist trainers running business man-

agement workshops for small boat operators. Fisheries departments, training institutions and fishermen's associations will receive the video no later than July this year. Funding for this project was provided by the United Nations Development Programme.

The area of small boat safety has already been covered by two videos produced in 1995 and 1996 (see titles above). To reinforce the message, the Section will produce a series of eight short video clips, each one focusing on a specific safety issue.

These video clips will be filmed in July by Pasifika Productions, a Suva-based commercial video company. The actors will be the same as those who performed in the now famous 'Better Safe than Sorry' video, including Rambo, the careless fisherman.

The clips will be distributed to all national TV stations in the Pacific region. Funding for this project is being provided by the Governments of Australia and France.



■ INFORMATION SECTION

SPC Fisheries Address Book

Our readers will remember that the FAO/UNDP Regional Fisheries Support Programme (FAO RFSP) used to publish annually the well-known 'Addresses useful to Pacific Islands fisheries personnel'. This publication was much appreciated in the region.

In 1992, the FAO RFSP ceased its activities and the South Pa-

cific Commission decided to carry on publication of the address book. The 1997 edition is now ready and has been distributed widely in the region. In addition to more than 1,000 addresses covering 50 countries and territories, the address book includes basic fisheries statistics, Exclusive Economic Zone areas and a map for each Pacific Island country or territory.

Copies of the Fisheries Address Book can be obtained by writing to the Fisheries Information Section, South Pacific Commission, BP D5, 98848 Noumea Cedex, New Caledonia (E-mail: cfpinfo@spc.org.nc). We trust that this document will remain popular and we are always open to suggestions for making it even more useful.



Terii Luciani appointed Fisheries Training Officer

Terii Luciani, Fisheries Information and Training Associate, has recently been appointed Fisheries Training Officer. Terii will take up this position on 1 August 1997.



He will now be responsible, amongst other tasks, for the organisation of training programmes, the management of the Training Section's video programme, and the maintenance of the Section's databases (Fisheries Training Directory and Fisheries Personnel Database).

During his short attachment with the Information Section, Terii has gained useful experience and there is no doubt he will be putting his new skills to good use at the Training Section.

This means that the Fisheries Information and Training Associate position has now become vacant. Appointment is by secondment, for one year only. An SPC Recruitment Notice for this position will be issued shortly. Its duties and responsibilities are listed below:

- Maintain full familiarity with and active participation in the full range of activities being undertaken by the Information and Training Sections of the SPC Coastal Fisheries Programme;

- Gather, edit and collate materials for inclusion in the *Fisheries Education and Training Information Bulletin*, and assume responsibility for all aspects of the Bulletin's timely production on a bi-annual basis;
- Prepare teaching resource materials for use during fisheries training workshops and group teaching activities run by the Commission;
- Assist as required with the production of the SPC *Fisheries Newsletter* and Information Bulletins;
- Assist with the management of the Information and Training Sections' databases;
- Assist with the development and management of an internal system to store and retrieve information on training issues, activities and opportunities in the region;
- In liaison with the SPC Library and other staff of the Marine Resources Division, respond to requests for information from Pacific Island governments, training institutions and individuals.

For more information, please contact the Fisheries Information Adviser [JeanPaulG@spc.org.nc] or the Fisheries Education and Training Adviser [MichelBl@spc.org.nc] at the South Pacific Commission.



Information Section helps Niue publish its Domestic Fishing Regulations

During the last Regional Technical Meeting on Fisheries, held at SPC headquarters in Noumea, from 5 to 9 August 1996, several countries expressed their needs for the publication of educational materials. Recently an official request was received from the Ministry of Agriculture, Forestry and Fisheries of

Niue, asking the Information Section to prepare a comprehensive booklet on Niue's Domestic Fishing Regulations, in close collaboration with the Ministry.

This booklet has now been published and distributed to the fishermen in Niue. It was pro-

duced in both English and Niuean to facilitate public awareness. We believe that this kind of document is very useful and that many other countries will be interested in doing likewise. In the meantime, we have received a request from Vanuatu to produce a similar booklet in Bislama.



■ OCEANIC FISHERIES PROGRAMME

Seventeenth session of the Coordinating Working party on Fisheries Statistics

The Coordinating Working Party on Fishery Statistics (CWP) has met since 1960, at intervals of two or three years. Prior to the current meeting, its members included seven regional organisations — the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the International Commission for the Conservation of Atlantic Tunas (ICCAT), the International Council for the Exploration of the Sea (ICES), the Organisation for Economic Cooperation and Development (OECD), the North Atlantic Salmon Conservation Organization (NASCO), the Northwest Atlantic Fisheries Organization (NAFO), and the Statistical Office of the European Communities (Eurostat)

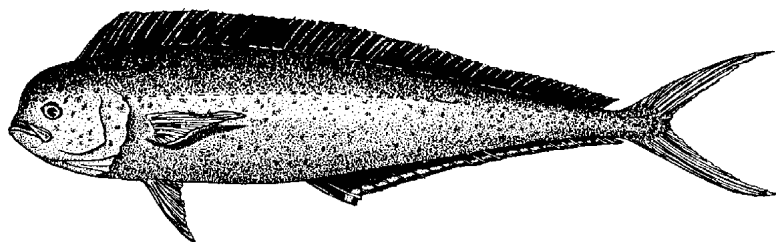
— and the Food and Agriculture Organization of the United Nations (FAO). Mr Richard Grainger, Senior Fisheries Statistician, FAO, is the Secretary of CWP, although CWP is not itself a FAO body.

The CWP terms of reference are to:

- Keep under continuous review the requirements for fishery statistics (including agriculture) for the purposes of research, policy-making and management, taking into account their purpose, usefulness, cost, burden in collection and collation, timeliness, quality, confidentiality needs and regional differences;

- Agree standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics; and
- Make proposals and recommendations for action in relation to the collection, collation and dissemination of fishery statistics, recognising the need to coordinate activities so as to avoid duplication.

The 17th session of the CWP was held from 3 to 7 March 1997 in Hobart, Tasmania, Australia. The agenda covered issues related to fishery statistics in general, and the work programme of the FAO Fishery Information, Data and Statistics Unit (FIDI) in particular. Issues of



relevance to the SPC region included changes in membership of CWP; international initiatives, such as the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and the Code of Conduct for Responsible Fishing; improvement in the reliability of catch statistics through measures such as observer programmes and vessel monitoring systems (VMS); the exchange and dissemination of information; discrepancies among agency databases; modifications to major fishing area boundaries; by-catch and discard issues; and conversion factors. Points of interest are summarised below:

- Following CWP-16, which was held in Madrid from 20 to 25 March 1995, the statutes of CWP were modified to allow an increase in membership. Previously, CWP consisted primarily of organisations concerned with the Atlantic, but for many years it had been felt that because the issues discussed by CWP were of global relevance, membership should be expanded. One of the first actions taken by CWP in this regard was to invite the SPC Fisheries Statistician to participate as an observer at CWP-15, held in Dartmouth, Nova Scotia, from 8 to 14 July 1992. In February 1996, other regional organisations concerned with fishery statistics were invited to apply for membership in CWP, and SPC did so in April 1996. The International Whaling Commission also
- applied for membership. Applications for new membership of CWP are decided by a two-thirds majority vote. Both SPC and IWC were accepted as new members at CWP-17.
- Article 36 of the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks provides for review of the implementation of the Agreement four years after its entry into force. Also, FAO is obliged to monitor and report on the implementation of the Code of Conduct for Responsible Fisheries and its effects on fisheries, including action taken under other instruments and resolutions by UN Organisations. It was noted at CWP-17 that CWP may have a role in coordinating the reviews by fishery agencies of implementation of those provisions of the Agreement and the Code of Conduct relating to fishery statistics and data.
- CWP considered that it is desirable to establish standards for the transmission of VMS data. Although it is inappropriate at this stage to specify data formats, CWP recommended that existing codes and standards be used where these apply, such as the use of FAO species codes.
- FAO has developed a Windows version of FISHSTAT, the software for accessing the FISHDAB database, which contains annual catch
- statistics by species and by FAO area. FAO has also developed a new software package, ARTSOFT, for use in processing fisheries survey data, which can be used to estimate catches in artisanal and subsistence fisheries.
- In the past, SPC has conducted comparisons of annual catch statistics published in the *SPC Tuna Fishery Yearbook* with FAO statistics, and this has resulted in improvements to the FAO statistics. SPC will continue to conduct such comparisons in order to eliminate discrepancies between the two databases.
- In the 1980s, FAO proposed a revision of FAO areas in the Pacific Ocean in order that the statistical areas more closely accord with inter-governmental agencies concerned with fishery statistics. In particular, it was proposed that a new Area 74 be introduced to accord with the area of interest of SPC, and that the current Area 71 be revised to accord with the area of interest of the Southeast Asian Fishery Development Centre (SEAFDEC). The proposal has not yet been adopted due to concerns expressed by the Government of Japan. It was suggested at CWP-17 that revisions of FAO areas in the Pacific could be revisited following negotiations for the establishment of the management organisation or arrangement, during which species boundaries will be discussed.
- Of the CWP member agencies, ICCAT and SPC are actively monitoring by-catch and discards. ICCAT has developed data collection

forms explicitly for such purposes, while SPC compiles data on by-catch and discards from the SPC and national observer programmes.

Most agencies are concerned strictly with the conversion of estimates of processed weight to estimates of live weight. SPC is an exception in that it is also concerned with length-length

and length-weight conversions, and is collecting data from observers specifically to examine such relationships.



Regional Training Workshop For Fisheries Observers

A lecture room at SPC offices in Nabua, Suva recently became the venue for a workshop to train participants from seven Pacific Island countries in the skills required to work as fisheries observers aboard commercial fishing vessels in the region. The workshop, which ran from 31 May to 9 June inclusive, is the latest in a series conducted over the last three years to enhance regional and national fisheries data collection capability.

In case you are still uncertain as to what fisheries observer work is all about, be assured that observer programmes are now recognised as highly efficient data-collection tools. They are

used to collect information on fishing techniques and catch composition from all fishing fleets whether they be domestic, purse seine, pole and line, longline, foreign, domestic, industrial or artisanal. This information is essential to developing effective management regimes over what is, for many Pacific Island countries and territories, their most valuable resource.

Another task that observers may be asked to do is to ensure that the rules in fishing agreements that allow foreign fleets access to Pacific Island waters are being properly followed by the vessel on which the ob-

server is placed. This is referred to as the 'compliance role' of observers. In some Pacific countries and territories observers have also proved to have an effective surveillance role. Observers who have reported sightings of other vessels which they observe fishing illegally in the same grounds as the observer's host vessel have, in some instances, netted their country hundreds of thousands of dollars in fines.

SPC has its own small observer programme whose role is strictly scientific. These observers are currently trying to get some base-line data on every significant fishing fleet in the



How long is a fish?

region. They are also asked to address specific areas of interest identified as important by fisheries scientists in the region. In order to foster the utmost cooperation from fleets, so as to get data that is as unbiased as possible, they do not report on illegal activities and their data is fed into a regional fisheries database as strictly confidential.

Maintaining the integrity and confidentiality of data is a critical part of all observer programmes and an important consideration in observer selection and training.

The usual observer activities include: gathering records on size and weight of fish and accurately reporting areas in which these fish were caught; making accurate assessments of total weight of each species caught; collecting biological samples; observing the efficiency of vessels' own catch reporting and hence helping to validate the logsheet data that is supplied to fisheries statistics personnel by fishing fleets; reporting on new developments on fishing gear and techniques in order that scientists can more accurately assess the impact of fishing on fish stocks; and reporting on incidents of interaction of different fleets and more generally on levels of activity observed in popular fishing grounds.

This most recent Observer Training Workshop was held primarily to ready observers for working aboard US purse seiners operating under the US Multilateral Treaty with Certain Pacific Island Parties. But a broader perspective was offered in order to prepare students for similar work as and when it becomes available amongst other fleets.

Participants were invited from



**Getting into the thick of things. What does it eat?
What sex? How bad is its liver?**

countries party to the US Treaty in which no in-country observer training had previously been offered. Not all invitations were taken up, but participants from Cook Islands, Marshall Islands, Nauru, Niue, Tokelau, Tonga and Vanuatu attended. Standards were high—a welcome bonus as the already compressed course had to be further reduced in duration due to air-schedule problems. Students worked through two Saturdays, a public holiday and, to catch up on difficult subject areas, in sessions with trainers outside normal hours.

Funds to cover logistical arrangements for this workshop came from a designated training fund component of the US Treaty.

SPC training support was provided under the South Pacific Regional Tuna Resource Assessment and Monitoring Project (SPRTRAMP) funded by the European Union. The Forum Fisheries Agency trainer is funded by AusAID. The recognition of the importance of the role of observers in Pacific Island fisheries and the support given are greatly appreciated.



Survival training at observer training courses. The trainers thank participants for resisting urges towards violent revolt. May they continue such dedication in their endeavours to improve the quality of fisheries data available in the region.

Update on the recent work undertaken by the Tuna and Billfish Research Section

The following is extracted from a working paper presented at the 10th Standing Committee on Tuna and Billfish, which was held in Nadi (Fiji) from 16 to 18 June 1997.

1. AGE AND GROWTH OF TROPICAL TUNAS

1.1 Background

Growth parameters are key inputs in assessment models. A growth study of yellowfin and bigeye tuna by otolith reading started in June 1996 with the

recruitment of a biological technician, Bruno Leroy, under the South Pacific Regional Tuna Resource Assessment and Monitoring Project (SPRTRAMP).

Preliminary results have indicated a daily periodicity of ring formation for these two species in the Western Pacific ocean.

The otolith samples (704 yellowfin and 61 bigeye tuna otolith samples) were collected during the Regional Tuna Tagging Project (RTTP). Since laboratory work requires the use of special equipment (microscope, diamond saw, etc.) in a properly-equipped laboratory, it is being done at the French Scien-

tific Research Institute for Development through Cooperation (ORSTOM) centre in Noumea, which has made laboratory space available for this purpose.

1.2 1996–97 activities

Otolith reading of ‘daily’ rings is now routinely carried out. Additional sampling of yellowfin and bigeye otoliths was required, particularly from larger fish, to complete sample sets consisting of at least 20 pairs of otoliths for each 10 cm length class between 30 and 150 cm fork length.

Collaboration with the ORSTOM Centre in Tahiti (programme ECOTAP) made it possible to complete the sampling, with additional samples of 68 yellowfin and 154 bigeye tuna otoliths, during two visits by B. Leroy during which he participated in a scientific cruise aboard the Research Vessel *Alis*.

A total of 190 yellowfin otoliths have been embedded in resin, cross-sectioned, etched and polished to be read under the microscope. Several counts were carried out for each otolith and a reliability coefficient was assigned to it.

The preliminary analysis of these results uses only samples with ‘good’ or ‘fairly good’ reliability, i.e. 79 per cent (N=140) of the total sub-sample. The plot of daily ring numbers in relation to the fork length seems to show a two-stanza growth pattern, a phenomenon already described for that species in the Atlantic Ocean by Gascuel et al. (1992).

As a direct consequence, estimation of the growth parameters is better when only samples with a fork length above 50 cm are used in the regression (see Table 1).

Sexual dimorphism in growth was tested. The difference between growth of males and females is significant, the females showing a higher growth rate than the males. However the absence of samples for females larger than 120 cm result in a poor estimation of L.

To compare and validate our techniques and results, contacts have been made with other laboratories involved in the same kind of work. Preliminary discussions with staff of the Commonwealth Scientific and Industrial Research Organisation (CSIRO [Hobart]) fish-aging laboratory led to a visit to their laboratory in March 1997.

Discussions with Dr John Gunn and his team, who are involved in a growth study of southern bluefin tuna, were useful and enabled us to compare our interpretation of daily rings. A problem arose in our interpretation of the first series of large ‘daily’ rings.

While SPC counts each mark as a daily ring, CSIRO considers many of them (approx. 1 in 2) to be sub-daily rings. This agrees with new, unpublished results, which show a cycle in concen-

tration of chemical constituents of the otolith along the growth axis.

In fact, the correspondence between that cycle and the first rings implies that some of them must be considered to be sub-daily rings. In these conditions we can have a constant bias in our counting of approximately 20–30 days.

But after that first series, we have agreed that every mark we can discern (the thinner are about two microns wide) should be counted.

That seems to be confirmed by the observations made on the few OTC (Tetracycline oxide)-marked otoliths (made by Stequert), which indicate that all the marks have to be taken into account to obtain the number of days at liberty between release and recapture

1.3 1996–97 work plan

The growth study for yellowfin tuna should be finalised this year with a publication, and after revision of our count in the light of the new information on the first daily rings. The analysis will include a comparison of

Table 1: Estimation of Von Bertalanffy’s growth parameters for yellowfin tuna for all samples (A), samples with FL>50 cm (B), females (F) and males (M)

	Parameter	Estimate	Std. Error	95% confidence interval	
				Lower	Upper
A	L	418.7	178.6	65.5	771.9
	K	0.123	0.064	-0.004	0.25
	To	-0.107	0.073	-0.252	0.037
B	L	188.1	37.2	114.18	262.1
	K	0.434	0.168	0.101	0.768
	To	0.312	0.149	0.016	0.609
F	L	246.4	150.4	-56.3	549.2
	K	0.293	0.28	-0.270	0.857
	To	0.253	0.264	-0.278	0.783
M	L	204.5	68.5	66.7	342.3
	K	0.35	0.215	-0.082	0.783
	To	0.201	0.244	-0.290	0.691

K = curvature parameter; To = initial condition parameter

growth parameters with those obtained from tagging data (3,482 recaptures). The study on bigeye has just begun and may be conducted in collaboration with Dr. J Gunn from the CSIRO.

2. ENVIRONMENTAL DETERMINANTS OF TUNA FISHERY PRODUCTION IN THE WESTERN EQUATORIAL PACIFIC

2.1 Background

The study of relationships between tuna and the environment started in 1995, with the objective of investigating the influence of the hypothesised distribution of tuna forage (as inferred from the redistribution of primary productivity using a global ocean circulation model) on catches of surface tuna.

A transport model based on the diffusion–advection equation was developed with monthly average current data for the tropical Pacific (20°N–20°S), then extended to the entire Pacific ocean by means of an ocean general circulation model (OGCM) providing the fields of surface current.

The first results were really encouraging, since they reproduced quite well the distribution of skipjack in the Pacific, particularly the antagonistic east–west distribution in the equatorial Pacific Ocean regarding primary production and tuna

abundance (results presented at the 9th Standing Committee on Tuna and Billfish — SCTB).

In a preliminary analysis, a general linear model (GLM) was used to seek the best relationship between skipjack catches and the environmental parameters, including classic variables used in such studies (sea-surface temperature and salinity, depth of the thermocline, depth of a limit oxygen value), as well as the new, promising tuna forage index.

Results of the analysis confirmed that the distribution of suitable prey is a key factor that interacts with the temperature parameter to define ‘zones of well-being’ where skipjack are abundant (results presented at the 9th SCTB).

The influences of tuna forage and surface temperature were therefore integrated into a population dynamics model for skipjack, to help account for the non-homogeneous distribution of the species.

2.2 1996–97 activities

Since the numerical simulation of the surface tuna forage had proved to be a promising approach, sustained effort was made to improve the model.

This included a critical analysis of the model and a search for the time lag which gives the

best correlation between simulated tuna forage and distribution of skipjack tuna.

The second major area of progress concerns the investigation of the influence of the inter-annual variations (El Niño–La Niña) on the distribution of skipjack tuna in the western and central equatorial Pacific Ocean.

It was demonstrated that the zonal displacements of skipjack abundance within a fishing ground extending over 6,000 km are highly correlated with movement of a convergence at the eastern edge of the warm pool (Lehodey et al., submitted).

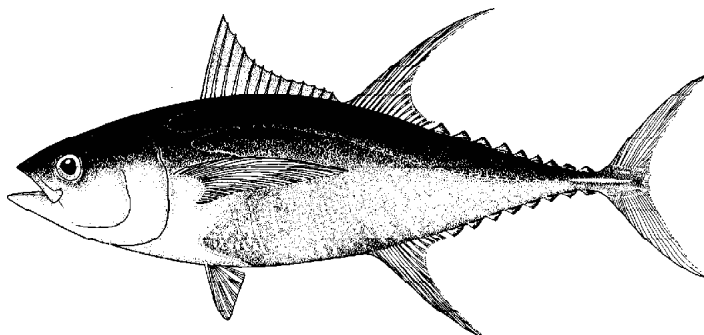
This convergence is induced by the westward advection of cold, saline water from the central–eastern equatorial Pacific encountering an eastward advection of warm, fresh water from the western equatorial Pacific (Picaut et al. 1996); the convergence also shifts in phase with the warm El Niño and cold La Niña events of the ENSO cycle.

These displacements can be identified with different indices (sea-surface temperature and salinity, Southern Oscillation Index), now predictable six months to a year in advance with reasonable probability of success (Chen et al., 1995).

For the tuna fishery, such predictions are of primary importance as they result, among other things, in considerable reductions in searching time and costs, and allow the choice of appropriate ports of call to be made well in advance.

2.3 1997–98 work plan

The critical analysis of the results concerning the simulated surface tuna forage should lead



us to test new OGCM data, as they become available, which reproduce the surface oceanic circulation in the western Pacific more adequately.

With these new simulations, or simply by taking into account the potential bias in the spatial distribution highlighted in that analysis, the effect of other environmental parameters (temperature, oxygen, thermocline) could be re-analysed with a general linear or additive model.

The strong relationship between skipjack tuna abundance, the water-mass convergence at the eastern edge of the warm pool and their drastic displacements associated with ENSO provides an excellent mean of validation for the model of tuna forage simulation.

However real time-series data are needed, rather than the month-averaged data used to date. A first attempt could use the Coastal Zone Column Sensor (CZCS) phytoplankton pigment concentration for the period 1979–84, including the strong El Niño event of 1982–83, but keeping in mind the prob-

lem of incomplete coverage on the oceanic scale of these data.

Furthermore, we should investigate the possibility of using ocean colour data from the new ocean colour sensor, OCTS (Ocean Color and Temperature Scanner), on the Japanese ADEOS satellite, launched in August 1996, or SeaWiFS (Sea-viewing Wide Field of view Sensor), which was expected to be launched in June 1997.

These data would allow us to compare recent surface tuna catches with outputs of the model on a continuous time series, and eventually on an almost real-time basis. The improvements then expected from the model would allow some prediction of fishing conditions some time in advance, and greatly assist our understanding of the dynamics of the western Pacific Warm Pool ecosystem.

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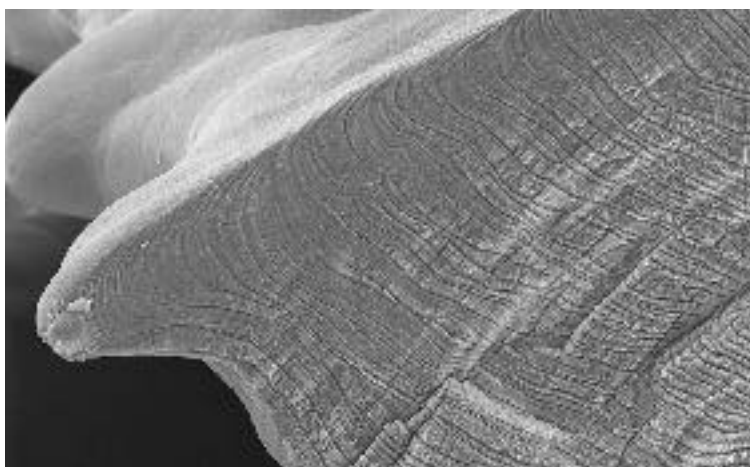
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Scanning electron microscope view of a cross-section of a yellowfin otolith

■ SUMMARY OF THE MEETING OF THE WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

The 92nd Western Pacific Regional Fishery Management Council closed its week-long series of meetings on 25 April 1997, taking action on a comprehensive range of fishery issues and setting forth an active programme for the calendar year.

The Council is the policy-making organisation for management of fisheries in the US Exclusive Economic Zone (EEZ), which is the area between three and 200 nautical miles offshore around American Samoa, Guam, Hawaii, the Northern Mariana Islands and other US possessions in the Pacific.

The Western Pacific Council is one of eight in the US and is unique in that it manages and regulates fisheries in an area of water equivalent to about one-half of all the ocean waters under federal jurisdiction.

As was evidenced by the 92nd Council Meeting, fish and fisheries remain extremely important to the diverse cultural mix of people that make up the populations of the islands in the Western Pacific region.

The first series of meetings was conducted by the Council's Advisory Panels on 21 April. There is an Advisory Panel, or AP, covering each of the Council's four Fisheries Management Plan areas: pelagics, bottomfish, crustaceans and precious corals. APs meet regularly throughout the year and provide input and recommendations to the Council's deliberations and decision-making. AP members are taken mainly from persons involved in the particular sector.

Thus, the Pelagics AP is made up predominantly of people who make a living from fishing, processing, or marketing tunas and billfish, as well as people representing related interests such as sportfishing and charter boat operations. The AP meetings addressed a diverse range of issues and then forwarded recommendations for the full Council's deliberations.

The Council's various Standing Committees then convened on 22 and 23 April, providing specialised reviews of each fishery management plan, ecosystems and habitat, fishery rights of indigenous people, and enforcement. These committees also develop recommendations for Council action.

On 8–10 April, the Council's Scientific & Statistical Committee (SSC) met in Honolulu to develop recommendations in anticipation of the 92nd Council Meeting.

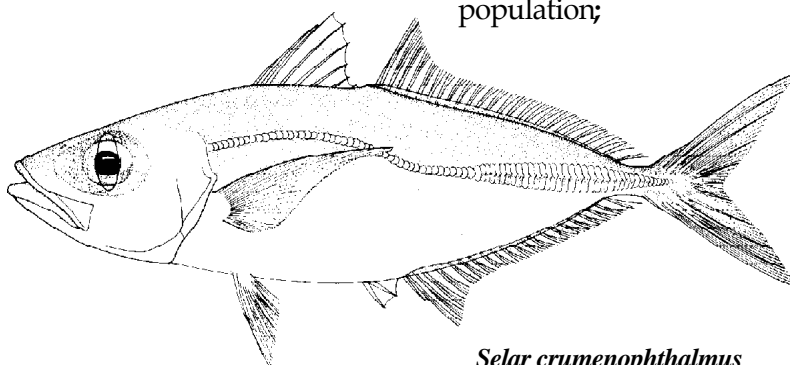
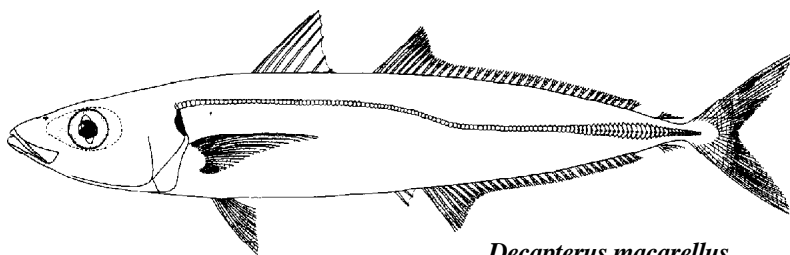
The SSC is composed of scientists and specialists from federal, state, and territorial agencies, academic institutions and other sources. Its members represent a range of academic disciplines, which are necessary in preparing and reviewing fishery management plans. The recommendations from the SSC meeting were included in the Council's agenda.

From 24 to 25 April, the full Council met and approved a wide range of actions. These included:

- Requesting that the Council be designated as the lead agency on any federal fisheries matters within the proposed humpback whale sanctuary for Hawaii;
- Reaffirming its agreement with the opinion that there is no clear evidence that the (whale) sanctuary will materially contribute to recovery of the whale population and that research goals do not clearly show what data are lacking now or what data are important to collect;
- Recommending that the lobster harvest quota for the Northwestern Hawaiian Islands (NWHI) for the subsequent year be announced 90 days after the close of the current season, and the lobster season be opened earlier, on 1 June each year;
- Requesting that the National Marine Fisheries Service (NMFS) provide funding and support for a voluntary observer programme for the 1997 NWHI lobster season;
- Requesting that the NMFS expedite the Vessel Monitoring System (VMS) for the NWHI lobster fishery by 1 July;



- Requesting NMFS Enforcement to open a local 'Hotline' in American Samoa, Guam and the Northern Mariana Islands, because the toll-free number established for the rest of the US is not available in these areas;
- Commending the Hawaii Division of Aquatic Resources for its efforts to manage the bottomfish fishery around the Main Hawaiian Islands and recommending speedy development and implementation of the management regime;
- Continuing development of the Council's back-up plan to manage **onaga** (*Etelis coruscans*) and **ehu** (*Etelis carbunculus*) stocks in the EEZ around the main Hawaiian Islands;
- Investigating non-harmful techniques to reduce the interaction between dolphin and bottomfish fishermen;
- Obtaining more, better information on seamounts and banks around American Samoa;
- Requesting NMFS to study bottomfish around the Northern Mariana Islands to establish whether bottomfish stocks are overfished;
- Finalising the limited-entry rules for bottomfish vessels in the Mau Zone of NWHI that will lead to a reduction in the fleet size;
- Extending the moratorium on the Hancock Seamount armorhead fishery for another six years while convening a meeting of experts to discuss international management of the entire fishery under the UN Agreement on Straddling Fish Stocks;
- Allowing the affected longline and handline fishermen to resolve their own differences and establish co-existence at the Cross Seamount fishery;
- Collaborating with longline fishermen to use techniques and devices that will reduce or eliminate the accidental taking of albatrosses, and to remove and return leg bands from dead birds to the US Fish & Wildlife Service without reprisal;
- Requesting NMFS scientists responsible for the Section 7 opinion on marine turtles to make a presentation on how they arrived at the allowable take-and-kill levels for the Hawaiian longline fishery;
- Requesting a ruling from NMFS on the exact interpretation of the Marine Mammal Protection Act section concerned with dolphin/whale interaction and its effects on all pelagic fisheries in the Council's jurisdiction;
- Studying the feasibility of implementing an electronic vessel monitoring system (VMS) for all US- and non-US-registered vessels operating out of American Samoa. Should a programme be approved, it would be supported with funding from the federal government;
- Establishing a Small Boat Working Group for American Samoa and the Northern Mariana Islands (NMI) to address concerns of fishermen and to conduct training workshops in the NMI to help fishermen improve their pelagic fishing skills;
- Conducting a study of how ocean recreation activities might be adversely affecting the **akule** (*Selar crumenophthalmus*) and **opelu** (*Decapterus macarellus*) fisheries around Hawaii, with the possibility of extending the study to American Samoa, Guam and the NMI;
- Studying the influence of purse seining for **akule** and how the removal of an entire school by such methods affects the gene pool of the population;

*Selar crumenophthalmus**Decapterus macarellus*

- Investigating the feasibility of recommendations from the Native & Indigenous Rights Advisory Panel, including:
 - allowing indigenous people of the US Pacific Islands to harvest sea turtles for home consumption and cultural purposes, provided such practices do not endanger the resource;
 - allowing indigenous people to enter federal, state, territorial and commonwealth marine conservation areas and sanctuaries to harvest marine life for home consumption or cultural purposes, as long as it is consistent with the overall conservation and protection objectives;
 - allowing only indigenous people of American Samoa and permanent residents currently active in local commercial fishing to fish within 50 nautical miles of shore and limiting the size of such fishing vessels to 10 gross tons or less in order to protect local, pelagic and bottomfish fisheries;
 - requiring all foreign vessels fishing within the EEZ of any US Pacific Island to carry a Council-endorsed Vessel Monitoring System;
- allowing indigenous US Pacific Islanders access to all shoreline recreational areas currently under US military jurisdiction or under other federal jurisdiction;
- imposing a tax on shark fins sold in the US Pacific Islands, with the monies generated to support market development for other shark products;
- obtaining all topographic and marine resource assessment surveys conducted in the Council's EEZ;
- Sponsoring a meeting of the Native & Indigenous Rights AP prior to the next Council meeting in order to address any outstanding issues;
- Budgeting US\$50,000 to expedite Council activities promoting indigenous fishing rights, practices and opportunities;
- Amending the Precious Corals Fishery Management Plan to establish a framework mechanism to allow the Council to adjust management measures as new information becomes available;
- Recommending that the appropriate agency investigate the importance of black coral as a juvenile fish nursery; and
- Establishing an International Affairs Standing Committee, primarily to work with Pacific Island Nations and Distant Water Fishing Nations on the management of highly migratory fisheries.

The Council's various plan teams will now meet to review the actions taken by the 92nd Council meeting and develop its recommendations in preparation for the next Council meeting on 18–22 August 1997.

The Western Pacific Fishery Council is made up of 16 members (13 voting) representing the Territories of American Samoa and Guam, the State of Hawaii, the Commonwealth of the Northern Mariana Islands, and various federal agencies. It is chaired by Jim Cook, a Hawaii commercial fisherman. Vice-chairpersons are: Paul Bordallo (Guam), Arnold Palacios (CNMI), William Paty (Hawaii) and Dr Paul Stevenson (American Samoa).

(Source: Mark Segami, WPFMC Public Information Officer)



■ ADB ASSISTANCE TO THE FISHERIES SECTOR IN PAPUA NEW GUINEA

ADB's recent assistance to NFA

In October 1996, the Government of Papua New Guinea (PNG) asked the Asian Development Bank (ADB) for an Advisory Technical Assistance (TA) programme to assist in further capacity-building and policy reform in the fisheries sector.

The Government and the Bank had previously agreed that this

TA would comprise much of the preparatory technical assistance that would help in preparing the previously proposed Sector Development Program (SDP) Loan. The SDP Loan is a new loan modality that combines three traditional assistance vehicles—the project loan, the programme loan and technical assistance.

In response to the Government's request, the Bank fielded

a fact-finding mission in November 1996 to discuss the objectives, scope, cost estimates, financing plan, and implementation for the TA with the concerned Government agencies.

A Bank-funded comprehensive sector study had been undertaken earlier, with a final report in December 1995. The sector study reviewed policy issues, sector and environmental issues, and institutional develop-

ment needs. Further sector studies have been undertaken on fisheries credit, vessel viability, Human Resources Development (HRD) needs, and surveillance needs. A beneficiary profile and a review of gender issues were prepared at that time.

A benchmark, socio-economic profile was also prepared and the methodology for project monitoring and evaluation suggested. Those earlier efforts provided much of the direction for further capacity-building and resource policy reform.

The Bank and other donors have assisted capacity-building and policy reform. One Bank-financed TA was concerned with strengthening the Department of Fisheries and Marine Resources (DFMR) which coincided with the formation of National Fisheries Authority (NFA) as the key agency in fisheries industry management and development.

This assistance was continued in the form of the provision of a Senior Fisheries Adviser. Assistance to NFA included the drafting of a Corporate Plan, restructuring NFA, drafting a fisheries policy, redefining the National Fisheries Training College, establishing a Trust Account, commencing the compilation of an Asset Register, and establishing close relations with the industry in the interests of lobbying for fisheries reform. All these efforts need to be continued with a view to establishing a semi-autonomous, self-financing, and more effective fisheries resource management institution.

ADB's future advisory technical assistance

The objectives of the technical assistance are to:

- (a) help consolidate the status of NFA as an efficient and effective, self-financing, appropriately staffed, and semi-autonomous agency managing the sustained development of the fisheries public resource and generally supporting industry development in the interests of the industry, investor, employee, government, and public at large;
- (e) complement and facilitate other donor support in the areas of HRD, surveillance, management information, monitoring, research and financial management.

It is intended that the self-financing status to be reached by NFA by the end of this TA will enable the authority to increasingly self-finance this kind of assistance.

To meet the TA objectives, individual consultants will be recruited by the Bank in the areas of fisheries management, fisheries industry development, corporate finance, and corporate law. These consultants will assist in further defining institutional strengthening, including possible incorporation, further improving the professional management of NFA, and incorporating NFA if and when required.

All consultants will be highly qualified and have suitable relevant experience. Every effort will be made to recruit recognised consultants with relevant experience in PNG, in the industry, and with matters of incorporation in PNG.

The consultancy services will total twenty-five person-months, including fourteen for a senior fisheries management specialist, five for a senior fisheries industry development specialist, four for a corporate accountant and two for a corporate lawyer.

If this assistance is approved at the Board level in ADB, the TA could get underway in mid-1997 and be completed by mid-1999.

(Source: *Fisheries Newsletter*, National Fisheries Authority PNG, Volume 2, No.2, December 1996)



- (b) help further strengthen the institutional capabilities of NFA in the specific areas of resource management and industry support;
- (c) help further define industry investment needs and further improve the policy environment in support of competitive and sustainable fisheries development;
- (d) help draft clear and consistent individual fishery management strategies and plans in support of the combined interests of all industry participants and sustained resource development; and



■ CANADA'S FISHERMEN PLUNGE BACK INTO DEEP WATER

Just four years after a lack of fish closed the cod fisheries on Canada's east coast, the government has decided to allow limited fishing to resume. But many fisheries scientists say that there is no evidence that stocks have recovered.

Over the next year, fishermen will be permitted to catch 10,000 t of cod off the South coast of Newfoundland, 6,000 t in the northern gulf of the St. Lawrence and 2,000 t in the southern Gulf.

The Fisheries Ministry, which announced the quotas last week, says it based its decision on recommendations of the Fisheries Resource Conservation Council (FRCC), a government-appointed body of fishermen, industry representatives and academics. Last year, the FRCC suggested that the fisheries could be re-opened if strict controls and enforcement procedures were put in place.

But the move has been heavily criticised. 'The reopening of the fisheries is completely irresponsible,' says Ransom Myers of

Dalhousie University in Halifax, Nova Scotia, and until three weeks ago a government scientist with the ministry. 'There is no indication from our best estimates that these stocks have increased.' He warns that population growth in cold water is very slow: the fish do not mature until they are seven years old, compared with about four years for warmer-water stocks.

William Doubleday, who heads the Science Unit within the Fisheries Ministry, calls the quotas 'quite conservative.' They are only a fraction of what was being caught in the 1980s, he says, and points out that the fishery off north-eastern Newfoundland, which was the biggest, supplying about half the cod fished from the Canadian Atlantic, remains closed.

But he admits that the Ministry does not have reliable population estimates for the fisheries now being reopened. 'We can't say there has been a substantial recovery,' he says, but adds that the fish that are there appear to be more healthy.

In 1992 and 1993, when the fisheries were closed, some fish were 'so thin that some may have died during the winter'.

Most scientists agree that in the early 1990s, unusually harsh temperatures may have stunted the fishes' growth. What it not clear, says Doubleday, is why the young fish are apparently not surviving as well as they should. 'The number of spawners is low, but not low enough to explain the number of survivors,' he says.

Fred Mifflin, Canada's Minister of Fisheries and Oceans, says that fishing will stop if there is evidence that stocks are suffering. But critics claim the decision to open the fisheries may be political. They point to a looming federal election, and the government's desire to attract votes in fishing communities.

(Source: *New Scientist*, 26 April 1997)



■ INFOFISH — TUNA 97

The Fifth World Tuna Trade Conference will be held at the Central Plaza Hotel, Bangkok from 25 to 27 October this year. TUNA 97 is organised by INFOFISH in collaboration with FAO-GLOBEFISH, Department of Fisheries Thailand and Thai Food Processors' Association.

The latest in a series of INFOFISH Tuna Conferences, the forthcoming event will be addressed by nearly twenty-five speakers, including industry leaders, experts and policy makers. They will present topics of vital im-

portance to the tuna industry and trade in four sessions. Wolfgang Krone, former Assistant Director-General a.i., FAO will be the keynote speaker and Conference Chairman.

James Joseph, Director of the Inter-American Tropical Tuna Commission (IATTC) will speak on the tuna resources and outlook in the first session focusing on global overview. Joji Morishita, Deputy Director, Japan Fisheries Agency is also a confirmed speaker for this session. A presentation on market-

ing strategy development for tuna products by Henk Brus, Vice-President, MCM Foods, Netherlands, is another highlight of this session.

Industry situation and outlook in major supply sources will be examined in two sessions where prospective speakers from Indonesia and Thailand will be making presentations.

The tuna situation in the Philippines will be presented by Francisco Tiu-Laurel, Jr., Vice-President, Frabelle Fishing Cor-

poration. The Japanese tuna industry situation, with special emphasis on cultured tuna, will be assessed by Katsuo Taya, Tokyo University of Fisheries. Peter Wilson of Global Oceans Consultant, Hawaii will take a close look at the tuna industry in the small Island countries in Asia and the Pacific.

Paul Antonietti, Saupiquet, France, will speak on the tuna industry situation and outlook in the Western Indian Ocean as well as West Africa. The tuna industry situation in Taiwan will be presented by Peter Ho, President, Overseas Fisheries Development Council of Taiwan.

Among other topics presented by prospective speakers in this session is the tuna industry situation in Latin America, by Luis San Miguel, President, Caribbean Fishing Trading, Panama.

Session three will deal with products, markets and marketing. An overview of tuna markets by Helga Josupeit, FAO-GLOBEFISH will be followed by a presentation on legal and

pricing strategy for Japanese tuna markets by Steve Williams, University of Queensland, Australia. Jose Munoz, Jr., President, LMR Fisheries Research, USA will cover the US markets for non-canned tuna products. Walter Anzer, Secretary General, BACFID will speak on the European market for tuna, including issues related to import regulations for canned tuna.

Ryuichi Tanabe, President, Japan Far Seas Purse Seine Fishing Association and former Executive Director of Japan Marine Products Importers Association will speak on Japanese canned tuna markets and will be followed by a presentation on emerging Asian markets for tuna by Fatima Ferdouse, INFOFISH. An update on pet food products from tuna and markets will be presented by Lawnin Crawford, General Manager, Purina Japan in the same session.

Technological, quality and trade issues will be the focus of Session four. The highlight of the session is a presentation by Mary Sender, Food and Drug

Administration (FDA) CFSAN, USA on Hazard Analysis and Critical Control Points (HACCP) for canned tuna.

Other topics slotted in include application of HACCP in tuna industries in developing countries by Dan Brooks, International Food Technology, Thailand. Presentations on the latest developments in tuna filleting and handling and bulk transportation of tuna and trade barriers are among the topics included in this session.

Each session will be followed by a panel discussion. Day one will have morning and afternoon sessions, while afternoons will be kept free on Days two and three. The Conference will feature a video film on tuna processing and fishing as well as catalogue display. Post-conference optional tours to tuna canneries are arranged.

(Source: INFOFISH) 

■ THIRD SPREP MEETING ON CLIMATE CHANGE AND SEA LEVEL RISE IN THE PACIFIC

Pacific Island countries and territories (PICTs) are particularly vulnerable to climate variability change, and sea-level rise, due to their physiographic, ecological, socio-economic and cultural characteristics.

With assistance from the United Nations Environment Programme (UNEP) Ocean and Coastal Areas Programme, the governments of Australia, USA, Denmark and Japan, the Commonwealth Secretariat and the region's scientists, PICTs mandated the South Pacific Regional

Environment Programme (SPREP) as the regional organisation to coordinate climate-change activities in the region. Since then, numerous projects and activities have been implemented.

Amongst these activities, SPREP organised the last two Intergovernmental Meetings on Climate Change and Sea Level Rise in the Pacific (Majuro, Marshall Islands, July 1989 and Noumea, New Caledonia, February 1992). A regional climate-change programme was developed in 1991

and is being implemented by SPREP. The objective of the SPREP climate-change programme is to understand and respond to climate change, particularly through integrated coastal management.

This third Climate Change and Sea Level Rise Meeting is organised by SPREP in collaboration with ORSTOM (the French scientific research institute for development through cooperation) and with local support from the South Pacific Commission. The Meeting will be held

from 18 to 22 August 1997 in Noumea, New Caledonia. It is aimed at decision makers, senior governmental and planning officials from all SPREP member governments and administrations, and media and NGO representatives from in and around the region.

SPREP and ORSTOM will coordinate and invite resource people from international organisations (i.e. the Intergovernmental Panel on Climate Change (IPCC), the World Meteorological Organisation (WMO), the Intergovernmental Oceanographic Commission (IOC), UNEP) working in this region, regional institutions (i.e. ORSTOM, the University of the South Pacific (USP), the South Pacific Applied Geo-Science Commission (SOPAC), the Forum Secretariat, the South Pacific Commission (SPC), the University of Papua New Guinea (UPNG), etc.), relevant



scientists, planners and policy advisers to assist in achieving the objectives of this meeting.

In addition the Meeting will enable participants to exchange ideas, information and foster working relationships between scientists and governments of the region.

The main objectives of this meeting are to:

- Review the results of the latest scientific developments in particular, reports of the IPCC Working Groups and their implications for the region, and opportunities to advance the understanding of climate change;
- Review the results of climate-change activities relevant to the Pacific region, such as:

- (a) Tropical Ocean and Global Atmosphere (TOGA), Coupled Ocean Atmosphere Response Experiment (COARE), South Pacific Sea Level and Climate Monitoring Project, Atmospheric Radiation Measurement (ARM), Intergovern-

mental Oceanographic Commission (IOC)/UNESCO, Joint Global Ocean Flux Study (JGOFS) and other regional scientific research and activities,

- (b) Meteorological Programmes including the South Pacific Meteorological Project, WMO/CLICOM activities,

- (c) SPREP reports and studies;

- Update participants on the ongoing UNFCCC negotiations.
- Identify the needs of PICTs and raise their awareness and understanding on the climate-change issue in order to facilitate policy development;
- Strengthen and enhance co-operation between international organisations, such as the Intergovernmental Oceanographic Commission (IOC)/UNESCO, the World Meteorological Organisation (WMO) and United Nations Environment Programme (UNEP) with SPREP member countries.

(Source: SPREP/ORSTOM)



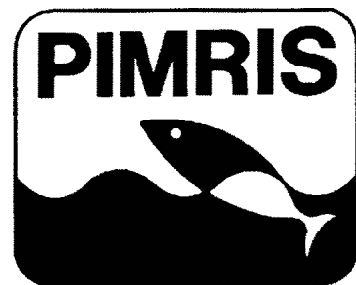
■ MARINE DOCUMENT ACCESS VIA INTERNET

The Pacific Islands Marine Resources Information System (PIMRIS) at USP Library has successfully completed a trial project on the use of Internet to receive documents from marine institutions outside the region. The Document Delivery Project proper, the first of its kind at USP, was launched on Friday 16 May, thanks to the International Association of Aquatic and Marine Sciences Libraries and Information Centres (IAMSLIC) Grant which enabled PIMRIS to establish itself as a document receiving station.

The Coordinator of PIMRIS, Ganeshan Rao, explained that the project required a specific technical setup which connects a workstation onto the Internet with its independent Internet Protocol (IP) address.

The project uses a specific software—ARIEL for Windows, the document transmission system from the Research Libraries Group (USA). ARIEL runs on MSDOS as well as Windows machines. With this software, a 486+ computer, a Hewlett Packard (HP) laser printer and


HP flatbed scanner, images or any printed page can be scanned into the computer and a file sent via Internet to another site with an "Ariel workstation". The image or file is received at the destination site and printed.



ARIEL software provides a fast, inexpensive, and high-quality document delivery. Although it integrates scanning, transmitting, receiving and printing into a single system, in view of the immediate needs and funding limitations, PIMRIS has opted to become a 'receive and print only' station. However, Mr Rao anticipates that the project will eventually grow to include scanning and transmitting. 'This new development at USP Library can also facilitate its Inter-Library Loan services,' he said.

PIMRIS has established reciprocal arrangements with a number of marine science institutions outside the region for information exchange. In the beginning, the Project will assist PIMRIS to receive documents at no cost from Scripps Institute of Oceanography, Marine Science Institute (University of Texas at Austin) and University of Hawaii Science Library. It is likely that other institutions which are associated with IAMSLIC and have ARIEL stations will offer their services to PIMRIS.

During the trial phase of the Project the main partners who cooperated with PIMRIS were Scripps Institute of Oceanography (University of California at San Diego), University of Hawaii—Science Library, and Research Libraries Group (USA). Advice and expertise on technical work was provided by the USP Computer Centre.

(Source: *The University of the South Pacific Bulletin*, Volume 30, No: 14, 23 May 1997) 

■ SCIENTISTS DEVELOP OCEANIC SOFTWARE

Scientists have developed a way to track elusive fish in the ocean around the Hawaiian archipelago. The information could lead fishermen to bigger catches and help fishery managers preserve and build up resources.

A group led by Jeff Polovina, ecosystem environmental investigations director at the National Marine Fisheries Service's Honolulu Laboratory, developed a software to make maps of ocean features similar to these of land topography with hills and valleys.

For the first time, he said, they are able to plot eddies, currents and other ocean features, monitor their changes and see how they affect fish movements. They are using data from the Topex-Poseidon satellite, which measures the ocean's height within an inch. Topex-Poseidon spins around Earth every 10 days covering the ocean, and the information is on the Internet tool.

National Marine Fisheries Service's fishery biologist Don Kobayashi said, 'We can basically do a new map every 10 days, and within these maps we are able to predict where things might end up, how features are moving.'

Companies have approached the scientists for help in developing and using research technology commercially, Polovina added.

Hawaii's longline fishery has grown over five years into a US\$ 50 million-a-year operation, primarily for swordfish to the north and bigeye and yellowfin tuna around the Hawaiian Islands, he said.

Kobayashi said the team is concentrating on use of the satellite data to understand the swordfish fishery in the northern part of the archipelago. 'If swordfish are following areas of good food, that can also have an effect on where they will end up.'

A subtropical front weakened in the swordfish grounds in 1994-95 but is stronger now, he said. 'We can see these features and send them out to look at what's going on in the whole water column.' Until now, he said, 'there was no way to know if you were sitting in the middle of one of these things.'

Measurements below the ocean surface and information collected on plankton and other sea life will help his group calibrate calculations of currents

and interpret the features, he said. The researchers also are getting a better picture of circulation around the Hawaiian Islands and the impact on larvae distribution, Polovina said.

For long time, for instance, they wondered about lobsters, he said. 'Where do larvae go? Are they swept away?' The larvae float around for one year in the ocean, so the pattern of currents is important, he said. The group used satellite data for a computer simulation program to show where the larvae would end up a year after leaving Maro Reef and Necker Island.

The information is valuable for fisheries management because it indicates that some islands could be harvested heavily while others, with few larvae, may take a long time to rebound, he said.

The scientists are also applying the data to study the range of turtles, sharks, tunas, swordfish and other animals, and where they go to eat, whether the fishery is changing because of habitat variabilities and if there is overfishing, Polovina said.

(Source: *Star Bulletin*) 

PACIFIC ISLAND COUNTRIES AND THE AQUARIUM FISH MARKET

INTRODUCTION

The marine aquarium-fish market is supplied through international trade in fish captured live in their natural environment, as very few ornamental sea fish breed in captivity. This difficulty is linked to their early life history when the fish are larvae a few millimetres in length, living in the open ocean.

Larvae develop in this environment for two weeks to three months. The life cycle of coral reef fish therefore consists of two stages, i.e. a planktonic larval stage in the ocean, followed by juvenile and adult stages on the reef. As marine fish harvesting (100 t annually worldwide) is still based on collection in the natural environment, the impact of gathering ornamental fish appears low in comparison to fishing, although it does account for millions of specimens.

THE MARINE AQUARIUM FISH MARKET

Marine fish represent approximately 20 per cent of a total world ornamental fish market worth three billion dollars annually (Andrews, 1990). The unregulated economies of the exporting countries, which are often also developing countries, make it difficult to obtain quantitative data about the species exploited for the aquarium-fish trade.

In addition, control in importing countries is often limited to packaging, which prevents

by Vincent Dufour¹

monitoring of the exact number of fish. Estimates are made from the total weight, including water, of imported packages (Sieswerda & Marquardt, 1995).

The aquarium fish trade has probably doubled since the early 1980s and salt-water fish account for a growing proportion of this activity. There are three main reasons why the market has developed:

- 1) improvement in farming techniques and in aquarium equipment,
- 2) within the flourishing pet business, aquariums represent decorative and exotic ecosystems attractive to residents of temperate countries who spend long periods indoors, and
- 3) increase in air traffic (a major factor). Since 1980, increased tourism to tropical countries has led to more flights to and from exporting countries, making the supply of ornamental marine fish more diversified and less costly.

IMPORTING COUNTRIES

The largest importers of ornamental fish are the United States, the United Kingdom, Germany, France and Italy. In

Asia, Japan is a major importer and China also has a tradition of keeping ornamental fish. The retail turnover of ornamental marine fish in the United Kingdom was worth £ 4.10 million in 1987, with an import value (CIF) of £ 1.10 million (Andrews 1990; Wood, 1992).

EXPORTING COUNTRIES

We identified the destinations of three different exporting countries (Table 1). The USA was followed by some European countries: the United Kingdom, Germany, France, Italy. There was little variation in percentages between these destinations. The strong ties which exist between the United Kingdom and the three countries studied explains the high proportion of exports it accounted for.

INTERNATIONAL REGULATIONS

The international trade in wild animals, which is governed by the Washington Convention (CITES) has not yet endangered ornamental marine fish. However, some endemic ornamental fish species could be wiped out if large-scale harvesting were carried out in their restricted habitats. Sea-horses, whose large-scale harvesting was recently revealed, are probably responsible for a growing awareness of the risk of extinction facing some reef fish species (Vincent, 1996).

MARINE AQUARIUM FISHERIES IN ISLAND COUNTRIES

The impact of aquarium fisheries on natural populations has been studied in detail only in the Maldives Islands, by Edwards and Shepherd (1992). Fish were harvested from an area of reef in a radius of 15 km from the capital, Malé. Almost

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Table 1: Destinations and trade percentage for marine fish exported from Sri Lanka (Wood, 1985), the Maldives (Edwards & Shepherd, 1992) and Singapore (Wood, 1992). The reference year is given in parentheses

SRI LANKA (84)	800*	MALDIVES (86)	233**	SINGAPORE (89)	4,190**
United Kingdom	22%	Sri Lanka	69%	USA	31%
USA	20%	United Kingdom	14%	United Kingdom	18%
RFA	15%	RFA	6%	Germany	8%
Italy	9%	France	5%	Italy	8%
France	7%	Singapore	3%	France	7%
Belgium	7%	USA	1%	Switzerland	5%
Singapore	5%	Japan	1%	Japan	4%
Others	15%	Others	1%	Others	19%

* Value (£'000,000)

** Quantity (thousands of fish exported).

Table 2: List of fish species exported from the Maldives in quantities (specimens per year) greater than the theoretical yields in the fishing areas

Species	Quantities exported
<i>Chaetodon auriga</i>	1,840
<i>Chaetodon lunula</i>	230
<i>Chaetodon unimaculatus</i>	60
<i>Chaetodon xanthocephalus</i>	1,320
<i>Apolemichthys trimaculatus</i>	330
<i>Pterois antennata</i>	230
<i>Pterois radiata</i>	1,910
<i>Balistoides conspicillum</i>	80
<i>Rhinecanthus aculeatus</i>	1,570
<i>Coris formosa</i>	100
<i>Macropharyngodon bipartitus</i>	49,110
<i>Novaculichthys taeniourus</i>	1,860

Table 3: Number of specimens caught and value of the four main species of marine organisms concerned by the aquarium fish trade in the State of Hawaii in 1994

Species	Quantities caught	Value (US\$)
<i>Zebrazoma flavescens</i>	199,359	318,262
<i>Ctenochaetus strigosus</i>	22,512	32,092
<i>Acanthurus achilles</i>	17,824	71,000
<i>Zanclus cornutus</i>	11,617	34,145
Total	251,312 *	455,499 **

* 59 % of total quantities exported

** 54% of total value of exports

100,000 fish were being gathered annually in this zone (1 specimen/year/100 m²), but this figure was very low for the Maldives as a whole.

According to the abundances observed at fishing grounds and the number of specimens exported annually per species, 27 species seem to be threatened with overfishing and 12 of these species are being exploited at a rate equal to or higher than estimated yields, even if some are only collected in small quantities (Table 2).

From the economic point of view, the study revealed both a turnover of 600,000 French francs (FOB value) and 25 full-time jobs. The price of fish varied by a factor of 100 depending on the species (average: US\$ 2.43). The study pointed out that the average price of fish increased by a factor of seven between 1980 and 1989.

HAWAII

In 1994, 430,000 ornamental fish were collected in Hawaii. Of the 210 species captured, four accounted for 71 per cent of the total number of specimens (Table 3). Two-thirds of the fish

were sold locally to exporters or retailers (Miyasaka, 1991; 1994). The fish caught were valued at US\$ 850,000 (US\$ 1.97 per fish). In 1994, 220 commercial licences were issued, but fishing and trading represented less than 100 full-time jobs.

SRI LANKA

A study carried out in 1984 (Wood, 1985) gave a list of the fish exported from Sri Lanka which included 29 species of Chaetodontidae, 13 of Labridae, 11 of Balistidae, 10 of Pomacentridae and 9 of Acanthuridae. The estimate given was 200,000 fish exported annually, equivalent to a turnover of US\$ 600,000 to US\$1,200,000 (FOB). The number of jobs was estimated at less than 500, many of which were probably only occasional.

PUERTO RICO

Sadovy (1992) reports that 160,000 to 200,000 ornamental fish are harvested annually around the island and exported. Five fish species account for two thirds of the exports: *Gramma loreto*, *Opistognathus aurifrons*, *Holocanthus tricolor*, *Pomacanthus paru* and *Balistes vetula*. The author estimates that some species are already being overfished. This activity has created about 70 jobs, including 40 full-time ones.

PHILIPPINES AND INDONESIA

Few data are available on these two countries, although they are the two largest exporters of ornamental marine fish in the world. In the Philippines, this trade increased by a factor of 20 between 1970 and 1979 and continued to expand until 1990, with more than a million fish exported. It seems to have stagnated in the meantime due to

the negative effects of cyanide fishing (Hingco & Rivera, 1991). More than 2,500 people were thought to participate in this activity. Indonesia exports ever-increasing numbers of ornamental marine fish. Damage to fishing grounds, by either increased cyanide fishing or overexploitation, is now posing severe problems in that country (Dayton, 1995).

TECHNIQUES USED TO HARVEST ORNAMENTAL FISH

Destructive fishing methods are currently the most serious problem for this sector. In the Philippines, fishing with sodium cyanide is prohibited, but is still used in 80 per cent of cases (Hingco & Rivera, 1991). This poison kills many fish during fishing or in the weeks that follow and is also dangerous for the fishermen themselves.

Courses to train fishermen in other techniques are being tried. Amongst the other toxic substances used to harvest ornamental marine fish are organophosphorous insecticides, quinaldine, chlorine, diesel fuel and dynamite (Randall, 1987, Sadovy, 1992).

Quinaldine is thought to carry a risk for the divers' thyroid glands. Although some people do not see any disadvantage in using quinaldine, Australian scientists, for example, now use other alternative substances.

But all the various chemical substances put in the water to harvest ornamental fish have been shown to be harmful, either to the environment or to the fish or the fishermen. We strongly urge that any use of synthetic chemical products or natural substances to collect ornamental fish be banned.

Of the other fishing techniques used, the barrier net is best. This is a 2 m high net, 10 to 15 m long, with a mesh size under 2.5 cm (Randall, 1987). Hand nets or dip nets are used for fishing with diving equipment, as they are selective.

There is also a large variety of traps and scoop nets which can be used to catch ornamental marine fish. Care should be taken to ensure that live coral is not knocked over or broken by fishermen who want to capture the ornamental fish which hide there.

Only nets with a mesh size under 2.5 cm should be used, as many small species are likely to be injured by bigger mesh. Stationary nets, dip nets, scoop nets and breathing apparatus may all be permitted.

CHOICE OF SPECIES AND QUANTITIES HARVESTED

If harvests remain localised they do not endanger the natural stock, because it can be replenished through the movement of fish from adjacent areas or through colonisation by fish larvae from the ocean (Couchman & Beumer, 1992; Edwards & Shepherd, 1992; Randall, 1987; Wood, 1992).

For that reason, it is preferable to have an 'after-the-fact' inspection of fish which have already been captured, to record the species, fishing ground location and harvesting conditions (dates, methods, etc).

Study of natural stocks of ornamental fish should only be considered if fishing activity increases significantly. However, in order to avoid any possible risk of overfishing, the precautionary approach (Garcia, 1994) should be taken, so as to define

Table of regulatory methods used in the main ornamental fish exporting countries

temporary fishing quotas for ornamental fish with high commercial value and low abundance on the reef.

These quotas should be applied on a species-by-species basis (e.g., annual harvest of 100, 1000 or 10,000). The quotas could be increased after verification that the natural stocks of the various species are not threatened if they are exceeded. In a similar manner, a quota could be set for endemic species, when they are sufficiently abundant.

LIMITS TO THE MANAGEMENT OF FISH STOCKS

A pre-requisite of stock management is an estimate of the population from which harvesting will occur, followed by a count of the number of fish harvested.

However, fish abundances sometimes contradict harvest forecasts based on estimated stocks, even with commercial fishing. One of the principal factors in the natural fluctuation of ornamental marine fish stocks is the number of larvae colonising the reef, which represent true natural fish production.

As fishing for the aquarium trade is based on the number of specimens and not on biomass, the colonisation rate could yield a theoretical maximum harvest.

However, for many species, the number of larvae colonising



any given island in any one year depends on how well the larvae survive in the ocean and cannot be used to predict figures on another island or even for the following year. On a smaller scale of time and space, the colonisation rate is more easily predictable by species (Dufour & Galzin, 1993).

Also, the mortality rate for young reef fish, which is very high on the reef during this period, decreases rapidly. The number of very young fish colonising the reef is therefore much higher than the number of adults already settled in the reef (Dufour et al., 1996).

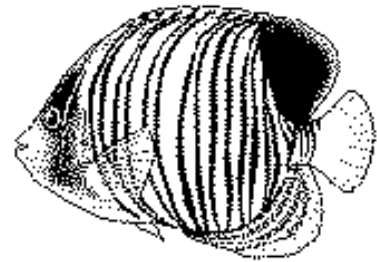
In contrast to the normal fishery management methods, which optimise biomass and not the number of specimens harvested, it would be preferable in this case to collect the fish as young as possible, since about 90 per cent of them will disappear before adulthood. This practice would conserve the stock of adult fish, which are the natural producers of these larvae. But little is yet known about very young fish, which are difficult to catch alive.

SMALL ISLAND COUNTRIES' PARTICIPATION IN THIS TRADE

Collection of ornamental fish and lagoon fisheries

Aquarium-trade fish species are not those normally harvested for food, which enables diversification of the species targeted (Couchman & Beumer, 1991; Edwards & Shepherd, 1992). Collection of ornamental fish can also help diversify fisheries, without any particular effect on the resources which are already being exploited.

Conflicts of interest are, however, possible with some users



of the reef, particularly tourists, who visit the lagoon.

Assessment of economic impact

Although ecological considerations must be applied in a way that ensures the natural environment is better protected, economic criteria remain decisive in this type of activity.

Regulatory requirements for the collection of fish must not hamper the economic viability of the activity, or fishing will go on either illegally or without providing any economic benefits.

For example, it would be pointless to authorise collection of fish only on remote islands, because the cost of local transport would then make these fish more expensive than those produced in other exporting countries.

For these reasons, absolute ecological requirements must take the form of regulatory constraints which do not threaten the economic viability of this activity. They should allow for sustainable development of the activity while preserving the natural environment.

AN ASSESSMENT OF THIS ACTIVITY IN ISLAND COUNTRIES

By comparing this market in exporting countries, it can be determined that the export of 100,000 fish represents an annual turnover of approximately US\$ 200,000 and 10 to 20 full-

time jobs. Except for a few countries which have very limited reefs, it seems reasonable to assume that the ichthyological fauna and the extent of the reef structures in most of the island countries in the Indo-Pacific zone permit a level of production comparable to that of the Maldives or Fiji. It is also important to know whether the cost of harvesting and exporting the fish will be competitive in comparison with competing countries.

Air freight represents 50 per cent of the price and its cost cannot be locally controlled. However, as the FOB value of ornamental fish includes the cost of fishing, storing, packaging and local transport, it must also be very competitive.

Fishing costs (boats, fuel, gear etc.) can be quite high, as can labour costs, and this is significant, as the fish are caught by hand. Labour costs will therefore be a determining factor in the economic viability of this fishery, since some exporting countries have very low-priced labour.

This type of fishing is also often a secondary professional activity. In order to encourage it, local regulations must lessen the salary-related costs and grant customs-duty reductions on the gear needed for this activity.

RECOMMENDATIONS AND CONCLUSIONS

The harvest of ornamental marine fish is of economic interest for Island countries. If the costs of transport and salaries can be controlled, the development of this activity could quickly yield, for an annual harvest of 100,000 fish, a turnover of US\$ 200,000 and 10 to 20 permanent jobs. In order to conserve resources, the

first thing to be done is to ensure that there are no transgressions of authorised fishing methods. Arrangements must be made to ensure that inspections are carried out during fishing or later if necessary and dissuasive penalties must be applied.

We propose that catches of the most vulnerable species be regulated according to the precautionary approach, by setting quotas. Monitoring of the quantities exported, together with visits to the fishing grounds, should make it possible to adjust the quotas.

If the activity increases significantly (say more than 250,000 fish annually), monitoring of the densities of exploited populations would be needed at the fishing grounds in order to ensure sustainable development of this activity. Tax incentives should also be devised.

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