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SPC ACTIVITIES

DEEP SEA FISHERIES DEVELOPMENT PROJECT (DSFDP) NOTES

Tonga - Gear Development Sub-project

In recent months, Masterfisherman Paul Mead, supervising gear development trials in Vava'u, Tonga, has worked at refining an improved vertical longlining system. Paul has used vertical longlines to take tuna during many DSFDP assignments in the islands and has, like the other SPC Masterfishermen, devoted a good deal of effort to devising more efficient and productive ways of rigging the basic gear and experimenting with various setting and hauling techniques.

Present-day vertical longlining grew out of the traditional Polynesian mid-water tuna fishing techniques generally known as *palu ahi* or drop-stone fishing, in which fishermen use the weight of a stone to carry a baited hook and chum (*palu*) to a calculated depth in areas where tuna are known to gather. Fishermen typically used a single line held in the hand or a single free-drifting line supported at the surface by a float.

The essential improvement made to this technique, and known as vertical longlining, was to rig the single dropline with multiple hooks and a fixed terminal sinker, so that the line would fish a range of depths simultaneously. When vertical longlining was first tried, *Kuralon* (the common line used by Japanese commercial longlining operations), which is particularly bulky, was used for the main vertical line, or dropper, and gear was hauled by hand. Later trials experimented with braided nylon, Super Toto, and nylon monofilament, all three of which were much more compact than *Kuralon*. The small-diameter lines also created less drag in the water and were less affected by current than *Kuralon*, so lines hung more near vertical and only required a small sinker. The major disadvantage to the small-diameter lines was they were difficult to haul by hand.

The wooden, FAO-design, Samoan deep-bottom fishing handreel was modified to solve the hauling problem. The usual ceramic insulator line guide was replaced with a 150 mm diameter nylon pulley, which allowed swivels tied into the dropper to pass through easily. Conveniently, reels also worked to store the droppers compactly. A single reel could hold several droppers. Setting and hauling were simplified by interchanging full and empty reel spools. Similarly, the branchlines, or snoods, which carry the hooks, were conveniently stored on plastic handcaster spools. Gear was generally set sinker-first, and snoods were clipped to the swivels in the dropper as the dropper was unwound from the reel.

As gear became more compact and easier to handle, SPC Masterfishermen began working on techniques to concentrate hooks in a target area. At first they simply tried setting additional droppers. With that technique, it was often hard to keep track of gear because sinker-first sets were slow, and single droppers frequently drifted far apart. That led fishermen to tether droppers together with sections of floating line: lines short enough to keep droppers tight within a fishing area, but long enough to prevent them from tangling together.

By the start of the Gear Development Project in Tonga, gear had evolved from hand-hauled bulky mainlines, fished singly, to lighter, more easily stowed line set with handreels, that could be fished singly, or strung together along the surface and fished several at a time. Most sets were still sinker-first, and gear was set with a wooden handreel.

Until this point, sinker-first sets had been the standard. Fishermen had experimented with a float-first technique, although not extensively. However, when the methods for fishing several single droppers at once, or strings of droppers, were worked out, setting rate mattered more. It became even more important to try and get more gear in the water as quickly as possible.

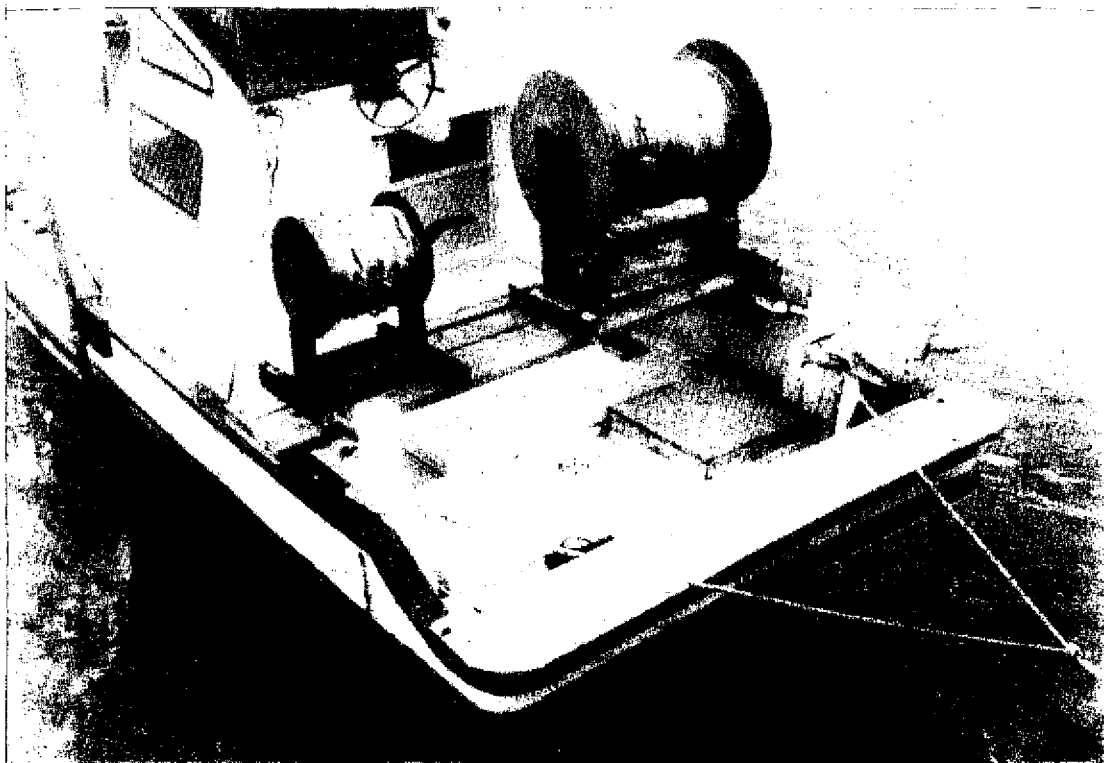
198 Sinker-first sets were slow, especially in calm waters. Setting could not exceed the natural sinking rate of the bait, otherwise snoods twirled and tangled around the mainline. In strong current, it was possible to speed up sinker-first sets because the current held snoods out away from the mainline. Fishermen continued to work on float-first setting and found it to be faster and generally more tangle-free than sinker-first sets. The mainline, along with the baited snoods, is strung along the surface from the float to the sinker. Then the sinker is released, and the mainline sinks in an arc from the surface to a vertical position, with the sinker suspended beneath the surface float. While the mainline swings into place, the baited snoods stream out behind, reducing the chances of tangles.

Much of Paul Mead's work in Tonga has focused on streamlining operations, devising techniques based on a simple, inexpensive system which enables fishermen to set a reasonable number of hooks in a short amount of time. To that end the Tonga project has developed a method for a three-man crew to make float-first sets of strings of droppers quickly and efficiently, at rates up to about 50 hooks in 50 minutes. The process is centred on an easy-to-construct two-spool system for mainline and snoods, a modified Samoan wooden handreel, and a stowage bin for surface line.

The two wooden reels resemble scaled-down versions of ones used in larger-scale longline operations. The snood spool can hold 100 snoods, and the mainline reel can handle 10-150 fathom droppers. During setting operations, both reels sit in stands mounted on a platform near the stern. For hauling operations, the snood reel is transferred to a forward stand, not far from the handreel.

Setting is done off the stern and only requires the mainline and snood reels. Hauling operations use the modified wooden handreel and the forward-mounted snood reel. The floating surface line used to string droppers together is worked from a bin during both setting and hauling.

SPC intends to produce a detailed technical handbook describing both the construction of the gear components used in this system and their use.



Views of the float-first system arrangement

INSHORE FISHERIES RESEARCH PROJECT (IFRP)

Ciguatera sampling protocol, Federated States of Micronesia (FSM)

The FSM government is concerned that ciguatera toxicity in fish may hinder attempts to develop an export-based industry there. The IFRP assisted the FSM Department of Marine Resources to initiate a project, via the Community College of Micronesia, that aimed to compile information on ciguatera case histories throughout the country. This will provide the basis for future stratified sampling of fishes from areas or seasons suspected to be prone to yielding ciguatoxic fish, and development of a means of excluding them from the marketed catch.

Deep-bottom fishery data analysis, Vanuatu

The efforts of the Deep Sea Fisheries Development Project in Vanuatu led to the establishment of village-based, deep reef, dropline fisheries in 1982. The accumulated data from 1982 to 1988 were only partially analysed until the attachment of a fishery scientist from the Vanuatu Fisheries Division to the Inshore Fisheries Research Project.

Analysis of the catch data showed an overall decline in catch per unit of effort (CPUE), with some marked reductions in certain areas. An estimate was made of the fleet size that would generate maximum sustainable yield (MSY) of deep reef fishes from the area presently fished in Vanuatu.

FISHERIES INFORMATION PROJECT

In April, 1989, *Jean-Paul Gaudechoux* started work with SPC as Fisheries Information Officer. Jean-Paul has a Master's degree in Marine Biology and Aquaculture from Montpellier Scientific and Technical University in France. Before he joined SPC, he was employed as fisheries biologist in the Ministry of Fisheries of the Islamic Republic of Mauritania, in Nouakchott, where he was technical adviser for all matters concerning fisheries development and was also responsible for the management of the Ministry's computer system.

The Fisheries Information Officer's main task is to assess, abstract, catalogue and circulate documents and other information sources relevant to Pacific Island marine resource development. He is also expected to identify information sources and collaborate with SPC fisheries staff in responding to requests from SPC member countries for detailed technical information. His other duties include the production of the SPC *Fisheries Newsletter* and Information Bulletins relevant to the interests of members of Special Interest Groups (SIGs).

The SIGs serve as information and communication networks for researchers with common interests. A major concern of the Workshop on Pacific Inshore Fishery Resources, held in Noumea in 1988, was the low level of communication and information exchange in the Pacific Islands region. To initiate the SIGs, a questionnaire seeking information on the interests of regional fishery workers was circulated. About 200 responses have been received and these have been entered into a computerised database so that members can be sorted according to areas of interest and appropriate mailing lists can be established. From the responses, the most common areas of interest have been identified as beche-de-mer and pearl shell. Information Bulletins for these two SIGs will be produced before the end of the year.

TUNA AND BILLFISH ASSESSMENT PROGRAMME

Second South Pacific Albacore Research Workshop

The second South Pacific Albacore Research Workshop was held in Suva, Fiji, on 14-21 June 1989, with participants from Australia, the Federated States of Micronesia, Fiji, France, French Polynesia, Japan, New Caledonia, New Zealand, Solomon Islands, Taiwan, Tonga and the United States. Regional organisations represented at the meeting included the Food and Agriculture Organization (FAO), the Forum Fisheries Agency (FFA) and the South Pacific Commission (SPC).

The first South Pacific Albacore Research Workshop was held in Auckland in June 1986 to review existing albacore fisheries, identify types and availability of albacore fishery statistics, and review and provide co-ordination of research on South Pacific albacore. Since that time, a drift gillnet fishery has developed, following exploratory cruises by Japan. By 1987, the growing Japanese gillnet fleet had been joined by Taiwanese gillnet vessels. The fishing area has expanded to include the Tasman Sea and the Sub-Tropical Convergence Zone (STCZ) as far eastward as 120°W. The rapid expansion of the South Pacific albacore fishery has resulted in at least a doubling and perhaps a tripling of the catch in the three years between the first and second workshop. As a result, the second workshop was faced with an urgent need to re-orient research studies on the albacore resource.

The catches of albacore for the principal surface and longline fisheries were tabulated. Before 1983, the major component of the surface fishery was the New Zealand troll fleet, which produced less than 3,000 mt annually from waters around New Zealand. Since then, gillnet vessels from Japan and Taiwan, as well as troll vessels from Canada, Fiji, French Polynesia and the United States, have entered the fishery. The surface fishery catch for the 1988-89 season was estimated to be 34,000—59,000 mt. The longline fishery, in contrast, has remained relatively unchanged in recent years. The catch has averaged about 30,000 mt annually and the 1988 catch has been estimated to be 29,000 mt.

The meeting noted that in view of the considerable uncertainty about the population dynamics of South Pacific albacore, the rapid increase in surface yields, due principally to the gillnet fleets, is a cause for concern. Unfortunately, the increase in catch has occurred without the concurrent collection of catch statistics and biological data that would permit a quantitative evaluation of its impact. Nevertheless, the participants considered that it was reasonable to expect that a sustained surface catch at the level currently realised would markedly reduce potential yields in the longline fishery.

In order to conduct stock assessment, the most urgently required data are those describing catch, effort and size composition in the gillnet fisheries. The introduction of data collection procedures for the Taiwanese gillnet fleet is of paramount importance. Japan currently collects gillnet catch and effort data on a voluntary basis, but, due to limited coverage, has decided to make provision of data compulsory.

Following discussion on stock assessment methods, a number of priority research areas were identified by the workshop. These include simulation modelling of stock and fishery dynamics, tagging studies, studies on seasonality of spawning, age and growth studies, research on the relationship between oceanographic conditions and fishing success, and examination of incidental mortality caused by the drop-out of fish from gillnets during hauling. SPC summarised its plans to undertake a tagging programme in the STCZ during the 1989-90 season, with funding from the European Community. Three month-long tagging cruises are planned, using a chartered pole-and-line/troll vessel.

Meeting of the Standing Committee on Tuna and Billfish

The Standing Committee on Tuna and Billfish (SCTB) met for the second time in Suva, Fiji, on 19-21 June 1989. The role of the SCTB is to review the work of the SPC Tuna and Billfish Assessment Programme and to report to the SPC Regional Technical Meeting on Fisheries. Members of the SCTB include not only SPC member countries, but also non-member countries which have been involved in the tuna fisheries of the region. The SCTB is thus an international forum for research on tuna stocks in the Central and Western Pacific Ocean. Countries represented at this year's meeting included Australia, the Federated States of Micronesia, Fiji, France, Indonesia, Japan, Malaysia, New Zealand, Papua New Guinea, the Philippines, the Republic of China, Solomon Islands, Tonga and the United States of America. International organisations represented at the meeting included the Food and Agriculture Organization (FAO), the Forum Fisheries Agency (FFA) and the Indo-Pacific Tuna Development and Management Programme.

The meeting reviewed the activities of the SPC Tuna and Billfish Assessment Programme, including the Regional Tuna Tagging Project, the Fisheries Statistics Project and collaborative research with ORSTOM on oceanography and tuna fisheries. The requirements for stock assessment and fisheries interaction studies on Western Pacific yellowfin tuna were examined in detail.

Discussion focused on future collaboration (including the exchange of fishery statistics) between Pacific Island nations (PINs), Distant-Water Fishing Nations (DWFNs) and the Association of South-East Asian Nations (ASEAN). The meeting noted that SPC had succeeded in gathering most tuna catch and effort data available through SPC member countries, but these data, collected from local fleets or from DWFNs under access agreements, still did not adequately cover the tuna fishing activities by DWFNs in the region. The meeting agreed that the establishment at SPC of a common database, consisting of data provided by all fishing nations, would be extremely useful and would solve the current problem of inadequate coverage of tuna fisheries in the region. It also agreed that data should be provided at a level of aggregation consistent with levels of aggregation used by other tuna research organisations, i.e. by five-degree square and month for longliners and gillnetters and one-degree square and month for other gear types. Further, the meeting considered that data held in the common database, subject to the minimum level of aggregation (i.e. five-degree square and month for longliners and gillnetters and one-degree square and month for other gear types). SPC was requested to work towards the implementation of the common database and report to the next meeting of the SCTB.

FISH HANDLING AND PROCESSING PROJECT (FHPP)

The project is playing an increasingly active role in evaluating and supporting the needs of women from coastal communities in the region. The first activity of the quarter in this area was a planning meeting in Port Moresby, Papua New Guinea for the Papua Region Women's Workshop in Fish Processing and Marketing (funded by the International Centre for Ocean Development), which was scheduled for September. The meeting brought together PNG Government officers from Fisheries and Women's Departments; NGO women's groups, Fisheries staff from the University of Papua New Guinea, as well as the Fish Handling and Processing Officer and a Women's Programme Officer from SPC. The meeting resolved administrative and technical details and planned the content and timetable of the workshop.

The second activity for women-in-fisheries was a Commonwealth Secretariat initiative. It hosted a preparatory meeting at SPC headquarters in Noumea for development agencies to discuss a Consultation on the Role of Women in Small-scale Fisheries in the South Pacific, to be held in Tonga later in the year. A report was presented to the meeting by two consultants, P. Schoeffel and S. Talagi, who had visited Commonwealth Melanesian and Polynesian countries to identify the needs of coastal women. The meeting decided on a number of key areas for discussion at the

Consultation in Tonga, including handling and quality control, marketing and distribution, health and nutrition, credit, aquaculture/mariculture, information and awareness.

A three-week tuna product development project was undertaken in July at the Institute of Marine Resources (IMR) in Suva, Fiji, to test a number of simple processing/preservation techniques on fresh tuna, with a view to establishing the potential for a more detailed programme on value-added, non-canned tuna products. The overall objective is to find alternative marketable products that the more isolated island communities can manufacture and export profitably. A range of smoke-dried and marinated dried tuna ('jerky') products was produced, including a highly acceptable form of dried marinated tuna which can be eaten as a small snack. The recipe for this is available from the FHPP.

An initiative for a regional post-harvest fisheries facility, discussed in detail and approved in principle at the Twentieth Regional Technical Meeting on Fisheries in August 1988, continued to develop. It is proposed that the facility be installed at the Institute of Marine Resources, as a joint project of IMR and SPC, and potential donors have been approached. IMR would use the facility to upgrade the post-harvest component of the Diploma in Fisheries, while SPC's FHPP would initiate and direct applied research activities. Technical training workshops on specialised topics would also be run, with input from both IMR and SPC.



NEWS FROM IN AND AROUND THE REGION

NEW BOATS, NEW MARKETS*(Source: ICOD Info)*

A fisherman's boat is his bond with the sea and his major tool in earning a livelihood. This is true the world over and a Canadian, Patrick Purcell, is using a good, new boat as the central component of a plan to develop four fishing groups in Solomon Islands.

Under an ICOD project, Purcell was engaged by the Solomon Islands Department of Fisheries to develop small commercial fishing enterprises within the country's inshore fishery. Central to the project was the construction of four inshore fishing boats.

Chosen for his prior experience in Solomon Islands (under a two-year CUSO project), and his fluency in the local language, Purcell was the main consultant in the C\$ 83,500, 24-month project. As a fisherman himself, he understood the role a new boat could play in promoting productivity and interest.

The Department of Fisheries wanted to expand the productivity of its artisanal fisheries by focusing on four pilot fishing groups in Gizo Province. Each of the groups expressed a strong interest in purchasing a new fishing boat that would be owned and maintained co-operatively. Fishermen from the groups are meeting with Purcell for training in the handling and maintenance of the boats, new fishing techniques, and the care and marketing of the catch.



Patrick Purcell (on the right) and colleague inspect new boat design

Purcell is directing the construction of four 7.4 metre trimarans, based on a design supplied by the United Nations. The boats combine modern building techniques with traditional lashings and will be used to catch grouper, a generic term describing about a dozen bottom-dwelling

fish. By increasing their catch, artisanal fishermen will be able to expand beyond subsistence fishing and begin to sell in the local markets. A portion of the catch may also be exported to New Zealand, Australia and Japan.

Purcell worked with each of the groups individually, checking back and forth with them to monitor their progress. His activities involved training sessions, with an important emphasis on maintenance procedures. In some cases, projected statements of profit and loss were submitted to banks to help secure a loan for the groups that were purchasing the boats.

Purcell is confident that the overall programme will promote productivity. 'The new boat takes a traditional design and makes it a more efficient work platform. Fishermen will reach distant destinations more quickly, they will have a safer technique for hauling and emptying their nets, and they will be able to carry a good load of fish to market. This marks a positive development in their traditional techniques. As a result of working with four groups, we are getting enquiries from other groups interested in purchasing their own vessels.'

LABELLING REQUIREMENTS FOR FISH EXPORTS

(Source: *Australian Fisheries*)

The Australian Quarantine and Inspection Service (AQIS) has re-issued its labelling requirements for fish exports, following recent indications that the requirements are not being met by all the fish export industry. AQIS issued its requirements for labelling to all fish exporters and processors in April 1987 but 'it seems that the message has not reached everyone', Director of AQIS, Mr G Murray, said. He added that it was necessary to clarify the country-of-origin labelling requirements for fish that have been imported to Australia, processed and then re-exported, or just stored and re-exported without processing.

While the Fish Order states that imported fish processed in Australia (thereby altering its nature) should be described as 'Product of Australia', the Trade Practices Act makes it an offence to make false or misleading representation concerning the place of origin of goods.

The Trade Practices Commission says that the 'Product of Australia' description is only appropriate when the essential character and qualities of the product are transformed into the kind of goods that consumers wish to buy. If this does not occur, the 'Product of Australia' description should be qualified.

To ensure consistency with the Trade Practices Act, the country-of-origin statement for re-exported fish is:

- Fish that has only been stored in Australia remains the product of the original country of export;
- Live or refrigerated fish that has been subjected only to grading, sorting or packing remains the product of the original country of export, but a 'Packed (or re-packed) in Australia' description can be used with the country-of-origin statement;
- Imported fish that has been subjected only to thawing, dismembering, crumbing, cleaning, chilling, freezing or re-freezing can be labelled 'Product of Australia', but the label must also indicate the fish's imported origin;
- Canned, pickled, smoked, dried or crumbed imported fish can be described as 'Product of Australia', but the exporter has the option to include an additional statement on the country of origin of the product;
- In other cases the country-of-origin statement will be determined by AQIS on a case-by-case basis.

KIRIBATI MARINE TRAINING SCHOOL TO INTRODUCE POLE AND LINE FISHERIES COURSE IN MAY

(Source: *FFA News Digest*)

Following a request by the Kiribati Government to the Japanese Government in 1988, the Japanese skipjack fishing industry is co-operating with the Marine Training School (MTS) to initiate a course at MTS aimed at developing the coastal skipjack pole and line fishery in Kiribati. A training programme for I-Kiribati course instructors, to include practical on-board training, has been set up in Japan.

The first six-month MTS course was held from May 1989 to October 1989 and the second from November 1989 to the following May. Graduates from the course will undergo further practical training on Japanese commercial vessels.

CORAL REEF FISH

(Source: *Newsletter of the Species Survival Commission*)

A Special Interest Group on coral reef fish, established by the Species Survival Commission, is in the process of formation and defining its goals, reports the Chairman, Dr Don MacAllister.

Destruction of the coral-fish habitat is widespread and serious, but the actual status of most coral-fish species is largely uncertain. None appear on the rare and endangered species lists in the Red Data Book, chiefly because of the lack of studies, but many have declined due to habitat loss and overfishing. Quantified population estimates are lacking and species status reports have not been attempted.

The Group's provisional goals are to:

- Produce a world list of coral fishes. The Chairman will produce a subset of his computerised list of fishes of the world, which contains about 24,000 species;
- Produce a list of marine aquarium fishes of the world, again as a subset of the computerised list, and attempt to classify the species in order to help the industry regulate the sale of species unlikely to survive under ordinary aquarium conditions. Also prepare a report on the size, geography and nature of the marine aquarium industry, and evaluate the industry's effect on species diversity and survival;
- Establish a Geographic Information System (GIS) grid for the world, to show the presence, absence or loss of species, habitat conditions, and selected environmental parameters. Species richness would be calculated as an aid to identifying important coral-fish areas;
- Input coral-habitat status data, or annotate lack of it into the GIS grid. Missing data will indicate the need for study. Poor habitat condition plus species richness will indicate areas urgently in need of attention;
- List countries with coral reefs, adding names of government and NGO organisations responsible for or knowledgeable about coral reefs, send a questionnaire on status of coral reefs and coral fishes to these organisations, and summarise and analyse the data;
- Obtain distribution data for a selected sample of coral-reef fishes. Input presence or absence of fishes into a microcomputer for GIS analysis. Compile maps of species densities, find species-rich areas which are in degraded reef areas and draw attention to these as 'critical' areas. Establish world conservation priorities;
- Analyse responses to questionnaire. Prepare potential action plans. Prepare, circulate and publish draft report.

Persons interested in coral reef fishes are asked to send any available information, reports or publications to the Chairman.

Contact address: Dr Don E. McAllister, c/o International Marine Life Alliance Canada, 2883 Otterston Drive, Ottawa, Canada.

FASTER PATROL BOAT FOR AUSTRALIA.

(Source: *Fishing News International*)

Western Australia's Fisheries Department is now operating a new fisheries patrol vessel. She is the *Baudin*, built at Geraldton by Geraldton Boat Builders. The vessel is designed to increase the effectiveness of fisheries management operations in the area and replaces the 15-year-old patrol boat *Freycinet*.

Premier Peter Dowding said the Fisheries Department fleet of four patrol boats is responsible for supervising a fishing industry worth A\$ 300 million a year to Western Australia. The *Baudin* is named in honour of the early French navigator, Nicholas Baudin, who surveyed much of Western Australia's coastline between 1801 and 1803.

The *Baudin's* new aluminium hull design is expected to allow fisheries officers to maintain a higher cruising speed in adverse weather and improve fuel efficiency by up to 30 per cent. She is based in Geraldton and used primarily for fisheries management between Shark Bay and Jurien. The vessel will also spent time around the Abrolhos Islands, but she is equipped to respond to patrol needs on the north-west and Kimberley coasts as well.

AUSTRALIA OFFERS A\$2 MILLION PATROL BOAT

(Source: *Marshall Islands Journal*)

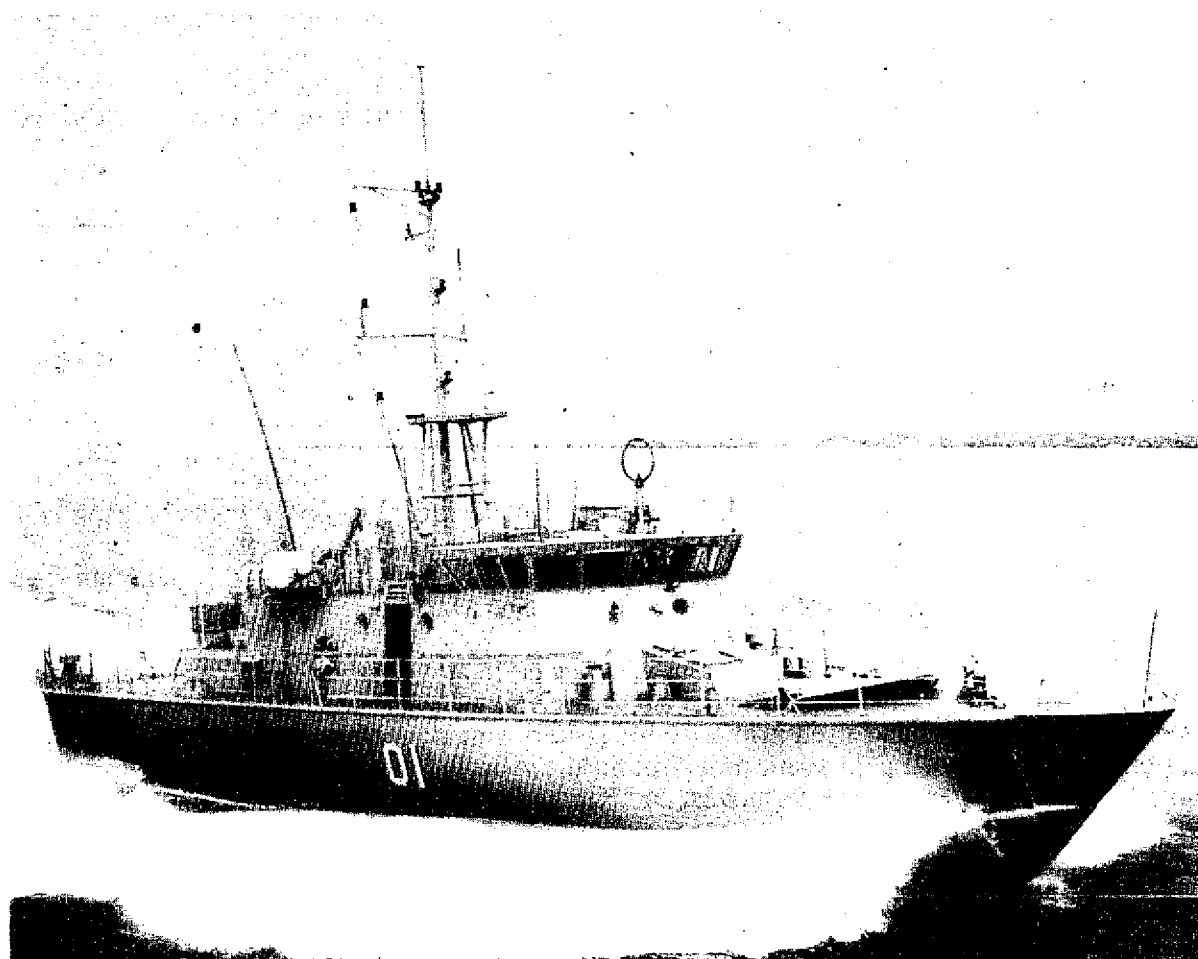
Australian aid to the Marshall Islands and the Federated States of Micronesia has increased since diplomatic recognition was extended to these two north Pacific Island nations in 1987, said Richard Smith, an Australian Minister, during a visit to the Marshall Islands.

Mr Smith said that Australia is providing the Federated States with its first patrol boat for ocean zone surveillance. The patrol boat, now under construction in Australia at a cost of more than A\$2 million, is similar to eleven others that Australia has provided or is building for South Pacific countries, he said.

Chief Secretary Oscar deBrum said the Cabinet would be making a decision as to whether or not to accept the patrol boat offer. He indicated that there was support for the offer, in part because the patrol boat offered is extremely versatile and is built for the islands.

In addition to its function as a surveillance vessel, the boat can be used for search and rescue and medical evacuations, said Mr deBrum. It has a range of 4,000 miles and equipment to make its own fresh water. Australia would provide training for the crew and spare parts. It would cost the Marshall Islands about A\$100,000 a year to operate the boat.

The patrol boat aside, Australian aid to these two island groups has peaked at A\$750,000 during the past year, mostly in the form of small-scale community development projects, Mr Smith said. Prior to diplomatic recognition of the islands in mid-1987, there was scant Australian development aid to the Marshalls and FSM. During the past two years, Australia has provided funding for a variety of technical training programmes in fisheries, advanced vocational skills, and legal matters, and has contributed aid to local governments and for the renovation of the Likiep Atoll dispensary.



Patrol boat of type offered to Marshall Islands

FISH PRICES SOAR ABOVE MEAT

(Source: *Fishing News International*)

Australians in New South Wales (NSW) now have to pay twice as much for fish as they do for meat, following consistent price rises over the past few years.

Since 1980—81, fish prices have soared by 95 per cent, while beef and veal prices have increased by 54 per cent. Lamb and mutton are up 50.5 per cent and poultry has increased by 34 per cent. The cost of a fish dinner is likely to remain well above that of roast beef or steak, according to Terry Kennedy, assistant general marketing manager of the NSW Fish Marketing Authority. He blames the sharp price hike on a shortage of supplies. He said NSW imports at least half its fish from other States in Australia and from other countries such as New Zealand, South America and Japan, which supplies halibut and squid. 'We have commodity in demand and we don't have the resources for it—that's one of the main reasons for the high prices', he explained.

Fishermen are building bigger boats and going further afield and into deeper waters to try and boost supplies but, as Mr. Kennedy points out, 'What fish we do find out there is going to end up as fillets. The deeper you go, the uglier the fish you find, so I don't think we will find any John Dory or snapper out there'. He said that even though the State is surrounded by water, the fish don't seem to be attracted. He believes people should try different species which may be more easily available and, therefore, cheaper. 'People are still eating the traditional types of

fish—snapper, John Dory, whiting and ling—and we are encouraging them to try other varieties such as silver wahoo and blue grenadier.'

According to Mr. Kennedy, fish prices were depressed until 1980 and had not kept up with inflation. Fish was as cheap as beef. Now the Marketing Authority hopes to bring fish in from other States in bigger quantities. The Great Australian Bight is being opened for the development of fishing and talks have been held with local fishermen.

CHINESE VESSELS VISIT AUSTRALIA FOR FIRST TIME

(Source: *World Fishing*)

The first Chinese fishing vessels to visit Australia's North-West, under a new Sino-Australian fishing agreement, arrived recently in Broome. The agreement, which was signed in Canberra in November 1988, allows the Chinese to fish no closer than 12 nautical miles to the coast and, in some pearling areas, no closer than 35 nautical miles.

Fisheries Minister Gordon Hill said recently that the local fishing industry would not be threatened by the new agreement. He added that the Federal Government would monitor fish stocks to ensure that the resource was sustained and available for any future expansion of Australian vessels in the area. He also said that the Chinese use of Broome as a base will benefit the local economy through the supply of fuel and stores to the vessels.

MASTERING THE TOOLS OF THE TRADE

(Source: *ICOD Info*)

Microcomputers were introduced to South Pacific Island nations to assist in stock assessment and fisheries management. In many cases, the technology was put at the disposal of fisheries personnel who were untrained in its use. In other cases, partially trained staff worked in postings geographically distant from other computer users, making it difficult to improve their skills by learning from others.

A solution suggested by the South Pacific Commission (SPC) and the South Pacific Forum Fisheries Agency (FFA), was a computer training programme for fisheries personnel. The initial component—an introductory level six-week course—recently took place at the University of the South Pacific (USP). The course introduced sixteen participants to basic skills, word processing, spreadsheets, and database management.

A Fisheries System Workshop of four weeks duration for six participants followed the introductory course. The workshop trained advanced students to expand their skills in the development and maintenance of statistical databases. A second course for sixteen participants, this one at an intermediate level, was scheduled to run later in 1989.

The courses and workshop were a co-operative effort involving the SPC, FFA and USP, with the Institute of Marine Resources providing some administrative assistance. The USP Computer Centre facilities and technical support services have been utilised for both courses and the workshop. ICOD has contributed up to C\$ 135,000 in project assistance, while the participating agencies contributed approximately C\$ 20,000. The introductory-course participants were drawn from various South Pacific countries.

Alastair Robertson and Tim Lawson, respectively Fisheries Training Officer and Statistician with SPC, were instrumental in organising the introductory-course details. 'One of our key considerations', said Robertson, 'was to individualise the course to accommodate the diverse initial abilities of the students'. To this end, two tutors were employed, Glen Sutherland of Canada and Les Allison of FFA. By course end, all participants had achieved a degree of familiarity in working with fisheries data via computer.

CORAL CONSERVATION POSTER(Source: *Makai*)

Taking live coral destroys one of Hawaii's most important natural resources. Old reefs make up parts of the Hawaiian islands. Broad reefs that surround the shorelines act as natural breakwaters. Coral reefs provide homes for sealife, and small particles of broken coral make up the white sand beaches along many of Hawaii's shorelines.

A full colour poster illustrating several types of coral and State coral conservation laws is available to teachers at no cost from the State of Hawaii Division of Aquatic Resources.

- To order the poster call 548-5899 or write to: The Education Program, Division of Aquatic Resources, 1151 Punchbowl St., Rm 330, Honolulu, HI 96813.

NOTES ON SOUTH PACIFIC FISHERIES INFORMATION

(Source: R.Gillett — FAO/UNDP)

In the recent past the FAO/UNDP Regional Fisheries Support Programme has compiled fisheries bibliographies for several countries. This involved searching hundreds of offices, libraries, collections, archives, and files in Fiji, Guam, Hawaii, Japan, New Caledonia, Palau, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa for published and un-published material relating to fisheries and marine resources. In the course of doing this work several issues became apparent. The following is an attempt to highlight some of them.

Even though the country bibliographies were far from 100 per cent complete, it is noteworthy that the staff of the fisheries divisions concerned were surprised at the amount of historical fisheries information uncovered. In most countries, a large portion of the references was not readily available to fisheries workers. This would suggest that more work than a simple compilation of references is required if the fisheries information situation is to be substantially improved. Locating important documents listed on the bibliography and placing them in a fisheries library would appear to be required. This, however, may entail more commitment of staff time than was necessary for the bibliographies.

It is surprising to learn of the number of disasters suffered by fisheries libraries in South Pacific countries. They have been burned down (1 country), blown away (2), flooded (3), washed into the sea (1), and moved multiple times to the point of having important documents scattered (1). In all of these cases, valuable documents were lost forever. This seems to demonstrate a need to have copies made of important reference documents; the copies could then be stored for safekeeping. Consideration should be given to sending these copies to the Pacific Collection of the University of the South Pacific Library, where security and environment conditions would assure preservation.

Many references relating to fisheries in South Pacific countries are unpublished. This is especially true of survey reports. Multiple copies are frequently not available and the original works are especially prone to loss. Another feature of unpublished reports is that they are often undated and lack the author's name. As the usefulness of a document is frequently enhanced by knowing who wrote it and when, it is recommended that all reports, however crude or preliminary, be dated and have the author listed. This suggestion may also be applicable to fisheries reports produced by regional organisations.

Computer searches for Pacific Islands fisheries literature can be quite unproductive. Only a small percentage of the entries in the seven fisheries bibliographies was located in searches, including Aquatic Sciences and Fisheries Abstracts (ASFA).

FROM QUALITY BUTTONS TO MEDICINE: TROCHUS IN FIJI

(Source: *Fiji Times*)

The turban top snail or trochus (*Trochus niloticus*) is a reef-associated marine snail which occurs naturally over a wide area of the Indo-Pacific. It has also been introduced to many islands outside its natural range, including Micronesia, French Polynesia, the Cook Islands and Tuvalu.

Trochus are found on the reef flat, especially where there is growth of calcareous algae on which they feed, on back reef lagoon areas and also in surge channels along the reef front. They are most abundant in the windward areas and they thus occur entirely within customary fishing rights areas and mainly in shallow water. Although most active at night, trochus are quite conspicuous and relatively easily collected at any time.



A trochus shell

Trochus attain a maximum size of about 15 cm when they are 15 years old. Maturity is attained at a size of 6—7 cm (3 years of age), after which the growth slows appreciably. Spawning occurs during the summer months (November—April). A 12 cm female may have more than 10 times the reproductive potential of a 6 cm female spawning for the first time. The larvae may spend only 2—3 days as plankton.

With its nacreous (mother of pearl) inner layer, trochus is collected for the production of quality buttons and for ornamental purposes. Collection is done by hand, usually by people walking the reef flat at low tide or by the free diver.

In South-East Asia, there is a medicinal market for the thin operculum (shell cover). The shell is usually boiled to extract the meat, which generally comprises 15 per cent of the live weight. The meat may be eaten as a subsistence item but is often discarded. It does, however, command good prices on international markets in fresh, frozen, dried or canned form. The texture of the large foot muscle is similar to that of abalone.

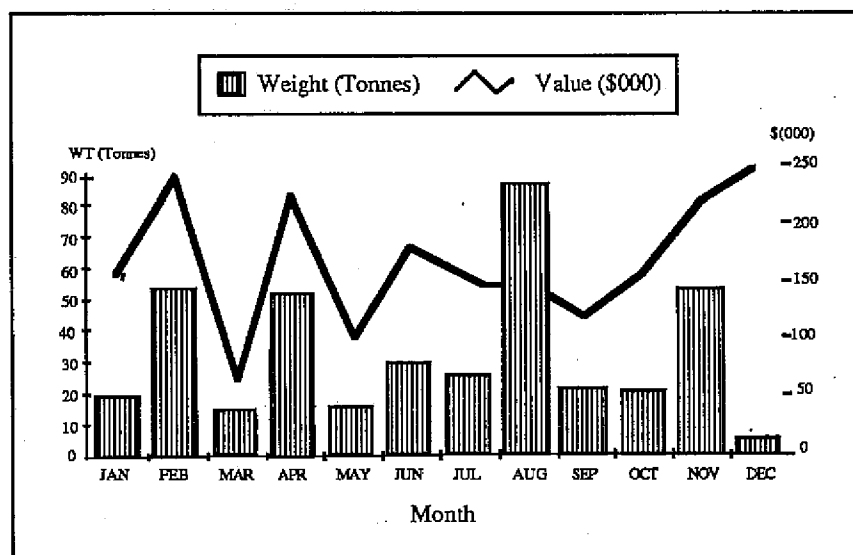
In the manufacture of buttons, blanks are cut from the shell, following the whorls around, and later buffed and polished. The residual shell still has value and can be further processed to produce mother of pearl chips.

The closely related **tovu** or top shell (*Tectus pyramidus*) is common in Fiji, but is not utilised commercially. The valuable green snail (*Turbo marmoratus*) does not occur in Fiji.

As in other countries, production for export in recent times has fluctuated markedly in Fiji from a high 340 tonnes in 1984, down to 233 tonnes in 1986, and up again to 398 tonnes worth F\$ 2.6 million in 1988. Subsistence production is not included in these figures, as it is difficult to estimate, but a large portion is utilised by women for ornamental handicrafts.

As many as ten companies are now buying trochus; four are full-time manufacturers and exporters. The trochus is harvested in nearly all reef areas of Fiji, with Lau and the Northern Division, Lomaiviti/Kadavu, Yasawas and the Central Division being notable producers. Shells of 7–10 cm size are most sought after for commerce. The current price paid for dry shell is between F\$ 4.00 and F\$ 5.00 per kg. This is a sharp rise from the 1985 price of F\$ 1.40 per kg. FOB export prices have also risen.

Of the ten companies operating, three have established button-blank factories in the last couple of years. It is anticipated that together they will process 300–400 tonnes of shell this year, producing blanks and finished buttons for export as well as exporting the residuals.



Monthly exports 1988 - Trochus shell

Small quantities of trochus meat (**sici**) are sold through municipal and non-municipal markets. In 1988, **sici** fetched an average price of F\$ 2.33 per kg. No meat is exported.

Trochus fisheries in most countries have been characterised by sharp fluctuations in annual production, with periods of high production typically followed by periods of reduced harvest. Trochus are easily collected and are thus vulnerable to over-exploitation. This has occurred in many countries. There are no unexploited or deep-water stocks to fall back on.

To afford these stocks some measure of protection, most countries have introduced management measures. The Fiji Fisheries Regulation prescribes a 3.5 in. minimum size. Exports are required to be licensed and are subject to inspection. There are no other restrictions in force. There is little general understanding of the biological principles of the population dynamics of trochus. Sustainable harvest figures for most exploited species and specially vulnerable ones are generally 20–25 per cent of the available stock. Production in Fiji is believed to be approaching maximum levels and diversion of much of the harvest to local processing facilities is being encouraged.

MEETING EYES FISH FACTS*(Source: Marshall Islands Journal)*

The Technical Sub-Committee of the Forum Fisheries Committee concluded its meeting in the last week of April 1989 in Majuro, after discussing fisheries surveillance, albacore tuna fishing, ocean resource management and outside fisheries aid, among other issues.

Many of the countries presented reports outlining new developments and problems in local fisheries development programmes and areas in which they want Forum Fisheries Agency assistance. The delegates discussed a proposal to develop a more effective surveillance programme in the region, according to one of the participants. A report from a March consultation on albacore tuna fisheries was presented and discussed. The meeting endorsed its recommendation that talks be held with Asian nations involved in gillnet fishing, for the purpose of establishing a commission to limit the exploitation of fisheries by gillnetting.

Another issue in the technical meeting was the access of countries to up-to-date fisheries research information. FFA staff now have access to computer databases on all fisheries information since 1982, and provided that information on computer disks for the participants to take home. In addition to being helpful to local fisheries development, the data are critical to negotiations with foreign fishing nations.

A number of aid agencies were represented at the meeting, including the United Nations Development Programme, Food and Agriculture Organization, and the South Pacific Commission.

VANUATU'S COCONUT CRABS ENDANGERED*(Source: Pacific Islands Monthly)*

A recent study has warned that extinction could be a possibility for Vanuatu's coconut crab unless urgent attention is paid to the proper management and conservation of a resource that has been disappearing from its natural habitats almost as quickly as it has been vanishing down the throats of tourists.

Despite a two-year population survey, scientists have been unable to find a single juvenile specimen of *Birgus latro*. They have also noticed that areas with reasonable stocks of crabs in 1985 were severely depleted by 1987. These data, together with over-exploitation of crab populations for the tourist market, are causing anxiety in the Vanuatu Fisheries Department.

The population study was part of a research and conservation management project funded by ACIAR (the Australian Centre for International Agricultural Research) and designed by the Queensland Department of Fisheries, the University of Queensland and the Vanuatu Fisheries Department. Craig Schiller, an Australian biologist who took part in the study, estimates that 'Coconut crabs wherever they are—with the exception on those on Christmas Island—are headed for extinction'.

Dr Rick Fletcher, senior on-site biologist for the project, wrote in the March 1988 issue of *Naika* (the newsletter of the Vanuatu Natural Science Society) that 'to be absolutely sure of saving the coconut crabs, it may be necessary to ban all collection for sale in restaurants'. Coconut crabs feature heavily in tourist promotions as an exotic and very popular culinary experience that travellers are encouraged to try.

Coconut crabs are primarily nocturnal, and are usually found within a few hundred metres of the sea — but contrary to conventional wisdom, coconuts do not form a major part of their diet. Many crabs live where there are no coconut palms, but even more compelling evidence for the species' mis-naming is that a large crab can take up to *three weeks* to open a coconut! Small crabs cannot open them at all and it has been revealed that the animals are, in fact, omnivorous

scavengers that willingly consume coconut meat... when it is used as bait by humans. The minimum legal size for commercial coconut crab in Vanuatu is 9 cm along the top of the shell: a crab of this size would be between 12 and 15 years old, while a large, mature specimen—weighing more than 2 kg—would be at least 30 years of age.



The coconut crab, *Birgus latro*

Dr Fletcher's article makes five recommendations:

- that a publicity campaign be established to draw attention to the problem;
- that stronger legislation be introduced to restrict crab sales to licensed vendors, with a quota system on harvesting;
- that the Vanuatu Fisheries Department maintain a yearly sampling programme to assess remaining crab stocks;
- and that areas be regularly 'reseeded' with juvenile crabs that have been reared in captivity.

Larry Vallance, manager of Natai (the commercial processing and marketing arm of the Fisheries Department) says the findings of the study have resulted in a 'gentleman's agreement between village chiefs, local councils and ourselves'. Villagers of the Banks and Torres Islands, where the main commercial stocks of coconut crabs are harvested, have established a voluntary quota of catching no more than 10 per cent of the total estimated crab population each year over a 10-month season (the restricted months of November and December are part of the crabs' breeding season). Natai has been authorised to deduct five per cent of the total value of the catch, and this amount is passed on to the local councils to help with the cost of monitoring the crab populations.

Natai is not, however, the only buyer of crabs from the Banks and Torres groups—one of the international hotels in Port-Vila is buying directly from an operator in the islands—but the islands are the only participants in the voluntary quota scheme. If the crabs purchased by Natai are not sold in one calendar month, there is a proportional restriction on the next month's catch. After the May 1988 riot in Port-Vila, the demand for crab slumped along with the number of tourists, so after three months Natai had stockpiles of 1.5 tonnes of frozen crabs. A total

restriction on crab harvesting followed until February 1989, by which time the frozen stock had been sold.

The economic value of Vanuatu's coconut crab industry is difficult to estimate, and there are few reliable figures available. According to Vallance, Natai supplies about 60 per cent of the Port Vila crab market and would buy approximately A\$ 35,000 worth of crab from the Banks and Torres communities each year.

The concept of establishing sanctuary areas is currently under consideration, and two islands are being investigated with a view to restocking them with crabs purchased with aid funds from Natai. The feasibility of sanctuaries will depend on research currently in progress at the University of Queensland, where Shane Lavery, a doctoral student, is studying the genetic make-up of coconut crabs.

If genetic differences are found in crabs from different areas, they are unlikely to undertake mass migrations and numbers must be replaced from within the local stock; if this is the case, each crab resource must then be managed separately, whether distinct populations are found on individual islands or in separate areas on one island.

Restocking an area with live crabs from a different area may therefore be harder than it sounds; but according to Shane Lavery, 'The indications are that the coconut crabs in Vanuatu are generally the same, which that means restocking them or culturing them is possible'.

Although no official sanctions on serving coconut crab to tourists have been instituted, public awareness is being heightened through the sale of T-shirts (profits from which go to further conservation research).

USP TO GET U.S. RESEARCH VESSEL

(Source: *Fiji Times*)

The University of the South Pacific has received a US\$ 85,000 research vessel to help develop new fishing methods for small-scale offshore fishing.

The nine-metre vessel has been donated to the USP's Institute of Marine Resources (IMR) by the United States Navy, under a goodwill programme, Operation Handclasp. A spokesman for the U.S. Embassy in Suva said the vessel would carry out research on development of an off-shore fishery for high quality tuna and deep-water snapper for export by island fishermen.

The vessel would also be used to teach students about engine repairs and maintenance. Navy personnel spent about 1,000 man-hours rebuilding and repairing the boat, which arrived on the U.S. frigate, *Robert E. Peary*, then on a goodwill tour. The boat has been fitted with a Detroit 435 diesel engine, fuel tanks, magnetic compass, fuel pumps and other equipment.

The spokesman said a supplementary grant of US\$ 10,000 from the United States Agency for International Development (USAID) to the IMR would help buy additional equipment for the vessel.

BECHE-DE-MER EXPORTERS DECLINING

(Source: *Fiji Times*)

A sharp decline in the number of beche-de-mer exporters has been reported by the Fisheries Division Licensing Office. From a total of thirty exporters operating during the 1988 period, only ten were active in April 1989. The report indicated that of the ten companies operating, seven are in the Central and Northern Division, while the other three operate in the Western Division. The two main exporters operating from the Northern Division—Driloli Products in conjunction with Feeders Seafoods Limited, and the Fiji Co-operative—have ceased operations

completely. Feeders Seafoods Limited is now a full-time exporter of processed snapper (mainly fillets) and tuna.

The report stated that the production of beche-de-mer increased to more than 1,000 tonnes by the end of 1988 compared to 640 tonnes in 1987 and although exports during 1989 were expected to show a considerable decline (due mainly to the size limit imposed on all export species), more than 70 tonnes had been exported by the end of March 1989. Reports from the Northern Division have indicated a reduced amount of beche-de-mer being harvested. The Division has been one of the largest areas of operation.

Meanwhile, discussions are under way between the Fisheries Division and beche-de-mer exporters to form an exporters' association. At a recent meeting held in Suva, exporters and officials discussed the role of the association in controlling the number of exporters and how it could assist in the harvesting and production of quality products for export.

JAPANESE TO HELP WESTERN SAMOA

(Source: *Samoa News*)

Japan has decided to extend an aid grant to Western Samoa to further upgrade the port of Apia. US\$ 6.5 million is being provided for the second phase of the work, which includes upgrading the container terminal area, providing a breakwater with marker lights, and associated facilities. The first phase of the aid package, signed in October 1988, was worth US\$ 4.9 million, to be used for a new tug boat and for upgrading the Apia wharf.

Previous Japanese aid to improve sea transport in Western Samoa included the provision of an inter-island passenger ferry and upgrading all domestic ports.

WPFCC TUNA RESEARCH WORKSHOP

(Source: *SPC Regional Tuna Bulletin*)

The Western Pacific Fisheries Consultative Committee (WPFCC) Tuna Research Workshop was held in Manila, Philippines, from 3 to 6 April 1989. The workshop was organised by the WPFCC Secretariat with assistance from the South Pacific Commission and the Pacific Economic Cooperation Conference (PECC) Fisheries Task Force. Funding support was provided by the Canadian International Development Agency. The workshop was attended by representatives from four Association of South-East Asian Nations (ASEAN) countries—Indonesia, Malaysia, Philippines and Thailand, five Pacific Island Nations (PIN)—Federated States of Micronesia, Fiji, Papua New Guinea, Solomon Islands and Tonga, and three regional organisations, the FAO/UNDP Indo-Pacific Tuna Programme (IPTP), PECC and SPC.

Country reviews, including a brief description of the fisheries and research programmes, were provided. Of the four ASEAN countries represented at the workshop, the Philippines is the largest producer of tuna, with annual landings of 270,000 mt, followed by Indonesia at 230,000 mt, Thailand at 90,000 mt and Malaysia at 29,000 mt. The Philippines exploit a wide variety of species with numerous gear types, both industrial and artisanal. In Indonesia, the bulk of tuna production comes from industrial vessels operating in eastern Indonesia. Thailand exploits coastal tunas exclusively and has become the largest producer of canned tunas in the world. Malaysia has been increasing its production of coastal tunas and is also directing efforts at developing its offshore fisheries.

Among the PINs, Solomon Islands is now the largest domestic producer, catching 40,000 mt annually with purse seine and pole-and-line vessels, in addition to production by distant-water vessels. Fiji has the most diverse domestic tuna industry, with pole-and-line, longline and purse seine vessels, as well as access agreements with distant-water longliners. Tonga operates one longliner, with plans to increase the fleet to ten vessels in the near future. Papua New Guinea has access agreements with several distant-water fishing nations.

The Indo-Pacific Tuna Programme has been involved in tuna research, including analysis of regional statistics, in-country assistance with data collection and analysis, and a small-scale tagging project, since 1981. IPTP was supposed to be terminated at the end of 1989; meanwhile, a draft proposal has been prepared for a follow-up tuna project for ASEAN countries.

The meeting examined various aspects of tuna research methodology, including experimental design in tuna tagging projects, tuna tagging experiences in the Philippines, a review of tagging methods used in the Western Pacific and the interpretation and analysis of tagging experiments.

Finally, a plan of action for developing co-operation in tuna research between the ASEAN and PIN countries was defined and approved by the meeting.

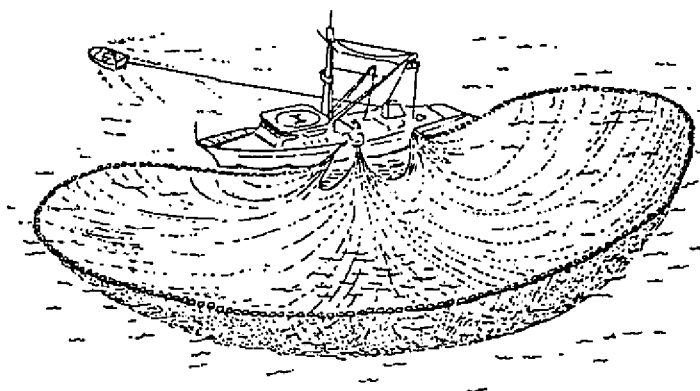
MARSHALLS SEINER ENDS FIRST CRUISE

(Source: *Pacific Daily News*)

On its first fishing trip, the Marshall Island purse seiner *Koorale* caught tuna worth US\$ 850,000. The ship sold its haul of 1,100 tons of tuna to the Starkist cannery in American Samoa in May 1989, before arriving in the Marshalls during the last week of May on its inaugural visit.

For at least the first year, any revenues earned from fishing will go to pay off a US\$ 3 million federal loan used to purchase the boat, for the operating costs and to build a working capital reserve. The ship is a joint venture between Fermin Ferreira, an American fisherman, and the Marshall Islands Development Authority, the business arm of the Government. The ship was purchased in 1988 with the assistance of the U.S. National Marine Fisheries Services. Compact funding was used as collateral to obtain the American loan.

Marshall Islands officials are looking to purchase two or more additional purse seiners.



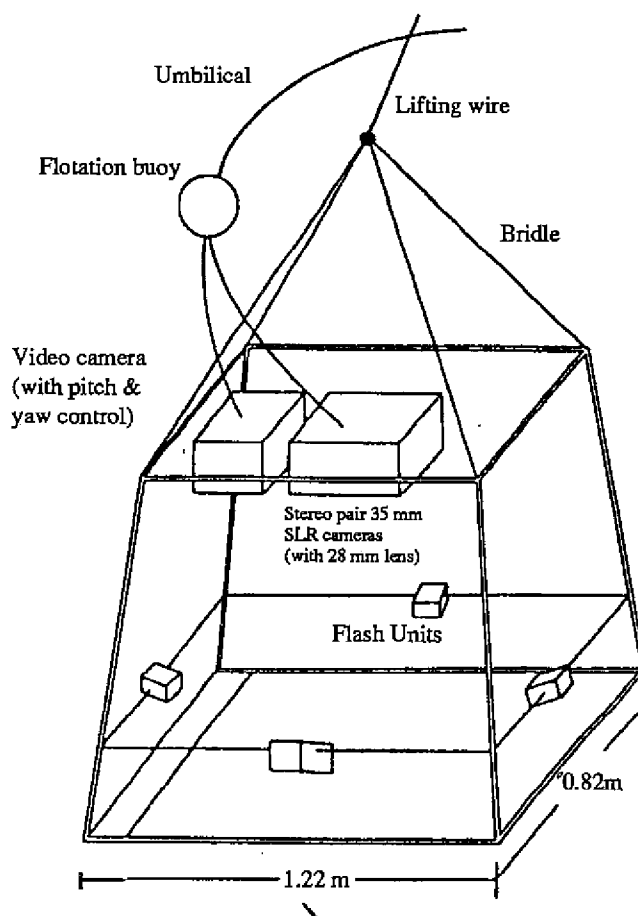
FISHERIES SCIENCE AND TECHNOLOGY**UNDERWATER CAMERA RIG TO MONITOR POLLUTION**

(Source: *Australian Fisheries*)

An underwater camera rig is to be incorporated in the Sydney Water Board's A\$8 million Ocean Outfall Monitoring Program being undertaken three kilometres off-shore from Sydney.

The underwater camera rig was designed by Paul Anink of Marine Pollution Research for the rocky reef biological component of the Program. His design evolved from a number of shallow water experiments at the State Pollution Control Commission, including the investigation of the effects of ocean disposal of waste waters and dredge spoil on rocky reef macrofauna.

For the Water Board project, he has designed a 'jump camera' which can be lowered to provide quantitative data on attached macroinvertebrates living on rocky reefs. An important component of the project will be the collection of sponges for taxonomic purposes.



The underwater camera rig

NEW CANOE DESIGN TESTED

(Source: *Times of PNG*)

The Papua New Guinea Department of Fisheries and Marine Resources (DFMR) is currently testing and promoting different sizes and designs of village fishing transport craft through the Manus and Oro fisheries authorities. According to the Secretary of the DFMR, Barney Rongap, a new design, called the Barracuda, has recently been launched in Lorengau, Manus Province. Mr Rongap stated that DFMR is aiming to encourage the building of the new designs by local builders, if markets can be established for these types of craft.

Details of the small craft development programme were made known to the public in January 1989. There was also the mention of a new design of *Mon* (canoe without outrigger) which was designed for PNG waters. The Barracuda is 9.3 m overall in length and 1.5 m wide. It is designed to be used with a 25 to 30 horsepower outboard motor and gives a speed of 12 knots when carrying a weight of 700 kg. The craft is designed as a modern plank and plywood alternative to the big *Mons* found in areas such as Manus, New Ireland, Siassi Islands, Gulf and West New Britain.

The canoe development programme is receiving valuable financial assistance from the United States Agency for International Development (USAID). This assistance is administered by the Foundation for the Peoples of the South Pacific (FPSP) office in Port Moresby. Technical Instructor Michael Hartong from West Germany is supervising the canoe construction programme in Manus and is working closely with Mr Ambrose Guarim from Madang Province — a qualified boat builder and workshop manager.

Mr Rongap added that after a series of trials by Fisheries staff, if the new vessel proves potentially suitable, it will be offered for hire to Manus people to find out if it is really suited to local conditions. The construction of new prototypes by DFMR is currently centred in Manus Island under the Artisanal Fisheries Extension Training Programme (AFET) of Manus Fisheries Authority. Smaller workshops are also located in Oro Bay and Port Moresby.

SOLAR-POWERED BLOCK-ICE PLANTS

(Source: *World Fishing*)

Søby Sunice A/S is an independent, limited liability company in the Danish Henry Søy group. This group has existed for more than 30 years, during which time it has gained wide experience in the field of refrigeration, for domestic and export markets.

Demands

The philosophy of Søby Sunice A/S is, through intensive effort, to carry out development, production and sale of products complying with the following principal demands:

- using the sun as the only source of energy;
- compliance with basic needs of the population in developing countries, i.e. by ensuring an improved durability of food-stuffs and vaccines and, therefore, contributing towards reducing the spread of infectious diseases;
- no moving parts;
- reliability and longevity;
- no demand for skilled labour;
- no demand for import of items such as diesel or lubricating oil, or spare parts;
- simple installation; no running costs and minimal maintenance requirements.

Development

Sunice commenced development work on its solar-powered ice plants in 1973, in co-operation with Denmark's Technical Industry, and today its products may be found in many countries, including Columbia, Gambia, Tanzania, India, Australia and Tuvalu. Its production programme includes plants for cooling vaccines and food-stuffs, for block-ice production for the fishing industry and for various other requirements such as water pumping, hot-water systems and cooking.

Cooling fish

The block-ice plant is designed primarily for cooling fish and other perishable food-stuffs. Each plant is constructed as a standard module, with a nominal capacity of 200 kg of block ice per 24 hours. It works with solar energy in combination with a closed-loop refrigeration system, using ammonia as the refrigerant. Because the system is self-contained and works independently of external energy sources, it requires no maintenance other than weekly cleaning of the solar collectors and topping-up of water in the condenser. During hours of sunlight, ammonia is boiled out of the salt in the solar collectors. The vaporous ammonia is liquified in the condenser and stored in the receiver and evaporator.

Automatic

As the sun sets, a built-in cooling system is automatically activated. This results in a drop in temperature and pressure, which causes the ammonia to boil in the evaporator. As it boils, temperatures as low as -15°C to -25°C may be reached and the water in the block-ice moulds is frozen, while the vaporous ammonia is re-absorbed in the solar collectors. This cycle is repeated every 24 hours.

THE GREENHOUSE EFFECT: WILL CORALS SURVIVE?

(Source: *Reflections*)

The highlight of the Marine Education Society of Australasia's (MESA) annual conference in Townsville, September 1988, was the opening address by Professor Ian Lowe, Acting Director of the Commission for the Future, on 'The effects of greenhouse on the marine environment'.

'Greenhouse' refers to the belief that increasing atmospheric concentrations of carbon dioxide and other gases will alter the climate, because more heat radiating from the earth's surface to space will be retained in the earth's atmosphere, trapped by the gases acting rather like the glass walls of a greenhouse. The most relevant concern for marine educators is the predicted rise in sea level and its possible effects on the coastal environment.

Australia, like other maritime nations, will be affected by the expected rise in sea level. There has been an observed increase in sea level of about 15 cm this century, and estimates of the further increase range from 24 cm to 1.2 m in the year 2050, and 60 cm to 3.5 m by the end of next century. This is an area of considerable uncertainty because of the lack of reliable historical data and the imprecision of estimating the rate of transfer of heat into the oceans, given that the increasing sea level is primarily due to thermal expansion.

Professor Lowe warned local authorities Australia-wide that they may soon face legal action for negligence, unless they quickly come to terms with the implications of the Greenhouse effect, as some stretches of coastline would be reclaimed by the sea as rising temperatures and melting ice caps forced ocean levels up.

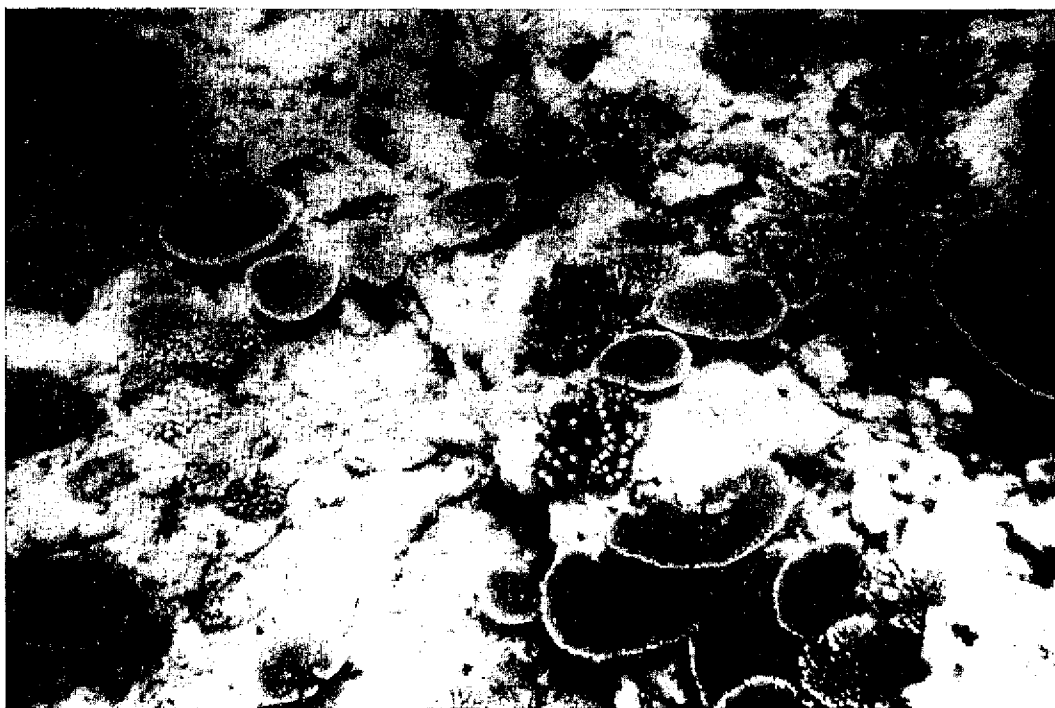
Effects on the Great Barrier Reef

Dr Don Kinsey, Executive Officer, Great Barrier Reef Marine Park Authority (GBRMPA) made the following comments on the rapid short-term sea level rise on the Great Barrier Reef and an increase in water temperature, two likely outcomes of the Greenhouse effect.

Rapid rise in sea level

In the short term (50—100 years), the effects of a rapid rise in sea level on the Great Barrier Reef may, on balance, be beneficial rather than detrimental. Rejuvenation of the largely depauperate reef flats by renewed coral growth will certainly make them appear more pleasing.

In the long term, however, reefs may slowly become submerged. They would not be able to grow fast enough to keep up with predicted rates of sea level rise. As the water depth exceeded 2—3 m, reefs would be growing at their maximum rates and would maintain high productivity until covered by at least 15 m of water.



Coral reef beauty — how many centuries will it last?

Increase in water temperature

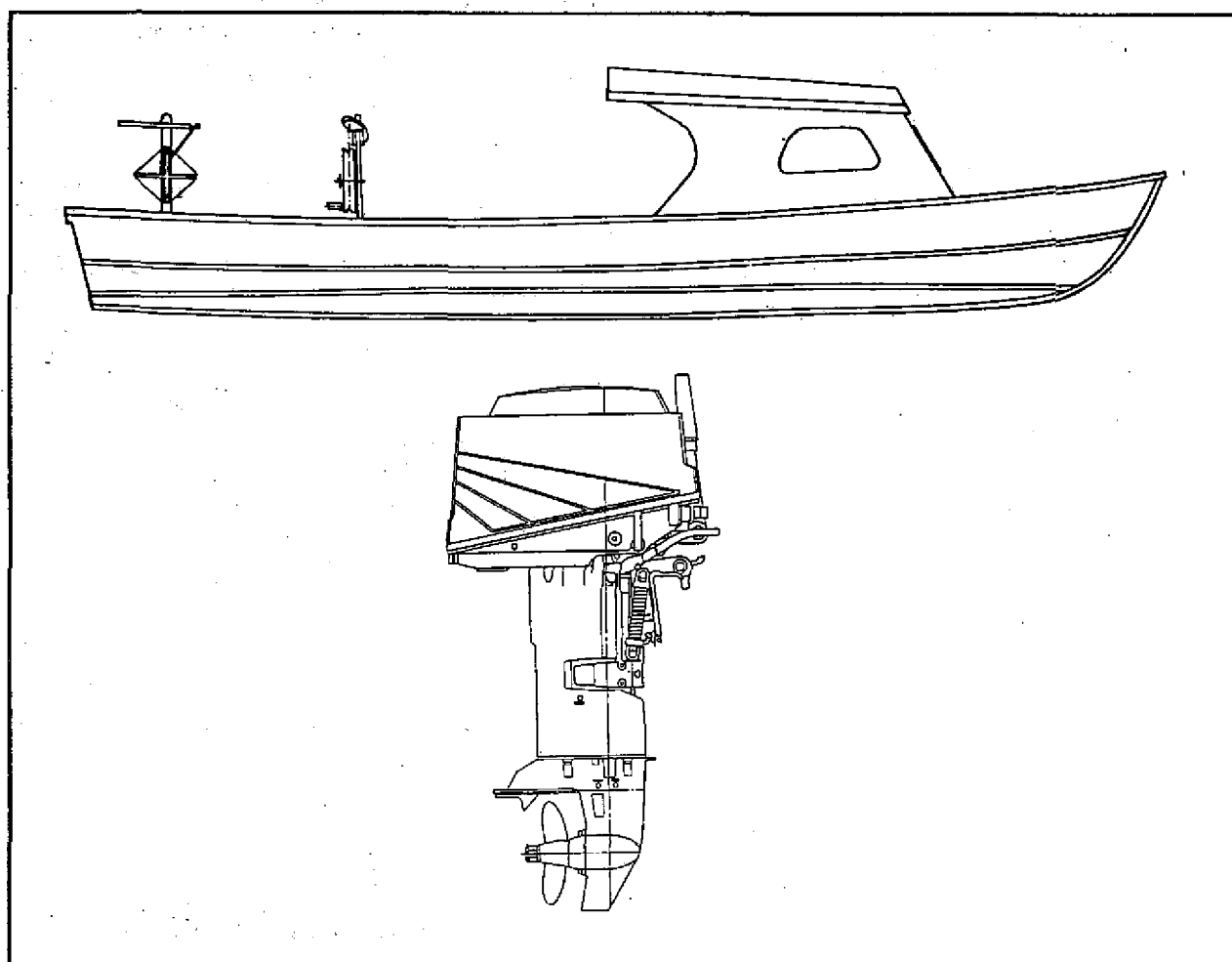
This ultimately may disadvantage coral reef organisms. The effect would be most pronounced in the north, where present-day summer temperatures already approach the 30°C upper sustained limit of tolerance. Many other aspects of a 'Greenhouse'-modified environment may have a more subtle effect, though most would be long-term rather than immediate. Increasing cyclone incidence and severity may retard recolonisation of submerging reef tops. Increased rainfall and greater cloudiness may have detrimental effects, particularly on inshore fringing reefs, though the presently suggested climatic modifications may be relatively trivial for coral reefs. Changes to runoff, upwelling and oceanic circulation may affect the delicate nutrient status of shelf waters, but again the responses are most likely long-term rather than short-term.

Don Kinsey concluded that other influences, such as the effects of development on the adjacent mainland and high islands and increasing tourist pressure on the Reef itself, may be of greater significance for coral reefs than the 'Greenhouse' effect.

ABSTRACTS**TESTING OF DIESEL OUTBOARD ENGINES FOR THE ALIA SMALL BOAT FISHERY IN WESTERN SAMOA**

(Source: FAO/UNDP Regional Fishery Support Programme)

Two new models of a 27 horsepower outboard diesel engine manufactured by Yanmar Diesel Engine Company of Japan were acquired by the Fisheries Division in Western Samoa for testing during 1987—88. Results of controlled tests over measured distances on a vessel representative of those now in use by the small-boat fleet showed considerable savings in fuel consumption at a relatively small sacrifice in speed. Further tests aboard actual fishing vessels operating in the commercial fishery showed that trolling catches, comparable to those of boats powered by 40 hp gasoline outboards, could be achieved. After one engine had been run for 1,000 hours and a second for 350 hours, both were dismantled and checked for wear. Several operational engineering problems are discussed, as well as the economics of operating a diesel outboard in the current troll fishery for skipjack and yellowfin tuna in Western Samoa. A final section covers special considerations, including user serviceability and maintenance, along with recommendations and conclusions.



Boat and outboard diesel engine used during the tests

Tilapia in the Pacific Islands: are there lessons to be learned?

by

Robert Gillett

FAO/UNDP Regional Fisheries Support Programme
Suva, Fiji

In the 1950s various fisheries experts encouraged the introduction of tilapia (*Oreochromis mossambica*) to the Pacific Islands. At that time the fish was hailed as being excellent for human consumption and mosquito control, entirely harmless, and perfectly designed for its role in the South Pacific. In short, tilapia was considered a 'wonder fish' and an answer to many fishery development problems.

Several decades later the opinion of the value of tilapia introductions has changed somewhat. 'The introduction of tilapia was a disaster on nearly all Pacific Islands' (Baird 1976). Although there are a few exceptions, tilapia is now considered a pest in most places where it was introduced. In fact, several Pacific Island governments perceive the eradication of tilapia as a priority fisheries project.

Something obviously went wrong with the tilapia scheme. Are there lessons to be learned from examining that fisheries development exercise with the benefit of hindsight? An historical review of the tilapia situation reveals that there could be points worthy of consideration by individuals contemplating future fisheries development work.

The native range of *Oreochromis mossambica* is restricted to East Africa, but the species has been introduced to many parts of the world. All Pacific introductions seem to have originated from an Irian Jaya river estuary (Devambez 1964). From there they were introduced to other South-East Asian countries in the 1940s, then to Fiji from Singapore in January 1954 and shortly thereafter to Guam and Saipan from the Philippines (Van Pel 1955, Eldredge 1988). From these original Pacific introductions, the fish appear to have been transferred to most other Island areas. One author has indicated that Norfolk and Pitcairn are the only Island groups where tilapia introductions have not been attempted (Devambez 1964).

What were some of the considerations prior to moving tilapia to new areas? Although there is some documentation on the subject, this is mainly in the form of popular accounts appearing in regional news magazines. The best source of information on the subject has proven to be personal accounts by individuals working in the fisheries sector at the time. Ron Powell, a former Fisheries Officer at the South Pacific Commission (SPC), writes:

You have probably read about the first days when the South Pacific Commission was first formed. In the beginning, there were apparently requests for some help and advice on any form of marine resources. Ultimately, in the early 1950 period, they recruited Herbertus Van Pel, a Dutch fisherman who had spent all his early life in Holland fishing as a trawlerman in the North Sea. He worked for many years and travelled widely in Java, Sumatra, and other areas under Dutch administration. When the Dutch left, the SPC recruited Bert to the post of Fisheries Officer. I can well imagine his first day at work as I guess it was much like mine — when I later worked for SPC. The Commission building, as you know, is rather like a scene from an American penitentiary where one is led down a long corridor with one's feet echoing until someone produces a key and opens a dusty office. Well so there it all is. The Pacific is half the world. There are no facilities, no boats, no staff, correspondence takes over six months to the outer islands, there is no money budgeted. Never mind, it's all yours. Just develop fisheries...period. Bert started with enthusiasm. When he surveyed the area, he realised fishermen with any experience

of power boats or making gear, mending nets, servicing engines, were scarce. He saw the problems of starting any fishery with modern gear and knew it would take some years to get any kind of operation together anywhere. So he hoped to get it off on a small scale, backyard attempts to grow fish by simple aquaculture, at the grass roots level. Bert Van Pel introduced tilapia everywhere he went with enthusiasm.

Luis Devambeze worked at the South Pacific Commission a few years after Ron Powell. He comments:

Tilapia got around the Pacific in the 1950s and 1960s. I remember an administrative officer in the Lau Group of Fiji asking for some to put in a marshy area that had exceptionally gone dry one year—his aim was to lower the mosquito population, claiming that it would also help lower the birth rate in the area, since people would not have to rush under the mosquito nets so early in the evening. The usual argument for tilapia introductions was availability of fish in periods of bad weather, also readily available bait for fishing. I suspect that a lot of tilapia introductions were private efforts. There are still some cases in New Caledonia of people taking tilapia to the Yate Lake "to provide food for the black bass". Most South Pacific countries did not have fisheries departments at the time and fisheries officers, generally speaking, were considered as pretty low specimens if they could not produce miracles on demand.

From the above it appears that one of the motivating factors behind the tilapia introductions was a need to produce rapid tangible progress in fisheries development. Tilapia had an intuitive appeal, as it gave results fast, in marked contrast with some of the fisheries projects generally considered to have been successful. The SPC efforts to encourage bottomfishing for deep-water snappers commenced in 1974 and are still continuing. Trochus were transplanted to Aitutaki in the Cook Islands in 1957; however, 24 years elapsed before the first trochus harvest occurred. A quarter of a century of research has preceded the present-day operations of the commercial pearl-oyster farms in French Polynesia. This time-frame should be borne in mind when considering on-going projects, such as the relatively short history of giant clam culture in the South Pacific. It also suggests that the time required for successful projects can easily outlive short-term target-oriented funding or the employment commitments of a single individual.

It is obvious that the benefits of introducing tilapia were exaggerated. Three decades after the introductions Ron Powell writes:

At that time tilapia were being written up worldwide as the *wonder fish* that had all the virtues one could ask for in the tropics. They appeared easy to sex, omnivorous, could be fed on almost anything available. They multiplied fast, would eat mosquito wrigglers, could be introduced into any swamp, where they would clean out mosquitoes fast. As a fresh-water species they offered sport. It was claimed that a backyard pond would make three fish meals a week for the average family. What could possibly go wrong?

The fish was also promoted as being entirely harmless, excellent for human consumption, and potentially capable of yielding over one tonne per acre (Van Pel 1954). It was claimed that young children could catch a kerosene tin full after school (Anon 1960).

The situation turned out a bit different from what Bert anticipated. Although there are exceptions in which tilapia has made a positive contribution (perhaps in areas of Papua New Guinea, Tonga, and Fiji), more typically they have been less than beneficial. For example, on Fanning Island, 'The careless and needless introduction of the Mozambique tilapia has had no beneficial results... fishermen claimed that the introduction and subsequent spread of the Mozambique tilapia has resulted in a decrease of mullet, bonefish and milkfish' (Lobel 1980). In Nauru, tilapia was not well received by the local people (Uwate *et al.* 1984). In Tarawa, tilapia is considered as a major constraint in milkfish production (National Planning Office 1988), and has been given as an example of a 'poorly thought-out and poorly researched

project with negative effect on the community concerned' by the government minister responsible for fisheries (Iuta 1989).

As far as production figures are concerned, it is quite possible that the one tonne per acre could be achieved. However the size of backyard pond being advocated in the 1950s, about 20 feet square, only amounted to about 1/70 of an acre. According to Ron Powell:

This only meant enough fish for a Polynesian family to eat once a year. It was obviously easier to spend one night fishing to get the same amount of fish without the back-breaking job of digging a pond. Like the Arabs, we tilapia farmers slowly folded our tents and disappeared into the night.

It can therefore be seen that the potential benefits of tilapia were over-sold. It also appears that risks involved were discounted. Advice was given to the Western Samoa Government on the initiation of tilapia culture:

It is evident that it would be preferable to investigate all factors for a whole year, but this would involve great expense and even then, there might be some uncertainty with a few points. It is much cheaper to start with an experimental pond and stock it with tilapia (Van Pel 1954).

Recently the Kiribati Minister for Natural Resources Development gave a different view on the importance of investigations of factors prior to the introduction of tilapia.

The well known tilapia fish was introduced into our fish ponds and landlocked lagoons by well-meaning *developers* to increase the protein supply. The result was that this highly competitive fish, which rarely grows longer than six inches in Kiribati, has replaced the culturally, commercially, and nutritionally important milkfish, which grows to a considerable size in our atoll environment...If only applied research on the ecology of tilapia had been conducted in Kiribati *before* the project was operationalised, such negative development could have been avoided' (Iuta 1989).

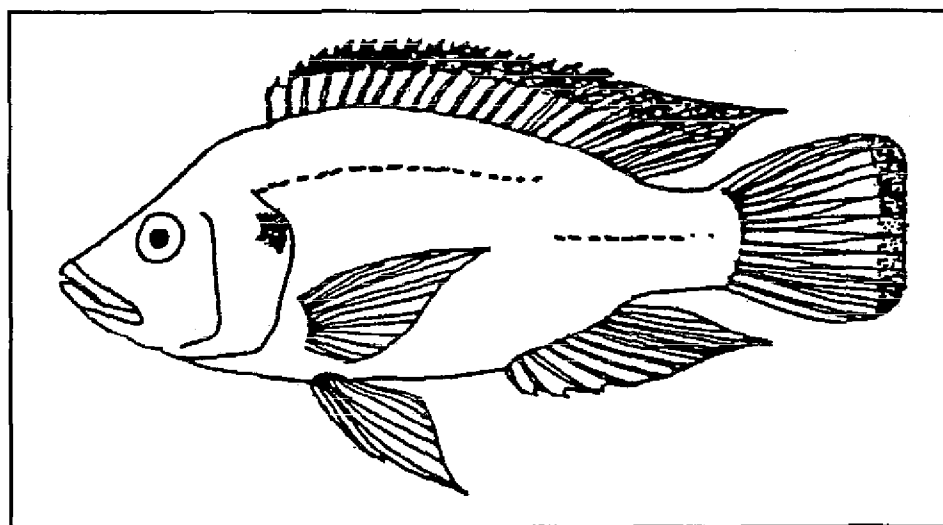
The above emphasises the need for a critical evaluation of the benefits and risks of proposed fisheries development endeavours. In the years since tilapia was introduced, human nature and institutional pressures still result in the 'selling' of fisheries projects. If anything, a general increase in financial resources available for the development of fisheries in the region has exaggerated the situation.

At the time when tilapia introductions were being encouraged, there was apparently little opportunity of obtaining alternative opinions on the proposed project. Few of the countries had a government fisheries division or access to individuals capable of taking a critical view of what was being offered. Had there been an assessment of the proposed tilapia plans by an unbiased party, it is possible that the outcome would have been different.

In summary, a review of the tilapia project indicates a situation in which fishery workers were expected to produce impressive results in a small amount of time. The benefits of doing what the expert suggested were exaggerated, while the risks were downplayed. Apparently, little has changed in this regard in the last 35 years. A major difference, however, between the 1950s and today is the increased local sophistication in fisheries matters and the additional private, regional, and international expertise available. A review of the tilapia situation suggests that there could be benefits in making full use of this expertise to evaluate proposed fishery plans. Another lesson to be learned from the Pacific Islands tilapia experience is that there can be serious consequences in encouraging unrealistically rapid progress in fisheries development.

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Oreochromis mossambica

The following article is reprinted, with slight modifications, from *Fishing News International*.

NEW WAY TO TEST FISH QUALITY

With quality and presentation of fish becoming increasingly important in maintaining and expanding sales, the industry will welcome a new electronic portable terminal designed to help with quality assessment and provide information on the remaining storage life of fish. It has been developed by Jesper Heldbo as part of a Ph.D. research project between the Danish Ministry of Fisheries' Technological Laboratory and Matcon Consulting Engineers and Planners Ltd. of Herlev, Denmark.

The new terminal is designed to assist the quality controllers working in the service that inspects fish processing plants to integrate quality into their computer-controlled production systems. Matcon explains that this newly developed method ensures greater uniformity of assessment among experienced inspectors and reliable results can also be obtained relatively quickly by inexperienced assessors.

The method is based on knowledge of the relationship between quality, temperature and storage time, and was originally developed for Australian fish species. The results from this have been revised and converted for the assessment of fish from northern latitudes.

Smell

According to the Danish consulting firm, the evaluation system is easy to use and is based on known principles (appearance, feel, smell), which together provide a picture of quality of the fish. The appearance and firmness of the fish are assessed, together with the colour of the eyes, gills and flesh. Each characteristic has to be given a grade and checked.

As people are generally best at pointing out defects and not as good at seeing the degree of perfection, the new method uses a scale which gives more points the poorer the quality is.

Parameters which are considered to be of greatest importance in the overall quality are assessed on a three- or four-grade scale, while less important parameters are assessed on a two-grade scale.

Each species of fish has its own characteristic quality parameters. The method takes account of this by using different evaluation systems for different fish. This is necessary even among closely related types: haddock, for example, has a smell of intestines, which would be assessed as poor if found in cod.

The quality of the fish after being caught depends on temperature and storage time. The best quality is ensured by rapid chilling and correspondingly good chill storage.

Price

Different lots of fish with the same storage time (catching date) can be treated and stored very differently. This is of great importance in terms of quality and, consequently of sales, processing and price.

The quality assessment is made in such a way that there is a correlation between points and the storage of the fish. The quality can, therefore, be converted and expressed as the number of days in storage under the best possible temperature conditions.

This makes it possible to specify the remaining shelf life of the fish and what it can be used for, explains Matcon. In the example (see figure 1) a score of 15 points corresponds to six days of remaining storage life in ice at 0°C

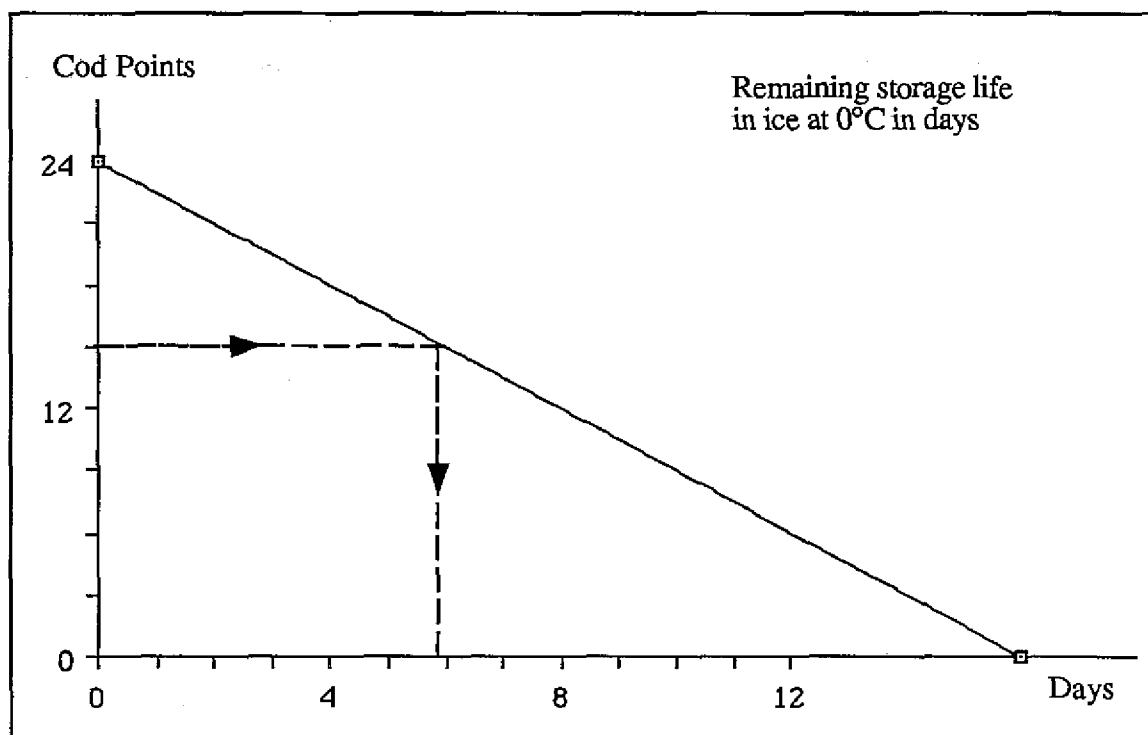


Figure 1 : An example of the scale of quality assessment. A score of 15 points corresponds to six days of remaining storage life in ice at 0°C.

This method is incorporated in a handheld data terminal. The terminal asks the assessor the relevant questions and guides him through the entire assessment. It is possible to make a note of other relevant information such as vessel numbers of boxes.

When the evaluation of the fish is complete, the sum of points and remaining storage life are displayed on the screen. This information can, for example, be converted to the EC standard (quality E, A, B and discarded). Information may be printed on a 'voucher' or transferred to another computer.

Terminals

The method can be programmed into terminals from different suppliers. The terminal shown in the photograph is said to be able to withstand the harsh environment of the fish industry and can be linked to a printer, bar-code reader, radio transmitter/receiver or telephone modem.

Matcon point out that, with the quality of fish as the principal sales argument, the system can be used in many situations: on board, for landing and sales, for stock control and production planning, and for fish inspection.

The system has been tested in the laboratory and by the fish industry. It is currently being tested by the Danish Fish Inspection Service.

To obtain the greatest possible yield and maximum marginal return, the fishing industries in the North Atlantic frequently use advanced electronic equipment in production, points out Matcon.

'A handheld terminal can be used to advantage for a large number of functions,' says the firm. 'Using the new method, quality can finally form an integral part of the production management.'



Figure 2 : The terminal for quality assessment in use

**Pacific Islands Marine Resources Information System
(PIMRIS)**

by

**The PIMRIS Co-ordination Unit
(University of the South Pacific Library)**

What is PIMRIS?

PIMRIS is the Pacific Islands Marine Resources Information System and is a co-operative project among four regional organisations:

- Forum Fisheries Agency (FFA)
- South Pacific Applied Geosciences Commission (SOPAC)
- South Pacific Commission
- University of the South Pacific (USP)

PIMRIS co-ordinates, collects and disseminates information on fisheries and non-living marine resources in the tropical Pacific.

The PIMRIS Co-ordination Unit is based at the USP Library.

Who can PIMRIS help?

It can help:

- government officers
- institutes
- research workers
- librarians / information officers
- fisheries officers
- fishermen
- students
- general users

How can PIMRIS help?

It provides:

- bibliographies
- computer literature searches
- current awareness services
- information packages on tropical marine subjects
- inter-library loans
- reference service
- question / answer service
- *PIMRIS Newsletter*
- training and information management

How to apply for help

Send in a written request, giving details of the kind of help you require or a fax if the information required is urgent.

For further information contact:

PIMRIS Coordinator or PIMRIS Assistant
Pacific Island Marine Resources Information System (PIMRIS)
USP Library, Suva, Fiji
Phone: (679) 313 900 Ext 233
Fax: (679) 300 830

PIMRIS Coordination Unit

Products

University of the South Pacific

- contents pages awareness service (regular)
- IMR database on hardcopy
- Information packages (quarterly)
 - n° 1 - Driftnet fishing
 - n° 2 - Sea level rise and greenhouse effect
- *PIMRIS newsletter*
- Recent publications list (monthly)

Forum Fisheries Agency

- *FFA news digest*
- FFA serials list

South Pacific Applied Geoscience Commission (SOPAC)

- Bibliography of selected works on sea level rise
- Current awareness service
- List of journal titles on marine resources held by SOPAC

South Pacific Commission

- Information bulletin on beche-de-mer
- Information bulletin on pearl shell
- Future Information bulletin on ciguatera
- *Fisheries Newsletter*
- List of journal titles on marine resources held by SPC

PIMRIS Focal Points

SOPAC - Fiji

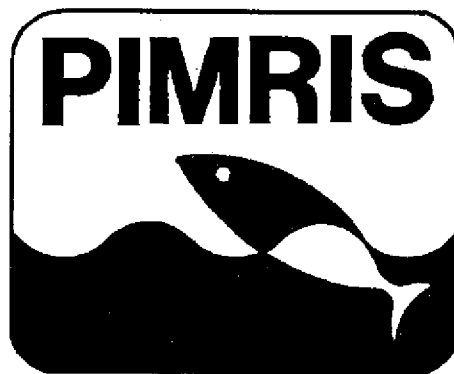
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FFA - Solomon Islands

Information Officer
Forum Fisheries Agency
PO Box 629
Honiara
Phone: (677) 21 124
Fax: (677) 23 995



THE CONTENTED FISHERMAN

The rich businessman was horrified to find the fisherman lying lazily beside his boat, smoking a pipe.

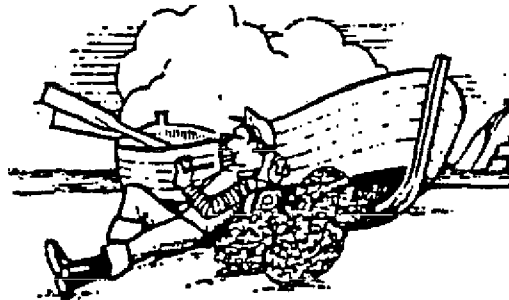
'Why aren't you out fishing?', said the businessman.

'Because I have caught enough fish for the day,' said the fisherman.

'Why don't you catch more than you need?', asked the businessman.

'What would I do with it?' asked the fisherman.

'You could earn more money', was the reply.



'With that you could have a motor fixed to your boat. Then you would make enough to buy nylon nets. These would bring you more fish and more money. Soon you would have enough money to own two boats. Then you would be a rich man like me.'

'What would I do then?', asked the fisherman.

'Then you could sit down and enjoy life', said the businessman.

'What do you think I am doing right now?', said the contented fisherman.