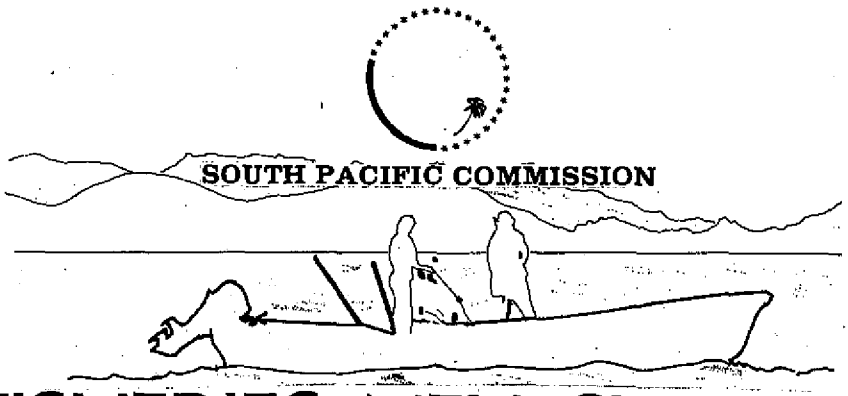

FISHERIES NEWSLETTER

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Contents

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SPC ACTIVITIES

SPC/USP/FFA FISHERIES INFORMATION ADVISORY GROUP MEETING

The above meeting, jointly sponsored by SPC, the University of the South Pacific (USP) and the Forum Fisheries Agency (FFA), was held at SPC Headquarters in Noumea, New Caledonia, from 23 - 27 March 1987. Its aim was to discuss ways to improve the recognised deficiencies in the collection, organisation and dissemination of marine resource information to Pacific Island countries. In doing so it brought together fisheries officers, librarians, information specialists, and communications and computer technologists, representing both SPC/USP/FFA member countries and the various national and international bodies concerned with marine resource information.

The agenda of the meeting, which covered all aspects of Pacific Islands marine resource information collection, storage and use, was as follows:

1. Opening address
2. Administrative arrangements
3. Appointment of Chairman, Vice-Chairman, and drafting committee
4. Approval of agenda
5. Report by the Chairman on relevant recommendations of the 18th South Pacific Commission Regional Technical Meeting on Fisheries
5. Overview of marine resource information questionnaire responses
7. Analysis and discussion of South Pacific Commission area marine resources information: discussion of present situation, needs and priorities
8. State-of-the-art of international fisheries and marine information systems
9. Trends in the development of fishery information centres and networks
10. Communications: present state and possibilities
11. Matters arising from previous sessions
12. Computer mediated communication
13. Solomon Islands marine resources bibliography - a case study
14. Presentation by ICOD
15. Preliminary draft project proposal for a Fisheries and Marine Resources Information System
16. Recommendations and agreements arising from discussions of the preliminary draft proposal; basic systems, practical co-operation between countries and organisations represented; design and implementation
17. Presentation and discussion of draft proposal for a Pacific Islands Marine Resources Information System
18. Demonstration of TEXTO software package
19. Adoption of draft report and basic elements of draft proposal for a Pacific Islands Marine Resources Information System
20. Close of meeting

During the discussions, the meeting worked towards developing and refining a proposal for a Pacific Island Marine Resources Information System (PIMRIS). A draft proposal was ultimately agreed on whereby PIMRIS would be a joint activity of SPC, the Pacific Information Centre (PIC) based at USP, and FFA, in conjunction with selected national contact points in Pacific Island countries. Different activities in information hunting,

cataloguing, archiving and dissemination will be undertaken by different agencies. Under the project, SPC will expand its capabilities and activities in actively circulating technical material to specialist workers, in evaluating, reviewing and summarising technical documentation, in compiling information packages (either generally on on request) and in accessing marine resource databases in other parts of the world. SPC will also be responsible for providing the full range of PIMRIS services to those SPC member countries that are not at present members of FFA or USP/PIC.

The draft proposal agreed by the meeting will now be refined in consultation with member countries by consultants Esther Williams (director of PIC) and Ueta Fa'asili (chief Fisheries Officer from Western Samoa). A budget for the system will also be drawn up and tabled for final discussion and approval at the forthcoming 19th Regional Technical Meeting on Fisheries (see article below) prior to presentation to potential funding agencies.

19TH REGIONAL TECHNICAL MEETING ON FISHERIES ANNOUNCED

The annual SPC Regional Technical Meeting on Fisheries provides the only opportunity for senior fisheries officers from all SPC member countries to meet and discuss technical aspects of fisheries development, and through the exchange of experience, ideas and information, to identify mutual needs and problems which can best be met by a regional approach.

This year's meeting, announced in April in SPC Savingram 23/87, is scheduled to be held in Noumea, New Caledonia from 3 - 7 August 1987. Key items proposed for the agenda include a review of the structure and activities of the SPC Inshore Fisheries Research Project, consideration of the external evaluation report on the Tuna and Billfish Assessment Programme, and discussion of a draft proposal calling for the establishment of a Pacific Islands Marine Resources Information System (see article above). This year's workshop session will examine opportunities and approaches for the marketing of Pacific Islands fisheries produce.

The full agenda is as follows;

1. Opening address
2. Administrative arrangements
3. Appointment of Chairman and other office bearers
4. Approval of agenda and timetable
5. Review of Coastal Fisheries Work Programme
6. SPC Inshore Fisheries Research Project
   (i) review of structure and activities
   (ii) workshop on Pacific Inshore Fisheries Resources
7. Consideration of a draft proposal for the development of a Pacific Islands Marine Resources Information Service
8. Report on the Tuna and Billfish Assessment Programme activities
9. Review of the TBAP evaluation report prepared by consultant Mr T. Curtin
10. Standing Committee on Tuna and Billfish
11. Workshop: Marketing of Pacific Islands Fisheries Produce
12 .Ciguatera - a regional update
13. Reports by other organisations
14. Other business
15. Adoption of the report

As in previous years, the meeting promises to be a stimulating and informative event.

KIRIBATI DEEP-WATER PRAWN SURVEY COMMENCES

Consultant deep-water fisherman Bernard Crutz and SPC Assistant Fisheries Officer Garry Preston travelled to Kiribati in mid-March to assist the Fisheries Division carry out an initial survey of deep-water shrimp resources in the Northern Gilbert islands. The survey, which has been planned for over a year now, was originally meant to start in January, but protracted westerly winds coupled with some engine problems on the project vessel Nei Tewenei led to a postponement.

Photo: G.L. Preston

Final checking of a large trap, one of two trap sizes used during the survey

The first couple of weeks of the field work involved constructing the traps to be used. As well as aiming to determine the relative abundance of deep-water prawns in the area, the survey aimed to compare the effectiveness of two different trap sizes in catching the shrimps.

The results of the survey will be reported in the next issue of the Newsletter.

DEEP SEA FISHERIES DEVELOPMENT PROJECT NOTES

--Pale Taumaia leaves SPC.

Pale Taumaia, Master Fisherman with the SPC for the past 7 years, resigned his post in February 1987, in order to be able to take up a fisheries extension position in Tuvalu.

Pale's presence on the SPC Coastal Fisheries Programme team will be missed by his colleagues. His ability to live and work in very difficult and basic conditions made him a valuable asset to a village-oriented development activity like the Deep Sea Fisheries Development Project. Ironically, this talent gained Pale the dubious privilege of being given some of the most difficult and challenging assignments undertaken by the Project.

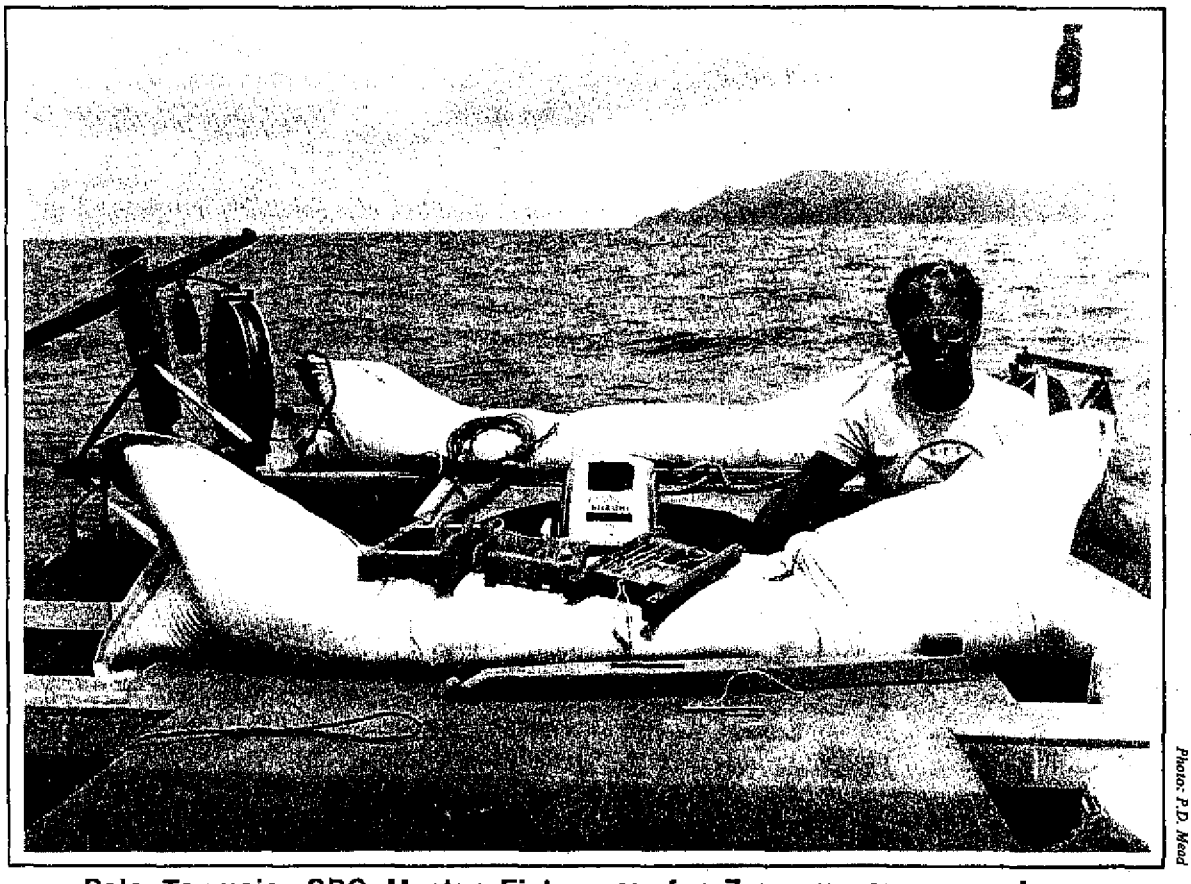


Photo: P.D. Mead

Pale Taumaia, SPC Master Fisherman for 7 years, on a previous assignment to Fiji.

Pale's ability to readily identify with fishermen in remote or rural communities made him an excellent choice to undertake extension work in the outer islands of Tuvalu. His colleagues at SPC wish him well in his new job, and hope that, although on somewhat different terms, his association with the Commission will continue.

--Gear Development Sub-project

As noted in the last issue of the Newsletter, this activity was established for an anticipated 2-year period in Vava'u, Tonga, starting in September 1986. The aim is to permit longer-term gear development work to proceed without interference from short-term seasonal effects, or the need to re-locate every few months, as is the case with "routine" DSFD assignments.

Initial work has involved vessel and gear preparation, and the deployment of four FADs around Vava'u to serve as fish aggregators during the forthcoming fishing trails. Unfortunately, FAD No 4 was lost during strong winds and rough sea conditions associated with the cyclone that passed through the Manu'a islands of American Samoa in January 1987. The float from FAD No 3 was also lost but subsequently recovered and replaced.

SPC Master Fisherman Paul Mead, who is carrying out the work with the assistance of an SPC-employed local crew, and officers of the Tonga Fisheries Division, has been investigating the fishing potential of the area by trolling and bottom fishing. Here is an extract from an account of his work, written at the end of March.

> "Just a few comments about last weeks fishing trip and observations in general on the billfish we have caught. Monday my crew and I worked from 08.30 until 22.00 preparing the Vete and gear for a trip to a seamount approx 30 miles north of Fonualei. We had arranged to accompany Naita but this arrangement did not work out as he left at 17.00 and we were not ready. We had planned to stay 3 to 4 days and use his boat as a mother ship to store our catch as the ice box on Vete is small. We were going to catch flying fish at night, the moon phase is right, and use the flying fish for deep trolling baits over the seamount in the day time. We left at 11.00 Tuesday trolling large lures and arrived at the small volcanic island of Fonualei well after sunset. We had one billfish strike on the way over but it did not take the lure enough to set the hook after striking three times. The flying fish catching part of the trip fell through almost immediately as our light burned out when we turned it on. After spending a wet miserable night trying to sleep on the Vete's deck we were up at 05.00 and spent a couple of hours trolling the large lures around the island. We caught a couple of small wahoo, a caranx, one small dogie, and three small barracuda. Our forward mounted round wooden reels run through pulleys on the outriggers worked well. After a cup of tea we headed north to try to locate Naita and the seamount trolling four medium size lure, consisting of:
>
> 1. one 15mm ruby-eye hex head with a red and pearl skirt with 275 lb (125 kg) test 49-strand stainless trace-single hook;
> 2. one 17mm pearl head with bluish skirt, 175 lb (80 kg) test 49-strand brown stainless trace and double hook;
> 3. one size No. 4 (approx 18mm) fish eye head with orange skirt on single 175 lb (80 kg) test stainless trace and double hook;
> 4. and one (old faithful) 17mm plain chrome bullet head and a pinkish (color No. 2) skirt, 250 lb (115 kg) test nylon leader with double hook and green spring spacer.
>
> "At approx 15:45 we had a marlin strike on lure No. 4) which was trolled off the small Alvey reel. Line on the Alvey consisted of 80m of 300lb test clear monofilament backed by 200m of approx 200lb test super toto. The fish nearly stripped the entire reel on the strike before we could turn the boat and chase him. After 15 minutes I had gained back a 100m of super toto and had a more comfortable fight from my fighting chair, an 8 litre bucket turned upside down. We landed the fish, approx 125kg blue marlin (114 gutted), at 16.50 and continued on to Naita's boat. Although we had planned to use Naita's boat as a mother ship a

heavy swell and choppy sea made it difficult to transfer our fish. We decided to troll until dark for bait and make a decision at that time. We left Naita's boat and headed east towards a shallow area of the seamount. Approx 400m from Naita's boat we hooked, played and landed a sailfish weighing approx 40kg on the same lure which had caught the marlin. The two lures off outriggers were trolled from 80-100m behind the boat while the two lures on the Alveys were from 70-80m back. I do not think the distance behind the boat had any effect on the lures. After landing the sailfish our echo sounder quit working, possibly a short in the boat's electrical system, spoiling our chances of deep trolling the next day so we headed back towards Vava'u catching 1 wahoo, 3 small yellowfin, 1 skipjack, and losing my good lure No. 4 after what appeared to be another billfish strike on it. At 22.00 we stopped for a cup of tea and iced the two big fish again. I ran the boat all night as neither of my crew could follow the Vete's compass. The 70 mile run took all night and we arrived at the wharf a few minutes past 07.00 the next morning. Cleaned to boat and sold the bigger fish to FIMCO.

"In the last three months on a limited number of trips we have landed 7 billfish and hooked from 3 to 6 others, 3 of them verified by visual contact. Of the 7 landed 6 were caught on the same lure head with only a slight variation in skirt colour, either pink or red. The other one was caught on a rigged fresh-caught shark mackerel. Of the 3 to 6 others hooked but not landed one cut the lure off with what was probably his tail, and two others threw the lure, while three possibles struck the lure 2-3 times and did no damage to it. Twice this occurred on large lures. It would seem that a good hook-up occurs more often on the 150-200mm length lures which the fish tends to swallow than on the larger 300mm plus lures which the billfish seemed to hit at without swallowing. Only two of those landed were hooked in the lower jaw, one on a lure and one on the bait. Two were on wire trace, the rigged bait was on 275 lb (125 kg) stainless cable and a bullet head on 175 lb (80 kg) test mono stainless. The rest were on mono nylon trace varying from 150-250 lb (70-115 kg) test and terminating with double hooks. After the initial first long run and usually a couple of jumps the fish settle down to big circles which gradually become smaller as they are worked in toward the boat. Once the fish settles into this circling motion one should be patient and not try to force him or he breaks the pattern and makes unpredictable moves. The fish should be kept in the circling pattern until completely exhausted at which time it will usually be within 10m of the boat and using its body angled against the forward motion of the boat with very little movement of the head or tail. At this time the boat is slowed to very slow forward but still maintaining a tight circle with the wheel hard over. The fish is worked close to the boat, speared through the head, gaffed and boated.

"I am sure there are probably no new startling revelations in this long winded account but I thought you might be interested as the landing technique does differ from landing wahoo or tuna. Game fishing could become more financially important to Vava'u than commercial fishing in the dim distant future.

"Monday and Tuesday I plan to work on and deploy the 80m FAD replacement and do short observation dives around the others. Mark was checking bivalve growth, which is heavy on the nylon ropes, on Fad No. 2 last week. He reported large schools of small bait of several different species around it with a few larger predators, possibly Megalaspis, circling wide. The entire net is covered in heavy weed growth 1-3 feet long. Possibly Wednesday and Thursday I will try to complete the quarterly report and Friday's activities depend on the weather."

EIGHTH NELSON COURSE STARTS

The eighth SPC/Nelson Polytechnic Pacific Island Fisheries Officers Training Course started on 9 February 1987 in Nelson, New Zealand. The 12 participants from 12 Pacific Island countries will be based in Nelson for 14 weeks before moving to Vava'u, in the Kingdom of Tonga, to undertake the 5-week practical fishing module associated with the course. The module finishes on 17 July 1987, at which time the trainees will return to their home countries.

The subjects covered during the course, which also includes attachments to New Zealand fish processing factories and to the Fisheries Research and Management Division of the New Zealand Ministry of Agriculture and Fisheries, are as follows:

1. Subjects covered in Polytechnic-based lecture and practical work (14 weeks)

(i) Practical netting and seamanship
net repair and construction; reading net plans; ordering netting materials; rope work; splicing wire ropes; use of blocks and compound pulley systems.

(ii) General fishing subjects
fish catching methods (trolling, gill netting, longlining, dahnlining, deep-water handlining, purse seining, beach seining, pole-and-line fishing, bait fishing, shellfish dredging); fishing economics; benefits of fishermens organisations.

(iii) Navigation and chartwork
chart reading, abbreviations and symbols; position fixing; laying courses; use of compass (to a standard required for coastal and short inter-island passages by small boat).

(iv) Refrigeration
general principles of compression and absorption refrigeration cycles; characteristics of insulating materials; simple fault finding and repair.

(v) Fish quality control
physical and chemical composition of fish; bacterial, enzymic (autolytic) and oxidative spoilage; control of spoilage; on-board fish handling; properties and use of ice; freezing and cold storage of fish; salting, drying and smoking.

(vi) Engineering workshop practice
use of basic metal working tools; drilling, tapping and threading; soldering; work with metal sheets, bars and pipes.

(vii) Marine Engineering
principles of 2- and 4- stroke compression cycles; principles of petrol and diesel engines; use of measuring tools; care and maintenance of lead-acid batteries; engine inspection and overhaul; maintenance of pumps and filters; lubrication; bilge systems.

(viii) Outboard motor maintenance
routine maintenance and testing; propeller selection; emergency treatment following immersion.

(ix) Fibreglassing
properties and uses of fibreglass materials and tools; skinning wooden surfaces; construction of small icebox; repair of holes in fibreglass hull; construction of fibreglass boats.

(x) Welding
operation and maintenance of gas and electric arc welding plants; welding sheets and pipes; brazing.

(xi) Visiting lecturers/private study
time is allocated each week for trainees to write up research projects and log-books. Visiting lecturers are engaged to speak on relevant topics during this period when possible.

2. Subjects covered in field attachments

(i) Fish factory experience (3 weeks)
trainees work under supervision in small or medium sized fish processing factories and become familiar with various aspects of the processing industry.

(ii) Fisheries research and management (1 week)
visits to Fisheries Research Division, Fisheries Management Division and Fishing Industry Board in Wellington. Lecturers, demonstration and practical work on aspects of fisheries research and management in New Zealand and overseas.

3. Subjects covered in the Practical Fishing Module (5 weeks)

Students receive on-the-job instruction under the supervision of an SPC Master Fisherman in the following fishing and related activities.

(i) Surface and sub-surface trolling
(ii) Daytime and nighttime deep reel fishing
(iii) Vertical longline
(iv) Deep bottom-set longlines
(v) Use of small echo-sounders
(vi) Construction, deployment and use of FADs
(vii) Onboard and onshore fish processing
(viii) Record-keeping and economics of fishing operations

The Practical Fishing Module will be integrated with the Nelson-based training to allow practice and development under working conditions of the skills taught during Polytechnic lecture and practical sessions.

THIRD REFRIGERATION COURSE PLANNED

In response to a request from the Government of Papua New Guinea, the SPC is planning to conduct a fisheries-oriented refrigeration training course in PNG to train sufficient refrigeration mechanics to meet at least the minimum national requirements for servicing government fish buying and processing stations. The course will be similar in content and approach to those held in Rarotonga in 1985 and 1986 (see SPC Fisheries Newsletter #32, page 2: #36 p 2; #37 p 3; #39 p 2), covering the theory and practical application of refrigeration as used in South Pacific small-scale artisanal and commercial fisheries. Successful trainees will develop the skills and understanding necessary to be able to operate, maintain and repair commercial refrigeration systems, including all common types of freezing and holding units, and ice machines. The course will include related diesel generator maintenance and repair, electrical repair, and training in various types of welding and soldering.

As some other countries of the region have expressed a need for additional training opportunities for refrigeration mechanics, six of the 16 places have been reserved for regional students, with the rest allocated to PNG. A venue is still under discussion but is likely to be Kavieng, with a start date some time around the middle of 1987.

NEWS FROM IN AND AROUND THE REGION

MORE KOREAN BOATS FOR TONGA

(Source: SPC)

Deep-water pelagic trawling on Tonga seamounts by the Korean vessel Taha Noa Taha (see SPC Fisheries Newsletter No 39, page 13) has been so successful that the Tongan-Korean joint venture company Ma'alata Fisheries (Tonga) Ltd has brought in two more vessels to enable it to expand its operations.

Local fisheries officials are expressing fears that the vessels fishing capacity may be excessive, given the limited extent of Tonga's deep bottom resources and the likelihood that at least part of the Korean vessels' catch consists of deep-water snapper species which are also being targetted by local boats. So far, the true nature of the Korean vessels catch has not been disclosed to the local Fisheries Department.

SIXTH INTERNATIONAL CORAL REEF SYMPOSIUM ANNOUNCED

(Source: Symposium organising committee)

This conference will be held in Townsville, Australia from 8-12 August 1988. All interested reef scientists and environmental managers are invited to attend the symposium, which will emphasise interaction at all levels. In the first circular announcing the symposium, the conference organisers outline their objectives in the following terms:

> "First, we will provide a series of foci for the sort of multidisciplinary interaction which will stimulate specific research priorities for the next decade.

"Secondly,as coral reef studies are essentially field oriented, we intend to emphasise the field aspects and make them complementary to the technical sessions.

"Our third objective will be to ensure that some of the themes addressed at the Sixth Symposium emphasise results that impinge directly upon, and ensure good management of, a possibly fragile resource. In recent years it has become apparent to both developed and developing nations alike that reefs and their living communities constitute important resources widely subjected to current and future deterioration. The successful management of such resources has been pioneered in Australia, where the combination of science and management is operating effectively. The sixth Symposium will attempt to foster this at the international level.

"Those who gather together in Townsville in 1988 will have the opportunity to determine whether we succeed or fail in our objectives.

"Come to Townsville and help mould the directions of reef science in the 1990s."

For more information, contact :

Australian Convention and Travel Services Pty Ltd
GPO Box 1929
Canberra, ACT 2601
Australia

NEW ODA FISHERIES ADVISER

(Source: ODA/SPC)

The United Kingdom Overseas Development Administration (ODA) has recently appointed Dr Nick Willoughby as Fisheries Adviser with its Suva Office (British Development Division in the Pacific, Private Mail Bag, Suva, Fiji). Dr Willoughby replaced outgoing Fisheries Adviser Dick Beales in March, and will take over his responsibilities, which include advising ODA on fisheries development activities and proposals in the Pacific and co-ordinating the activities of ODA funded fisheries specialists working in the region.

PECC PROMOTES INTER-REGIONAL FISHERIES CO-OPERATION

(Source: SPC/University of British Columbia)

The Pacific Economic Co-operation Conference (PECC) is an association of Pacific rim and Pacific Island countries with a common interest in promoting trade links and cooperation in economic, developmental and other areas in the Pacific region. The conference, which met for the fifth time in Vancouver, Canada in November 1986 includes members from Latin America (Peru, Chile), North America (USA, Canada), the north-west Pacific (Japan, USSR, Taiwan), south-west Asia (Philippines, Indonesia), and the south-west Pacific (Australia, New Zealand), as well as several Pacific Island nations. During the course of its development, PECC has established a number of task forces which focus either on broad themes (e.g. direct investment, international trade policy) or specific sectors (e.g. mineral exploitation, agriculture, forestry) and which advise the PECC on specific avenues in which co-operative activities might be fostered.

The PECC task force on Fisheries is chaired by Dr Gordon Munro, Professor of Economics with the University of British Columbia in Canada. At its last meeting in May 1986, the task force was attended by several Pacific Island delegates, including representatives of the Federated States of Micronesia, Guam, Forum Fisheries Agency, University of the South Pacific, and South Pacific Commission. The meeting discussed a number of potential co-operative activities in the fields of training, resource assessment and surveillance, and ultimately made recommendations that the next PECC meeting develop the possibility of

holding two inter-regional workshops (one for south-east Asian and Pacific Islands Fisheries specialists, another for Latin American and Pacific Island representatives) to identify specific technical areas for co-operation. The November PECC meeting endorsed the concept and Dr Munro is now in the process of trying to identify funding and encourage participation in the workshop. It is hoped that the workshop for appropriate Asian and Pacific Island Fisheries Specialists will take place in Manila, Philippines in the third quarter of 1987, while that for Latin American and Pacific Island workers would be held in Lima, Peru, prior to October 1987 if this proves to be feasible. In both cases, the purpose of the workshop would be to specify in detail the areas in which fisheries co-operation could be developed. The outcome of the workshops would be discussed by the next meeting of the task force on Fisheries, which is expected to be held in October 1987 and which would aim to ensure that appropriate workshop initiatives find the necessary political and financial support via PECC.

MMDC VISITING SCIENTIST PROGRAMME

(Source: MMDC)

The Micronesian Mariculture Demonstration Centre (MMDC) in Palau is encouraging marine researchers to use its visiting scientist programme (VSP). The aims of the VSP are to promote basic and applied research on the marine environment and resources of Palau, to further the exchange of information and goodwill between the international marine science community and the people of Palau, and to generate revenue from rental of dormitory space, laboratory space and boats.

Application for the use of MMDC facilities is open to professional marine scientists who have an active association with a recognized institution or university. Each visitor must be part of an organized research project (the MMDC does not cater to vacationing divers or persons who are not involved in a bona fide marine science research project).

Available facilities include: dormitory accommodation, air conditioned or ambient temperature laboratories with water tables, holding tanks, and running fresh and sea water, and 14 ft (4.2m) or 23 ft (6.9m) boats available for charter. Diving equipment, ground transport and other services and facilities can be rented locally.

Further information from:

MMDC,
P.O. Box 359,
Koror State,
Republic of Palau 96940.

AQUACULTURE SYMPOSIUM HELD IN FIJI

(Source Fiji MPI)

An in-house symposium on aquaculture was held by the Fisheries Division of Fiji's Ministry of Primary Industries in February 1987, with the aim of reviewing the technical achievements and progress to date of aquaculture projects in Fiji. The symposium was held one month before the end of the five-year joint Fiji-Japan Aquaculture Project, under which considerable Japanese Technical Assistance was provided for aquaculture development in Fiji. The meeting allowed the Fisheries Divisions technical staff to take stock of the results of the projects work, and other aquaculture-related activities, and lay plans for future work and directions.

Aquaculture projects in Fiji in recent years have been varied in extent and objectives. The Japan-Fiji project has investigated the technical feasibility of culturing imported and local species of Macrobrachium as well as estuarine and marine penaeid prawns, and hybrid (red) Tilapia. The tilapia work will be continued with funding and technical assistance from Taiwan. The Peace Corps Rural Aquaculture Project has aimed to establish small fish ponds in inland villages in Fiji to improve local protein supply. With the collaboration of an overseas processing company, significant progress has been made in developing smallholder seaweed (Eucheuma) farming in Fiji, to the point where a processing plant is now being considered for Lautoka. A cooperative project with France Aquaculture has led to the development of the first truly commercial-scale penaeid prawn farm in Fiji, and this is now both supplying the local market and generating export revenue.

A number of papers were presented during the symposium, covering technical aspects of many of the aquaculture trials carrid out in Fiji in recent years. Abstracts of these papers have been put together in a document, entitled Fiji Aquaculture Symposium, which is available from:

Fisheries Division,
Ministry of Primary Industries,
P.O. Box 358,
Suva,
FIJI.

U.S. FISHERIES STRATEGY REPORT COMPLETED

(Source: ICMRD)

Dr Phil Helfrich, Director of the Hawaii Institute Marine Biology, has completed a report commissioned by the United States Agency for International Development (USAID), which makes recommendations for long-range U.S. fisheries development strategy in the Pacigic Islands region. Dr Helfrich, a well-known figure in the region for many years, travelled to several Pacific Island countries in July and August 1986 for consultations with fisheries specialists and others, and has also been using the facilities of the International Centre for Marine Resource Development (ICMRD) at the University of Rhode Island, to research past fisheries problems and development activities in the region. The report makes a number of wide-ranging recommendations for future USAID fisheries development activities in the fields of stock assessment, artificial reef development, equipment and technology transfer, education and training.

The report, which was completed in December, can be obtained from:

ICMRD Information Services,
University of Rhode Island,
Kingston,
RI 02881 - 0804,
USA.

DATA COLLECTION SYSTEMS DEVELOPED IN U.S. AFFLIATED PACIFIC ISLANDS
(Source: NMFS)

The Marshall Islands Marine Resources Department is currently holding discussions with officers of the U.S. National Marine Fisheries Service (NMFS) with the aim of co-operatively developing fisheries data collection and processing systems in the Marshall Islands. The Department intends to submit a proposal requesting U.S. Federal Funds to begin developing fisheries data collection systems in the Marshall Islands, and wants to make sure that these systems are developed with the cooperation and technical guidance of WPACFIN to ensure compatibility with other Pacific islands systems. WPACFIN is the Western Pacific Fishery Information Network, which is administered by NMFS and serves to collect and make available local fishery statistics from US-affiliated Pacific Island states.

David Hamm, of the NMFS Honolulu Laboratory, has been providing advice and some on-site training to other non-WPACFIN Pacific Islands fisheries offices over the past 3 years, for example to the Marshall Islands which are now beginning to develop a system compatible with others being implemented in Micronesia. In return for this technical assistance, fisheries offices will make their data available to NMFS. Development efforts are already under way and systems are partially functional in the non-WPACFIN participating islands of Palau, Yap, Pohnpei, Kosrae and Truk. These will add to the information base from the established systems in the islands of Americam Samoa, the CNMI, Guam, and Hawaii, which officially participate in WPACFIN.

TROCHUS SHELLS FOR TUVALU
(Source: Tuvalu Echoes/UNDP)

Following the successful transplantation of trochus (Trochus niloticus) to Tokelau (see SPC Fisheries Newsletter #38), the FAO/UNDP South Pacific Regional Fisheries Support Programme (SPRFSP) based in Suva, Fiji, is preparing to assist Tuvalu in a similar venture. SPRFD Fisheries Development Adviser Bob Gillett travelled to Funafuti in June 1986 to discuss the project with Tuvaluan officials. It is hoged that the transplantation will be carried out by military air transport in May or June 1987. Crates of live trochus will be dropped from the plane by parachute to waiting groups on the reef, who will release the trochus at suitable sites.

The introduction of T.niloticus to Tuvalu was originally recommended by conchologist Brian Parkinson following a survey of Tuvalu's specimen shell resources that he carried out on behalf of the South Pacific Commission in late 1983. In his report (The Potential for Introduction of Trochus niloticus to Tuvalu, South Pacific Commission, 1984), Brian noted a number of suitable sites for trochus liberation and observed that two other species of topshell, Trochus pyramis and T. verrocosus were present in Tuvalu, indicating suitable conditions for T. niloticus, the only commercially valuable species of the three.

FIVE YEAR TUNA TREATY AGREED

(Source: Fishing News International and various others)

A five year deal between the USA and the members of the South Pacific Forum was agreed in Tonga in October 1986, and will allow U.S. seiners to carry on fishing in the region for at least 5 years.

The agreement follows more than two years of negotiations and a series of incidents which have created a degree of tension between the two parties. Sixteen Pacific countries are affected by the treaty - Australia, the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, the Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, the Solomom Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. The U.S. government regards the treaty as both an aid programme and a fishing access agreement for its tuna industry, though the Pacific countries place far more emphasis on the latter aspect.

The possibility of a treaty was informally discussed as early as March 1982, when Papua New Guinea seized the US seiner Danica for illegal fishing in its EEZ. This was the first time that a US vessel had been apprehended by an island country for illegal fishing. But it was the 1984 seizure of the Jeanette Diana by the Solomon Islands, and the difficulties that this caused for both governments, that created the impetus for formal treaty negotiations.

Initial rounds progressed slowly. Logistical difficulties were caused by the large number of island countries involved. Other problems came from the presence of the American Tunaboat Association (ATA) as industry adviser to the US negotiating team. However, after the ATA was replaced by the US Tuna Foundation, and the Secretary of State's personal envoy was appointed to oversee negotiations in September 1984, better progress was made. Kiribati's tuna access agreement with the USSR, conclued in October 1985, and more recent Soviet initiatives in the region also played a significant part in encouraging a swift conclusion.

Over the five-year treaty period a total of approximately $60 million will be paid in cash and in kind to island countries. Each year the US government will pay $9 million in cash, plus one million in aid to support fisheries development. The aid component will be channelled through the USAID's regional office in Fiji.

In addition to the US government contributions, the US fishing industry will pay license fees in return for access. Vessels will be licensed at the rate of $50,000 per year for the first 40 vessels seeking licenses. The fee will increase to $60,000 for additional vessels. In the first year of the treaty the US industry has guaranteed a payment of US$ 1.75 million, implying that at least 35 vessels will take out licenses. The US tuna industry will also contribute $250,000 annually to the region as an in-kind contribution to assist the development of domestic tuna industries. It is expected that this assistance will come in the form of technical cooperation.

To ensure that Pacific island countries are not financially disadvantaged, the treaty provides that access fees will never drop below $50,000 per vessel per year. Also, an escalation clause has been included in the agreement so that, if tuna prices increase over the treaty period, fees will increase by a corresponding amount. Access fees will be indexed to tuna price movements for fish delivered to Americam Samoan canneries.

Access fee payments are the only variable financial component in the treaty package. After the first year the US has made no commitment as to the number of vessels that will seek licenses. Consequently, the amount of revenue for the island countries will fluctuate from year to year. But the US government contribution and technical assistance will be available irrespective of the number of vessels.

While fishing in the region's EEZs, the US fleet will be subject to national fishing laws. This means that if a US vessel fishes illegally and is seized by an island country, the vessel owner will no longer have the protection of US domestic legislation. Furthermore, the US government is obliged to ensure that vessels observe the terms and conditions of the treaty, and to bring sanctions against vessel owners who violate its provisions. Island countries will also have the right to place observers on licensed US vessels.

Vessels will be restricted to fishing in the country which issued their licences, and will have to report their catches using the standard South Pacific Commission logsheets. They will have to report each time they cross from one EEZ to another, as well as giving their locations on a weekly basis.

The US National Marine Fisheries Service will set up offices in American Samoa and Guam to administer the treaty. These offices will handle catch data reports from the vessels, and deal with any complaints which might arise.

Revenues paid by the US will be divided among the island countries. Formulae will be devised as to how revenues will be shared, though the primary means will be on the basis of where the fish is caught. As most purse-seine fishing effort is confined to Micronesian and Melanesian waters, it is anticipated that countries in these areas will benefit the most.

FISHERIES SCIENCE AND TECHNOLOGY

NEW 'SEABRAKE' DEVICE DEVELOPED IN AUSTRALIA

(Source: FINS)

An Australian designed sea braking device which increases boating safety for both commercial and pleasure craft was unveiled in Western Australia recently. The 'Seabrake' was designed and developed by John Abernethy while he was operating his own charter boat company in Port Fairy, Victoria, and is being manufactured in Western Australia by a Bayswater company, RIMCO.

Seabrake, which is made from impact-resistant polyurethane, is towed from the rear of boats in large following seas whwn there is a danger of broaching or pitch-rolling if the boat's speed cannot be controlled. The device overcomes the problem and a number of others by operating in reverse to the normal sea anchor.

'The key to Seabrake's effectiviness is its ability to dramatically increase the drag exerted on a vessel when a predetermined speed is reached, and to release it quickly when the speed is suddenly decreased,' Mr Abernethy said. 'The product's braking action results from the inward opening of special baffles located on the side of the cone.'

The opening of the baffles is controlled by a variable spring mechanism which is an integral part of the tow connection. As the boat speed increases, tension on the spring opens the baffles allowing water to enter the base of the cone. This instantly increases the drag to many times that of Seabrake in its closed-baffle mode.

Photo: FINS

John Abernethy demonstrates how Seabrake's internal baffles operate when water pressure increases

The Seabrake is initially available in 3 sizes (and later in 5 sizes) and can also be custom-built to requirements. Round-the-word yachtsman John Sanders has taken a Seabrake on his voyage and the Royal Australian Navy is interested in using Seabrake on its patrol boats. In addition to being towed behind vessels in rough weather Seabrake has been proven to be effective for vessels under tow, as it increases stability in the towing vessel and reduces the risk of broaching.

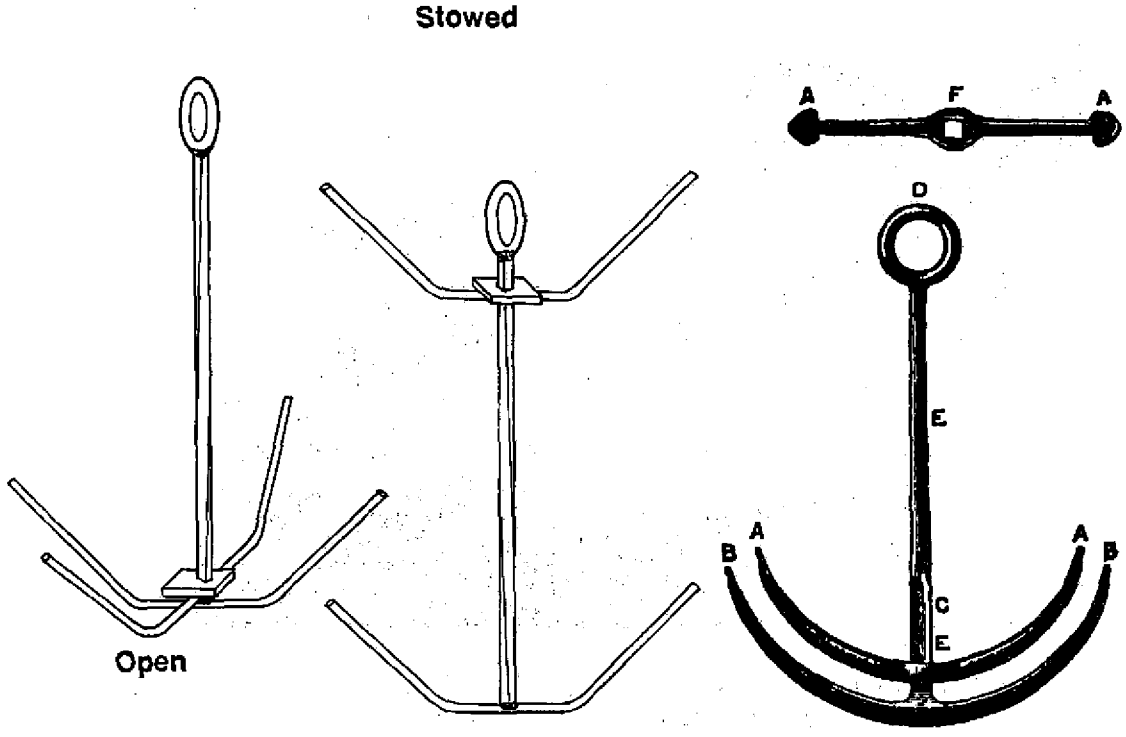
Mr Abernethy, who is also a former professional diver and commercial fisherman as well as a charter boat operator, said some fishermen were worried that the Seabrake increased fuel consumption. However, the extra stability in rough conditions improved consumption. He discovered the Seabrake principle during a gale in Bass Strait when he was forced to cut the sea anchor free because seas were breaking over the boat. Mr Abernethy chopped a number of holes in the bottom of a stainless steel bucket and used that in its place. The Seabrake has been tested at the Australian Maritime College at Launceston, where it got a very favourable report.

When the Seabrake was unveiled in Western Australia, Mr Abernethy demonstrated if off Rottnest on a day when SW winds had whipped up a rough sea. The improvement in the test boat's performance was obvious when a a Seabrake was towed behind. It was replaced by a conventional sea anchor which broke free after a short time.

STOWABLE GRAPNEL ANCHOR

(Source: Catch)

"Again Kiwi ingenuity has produced something inexpensive, simple, and so effective that international patents have been filed," says Stowflat Trading of its new Stowflat folding grapnel anchor. Designed and manufactured in New Zealand, the grapnel is ideal for rocky or unknown bottom conditions, the manufacturer claims. It is designed to free easily from a jam to enable anchor, chain, and warp to be recovered every time.



The "Stowflat" fishing anchor... ...and its predecessor

He says that the invaluable aspect of the Stowflat is the novel way it folds and lies on the deck, being lower to step over than the chain itself. The anchor has no pins or locks, and when the anchor chain is picked up it sets in the working position automatically. "Folding to stow is the same effortless one-handed operation", he said.

In fact the idea behind the anchor is not so new as it's "inventor" claims. A similar design was featured in the 7th edition of the Manual of Yacht and Boat Sailing published in 1891. The sketch at right, taken from the manual, shows the grapnel lying flat. The bottom pair of claws (B) are welded to the shank (E) but the top pair (A) slide up and down on a square hold (F). To use the grapnel the top pair of claws are slid up the shank to the rounded part, turned at right sngles, and dropped back onto the squared part of the shank above the lower claws. In 1891 this type of grapnel had been in use for many years by fishermen in small boats, and was available from any ship chandler or yacht fitter of the time.

The Stowflat anchor will be available shortly. For further information contact:

Stowflat Trading, P.O. Box 15-150, Hamilton, New Zealand.

DETERGENTS MAY BE SHARK REPELLENTS

(Source: Australian Fisheries/ Catch)

Israeli scientists claim to have discovered that some common laundry and dish-washing detergents are effective shark repellents.

Two professors at the Hebrew University of Jerusalem found that the Moses sole, a fish found in the Dead Sea, had an amazing ability to repel its enemies, including sharks. The key to the repellent was a complex protein called pardaxin with a number of detergent-like properties, such as making water foam, and reducing surface tension. The scientists decided to test some standard synthetic detergents for their shark-repellent properties. Out of 15 detergents tested, 7 worked as shark repellents, two of them even better than pardaxin. However, it will take another 2 or 3 years to isolate the most effective combination of detergent substances and the best method of dispatching them.

One major problem is that the majority of detergents are toxic and would pollute the seas. Research is now focusing on a biodegradable shark-repelling compound in slow release formula, that would act something like an "aquatic deodorant".

One of the researchers, Professor Zlotkin, said the test they used on the sharks included starving them for a few days before offering them a small fish. "Just as the shark was about to make contact with his prey, we released the detergent through a syringe attached to the bait - and the shark swam off as fact as it could" he said. "The method is cheap, effective, and humane."

ABSTRACTS

THE DYNAMICS OF TUNA MOVEMENTS: AN EVALUATION OF PAST AND FUTURE RESEARCH

by J.R. Hunter, A.W. Argue, W.M. Bayliff, A.E. Dizon, A. Fonteneau, D. Goodman and G.R. Seckel, 1986, 78 pp.

Weaknesses in understanding of tuna distributions and movements have constrained the development of rational management policies. Uncertainties exist in: the selection of management plans and catch and effort data that are representative of a stock; quantification of exchange of adults among management jurisdictions and fishing gears; and identification of the relationships between the environment and tuna movements.

This report summarises a series of discussions between a panel and groups of experts on how to increase understanding of these and other tuna management problems. The authors discuss the uncertainties in current management policy caused by lack of understanding of tuna movement dynamics and outline and evaluate the research approaches used to describe the movements of tunas. These include already established methods, such as mark and recapture techniques and acoustic tracking, as well as those which might be used or are just beginning to bebeing applied, including new taggins systems, measurements of physiological state, and microconstituents of mineralised tissue. Specific chapters cover eastern Pacific yellowfin and South Pacific skipjack.

The report concludes by recommending actions needed to improve the knowledge of tuna movements. These include:

1) establishment of international arrangements to share tuna movement data, to analyse movements on an oceanwide and worldwide basis and to link international oceanographic programs;

2) increased numbers and kinds of observations of movements of tuna in the vertical plane;

3) development and use of technology for tracing the actual paths followed by tunas over extended periods and for measuring movements independent of the fishery; and

4) conduct of intensive studies on tuna movement dynamics which combine the old and new technologies discussed in the report.

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CURED FISH PRODUCTION IN THE TROPICS
edited by A. Reilly and L.E. Barile, 1986. 236 pp.

This publication is actually the proceedings of a workshop held at the Department of Fish Processing Technology, University of the Philippines in the Visayas, in April 1986. The book contains sixteen papers which were presented and discussed at the workshop. These cover a variety of topics, including: Principles of Fish Drying and Salting; Utilisation and Design of Agrowaste Fish Dryers; Mycotoxins in Cured Fish; Fish Smoking; and Production and Marketing of Cured Fish.

The collection of papers include a number which are of direct practical relevance to fish processing and marketing in the Pacific Islands region. Among these are Production of Smoked Spanish Mackerel by L.M. Trinidad and A. Reilly, which gives details of procedures, cost factors, recovery rates and grading methods which apply when smoking spanish mackerel (Scomberomorus commerson) and Agrowaste Fish Driers by S.F. Roberts, which presents a number of designs for fish drying ovens, of various degrees of complexity, that burn coconut husks or other agricultural waste products.

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A BIOMASS-FUELLED ICE-MAKING MACHINE
by T.A. Reddy and G.J. Saunier. In Renewable Energy Resource Journal, Vol 8, No 2, December 1986, 11-56 pp.

A prototype intermittent ammonia-water absorption ice-making system has been designed, manufactured and tested at the Asian Institute of Technology and for the past year has been undergoing field operations on a remote rural island in the south of Thailand. The system can be fuelled by any biomass residue, such as coconut husks or other agricultural waste, and apart from this source of energy is completely energy-autonomous. The system has no rotating parts and does not involve the opening and closing of any ammonia valves, features which would be detrimental to the long life of any machine of this sort. The unit can provide about 25 kg of ice per cycle, and two cycles can be run per day.

After a brief description of the operating principles and the novelties of the ice-making machine, this paper outlines the attractiveness of the machine from both an economic and social point of view. Feedback from actual operation has led to a certain number of technical modifications and, more importantly, has enabled the socio-economic impact of such a machine to be evaluated. These aspects are also discussed in the paper.

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January - March 1987

THE ENIGMATIC JUNGLE PERCH - RECENT RESEARCH PROVIDES SOME ANSWERS

by

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Queensland, Australia.

INTRODUCTION

Mountain trout, aholehole, sesele, sakelo, ika droka, mahore, umatari, jungle perch - all names given thoughout their wide Indo-Pacific range to small silvery fishes of the family Kuhliidae. Found in both marine and freshwater habitats, from east Africa to Hawaii, most of the six or so species have characteristic tail marking which give them their common name of flagtail perch. They are believed to be most closely related to the well known north American basses (Centrarchidae). Although good food fish, most flagtails attain relatively small sizes (less than 300 gm) and arouse little interest where they occur, other than as a minor subsistence food item.

The exception is the largest member of the family, the jungle perch, Kuhlia rupestris (Lacepede), which grows to 450 mm in total length and 3 kg in weight and has acquired, in Australia at least, the reputation as a "legendary angling species" (Merrick and Schmida, 1984), as well as a considerable mystique. A handsome silvery species, with black markings dorso-laterally and a dark blotch on each caudal lobe (Figure 1), it is also regarded as excellent eating.

The typical jungle perch habitat (figure 2) is fast-flowing perennial coastal streams in rain forest areas. In Australia, for example, the species is apparently restricted to the north-eastern and central Queensland coast and is absent from the slow-flowing Gulf of Carpentaria and Northern Territory rivers. Reliable literature records for the Pacific Islands show jungle perch to occur as far east as American Samoa (Wass, 1984), but it is not recorded from French Polynesia (Randall, 1985) and most of Micronesia (Schultz et al., 1953; Gawel, pers. comm.) being generally restricted to high islands where there are perennial streams. Records of Kuhlia from low islands and atolls generally involve the wider ranging primarily marine species K. marginata and K. mugil. There are, however, two spcies endemic to the eastern Pacific – K. sandvicensis (aholehole) from Hawaii and K. nutabunda from Easter Island. K. rupestris was introduced to Hawaii (Brock, 1960), but has not survived (Kanayama, 1967).

For a fish which is so well known and widely distributed, the life history of jungle perch remains an enigma. It is mostly found in freshwater, but does it breed there? Why are K. rupestris rarely seen in estuaries with other Kuhlia species? Do they grow rapidly enough to be considered for aquaculture in preference to introduced exotics?

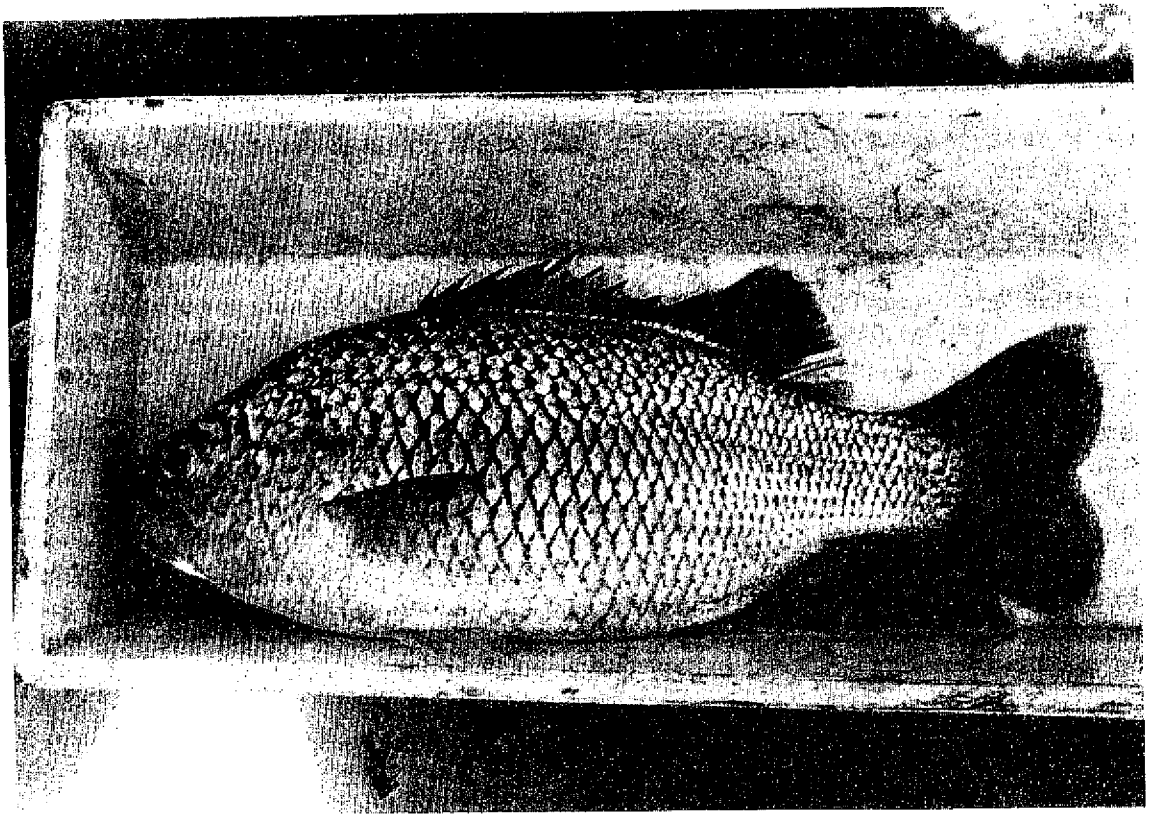

Photo: A.D. Lewis

Figure 1: Kuhlia rupestris, the jungle perch

Photo: A.D. Lewis

Figure 2: Typical jungle perch habitat

Small scale research projects were recently initiated independently, by the Queensland Department of Primary Industries Fisheries Research Branch and the Fiji Fisheries Division to unravel some of the details. This joint article presents some of the early results of these studies.

RATIONALE AND METHODS

In Fiji, jungle perch are most commonly known as ika droka (probably a corruption of ika ni waidroka , or "river fish"), ika ni vatu ("fish of the rocks") and, somewhat wistfully, as "Fiji trout". They are an important subsistence food in the interior of the large islands

The species could not be considered for stocking the recently constructed man made impoundments of Monasavu and Vaturu as it was not known whether they reproduce naturally in fresh water. The exotic tilapias (Sarotherodon mossambicus and S. niloticus) and black bass (Micropterus salmoides) were ultimately used. In addition, there were reports that "ika droka" numbers were diminishing as a result of increased river siltation, presumably associated with improper logging and agricultural practices in catchment areas, and with illegal net fishing. The part-time project undertaken by the Fiji Fisheries Division therefore aimed to gather basic life history and population data.

In North Queensland, it was considered desirable to introduce this popular sport fish to the growing number of freshwater storage reservoirs. Again, it was not known whether such introductions would be self-sustaining. Conservation measures in response to a public perception that natural populations had decreased were also being called for. The DPI Fisheries Research Station at Walkamin (on the Atherton Tablelands) therefore initiated a study of the reproductive biology of jungle perch.

Saltwater Creek, a small coastal stream 20 km in length near Mossman (16°25'S, 145°25'E) was chosen as the Queensland study site. Between November 1983 to February 1985, jungle perch were sampled by rod and line in the fast flowing upper reaches and by 2" (5 cm) mesh gill nets in the lower reaches, with some individuals transferred to ponds at Walkamin for experimental work. Specimens sacrificed were routinely processed to obtain basic biological data and otoliths for age and growth studies. Smaller numbers of fish were also collected from nearby streams.

Fiji's third largest river, the Navua, draining the central south coast of Viti Levu, the main island, was chosen as the Fiji study area. The main river is approximately 90 km long, flowing through spectacular gorges for one third of its length and entering the sea at 18°15'S, 178°12'E. Sampling commenced in August 1984. Specimens collected in the upper reaches by rod and line were generally tagged and released. Some of those gill netted (2.5" (6.5 cm) and 3" (7.5 cm) mesh) in the lower reaches were also tagged, as the species proved quite hardy despite slight damage sustained during gillnet capture. Specimens were also purchased from local markets. Basic biological data and otoliths were obtained from most non-released specimens. During 1985, sampling was extended to streams in the more extensive Rewa River system, but this work is not discussed in the present account.

POPULATION STRUCTURE

It became clear early in both studies that females attained considerably larger sizes than males and that a degree of sexual segregation was occuring along the lengths of the streams. The gears in use, articifial lures and 2" (5 cm) gill nets, captured few fish below 15 cm standard length (SL). The length-frequency data discussed below comprises adult and sub adult fish only. Note that all length measurements used are standard length (from the tip of the snout to the base of the caudal peduncle).

Figure 3 shows the length-frequency distribution of 187 males and 75 females examined from North Queensland. No males longer than 23 cm SL (O.4 kg) were taken, whereas females up to 35 cm SL (1.3 kg) were recorded. Half of the females in the sample were larger than the largest male. Males were rarely captured in the upper reaches; on the other hand no females were caught in the Saltwater creek estuary or at the salt water/ fresh water interface. The largest fish taken from Saltwater Creek was 29.5 cm (0.8 kg).

The comparable Fiji data (Figure 4), 109 males and 32 females, shows a similar size distribution by sex. It is a considerably smaller sample since most fish, 317 out of 400, were tagged and released. As in the Queensland sample, there were no males larger than 23 cm SL whereas 60 per cent of the females were above this size.

All fish sexed in the lower reaches (n=106) were males. In the smaller upper reaches sample (n=35), the female:male ratio was approximately 10:1

Figure 5 shows the size distribution of all tagged fish (n=317, measured to the nearest cm at release), divided into upstream and downstream components relative to a point just above tidal influence, 5 km from the mouth. Only five of the 124 downstream fish are 23 cm SL or greater. These are assumed to be females. The upstream fish, as expected, are larger with the largest being 34 cm SL (1.2 kg estimated).

It thus appears in both situations that the smaller males generally do not move far from tidal influence. Their clumped distribution in gill net catches also suggests they may aggregate or school to some extent.

Segregation is not total, as evidence bu occasional catches of females in estuaries and regular but minor catches of males upstream. Overlap of adult males and females is obviously limited. Very little information is yet available on the distribution of juveniles along the stream length.

LENGTH-WEIGHT RELATIONSHIPS

The following length-weight relationships were fitted for jungle perch in north Queensland. Preliminary data from Fiji indicate similar relationships.

Females (n=75): $\text{Weight} = 1.4041 \times 10.5 \ (SL^{3.1418})$

Males (n=187): $\text{Weight} = 1.701 \times 10.5 \ (SL^{3.1108})$

All fish (n=332): $\text{Weight} = 3.6268 \times 10.5 \ (SL^{2.9628})$

Females are significantly heavier than males for a given length.

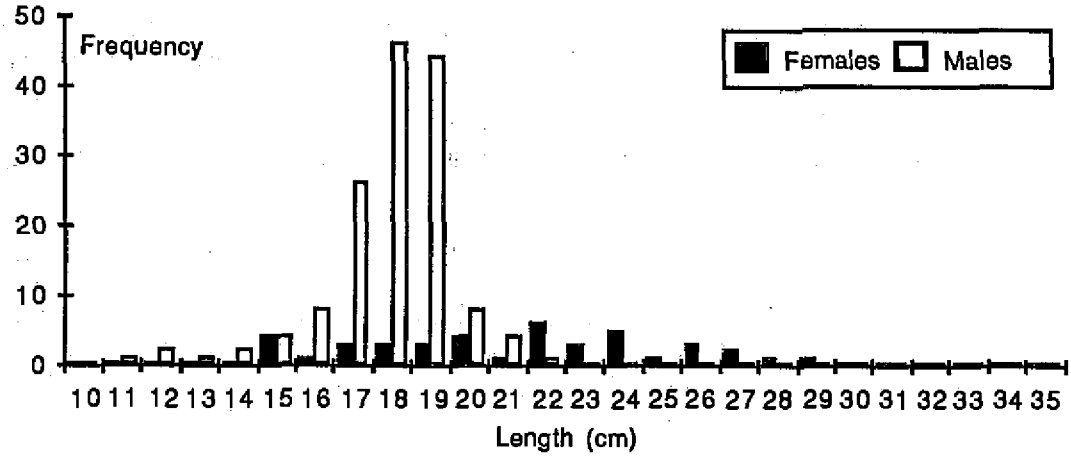

Figure 3: Length distributions of Kuhlia rupestris from north Queensland

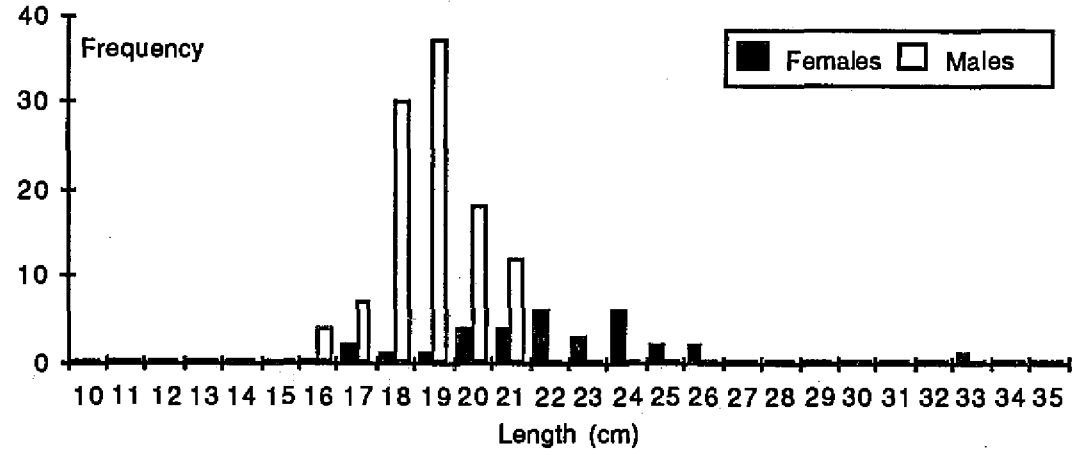

Figure 4: Length distributions of Kuhlia rupestris from Fiji

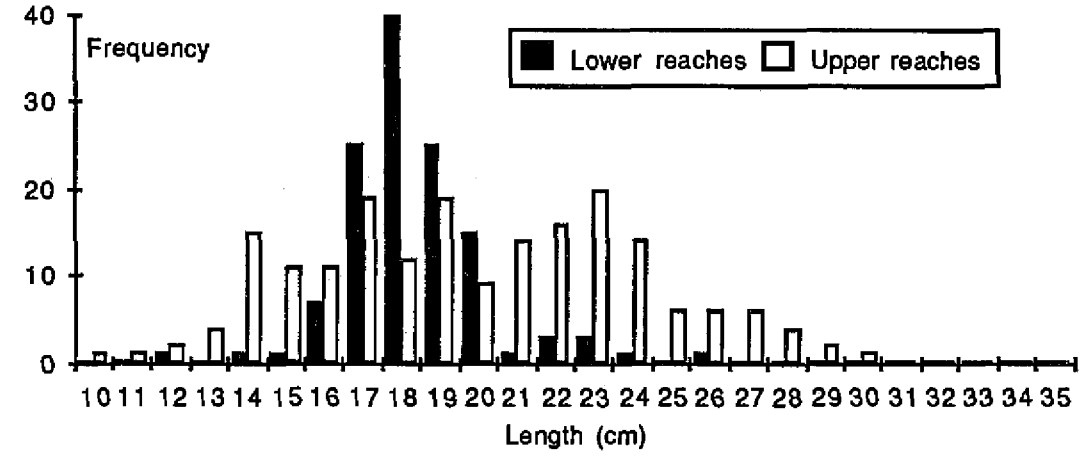

Figure 5: Length distributions of Kuhlia rupestris from upper and lower reaches of rivers in north Queensland and Fiji

SPAWNING

Apart from one suggestion in the literature that jungle perch probably spawn in brackish water (Lake, 1978) nothing is known of their spawning habits, one of the reasons for undertaking the work. No ripe females were observed in either study[1] although one nearly ripe female (24.5 cm SL) was captured in February 1984 in Queensland in a stream near the study area. Males in spawning condition were observed in north Queensland from late November to April and apparently spent females were observed from January to May. The difficulties of netting estuaries and lower reaches during this period, which is the wet season in both areas, are formidable. High water velocity, abundant debris, and high water levels in the coastal streams make the use of gillnets very difficult indeed, and line fishing other than with baits is similarly precluded.

One of us (AEH) therefore examined sperm motility in sexually mature males at various salinities as an alternative first step in delineating the spawning environment (Hogan and Nicholson, in press). It was found that jungle perch sperm were completely inactive in freshwater, showing maximum activity in water of 20 parts per thousand (ppt) salinity and above. In contrast, the sperm of the co-occuring sooty grunter (Hephaestus fuliginosus) which is known to spawn in fresh water, was completely inactive at 25 ppt and above. This would indicate that spawning occurs in estuaries or the coastal zone.

Further evidence came from serial estuarine sampling at the north Queensland site in February, 1985. There was a short term disappearance of running ripe males from the estuary around the new moon period (19/2/85). Fish were readily caught in quantity each side of this period. This, combined with the rarity, if not total absence, of ripe jungle perch females in numerous serial samples of North Queensland estuaries (Garrett, 1985: Blaber, 1980) and in commercial estuarine fishing catches, suggest that spawning is a well coordinated event of short duration.

We hypothesise that males and females migrate briefly to the edge of the flood plume near river mouths to spawn in salinities of more than 30 ppt. Because of sampling difficulties, rigorous testing of this hypothesis continues to be problematical.

If this hypothesised spawning migration occurs en masse, it presumably would be detected. As females with undeveloped gonads can be caught year-round in upstream areas, it is probable that not all fish migrate downstream to spawn each year. In the larger streams of Fiji and Australia, migrations of 100 km or more would be necessary. It seems likely to us that rainfall regimes may influence the proportion of the population which may spawn each year and the number of migrants which descend streams to the estuary. Spawning presumably occurs over the January - April period. There is still no information on the frequency and timing of spawning by individual fish, or the return of females upstream.

The smallest running ripe male observed was 17 cm SL; an apparently spent 21 cm SL female was recorded. These may approximate jungle perch minimum sizes at first maturity, although the under-representation of smaller fish in samples makes this difficult to pinpoint.

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1 A ripe individual of Kuhlia marginata (19.5 cm SL) was however captured in the Navua estuary early in January 1985.

TAGGING RESULTS

Between 1979 and 1983, sportsfishermen voluntarily tagged 435 jungle perch in various north Queensland rivers using anchor tags. Only 4 recaptures, all short-term, were recorded and extensive slippage of the anchor tags is suspected. Securing these tags behind finray supports is crucial to their long term retention.

In the Navua River, 317 jungle perch have been tagged to date, 191 upstream and 126 in the lower reaches. Anchor tags of two types and a lock-on tag have been used. Relative recovery rates will ultimately be compared.

Figure 6: Prominent Fiji civil servant and keen angler Robin Yarrow displays a recaptured tagged jungle perch

A total of fifteen recoveries (4.9 %) has been received, the longest after 9 months at liberty. Nearly all have shown negligible nett movement from the point of release. The difficulties of sampling postulated spawning areas to recapture tagged fish and conclusively demonstrate downstream female spawning migrations have been pointed out. Very large tagged jungle perch (1 kg plus and therefore females) were observed by divers in march 1986 near the top of the Rewa estuary, many miles from the nearest possible tagging site in the Rewa system. It is possible that these fish were returning upstream after spawning.

AGE AND GROWTH

Little time has yet been devoted to attempts to age jungle perch from examination of otoliths, although rings which may be annual checks have been observed in some fish. The limited tagging data from Fiji however suggests that growth of adult females may be slow, with annual increments of the order of 2 cm/year. The smaller males must either exhibit slower growth or have a shorter average life span. Otoliths from a 21 cm male appeared to have seven clear annuli suggesting the former could be the case.

Nakamura (1968) reported slow growth of Kuhlia sandvicensis in Hawaiian ponds, this small species taking 4 years to attain 16-17 cm fork length. Growth of jungle perch in the Walkamin ponds showed great individual variation and was retarded in many fish by persistent nematode infection.

FEEDING HABITS

No work has been done on feeding habits in either locality, although jungle perch are known to be omnivorous, feeding on a variety of crustaceans, insects, small fish and even fruit . One Fijian vernacular name for juveniles refers to its apparent habit of nibbling the legs of bathers in fresh water! Another general Kuhlia name in fijian translates as "spit-eater", referring to the habit of seizing anything which drops into the streams from overhanging vegetation.

CONCLUSIONS

Whilst precise details of aspects of jungle perch life history in general and spawning in particular remain elusive, indications are that the species does spawn in the near shore marine environment over an extended period between January and April, possibly influenced by river levels and the lunar cycle. Fresh water impoundments stocked with the species would therefore require regular restocking, and hatchery techniques similar to those developed for other catadromous species would need to be developed (e.g van der Wal, 1983).

Marine spawning may be characteristic of all Kuhlia species, indicating that they are of primary marine origin despite their success in colonising freshwater habitats. Kuhlia mugil appears to rarely enter freshwater, and in Fiji typically inhabits the surge zone around rocky headlands. K. marginata has been collected on atolls where there is little or no freshwater (Schultz et al., 1953; Bullivant & Mc Cann 1974). One of us (ADL) has observed what appeared to be a spawning aggregation of K. bilunulata on a Fijian coral reef some miles from the nearest stream. K. sandvicensis, the Hawaiian endemic species, migrate as adults to the outer edge of the reef where they can be observed in schools (Tinker, 1974).

In contrast to its cogeners, the jungle perch, does seem to require access to freshwater streams to complete its life cycle. The species' general absence from low islands and atolls has been noted. The requirement may be even more specific. Its distribution (see earlier) indicates that fast flowing streams are clearly preferred. In the eastern Fiji islands, most of which are low coral islands, K. rupestris juveniles (sesere, equivalent to the Samoan name sesele) are recorded from most islands, but adults (which have different and quite specific Fijian names) from a few high islands only. This indicates that perennial streams may play a facultative role in some aspect of the life cycle.

Few details are available on the biology of most Pacific Island and indeed Australian freshwater fish. The similarities in life history pattern between jungle perch and the catadromus eastern Australian bass Macquaria novemaculeata (Percichthyidae), which grows to comparable size are however striking. In the latter species, Harris (1984) has demonstrated sexual segregation of populations (females remain in freshwater), smaller size and slower growth of males, migration of females to the brackish estuarine zone for spawning (although this occurs in late winter), and generally slow growth. Females up to 20 years old and males to 14 years were recorded. Growth is strongly influenced by habitat, and spawning and involution of ovaries do not occur unless there is flooding. Dam construction in eastern Australian rivers has thus had a detrimental effect on bass recruitment in recent years. Females make a precise return homing migration after spawning.

Although there is a little data on which to evaluate alleged declines in jungle perch numbers in both Fiji and North Queensland, some features of the species' biology would appear to render it vulnerable. Its preference for lentic, habitat and general avoidance of silted soft bottom habitat, the probable slow growth rates, susceptibility to gillnetting of males congregated in lower reaches, pollution in some areas, and the possible negative impact of introduced species such as tilapia all suggest that the status of this indegenous food and sport fish merits our close attention.

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STOCK ASSESSMENT NEEDS IN THE SOUTH PACIFIC

by

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INTRODUCTION

The SPC has been receiving numerous requests for assistance in the general area of fisheries stock assessment. These requests are normally for assistance in assessing the current status and productive potential of specific fisheries, or for assistance in establising data monitoring systems to provide a basis for fisheries development and management decisions now and in future.

In response to these requests, visits to Tuvalu and Tonga have been made by the Fisheries Statistician of the SPC Tuna and Billfish Assessment Programme. During these visits, the Fisheries Statistician helped evaluate and, in Tuvalu, set up, a data collection programme for artisanal statistics. In addition, we have outstanding requests for statistical or survey assistance from Kiribati, the Cook Islands and Niue.

The second major activity was a two-week course in Fisheries Stock Assessment methods, conducted by staff of the TBAP and an outside consultant, with funding from FAO/UNDP and the British Development Division in the Pacific.

As a result of these activities, SPC fisheries staff have proposed the establishment of an Inshore Fisheries Research Unit within the SPC. This proposal was approved at the 16th Regional Technical Meeting on Fisheries. There remains, however, considerable misunderstanding about stock assessment, and its relationship to fisheries development and management. The purpose of this article is to summarise answers to common questions about stock assessment, and discuss some of the recommendations that emerged from the SPC activities in stock assessment up to this time.

WHAT IS STOCK ASSESSMENT ?

Stock assessment is understanding how the stock responds to change; that is, predicting changes in stock size, catch rate, and production from the stock as exploitation takes place. Thus, at the beginning of a new fishery, one would like to know what kinds of catch rates can be expected, how these catch rates will change as the fishery develops, and what yields can be obtained on a reasonably stable basis

The exploratory surveys conducted to determine the potential for new fisheries development are also an integral part of the data needed for fisheries stock assessment. One of the major problems developed countries face in evaluating their fisheries is that they generally have no idea of what the abundance of their stocks were prior to fishing.

If a fishery is well developed, fisheries staff often want to know if the stock is overfished. This generally means that they would like to know if reducing the amount of fishing pressure would result in increased yields. Equally importantly they would like to know how long it would take for increased yields to be realised if fishing pressure were reduced.

Stock assessment is much more than predicting sustainable yield. The sustainable yield is only one of many considerations for fishery development, and in many cases it is both unknowable, and reasonably unimportant. In a new fishery, expected changes in catch rate will be much more important than potential yield, and in a developed fishery managers usually want to know if yields can be improved by reduced fishing. In both of these cases the actual estimated potential yield is not the most pressing question.

WHY DO SPC COUNTRIES NEED STOCK ASSESSMENT?

There is a common misconception, inherited from developed countries, that stock assessment is a "research activity" that must be conducted once stocks are overfished. In fact, stock assessment is probably most important in the early stages of a fishery to help determine the potential economic viability of a new fishery. Most of the data required for good biological stock assessment (spatial distribution of catch and catch rate, survey and abundance) are also very important for economic evaluation and development planning.

The most important purpose of stock assessment is understanding changes in the stocks as a fishery develops. It is vital to understand how catch rates will change, how the distribution of fish will change, and what kind of yields can be expected.

The second common purpose of stock assessments in SPC countries is determining the impacts on artisanal or subsistence fisheries of industrial scale fishing and environmental change. There is considerable concern that commercial fisheries development will adversely affect small scale fisheries. Without stock assessments it is impossible to determine beforehand if some change may occur, or determine afterwards if a change has occured, because of the fishery.

Finally, stock assessment can provide a basis for fisheries management and regulation. If countries anticipate making management decisions because of changes in stock size or catch rate, stock assessment provides the biological basis for such decisions. Currently there are few fisheries in SPC countries that are regulated, but if fisheries development is successful the need for some form of regulations will be more widespread.

THE TWO BASIC CHOICES REGARDING STOCK ASSESSMENT

There are two options regarding stock assessment. If one is willing to assume that catch rates will remain unchanged as fisheries develop, then there is no need for stock assessment. Biologically this means that fishing will have no impact upon the stock, which is rarely true. The economic analyses of fisheries we have seen for SPC countries generally make this assumption, which is highly dangerous.

The second option is to recognise that fishing will affect both the distribution and abundance of the fish. This has been clearly demonstrated in all the reef, seamount, invertebrate, and longline fisheries in the SPC region. Once you accept that fishing will affect the stocks, you must get involved in stock assessment. Because changes in catch rates directly affect the economics of fishing, stock assessment cannot be separated from fisheries develop-ment. Any fishery development plan should have built into it sufficient data collection so that changes in catch rates can be anticipated, detected, and, where possible, responded to.

WHAT KINDS OF DATA ARE NEEDED?

This depends upon the state of the fishery. To understand how catch rates and catch will change as the fishery develops, an understanding of the age structure or natural mortality rate of the stock is probably the most important. Stocks with low mortality rates (many old individuals), such as many snapper stocks, are likely to show great drops in catch rates and average size of the fish as the fishery develops and the older individuals are fished out. At the opposite extreme, skipjack tuna, with high mortality and growth, would be expected to show much smaller reductions in catch rate as the fishery develops.

When a fishery is well developed, and possibly overfished, one needs to know the current stock size, and the potential productivity of the stock at different stock sizes. This is best determined by historical data on total catch and abundance.

In general you need to know:

1) the history of catches taken from the stock;

2) an estimate of the abundance of the stock at different points in time.

Abundance can best be measured by surveys, which are quite possible for trochus, giant clams, and many reef fishes. Other powerful methods for determining abundance are:

1) depletion estimates, where heavy fishing pressure is applied to a small area over a short period of time to see how many fish can be taken out of the area;

2) spatial mapping of catch by effort.

Why catch and catch per effort are not sufficient

It is often assumed, in both developed and developing countries, that useful stock assessments can be made if data are collected on both the catch and fishing effort. This is rarely true, because quite often the catch per unit of fishing effort (CPUE) may not reflect the abundance of the population at all.

Snapper fisheries on seamounts provide a good example. Seamounts can easily be overfished, and the CPUE, usually measured in kg per line hour, normally drops quite rapidly on any particular seamount. However, as soon as the catch rate starts to drop the fishermen search farther for new untouched seamounts. Thus, the total catch data might be stable or growing, and the CPUE might be very stable, yet the fishery could be depleting a series of seamounts and headed to certain collapse when all the seamounts within economically reachable distance are depleted. Simple catch and effort data would provide no indication of the impending disaster. However, if the data were recorded by seamount, it would be very obvious what had happened, and the data could be used for good stock assessment.

The key to useful stock assessment is knowing the catches and the abundance. Using CPUE data on spatial sites, such as seamounts, assumes that CPUE is proportional to abundance on a particular site. This should be checked whenever possible. Small seamounts provide a good opportunity because they can be rapidly overfished in what are called depletion experiments. By intensively fishing a small seamount over a short period of time, one can determine how many fish were present on the seamount at the beginning of the depletion experiment, and how the CPUE changed as the seamount was depleted. Periodic follow-up fishing on the seamount can be used to determine recruitment or immigration.

Most of the major invertebrate fisheries in the SPC countries, particularly trochus and giant clam fisheries, can be easily assessed by underwater transect surveys to determine abundance. Periodic transects, combined with data on total catch, will provide a good basis for future stock assessments.

FIRST STEPS TO STOCK ASSESSMENT

Look at what happened elsewhere

This involves collation of information on similar species in similar environments. Experience gained by other countries (Pacific or elsewhere) may be the best guide as to what will happen in a new fishery in your country. We know, for instance, that snapper fisheries on seamounts are easily fished down, that average sizes drop rapidly, and that fishermen will tend to go farther and farther to maintain their catch rates. A recent ORSTOM study in Vanuatu provides an excellent biological survey of growth, distribution and mortality for many snapper species.

New Caledonia has had very valuable experience in trochus, with estimates of growth, mortality and potential yield assembled over more than 80 years of exploitation. Similarity many SPC countries have experience with giant clams. This experience should be the first thing one looks at in understanding a fishery in your own country

Mechanisms for sharing of information about specific fisheries need to be put into place. The snapper workshop at the 1985 Regional Technical Meeting on fisheries is an example. Regional meetings, networks, and communication systems have a major role to play in this.

Establish data collection systems now

With a reasonably small change in current administrative procedures, extremely valuable data could be collected and analysed which can be used to guide current fishery development, and provide needed answers if there are biological problems in the future. Most SPC countries have in place, or are establishing, data collection systems, but few if any of these systems are designed with stock assessment in mind. In particular, few provide information on the spatial distribution of catch and effort. There is a very dangerous potential for considerable effort to be put into data collection that will not be useful for stock assessment.

The data collection systems must have an explicit mechanism for estimation of abundance, either by spatial mapping of catch rates, or by surveys, or by small-scale depletion experiments.

Avoid the major pitfalls of stock assessment in developed countries

These include :

a) Not collecting data until a biological problem occurs. As mentioned previously the most valuable data for stock assessment comes from the beginning of the fishery. The tradition in developed countries of ignoring fisheries until the fishermen complain about low abundance generally means that no data are collected until a problem is perceived. SPC countries should avoid this by recognising that fisheries development is closely tied to fisheries stock assessment and the two should develop hand in hand.

b) Treating fisheries management as a response to problems rather than an integral part of fishery development. The tradition in developed countries is to not regulate fisheries until it is too late. SPC countries should learn by this experience and ensure that fisheries do not become overdeveloped and economically unviable. A useful technique would be to establish unfished reserves in many fisheries which could serve as a source of young fish for the intensively fished areas, and as a biological reference point if overfishing occurs.

c) Failure to establish strong cooperative links with fishermen and use them as a major resource for collection of data. There is an adversative tradition in developed countries: the fishermans job is to catch as many fish as he can and the fisheries officers job is to keep him from catching too many. This leads to antagonism and the requirement that any data collection be performed at great expense by government-chartered vessels. The SPC countries need to establish good cooperation between fishermen and fisheries officers, and have the fishermen help in supplying data as the fisheries develop. Fishermen need to be convinced of the need to understand the changes in abundance, and to assist in surveys when they are conducted. Fishermen also need to support the concept of closed reserves, and to protect these reserves by mutual consent.

"Traditional" fisheries management?

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The following paper is abridged from a contribution to the Forum Fisheries Agency Workshop on National Tuna Fishing Operations in Nuku'alofa, Tonga, June 1986.

PACIFIC ISLAND TUNA FISHING ENTERPRISES

by

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INTRODUCTION

The concept of a nationally operated fishing fleet is fairly new to the Pacific Islands. In socialist countries such an idea is the norm and the existence of the private operator of an industrial fishing fleet is uncommon. It seems that the intent of most governments in the Pacific is to initiate industrial fishing for tuna, prove that it is profitable, and then trust that private enterprise or entrepreneurs will take over the operation and let government carry on with its legitimate business. In some industrialised countries the reverse is true. Private enterprise developed large profitable corporations which governments have nationalised, operated in an inefficient manner, lost astronomically large amounts of money, and then tried to interest private enterprise in buying back the wreckage.

Several countries have started their national fishing enterprises and these operate with varying success. Others will follow, but much has already been learned and the problems that the pioneers have experienced need not be repeated if there is communication, and examination of the problems and how they have been and are being overcome.

INITIATION OF GOVERNMENT-OPERATED COMMERCIAL ENTERPRISES.

In assessing the potential for a tuna fishing enterprise, the following factors have to be taken into account.

Availability of the resource

In almost all of the Pacific Islands there is a known tuna resource. It has been known for some time to the Japanese, Taiwanese, Koreans and to some extent the Americans. Until recently fishing data were not readily available but in the last few years, catch and effort information from the long distance fishing nations have been collected and analysed by SPC, which has also made estimates of the skipjack resource of all SPC countries. Exploratory fishing trips have been made in almost all waters by various agencies. It could therefore be expected that the potential for setting up a fishing enterprise could be assessed fairly easily. Unfortunately this is not so because local conditions, international costs and markets change very rapidly and this can unexpectedly affect the success or otherwise of the enterprise.

Market

A market outlet must be available that is within convenient shipping distance of the fishing grounds. In the South West Pacific, markets for tuna are the two canneries at Pago Pago in American Samoa, PAFCO at Levuka in Fiji, and until recently the transhipment stations in Guam, Saipan, Vanuatu, the Solomon Islands and French Polynesia. Ideally, the fish should be landed by the catcher vessel, or they should be transhipped immediately after capture, such as is the case with the Japanese group seiners, or the Australian bluefin seiners. Shore

handling, freezing and bulk shipment such as is practiced by many American seiners, and by Te Mautari in Kiribati for skipjack is expensive and the need for such a system could in some cases be sufficient to make a tuna fishing enterprise uneconomic. Fiji, which has a marginal fishery, could not operate skipjack pole and line boats if it was not for the cannery in Fiji. National Fisheries Development Ltd of the Solomon Islands has been able to accept a very low ex-vessel price and tranship either to Levuka or to Japan because of the high catch rate and the year round fishery. The same applies to Te Mautari in Kiribati.

Availability of skilled and willing fishermen

Most of the Pacific Islands have a corps of seamen, many of whom are skilled captains, navigators and engineers. It has been the case in those countries which have been operating their national fishing enterprises to recruit their future fishing captains and skilled personnel from the merchant marine or from their fisheries departments. There is often no other alternative. Although these people are the best available, they have to be completely retrained, and their attitudes to the work of fishing changed. The regimentation, regular hours, the tranquility of peaceful watches where the helmsman steers the vessel under the eye of the navigator, or the oiler watches the engines while the Chief Engineer sleeps, do not exist and have no place on a fishing boat. This retraining may take many years, and will need the aid of patient and willing expatriate fishing masters.

Part of the retraining will be in persuading all of the crew to accept catch bonuses instead of wages. All of the national fishing enterprises in the Pacific Islands have started by paying guaranteed wages plus a small bonus. This may be necessary when the enterprise is in its exploratory stages, but it must, at all costs, be it strikes, go-slows, or whatever, be stopped as early as possible. It must be emphasised that if the enterprise cannot support above-average incomes at break-even catches, it will be doomed to failure, and is not worth pursuing. Any ideas of paid holidays, or other such benefits must not be considered, but the remuneration should be such that the crew member can afford to take a trip off at his own cost if he wants to.

Crew therefore must not only be trained to carry out the work of fishing, but must also be trained in the attitudes of a fisherman. It may be necessary to take into account the private inclinations of the people who are to do the fishing. For example, longline vessels operated from the east Asian coast have traditionally stayed at sea until the boat is full to capacity. This has usually meant a three-month trip. Although seamen from the Pacific islands have crewed on Japanese and Taiwanese longliners for many years, it seems that there is a reluctance for crews to stay at sea for long periods when the same type of vessel is operated by a local national company. Whether this is a long term problem remains to be seen.

Acquisition of suitable vessels

The development of a new fishery essentially needs new fishing boats of a design specific to the fishery in which the boat will be working. In some of the tuna fisheries in the South Pacific, the Japanese, under their aid programme have provided vessels with which to start national fishing ventures. In others, second hand pole-and-line and longline vessels have been acquired. The use of these vessels has been more or less successful in that the fishing potential of the area has been established, but few of the vessels acquired or provided have been ideally suited to the particular circumstances for which they were intended to be used, and they have been consistently unprofitable. The Japanese aid boats have often been supplied as "training vessels" to familiarise the crews with the operation of the boats and fishing

methods. All countries who have been recipients of the aid boats have attempted to run them as profitable ventures, but have had some difficulties because, usually, of the small carrying capacity and relatively high fuel consumption. However these boats have served their intended purpose in that many crews have been trained and new knowledge has been gained of the potential of the national fishing grounds.

It is quite essential now for countries that have had the benefit of these vessels to consider what kind of vessels are suited to their fishing conditions and how modifications should be made to make new boats more profitable. The design of boats is a progressive science which should adapt as conditions change. For example, in 1978 the US purse seiners were profitable, luxurious fishing palaces which carried often poor quality fish from the Western Pacific to San Diego. Catch levels and fish prices enabled owners to afford this type of boat but changes in the markets have now made these vessels floating dinosaurs. The new generation purse seiner, whenever it is built, will be cheaper, more functional and will serve a more demanding type of market. The Japanese pole and line boats carried fish on ice for long periods. Demands for high quality in the canneries now make this impossible and boats now have to have brine freezers. Part of the reason for this is that the canneries do not wish to have the expense of freezing the fish after landing.

Specific examples of changes to standard design are the Fiji 26 metre pole and-line boats which were adapted for Fiji conditions, and are being considered by Kiribati and the Solomon Islands. Fuel efficiency was a prime criterion in designing this vessel, and fuel efficient hulls were built to carry about 35 tonnes of fish. The 26 m boats, although smaller than a Japanese aid-provided vessel, carried about the same amount of fish, and it was thought that this vessel would produce greater profits. In fact, the 26 m boats were less profitable because they were unable to handle the frequent rough sea conditions as well as the larger Japanese boats, and more fishing days were lost. And so the quest for an economical boat for Fiji conditions continues. This is only as it should be if a venture is to be successful. But it must be recognised that costs of such ventures are substantial and it may be very difficult to persuade aid agencies to support this kind of development work.

Lack of risk capital

In industrialised countries tuna fishing has been developed by individuals and companies that have been involved in fishing for generations, and who have over many decades gradually expanded their enterprises because of need to invest their accumulated capital, realisation that there is potential in fishing beyond their national shores, and pressure on their domestic fish stocks. The Japanese long distance pole and line boats ventured out into the South Pacific and Indian Oceans after the last war; the Americans moved into the Western Pacific only recently when their technology developed sufficiently to allow large catches to be made with vessels that could carry a substantial cargo of tuna. Risk capital was provided by the companies themselves, aided by low cost loans, government subsidies and other incentives.

Pacific Island countries have neither the fishing establishment with sufficient financial backing, nor the experience and infrastructure to permit or encourage private enterprise to enter the capital intensive and high risk business of tuna fishing. Companies in New Zealand have explored the possibility of fishing in the Pacific, but again only with the assistance of substantial government grants. The Australians, so far, have remained on their home ground.

A few private individuals have tried their hand, but to date there is only one known success, which was to some extent supported in the early stages by his national fishing corporation. Harold Gatty tried skipjack fishing out of Fiji in 1955 and although he made encouraging catches, was unable to continue, probably because his market was not developed and he was not able to bear the costs of experimentation and development of the fishery.

Although in some Pacific Island countries there are families and companies with substantial assets that could be used to invest in tuna fishing, there are alternative and much safer opportunities, such as the tourist business, and trading, in which they will continue to prefer to invest. Only when fishing is proven to be highly profitable will business be inclined to invest. However, if that were the case, and government had invested in the development of the fishery, the present day ideal of privatisation of commercial government-sponsored enterprises would be overcome by the government's wish to retain its source of revenue.

National pride and development objectives.

In all national development plans in island countries, the exploitation of the fisheries resources is given high priority. Because the resources are there and it are seen to be being exploited by other nations, with or without permission, it must be irksome to be unable to take advantage them. Many countries have therefore attempted to enter the tuna fishing business. The ownership of tuna boats, possibly with the exception of super-seiners, does not provide the same sort of international prestige that is gained by owning an airline. But it would seem that nations are proud to be able to fly their flag on the sea as well as in the air.

During the period in which Pacific nations were declaring their rights to their fisheries zones there was much publicity on the radio and in the press. This inevitably led to popular pressure on the governments of the region to explain what was the purpose of declaring ownership of the seas. Governments have responded by declaring high priorities for developing their fisheries and it would seem that there is now fairly firm interest by Governments in direct participation in the tuna fishing industry. As the industry stabilises, after the past five years of market chaos, it can be expected that this interest will increase, and will attract further attention from aid agencies.

Development objectives usually stress the exploitation of the resource, training of crews, creation of employment opportunities, encouragement and assistance to other fishermen, and other rather high-flown ideals. The idea that the primary objective is to catch fish and make money is never mentioned. This omission has been the cause of considerable problems in at least one fishing company in the Pacific where the Board was unable to direct its Manager to stop usurping the responsibilities of the Social Services Department. It must be realised that a commercial company can only train people, encourage other fishermen, invest in development activities and engage in other philanthropic works, when it has sufficient surplus capital to do so.

ESTABLISHMENT AND MANAGEMENT OF A NATIONAL FISHING ENTERPRISE.

Company objectives

Whether the operating organisation is a limited liability company or a statutory body, the methods of management are similar. The stated objectives of the organisations are also similar in that all constitutions or articles of association have a strong developmental bias. Objectives of the national fishing enterprise usually include the following:

- To demonstrate that the type of development is feasible in a commercial context.
- To develop expertise and experience to enable further developments to take place.
- To encourage private enterprise to invest in the development.
- To encourage foreign investment.
- To earn revenue for the private and public sector.
- To create job opportunities.

Training fishermen is the job of the Fisheries Department, not the commercial body. If there are such needs, the Government must find funds either from aid sources or from its own coffers to pay for such training. Of course, the commercial body must progressively train its own deck crew, but it is unlikely that it would have for example, sufficient surplus funds to pay for a Fishing Master and a trainee Fishing Master on the same boat, or to send an engineer to school for six months of the year to improve his ticket. Yet this is what Governments often seem to expect of national fishing enterprises.

Corporate structure

Once it has been decided to operate a Government owned fishing operation, a means by which it will operate has to be established. Most of the existing fishing companies have been started within Fisheries Departments and have later been given over to a wholly owned Government company or corporation. The organisation is managed by a Board of Directors and regulated by a constitution or articles of association. In most countries it is necessary to move the fishing operation out of direct government control to enable it to have flexible management, to release management from the strictures of government regulations and to allow it to have some semblance of a commercial enterprise.

Examples of existing enterprises

Ika Corporation of Fiji was formed as a statutory body and has a constitution. It is managed by a Board of Management appointed by the Minister responsible for fisheries. Day to day management is by a General Manager who is appointed by the Board. There is no share holding, but the Corporation operates commercially and there is little interference from Government. Government has systematically injected capital into the corporation when needed and has given capital grants to construct new fishing boats. It is understood that the Corporation is financially stable at the moment and is operating on a break even basis. All vessels, including aid vessels, are depreciated on a 10 year basis.

Te Mautari Ltd. of Kiribati is a private company. Shares are held by the Minister for Natural Resources on behalf of Government (99%), and by the five Directors. Vessels were provided by the Japanese International Cooperation Agency (JICA) and further assistance has been provided by the EEC. Its operational viability has recently been improved by the addition of a carrier vessel. Further pole-and-line vessels will be obtained and it is possible that a purse seine vessel will join the fleet. Although Te Mautari may not yet be commercially viable (for example its revenues may not cover depreciation of the vessels), there is substantial potential, and when all the required infrastructure and assets are obtained, the company should be able to show a true profit.

The National Fishing Corporation of Tuvalu is a statutory body with six members on the Board of Directors. No share capital has been released. The United Kingdom provided an initial grant for working capital. The only vessel is one 175-tonne pole and line vessel, and because Tuvalu has very little bait fish, the vessel worked in Fiji for a couple of years and is now working in the Solomon Islands.

National Fisheries Development Ltd. of the Solomon Islands was established as a private company, with the assistance of an Asian Development Bank loan, to construct and operate ten ferro-cement pole-and-line vessels. Two sashimi longliners were later acquired. The company has been making ends meet, but has been having difficulty with the longliners which are now up for sale. It is believed that NFD is considering the construction of 26m steel vessels similar to those owned by Ika Corporation.

The Tongan longline vessel Lofa is managed by the Principal Fisheries Officer of the Fisheries Division. The vessel is operated through a revolving fund vote which is managed by the Government Treasury. Catch levels are similar to those experienced by the Taiwanese fleets and the vessel shows a cash surplus in each year of operation.

A final word

The tuna business is all about money. Plant and equipment is extremely expensive to buy, maintain and to insure. The smallest pole and line boat will cost US$700,000; a longliner about US$1,500,000; a small purse seiner about US$4,500,000; a 500 tonne seiner US$7,000,000. The annual fixed costs on a tuna boat, for depreciation, interest and insurance will amount to 25% of the capital cost. Therefore a small pole-and-line boat will have to land 250 tonnes just to pay the fixed costs. Operational costs for such a boat are about US$26,000, or 37 tonnes, per month. A small purse seiner would have to land 2,500 tonnes per year to break even. Only a few years ago, a super seiner which landed 2,500 tonnes would have made a substantial profit; he now has to land 5,000 tonnes to break even.