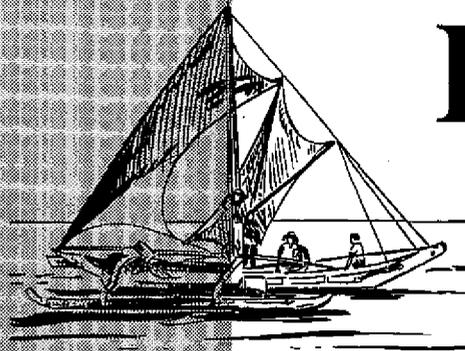


FISHERIES

Newsletter



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Swordfish longlining at night during the practical module of SPC/Nelson Polytechnic fishing course



South Pacific Commission
Prepared by the Fisheries Programme Information Section
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SPC ACTIVITIES

RESOURCE ASSESSMENT SECTION

Helping with American Samoa's research plans

As part of its preparations for a five-year plan for fisheries and management, American Samoa's Department of Marine and Wildlife Resources (DMWR) invited guest scientists from Hawaii, the Northern Mariana Islands, Western Samoa and the South Pacific Commission to attend a workshop for DMWR staff.

The workshop, held from 23 to 25 September, reviewed past and present research activities of the Fisheries Division and discussed future plans. Dr Jim Parrish, head of the Hawaiian Cooperative Fishery Investigative Unit (affiliated to the University of Hawaii), and Paul Dalzell, SPC's Inshore Fisheries Scientist, were invited specifically to comment on the Division's work programme.

The first day of the workshop was used to present the Division's current work activities in detail and plans for the future. Following the opening of the meeting by the Director of DMWR, Ray Tulafono, the Chief Biologist, Peter Craig, gave an introductory talk about fisheries in American Samoa and the work of the Division. American Samoa, in common with the other small Island countries and territories of the Pacific, has limited manpower available for fisheries research and monitoring activities.

Coastal fisheries are important in American Samoa as a source of protein, although they must compete with fish leaked from the two local canneries and with imports from Western Samoa. Concern was expressed at the rate of population in-

crease in American Samoa (3.0% p. a.) and the impact this would have on coastal fisheries in the future.

Inshore fisheries are monitored in conjunction with the statistical data-gathering project of the Western Pacific Fishery Information Network (WPACFIN), based in Hawaii. This project summarises the annual fisheries production in Hawaii and the American Flag Territories in the tropical Pacific (Guam, CNMI and American Samoa).

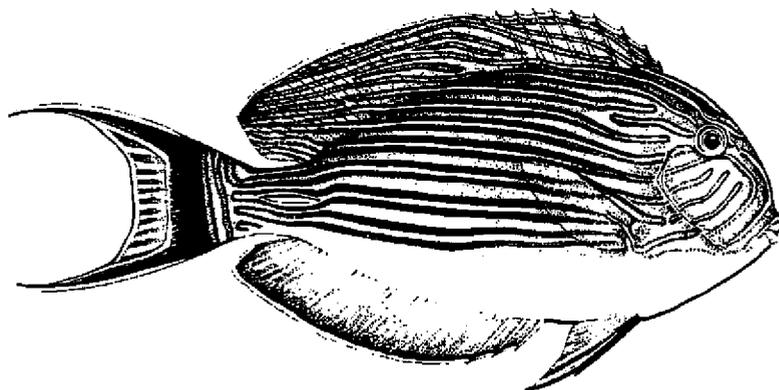
DMWR recently recruited a new biologist to be responsible for collecting the inshore catch data. A synopsis was presented of inshore catch data collected between 1991 and 1994, along an 18 km strip of the coast of the main island, Tutuila, including the capital Pago Pago.

Most of the Territory's population is concentrated in this area. The gist of the presentation was that, according to the available information, landings of coastal fish in American Samoa had declined over the past four years, and that the CPUE of the major gears had also declined.

Suggested improvements to the inshore catch monitoring project include expanding the data collection to the rest of Tutuila and the Manua Islands, collection of more biological data from the main target species, improved market surveys, and comparative studies of species composition and size distribution in the catch with fishing pressure and environmental data.

The catch monitoring project was felt to be very important for management and development of the inshore fishery, and should be viewed as a permanent responsibility of the Department. Suggestions were made on ways in which the project might expand the area of data collection to other parts of American Samoa, given the limited available resources.

Recommendations were also made on collection of basic biological data, using the commercial catch composition data collected between 1991 and 1994 to identify key species. The basic information to be collected would be length, weight, sex and gonad maturity stages.



Acanthurus lineatus

It was suggested that DMWR also find out whether any nutritional data were recorded by the health authorities in American Samoa which could be used to make an independent estimate of fisheries production. This would allow the staff of the inshore data collection project to compare their total catch estimate and market data with the estimated volume of fish consumed in the territory.

The generally poor state of the inshore fishery was thought to be due in part to the severe damage to the reefs by cyclones during 1992. As little quantifiable information is available on the status of the reefs in American Samoa, DWMR recently recruited an ecologist from Australia, who is in the process of surveying the reef sites and estimating fish abundance through UVC techniques.

Concern was also expressed about other factors affecting coral reefs around Tutuila, including water eutrophication from the effluent of two tuna canneries in Pago Harbour, garbage jettisoned on the reefs and sedimentation from stream runoff.

The objective of the coral reefs project is to provide a benchmark or snapshot of the present status of American Samoan reefs against which future comparisons can be made. There are relatively few quantified data on fish and corals around American Samoa compared with the volume of purely descriptive observations.

For this reason, it is important for sites studied to be properly identified so that replicate observations can be made in the future. It was also thought essential to bring in a coral specialist to compile a checklist of

corals in American Samoa and to quantify the abundance of coral species at some of the sampling sites.

A study of the blue-lined surgeonfish (*Acanthurus lineatus*), which forms 25 per cent of coastal fisheries landings on Tutuila, was presented. Besides collecting information on landings, length frequencies and spawning condition from the commercial catch, observations have been made of a population of these fish to collect further data on growth and mortality rates.

From the presentation, it appears that *A. lineatus* can live for about six years, but most individuals fail to live for more than two and a half or three years following recruitment.

Offshore fisheries in American Samoa comprise small scale-fishing for deep-slope fishes on offshore banks and seamounts and recreational fishing around FADs (deployed by SPC) for large pelagic fishes. Information on the offshore fishery is obtained from regular boat sampling and from receipts for the sale of fish in domestic markets.

Deep-slope fisheries landings are limited, probably between five and ten tonnes a year, with most offshore production from pelagic fishing. The total offshore catch in 1993 was 65 t.

The status of deep-slope fish is not a major priority at present, given the scaling down of the fishery in the 1980s. Concern was expressed that the fishery may expand again if overseas demand increases.

The pelagic fishery is in no immediate danger either, although the fishermen in this fishery must compete with

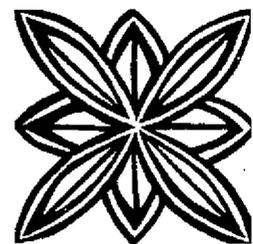
'leaked' fish from the two tuna canneries when marketing their catch in Pago.

The Department recently conducted a questionnaire survey of American Samoans to gauge the public perception of problems in inshore fisheries. Over half the people surveyed believed that fin-fish catch rates in the inshore fishery were getting worse, and 100 per cent stated that this was true for giant clams.

The top priority, according to those surveyed, was the implementation and enforcement of fishing regulations proscribing illegal fishing, establishment of closed seasons for some species and the limitation of commercial fishing to residents of American Samoa.

It was thought worthwhile for DMWR staff to compile resource profiles of the important species in the inshore and offshore fisheries. Such an exercise will summarise what is already known about these species in American Samoa and elsewhere and reveal where data are deficient for management.

Finally, the need to document research findings was stressed, in order not to repeat the mistakes of other fisheries divisions, where research results remain unsummarised and undocumented or disappear with expatriate researchers when their contracts expire.



Resource Assessment Section participates in Traditional Marine Tenure Workshop

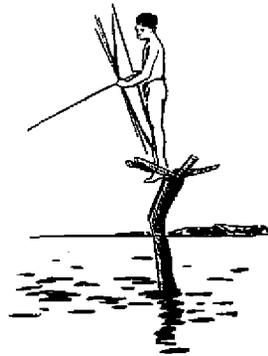
Inshore Fisheries Scientist, P. Dalzell attended a workshop convened by the International Ocean Institute and University of the South Pacific between 4 and 8 July in Suva.

The title of the workshop was Traditional Marine Tenure and Sustainable Management of Marine Resources in Asia and the Pacific. Its aim was to encourage the exchange of information on marine tenure between institutions in South-East Asia and the South Pacific. For this reason, participants were invited from universities and fisheries departments in Thailand, Vietnam, the Philippines and Indonesia.

The workshop was organised into sessions begun by a formal

presentation, followed by a number of short commentaries from invited participants, and then a general discussion. A joint presentation on work in Woleai Atoll, Yap State, FSM, was made by P. Dalzell and Mr Andrew Smith, now working with SPREP.

P. Dalzell presented the results of a stock assessment study,



which relied for its implementation on initial research into traditional marine tenure and fisheries knowledge.

Mr Smith, who planned and led the research in 1991 when he was working with the Yap State Government, explained in detail the laborious steps required to make this study a success and suggested that other researchers planning similar work could benefit from these experiences.

The proceedings of this workshop were published in November and are available from the University of the South Pacific. They will be reviewed in the next *Fisheries Newsletter*.



■ TRAINING SECTION

Certification workshop promotes regional standards for fishing vessel training

Following a consultative process spanning more than two years and involving fisheries trainers, administrators, industry and organisation representatives, a workshop to discuss possible standardised certification for fishing vessel crews was convened at the Forum Secretariat in Suva during the last week of September.

The workshop discussed a series of working papers prepared by the South Pacific Commission, which summarised the major issues in determining whether a regional standard for fishing-vessel crew training would be advantageous and achievable. It was supported by the joint SPC/FFA, UNDP-funded Regional Fisheries Support and National Capacity Building Project and

brought together 35 trainers, administrators and industry representatives from 16 countries.

In opening the workshop, the Secretary-General of the Forum Secretariat, Mr Jeremia Tabai, noted that an active programme to promote employment in regional fisheries could produce as much as US\$ 40 million per annum in direct income. He suggested that, with many countries suffering from high rates of youth unemployment, the potential for increased employment in fisheries through common training standards was a key consideration for the workshop.

Mr Tabai advised the workshop that the 1993 Forum Report on the development of a Regional

Maritime Training Plan had strongly recommended the establishment of a regional certification system for fishing vessel crews, based on the South Pacific Maritime Code, and requested participants to frame recommendations as to how such a system might be established.

Participants were asked to consider the potential adoption of a common structure for fisheries certification which would promote a career path in fishing, and also to decide whether such a structure should have a common entry-level standard, a Pacific Island Qualified Fishing Deckhand Certificate.

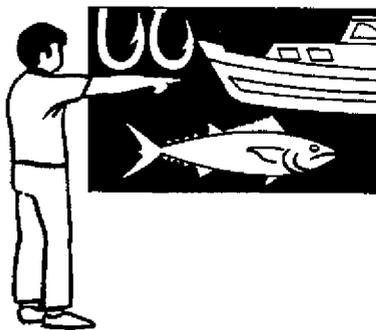
For most of the sessions, participants worked in informal groups, guided by a series of

questions posed in each of the working papers. The informal groups reported their discussions back to the plenary sessions and an additional working group was established to draft recommendations reflective of the findings of the workshop.

In considering the major issues, workshop participants acknowledged that the establishment of a common standard for fisheries certification would be a gradual process, but there was strong agreement that a common structure should be established and that a deckhand certificate should be the entry-level qualification.

The establishment of common standards will ultimately involve national legislation, but in the short term, training programmes can be initiated to a common standard. With this in mind, workshop participants proposed the formation of a coordinating body to liaise with national interest groups in the further development of common certification standards.

The following recommendations were put forward by the workshop, with the suggestion that they be widely circulated to national administrations, marine and fisheries departments, national and foreign industry representatives and regional and international organisations.

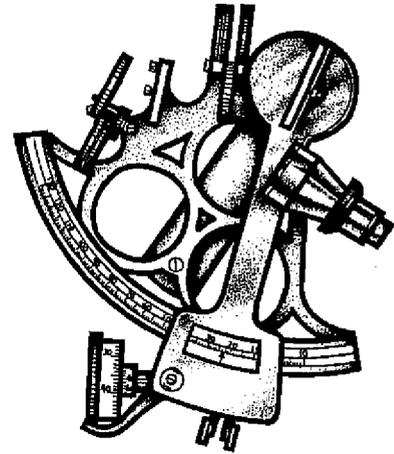


1. Following consideration of the issues relating to the establishment of a regional standard structure for certification of fishing vessel crews, the workshop recommended that:

- ☞ A regional standard structure for fishing-vessel crew certification should be adopted;
- ☞ The basic qualification in such a structure should be at the deckhand level;
- ☞ Advanced certification should be based on established international and regional codes.

2. Following discussion on a certification model which would best address regional circumstances and encourage employment and career structures, the workshop recommended that:

- ☞ A certification structure be developed for training of fishing-vessel crew to a level of competency suitable to appropriate vessel sizes/engine power, fishing methods and operational areas. Whilst the SPMC might be used as a guide, this should not preclude the possibility of using the Code to develop a simpler model;
- ☞ The minimum size of 15 metres, as outlined by the Code, should be reduced to a level which reflects local legislation and circumstances;
- ☞ The certificate structure should be developed in a way which would allow the holders of fishing certificates to obtain trading-vessel certificates by



completion of bridging courses and additional sea-time on trading vessels.

3. The workshop recognised the importance of maintaining a regional standard and recommended that:

- ☞ The Forum Secretariat, the South Pacific Commission, the Forum Fisheries Agency and representatives of industry liaise with the South Pacific Board for Educational Assessment, training institutions and appropriate national bodies to examine ways to develop an effective regional accreditation and certification system;
- ☞ The initial focus for implementing regional standard fishing vessel-certification should be a qualified fishing deckhand certificate.

4. Mindful of the potential for increased employment opportunities for fishing-vessel deckhands through standardised certification, the workshop recommended that:

- ☞ A regional standard for fishing-vessel deckhand certification based on a combination of established

regional and international guidelines be adopted;

- ☛ Appropriate national administrations give consideration to adoption of regional standards for fishing-vessel deckhand certification.

5. In regard to course entry and certification criteria, and noting the requirements of international codes and the jurisdiction of national administrations, the workshop recommended that:

- ☛ A minimum age of 16 be a prerequisite for course entry;
- ☛ A period of appropriate sea service of not less than 18 months be required for certification as a qualified fish-

ing deckhand. Sea service remission of 6 months may be obtained on the successful completion of an approved training programme.

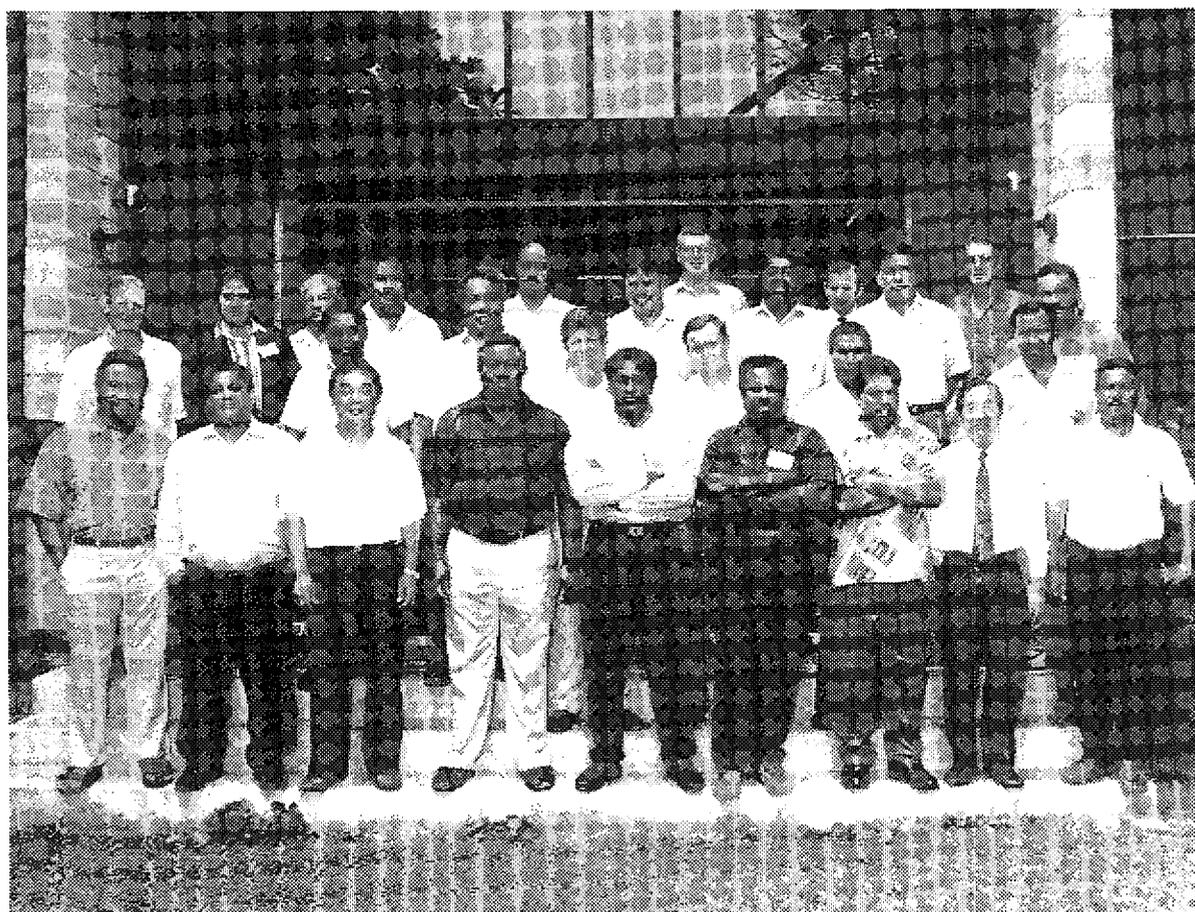
6. In view of the need to further advance the certification of Qualified Fishing Deckhands's and to develop a regional certificate structure and standards for fishing vessel crews, the workshop recommended that:

- ☛ The Forum Secretariat, the South Pacific Commission and the Forum Fisheries Agency co-operate in the formation and funding of a body which will co-ordinate the development of a regional structure for the certification of fishing vessel crews;

- ☛ In making this recommendation, it is suggested that one function of the body will be the establishment of a network of national advisory structures to ensure all aspects of the process are covered and consensus is obtained.

7. Acknowledging the varying stages of development of training institutions and being aware that a minimum regional standard of Qualified Fishery deckand training is important, the workshop recommended that:

- ☛ The co-ordinating body undertake the collection and dissemination of information and the development and distribution of appropriate course materials and a standard teaching



Participants in the workshop on standardised certification for fishing vessel crews

resource training package in line with the syllabus proposed for qualified fishery deckhand certification;

- ☛ Pilot courses be conducted for the purpose of course evaluation and determination of training resource and equipment needs and associated costs.

Although the further development of common standards for

fisheries certification will thus be co-ordinated between the regional agencies, the extent to which the entry-level deckhand programme is developed will depend to a large degree on national initiatives from training institutes and the employment prospects for newly trained deckhands.

Financial resources available under the SPC-FFA-UNDP project will be used to support

the development of resource materials to assist national institutions in course delivery and to help them further to develop fisheries-related teaching skills.

However, the future of the programme will ultimately rest with national initiatives to prioritise skill development and employment in fisheries.



■ OCEANIC FISHERIES PROGRAMME

Computer support for fishery sector in French Polynesia

The French Polynesian fishery sector is showing strong growth and emerging as the best economic bet for the Territory over the next few years. A recent study by a member of the French External Trade Centre (CFCE) identified the economic sectors with the best prospects for increasing French Polynesia's exports. According to the study's initial conclusions, this French Overseas Territory could greatly develop its fishery activities in the same way as it has expanded the black pearl industry and the vanilla sector.

The current fairly diverse fishing fleet consists of 35 vessels from 13 to 30 m in length, mainly engaged in tuna fishing, and approximately 300 smaller boats

forming a more artisanal fishery. The Territory's objective is to expand the fleet to 110-120 tuna boats, while protecting the existing artisanal fleet. The prospect of such a degree of growth prompted EVAAM (Establishment for the Development of Aquacultural and Maritime Activities) to start work on a major computer support project, in order to study and monitor production.

The South Pacific Commission assisted in the project. Emmanuel Schneiter, Research Officer and Computer Programmer with the Oceanic Fisheries Programme (OFP), spent four weeks on an assignment analysing the computer-related needs of this fishery activity and then devel-

oped a prototype software, which is used to capture fishery data from a range of vessels and process it for statistical purposes.

Developed using the FOXPRO database management system, this project is scheduled to continue in the months ahead in order to include information from all types of fishing activity, including the most artisanal type, in the database.

In the near future, the project will also produce a total analysis tool for the study of the various fishing methods, their interactions and their yields, while ultimately making it possible to enhance vessel efficiency.



Seventh meeting of the Standing Committee on Tuna and Billfish

The seventh meeting of the Standing Committee on Tuna and Billfish (SCTB7) was held in Koror, Palau, from 5 to 8 August 1994. The meeting was attended by participants from nine SPC member countries and territories (Australia, Federated States of Micronesia, Fiji, Kiribati, Palau, Papua New Guinea, Solomon Islands, United States

of America and Vanuatu) and four other countries (Japan, Indonesia, Philippines and the Republic of China), as well as the South Pacific Commission and the South Pacific Forum Fisheries Agency.

The agenda included an overview of western Pacific tuna fisheries; a review of the work

of the Oceanic Fisheries Programme (OFP) and the OFP work plan for 1994-1995; the OFP operational plan for 1994-1998; and the Multilateral High Level Conference on South Pacific Tuna Fisheries, to be held from 5 to 7 December 1994 at the Forum Fisheries Agency Conference Centre, Honiara, Solomon Islands.

During 1993, the total catch in the SPC statistical area and the waters of eastern Indonesia and the Philippines was approximately 1.26 million mt, which represents a decline of 8 per cent from the 1992 catch of 1.37 million mt.

Total catches have thus declined each year since they peaked in 1991 at 1.44 million mt. Almost all of the decline was due to a drop in skipjack catches. Skipjack catches by purse seiners dropped from 623,000 mt in 1992 to 490,000 mt in 1993; skipjack catches by pole-and-line vessels dropped from 67,000 mt in 1992 to 63,000 mt in 1993.

During 1993, as in previous years, 90 per cent of the catch in the SPC statistical area were taken by four countries: Japan, Korea, Taiwan and the United States.

Purse-seine catches by the fleets of Japan and the United States were similar to catches during 1992. Catches during 1993 by the purse-seine fleets of Korea and Taiwan declined significantly, largely due to the ban on transshipment at sea, which was implemented by South Pacific Forum member countries in June 1993.

As a result, Korean and Taiwanese purse seiners, which had previously transshipped

most of their catch at sea, were required to transship in ports in the region, which resulted in a reduction in days fished.

During 1993, the number of mainland Chinese offshore longliners increased to about 319 vessels; the number of offshore Taiwanese vessels was about 254. The number of Japanese distant-water pole-and-line vessels active in the region has declined consistently since the 1970s, as older, less efficient vessels were retired; nevertheless, the Japanese fleet still accounts for 64 per cent of the total pole-and-line catch. The Solomon Islands pole-and-line fleet experienced its second successive poor year.

The total catch of yellowfin exceeded 400,000 mt for the first time in 1993. The increase was due mainly to an increase in the purse-seine catch to 292,000 mt, the highest on record. The main catch-per-unit-of-effort (CPUE) indicators for yellowfin are Japanese and US purse seine and Japanese longline.

Purse-seine CPUE by the American and Japanese fleets shows similar patterns, averaging about 6 mt per day since the late 1970s with considerable interannual variability. CPUE in the last three years has been stable at about the average level. CPUE by Japanese longliners has declined steadily since 1978,

and the provisional estimate for 1993 is well below the previous lows of 1974–1975 and 1990–1991.

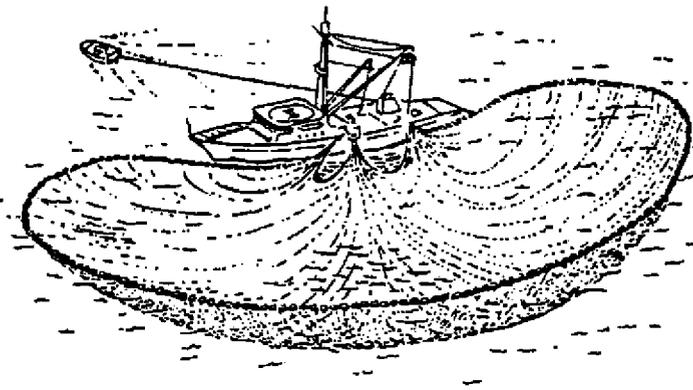
Several possible reasons for the decline were identified, including high fishing mortality on large fish and a gradual decline in vulnerability brought about by changes in targeting towards bigeye.

The tagging-based assessment presented in 1993 at SCTB6 was updated to include new tag-return data and a more representative estimate of the overall tag-reporting rate. The average exploitation rate on juvenile yellowfin for 1991–1993 was approximately 0.20, with 95 per cent confidence intervals of 0.16–0.25. It was estimated that annual catches up to 600,000 mt could be sustained.

Total skipjack catches have declined by about 20 per cent since the record high in 1991 of 974,000 mt. Purse-seine CPUE time series for American vessels show tendency to increase since the early 1980s, while CPUE for Japanese vessels has been fairly stable at 15–20 mt per day.

The patterns of interannual variability are similar for both fleets. The updated tagging analysis continues to suggest low-to-moderate exploitation rates (0.20 with 95 per cent confidence intervals of 0.16–0.25). It was estimated that annual catches up to about 1.3 million mt could be sustained.

Some progress in the assessment of South Pacific albacore was achieved, using an age-structured model based on length, catch and effort data. The estimated time series of recruitment is unremarkable, except for very low recruitment in 1985 and 1990; this probably



corresponds to the 1982/83 and 1987/88 spawning seasons.

It is interesting to speculate whether environmental conditions related to the ENSO events that were in progress during those years might have played a role, for example by causing poor larval survival. However, it is also possible that the much greater variability in estimated recruitment from the mid-1980s on reflects the much better information on year-class strength that became available from the surface fishery, which developed during that period.

It may be that similar variation in recruitment occurred throughout the time series, but the estimates are obscured because of ageing errors during the period when only the longline fishery operated. The total biomass time series shows a decline from the mid-1980s onwards, as

the two poor year classes moved through the population.

This decline is likely to continue for several years, and its impact on longline catch rates could be substantial.

An abundance index for bigeye tuna, standardised for season, area, by-catch and gear effects, and based primarily on Japanese longline data for the entire Pacific Ocean, showed steadily declining abundance since the late 1950s.

Production models were fitted to the abundance index and observed catch-and-effort-data. The estimated maximum sustainable yield, 120,000 mt, is less than recent catch levels, but the confidence intervals on the estimate are large. Careful monitoring of the stock and fisheries was recommended, and the possible need for conservation

measures in the future was foreshadowed.

The two recommendations that were made at SCTB7 concerned the standardisation of catch-and-effort logsheets for domestic and foreign fisheries in the region; and funding for the position of the SPC Oceanic Fisheries Coordinator.

The four action items concerned a revision of SPC catch and effort logsheets; publication of an OFP review of by-catch and discards from industrial tuna fisheries in the SPC region; setting priorities for the activities of the OFP work plan; and the preparation of background papers on the status of the stocks and data collection by the OFP for the Multilateral High Level Conference on South Pacific Tuna Fisheries.



Fourth meeting of the Western Pacific Yellowfin Research Group

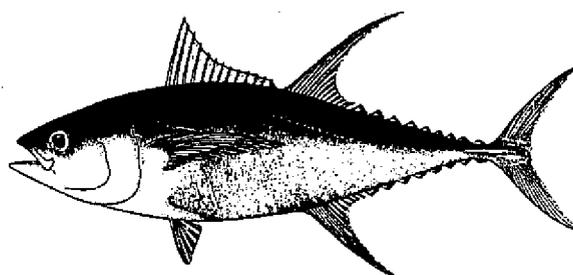
The fourth meeting of the Western Pacific Yellowfin Research Group (WPYR4) was held in Koror, Palau, from 8 to 10 August 1994, immediately following the seventh meeting of the Standing Committee on Tuna and Billfish.

The participants at WPYR4 were those who attended SCTB7, with the exception of participants from the National Fisheries Research and Development Agency of Korea, who attended WPYR4, but not SCTB7. The agenda included reviews of the fisheries, research assignments, fisheries statistics, stock status, fishery interaction, new developments, and a discussion on future directions of the group.

During the review of research assignments, the results from yellowfin production model analyses were shown to be congruent with tag-based assessments (see the SCTB 7 report above).

The results from standardising longline catch rates with a gen-

eral linear model showed that much of the variation in yellowfin catch rates could be explained by the effect of bigeye catch rates. This suggests that catch rates for yellowfin and bigeye are more highly correlated than might have been expected.



United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks

The fourth session (the third substantive session) of the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks was held in New York, from 15 to 26 August 1994.

Credentials were accepted from delegations from 99 countries and the European Union. Pacific countries represented at the Conference included Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, New Zealand, Niue, Papua New Guinea, Solomon Islands, Tonga, Vanuatu and Western Samoa.

Several intergovernmental organisations, such as the Inter-American Tropical Tuna Commission (I-ATTC), the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the South Pacific Commission, and several non-governmental organisations, were also represented.

In his opening statement, the Chairperson of the Conference, Ambassador Satya N. Nandan of Fiji, referred to the Earth Summit held in Rio de Janeiro, which identified problems of inadequate management of fisheries, over-utilisation of some stocks, unregulated fishing, over-capitalisation, excessive fleet size, vessel reflagging to escape controls, insufficient selectivity of gears, unreliable databases, and lack of sufficient co-operation between states.

He stated that for the conference to answer these problems, the outcome must have the following key elements:

- ☞ It must establish minimum international standards in sufficient detail for the conservation and management of fishery resources;
- ☞ It must ensure that the measures taken for conservation and management in the exclusive economic zones and in adjacent high-seas areas are compatible and coherent, in order to take into account the biological unity of the stocks and the supporting ecosystem;
- ☞ It must ensure that there is an effective mechanism for compliance with and enforcement of those measures;
- ☞ It must provide for a globally agreed framework for regional co-operation in the field of fisheries conservation and management, consistent with the situation prevailing in each region, as is envisaged by the Convention on the Law of the Sea;
- ☞ It must provide for a compulsory binding dispute-settlement mechanism, consistent with the Convention on the Law of the Sea, while providing the necessary flexibility to the parties to a dispute to use the mechanism of their choice.

The Chairperson noted that some of the outstanding issues can only be resolved once the Conference has decided upon the form of the outcome, which could be a legally binding agreement, a non-binding resolution, or a hybrid.

Early in the session, the United States delegation stated that it now supported a legally binding outcome.

The 16 member countries of the South Pacific Forum Fisheries Agency, making a joint statement, also expressed strong support for a legally binding outcome.

During the second week of the session, the Chairman introduced a revision of the negotiating text; this was drafted in the form of a legally binding agreement with the words 'Draft Agreement' in the title.

Although consensus was building for a legally binding outcome, at the end of the session the delegations of China, the European Union, Japan, Korea and Poland stated that they did not consider that consensus had yet been reached.

The Japanese delegation, in particular, stated that Japan had assumed that the outcome would be non-binding and that, otherwise, Japan would have proceeded with the negotiations in a different manner.

Presumably, the delegations which did not express support for a legally binding outcome returned to their capitals after the session to consider such an outcome and how it would affect their negotiating positions.

Throughout the Conference, distant-water fishing nations stressed that conservation and management of straddling fish stocks and highly migratory fish stocks must be considered throughout the ranges of the stocks, both within and beyond economic zones.

On the other hand, the coastal states stressed that conservation and management of straddling fish stocks and highly migratory fish stocks must not prejudice their sovereign rights to manage fisheries within areas under national jurisdiction, as provided for in the Convention on the Law of the Sea.

The Draft Agreement states that the Agreement applies to the conservation and management of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction.

It also states that conservation and management measures taken on the high seas and those taken in areas under national jurisdiction shall be compatible, and that in determining compatible conservation and management measures, states shall, among other things, take into account the biological unity of the stocks, including the extent to which the stocks occur and are fished in areas under national jurisdiction.

During previous sessions of the Conference, the negotiations resulted in the identification and resolution of several issues; however others continued to be problematic.

Concerning the issue of enforcement, for example, several delegations stated that while they could accept boarding and inspection on the high seas, they could not accept arrest on the high seas by non-flag states, while others argued that non-flag state arrest on the high seas was necessary in order to ensure strong enforcement of conservation and management measures.

Rather than dealing with the issue directly, the Draft Agreement requires that flag states co-operate with coastal states, or through regional fisheries management organisations or arrangements, in the development of regionally agreed procedures for the conduct of enforcement, including procedures under which the authorities of one state might board, inspect, arrest and detain a fishing vessel flying the flag of another state.

The issue of mechanisms for international co-operation is of particular relevance to tuna fisheries in the western tropical Pacific, since no regional fisheries management organisation or arrangement currently exists for these fisheries.

During the session, the discussion on mechanisms for international co-operation focused on details, such as new members and data requirements of management organisations or arrangements; the underlying principle of the need for such organisations or arrangements was not questioned.

Where there is no regional fisheries management organisation or agreement, the Draft Agreement requires that states co-operate to establish such an organisation or enter into other appropriate arrangements to ensure conservation and management.

In fulfilling their obligation to co-operate through regional fisheries management organisations or arrangements, the Draft Agreement requires that states shall, among other things, agree on and comply with conservation and management measures to ensure long-term sustainability of the stocks; agree, as appropriate, on alloca-

tion of participatory rights, such as allocations of allowable catch or levels of fishing effort; and adopt mechanisms by which the organisation or arrangement will obtain scientific advice and review the status of the stocks, including, where appropriate, the establishment of a scientific advisory body.

The Draft Agreement further states that if no agreement on conservation and management measures can be reached within a reasonable period of time, the states concerned shall resort to the procedures for dispute settlement provided in the Agreement; the Agreement also contains procedures for establishing provisional measures pending resolution of a dispute.

As the Conference could not conclude its work during the fourth session, the Chairman proposed that two more sessions be held.

A fifth session is scheduled to be held from 27 March to 12 April 1995 with the objective of completing negotiations, and a sixth session is scheduled from 17 to 28 August 1995 with the objective of formally adopting the final outcome.



■ UNTIMELY DEATH OF MAXIME NEAOUTYINE

We were greatly saddened to learn of Maxime Neaoutyine's untimely death in an automobile accident. He was only 33 years old.

After studies in the Faculty of Science at the University of Lyons, Maxime took up a post as extension officer in the Northern Province of New Caledonia. We came to know Maxime better when he was a trainee in the 1991 SPC/Nelson Polytechnic module, during which he demonstrated both a great deal of motivation and an unfailing interest in the topics studied.

In 1994, Maxime became the Head of the Fisheries Department for the Northern Province. As part of his new duties, he worked closely with our Training Section staff during organisation of the SPC/Nelson Polytechnic Practical Fishing Module this past July.



GA NAŌ WANA NAĀNAPŌ.

■ FRANCE AND JAPAN SIGN NEW ACCESS AGREEMENT

A new access agreement between France and Japan for tuna fishing in the exclusive economic zones of New Caledonia and Wallis and Futuna was signed in July 1994.

This agreement authorises 36 Japanese fishing boats (2 pole-and-liners and 34 longliners) to fish in the New Caledonian EEZ, with a maximum of 20 allowed in the zone at any one time. The total annual catch quota is 2,500 t. These Japanese fleet operators can also send 3 boats to the Wallis and Futuna EEZ, where the annual quota is 500 t.

Worthy of note is the fact that 15 of the boats working New Caledonia's EEZ will be equipped

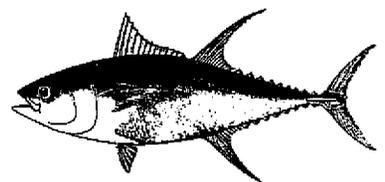
with Argos beacons from 1 October 1994. These beacons will be activated during the time spent in the fishing zone and will make it possible to keep track of vessel movements.

Regarding the financial arrangements, Japan will pay New Caledonia 4.55 million French francs in access fees and FF 1.2 million under a technical co-operation programme.

This programme of aid to the Territory could take the form of equipment, construction of buildings, staff training or provision of experts. Wallis and Futuna will receive FF 390,000 in access fees and technical assistance worth FF 400,000.

The Japanese boats will be under an obligation to provide statistical information on their fishing activities on a weekly basis. At the end of each trip, they will be allowed several months to provide duly completed fishing logs. The agreement runs from 12 August 1994 to 11 August 1995.

(Source: *Les Nouvelles Calédoniennes*)



■ ATALANTE RETURNS TO NEW CALEDONIA

Zoneco 2 will investigate the nature, topographical features and resources of the sea floor of New Caledonia's Northern Province in the area between Grande Terre (the main island) and the Loyalty Islands, and between the various Loyalty Islands. Zoneco 2 is the second part of a research programme commenced in 1993 with the support of the *Atalante*, flagship of the IFREMER (French Ocean Research Institute) fleet.

The *Atalante* went to sea with 20 technicians, engineers and scientists aboard. Their main task was to obtain seabed maps of a zone 240 nautical miles in length between the east coast of main island and the Loyalty Islands. For good measure, Grand Passage, a wholly unmapped zone to the north of the Belep Islands, was added to the assignment. The cruise started with a long trip up the west coast before the scientists really got down to work within the Belep Island group on Grand Passage.

The *Atalante's* work consists of adding other data to relief mapping with contours, to produce an image of the seafloor relief. Scientists thus rapidly learn what types of ocean floor they are dealing with: sediment, former volcano, sand, rock, etc.

Seamounts and encrustations

Using this information, the researchers paid special attention to seamounts. These features, some of which remain unknown, are thought to favour the aggregation of certain species of fish, making them important for fishery development purposes. They also studied the endemicity of certain populations inhabiting the waters around these seamounts and their productivity.

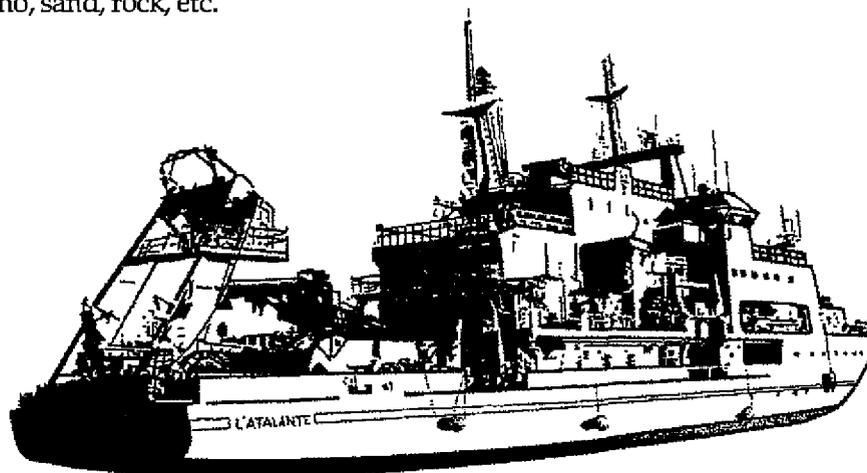
The technical resources used enabled them to identify possible traces of hydrocarbon deposits, platinoid encrustations, phosphorus concentrations, precious corals and mineralisations. They also expected to obtain geological and geophysical information while pursuing three main objectives: to facilitate the exploitation of marine resources and the development of the Territory, to take part in the enhancement of scientific knowledge of the ocean-

Atalante carries ultra-high performance echo-sounder

The *Atalante*, flagship of the fleet operated by IFREMER, is 84.60 m in length. It can make 14.5 knots with its two engines. Accommodation capacity is 59 people, including 17 to 30 crew members and 25 to 29 scientists. It has a range of 60 days. The *Atalante* carries outstanding scientific equipment. In a special 450 m² area can be found the ultimate weapon in mapping: a 162-beam sounder which sweeps a band seven times wider than the water depths at the relevant spot (for example a strip 14 km wide where the water is 2000 m deep).

The *Atalante* also carries another echo-sounder operating under similar conditions, but more effective in depths of between zero and 350 m, which covers a band five times wider than the water depth.

A processing unit connected to a plotter makes it possible to immediately and in real time obtain a chart of the ocean floor passed over by the vessel, which is drawn on the plotting table; relief cross-sections are also produced. A gravity metre, a magnetism metre, eight laboratories, a local area network serving all cabins and a scientific PC complete this set-up, which is considered at the present time as the ultimate in world oceanographic research equipment.



graphic zone around New Caledonia, and to participate in the implementation of a policy of integration of the Territory in the wider South-West Pacific region.

Strategic phase

For the time being, the Zoneco programme is in its strategic phase. The 'active' phase will commence in 1995, as far as fishery resources are concerned.

The team of scientists has already planned a mission to identify stocks of fish such as alphonsin on sites revealed by Zoneco 1. Sampling of metallic encrustations may have to wait a little longer.

The first cruise, Zoneco 1, which dealt with the western part of New Caledonia, has already proved fruitful: charts and relief maps are now appearing in many scientists' folders.

This programme uses resources and funding from a variety of organisations or administrations: IFREMER, ORSTOM, French University of the Pacific, Territory of New Caledonia, the three Provinces of that Territory and the French Government.

(Source: *Les Nouvelles Calédoniennes*)



■ AQUACULTURE IN HAWAII

Hawaii, the 'Big Island', possesses an asset of incalculable value for aquaculture. The water pumped up from the ocean depths to fill the tanks at Keahole Point is particularly suitable because of its purity, its temperature and its rich nutrient content. Hawaii is already successfully producing abalone, salmon and sea urchins, but that is not all.

Lobster is also on the agenda and another Hawaiian company, Aquaculture Enterprise, has started a lobster farm. The demand for crustaceans has doubled worldwide over the last two decades and their price has also scaled great heights. The problem of lobster-type crustaceans is that they grow very slowly.

The natural populations are quickly decimated and farmed specimens take many years to reach a commercially valuable size. Water pumped up from the deep brings with it the solution to this problem.

Lobsters reared in this nutrient-rich water take only three years to reach the adult stage, instead of the seven taken as a general rule. But, according to Philipp Wilson, an Aquaculture Enterprise (AE) executive, the project

has still not reached a commercial scale.

Hawaii is a very interesting place for his company because of this deep water, but work is still at the experimental stage. The setting-up costs for such a venture are very high. The first step is to construct a pumping station with attendant pipework, which is very costly. The last pipeline installed cost over a million dollars.

For the moment, then, AE are using water supplied by the Natural Energy Laboratory. They have 800 m² of ponds in which to conduct experiments. The growth of the lobsters is measured and their reactions to environmental variations monitored. An economic review will be done to determine whether this could be a profitable operation or not.

Another company, Sianotec, has used the capacity of the Natural Energy Laboratory's cold-water tanks to grow a microscopic alga. Marcia Allen, one of the Keahole Point project leaders, was the source of the following information about this highly specialised project.

This microscopic alga, called spirulina, has the special qual-

ity of possessing a very high protein content. It contains 60 per cent protein. Sianotec manufactures concentrated protein tablets from this alga, which is used as a food supplement in some diets.

This alga is also very rich in beta-carotene and Vitamin B12. From it, Sianotec also extracts a fluorescent blue pigment used for bacteriological preparations in medicine and a red pigment for the food industry. This colouring agent, in particular, used to make salmon flesh an attractive bright pink without needing to resort to artificial colouring agents.

It is noteworthy that the spirulina tablets are becoming increasingly popular with vegetarians in the United States, who supplement their meat-free diet with these vegetable proteins in concentrated form.

Some health-food shops even offer milk-shakes made from this microscopic alga, which come in a very pretty apple-green colour. Gerald Desaising of Sianotec outlined the advantages that Keahole Point offers his company.

First and foremost, Keahole Point is such a suitable place for

microscopic algae culture because of its light. It receives the greatest amount of solar radiation at sea level of the whole United States. Rainfall is very moderate, only 30 cm per year, and the company has access to deep water pumped up from 600 m, which is very pure and rich in nutrients.

The cleanliness of the water is particularly important. It contains no trace of industrial pollution or any other algae which could contaminate the ponds. In fact it is a virtually sterile environment. The nutritional richness of this water is such that it contains 10 to 30 times more nutrients than surface water.

Urchins, shellfish, salmon, lobster, microscopic algae: the prospects for the Hawaii Natural Energy Laboratory's cold-water tanks, in terms of aquaculture, are expanding rapidly. Marcia Allen outlined why this list was far from complete.

She explained that a Japanese company markets a species of plaice-type flat fish which it calls 'hadame'. This fish is served raw in very thin slices.

Another company, Royal Hawaiian and Sea Farm, cultivates edible algae for the local food market. Algae have a very similar composition to lettuce. People in Hawaii use them to make salad with pieces of octopus or raw fish. They make an excellent substitute for lettuce.

Another popular alga is the 'nori', in which the Japanese wrap rolls of cooked rice for sushi, and there is another local alga which is used as a condiment.

At Hawaiian and Sea Farm, the algae are harvested by simply emptying the ponds at regular intervals. The problem is rather that of convincing the Western market of the value of edible algae, as one of the company executives, Steve Katarse, explained.

He said that the company's objective is to produce the widest possible range of edible algae and conduct public education in Hawaii itself and throughout the United States to develop an appreciation for this very healthy and nutritious food.

His company hopes that, one day, the consumer will use its products as if they were ordinary vegetables such as spinach or Brussel sprouts. The advantage in working with sea vegetables is that they grow very quickly. Their growth rate is 5 to 30 per cent per day, which is very, very fast.

Marketing the product is not, however, without its difficulties, since the image of algae is not generally a good one in the mind of the Western public. It is seen as sticky, stringy and not very appetising. Royal Hawaiian and Sea Farm is trying to fight this poor image by calling these products not algae, but sea vegetables.

The image it wishes to project is that of an agricultural product just like any other, tasty and healthy, the only difference being that it grows in the sea rather than on the land.

(Source: Radio Australia)



■ FSM AND PNG SIGN BILATERAL COOPERATION IN FISHERIES

A bilateral Cooperation in the Field of Fisheries agreement has been finalised and initialled by FSM Ambassador Alik L. Alik and PNG Secretary of Foreign Affairs, Gabriel Dusava.

The agreement will give the two parties mutually preferential access to each other's Exclusive Economic Zones. This is in addition to other sub-regional and regional co-operative arrangements on conservation and development of highly migratory fish stock within, beyond and adjacent to such zones.

Provisions regarding development of the parties domestic fishing industries include access to shore-based facilities for off-loading and transshipment of catch at either party's port, enhancing employment opportunities for nationals; promotion of technical co-operation, scientific research and training; exchange of information, experts, observers; and co-operation on fisheries surveillance and law enforcement.

Fishing by fishing vessels of one party in the other's fisheries zone will be conducted in accor-

dance with this agreement and subsidiary agreements between the government of the Federated States of Micronesia and the Government of Papua New Guinea. Appropriate fishing permits to engage in fishing activities must be acquired.

The two governments will hold annual consultation meetings regarding implementation of the agreement. Any dispute arising out of the interpretation or implementation of the agreement or subsidiary agreements will be solved through peaceful negotiations.

Upon implementation of the agreement, it will remain in effect unless terminated by either party. In this connection the terminating party will give six (6) months written notice to terminate the agreement. The first round of negotiations was held from 11 to 15 June and the sec-

ond in Brisbane, Australia, on 29 and 30 July 1994. The FSM was represented by Micronesian Maritime Authority's Executive Director, Bernard Thoulag; and Chief, Division of International Law, Marilyn P. Lee, Office of the Attorney General. Representing the PNG

Government were Veali Vagi, Director General, Bilateral Affairs; and Henry Foeike, Director, International Trade and Economic Affairs, Department of Foreign Affairs and Trade.

(Source: FSM Government press release)



■ NEW THEORY STRENGTHENS FAT-HEART DISEASE LINK

A new hypothesis is emerging on the link between heart disease and types of fat in the diet.

A cardiac arrhythmia hypothesis is well-grounded in the observation that chaotic disorders of heart rhythm, particularly ventricular fibrillation, are the ultimate cause of sudden cardiac death. (This is the heart attack that occurs without warning, is fatal within one hour of symptoms beginning and accounts for up to half of heart-disease deaths in Australia and other western nations.)

A British study (1) of men who had suffered a non-fatal heart attack demonstrated that inclusion of fish in the diet (as little as twice weekly or the equivalent of 2.4 g of the omega-3 polyunsaturated fatty acid EPA) could greatly reduce mortality in the ensuing two years – a time in which such men are at higher-than-normal risk of suffering a sudden fatal heart attack.

This report provided a clinical link to earlier experimental evidence which showed that the fatty acids in fish and fish oils have potent antiarrhythmic properties (2).

Experiments by the CSIRO's Division of Human nutrition over several years (2,3) show that the omega-3 fatty acids in fish oils are taken up by the heart muscle cells and protect

them from getting out of synchrony, as occurs in cardiac arrhythmia.

Commonly in a heart attack, coronary blood vessels are narrowed and blood clots form, stopping blood flow to the heart muscle. This is a potent stimulus for cardiac arrhythmias.

Other factors, such as physical or emotional stress, adverse reactions to drugs or even the sudden return of blood flow to a region of heart muscle with impaired flow, can stimulate fatal arrhythmias, even in the absence of significant coronary artery disease. Sudden cardiac death can occur in people who have no previous symptoms of heart disease.

Increasing the amount of fish in the diet (fatty fish are best), rather than taking fish-oil capsules, has a twofold advantage of providing omega-3 fatty acids and perhaps replacing food-stuffs that may be more fatty and overly rich in saturated fatty acids.

The CSIRO experiments have shown that saturated fat has an arrhythmia-promoting effect, while polyunsaturated fatty acids from plant oils have antiarrhythmic properties but these do not match those of the fish-oil fatty acids.

The results of the CSIRO experiments together with the long-

recognised, anti-clotting and blood-lipid-lowering and reported anti-hypertensive actions of omega-3 fatty acids, suggest that, by eating more fish, we can take a multifaceted approach to reducing heart disease risk.

The research into fish-oil fatty acids reinforces the idea that heart disease is a multifactorial process and is best dealt with by the consideration of more than any single risk factor. An added bonus when it comes to taking any medicine is that fish tastes good too!

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(Source: *Nutrition News*)



■ 'IOC OCEAN FORUM' BOOK EXPLORES COASTAL ISSUES

UNESCO announces the availability of *Coastal zone space: prelude to conflict?*, by Edward D. Goldberg (Professor of Chemistry in the Marine Research Division at Scripps Institution of Oceanography, USA). In this 138-page volume, the author addresses one of the 'critical uncertainties' identified by UNCED concerning the environment and sustainable development of the planet's resources, namely the capacity of the coastal areas.

Prof. Goldberg, well-known as a writer and lecturer on a wide range of ocean topics, explores various facets – including scientific, technical, practical and

cultural aspects – of the conditions facing this zone. The relevant advantages as well as dangers of selected alternatives are elaborated. Information and arguments are given in easily readable forms.

For the reader who wants to explore further, an ample list of literature sources is provided at the end of each chapter. This compact volume contains considerable information and food for thought for environmental policy-makers and other readers, including members of the general public who wish to familiarise themselves with the issues at stake.

The Intergovernmental Oceanographic Commission (IOC) launched the 'Ocean Forum' series in order to foster open discussion, based particularly on scientific knowledge of pertinent issues facing society at present and its use.

Coastal zone space: prelude to conflict?, UNESCO, 1994 (ISBN 92-3-102953-3) can be purchased directly from UNESCO (Paris) at the price of FF85 or US\$16, or from distributors of the organisation's publications in countries around the world (individual dealers must be consulted for local prices).

(Source: *IMS Newsletter*)



■ JAPAN'S RAW TUNA IMPORTS DOUBLE

Seventy countries targeted Japan last year to supply 253,000 tons of tuna into the sashimi (raw fish) market. Imports into Japan pushed up the country's total sashimi tuna supply to 520,000 t.

Yuichiro Harada, of the Federation of Japan Tuna Fisheries Cooperation Associations, told the recent ASEAN Fisheries Federation meeting and business conference in Jakarta, Indonesia, that there has been a decline in sashimi tuna consumption in Japan. A main reason – especially with the younger generation – is a rise in the trend to eat red meat, such as hamburgers.

However, imports have virtually doubled. The total sashimi supply into Japan in 1993 was 520,000 t from the domestic catch and imports. This, according to Yuichiro Harada, is a substantial increase from the 1992 supply of 500,000 t, made up with imports of 130,000 t.

This increase has led to an oversupply on the Japanese sashimi market, which is seen as unstable and having declining prices. To stabilise the situation, the Japanese Government is encouraging the younger generation of Japanese to eat more tuna, basing its arguments on health studies.

Yuichiro Harada concluded his speech by requesting ASEAN countries' tuna industries to discuss the problem and find ways to resolve the conservation of highly migratory species to bring about a stable market and sustainable future exploitation.

Sashimi prices could firm up for the remainder of 1994 because of recent increases in consumption not only in Japan but also in Korea and America.

The chief delegate from the Philippines reported to the meeting that strict quality demands and the quota system

imposed by the European Union are causing problems. They have put several canneries in General Santos on the automatic detention list of the US Food & Drug Administration. Recession in the US has also caused lower market prices, while EU prices are not very attractive.

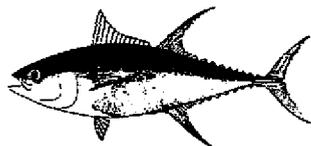
Currently, Philippines tuna canneries are operating on small profit margins or at break-even. Canneries in Thailand and Indonesia are reported to be processing below capacity.

ASEAN tuna producers must follow the Hazard Analysis on Critical Control Points (HACCP) to be able to enter international markets and avoid delays at ports.

The meeting concluded that the pole-and-line method cannot deliver enough fish and that longliners would not be cost-effective.

Therefore, the answer would be the purse-seiner. However, it was agreed that there must be a memorandum of understanding to regulate net-mesh to avoid catching juveniles.

It was reported that the Thai tuna canning industry is not



making profits and operations are only ensuring survival.

Although the Philippines reports that there has been very poor catch from the Pacific area, there is still an abundant supply of canned tuna in the international market—especially from South America.

Malaysia's tuna industry is more sashimi-oriented than canning and therefore the main

problem is currently the lower price of sashimi in Japan.

It was observed that there may be changes in the presentation/packaging of sashimi shipped to Japan and Korea in the next half-year. Instead of whole fish, gilled and gutted (GG), it is now frozen and packed in smaller pieces.

(Source: *Fishing News International*)



TARAWA LAGOON PROJECT

A project to develop a plan to preserve and enhance the sustainable harvest of fish and shellfish, especially important food species, from Tarawa lagoon is now in its final phase: implementation of a management plan.

The three-year joint project involves USP's Atoll Research Programme (ARP), the Kiribati Ministry of Environment and Natural Resources Development's Fisheries Division, and Biosystems Analysis Inc., a US environmental consulting firm. The USAID has provided US\$ 1.5 million towards the project.

Senior Lecturer in Marine Geology at the Marine Studies Programme, Dr Gary Yeo, said that the important goals of the project were to involve the communities of Tarawa as much as possible in identification of lagoon problems and development of a lagoon management plan, and to train local personnel who could carry on environmental monitoring and research work after completion of the project.

Dr Yeo said the project was the most intensive interdisciplinary environmental study ever undertaken in Kiribati.

Scientific investigations included development of a computer model for lagoon circulation, assessment of lagoon water quality, assessment of productivity of organisms at the base of the lagoon food web, assessment of shellfish and finstocks, interviews with fishermen to learn their knowledge of the lagoon and its resources, and a survey of Tarawa households to document their dependence on the lagoon.

Most of this work was done through 1992 and 1993 by Biosystems staff, with support from ARP and Fisheries. Two important components of the project were studies of *te bun*, a popular shellfish similar to Fiji's *kaikoso*, by Temaki Tebano, manager and research fellow at ARP, and of South Tarawa water quality by David Kelly, a University of Victoria, Canada, exchange student at ARP, said Dr Yeo.

He said about 17 i-Kiribati staff were employed on the project at various times, receiving training in computers, data management, laboratory procedures and field research. To encourage public participation in the project, video documentaries were made available through the USP Media Centre, public

meetings were held, and newsletters and posters were produced', Dr Yeo added.

In a series of recent public meetings the project's draft findings and proposals to the Government of Kiribati were presented.

Dr Yeo said that it was important for the Tarawa community to realise that the resources of the lagoon were limited, and must be co-operatively managed to be sustained.

He said that the establishment of a lagoon management council, made up of elders, the Island Council, fishermen, NGOs, and government representatives, was suggested. Recommendations included:

- ☞ a ban or restriction on use of gill nets;
- ☞ a ban on scuba gear used for shellfish harvesting;
- ☞ a ban on *te ororo* (splashing) fishing;
- ☞ creation of protected areas as marine preserves or fish sanctuaries;
- ☞ shifting fishing activities from the lagoon to the ocean and outer reef;

- ☞ opening up the causeways to allow fish migration, improve water circulation near the islands and improve fishing access to the ocean;
- ☞ continued research on **te bun**;
- ☞ a ban on giant clam harvests for five years and establishment of a clam hatchery programme and clam preserve areas;
- ☞ a ban on taking of marine turtles and creation of a turtle nesting preserve;

- ☞ setting a 'no net loss' policy for mangrove areas and encouraging mangrove replanting;
- ☞ setting a minimum size on beche-de-mer;
- ☞ reducing use of the lagoon as a toilet to reduce near-shore pollution; and
- ☞ developing a ciguatera test programme for reef fish.

In addition to continuing the **te bun** study, several projects involving USP Marine Studies, Institute of Applied Sciences,

and Biology staff at ARP are planned to complement the Biosystems study.

These include studies of lagoon bottom animals as potential indicators of environmental quality and of primary productivity in the lagoon (with an ORSTOM scientist); initiation of a long-term reef monitoring project; and workshops on water quality assessment, identification and systematics of benthic organisms, and marine public education for Kiribati teachers.

(Source: USP)



■ CONCERNS AT EXPLOITATION OF SCALLOPS IN NEW CALEDONIA'S NORTHERN PROVINCE

Although the industrial-scale exploitation of scallops in the waters of the northern lagoon by an Australian-based company has not yet started, the introduction of this fishery is already raising concerns and protests in the Poum area of New Caledonia.

'Most of the stocks are in our custom fishing grounds and we disagree with the use of trawlers, which will decimate the resource and cause pollution', state the members of the village council of Tanlo, near Poum, in a letter to the Government Delegate.

Echoing their colleagues, local fishermen have also written to object to the project which, in their terms, 'does not take our interests into account at all and, as a major source of pollution, is likely to destroy a resource which is essential to our survival'. Thirty fishermen and fifteen inhabitants of the village have put their signatures to this letter.

The council of elders of Tanlo village wrote to the Australian

Consul-General, saying 'the scallop resource is principally located within our custom fishing grounds. We have not so far been consulted in this connection and we will oppose this project until such time as we are considered as party to the negotiations'.

The Consul-General is asked to make representations to the company behind the project. The elders' hope is that the fishing methods used will not destroy the seabed. This condition 'must be respected for the proposed activity to be allowed to commence'.

Scraping the seabed

Other voices have joined in to express fears about the 'scraping of the seabed' and the risks of pollution to the inner reefs of the islets of the Poum region, particularly those located between Tanlo and Yandé, by particles stirred up by the trawling.

The trawlers are apparently seen in a very poor light by the parties concerned, who think

that the nets, as they drag along the bottom, will also kill 'the turtles and any fish which happen to get in the way'.

The same objectors refer to the need to protect inshore fishery resources and accuse the Government Delegate of indifference (in rather less moderate terms), suggesting that the Australian company which initiated the project in association with local interests wishes to start operations in the north because it has already 'destroyed the whole scallop resource' of the previous stocks it was exploiting 'forcing the fishermen to stop their own activities altogether'.

Some people obviously think the Northern Province scallop operation already smells bad. Some clarifications from the project's sponsors might help elucidate the issue.

(Source: *Les Nouvelles Calédoniennes*)



■ LAST QUARTER'S CLIMATE

April 1994

In a broad sense, April's atmospheric and oceanic conditions in the Pacific were again generally close to average, but there were some significant factors that are inconsistent, as part of what appears to be a rather slow and hesitant transition from the recent El Niño episode.

A weak La Niña trend is indicated by the slowly growing, narrow tongue of below-average sea-surface temperatures (SSTs) extending along the Equator from the Americas (reaching 1.5°C below average), and the slightly stronger-than-average equatorial easterly winds in the east.

However, residual effects of the El Niño were still very evident in the continuing pattern of positive SST anomalies of about 1°C or more outside the equatorial region, and in the most surprising fall of the Southern Oscillation Index (SOI) to -1.9, from its already unexpectedly negative value of -1.5 for the previous month.

The SOI, caused by opposite pressure anomalies at both Darwin and Tahiti, reflects the classical pattern of the negative phase of the Southern Oscillation that is normally associated with an El Niño.

The Pacific Islands rainfall data show generally lower rainfall than usual in the south-west parts of our region, west of about 175°E, and relatively more activity of the South Pacific Convergence Zone (SPCZ) in the central and eastern areas. High rainfall (at least twice average) continued from March over the Cook Islands and southern French Polynesia.

During April, rainfall was also about twice average over much of Western Kiribati, Rotuma Island (north of Fiji), and southern Tonga. The region from Vanuatu across to Samoa was also wetter than usual. Record high rainfalls were experienced at Rotuma (504 mm, 191% of average), and at Mururoa, southern French Polynesia (251 mm, 220% of average).

Drier-than-average conditions generally occurred elsewhere, though not to the same extent as in March. The only areas having less than half average rainfall were the northern Coral Sea, the main Fiji Islands, southern New Caledonia and isolated pockets of central French Polynesia.

Air temperatures were near average in most island groups, except for northern Papua New Guinea, Tuvalu and French Polynesia, where they were 0.5 to 1°C above average. TOGA Sea Level Center readings for the previous month (March) showed generally small above-average sea-level anomalies in the western Pacific, reaching +13 cm near Fiji.

May 1994

In a broad sense, May's atmospheric and oceanic conditions in the Pacific were near average, but there were inconsistencies, as part of the slow and hesitant transition out of the 1991-93 ENSO episode.

The indicators of a slowly emerging La Niña episode appeared to weaken this month—the tongue of below-average SSTs extending westward along the Equator from the Americas retreated relative to April, and the associated equa-

torial easterly winds slackened to near normal throughout most of the eastern and central Pacific.

There were continuing residual effects of the ENSO episode, particularly the extensive areas of SST anomalies in both hemispheres outside the equatorial region, which in some places reaches $\pm 1.5^\circ\text{C}$, and the systematic anomalies in pressure patterns, with Darwin above average, Tahiti below average, and hence the continuing negative Southern Oscillation Index (SOI) (-1.0). The equatorial easterlies in the western Pacific were weaker than usual.

The Pacific Islands rainfall data show generally lower rainfall than usual in the south-west parts of our region, west of about 175°E, from parts of Fiji westward across to Australia, and greater-than-usual activity of the South Pacific Convergence Zone (SPCZ), not only in the far eastern areas around French Polynesia, but also in the far western areas around Papua New Guinea and the Solomon Islands.

Abnormally high rainfall was measured at Port Moresby (403 mm, 983% of average, but not a record!), and at Willis Island (394 mm, 571%, record high).

Solomon Islands' Kirakira recorded 617 mm, but this was only about twice average. Record-high rainfall was also experienced at Mururoa, (308 mm, 261% of average), for the second month running.

Drier-than-average conditions continued (to a greater extent than in April) in central and eastern Kiribati, Vanuatu, New

Caledonia and eastern Australia, all with less than half average rainfall. Record-low rainfalls were recorded at Koumac (3 mm; 3% of average), Noumea (12 mm; 13%), Norfolk Island (25 mm; 18%) and Honolulu (2 mm; 8% of average.)

Air temperatures were above average by about 1°C in French Polynesia and 0.5°C in the Cook Islands. Most other island groups were near average, except Fiji and Tonga which were 0.5 to 1°C below average. TOGA Sea Level Center readings for the previous month (April) showed generally small above-average sea-level anomalies in the western Pacific, reaching +14 cm near Fiji.

June 1994

June's atmospheric and oceanic conditions in the Pacific were very similar to those of May. Most factors were reasonably near average. There were some inconsistencies, as part of the slow transition out of the 1991-93 ENSO episode.

Residual effects of the episode include extensive areas of SST anomalies in both hemispheres outside the equatorial region, which in some places reach $\pm 1.5^\circ\text{C}$, and systematic anomalies in pressure patterns, with a

resulting negative Southern Oscillation Index (SOI) of -0.9.

This represents little change from last month's value of -1.0. The indicators earlier in the year of a slowly emerging La Niña episode again weakened this month.

The equatorial easterly winds were still a little stronger than usual in the eastern Pacific, which is common in La Niña situations, but were weaker than usual in the western Pacific, which is more in keeping with El Niño conditions. The tongue of below-average SSTs extending westward along the Equator from the Americas, which usually heralds a La Niña, retreated during the month.

Our Pacific Island data show rainfalls about average or a little above. There were few extreme rainfalls. The South Pacific Convergence Zone (SPCZ) continued to be more active in the eastern areas around French Polynesia, and in the west over the Coral Sea and Solomon Islands, with areas of about twice average rainfall.

Henderson's 238 mm was four times average, though not a record. Record-high rainfall was measured at Hilo, Hawaii

(338 mm, 197% of average). Patchy areas of twice average rainfall also occurred in eastern Kiribati and western areas of Fiji.

Much of Fiji had one-day rainfalls of about 100 mm on 3 June. Drier-than-average conditions continued (though not to the same extent as in May) in Papua New Guinea (3 mm, or 7% of average at Port Moresby); Vanuatu (about 50% of average) and eastern Australia (less than 50%).

Air temperatures were above average by about 1°C in French Polynesia and the Cook Islands, as well as in most American flag territories. Elsewhere, other island groups were near average, except Fiji and Tonga where temperatures were 0.5 to 1°C below average (note also that SSTs in these areas were 1 to 1.5°C below average.).

TOGA Sea Level Center readings for the previous month (May) showed generally small above-average sea-level anomalies in the western Pacific, reaching +6cm near Fiji and +7cm near New Caledonia.

(Source: *South Pacific Climate Monitor*)



INTERNATIONAL WORKSHOP ON CIGUATERA

Review of the special issue of the *Memoirs of the Queensland Museum* containing the papers presented at the International Workshop on Ciguatera Management, Bribie Island, Australia, 12–16 April 1993

The International Workshop on Ciguatera Management was convened at Bribie Island, Queensland by the Queensland Department of Primary Industry.

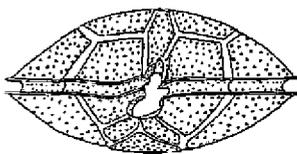
It followed the Fourth International Conference on Ciguatera convened at about the same time the previous year in Tahiti by the Institut Louis Malardé. Major themes of the Bribie Island workshop were:

1. Chemical and immunological aspects of the detection of toxins involved in ciguatera,
2. Pharmacology and treatment of ciguatera,
3. Origins of the toxins involved in ciguatera,
4. Clinical aspects and epidemiology of ciguatera

A total of 27 complete papers and 11 abstracts are contained in the workshop proceedings.

As in previous ciguatera meetings, much of the workshop focused on the biochemistry, physiology, pharmacology and treatment of ciguatera.

The generally accepted explanation about how fishes become ciguatoxic is through the ingestion of the dinoflagellate, *Gambierdiscus toxicus*, or through eating fish which have previously consumed *G. toxicus*.



Blooms of *G. toxicus* are thought to result from disturbances on coral reefs, leading to death of corals and the proliferation of calcareous algae which are an ideal habitat for *G. toxicus*.

A paper by Drs M.J. Holmes and R.J. Lewis reviews the biochemical evidence for the linkage between *G. toxicus* and ciguatoxicity in fishes. Three ciguatoxins (Ciguatoxins-1, -2 and -3) have been identified from fish flesh and two of these (Ciguatoxins-1 and -3) are thought to be linked to a toxin precursor (Gambiertoxin-4b) produced by *G. toxicus*.

As Holmes and Lewis point out, however, the link between *Gambierdiscus* and ciguatera remains circumstantial since Gambiertoxin-4b has not yet been unambiguously identified from cultures of this dinoflagellate.

Research on the treatment of ciguatera intoxication is presently focussed on the use of the sugar, Mannitol, which has been reported to be very effective if used shortly after a person begins to exhibit symptoms of ciguatera poisoning.

However, official approval for this treatment requires a set of clinical observations that follow a strict protocol known as 'double-blind' testing, where physician and patient are both unaware of whether a drug or placebo is being administered.

Such a study is being conducted by Dr Neal Palafox of the John Hopkins School of Medicine in the USA. Dr Palafox was previously a physician in the Marshall Islands, where the use

of Mannitol was first pioneered. Dr Palafox reported on the establishment of this clinical protocol in the Marshall Islands, Kiribati and Tuvalu. This study is still in progress and will be reported on further at a later date.

The first method to test specifically ciguatera toxins in fish flesh and fish extracts was developed by Dr Y. Hokama of the Hawaii Medical School during the 1980s.

Tests for ciguatoxicity in the past have relied on the use of live animal bio-assays using mice, mosquitoes, guinea pigs and mongooses. Live animal bio-assays are still regarded by many as the most reliable method to detect ciguatoxins in fish.

Hokama's method involves extracting ciguatoxins from the flesh of a fish on bamboo sticks or skewers coated with liquid paper. The presence of the toxin is then demonstrated through the use of antibodies that react with specific chemical reagents to produce a colour change from clear to blue in the final reagent immersion. The intensity of the colour change in the reagent is a measure of the fish toxicity.

A commercial version of this test, known as Ciguatetect™ was developed by Hawaii Chemtect and was demonstrated at the Ciguatera Conference in Tahiti in 1992 by Dr D. Park. This test was evaluated with reef fishes from the Caribbean by the Food & Drug Administration in 1992 and the results were reported at this meeting by one of the authors of the FDA study, Dr R. Hickey.

The conclusions were that at present the Ciguatect™ test results in an unacceptably high level of false positive and false negative values. Dr Hickey noted, however, that these results pertain only to Caribbean fishes and the study could not be extended to Pacific reef fishes.

SPC Inshore Fisheries Scientist, Paul Dalzell, presented a paper on ciguatera management in the South Pacific, which elaborated further on themes developed in an earlier paper presented at the conference in Tahiti.

Dalzell noted that ciguatera is not perceived as a major health risk in most Pacific islands but might represent a significant threat to fish exports and tourism. Management strategies should thus be focussed on minimising the damage to these enterprises.

Mr M. Chaloupka presented a study of ciguatera case histories in Queensland and demonstrated the importance of documenting case histories from the perspective of detecting changes in the temporal and spatial patterns of ciguatera intoxications.

An interesting presentation was made by an Australian lawyer,

Mr J. Payne, who reviewed the liabilities faced under Queensland law relevant to ciguatera poisoning.

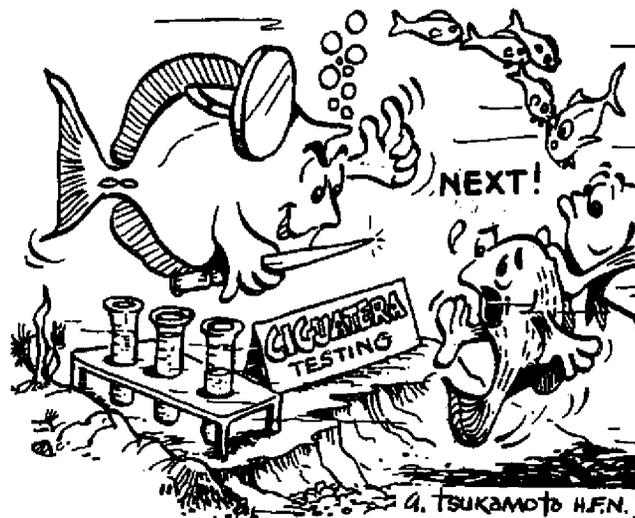
Although Mr Payne's presentation referred specifically to Queensland, it emphasised the need for persons involved in the fishing industry in the Pacific to acquaint themselves with their responsibilities, under both common law and specific statutes governing health and safety in the workplace and sale of goods, to prevent litigation in the event of an intoxication.

Persons wishing to obtain a copy of this volume of the *Memoirs of the Queensland Museum* should address their enquiries to the

Queensland Museum, P.O. Box 3300, South Brisbane, Qld 4001, Australia.

Given the connections between the papers presented at the workshop on Bribie Island and the 4th International Conference in Tahiti, it would also be useful for interested persons to obtain the proceedings of the latter meeting, similarly published in a dedicated issue of a journal, namely the *Bulletin de la Société de Pathologie Exotique*.

This journal is published by the Société de Pathologie Exotique, which can be contacted at 25 rue du Docteur-Roux, 75015 Paris, France.



■ A SELECTED BIBLIOGRAPHY ON SEAWEED AQUACULTURE RESEARCH AND DEVELOPMENT IN THE TROPICAL PACIFIC

This bibliography has attempted to cover materials on seaweeds and seaweed products relevant to the tropical Pacific region, particularly the Pacific Island countries, although many references also relate to other countries in the tropics. References on ciguatera-causing algae are also included.

The bibliography was compiled using a number of sources for the references, including personal libraries.

Several databases were searched, and most of the *Eucheuma* references that are included here are post-1987 as the older literature has been adequately reviewed. References on seagrass are also included.

There are also several other recent reviews available on related aspects.

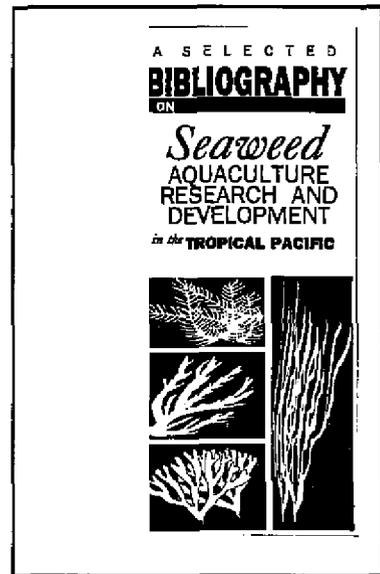
The Akatsuka volume announced for publication in 1992 should be consulted, as should the *Proceedings of the XIVth International Seaweed Symposium* and a special issue (No. 2) of volume 5 of the *Journal of Applied Phycology*.

The 'grey literature' has been more difficult to trace, and undoubtedly pertinent reports have been missed, hence this is not an exhaustive list.

The library of the Regional Fishery Support Programme of FAO/UNDP in Suva (this collection was held by the University of the South Pacific's (USP) Marine Studies Programme at the time of the production of this publication) and the library of the Fisheries Divisions in Kiribati, Fiji, and other Pacific Island countries have been excellent sources of 'grey literature'.

This bibliography is organised alphabetically by author and in the case of identical authors by the year of publication. In the case of identical dates, it is sorted by the title.

A subject index comprising the most appropriate terms, (predominantly using headings from the Aquatic Sciences and Fisheries Thesaurus) with cross-references, has been provided. Genus/generic names are also included in this index. A list of journal abbreviations (used in the bibliography) has been provided with their full titles.



■ TONGA FISHERIES BIBLIOGRAPHY PUBLISHED

During the late 1980s and early 1990s, the Food and Agriculture Organization of the United Nations (FAO) produced fisheries bibliographies for most Pacific Island countries. As part of this series, R. Gillett, S. Zirkel and S. Langi compiled a Tonga Fisheries Bibliography in 1988.

For that project, a total of 26 offices and collections in Tonga, Fiji and New Caledonia were examined in March and April 1988 for both published and unpublished material appropriate for the bibliography.

In addition, eight expatriate workers who had previously worked in a fisheries-related field in Tonga were contacted. Three bibliographic searches were carried out and five major university libraries were asked for relevant material. That work resulted in a list of 506 references.

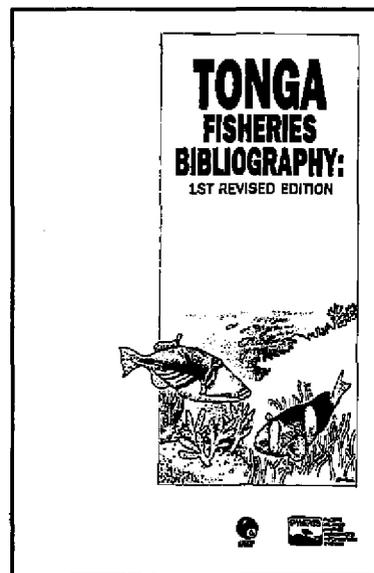
In 1993, the FAO provided a Fisheries Adviser to the Government of Tonga.

During his one-year assignment, 113 additional references relevant to fisheries in Tonga were added. This information was incorporated into the original bibliography and listed by author and by subject, resulting in this revised document.

As the objective of the project was to produce a document as

useful as possible to fisheries workers in Tonga, a 'user-friendly' bibliographic style was adopted.

The Pacific Islands Marine Resources Information System (PIMRIS) Coordination Unit at the University of the South Pacific Library has contributed to this publication by assuming the publishing role and any associated technical work.



NORTHERN PROVINCE OF NEW CALEDONIA HOSTS PRACTICAL MODULE OF SPC/NELSON POLYTECHNIC FISHING COURSE

For the first time since the inception of the SPC/Nelson Polytechnic course for Pacific Islands fisheries officers in 1979, the concluding practical fishing module took place in New Caledonia, from 25 June to 28 July 1994.

In August 1993, in response to an offer from the Northern Province Fisheries Service, Hugh Walton and Michel Blanc, respectively Fisheries Training Adviser and Fisheries Training Officer at the SPC, paid a short visit to the Province. The facilities at Touho (a village on the east coast approximately five hours' drive from Noumea) were perfectly suited to the course requirements and, in June 1994, the SPC officially accepted the Northern Province's offer to host the practical fishing module.

The course participants arrived on New Caledonian soil on Sunday, 25 June in the company of Alastair Robertson, an instructor at Nelson Polytechnic, who supervises the New Zealand course module.

Before travelling north to Touho, the students spent three days in Noumea with the SPC. Their brief stay familiarised them with the SPC's fisheries programmes and gave them time for a few hours of tuition on the management of deep-swimming fish stocks and tunas.

by Michel Blanc
South Pacific Commission
Noumea, New Caledonia

On Tuesday 28 June, after visiting the Noumea fish market, the participants watched the unloading of longliners belonging to the Navimon company and the packaging of tuna for Japan (a foretaste of what they could expect in Touho!).

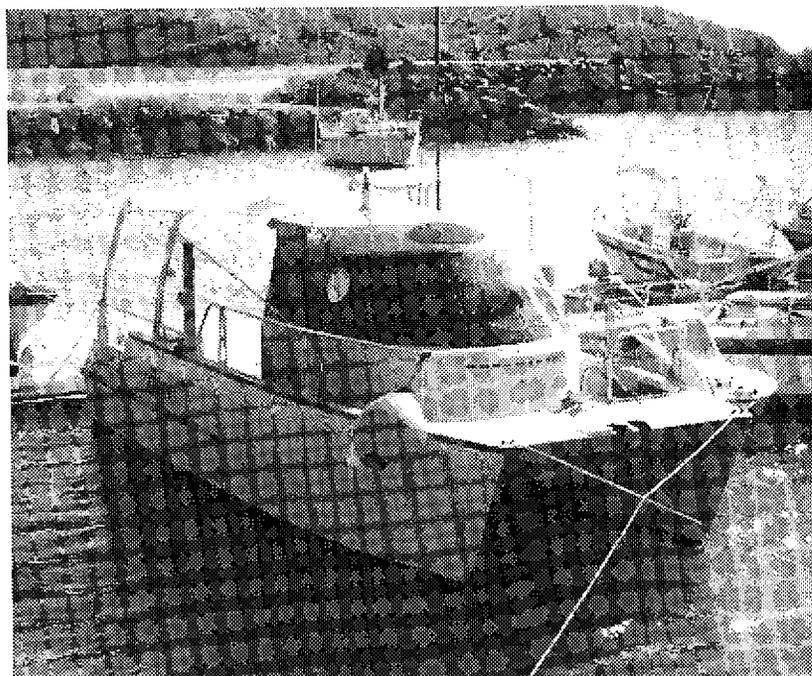
Then, on 29 July, the 13 participants, accompanied by Alastair Robertson, the SPC Fisheries Training Officer and Bernard Lepron, an instructor at the New Caledonia Marine Trades

Training School, set out for Touho in two vehicles which had been rented for the duration of the course. The participants were accommodated at the Touho Curriculum Development Centre, located in a former hotel built around a beautiful little bay 2 km north of Touho.

The next two days were set aside for the preparation of the fishing boats and gear and also used for teaching on the theory of fishing methods and small fishing venture management.

The venue for the theory classes and the preparation of the fishing gear was ideal: the marine annexe of the Touho Vocational Training School situated near Touho fishing port.

In addition to classrooms equipped with a television and video cassette recorder, an overhead projector and white boards, we also had the use of welding sets for making deep-sea fishing moorings and of a



The training vessel *Tradwa* of the Northern Province was launched a couple of weeks before the start of the practical module

workshop big enough to store the fishing gear.

The Touho cold store, kindly lent to us free of charge for the duration of the course, consists of a 250 m² building housing 2 operational cold rooms (1 above zero and 1 below). This building is situated near the port, 200 m from the marine school annexe. Three fishing boats were used by the students: the *Dar Mad*, an 11 m aluminium catamaran belonging to the Territorial Merchant Marine and Fisheries Department; the *Tradwa*, a 7 m wooden catamaran operated by the Northern Province Fisheries Service; and the *Pop*, a 5.5 m single-hulled fibreglass boat from the Marine Trades Training School. Each was equipped with the following essential electronic equipment: VHF radio, echosounder and GPS (plus radar on the *Dar Mad*).

Fishing proper began on Saturday 2 July and went on continuously until Monday 25 July. Because of the loss of the FADs, specially moored off Touho by the *Dar Mad* last June, the emphasis was put on fishing for deep-swimming species using the handreel and bottom longlining methods.

Each course participant took part in two pelagic longline sets (200 hooks each) aboard the *Dar Mad*, one in the daytime for tuna fishing and the other at night for swordfish. During the last week, some trolling was done on the *Tradwa* and the *Pop*.

Although the practical part of the course primarily involved training in fishing techniques and boat handling, a lot of attention was paid to rational vessel management and data collection; as during the two previous practical modules, the

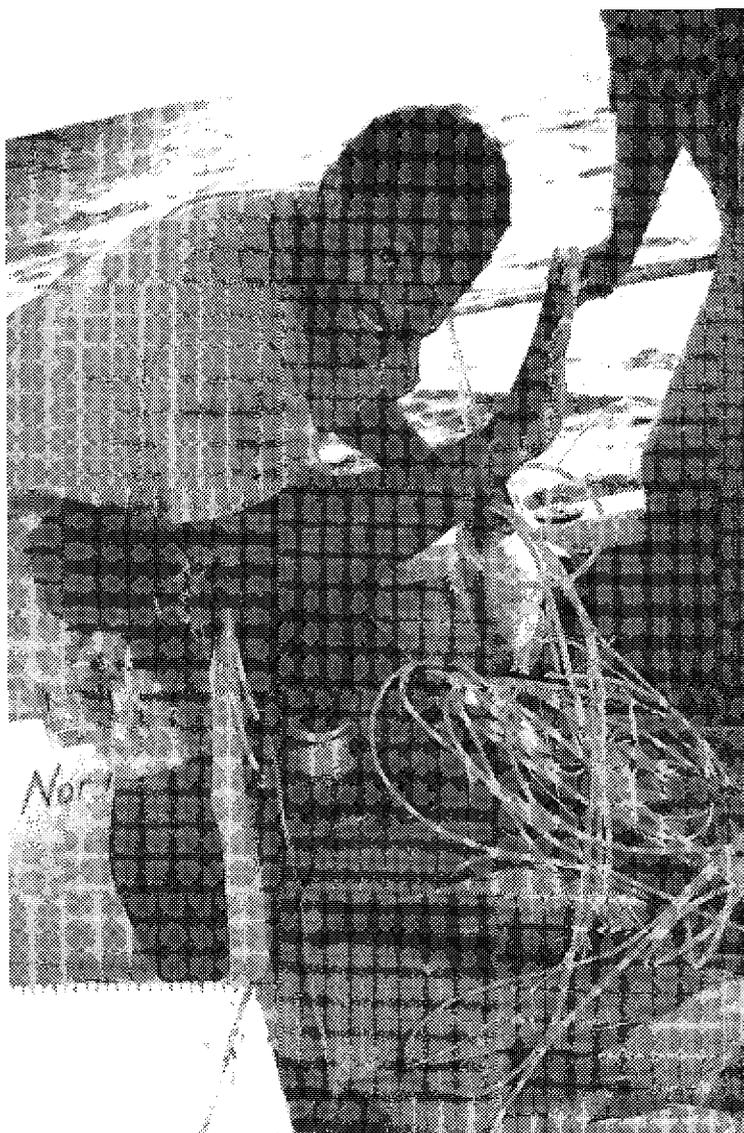
course participants prepared daily catch records and general reports.

After analysis in group sessions, this work yielded profit-and-loss statements for each boat. The report format prepared by the SPC Training Section in 1992 was used as a reference document for these exercises.

This is already in use in fishery extension divisions in a number of regional countries; copies are available on request from the SPC.

Fish marketing was a new component introduced into the practical module this year. The fish landed during previous courses had been handed over to the host organisation and, in most cases, simply sold locally. In New Caledonia, the regulations governing the sale of seafood make it illegal for fisheries department boats to sell their catch.

Since the fish could not therefore be sold on the local market, it was decided to export all landings to the Sydney fish



Zacharie Moenteapo (New Caledonia) untangling his 30-hook longline after a good set

markets. Four shipments of fresh fish, amounting to 1,800 kg in all, were freighted on Air France's Tuesday afternoon Noumea-Sydney flight.

The fish caught during the days prior to the shipment date were stored whole on ice in an above-zero cold room.

Every Monday evening, the participants weighed and packaged the fish after sorting them by species and weight. Carefully numbered and labelled, the boxes were loaded onto a refrigerated lorry and driven to Tontouta airport on Tuesday morning for the Noumea-Sydney flight. Similarly, 470 kg of tuna caught by the horizontal longlining method on the *Dar Mad* (mainly bigeye tuna) were exported to Japan through the Navimon longlining company.

From a strictly economic point of view, these trial exports yielded a profit of approximately 6,000 US dollars. This sum almost exactly covers the costs incurred by the Training Section to moor the Touho FAD, which unfortunately disappeared just a few days after being set.

From the skills point of view, this new component was a great success. The students left New Caledonia with full knowledge of the difficulties and the amount of work associated with a commercial fresh fish exporting venture.

The 1994 SPC/Nelson Polytechnic practical fishing module was concluded in fine style on Thursday 28 July with a barbecue laid on by the Training Section.

This 1994 practical module was one of the most successful in



Sydney fish market requests fish to be spiked — Zacharie on the job

the history of the SPC/Nelson Polytechnic course. The ingredients for success were favourable weather (with enough bad weather to teach the trainees the hard realities of the fisherman's life), good fishing grounds, a motivated and hard-working group of participants and, of course, fruitful co-operation between the SPC Training Section and the various fisheries organisations in New Caledonia.

The officers of the Fisheries Training Section wish to thank the government of New Zealand, the Commonwealth

Secretariat and the Commonwealth Foundation for the financial support they provided, which secured the success of the annual course organised by the Nelson Polytechnic Fishing School and of the practical module included in it.

The 1994 course is over, so it's already time to think about the 1995 course! The fisheries departments of Pacific Island countries and territories were requested to send in their nominations for the SPC/Nelson Polytechnic course next year by 15 November 1994 at the latest.



Eric Dako (PNG) and Uelese Tufuga (Western Samoa)
packing 20 kg of fish for export to Sydney

Fish marketing trials in Australia

In 1994, the SPC/Nelson practical fishing module included a new component on fish marketing. Four shipments of chilled deep-sea fish, amounting 1,800 kg in all, were freighted out to the Sydney Fish Market. The technical and administrative procedures followed by the trainees as well as the economical analysis of these marketing trials were covered in a specific report (Report on marketing trials in Australia for fish harvested during the 1994 SPC/Nelson Polytechnic practical fishing module). The French version has already been distributed to the various New Caledonia fisheries administrations and the English version is now available. People interested in this report should contact the Commission's Fisheries Training Section.

BOTTOMFISH PROJECT CONCLUDES IN TUVALU

The Tuvalu Deep Bottomfish Project, accounts of which have been given in previous issues of the SPC *Fisheries Newsletter*, was initiated as a component of the Pacific Islands Marine Resources (PIMAR) Project funded and administered by the USAID office in Suva, Fiji.

The Tuvalu work, extending over three years, was aimed at assisting locals to increase income-generating opportunities through proper utilisation and good conservation and management of marine resources. Commencing in late 1991, the project was implemented by a US firm, RDA International, with an overall budget of US\$ 930,000.

A field office was established in Funafuti, Tuvalu, to co-ordinate, manage and implement activities in the field. This office was fully manned by Tuvaluans, including the Marine Resource Advisor/Team Leader, an office secretary, masterfisherman, data collectors and vessel crew.

The project was officially closed as of 30 September 1994. However a four-month unofficial extension was allowed for the Contractor to complete all final reports.

Objectives

The project's principal objectives were:

- ☛ To assess the potential of offshore deep bottomfish resources in Tuvalu;



by **Safalaka Petaia**
RDA Marine Resource Adviser
Funafuti, Tuvalu

- ☛ To train locals in all areas related to bottomfishing technology, marketing, and fish handling;
- ☛ To identify and recommend fishing vessels with the capacity to effectively exploit the bottomfish resources of Tuvalu;
- ☛ To establish markets and marketing contacts overseas for Tuvalu bottomfish; and
- ☛ To assess the economic viability of the bottomfishing industry through test commercial fishing and export marketing.

Project components

Resource assessment

In order to determine the potential of the deep bottomfish resource, research activities were carried out using a Government owned vessel, the *F.V. Manaua*.

The resource assessment activities focused on hydrographic exploration; fish sampling; and cruise log. Research was concentrated on offshore seamounts within Tuvalu's 200 nm EEZ, in both the northern and southern sectors.

The data collected from these activities will be used to determine the potential of the bottomfish resource and to formulate management and regulatory measures for the long-

term sustainable use of the resource. This data analysis will be carried out by US National Marine Fisheries Service biologists.

Although a final report of this work will not be completed until January 1995, there are strong preliminary indications that the resource has the potential to support a commercially viable, small-scale bottom-fishing industry.

Commercial fishing trials

Commercial fishing trials were conducted on offshore seamounts to:

- ☛ Test the suitability and effectiveness of various fishing gears and equipment;
- ☛ Test and locate suitable fishing grounds for bottomfishing, mainly targeting valuable species with export market potential; and
- ☛ To determine what fishing-vessel types would be able to operate effectively on offshore seamounts.

A commercial fishing vessel was chartered from Fiji by the Government of Tuvalu to conduct the fishing trials. However, due to frequent breakdowns and maintenance requirements, the vessel proved largely unsuitable. Subsequently the government-owned vessel, *F.V. Manaua*, was used to conduct the trials.

Six commercial fishing trials were conducted between August and September 1994. The final report on these trials will be ready for distribution by January 1995.

Preliminary results, however, indicated that a 19 m vessel

such as *F.V. Manau'i* may be inappropriate for this type of operation as it is relatively expensive to operate.

However, it is anticipated that smaller vessels of approximately 15–17 m in length and fitted with appropriate fishing equipment and refrigerated fish holds can be identified which would be better suited. Sixty to seventy per cent of the total catch from these trials was considered exportable to overseas markets, in particular to the Hawaiian market.

Export marketing trials

In order to determine the potential of an export-oriented bottomfish industry in Tuvalu, export marketing trials were conducted during the second and third year of the project, in conjunction with research and commercial fishing activities. Emphasis in this respect is on fresh fish export.

The principal objectives of this activity were:

- ☞ To identify and establish suitable markets and marketing contacts overseas for Tuvalu bottomfish species;
- ☞ To assess the economic viability of exporting fresh bottomfish species from Tuvalu to overseas markets; and
- ☞ To train locals in all aspects of export marketing, particularly in the area of fish handling, packaging, and documentation procedures.

During the whole life of the project a total of six export shipments by air was undertaken, mainly to Hawaiian markets. During the course of the trials, three buyers were identified;

Fresh Island Fish Co. (FIFCO) in Maui; and Garden Valley Isles and Kibun Seafoods Hawaii Inc. in Honolulu.

A total of 4,000 kg of fresh fish was exported to Hawaii during the course of the trials, 40 per cent of this being longtail red snapper (*Etelis coruscans*), 40 per cent Opakapaka (*Pristipomoides filamentosus*), and 20 per cent other bottomfish species.

The average Hawaiian price recorded for these species during the trials ranged between A\$ 6.00 and 7.00/kg.

The report, detailing the results of marketing activities, together with a separate report focusing on the economic analysis of the operation, will also be compiled and made available by January 1995.

Economic and marketing evaluation of bottomfish

The purpose of this activity was to assess the economic potential of the overall bottomfish operation, with special emphasis on costs associated with operation of the vessel, marketing (freight, packaging, materials, communication) and other costs, compared to revenues derived from local and export sales of fish.

The report of this evaluation will be based on the final results of the resource assessment, export marketing trials, and commercial fishing trials.

Vessel characteristics and specifications

This component of the project focused on the need to determine the appropriate features, characteristics, and detailed specifications of the most suitable and cost-effective vessel

able to exploit the offshore bottomfish resources of Tuvalu. The final report on this activity will provide detailed information on fishing gears and equipment; vessel layout and arrangement; engine power, type and model; refrigeration system and fish-hold capacity; and crew requirements.

Short- and long-term training

In order to develop and expand the bottomfish industry in Tuvalu, manpower skills must be developed, particularly in the areas of bottom-fishing technology, marketing, fish handling, and data collection. In this respect the project was also involved in developing and organising specialised training programmes of both short- and long-term duration.

Bottomfish resource management plan

The main purpose of this component of the project was to develop and formulate an efficient and effective management regime that would ensure the long-term sustainable use of the offshore bottomfish resource in Tuvalu.

The plan will be based on the final results of the resource assessment, commercial fishing trials, and export marketing trials. In developing the management plan, local officials, fishermen, and government fisheries personnel will be involved to ensure that the views and inputs of local people are incorporated.

Summary of preliminary results

Although the final analysis on project data has not been completed and compiled into final reports, the following prelimi-

nary information and results from the project are available:

- ☛ The offshore bottomfish resource within the 200-mile EEZ, with proper utilisation, effective management, and close monitoring of exploitation, can support and sustain a commercially viable, small-scale bottomfish fishery;
- ☛ Export markets and marketing contacts have been identified and established for Tuvalu bottomfish in Hawaii. However, there is a need to explore other marketing opportunities, either within Hawaii or in other countries. It has also been demonstrated that fresh fish from Tuvalu can be exported by air to Hawaii at competitive prices and in premium condition;
- ☛ A good number of local private fishermen and government fisheries personnel have been variously trained in all areas related to bottomfish capture, export marketing, management and effective monitoring of the bottomfish resource;
- ☛ The commercial fishing trials and research cruises have identified suitable fishing grounds, new seasons, and appropriate vessel characteristics and

specifications. Detailed information on fishing gears, equipment, and vessel arrangements have also become available. A vessel between 14 m and 17 m, with appropriate navigation, acoustic and communication equipment would be most appropriate and cost-effective for the offshore bottomfish fishery in Tuvalu;

- ☛ Management and regulatory measures to monitor the status of the fishery should be formulated in order to sustain the resource in the long term. Regulatory measures would include such factors as a quota system, closed seasons and areas, and restriction on use of certain fishing gears. The overall management regime would need to be modified as appropriate from time to time in order to be consistent with the probably rapidly changing nature of the fishery;
- ☛ Although the final assessment on the future economic potential of the bottomfish industry in Tuvalu is not yet available, there are strong indications that such a fishery can be economically viable. Success will depend in large part on: transport links; the availability of basic infra-

structure to facilitate the development of the industry; operation of four or five small, cost-effective fishing vessels with appropriate fishing gears and equipment; establishment of an effective bottomfish resource management regime; and the availability of suitable export markets.

Conclusion

The project has been very successful in meeting most of its goals, despite numerous problems encountered during the course of implementation. The information arising from project activities is likely to contribute very positively to the future development of the bottomfish industry in Tuvalu.

Successful development, however, will very much depend on the availability of funding for the purchase of suitable fishing vessels and construction of basic infrastructure and facilities to support expansion of the industry.

Such developments are likely to require government support, but in the long term it is likely that the fishery will be privatised and operated by private individuals, groups of fishermen, co-operatives, and organisations which have the financial and technical capacity to develop the industry.

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SOUTH PACIFIC COMMISSION



FISHERIES EDUCATION AND TRAINING ADVISER

Applications are invited from suitably qualified and experienced persons to fill the above position within the Commission's Coastal Fisheries Programme.

The successful applicant will be required to manage the programmes and activities of the Commission's Fisheries Training Section whose terms of reference are to:

- enhance the transfer of fisheries-related skills and knowledge to Pacific Island nationals;
- promote the co-ordination and efficient use of training opportunities in fisheries by Pacific Island governments and administrations;
- assist Pacific Island governments and administrations to undertake and implement human resource development planning programmes in the fisheries sector;
- develop and implement purpose-designed fisheries training programmes in areas where existing opportunities do not fully satisfy Pacific Island needs;
- provide appropriate support and input into training activities of other sections of the SPC Fisheries Programme.

Applicants should have an appropriate recognised tertiary qualification in either fisheries or education, with substantial proven practical, developmental and managerial experience in fisheries training and education, preferably in Pacific fisheries. Well-developed English language oral and written communications skills are essential, with a good working knowledge of French an advantage.

The position is offered for a three-year term and will be based at Commission Headquarters in Noumea, New Caledonia. Benefits include a tax-free salary at regional levels, housing and medical benefits, provident fund membership, education allowances, and fares and removal expenses.

Applicants should detail their education and employment background, with particulars of three referees. All applications, which close on **13 January 1995**, should be addressed to the Secretary-General, South Pacific Commission, B.P. D5, 98848 Noumea Cedex, New Caledonia. Phone: 687 26 20 20, Fax: 687 26 38 18.

Potential applicants may obtain an information package relating to SPC and the details of the post upon request.