

FISHERIES NEWSLETTER

No. 27 October - December 1983

This issue

.... contains a new occasional feature, 'Abstracts', which is introduced at the suggestion of one of our readers, and which specifically addresses the problems associated with the dissemination of marine resource information in the SPC region.

The function of the 'Abstracts' section is to announce the existence of fisheries-related documentation produced in SPC member countries but not widely circulated. A good deal of literature falls into this category, including, for instance, project documents or reports of ongoing work which are written informally, often in a hurry and distributed only to those immediately connected with the project in question. Material of this type may never receive a wider circulation despite its potential usefulness to technical staff working on similar projects elsewhere in the Pacific.

In the 'Abstracts' feature we will (with the permission of the authors) briefly describe 'limited-distribution' documents of this nature and give information on contacts for those who wish to obtain copies. By definition, the type of literature we hope to cover will be very limited in availability. We will not be including journal publications, major books or other material likely to appear in academic bibliographies or reference listings.

'Abstracts' appears for the first time on an experimental basis and its regular or occasional inclusion in future issues will depend upon response. Readers who are involved in or aware of the production of 'limited-distribution' documents of potential technical interest to fisheries specialists in the SPC region are invited to write in with information and, if possible, sample copies.

<u>Contents</u>	<u>Page</u>
1) <u>SPC Activities</u>	2
2) <u>News From In and Around the Region</u>	6
3) <u>Abstracts</u>	23
4) <u>Synopsis of the Third International Artificial Reef Conference</u> by Dr Richard Brock	25

SPC ACTIVITIESDeep Sea Fisheries Development Project Notes- Palau

Master Fisherman Pale Taumaia completed his assignment in Palau in late October, after a total of five months spent there. The last few weeks of the visit saw the finalisation of a training programme in which Pale and a government demonstration team worked for one-week periods with 10 local cooperative fishing organisations. One cooperative comprised a good number of lady members, and their participation in the training programme marked the first time that women have been involved to any significant degree in Project activities. The demonstration team gave instruction both in deep-bottom fishing techniques, and in proper handling of the catch, particularly the correct method of chilling fish using an ice/brine slush. All the catch was sold to the Palau Fish Marketing Authority and subsequently airfreighted to Guam, where a high-priced market similar to that in Hawaii exists for whole chilled fish in perfect condition.

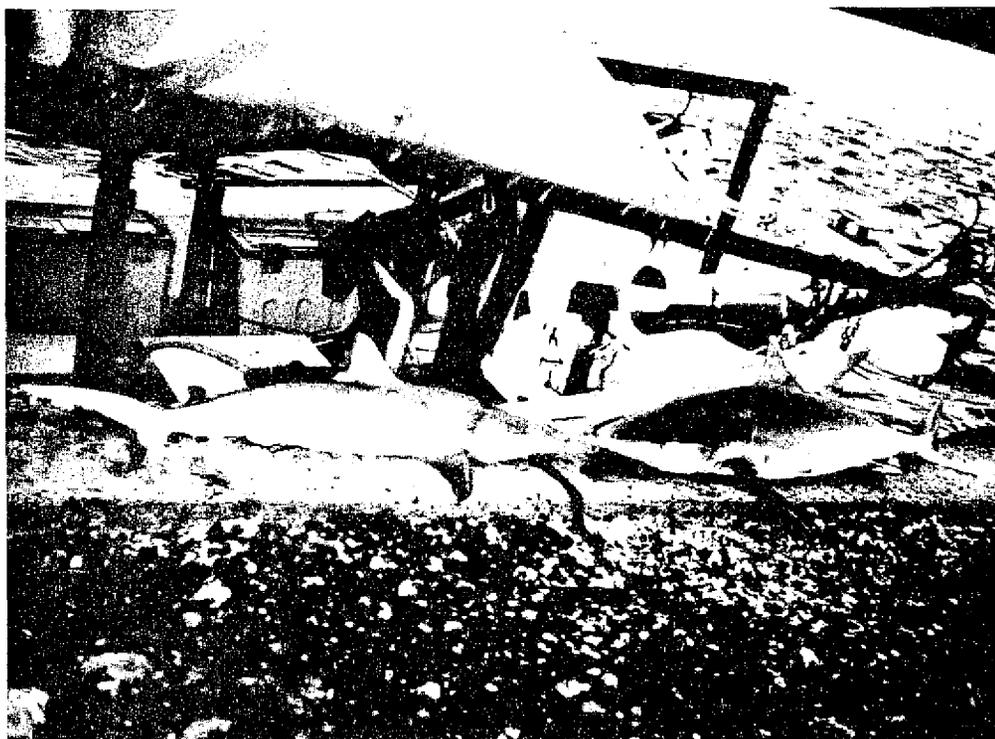


Photo: P. Taumaia

Two large sharks landed after an overnight fishing trip in Palau.

A notable feature of the Palau catch was the predominance of large sharks. Almost every trip yielded at least one 60-100 kg shark, and sometimes 3 or 4. These were generally unsaleable, although on one or two occasions they were consumed locally.

- Tuvalu

Late December saw the completion of Master Fisherman Lindsay Chapman's visit to Tuvalu, which commenced in September. During his stay Lindsay spent a total of two months working with Fisheries Department staff around Funafuti, deep-bottom droplining being the main fishing method used. Catch rates were good at over 8 kg/reel-hour but over half the fish were oilfish (Ruvettus pretiosus), which were taken during night-time fishing operations. This species is locally acceptable if salted and dried, but the economics of processing the fish to this stage are not attractive as the final recovery rate is of the order of only 25%. Fishing trips were thus restricted to daylight hours later in the visit, to reduce the proportion of oilfish.

One-week training visits were also made to the islands of Vaitupu, Nukulaelae and Nukufetau, with 15-20 trainees being taken out on fishing trips at each place. Good bottom catches were obtained at Nukulaelae, with large fish indicating an almost untouched resource. Several short-tailed red snapper (Etelis carbunculus) beyond the range of Lindsay's 25 kg scales were caught, and three saddle-backed grouper (Epinephelus septemfasciatus) caught together on the same day weighed in at an estimated total of 200 kg. Nukufetau and Vaitupu gave poorer bottom catches, mainly because of strong currents and lack of bait which severely hampered effective fishing.



(Photo: L.B. Chapman)

'... large fish indicating an almost untouched resource' at Nukulaelae, Tuvalu.

As no ice was available on the three outer islands, those fish which could not be sold fresh were filleted, salted and sun-dried. This resulted in a product which could be stored for a reasonable period of time, and which was locally very acceptable.

- Wallis and Futuna

The Project visit to Wallis and Futuna commenced in November with the arrival of Master Fisherman Pale Taumaia. Pale's first two weeks were spent in company with Assistant Fisheries Officer Garry Preston examining the level of local fishing activities both on Uvea (Wallis) and Futuna and participating in some exploratory fishing trips with local fishermen. A small number of boats are currently deep-bottom fishing outside the barrier reef at Wallis with considerable success, but most fishermen are not familiar with the techniques or equipment required for this type of fishing. This is also true at Futuna, where a rocky and very exposed coastline makes the handling of fishing boats difficult.



(Photo: G.L. Preston)

The results of a day's exploratory deep-bottom fishing at Wallis Island.

Pale started his training programme in Futuna, demonstrating bottom fishing techniques to members of two local fishing groups. After 4 weeks, he returned to Uvea to continue his programme there.

Computer entry of DSFD Project Data underway

Work is progressing well with the computer entry of catch, effort and related data from the Deep Sea Fisheries Development Project's thirty (to date) country visits. This work, commenced at the direction of the last SPC Regional Technical Meeting on Fisheries, will form a basis for the production of biological and management information relating to deep-bottom fish stocks. Following the compilation of an exhaustive list of deep-bottom fish species caught during the Projects activities over the past 7 years, about half of the daily catch-and-effort forms have now been coded and punched onto computer files. Many minor problems have been encountered in coding, particularly due to minor inconsistencies or omissions, which take a long time to correct by checking past files, logsheets and correspondence. However, most of the data has been converted to a computer-usable form, and entry should be completed shortly.

Tuna and Billfish Assessment Programme

As well as the ongoing work of logging and processing tuna catch statistics from SPC member countries, work has been continuing on the publication of concluding reports of the Skipjack Programmes work in the waters of all SPC member countries and territories. Final reports have so far been published for Fiji, Cook Islands, Solomon Islands, Pitcairn Islands, Kiribati, New Zealand, Tuvalu, French Polynesia, Vanuatu, Tokelau and Tonga.

Tuna Resource Assessment and Conservation Meeting Planned

In response to a decision taken by the Twenty-third South Pacific Conference (1983), a meeting between Coastal States and Distant Water Fishing Nations to discuss future approaches to tuna resource assessment and conservation has been announced. Invited participants include all SPC member countries, the Governments of Japan, Korea, Taiwan, Philippines, Indonesia and Mexico, the Forum Fisheries Agency (FFA), the Food and Agriculture Organization (FAO), the South Pacific Bureau for Economic Co-operation (SPEC), the Inter-American Tropical Tuna Commission (IATTC), and the International Commission for the Conservation of Atlantic Tunas (ICCAT). An earlier recommendation from the Fifteenth SPC Regional Technical Meeting on Fisheries (1983), quoted below, explains the rationale behind the meeting, which will be held at SPC headquarters in Noumea from 18-22 June 1984:

"The meeting recognised that there are substantial gaps in the catch and effort data available to the Programme, but was unable to identify methods of obtaining the information required. Accordingly, the meeting recommended that the Twenty-third South Pacific Conference explore ways and means of obtaining input from the distant-water fishing nations in pursuing the objectives of the revised work programme. The meeting suggested that this include the convening of a meeting of coastal states, distant-water fishing nations, and international organisations with an interest and experience in this field, such as the Forum Fisheries Agency (FFA), FAO, IATTC and ICCAT, to identify methods of collection, integration, and analysis of statistical and other scientific data on highly migratory species in the region. The meeting understood that the information generated from the Programme would be used to identify issues relating to the conservation of highly migratory species in the region. The suggested meeting would therefore need to explore

possible structural arrangements which might be required for the conservation of tuna stocks of the region".

Fisheries Statistics Training Course to be held

Following a recommendation from the Fourteenth Regional Technical Meeting on Fisheries (1982), the Commission has obtained funding to enable a training course in fisheries statistics to be held. The course, planned for 3-14 September 1984, will be open to participants selected by SPC member countries as being most likely to contribute to the improvement of their national fisheries statistics capabilities.

Instructors for the course will comprise both SPC staff and outside specialists. Emphasis will be given both to coastal and offshore fishery statistics, although the tuna statistics already supplied to SPC by member countries will comprise most of the study material used. The course will be structured to improve the trainees understanding of the use of fisheries statistics, and the role that computers can play in this use, and the Tuna and Billfish Programmes computer facilities will be available for this purpose.

NEWS FROM IN AND AROUND THE REGION

Joint Fisheries Survey Planned for Tuvalu and Fiji waters

The Tuvalu News Sheet of 10th November 1983 announces the finalisation of an agreement between Japanese, Fijian and Tuvaluan concerns which will result in the chartering of Tuvalu's only pole-and-line boat, the Te Tautai, to conduct a fishery resource survey in both Tuvaluan and Fijian waters. The agreement, between the Japan International Cooperation Agency (JICA), the Government of Fiji, the Government of Tuvalu, Fiji's national fishing company Ika Corporation, and Tuvalu's national fishing company NAFIGOT, will be managed by a committee of representatives from each of the bodies concerned, who will meet twice a year to supervise and plan operations. The survey period will run from May 1984 to March 1986, and all three countries will receive full reports of the results of the survey on its completion.

Fishing base feasibility study carried out in Marshall Islands

A Japanese team of engineers and other specialists arrived in Majuro in mid September to carry out final studies into the feasibility of establishing a fishing base there, according to the Marshall Islands Journal of September 27th. The survey team looked at available sites, power and water supplies, current ice-making and warehousing facilities and other factors which would bear on the feasibility of establishing a fishing base.

The project has been under discussion between the Governments of the Marshall Islands and Japan for three years, but looks set to go ahead since the fruitful discussions held during President Kabua's trip to Japan in July. Since there have already been a number of study visits to gather basic information, this final survey is seen as an indication of likely favourable support for the project by Japan. If approved, the base will include an initial freezer storage capability of 700 tonnes of fish, and bunkering, supply and maintenance facilities for foreign and local fishing vessels. The base would be built by the Japanese government, who would subsequently oversee its operation.

American Samoa fishermen's association reactivated

The American Samoa Commercial Fishermen Association has been reactivated to work cooperatively with the Office of Marine Resources in the development of the local fishing industry, according to the December 1st issue of the American Samoa News Bulletin. The Association, which was originally incorporated in 1973, met for the first time in five years on November 30th to elect officers and identify its objectives.

Newly elected Vice-President Tony Langkilde says that the Association plans to work closely with the Office of Marine Resources in identifying and solving the problems faced by local fishermen, which are identified as inadequate marketing and fueling facilities, lack of spare parts and reliable engine service, and expensive ice. The Association has 15 potential new members and eight charter members.

Asian Development Bank approves assistance to Solomon Islands

The Asian Development Bank has approved technical assistance to the Solomon Islands for the preparation of a second ADB Fisheries Development Project in the country. According to the Bank's News Release No. 114/83, the technical assistance will help the Government to evaluate the current status of the country's fishing industry and identify opportunities for and constraints to development in this sector. This will serve as a basis for formulating a development strategy to exploit more fully the nation's fisheries resources.

A detailed study will be undertaken to establish basic parameters within which the fisheries sector can and should be developed. The study will recommend a strategy that will lead to a balanced development of artisanal and industrial fisheries, taking into account the fisheries sector's economic potential, resource management, fisheries technology, infrastructure facilities, marketing facilities, social implications and institutional and organisational capabilities.

The Bank's technical assistance will provide consulting services in the areas of economics and institutions, resource management, infrastructure, marketing and fisheries technology.

New Japanese aid vessel for Kiribati

The Kiribati Government formalised an agreement late in November with the Yokohama Yacht Co. Ltd and the Overseas Shipbuilding Cooperative Centre (OSCC) of Japan for the construction of an A\$2-million pole-and-line boat which will be financed via Japanese aid.

The boat, to be called Nei Mataburo, will be a sister ship to the currently operating Nei Momi, and is expected to be delivered to Tarawa in July or August of 1984. The OSCC will act as the Kiribati Government's consultant agent in Japan, and will oversee the boat's construction on the Government's behalf. The Yokohama Yacht Co. was selected from eight companies who submitted tenders to build the vessel, and has guaranteed that work will be completed within eight months.

Encouraging results from UNDP boatbuilding project in Kiribati

Following a design study carried out by FAO consultant naval architect Oyvind Gulbrandsen in June 1982, the United Nations Development Project (UNDP) has established a boatshed on Tarawa for the construction of fishing canoes designed specifically for I-Kiribati fishermen.

The new boatbuilding scheme is run by UN Volunteer Mr Michael Savins, who arrived in Kiribati in April 1983. After ordering boatbuilding materials and building a boatshed, work began on the construction of two prototype motor sailing canoes, KIR-1 and KIR-2, designed by Mr Gulbrandsen. The prototypes were completed in August 1983, and given technical trials the following month. Some of the performance figures obtained at this time are shown below.

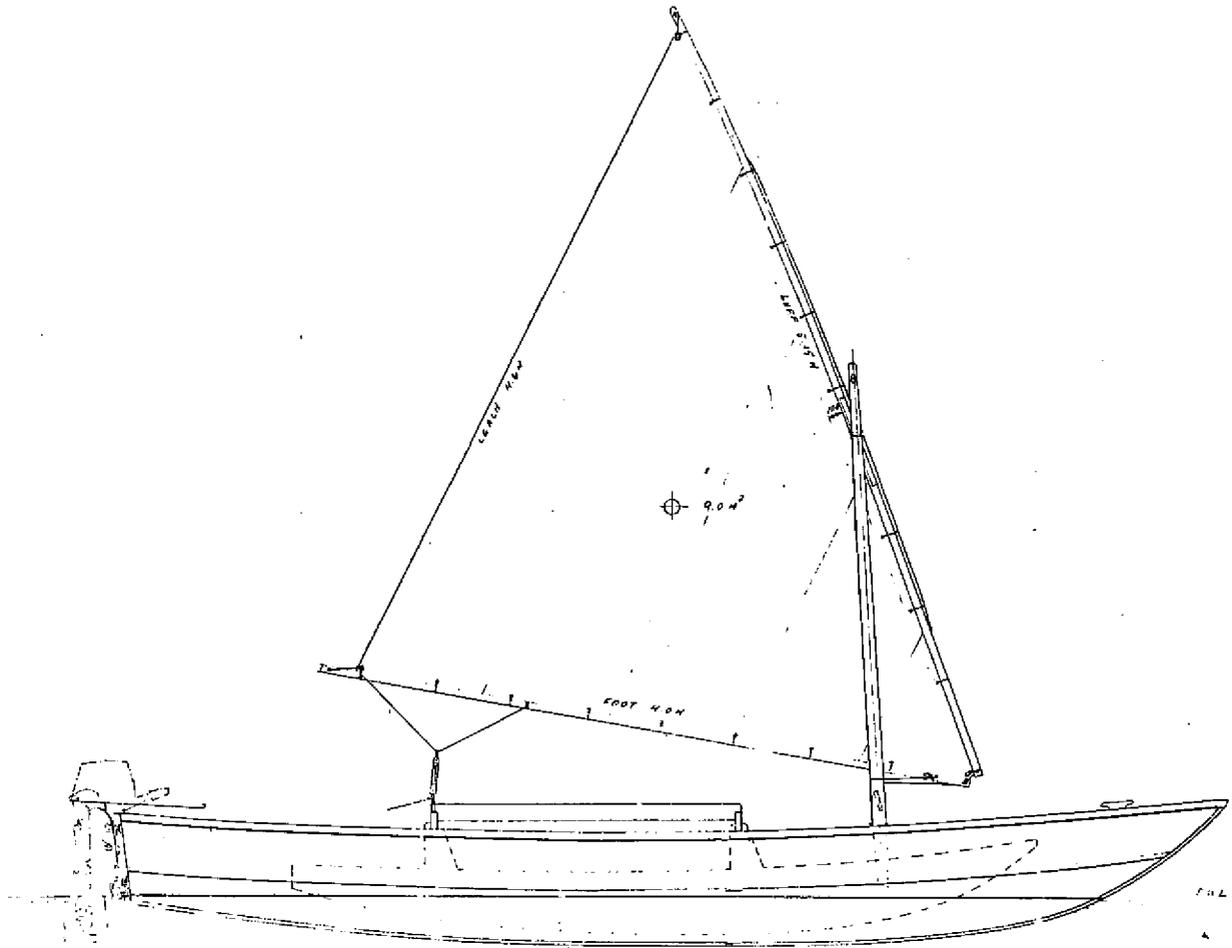
Specifications and features of the KIR-1 and KIR-2

(condensed from plans, reports and comments by O. Gulbrandsen and M. Savins).

Model	KIR-1 (Teikabuti)		KIR-2 (Buti-n-ang)	
Description	Outrigger motor-sailing canoe designed principally for commercial trolling and other fishing activities where speed is required.		Outrigger motor-sailing canoe designed principally for subsistence or commercial fishing activities (e.g. gill-netting, line fishing) where high speed is not essential.	
L.O.A.	7.2 metres		7.2 metres	
Unladen weight	242 kg		235 kg	
Principal power source	Outboard motor		Sail	
Sail area	9m ²		12m ²	
Recommended motor	10 h.p.		5 h.p.	
Speed under outboard power (knots)	10 h.p.	5 h.p.	5 h.p.	2 h.p.
2 persons (150 kg)	10 +	9.4	9.4	6.0
3 persons (225 kg)	10 +	8.7	8.6	5.8
4 persons (300 kg)	-	8.0	8.1	5.6
5 persons (375 kg)	-	6.4	6.5	5.4
Estimated cost (\$A)*	2100		1700	

* Includes sail, motor and some fishing gear.

Since October the two models have been going through their paces in fishing trials designed to assess both the vessels' performance during fishing operations and the degree to which they are acceptable to local fishermen. A good deal of useful information has already been gained in this way, such as the fact that under normal use the Buti-n-ang (KIR-2) suffers very little loss of speed but consumes far less fuel if fitted with a 2 h.p. engine rather than a 5 h.p. as originally planned. Demonstrations to local fishermen have met with very favourable responses and a number of orders have been placed for both types.



O. Gulbrandsen/FAO

Above: Sheer profile and sail plan of KIR-1.
Below: KIR-2 moored in Betio harbour.

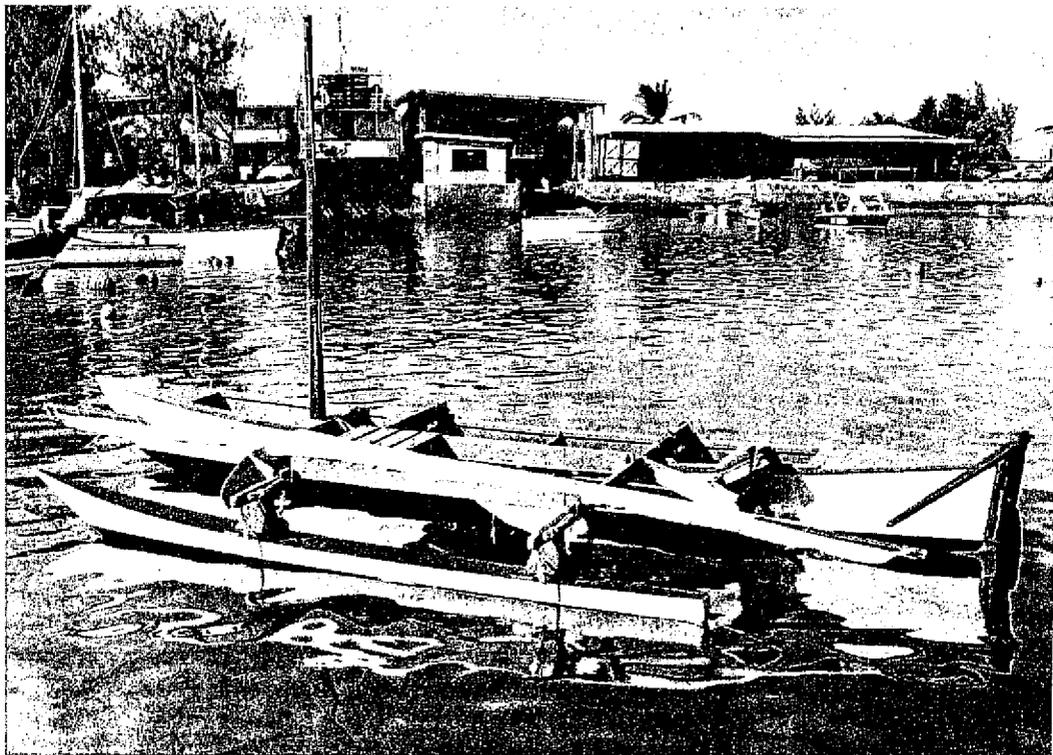


Photo: B. R. Smith

I-Kiribati fisherman's 36-day ordeal at sea

On September 4th I-Kiribati fisherman Tetuai Bina lost sight of land while fishing from his canoe, and drifted for 36 days without food or water before being rescued by a passing Japanese longliner 400 miles from his home village. The November 18th issue of the I-Kiribati weekly newspaper 'Te Uekara' contains Mr Bina's account of his ordeal, and warns of the dangers facing unwary small boat fishermen.

"It was dawn when one of my daughters and I dragged my canoe to sea. It was a one-man sailing canoe. As soon as my canoe could float I boarded it and sailed to a place where I thought I could get a good catch. I knew the current was strong and that it would drag me away from the land but I thought I could manage to get back easily. I first lost sight of land after chasing a school of fish, which led me away from the land. The current was also in the same direction and when I tried to turn back, I couldn't. I knew then that I was lost.

"The first few days I ate my catch and drank their blood. Then I was left with no food and drink. I decided to float beside my canoe to cool my body which was dry. I did not stay there long in fear of the sharks which often circled my canoe. It was getting dark, so I propped up my sail to shield myself from the cold night breeze. Before sleeping I prayed and recited a verse from the Bible I knew well, sang a few hymns and then lay down. I have a wife and children and at that moment I began to think of them, until at last I fell asleep.

"I woke up the next morning at dawn and said my usual prayers. No rain had fallen and I had no food so I sat down depressed and ever so lonely. My only hope was in God Almighty so I prayed again. This was my fourth day at sea, and on this day I lay down on my chest, dangling my feet in water as hour by hour I prayed tirelessly.

"I did not know how long I stayed like that. I suddenly felt something banging into my feet. I turned and saw a turtle diving away. Quickly I dived after it opening my eyes so that I could not lose it. I caught it, killed it and drank its blood. I ate some of its flesh and kept the rest which kept me going for one week. At the end of the week I had nothing left. For a few days I had no food but I never got tired of praying for help.

"One day a bird (red footed booby) came and sat on my head. I caught it and drank its blood and ate every part of its flesh, brain and even the intestines which I cleaned with seawater. At dusk I prayed: "Jesus, you are the way to life, please guide me to land if it is your will". After praying I prepared myself to sleep and just when I was about to lie down another bird came and sat on my head. I caught this one, drank its blood and kept the flesh for the next day.

"I woke up the next morning, said my prayers with nothing on my mind but to reach land. After saying my prayers this time, a lot of birds came and some settled on my head, and some on my canoe. I caught as many as I could; some of them I ate and the rest, I tied to my canoe alive, to be eaten later. It took me two weeks to eat all the birds.

"After those two weeks with food and drink from the birds, I began to realise the fact that it had not rained. At this time rain clouds gathered overhead and then floated away, leaving me praying harder. If it rained, it did not rain where I was but further away.

"One night it stormed. I thought the howling winds would capsize my canoe or the huge waves would sink it. I did not know what to do to keep me warm so I stood up, sat down again, shivered and even cried. Crying did not help so I started singing hymns, putting into pictures the words of the songs and I thank God for giving me hope and courage, during these dreadful moments.

"On the day I was found, I had had no food for days and I had given up hope of reaching land. I had prepared myself before death came. I made a sort of hammock with some ropes on which I was going to lie, tied and covered with the sail. All was completed and I was lying down on my deathbed covered with my sail. It was not very long after I lay down when I heard a horn blown twice. I peeped from under the sail and saw a ship to the west of me. I got up as quickly as I could and waved hard to attract the crews attention. It was no use. The ship just went on its way and soon it was out of sight. As soon as it disappeared I collapsed onto my canoe and started crying. It was about three o'clock in the afternoon.

"I did not give up hope. I prayed and prayed, harder than I had ever prayed that the ship be returned to pick me up. At about five o'clock in the afternoon I sighted the ship heading towards me. After a while it reached me but it hit the back of my canoe breaking it. Aboard the ship with my canoe the crew asked my name and where I came from. I told them that I came from Makin. On hearing this they told me that they would drop me at Makin after three days. On the third day which was a Friday we finally reached Makin at about 7 in the morning".

Second International Conference on Warm Water Aquaculture Announced

The Hawaii Campus of the Brigham Young University has announced that its second International Conference on Warm Water Aquaculture is to be held at Laie, Hawaii from February 5-8 1985.

Whereas the first conference, held in 1983, focussed specifically on crustaceans, the second conference will be devoted to topics dealing with the culture of commercially important finfish. Sessions are envisaged on; Hatchery Technology and Larval Biology; Maturation, Spawning and Breeding; Nutrition, Feeds and Feeding Practices; Diseases and Predators; Growout Management Techniques and Water Quality; Production Economics and Marketing; Government Support and Attitudes; and Legal Aspects of Fish Farming.

Participants are encouraged to present papers at the meeting, either orally or by preparing a poster presentation. The deadline for the submission of abstracts of such papers is June 1st 1984.

More details can be obtained from Professor T. Aaron Lim, Division of Continuing Education, Brigham Young University, Hawaii Campus, Laie, Hawaii 96762, USA.

Fish identification poster published

The Fisheries Division of Fiji's Ministry of Agriculture and Fisheries has recently produced a wall poster, entitled 'Food Fishes of Fiji', which features photographs of 60 of the more commonly sold or eaten local fish species. The poster, funded under the New Zealand Bilateral Aid Programme, is intended for use both for identification purposes by fishermen and fisheries workers, and as an educational tool in schools. The photographs are broadly grouped according to the habitat of the fish (e.g. estuaries, coral reefs, etc.) and are labelled with scientific, English and Fijian names.

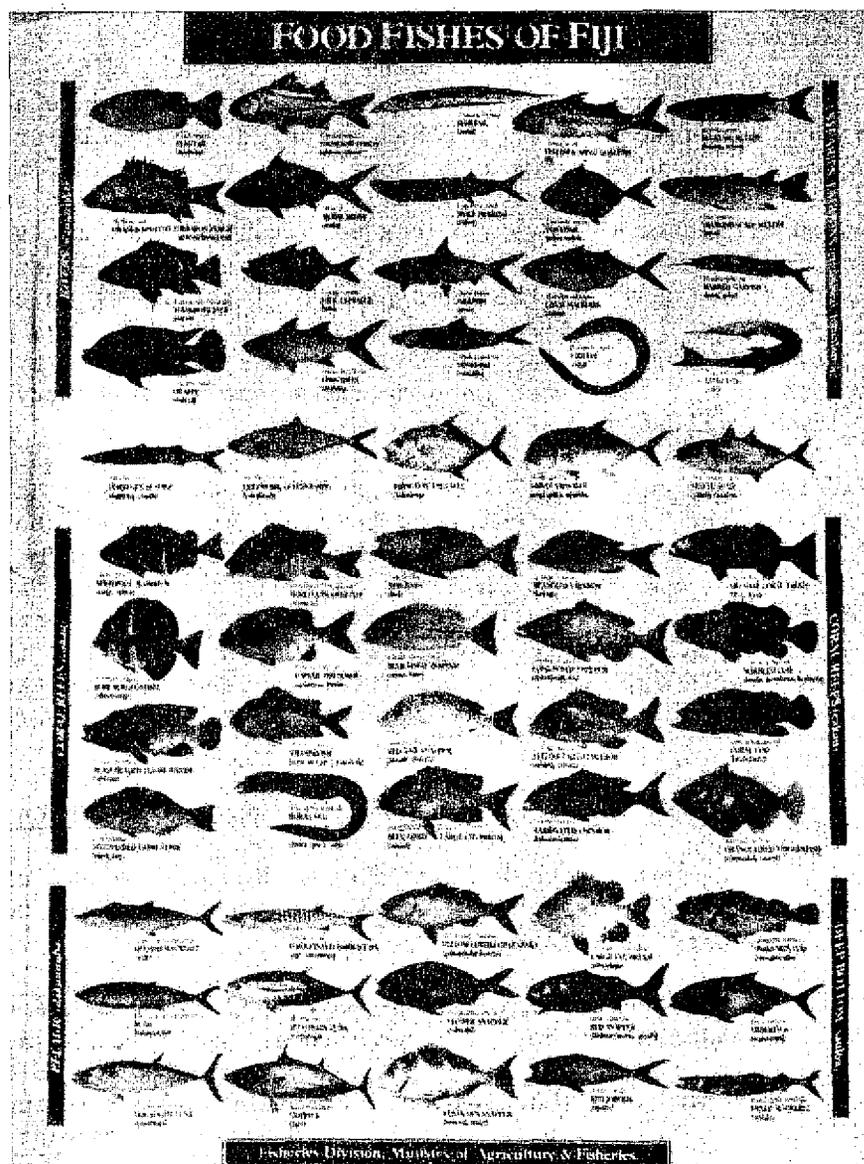


Photo: G. Preston

"Food Fishes of Fiji".

The posters are on sale for F\$2 + postage. Copies can be ordered from the Librarian, Fisheries Division, M.A.F., Box 358, Suva, Fiji.

Dr Tony Lewis, who compiled the poster from photographs taken by himself and a number of other fisheries workers, is currently working on a companion poster, which will feature non-fish marine products (e.g. crustaceans, molluscs, turtles, seaweeds, etc).

Fishing boat disaster kills one, injures six

An explosion in the engine room of the U.S. purse seiner Ocean Pearl on November 21st resulted in serious injuries to six of her crew and the death of her captain, 28-year old American John Medina.

The explosion, whose cause is still not known, occurred while the seiner was operating near Tuvalu. Captain Medina and the other injured crew members were badly burned during the explosion, and in the ensuing fight to control the fire. John Medina's younger brother Wade, who also works on the boat, led the injured into the ship's walk-in freezers to cool down their burns, and, while other crew members dressed their injuries, had the main skiff launched in case the boat began to sink. Another seiner, the Island Princess working in the vicinity came to the Ocean Pearl's assistance, and, using their two helicopters, the burn victims were flown to Funafuti for medical attention.

In statements to the San Diego Times, Wade Medina said of the attention they received in Tuvalu "I can't say enough good about those people there ... there were never less than three nurses taking care of each one of the guys who was burned. There were about 40 people outside of the hospital all the time, just waiting to do something to help. They kept going for ice wherever they could get it - there aren't many freezers there. They kept bringing us food and if they thought we looked thirsty they brought us things to drink. They were just fantastic - it's a spirit they have, and it's a shame we don't have it here. It's like a brotherhood".

Over a hundred island residents offered to give blood if it was needed, and some of the hospital's medical supplies were exhausted in caring for the injured while waiting for a U.S. Coastguard plane to arrive and fly them to intensive care facilities in Hawaii. Wade Medina said "the Coastguard plane was coming but we didn't know exactly when and there were 100, maybe 150, of the people who stayed up all night at the airstrip. There were a few cars, but the people were out there all night with flashlights and matches and cigarette lighters to try and light the field if the plane came."

The plane in fact arrived the following morning, and by that time John Medina had died at the hospital. The other burn victims survived and were flown to hospital in Hawaii. The Ocean Pearl was towed to American Samoa by the Island Princess.

The Medina family is one of the pioneer tuna fishing families of southern California and is highly respected in the tuna industry. Wade Medina said the family is planning to show its gratitude for the help given by the Tuvaluan people by establishing, through the American Tunaboat Association, "something like a 10-bed intensive care wing with an operating room at the hospital at Funafuti", as a memorial to John Medina.

Black bass introduced to Fiji

In 1963 New Caledonia's man-made Yate lake, which is used for the generation of hydroelectricity, was stocked with black bass (Macropterus salmoides), a popular American fresh water game fish. The brood stock thrived and multiplied, and now, 20 years later, forms the basis for a very popular sport fishery. Black bass is also greatly sought after as an eating fish in and around the capital, Noumea, although its sale is prohibited since a small and

relatively susceptible lake population cannot be expected to support a commercial fishery.

On October 25th 1983 a consignment of black bass fingerlings was made to Fiji in order to establish a similar population in Vaturu lake, a recently dammed drinking water reservoir on the western side of Fiji's main island of Viti Levu. The shipment, made under a government to government agreement, was handled by New Caledonia's Water and Forest Service, and Fiji's Fisheries Division. 141 fingerlings were airfreighted to Nadi, individually packaged in sealed plastic bags half full of water and inflated with oxygen.



(Photo: Les Nouvelles Calédonniennes)

One of the black bass fingerlings which died on the way to the packing station.

The fish were caught the preceding morning by using fine meshed nets, folded over several times to ensure the fingerlings would not become gilled or meshed. Black bass make spawning pits, similar to Tilapia nests, in the shallow water of the lake edge, and the young stay in the vicinity of the nests after hatching. The nets were operated around the spawning pits by a team of collectors from the Water and Forests Service's training school, and the morning's fishing yielded 143 baby bass, 2 of which died during transport to the packing station. A further 15% mortality occurred during transport, leaving approximately 120 for the Fiji Fisheries Division's broodstock. Of these, about 70 were released into Vaturu, and the remainder have been placed in a pond at the Division's Naduruloulou fish farm complex, from where further releases can be made in future if necessary.

70 fingerlings may not sound like much of a start to ensure future generations of black bass in Vaturu lake, but the Division is optimistic about its success: the thriving Yate lake population itself is derived from an initial release of only 19 fish.

Buyers want Beche-de-mer

Two Hong Kong companies have recently been in touch with SPC seeking potential producers of beche-de-mer and other marine products from the Pacific region. Tai Hing International (Trading) Ltd (address: GPO Box 5690, 308-309 International Building, 141 Des Voeux Rd, Central, Hong Kong) are looking for supplies of beche-de-mer and dried sharks fins. Sea Sources (Hong Kong) Company (address: 2nd Floor, General Building, 6-14 Centre Street, Saiyingpun, Hong Kong) is also interested in these two products, plus dried shellfish meat (e.g. trochus, some bivalves, etc.). Interested potential suppliers should write to the two companies' respective managers: Mr K.S. Tao (Tai Hing) and Mr F. Yui Man (Sea Sources).

Australian institution seeks collaborative research projects

As a way of furthering agricultural research objectives and fostering relationships between Australian and Pacific Island marine scientists, the Australian Centre for International Agricultural Research (ACIAR) is interested in funding collaborative research work involving Australian and overseas institutions in the fields of marine science, aquaculture and post harvest use of marine products.

The Centre, based in Canberra, already funds a large number of agricultural research projects which involve participation between Universities, Government departments, international aid and research bodies, etc. The criteria for a research project to be considered for ACIAR funding are that;

- a) it is a research priority of the country involved
- b) there is a scientific base in Australia to support the project
- c) it is a collaborative project in design and intent.

Two examples of the type of work ACIAR is currently funding are projects entitled "Prediction and Control of Spoilage of Fresh, Cured and Dried Tropical Fish in Indonesia" and "Fish Drying in East Java". Involvement in a giant clam mariculture project is also under consideration, as is a study of the population dynamics of the coconut crab, both in Pacific Island countries.

Further information is available from: Dr J.W. Copland, Research Programme Coordinator, ACIAR, GPO Box 1571, Canberra City 2601, Australia.

Hefty catches in American Samoa

The American Samoa Game Fishing Association's Thanksgiving Fishing Tournament held at the end of November produced some good fish, with prizes being awarded for a 106 lb marlin and a 90-pound yellowfin caught on rod and reel. (A "smallest fish" prize was also awarded to the angler who caught a one-ounce fish). However none came close to the record-breaking 584 lb blue marlin caught the following day by local fisherman Abe Samana. Mr Samana erased the previous record of 425 lbs when he hooked the fish while handling from his canoe near Tafuna airport. The marlin was landed after a three hour fight.

Fiji's Ika Corporation launches efficient new pole-and-line boats

The national fishing company of Fiji, Ika Corporation, is going full steam ahead with plans to upgrade its fishing fleet to improve the company's

operating economics.

A major step forward has been the development of smaller, fuel-efficient pole-and-line boats to replace the ageing fleet of Japanese boats designed in the days before fuel prices became a major constraint in industrial fishing operations.

Two similar boats have so far been built to designs by Australian naval architect Chris Williams. The boats are Ika Corporation's Ika 7, and Independence, which is privately owned but chartered to Ika Corporation, who plan to build more vessels to the same basic design. Both Ika 7 and Independence have made profits during their brief fishing careers because of the fuel savings they generate, estimated to be F\$4000-6000 per monthly trip. Despite their fuel economy and relatively small 250 h.p. engines, these boats cruise at 9 knots, due to their hydrodynamically efficient shape and carefully selected propellers.

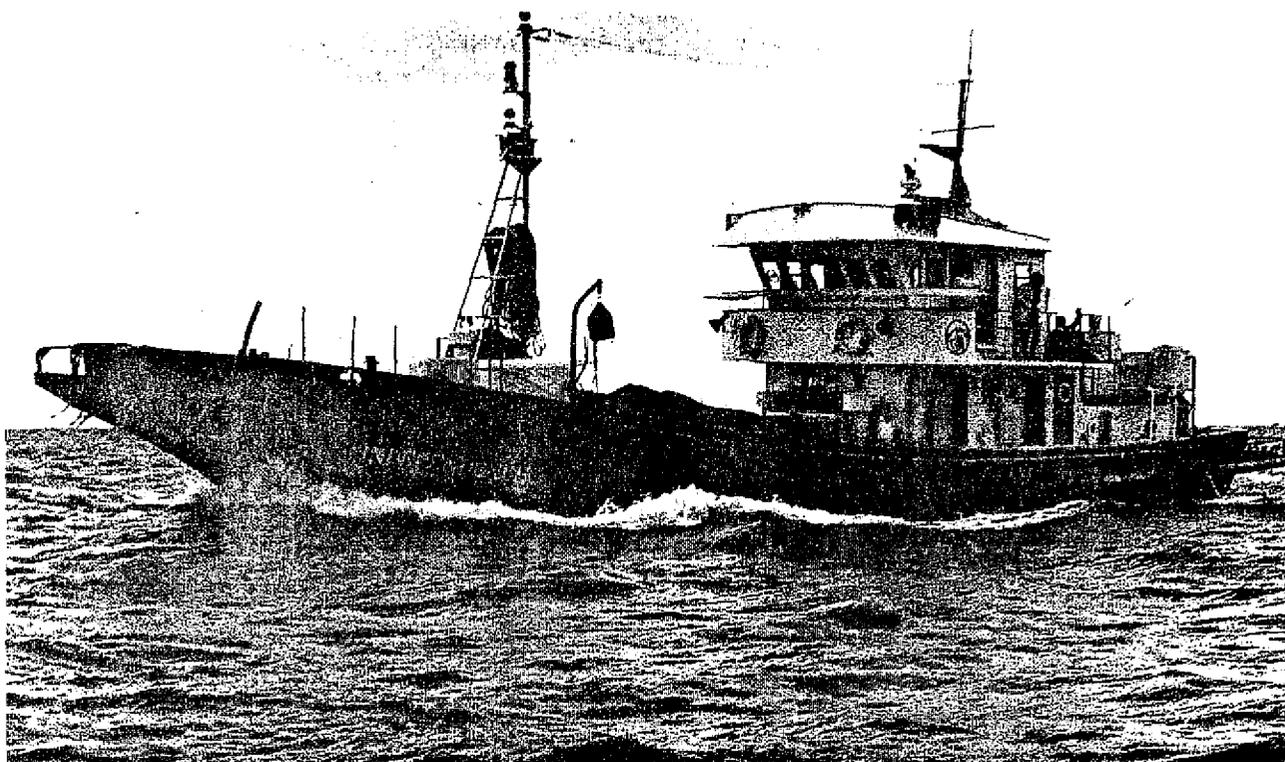


Photo: Professional Fisherman

Independence, one of Fiji's new generation of pole-and-line vessels.

These new generation boats differ from their Japanese predecessors in other ways too. The original design requirements were laid down by Graeme Southwick and Robert Stone, both managers of private fishing companies who have served as managers of Ika Corporation, and both of whom have been closely involved in the development of Fiji's tuna fishery. The new boats had to retain a large carrying capacity despite the reduced hull size and horsepower, and they had to have simplified equipment and machinery which would cost less and be easier to maintain and repair locally.

Mr Williams has likened combining these features to running a

3-minute 50 second mile. He feels that one of the main problem in improving vessel designs is in getting new ideas accepted in the face of local conservatism. Nevertheless initial fishing results seem to be proving the success of the venture, and Ika Corporation have already started work on the Ika 8, which, like the other two boats, is being built at the Suva Government shipyard.

..... and scuttles inefficient old ones

In the same bid to improve fleet efficiency, the Ika Corporation has systematically scuttled three of the Hatsutori Maru series of pole-and-line vessels belonging to the Hokoku Marine Products Company of Japan and chartered to the Corporation. The three vessels, Hatsutori Maru # 2, 5 and 6, were all sunk during October by motoring them outside the reef and then opening seacocks in the engine room to let the vessels flood.

Many fisheries personnel in the region will remember the Hatsutori Maru # 5 as the tagging vessel used by the SPC Skipjack Survey and Assessment Programme from November 1979 to August 1980. The boats were sunk because maintenance and repair costs were prohibitively high due to their old age. They could not be converted to passenger or cargo vessels without expensive modifications, and although they had been on sale no buyers had been found. The ships were stripped of everything usable before being sunk. Three other Hatsutori Maru vessels are still on charter to Ika Corporation.

New Zealand provides new fisheries jetty for Tuvalu

Construction of a new fisheries jetty, worth about NZ\$90,000, commenced at Funafuti early in December. The project is funded by the New Zealand Government and is being supervised by a four-man team of consultant engineers.

The work is expected to take about three months and, will provide better access and safer bad-weather moorings for Government and private fishing boats.

PIDP Aquaculture Team completes case studies

The Aquaculture Team of the Pacific Islands Development Programme (ADP) of the East-West Center has recently completed draft reports for the governments of Tonga and Kiribati on various aquaculture activities in the two countries. The team, which comprises Dr Roger Uwate and Mr Peniasi Kunatuba, have submitted a draft report on the feasibility of a proposed mullet farm in Vava'u to the Tongan Government, with supporting reports on world and regional mullet culture activities, the animal protein market in Tonga, and tidal area usage in Vavau'u. In Kiribati, the team carried out an economic evaluation of the Temaiku Baitfish Farm, with supplementary reports on the possibility of milkfish fry export from Kiribati to Guam, and the fish and animal protein market in Tarawa. The reports are currently being reviewed by the Fisheries Divisions of the two governments.

In addition to these reports and the preparation of aquaculture activities reviews, the team is also preparing a report on the Awareness and Perceptions of Aquaculture of Fisheries Officers in the region. This is based on information collected this year at the 15th SPC Regional Technical Meeting on Fisheries, and from participants in the Forum Fisheries Agency's EEZ

management training course held in Suva, Fiji.

NZ firm plans seaweed farm in Tonga

A brief article on the November 4th issue of the 'South Seas Digest' notes that Coast Biologicals Ltd of New Zealand is planning to establish a seaweed farming operation off Vava'u, in Tonga. About 100 acres of shallow water will be seeded as a pilot project and subsequently harvested by about 250 local people, each of whom will operate small allotments producing about 3 tonnes of dry seaweed a year. Coast Biologicals produces seaweed extracts for use in the manufacture of foodstuffs, the waste being made into fertiliser.

New Caledonia invites investment in the fishing industry

The Territorial Assembly of New Caledonia is currently offering incentives to new investors in development activities, including the fishing industry, in order to promote local production and export. Investors, including those from overseas stand to gain: a 15% grant on investment; exemptions from tax on company profits, license fees and land tax for 8 years; and a 50% exemption on company tax. For further information contact: SDAE, B.P. C5, Noumea Cedex, Nouvelle-Caledonie.

'Fishermen's Day' promotes fishermens image

Several Pacific countries are taking steps to promote both the image of the fishing industry in society, and the interest of fishermen themselves in developing the industry, by organising contests and festive occasions which draw attention to local fishing activities. An example is the recent 'Fisherman of the Year' competition organised by Fiji's Fisheries Division, in which local companies donated outboard motors, punts and fishing gear as prizes for the winners.

The Government of the Maldives in the Indian Ocean have taken this concept a step further by organising an annual 'Fishermens Day' according to a report in the 'Bay of Bengal News'. The third Fishermens Day was celebrated on December 10th 1983 with a variety of activities which aim to improve the status of fishermen in society, push efforts to improve their earnings and living standards, and encourage more young people to take to fishing-objectives shared by the administrations of most Pacific Island countries. The day is a media event, with plenty of radio and television coverage, and special events organised to generate public appeal.

To fisheries development workers, the highlight of the first Fishermens Day in 1981 was the introduction of fisheries science into the Maldivian school curriculum. This was meant to impart systematic knowledge of fisheries at an early age, with environmental ecology, fishing technology and fisheries management being incorporated into a curriculum which UNESCO helped develop. Since that time, the government has engaged a specialist specifically to develop fisheries education in schools.

Other events which helped launch the first Fishermens Day were the launching of a tree-planting scheme to help overcome timber scarcity for boat-building: a commemorative stamp issue: a childrens art competition on the theme of fisheries: and the release of a local fisheries magazine, distributed free among schools, and sold in bookshops.

Fisheries development activities have also been timed to coincide with Fishermens Day, thus adding impact to the annual event and publicity to the activity. In 1982, for example, December 10th saw the opening of two fish marketing warehouses for salted and dried fish.

The big event of the 1983 Fishermens Day was a 120 km sailing contest, open only to non-motorised craft, and meant to promote sail power as well as providing an exciting visual event for the day.

Complaints of dumping undersized tuna in Solomon Islands

The practice of dumping large quantities of undersized skipjack by Solomon Taiyo and National Fisheries catcher boats came under sharp attack during a visit by Solomon Islands Prime Minister Mr Mamaloni to the Western Province in August this year, according to a report in the 'Solomon Star' of September 2nd. The Reverend Qebi Runikera told the Prime Minister at a meeting of the United Church Synod that Solomon Islanders were 'selling our birthright' by allowing tonnes of fish to be dumped into the Diamond Narrows at Noro.

Further discussions noted the fact that Gizo Hospital had an agreement in principle to use the fish, but that logistical problems often prevented this. Some delegates to the Synod noted that Solomon Taiyo had tried its best to give away the fish it could not use for canning. The Synod ultimately unanimously moved that Solomon Taiyo and National Fisheries be asked to make use of the fish rather than wasting them.

Polynesian countries sign fishing agreement with American Tunaboat Association

The Governments of Tuvalu, Western Samoa, Niue, and New Zealand on behalf of Tokelau have signed a memorandum of understanding with the American Tunaboat Association, under the terms of which members vessels will pay a license fee for the right of access to the 200-mile EEZs of the countries concerned.

After considerable discussions the ATA agreed that the memorandum, signed on 30th August, would be retroactive to January 1st 1983. The license fee has been set at US\$15 per net registered ton of vessel for 1983, and US\$30 for 1984.

Baitfish ponds for Fiji

The Government of Australia has recently approved a grant of A\$250,000 to the Fiji Government-owned Ika Corporation to establish baitfish culture ponds, according to a report in the November issue of the Australian magazine 'Professional Fisherman'. The aid money will be channelled through the Australian Development Assistance Bureau (ADAB) which will use it to buy equipment for the project in Australia. Fifteen fish ponds are to be built on a six hectare site at Togalevu, near Suva, by the Drainage and Irrigation Section of the Ministry of Agriculture and Fisheries. Once completed, these will be stocked with a broodstock of mexican mollie (*Poecilia mexicana*) which were transported from the Vaitoloa baitfish farm in Apia, Western Samoa, prior to its closure in 1983, and which have since been kept in holding ponds at the Fiji Fisheries Division's headquarters near Suva.

The bait farm is not intended to supply the entire Ika Corporation fleet with bait year round. Rather, the aim is to provide enough supplementary

live bait to enable the boats to carry on fishing when wild bait is seasonally scarce or during periods of short term shortage (e.g. the days around full moon). The farm should also reduce the need to harvest wild bait from coastal areas where fishing rights are a sensitive issue.

Researchers track yellowfin tuna

Research workers Dr Richard Brill, Dr Kim Holland, Lt J. Scott Fergusson and others aboard the U.S. National Marine Fisheries Service research vessel Kahele'ale, based in Hawaii, have recently successfully tracked the short term horizontal and vertical movements of yellowfin tuna (Thunnus albacares) using ultrasonic depth-sensitive radio transmitters attached to the fish. This work, described in the Southwest Fisheries Center's Monthly Reports, constitutes part of a study of fish behaviour around fish aggregation devices (FADs).

The first successful tracking was of a yellowfin caught a few miles off the coast of Waianae, Oahu, at 9.55 a.m. on October 7th, and released after attaching the radio transmitter. The fish was tracked for the next 26 hours, until it was lost off Kaena Point at noon on October 8th. After refuelling the boat, the crew returned to Kaena Point at noon on October 9th, and the fish was relocated and tracked until the following morning, when it returned to the vicinity where it was originally caught. The vessel then left to exchange crews and pick up more fuel, after which it resumed the search for the fish late in the afternoon of October 12th. The yellowfin was again relocated near Kaena Point and tracked until the following morning, when it returned to near the original point of capture.

The threat of hurricane Raymond forced the vessel to return to its home base, and on resuming the search for the fish, the transmitter was found to have been shed and was lying on the sea bed in 110 metres of water.

This very successful experiment resulted in three prolonged tracks spanning 6 days, during which unprecedented data on a yellowfin tuna's horizontal and vertical movements were acquired. The tuna showed a predictable behaviour pattern that allowed it to be repeatedly relocated for days after it was originally caught. It appeared to have a definite 'home range', and, though it made significant offshore excursions (well offshore of the present FAD locations) it always returned to the 90 metre isobath at about the same time each day. Also rapid dives to more than 700 metres were recorded.

A second tracking took place on November 17th. A transmitter was attached to a 55-cm fish caught on FAD "S" which is located off the Waianae coast. After release the fish stayed around FAD "S" for only a short period and then proceeded via a relatively direct course to FAD "V", which is located about 10 miles north of FAD "S". The fish remained in the immediate vicinity of FAD "V" for about 7 hours and then moved rapidly offshore (west) just before sunset. The fish was followed until 7 a.m. the next morning, when the tag was shed.

This track demonstrates that yellowfin will successively visit FADs that are up to 10 miles apart and that they have the ability to learn FAD locations and directly navigate from one FAD to another. Both trackings reveal motor, physiological and navigational abilities in yellowfin that have been deduced but never documented. The information obtained has significant implications with respect to the placement and effects of FADs, and further

tracks are planned for the coming months.

Fisherman poisoned by puffer fish

A 48-year old fisherman from the Isle of Pines in New Caledonia died in December after eating the raw liver and roe of a puffer fish (family Tetraodontidae) the previous afternoon. Six pigs and two cats also died after being fed the broth in which the rest of the fish, which fortunately was not consumed by the fisherman's family, was cooked.

Deaths from eating puffer fish (also called balloon fish, porcupine fish and toad fish) have occurred in many Pacific countries and continue to occur because of a lack of awareness of their potential toxicity. Puffer fish poisoning is not related to ciguatera poisoning but is caused by a toxin produced by the fish itself and found in greatest concentrations in the skin, viscera and gonads. 'Fishes of Tasmania' by P.R. Last, E.O.G. Scott and F.H. Talbot, contains the following notes on the subject:

"These fishes (families Tetraodontidae, Diodontidae and possibly Molidae) are among the most poisonous animals known to man. The poison, tetraodotoxin, is the most lethal of any of the poisons found in the flesh of fishes. Although the onset and severity of symptoms vary depending on the quantity of poison ingested, the death rate in humans is about 60 per cent and may occur within 6-24 hours of eating the fish. It interferes with the transmission of nervous impulses in the victim. Some early symptoms include weakness, dizziness, increased salivation, sweating, chest pain, increased pulse rate, vomiting and haemorrhaging. These may be followed by breathing difficulties, muscular twitching and uncoordination, unconsciousness, paralysis and death.

"The poison is concentrated mainly in the gonads, liver and intestines of the fish but small quantities occur within the skin. The flesh is reported to be mostly poison-free. During the breeding season, however, high concentrations of poison are stored in the reproductive organs and may be transmitted into the adjacent muscle tissue. In Japan, where these fishes are specially prepared and eaten as a delicacy, an average of 50 cases of tetraodotoxic poisoning are reported each year".

Comments requested on fisheries wharf development in American Samoa

In a November 21st news release from the U.S. Army Corps of Engineers, Honolulu District Engineer Colonel Michael M. Jenks requests public review and comment on a proposed fishing wharf construction project in Pago Pago, American Samoa.

The intention of the request is to avoid serious environmental damage or threats to cultural resources or endangered species in developing the wharf and associated mooring facilities. In line with this aim, advice has also been sought from the American Samoa Historic Preservation Office, the U.S. National Park Service, and the U.S. National Marine Fisheries Service, and all these comments will be taken into consideration before a final decision on whether to go ahead with the project.

Addressing the environmental impact of the proposed development, the

District Engineer made the following comments.

"The facilities to be constructed would be located adjacent to the Office of Marine Resources at Fagatogo Village and are intended for domestic fishing vessels mostly ranging in length from 16 to 40 feet with a maximum draft of 6 feet. The dock would be of concrete piles. An asphalt-concrete pavement 20 feet wide would adjoin the concrete dock. Approximately 1,500 cubic yards of dead coral, sand, and rubble would be dredged and excavated as part of the project.

"If the project is constructed, temporary increases in turbidity are anticipated during construction of the wharf and mooring facilities and the associated excavation and dredging. Common fishes in this area include sardines (Herklotsichthys sp.), silversides, juvenile mullet (Liza spp.), atule (Selar crumenophthalmus) and jacks (Caranx spp.). These fishes are usually found at depths and at the surface. Only a few gobies live near the relatively featureless bottom. Little subsistence or recreational fishing occurs in the area due to the relative lack of fishes and invertebrates. Offshore of the eastern edge of the wharf site rise the mounds to be planed off by dredging. The area to be dredged consists of large blocks of dead coral and sandy rubble on which are found sponges, coelenterates, such as jellyfish and coral, and algae. Nearby coral outcrops are already dead due to previous alterations of the environment.

"Upon completion of the project, the long-term impacts will include inputs of bilge water, engine oil, spilled fuel, fish blood and debris arising from the increased boat traffic. These problems, however, are expected to be of relatively minor significance. The stabilised shoreline and floating docks will likely have beneficial effect on the marine community. Like an artificial reef, the concrete bulkhead and piles and the underside of the floating dock will increase structural diversity of the habitat and provide new hard, stable substrates for colonisation by algae and sessile invertebrates which, in turn, will shelter and feed a variety of fishes, crustaceans and molluscs. Fishing will likely be improved as the result of increased biomass and because the area will be more accessible to fishermen."

Unexplained fish kill in Fiji

An unidentified chemical was blamed for the death of thousands of fish which floated onto the shore around Suva on December 21st, according to the Fiji Times. The fish included small mullets and sardines, trevallies, and others from all trophic levels, including reef fish, bottom feeders, midwater and surface dwellers.

Local health authorities issued a warning not to eat any of the fish, but nevertheless dozens of people scoured the beach filling up sacks and buckets, and some were reported to have been sold.

Tests carried out at the University of the South Pacific indicated that red tides or other natural phenomena known to cause fish kills were not responsible in this case. A number of other causes have been suggested, including washdown of agricultural or other chemicals during the heavy rains of the previous days, leakage of chemical waste dumped in the sea in sealed

containers, and accidental or deliberate discharge of poisonous compounds into Suva harbour.

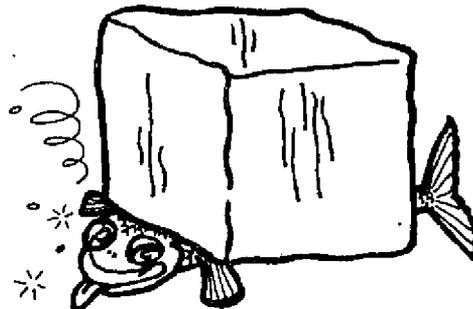
ABSTRACTS

The following 'limited-distribution' documents are listed as being of potential technical interest to readers, who should write to the contact addresses given for details of how to obtain copies.

- 1) Western Samoa's Fish Market Guide, 1983, by James R. Hollyer. Illustrated by Jackie Schuster. 24 pages. Pamphlet illustrating the lay-out of Apia fish market. Aimed principally at fish buyers, the booklet contains tips on selecting fresh fish, preparing fish for cooking or freezing, and fish recipes, plus notes on collection of reef invertebrates and seaside first aid.

Contact address: Chief Fisheries Officer, Fisheries Division, P.O. Box 206, Apia, Western Samoa. (Limited number of copies available from SPC).

- 2) Fresh Is Best, 1983, by the Fiji Fisheries Division. 16-page pamphlet on fish care and proper handling, with lively illustrations by Elaine Simon. Aimed principally at the fisherman, the booklet explains in simple terms proper cleaning and icing techniques for fish, and the means of identifying freshness in fish and invertebrates. Original print run is 1000 in Fijian and 1000 in Hindi, with a limited number only in English.



The DOs and DON'Ts of icing fish, illustrated by Elaine Simon in Fiji Fisheries Division's *Fresh is best*.

Contact address: Librarian, Fisheries Division, M.A.F., Box 358, Suva, Fiji.

- 3) Techniques, Operation and Production of the Prawn (*Macrobrachium rosenbergii*) Hatchery of Western Samoa, by Lui A.J. Bell, E. Jane Albert and Jackie Schuster. 38 pp. Describes techniques used in a very small hatchery supplying post-larval *M. rosenbergii* to local prawn farmer.

Contact address: Lui A.J. Bell, Marine Biologist, Laboratory, Fisheries Division, P.O. Box 206, Apia, Western Samoa.

- 4) Plywood Workboats for Small Scale Fisheries, by Timothy C. Visel and William H. Highsmith describes the method of construction of the Brockway skiff, a very simple, easy to build plywood hull suitable for load carrying and inshore work. Limited numbers of this manual are available and persons wanting a copy are required to complete a two-page book review sheet for the authors.

Contact address: The Library, International Center for Marine Resource Development, University of Rhode Island, Kingston, Rhode Island 02881, USA.

SPC Fisheries Newsletter No. 27 October - December 1983

SYNOPSIS OF THE THIRD INTERNATIONAL ARTIFICIAL REEF CONFERENCE

by

Dr Richard Brock
Hawaii Institute of Marine Biology
Honolulu, Hawaii, U.S.A.

The Third International Artificial Reef Conference was held in Southern California in November 1983. The conference was successful in attracting speakers from Australia, Japan, Philippines, Israel, Kuwait and the U.S. In total there were 45 papers delivered and 12 exhibits in the poster session.

The speakers covered numerous topics related to artificial reefs, FADs and midwater attractors. In this short summary, I would like to discuss a few of the papers that may be most pertinent to fishery problems and personnel in the SPC region.

The development of artificial reefs is frequently hampered by materials costs whether it be concrete pipes, used tyres or designed fiberglass modules (as used in Japan). These materials are not always readily available thus fisheries officers must use their ingenuity if they are to improve inshore fisheries through artificial reef development.

Dr F.J. Vande Vusse (Silliman University, Dumaguete City, Philippines) presented a paper describing the use of a novel reef material - bamboo. Artificial reef modules were constructed of bamboo lashed together and weighted with stones. Modules were 2 to 3 m in dimensions and the bamboo was drilled to let the air escape for easier submergence. The short life expectancy of bamboo modules (about 5 years) is more than compensated by the resulting increased productivity in the area of deployment, the low material costs, and the fact that construction and deployment can be carried out by local fishermen without any high technological support. Bamboo modules could have wide application in low energy habitats (i.e., protected bays, etc.), particularly if yields are depressed and the individuals utilising these areas are motivated towards improving them.

Dr E. Spanier (University of Haifa, Israel) working on two tyre reefs in the Mediterranean found a significant increase in commercially important fishes on one of the reefs because of a weekly addition of 15 kg of waste fish scraps. In some Pacific localities, however, such a food subsidy might cause a local increase in the shark population rather than in the target species.

Artificial reef researchers are not only attempting to enhance the populations of species residing in shallow water but are turning their attention to deep-dwelling bottomfish. Dr J. Polovina (National Marine Fisheries Service (NMFS), Honolulu, Hawaii) presented a paper outlining a

proposed program to study the use of artificial reef structures for enhancing snapper stocks in the Hawaiian deep handline fishery. In this study, artificial reef modules would be placed in waters 100 m or more in depth and would be monitored by use of a submersible.

A number of papers were given concerning the development and use of FADs. Dr I.K. Workman (NMFS, Pascagoula, Mississippi) reported on studies he has conducted around midwater fish aggregators. Midwater aggregators are tautline moored subsurface FADs that are usually deployed in relatively shallow (10-150 m) water. Depending on where they are placed, these devices can attract both shallow reef species as well as pelagic forms in the Caribbean. Dr Workman found that the recruitment of fish to midwater structures follows a daily routine where fishes begin concentrating around the devices in the morning, the populations peaking near midday and then decreasing in the afternoon. He noted that reef-associated species were more abundant around devices located near natural reefs while pelagic forms were common around structures placed out over open sand bottom away from reefs.

Mr D. Myatt (McIntosh Marine Inc., Fort Lauderdale, Florida) described the use of a string of midwater aggregators set up as "trolling alleys." Trolling alleys are a series of midwater aggregators spaced 200-500 m apart in two parallel lines ranging from 1 to 2 km in length. A surface marker buoy is set usually at each end, so the trolling alley can be found by fishermen. Users troll down the length of the alley. Mr Myatt presented evidence demonstrating the effectiveness of trolling alleys deployed in shallow (30 m) waters and noted that small midwater aggregators were more effective than larger units. Small aggregators were each made using a single float displacing about 20 litres that was tautline moored to a concrete block anchor. The aggregators were outfitted with webbing and old strapping for added cover.

The paper presented by Mr G. McIntosh (also of McIntosh Marine Inc.), focused on the use of small midwater aggregators in conjunction with benthic artificial reefs. Mr McIntosh showed that the fishery yield from an artificial reef could be increased by the simple addition of small midwater aggregators. He outfitted one of two identical artificial reefs with midwater aggregators and found a substantial increase in the fish standing crop on the reef with aggregators. He concluded that midwater aggregators are a cost-effective method of enhancing reef fisheries.

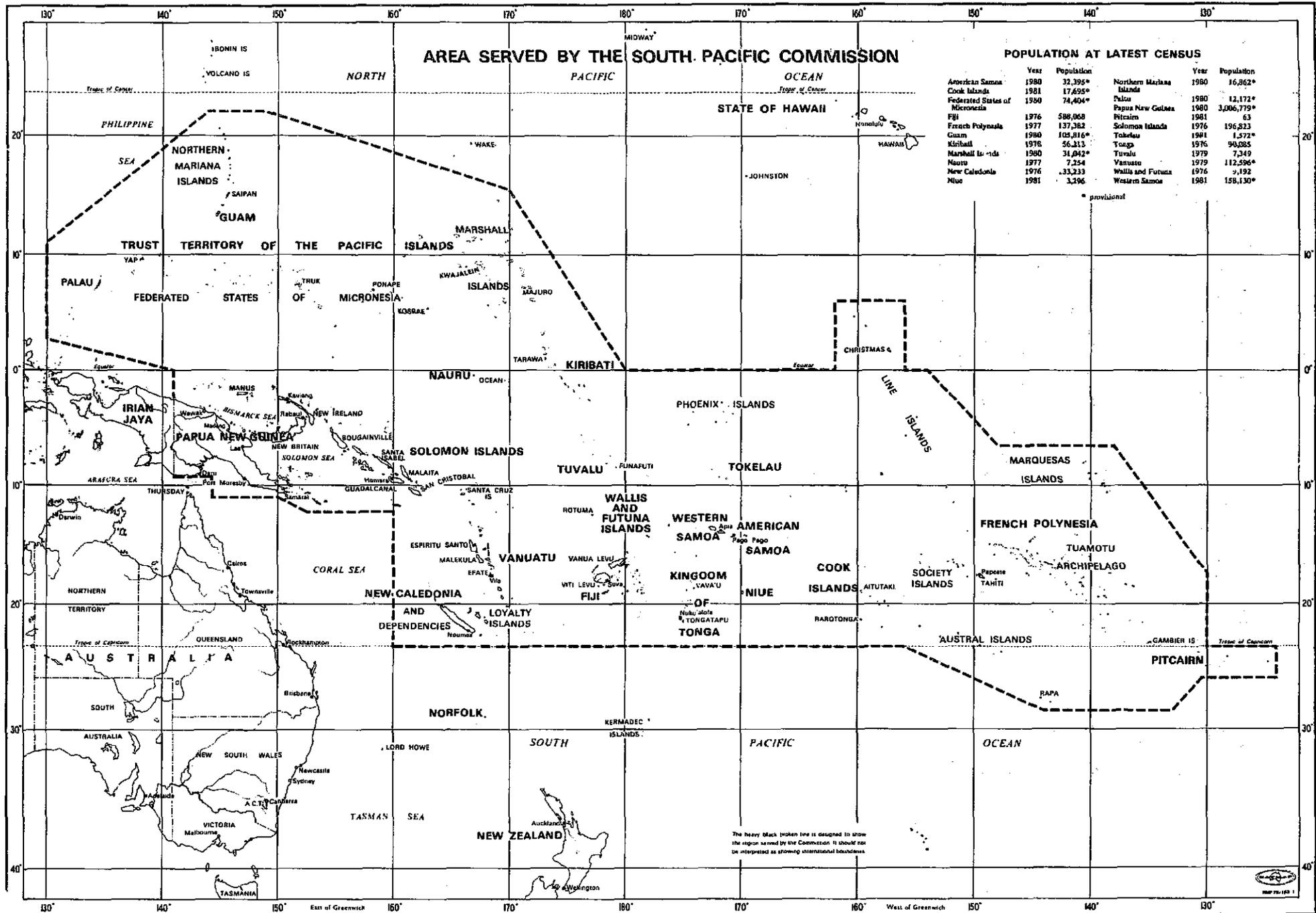
The results presented by these Caribbean researchers suggest that midwater aggregators are effective; the transfer of this technology to Pacific island ecosystems should pose no problems and could result in increased harvest of a large number of species. These "mini-FADs" are particularly attractive because material costs are minimal and deployment of small units in shallow waters means that mooring line costs will likewise be low. An additional consideration is that these devices being placed in shallow water means that they would be more accessible to fishermen who might not otherwise venture 15 km or more to sea to visit a deep-moored FAD. Midwater aggregators deserve testing and scrutiny in Pacific nearshore habitats.

At the conference I reported on the food and feeding habits of yellowfin tuna from around Hawaiian FADs. I have found that small FAD associated yellowfin show a significant dietary change relative to non-FAD associated yellowfin. These fish may stay around a FAD for up to several weeks and attain very high standing crop levels. In this situation around Hawaiian FADs, most yellowfin feed almost exclusively on deep-dwelling oplophorid

shrimps - a prey essentially absent in any other fish species either from the FAD fish community or elsewhere. This dietary shift may be causal to the maintenance of the high standing crop of yellowfin in the FAD fish community. I concluded that these FADs may contribute to the enhancement process by causing resident fishes to change their feeding habits to take advantage of otherwise untapped resources.

In the poster session Mr De Young (Cornell University Laboratory, Riverhead, New York) displayed an interesting and promising material for the mooring of FADs - rubber conveyor belting. Research has been carried out using this belting material as a replacement for 1/2" chain. It is about 75 per cent cheaper than chain, is inert in seawater and often exceeds the strength characteristics of chain. These researchers have found that an industrial glue is an appropriate way to fasten the belting thus eliminating materials that otherwise would corrode. The relatively low value of the material may ease vandalism and pilferage of structures moored with it. The research is continuing and the implications of the results to the problems of FAD loss due to mooring line failures are obvious.

There were many other interesting papers presented at the conference. Papers and abstracts are due to appear in a separate issue of the Bulletin of Marine Science, which will probably be published in late 1984 or early 1985.



AREA SERVED BY THE SOUTH PACIFIC COMMISSION

POPULATION AT LATEST CENSUS

Year	Population	Year	Population
American Samoa 1980	32,395*	Northern Mariana Islands 1980	16,862*
Cook Islands 1981	17,695*	Palau 1980	12,172*
Federated States of Micronesia 1980	74,404*	Papua New Guinea 1980	3,006,779*
Fiji 1976	586,068	Pitcairn 1981	63
French Polynesia 1977	137,362	Solomon Islands 1976	196,823
Guam 1980	105,816*	Tokelau 1981	1,572*
Kiribati 1978	56,313	Tonga 1976	90,685
Marshall Islands 1980	31,042*	Tuvalu 1979	7,349
Nauru 1977	7,254	Vanuatu 1979	112,596*
New Caledonia 1976	33,233	Wallis and Futuna 1976	9,192
Niue 1981	3,596	Western Samoa 1981	158,130*

The heavy black broken line is designed to show the region served by the Commission. It should not be interpreted as showing international boundaries.