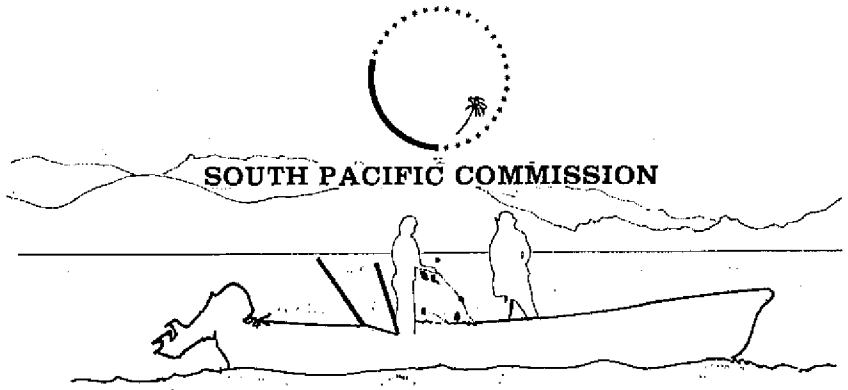

FISHERIES NEWSLETTER

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SPC ACTIVITIES

DEEP SEA FISHERIES DEVELOPMENT PROJECT NOTES

Kiribati — Gear Development Sub-project

SPC Masterfisherman Paxton Wellington has just started a 12-month assignment with the Fisheries Division in Tarawa, Kiribati. His brief is challenging: develop a system whereby tuna longlines can be effectively operated from skiffs, catamarans and other small boats, including, ultimately, canoes.

Canadian-born Wellington has had plenty of experience with bottom longlines in the colder waters of the United States and Canada, as well as several years deep-bottom fishing with village fishing groups in Vanuatu and Papua New Guinea. This new challenge, however, is outside his experience – or anyone else's – because, until now, no-one has even attempted to carry out tuna longlining on such a small scale.

Tuna longlining is traditionally a South-East Asian fishing method. Longline boats from Japan, Korea and Taiwan have been roaming the Pacific for years, often staying away from home for months at a time, seeking favourable areas to set their lines. The lines themselves, made of a rope mainline with hook-bearing branches of cord and braided steel wire, may be over 20 km long. The storage space required for the line, the numerous buoys required to keep it afloat, and of course the fish, have meant that longlining has until now been a big-boat activity.

However, things are changing. With the development of less bulky synthetic lines, and improved systems of hauling and storing the gear (sometimes using spools or drums on which the line is wrapped), smaller boats can now fit themselves out for longlining. All around the coast of Australia, as well as in the Gulf of Mexico, local fishermen are now able to get in on the longline act and access some of the catch that was previously taken by foreign boats.

In the Pacific, this development needs to be taken a step further. Few Pacific Island fishermen have boats over 30 feet long, and often they are much smaller. There is often little or no room for bulky deck equipment, and no possibility of mechanised setting and hauling. The system therefore needs to be taken back to absolute basics: light, compact gear that can be set and hauled using a minimum of deck hardware.

According to Wellington, this is not so unconventional as it sounds, even in these hi-tech days when most heavy work on a modern fishing boat is done by machine. There are still many boats using hand-hauled longlines in Canada, the United States and Europe. Additionally, in the budding New South Wales longline fishery in Australia, a number of boats are tuna longlining using hand-hauled lines made of braided dacron, or 'venetian blind cord' stored in buckets or boxes. This strong, light material is very compact, easy to handle, and may turn out to be suitable for use in Kiribati and elsewhere in the Pacific.

Wellington will be spending two weeks in March working on boats operating out of Wollongong and Ulladulla. While there, he will see first hand how Australian fishermen have adapted the gear to their particular needs and talk over his own ideas with people who have already been through the learning curve. This will short-circuit many of the normal obstacles and frustrations of starting from scratch.

In the meantime, Wellington is using vertical longlines for the first weeks of his assignment to get a feel for the local tuna fishing scene and see if there is any particular depth stratification to the fish population.

INSHORE FISHERIES RESEARCH PROJECT

January saw the start of a long-awaited project to carry out a comprehensive analysis of SPC's accumulated stock of deep-bottom fishing information. The Deep Sea Fisheries Development Project has among its files hundreds of catch forms from deep-bottom fishing activities, spanning over ten years and perhaps a hundred Pacific Island locations. The data have been accumulated by SPC's Masterfishermen during country visits which have involved various types of fisheries development, training and resource assessment activities.

All SPC Masterfishermen routinely record the species composition of the catch, total number and weight of each species, fishing depth (by hour when circumstances permit), hourly catch, bait usage and information on weather, tide and operating conditions. Although not initially collected for research purposes, the data represent a unique and extremely valuable body of information on the region's deep-water fish resources. The Commission has been trying for some years to acquire the manpower necessary to examine the information base and analyse it to provide an understanding of regional variation in the nature of deep-water fish resources and their potential productivity.

An arrangement has now been made with the International Centre for Living Aquatic Resource Management (ICLARM) under which the Inshore Fisheries Research Project will provide salary costs for a six-month secondment of an ICLARM staff scientist to the Commission to work on this project. The consultant, Mr Paul Dalzell, will be based at SPC headquarters in Noumea and will oversee the design of a computerised database, into which the dataset will be entered, and its subsequent analysis. Mr Dalzell will be supported by the staff of the Tuna and Billfish Assessment Programme, who have agreed to do the computer programming required to build the database, and by the Commission's other fisheries staff in the challenge of interpreting and standardising records gathered by a variety of individuals under widely differing circumstances.

REGIONAL FISHERIES TRAINING PROJECT

SPC/FFA Three-Week Introductory Micro-Computer Course

In collaboration with the Forum Fisheries Agency (FFA) and using the facilities of the University of the South Pacific (USP), a three-week introductory course to micro-computers was run from 9 to 27 January 1989. This course proved successful in bringing a large number of fisheries staff to a uniform and productive level of competence in a relatively short period of time. Sixteen fisheries officers attended this course, which was supervised and taught by the acting director of the USP Computer Centre, Mr G.Bahlman, with tutorial assistance from USP and SPC computer staff. The Institute of Marine Resources provided on-site administrative help.

The course was funded by the International Centre for Ocean Development (ICOD) with individual scholarships being provided for Tokelau and Northern Marianas participants by the UNDP Regional Fisheries Support Programme and SPC respectively.

Fisheries Systems Workshop

Recognising that some countries had an urgent need for assistance in further developing their fisheries databases, the 1988 Regional Technical Meeting on Fisheries recommended that arrangements to run a computer systems workshop proceed as soon as possible. In response, a four-week workshop was run from 1 to 24 February for six participants with well developed computer skills.The course aimed to assist them with the design or further development of database systems tailored to the specific requirements of their individual departments and countries. The quick implementation of this recommendation was made possible by a very prompt response from ICOD to the funding request.

The course was based at the USP Computer Centre and supervised by Mr G.Sutherland, a consultant from Canada, who was tutor and computer programmer for the course. For the middle two weeks of the course he was joined by Mr L. Allinson of FFA and Mr T. Lawson of SPC; during this time the participants were split into groups for intensive tuition and individual assistance with the development of their computer systems.

The operation of the two micro-computer courses and the systems workshop has largely addressed the immediate needs of countries for this type of training. There should be no further need for regional training at beginner level, as this is now available in most countries. However, if sufficient interest is expressed, it might be possible to organise a second Intermediate. Advanced training and system development is needed by a relatively small number of individuals whose requirements can be effectively addressed through attachments to SPC or FFA or through country visits by computer personnel from either organisation. If at a later date there is sufficient demand for another systems workshop, this could also be arranged.

FISH HANDLING AND PROCESSING PROJECT

Training

SPC was invited by FAO to assist with a National Workshop in Fish Handling and Processing which was held at the National Fisheries College, Kavieng, Papua New Guinea, from 28 November to 16 December. FHPO attended the first two weeks of the three-week workshop, lecturing and supervising practicals and demonstrations. The requests from the 14 participants (13 from PNG, 1 from Vanuatu) clearly indicated the high level of their interest and enthusiasm for additional lectures/practicals.

David James of FAO demonstrating how to assess the quality of fresh fish.

Women's role in fisheries is being given increased attention within the Fish Handling and Processing Project. In addition to women's involvement in the pilot project recommended for Tokelau, a workshop is planned for women in Papua New Guinea, and an active interest maintained in a regional consultative programme on the role of women in small scale fisheries in the South Pacific, directed by the Commonwealth Secretariat, that will have a major post-harvest input. The Fish Handling and Marketing Workshop, to be funded by ICOD, is a collaborative effort by the SPC Women's Bureau, and the Papua New Guinea Department of

Fisheries and Marine Resources, and Home Affairs and Youth. It will be held in Port Moresby in September, for 24 women from the Papuan region of the country. A planning meeting in April in Port Moresby, attended by the Fish Handling and Processing Officer and Women's Programme Officer, finalised the programme for the workshop. Interest in a similar workshop has already been expressed by other regions of Papua New Guinea.

TUNA AND BILLFISH ASSESSMENT PROGRAMME

Sampling of Japanese gillnetters in Noumea

Between 12 December 1988 and 8 February 1989, 29 transhipments of tuna from 26 Japanese gillnetters fishing in the Tasman Sea took place in Noumea. A total of 4,310 mt was transhipped into three reefer vessels bound for Bangkok and Japan. Approximately 83 per cent of the fish was albacore, while almost all the remainder was skipjack. Individual transhipments ranged from 60 mt to 250 mt. With the co-operation of Agence Maritime Ballande and the Service territorial de la marine marchande et des affaires maritimes, 14 of the transhipments were sampled by SPC staff for size composition and other data relating to the catch and fishing operations.

Second Consultation on Southern Albacore

In late 1988, a large number of gillnet vessels were expected to enter the southern albacore fishery and concerned fisheries officials from countries bordering this fishery called for consultations. Consultations were first held in November 1988 and a plan of action was put forth to address these concerns. The Second Consultation on Southern Albacore Fisheries Interaction was held to review progress on the First Consultation's plan of action and to provide guidance for further action.

The Second Consultation was held on 2 - 3 March 1989 in Suva and was attended by officials from American Samoa, Australia, the Cook Islands, Fiji, French Polynesia, New Zealand, Tonga, the United States and Vanuatu. Representatives from the Food and Agriculture Organization of the United Nations, Forum Fisheries Agency, South Pacific Commission, U.S. National Marine Fisheries Service and the fishing industry also attended.

The group provided an update of activities undertaken in response to the action plan proposed in the First Consultation. National positions concerning albacore fishing and transhipment activity were also presented.

A preliminary analysis of interaction between the fisheries was conducted using length frequency data obtained from a variety of sources, including samples taken during transhipment and data collected by observers onboard the vessels. The analysis indicated the following:

(1) Troll and gillnet vessels have been targeting the same size class of albacore;

(2) Gillnet-marked fish accounted for about 12 per cent of the troll catch, with incidence as high as 60 per cent reported on some days by individual vessels;

(3) A high level of interaction between troll and gillnet vessels is apparent, with effects evident even when vessels operated more than 400 km apart; and

(4) Gillnet operations will probably affect the longline and troll fleets during the next fishing season.

The meeting recommended that the Forum Fisheries Agency facilitate a subsequent meeting, to be held as soon as possible, between concerned parties, including both distant-water fishing nations and Pacific Island nations. The proposed meeting would discuss over-exploitation of southern albacore and consider conservation and management issues.

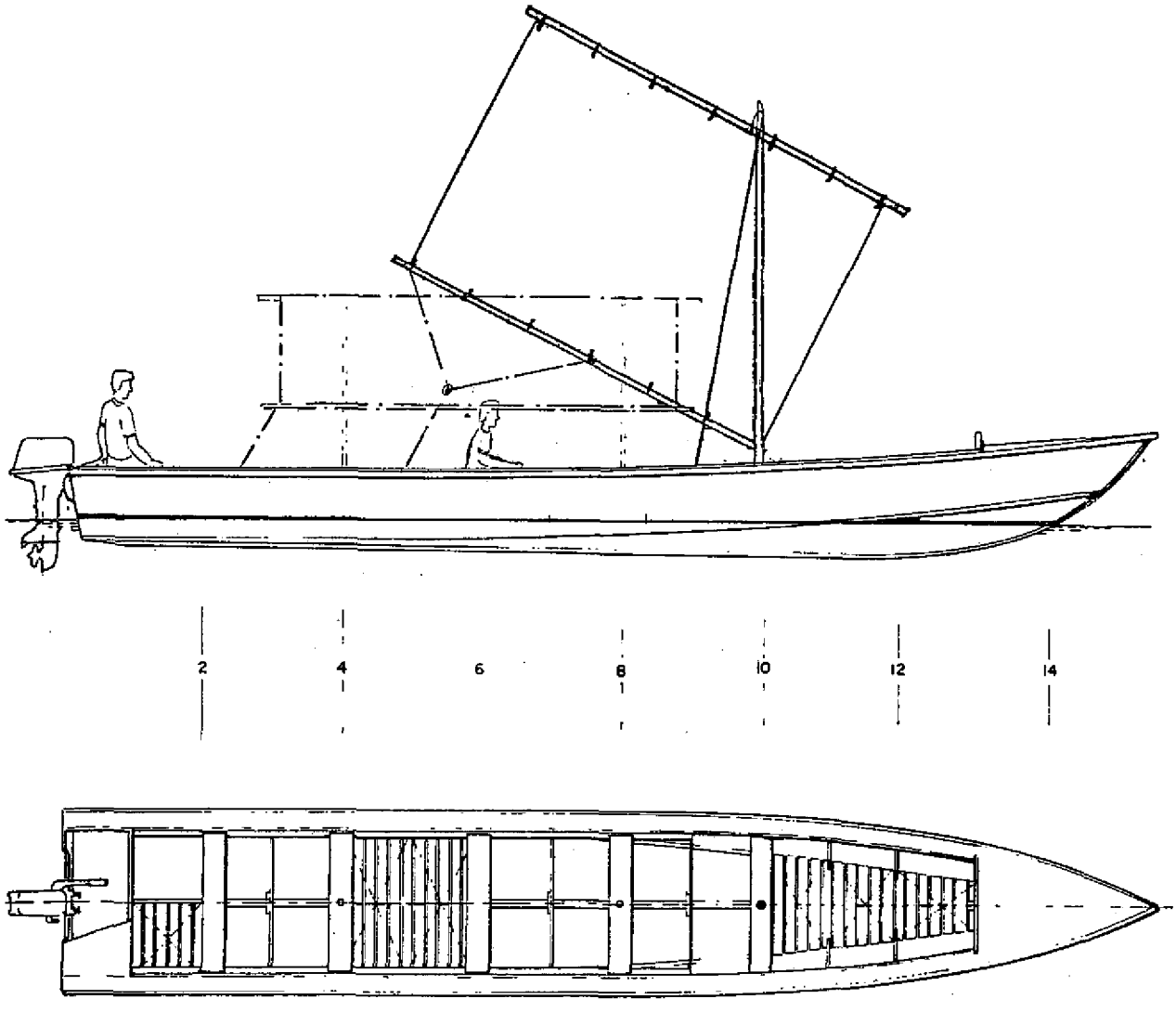
NEWS FROM IN AND AROUND THE REGION

PNG -8 CANOE DESIGN AVAILABLE
(Source: FAO/UNDP RFSP)

Full-size sheets of plans for the latest Pacific fishing craft design by the renowned Ø.Gulbrandsen are available through the FAO/UNDP Regional Fishery Support Programme.

The design, prepared for Papua New Guinea and designated PNG-8, is for a 9.3 m outboard-powered canoe style craft, with a loading capacity up to 1,200 kg and a service speed of 12 knots.

Further details from: *FAO/UNDP Regional Fishery Support Programme, Private Mail Bag, Suva, Fiji.*



The PNG-8 9.3 m canoe

PACIFIC ISLANDS FISHERIES CONSULTANCY

(Source: R.Gillett — FAO/UNDP)

In the April 1986 issue of the SPC Fisheries Newsletter, consultancies sponsored by the FAO/UNDP Regional Fishery Support Programme were listed. The objective of the listing was to make known to fishery workers some of the specialised consultancy work being carried out in various countries. It was also hoped that other agencies and organisations would be encouraged to do likewise.

During the three-year period 1986 - 1988, 91 consultancies and staff missions were carried out either directly by FAO South Pacific fishery programmes or indirectly through regional organisations. The following tables summarise this work for the year 1988. Reports for the regional missions are available from the FAO/UNDP office. Enquiries for country-specific reports should be made to the country concerned.

1. The FAO/UNDP Regional Fishery Support Programme (year 1988)

Area	Consultant/Staff	Work
Regional	Lewis	Co-ordinate SPC Inshore Resources workshop
Regional	Pollard/White	Carry out joint donors/strategy mission
Cook Islands	Bixler	Advise on aspects of albacore fishery
Federated States of Micronesia	Howell	Advise on fish handling and marketing
Federated States of Micronesia	Molina	Review statistical system
Federated States of Micronesia	Philipson	Evaluation of proposed fish processing facility (funded with FFA)
Kiribati	Savins	Assist boatbuilding project
Marshall Islands	Molina	Assist in setting up statistical system
Papua New Guinea	Savins	Conduct boatbuilding course
Papua New Guinea	Gulbrandsen	Review boatbuilding programme
Papua New Guinea	Polovina	Carry out prawn stock assessment (funded through FFA)
Papua New Guinea	Kailola	Rehabilitate fish collection
Papua New Guinea	Trachet	Assist with fish processing course

Solomon Islands	Savins	Training in construction, rigging, and sailing trimaran canoe
Solomon Islands	Cook	Review fisheries statistical system
Solomon Islands	Purcell	Instruct on the use of sail on fishing canoe
Tokelau	Gillett	Transplant trochus
Tokelau	Gillett	Compile fisheries bibliography
Tonga	Munro	Evaluate research activities
Tonga	Gillett	Carry out *Decapterus* fishing trials
Tonga	Gillett	Compile fisheries bibliography
Tuvalu	Gillett	Compile fisheries bibliography
Tuvalu	Gillett	Transplant trochus

2. The FAO/South Pacific Aquaculture Development Project (year 1988)

Area	Consultant/Staff	Work
Regional	Dashwood	Carry out shell marketing study (in association with FFA)
Regional	Juario/Villaluz/Lee	Co-ordinate workshop on milkfish aquaculture development
Federated States of Micronesia	Croft	Carry out stock assessment of marine sponges
Federated States of Micronesia	Wilkinson	Carry out feasibility study of marine sponge farming
Federated States of Micronesia	Yamagushi/Kikutani	Carry out feasibility study for introduction of green snails
Fiji	Cuzon	Carry out feasibility study of shrimp feed manufacturing
Marshall Islands	Heslinga	Formulate masterplan for mariculture development
Niue	Schiller	Carry out stock assessment of coconut crab
Solomon Islands	Hickman	Carry out feasibility study for green mussel farming
Tonga	Fuchigami	Carry out engineering survey and estimate costs for experimental fish farming ponds

Tuvalu	Braley	Carry out stock assessment of giant clams
Vanuatu	Hickman	Carry out feasibility study of farming green mussel
Western Samoa	Tanaka/Elsy/Stanley	Carry out feasibility study of farming green mussel

PACIFIC BECHE-DE-MER BOOM
(Source: SPC/R.Richmond/University of Guam)

Beche-de-mer, the dried processed product made from sea cucumbers, is a growing commodity. Since the opening of trading doors with mainland China a few years ago, world demand for beche-de-mer seems to have exploded. Previously worthless species are now being sought after, and once rigid processing standards appear to be declining. In 1988, the production from Fiji alone exceeded total Pacific beche-de-mer production of four years ago by a factor of two. In 1989 Fiji's beche-de-mer exports, totalling about 1000 tons of dried product, equates to about ten thousand tons of live sea cucumbers. This is more than all other fishery products in Fiji put together.

In the last quarter of 1988, the Fiji Fisheries Division, with assistance from the SPC Inshore Fisheries Research Project, carried out a survey of the resource of one type of beche-de-mer in Fiji, with a view to developing management guidelines for this species. The survey is described in more detail in issue number 47 of the *SPC Fisheries Newsletter*. Other researchers are also looking at what sort of beche-de-mer management measures might be necessary as a result of the boom in demand for this product.

One such research programme is that carried out by the University of Guam (UOG) Marine Laboratory. Lab. Director Bob Richmond and his team have been carrying out research into the reproductive biology of sea cucumbers. Reproduction, and particularly the process of recruitment, is poorly understood in holothurians and this major gap in our understanding makes the development of meaningful management programmes difficult.

As well as studying changes in reproductive condition of animals in wild populations, to determine spawning seasons and the fecundity of breeding holothurians, the UOG team has been successful in spawning three species (*Actinopyga mauritiana, Holothuria nobilis, Thelenota ananas*) in captivity, and raising the larvae part way through their development cycle. The team believes that by refining the technology during a series of experiments, beche-de-mer larvae can be raised to the stage of post-settlement juveniles. This could ultimately lead to relatively low technology, small-scale hatcheries that could be operated in Pacific Island countries. While further research is necessary to determine whether recruitment is likely to be a factor limiting beche-de-mer populations, if this ultimately proves to be the case then holothurians could well be good candidates for reseeding programmes using hatchery-produced juveniles.

Richmond has strong views on the future of the beche-de-mer industry in Micronesia. He believes that given the level of demand required by most buyers (about 80 metric tons a year minimum), no Micronesian island or island group could supply the markets for more than two or three years without over-harvesting their resources. If the sea cucumber is to be considered a sustainable profitable fishery resource, regional co-ordination of the resource is therefore essential. Richmond believes that if the marketing operation is centralised, beche-de-mer can form a sustainable fishery resource in the Micronesian area, possibly one day with juvenile restocking forming part of the management programme for the resource.

ICOD SCHOLARSHIP IN MARINE RESOURCE MANAGEMENT AND CONSERVATION

(Source: ICOD)

Each year the International Centre for Ocean Development (ICOD) offers four scholarships for civil servants from developing countries to attend the International Ocean Institute (IOI) training programme in 'Marine Resource Management and Conservation'. The 1989 course will be held in Halifax, Nova Scotia, Canada from 12 June to 18 August.

The basic purpose of the programme is to improve the analytic competence of the participants on issues relating to ocean management. Specifically the objectives of the programme are:

— To familiarise participants with all the major uses of the marine environment and its resources;

— To assist participants in the harmonisation of national legislation, integrating the policies of national and international institutions to maximise the contribution of the marine sector to the national economy, with due consideration to the conservation of marine resources and the marine environment.

The programme therefore contains a blend of policy making and managerial concerns. The first week lays down a foundation in oceanography, emphasising the interrelationships that exist across the globe and the relevance of the marine sciences to resource exploration and exploitation. In the second week participants examine the UN Convention of the Law of the Sea. Such diverse topics as polymetallic nodules, navigation, energy, artificial islands, archipelagic waters and other topics are considered. Subsequent weeks examine national experiences in ocean management, the role of international organisations, the management of fisheries, oil and gas, shipping and navigation as well as health and safety measures offshore.

For further information, contact: *ICOD, 9th Floor, 5670 Spring Garden Road, Halifax, Nova Scotia, Canada B3J1H6.*

NEW FISH MARKETS READY BY CHRISTMAS

(Source: *Australian Fisheries*)

Stage One of the Sydney Fish Markets' redevelopment programme was expected to be completed by Christmas. The new complex, built at a cost of AUS $ 18 million, will feature:

— three times the auction selling space of the existing markets,
— modern processing and cold storage facilities,
— increased space for seafood retailers and wholesalers,
— extra retail areas, car parking and improvements to the waterfront on Blackwattle Bay to capitalise on the market's growing tourist attraction,
— lower handling costs — the New South Wales Fish Marketing Authority to reduce costs and operate more efficiently.

One of the more innovative features of the new markets will be computerised Fair Auction Selling Technology (FAST). The Fish Marketing Authority, in a joint project with an Australian Company, Kel Aerospace, and with the assistance of both Federal and State Governments, is developing the first computerised FAST system in Australia.

The FAST auction (also known as the Dutch auction) was first implemented in northern Europe and has been running successfully for over a century. This method increases the speed of an auction where perishable goods such as fish require a fast turnaround time.

Unlike the conventional style of auction, the FAST system works in reverse, with the price starting at its highest point and decreasing until a buyer bids by stopping the price dropping. A sale is then made.

The Fish Marketing Authority's FAST system will be able to handle 250 buyers and run two auctions at the same time. Under the current auction system it takes more than two hours to sell 1 000 lots whereas FAST will sell 2 000 lots in the same time.

The main advantage is that the system operates on a more effective one bid/one sale principle rather than a number of bids/one sale. Buyers using the bidding terminals will be able to stop the clock and register a bid. A 'user friendly' display informs buyers if they have failed or succeeded in their bidding.

USA FINANCES PROJECT
(Source: *Samoa Observer*)

The United States Agency for International Development (USAID) has provided US$ 22,000 to fund a three-year programme for building and deploying fish aggregating devices.

In the past, USAID, along with other overseas donors, has already provided assistance to build and install the fishing devices. Most of them have either been scooped away by big fishing boats or damaged by vandals.

These devices, deployed about 10 miles from land in certain places around the islands, attract small fish, which in turn attract large schools of yellow-fin and other fish that prey on them. These schools of fish, in turn, attract fishermen and their baited lines.

USAID's assistance will purchase the materials such as ropes and steel fittings for the devices. It will also pay for their local assembling. It is hoped that the devices will not mysteriously disappear now as they have in the past. USAID has just given the Fisheries Division a multipurpose vessel, the *Tautai Matapalapala* , whose job is to patrol the devices regularly.

There are only five devices deployed around Samoa at the moment, three off Upolu and two off Savaii.

TUVALU GOES IN FOR TROCHUS
(Source: *Fiji Times*)

The United Nations Fishery Support Programme has come to the aid of Tuvalu as the tiny island nation tries to establish a new marine industry. Tuvalu asked the programme for assistance in transplanting trochus shells from Aitutaki in the Cook Islands. The shells are used to manufacture buttons for high quality clothing. Harvesting them can earn valuable currency for developing countries.

Unfortunately, transport was a problem. Most of Tuvalu's islands have no landing strips and many do not have harbours for ships. The Fishery Support Programme was able to find a solution. Five thousand trochus shells were collected in Aitutaki and flown by the Royal New Zealand Air Force to Tuvalu. Without landing, the planes parachuted boxes of shells into three remote atolls, where crews had previously been trained on how to seed trochus on the reefs.

NEW NATIONAL FISHERIES HEADQUARTERS FACILITY FOR SOLOMON ISLANDS
(Source: Ministry of Natural Resources, Solomon Islands)

The Fisheries Division of the Ministry of Natural Resources, Solomon Islands Government, recently took up residence in a new, specially designed headquarters building at Kukum, a

suburb to the east of the city of Honiara, capital of the Solomons. The building forms the major part of an institutional upgrading project intended to increase the Government's capabilities in the management and development of fisheries resources in Solomon Islands.

Built with funding assistance from the Australian International Development Assistance Bureau (AIDAB), the facility cost in the order of SI$1.4 million. Construction work was completed in August 1988, and the building was officially handed over to the Government by the Australian Minister for Foreign Affairs, Senator Gareth Evans, in November 1988; Fisheries personnel took up residence shortly afterwards.

The main building is situated on the sea front, which makes access to the sea a far easier proposition than was the case when the Division was situated behind the Ministry of Natural Resources' Forestry Division building, some two miles inland on the top of a hill! The new headquarters comprises a wet and dry laboratory, ample office space, a classroom, refrigeration workshop, fishing gear store, general gear store, two conference rooms, a library and a computer room. Also on the site are a small net repair/rigging facility and a covered car/boat park area and fuel store. A slipway to the east of the facility allows easy launching of Fisheries (and other Ministry) canoes.

Due to arrive during January/February 1989 are two trailer-borne, 8 metre aluminium workboats for research/survey work, additional computer hardware, an ice making machine, microscopes, chemicals and other laboratory supplies, an air compressor, and two 4-WD trucks.

Some offices in the building have been allocated to a number of agencies which are collaborating with the Fisheries Division in various ways; these include an office for a resident scientist from CSIRO of Australia, who is working with the Fisheries Division on baitfish/reef fish interaction studies; an office for ICLARM staff working at the coastal Aquaculture Centre, west of Honiara; and office space for research staff members of the Institute of Marine Resources, University of the South Pacific, the research wing of which is due to move to Honiara in the not too distant future. As a second phase to this project, a new Fisheries Sub-station will give the Fisheries Division a physical presence at the port, which will facilitate routine checking of vessel logsheets and baitfish catch reports as vessels land their catches. Fisheries personnel will also be able to investigate reefer vessels which call at the port and check for illicit shipments of turtle shells, crocodile skins etc.

The sub-station will also act as a staging post for Fisheries observers waiting to board commercial fishing vessels, as well as facilitating applied research and development activities in collaboration with Western Provincial fisheries authorities. A residential house and small wharf will also be constructed under the second phase.

The Government of Solomon Islands is grateful to AIDAB for its continuing support in the implementation of this project.

HONIARA HOSTS WORKSHOP IN LENGTH-BASED METHODOLOGIES

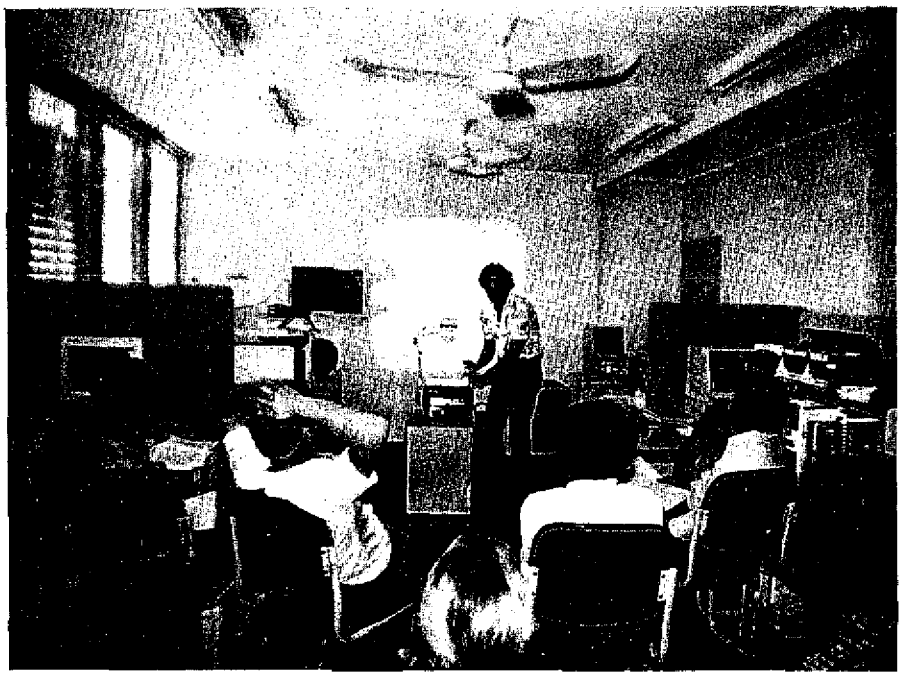
(Source: Ministry of Natural Resources, Solomon Islands)

A workshop on the use of length frequency-based methods in fish stock assessment was held from 5 to 16 December 1988, at the National Headquarters of the Fisheries Division, Ministry of Natural Resources, Honiara, Solomon Islands. Funded by the International Centre for Ocean Development (ICOD), the United States Agency for International Development (USAID) and the International Centre for Living Aquatic Resources Management (ICLARM), the workshop concentrated on the use of the Electronic Length Frequency Analysis (ELEFAN) suite of programs for analysing length data from a range of different fisheries. The workshop was conducted by Nonong Gayanilo of ICLARM headquarters, Manila, Philippines, and was organised in collaboration with Andrew Wright, Research Coordinator of the Forum Fisheries Agency.

Course participants included Sharma Subodh (Fiji), Being Yeeting and Temawa Taniera (Kiribati), Albert Carlot (Vanuatu), Alois Wafy (Papua New Guinea), Tanielu Sua (Western Samoa), Sarah Langi (Tonga), Gideon Tiroba (Solomon Islands) and Nick Rawlinson (CSIRO). Participants brought datasets from their respective countries to the workshop and applied the length-based methodologies to them.

During the second week, John Hampton, Senior Scientist, South Pacific Commission, assisted by demonstrating the application of other micro-computer programs such as MULTIFAN, as well as pointing out the general limitations of all length-based methodologies, especially when applied to datasets from deepwater snapper fisheries and certain invertebrate fisheries. However, the benefits of applying such software packages were apparent and their usefulness as tools in the analysis of extensive datasets or as a means of validating analyses by other techniques was appreciated by all participants.

On the final day of the workshop, a general discussion was conducted on the usefulness of the workshop, which identified areas in which future courses of this sort could be improved. It is anticipated that the National Fisheries Headquarters in Honiara will serve as a venue for similar workshops again in the future.



Workshop participants hear Tanielu Sua of Western Samoa presenting his analysis by ELEFAN of fisheries data from his country.

GOLDLIP SHELL SURVEY GETS UNDER WAY IN SOLOMON ISLANDS

(Source: Ministry of Natural Resources, Solomon Islands)

Solomon Taiyo Ltd., the largest tuna fishing company in Solomon Islands, undertook a survey of goldlip (*Pinctada maxima*) shell resources around the island of Isabel (in the north of the Solomons group), in collaboration with the Fisheries Division, Ministry of Natural Resources. The survey, conducted between 18 November and 23 December 1988, was carried out in order to assess the possibility of developing goldlip pearl culture in the country.

The survey was conducted around the areas of Kia (north-west), Buala (central) and Tatamba (south-east Isabel); these areas were commercially exploited during the 1960s, with an

estimated annual production of 18 tonnes. This fishery declined, however, due to dwindling stocks and a decrease in market prices for the shell.

Diving in selected areas was carried out by a team of three divers: two commercial contract divers from Japan, who used hookah (surface air-feed) equipment, plus Senior Fisheries Officer Paul Nichols of the Ministry of Natural Resources, who dived using SCUBA. Diving was carried out from a 7 metre Yamaha workboat, to a maximum depth of 40 metres in most places.

Results from the survey were not encouraging for the sites visited by the team; the coverage rate of shells was very low (on average, less than 1 shell / 1,000 sq.metres). However, due to reef ownership problems, some areas which are reported to hold substantial goldlip stocks were not dived; thus a follow-up survey may be planned. Should sufficient stocks of goldlip shells be located to supply adequate numbers of shells to a culture industry, the production of cultured blister and round pearls in Solomon Islands could become an important new development in the country's fisheries sector.

Members of the goldlip survey team holding specimens of *Pinctada maxima* aboard the survey vessel.

LOBSTER EXPORT FEASIBILITY STUDY

(Source: *Marshall Islands Journal*)

An international food distributing company from Tampa, Florida was in Majuro, Marshall Islands, recently to undertake a lobster export feasibility study. B & B Foods International was looking into the possibility of using commercial lobster traps to harvest lobsters locally. B & B staff have been laying traps in Majuro and Arno to study how they would work in an atoll situation.

B & B executive Bob Blanco said there was a big demand for lobster tails in the mainland United States and a market for live lobsters in Hawaii. He would like to service that market. The company had permission from the Majuro and Arno local governments to do a two-week

study. B & B is a conservation minded company which only harvests mature lobsters. Female lobsters with eggs are released to complete their reproduction cycle.

Michael Harris and Todd McVicker helped Blanco set traps in water 30 to 50 feet deep near Iroij island and Ine Arno. In their first attempts in deeper water no lobsters entered their traps. They said that if the traps did not work they might try the traditional reef-picking method and put holding pens in the outer islands. They could then just purchase live lobsters from Marshallese fishermen in the outer islands and process them for export.

The company currently buys lobsters from the Bahamas and other Caribbean countries. It then processes and distributes them throughout the eastern and southern markets in the United States.

FISHERIES SCIENCE AND TECHNOLOGY

OYSTER AND SHRIMP TEAM UP IN UH RESEARCH

(Source: *Makai*)

Oysters and shrimp are forming a partnership which may help make oyster aquaculture a profitable industry in Hawaii.

Researchers at the University of Hawaii (UH) Department of Agricultural Engineering are studying an oyster-shrimp joint production system, which could reduce costs and solve other problems related to oyster and shrimp aquaculture.

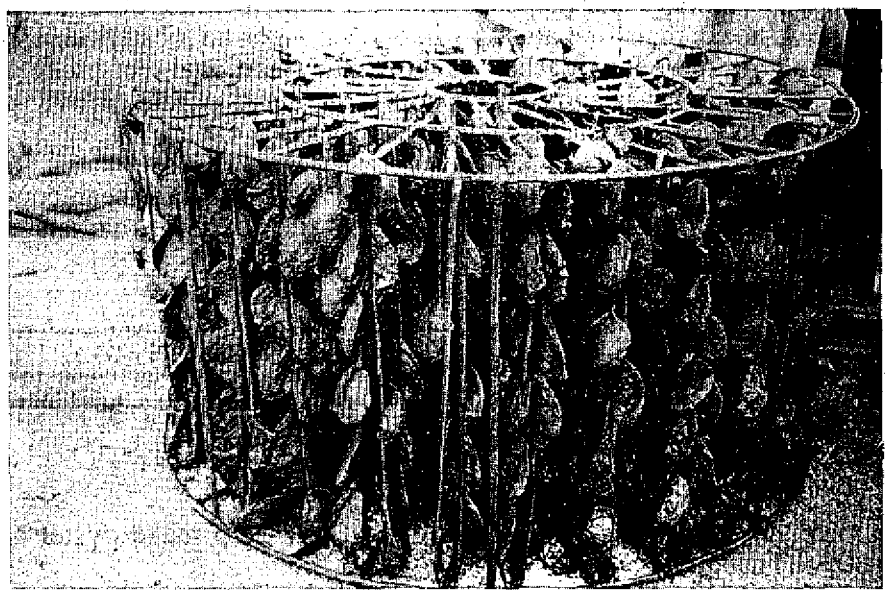
'Hawaii should be the major exporter of subtropical aquaculture products, but land here is limited and aquafarmers are having problems with waste water. So why not find a solution to both?', Dr Jaw-Kai Wang, who heads the research effort, said. Wang and his research team believe they have found a solution. Oysters are filter feeders, which means they feed by pulling suspended particles from water. In a joint production system, effluent (waste water) from shrimp ponds is pumped into oyster tanks and filtered by the oysters. This process feeds the oysters, maintains water quality for the shrimp, requires no additional land, and reduces energy and labour costs.

The joint production system project, which was Wang's brainchild, began last year at Amorient Aquafarms on Oahu and is funded by the U.S. Department of Agriculture. This project has led Wang and his team of researchers to other projects dealing with various aspects of oyster aquaculture.

'One problem was the parasitic worm *Polydora websteri* that drills into oyster shells and kills the oyster', Wang said. The *Polydora* worm was one of many problems that plagued attempts in the 1970s and early 1980s to raise oysters in Hawaii. Wang and researcher Greg Jakob solved this problem by soaking oysters in a fresh water solution for 30 minutes every other week. So far, no treated oyster has died from the *Polydora* worm, although non-boring species of the worm have been found in some tanks and naturally occur in some shrimp ponds. 'We are just in our first year, so we have to wait and see, but all indications look good that *Polydora* will not be a problem', Wang said.

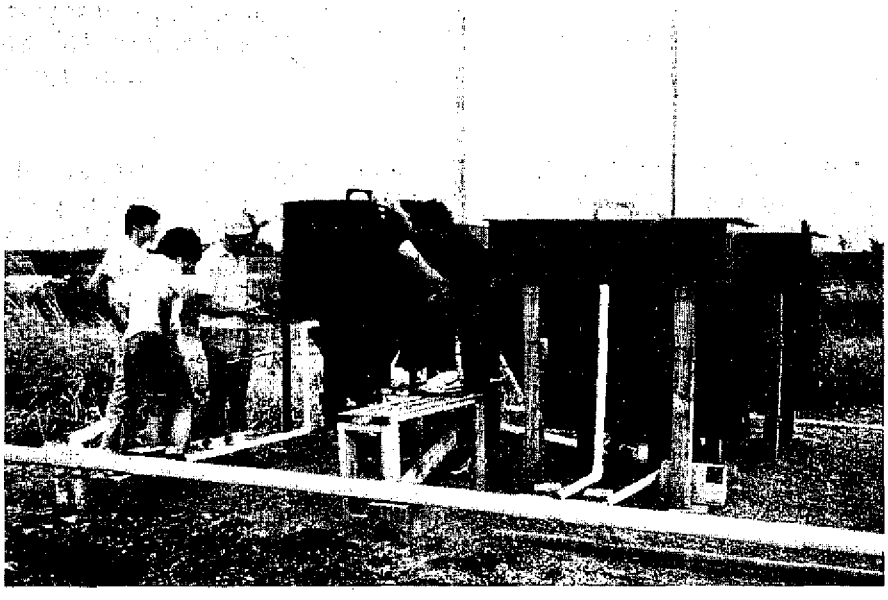
One major project is attempting to induce spawning in captive oysters in Hawaii. The American oyster, *Crassostrea virginica*, is native to the U.S. east coast and spawns when water temperature increases. Because temperatures remain relatively constant all year round in Hawaii, it is difficult to induce spawning. By lowering water temperature in oyster tanks and then raising it, researchers have 'fooled' oysters into spawning. UH researcher Dave Robichaux has used this technique with limited success. The need to induce spawning has become more pressing because of a serious problem with oysters from the east coast. 'MSX (multinucleated sphere unknown), a deadly disease that afflicts oysters, is destroying the oyster

industry along the entire eastern seaboard. We have a disease-free population in Hawaii, and we could ship them all over the world, year around, as guaranteed MSX free', Robichaux said.



These oysters will be cleaned and inspected before being returned to their tank. (Photo: Tom Allen)

One problem with using shrimp pond effluent for oyster aquaculture is that there are often too many particles in the water. 'Shrimp pond effluent has a lot of suspended solids that just eat up the oxygen in the water', Jakob said. The problem is compounded because of the design of some of the ponds. Shu Zhang, a graduate student from China, is studying ways to measure the quality of water going into and coming out of oyster tanks. Zhang is also designing a sedimentation tank that will hold the water from the shrimp ponds until the sediments settle on the bottom of the tank. The water will then be pumped into the oyster tanks. The key is for the water to have small suspended particles to feed the oysters, without large fecal and other particles that tend to deplete the oxygen supply and hinder the oyster's growth.



Dr Wang (third from left) and his research team check one of the oyster tanks at Amorient Aquafarms. (Photo: Tom Allen)

Labour reduction is a primary concern for the researchers. Jakob is designing several tanks that will have water jets mechanically clean the oysters. 'We get so much muck coming out of the ponds that we need a way of continuously cleaning the oysters without having to drive 50 miles out to the farm every week to do so', Jakob said.

Several researchers are also attempting to reduce labour by studying the settling of oysters. After a period of metamorphosis, free-swimming oyster larvae settle or attach themselves to a stationary object, often another oyster, and then continue to develop. This poses a special problem for the half-shell market because buyers don't want oysters that are stuck together.

Oysters farmers now spend a lot of time cleaning the oysters and keeping them separate. Through the use of a 6-foot acrylic cylinder, called a fluidised bed nursery, juvenile oysters grow unattached, supported by a stream of nutrient-rich water. If the fluidised bed is successful, the oysters will be clean and unattached, which means they will be highly attractive to the half-shell market.

'We don't know how long we can keep juvenile oysters in the fluidised bed before the growth rate slows; that is part of the experiment', said May Ver, a graduate student on Wang's research team. Other researchers are studying oyster arrangement in order to make harvesting and cleaning easier and to make mechanised handling possible. Under a project being conducted by Leo Ver, oysters are hung vertically on plastic strips suspended from the top of a tank. 'This allows for uniform growth and makes cleaning and checking easier because we simply lift the strips out of the tank', Ver said.

By growing oysters on plastic strips, researchers hope to make cleaning and handling easier. (Photo: Tom Allen)

The suspended culture has reduced cleaning, handling and general maintenance time. However, growth rates are still the same. Researchers on a related project are studying how to make the oysters attach themselves to the plastic strips. This is difficult because wild oyster larvae prefer to settle on certain materials. 'The larvae prefer other oyster shells and don't really care for plastics', Robichaux said. Currently, the oysters must be glued to the strips by hand. If they settle directly on the strips, a lot of time and manpower could be saved. People have known how to grow and cultivate oysters for centuries. Now, agricultural engineers, like Wang and his researchers, are exploring ways to make oyster aquaculture profitable.

ABSTRACTS

FISH TRAP TRIALS IN THE LAGOON OF NEW CALEDONIA, by Michel Kulbicki and Gérard Mou-Tham, 1987. Institut français de recherche scientifique pour le développement en coopération (ORSTOM). 22 pp.

In estimating the suitability of methods for evaluating coral fish resources, 112 Z traps were set, 69 in the south-west lagoon and 43 in the northern lagoon of New Caledonia. Yields were 4.57 kg/trap, average fish weight being 3.37 kg. Catch was distributed among 33 carnivorous species, representing 11 families.

Serranids, Lutjanids and Lethrinids made up 80 per cent of the catch. Species composition and yields varied with depth. Soaking time, which was between 9 h and 25 h, had no noticeable effect on catch. Yields and average fish size were larger in the northern than in the south-west lagoon.

Traps were not selected as sampling gear because yields were too low and, contrary to expectations based upon a bibliography review, all species caught were carnivorous.

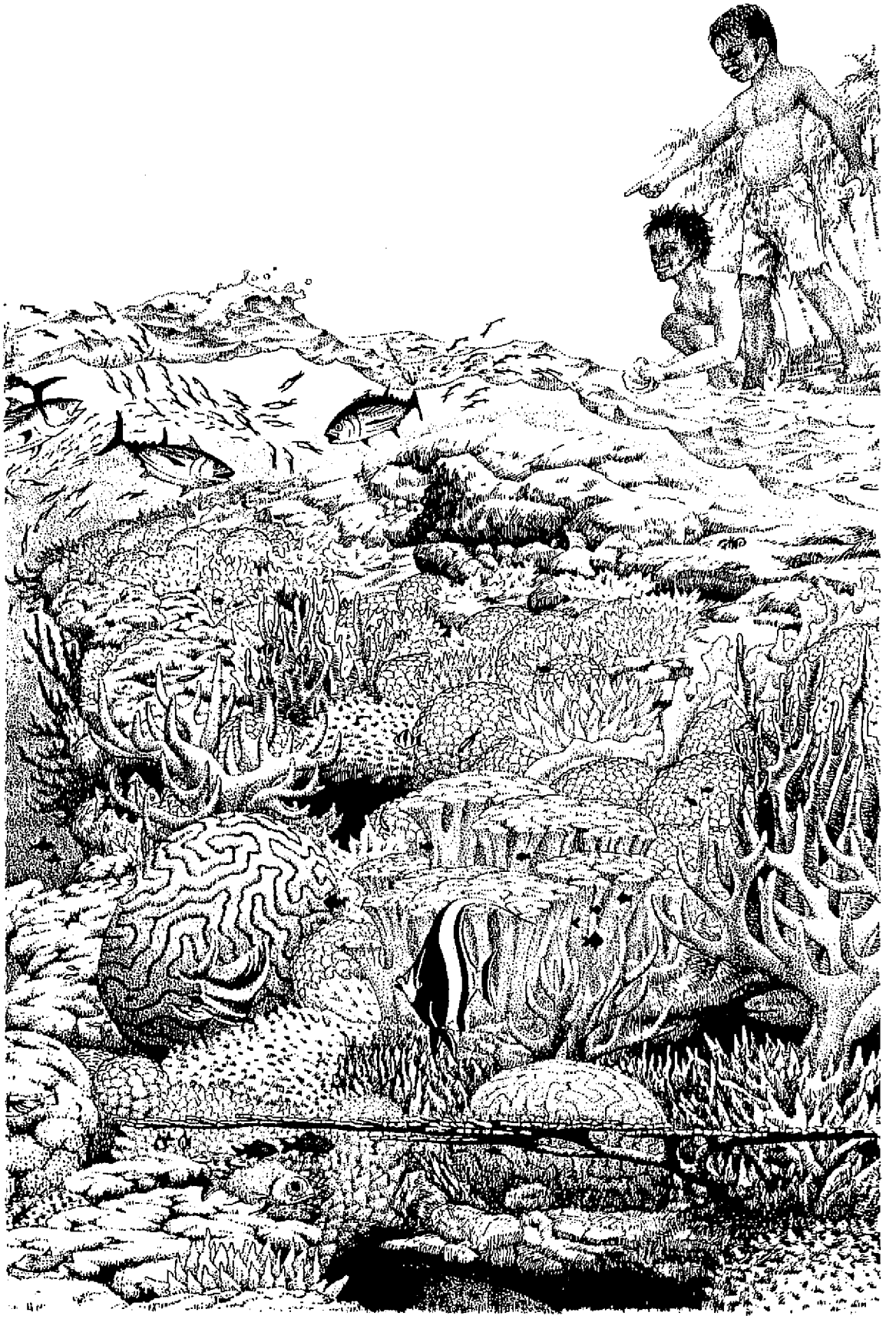
MANAGEMENT OF THE NORTHERN LAGOON OF NEW CALEDONIA: FIRST RESULTS OF THE STUDIES ON THE SAUCER SCALLOP *AMUSIUM JAPONICUM BALLOTI* (BIBLIOGRAPHIC SYNTHESIS, STOCK ASSESSMENT AND RELATED DATA), by Jacques Clavier and Pierre Laboute, 1987. Institut français de recherche scientifique pour le développement en coopération (ORSTOM). 73 pp.

Three trawl sampling surveys were performed in the northern lagoon of New Caledonia to assess the stock of the saucer scallop *Amusium japonicum balloti*. An estimated biomass of 3 000 metric tons was obtained from stratified sampling of *Amusium* beds which cover an area of about 700 km^2. These beds lie from the Belep archipelago down to the northern part of the Grande Terre. This species may be a potential source of income for local fishermen. In the sampling area, which covers 3 000 km^2, unsuitable trawling bottoms account for about 20 per cent of the local surface.

PRELIMINARY RESULTS OF BOTTOM LONGLINE TRIALS IN THE SOUTH LAGOON OF NEW CALEDONIA, by Michel Kulbicki, Gérard Mou-Tham, Georges Bargibant, Jean-Louis Menou and Philippe Tirard, 1987. Institut français de recherche scientifique pour le développement en coopération (ORSTOM). 104 pp.

Two hundred and seventeen bottom longlines, totalising 27 000 hooks, were set in the south-west lagoon of New Caledonia between August 1984 and December 1985. Catch was distributed among 15 families totalising 67 species. The main families were Serranids, Lethrinids and Lutjanids. The average CPUE was 7.5 kg /100 hooks, corresponding to 4.7 fish/100 hooks, with an average fish weight of 1.6 kg. Fishing time was between 5 am and 7 pm and had no significant effect on overall catch. CPUE in numbers and weight, along with

average weight, increased with depth and from the coast to the barrier reef. CPUE also increased with rough sand levels in the sediment but was inversely affected by silt levels. CPUE and the percentage of Serranids and Lutjanids in the catch decreased in a 20 nautical mile radius around Noumea. This is attributed to the high intensity of recreational fishing in that area. Visual censuses were performed over 20 longline sets, allowing correlation of CPUE with densities calculated from the visual counts. From these results it was possible to estimate at 13,500 tons the quantity of fish catchable by bottom longline in the south-west lagoon. Geographical distribution of the main families, the main species and overall CPUE are given.



HAWAIIAN-STYLE DECAPTERUS FISHING TRIALS IN TONGA

by

Robert Gillett
FAO/UNDP Regional Fisheries Support Programme
Suva, Fiji

Introduction

In March 1987, Hawaiian-style decapterus fishing trials were carried out in Niue. The results of this work were presented at the SPC Regional Technical Meeting on Fisheries in 1987. At the meeting, representatives from several South Pacific countries expressed interest in conducting similar trials and it was subsequently decided that Vava'u, Tonga would be the most appropriate location for the fishing. This decision was based on support by the Tonga Fisheries Division, previous ease of carrying out experimental fishing work in Tonga, and the fact that Paul Mead, an SPC Masterfisherman involved in gear development, was based in Vava'u. The month of February was chosen to do the trials, on the basis of reports of an abundance of decapterus on the local fish aggregating devices (FADs) and in nearshore pelagic areas during the previous February. In addition, decapterus is characteristically plentiful in February around Niue Island, which is relatively near Vava'u and at a similar latitude.

Decapterus

Fish of the genus *Decapterus* are called 'atule kau' in Tongan and scads, round scads, and mackerel scads in English. As in other members of the family Carangidae, scutes are present on the posterior lateral surface of the fish body. The feature that distinguishes these fishes from other carangids is the finlet behind the dorsal and anal fins. Personal correspondence and a review of the recent literature indicate that four species of decapterus are common in the Islands of the South Pacific: *Decapterus macarellus* (Figure 1), *D. macrosoma*, *D. kurroides* and *D. russelli*.

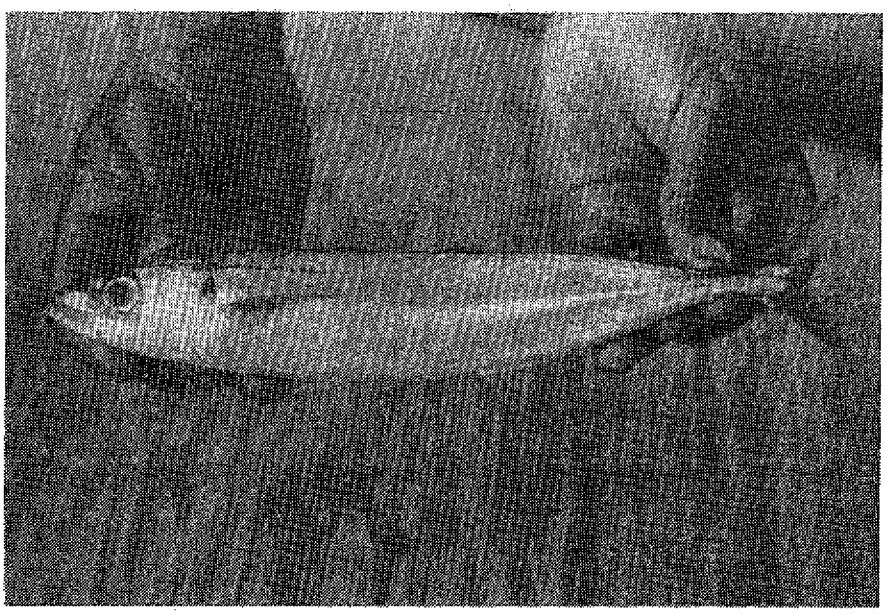


Figure 1. Decapterus macarellus

The most significant fishery for decapterus in the Pacific Islands is in Hawaii, where an average of about 122 tonnes of *D. macarellus* are captured per year. The majority of this catch is taken by hand lines and hoop nets. A diagram of Hawaiian hoop gear is given in Figure 2.

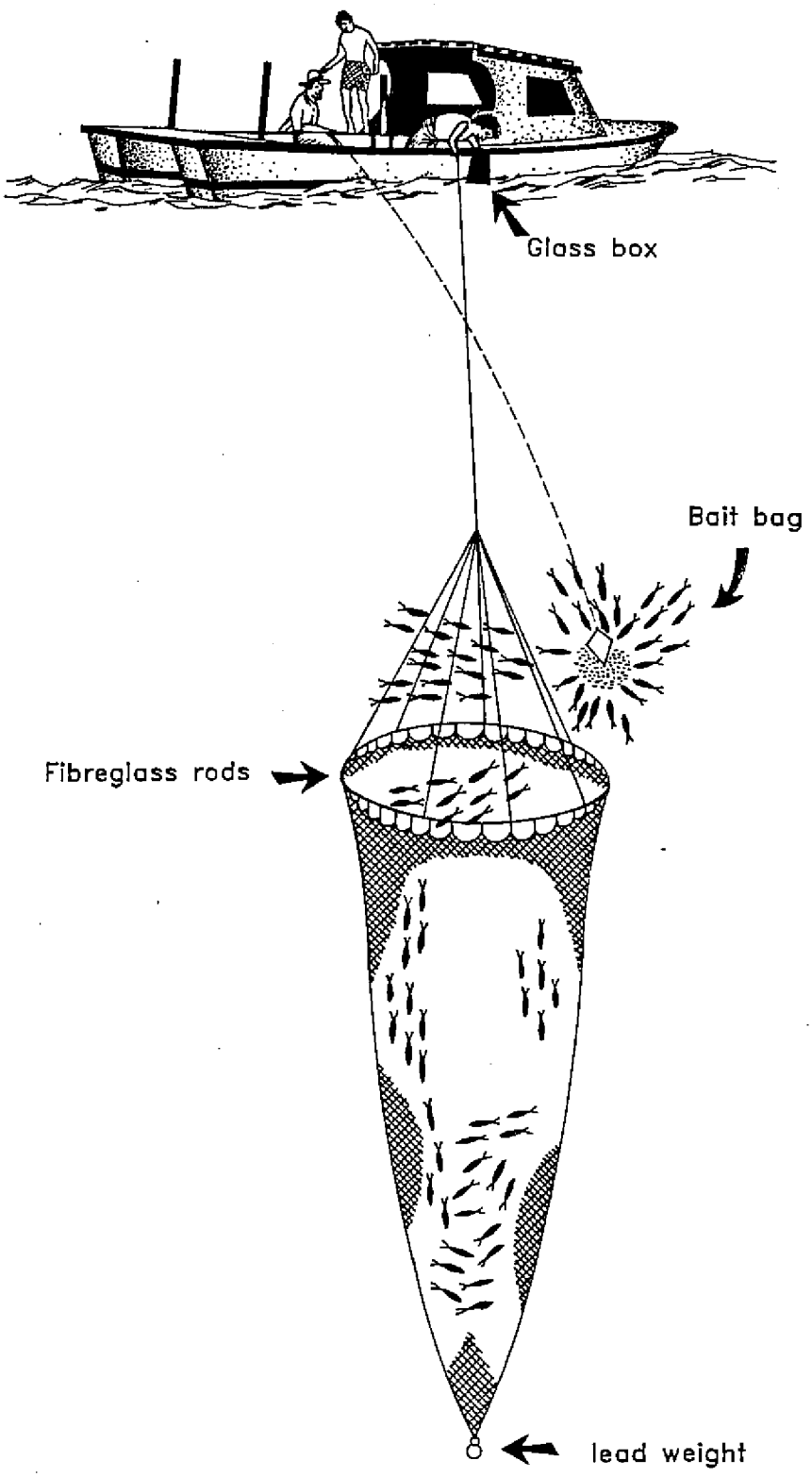


Figure 2. Hawaiian techniques for capturing Decapterus.

Tsubaki and Kawasaki (undated) give details on the catches made by a small purse seine vessel in Tonga. They report that *D. russelli* and *D. macrosoma*, along with two other carangids, comprised 38 per cent of the catch of the seiner in Vava'u.

The Tonga survey

The survey was carried out from 9 February to 1 March 1988. Personnel consisted of Paul Mead (SPC Masterfisherman), Robert Gillett (FAO/UNDP Fisheries Development Adviser), Mark Bondurant (U.S. Peace Corps Volunteer), Peni Lolohea (Tonga Fisheries Division) and Ekani Lisiate (Assistant to the Masterfisherman). A 10 metre open fibreglass skiff powered by a 55 hp outboard engine was used on all fishing expeditions. On one occasion an 8 metre diesel launch equipped with a Koden colour depth sounder accompanied the skiff.

The fishing gear consisted of the net, weights, fibreglass rods, chum bag, and sight box. Details of the equipment are given in Gillett (1987). Much of the work in the Tonga survey consisted of casting the chum bag to a desired depth, releasing the bait, and observing through the sight box any fish which might be attracted to the area. Bread, cabin biscuit, canned mackerel and pumpkin were used as chum.

Thirteen fishing expeditions were carried out during the survey period. The purpose of two trips was to familiarise the crew with setting the net and to practise manoeuvring fish with chum. Eleven of the expeditions were made specifically to locate areas in which decapterus were present. Most of the searching effort was directed towards areas in which decapterus would be vulnerable to hoop net gear, that is, nearshore pelagic areas in water 25 to 60 metres deep on the lee sides of islands and around four FADs. The locations surveyed are shown in Figure 3. Most of the decapterus prospection was done in the period shortly after dawn to mid-morning.

A Hawaiian fisherman with a long involvement with the decapterus fishery, Walter Paulo, was consulted twice by telephone.

Results and discussion

During the survey period, decapterus were not observed in areas where they would be vulnerable to the hoop net. After failing to detect these fish in these sites, the team searched other locations such as entrances to channels, shores of deep bays, windward sides of reefs, and isolated rock islands. This was similarly unsuccessful. Decapterus were observed on a few occasions at evening twilight in some of the calm bays, but poor water clarity and the fact the fish were not attracted by the bait eliminated the possibility of fishing in these areas.

The absence of decapterus in nearshore pelagic areas and around FADs was markedly different from that reported by the SPC Masterfisherman during the previous year. During February 1988 the weather was much warmer than usual, there was an uncharacteristic lack of wind, and the sea surface temperature was reported to be above normal. Perhaps these atypical environmental conditions may have affected the distribution of decapterus. It is interesting to note that during this period schools of skipjack tuna were rare in the area around Vava'u.

A small purse seine vessel, the *Albacore*, operated in Vava'u during the survey period. Seining was carried out in some of the larger bays at night by attracting schooling pelagics including decapterus by lights. The decapterus in the catch were tentatively identified by the staff of the survey as *D. macarellus* and *D. russelli**. During four nights of fishing an average of 116.5 kg

* Tsubaki and Kawasaki (undated) report, however, that *D.macrosoma* and *D.russelli* were present in the purse seine catch. During the present survey, specimens were forwarded to decapterus taxonomic authorities for verification.

of fish (57% selar and decapterus) were reported captured. In contrast, during February 1985 (the only other February for which catch data were available in Vava'u), the average catch per night was almost twice as large. This supports the contention of a reduced abundance of decapterus in February 1988.

It should be noted that decapterus attracted to lights at night are not vulnerable to hoop net fishing gear as they move too rapidly.

When casting the chum bag it was noted that a species of fusilier (*Caesio* sp.) was attracted and reacted similarly to decapterus. In the absence of decapterus, practice sets were made on the fusiliers to gain experience with the net and with enticing the fish into the area at the mouth of the hoop.

Future work

Because of the apparent absence of decapterus in areas where hoop net fishing gear can be used, it was not possible to evaluate the suitability of the technique for areas such as Vava'u. Assuming that the month was atypical with respect to decapterus abundance and distribution, there are several options for future hoop net trials. The SPC Masterfisherman and his assistant are well acquainted with the gear and the trial sets on fusiliers have allowed them to become familiar with the techniques for manoeuvring fish. All the fishing gear used in the survey was turned over to the Masterfisherman, along with sufficient funds for outboard engine petrol for seven fishing expeditions. If further assistance is required from FAO/UNDP staff, it may be possible to arrange this in conjunction with bibliographic work planned for Tonga in the near future. Alternatively, the services of a Hawaiian decapterus fisherman may be considered more appropriate.

Other matters of interest

In the course of searching for decapterus, several large coral heads were examined for the presence of cardinal fish. In the eastern lagoon, a coral head containing an estimated 100 kg of various species of cardinal fish was located. In Tuvalu, it has been shown (Gillett 1985) that these fish can be used as a supplement to night catches of baitfish for pole and line operations. In addition, their very low mortality in bait tanks allows them to be used on small, non-specialised fishing craft.

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INFORMATION ON FOAMING FAD BUOYS AND AVAILABILITY OF FOAM SUPPLIES

by

A.Robertson and R.Farman

During the South Pacific Commission (SPC) FAD workshop held in Kiribati in 1987, many participants reported that, in their experience, floats which used two-pot polyurethane foam became waterlogged. Also, during the foaming demonstration there were some unanswered questions raised about the properties of foam and debate about correct foaming techniques. Because of this, and following enquiries received by SPC about the availability of foam supplies, Richard Farman, Fisheries Research Scientist with the SPC Tuna and Billfish Assessment Programme, contacted the local supplier in Noumea (STIC) for information on these subjects. STIC is the only wholesaler of such material in Noumea; it specialises in building installations, principally roofing, but has some experience in the marine area, having constructed buoys for nickel barges and for supporting tanker fuel pipelines. At that time, the manager of STIC had just returned from a fact-finding mission in France where he reviewed the latest foam technology. He provided the information contained in this article.

Selecting a suitable foam

Whether polyurethane foam becomes waterlogged or not depends on its density. If it is not very dense (for example, 25 kg/cu m) it will be very light in weight, but there will be space for water to enter and the foam will very quickly become waterlogged. A density of 55 kg/cu m is necessary before the foam is impermeable (98%) and water cannot enter. At this density, pieces can be removed or knocked off without letting the water in and the float can eventually be repaired. It is, however, only possible to achieve this density by using specialised machinery, which makes it impractical to fill FADS in most Pacific Island areas. However, certain steps can be taken to lessen the porosity of foams, as follows.

Different densities of foam can be achieved in two ways:

(a) By increasing the amount of mixture for a given volume.

If an excess of mixture is poured into a sealed container, the foam will not be able to expand to the volume for which it was designed and, as it is restricted to a smaller space, it will become more dense. This is not recommended as a means of increasing density, however, as it puts a lot of pressure on the walls of the container, which would then need to be reinforced.

(b) By choosing a mixture which is designed to make a denser foam.

Two-pot mixes come with different specifications to give foams of different densities. The more dense the foam, the less it will accept water, but the heavier it will be. As it is not possible to make foams of more than 40 kg/m^3 without the use of machinery, it is recommended that a mixture be selected with a specification which will give a foam up to that limit of density (60% impermeable). Even this foam will become waterlogged in approximately six months if not protected. It should be noted that 40 kg/m^3 foam will, if not restricted, expand into a greater space and end up at a lesser density, so some sort of a restriction is necessary when foaming. The adviser considered that as long as correct amounts were measured, the pressures involved

in foaming with the 40 kg/m^3 mixture would be quite tolerable for most containers used as FAD buoys. Take care not to put more than the required mixture into a sealed space: the bubbles are formed by chemical action and the gas could split a container, whether sealed or not.

How to foam a container

From the foregoing it can be seen that polyurethane foam, by itself, is not sufficient for use as a FAD buoy. This type of foam must only be regarded as providing reserve buoyancy, in the event that the buoy or float is punctured. It therefore remains essential to ensure that the buoy is completely watertight after foaming.

The aim when foaming a container is to fill the container completely with a foam of even density, leaving no airspaces which could fill with water.

The following instructions were given to fill a 200 l (44 gallon) drum with foam at 40kg/m^3 :

— Prepare your drum with two partitions (you can use the lid with a heavy weight on it);

— Mix 3.8 kg of each re-agent, this will give you 200 l of foam at 38 kg/m^3;

— Stir the mix thoroughly and then pour it into the bottom of the drum;

— The foam will expand to the first partition, which you should move when it bulges;

— Remove the first partition and let the foam expand into the second partition, again until it starts to bulge;

— Remove the second and let the foam expand to fill the entire drum.

The reason for using this method is that the foam will expand more evenly under slight pressure. If there were no partitions, the foam at the bottom of the container would be more dense than that at the top. Also, foam expands like a cake; it rises in the middle and drags along the sides; by using the partitions and slightly less mixture than would fill the container at that density you will get a more even fill and avoid an air space.

If you are filling through a hole, or filling a very irregular shape such as a catamaran, it is not possible to use the above method, but try to use the same principles. If doing a large container, remember that the bottom will be more dense, therefore try to make this the part that is in the water. If pouring an odd shape, like a catamaran, pre-plan carefully to ensure that the foam fills all spaces, even if this means standing the container on its side or on end.

Pour just enough to fill compartments with slight pressure and try to pre-calculate volumes and mixes. Foam is expensive, so take care not to mix too much. Buy small quantities of foam rather than large quantities; it has a short shelf life in warm climates. Try to foam in a cool place. Take your time and keep utensils clean between pours.

Cost of foam and suppliers

To foam the 200 l container in the example given would cost, in Noumea, about US$ 60, a cost of US$ 300 per m^3. Prices quoted by STIC in Noumea depend on the quantity ordered. Presently they could satisfy only small demands, but would consider quoting discount prices for bulk orders, perhaps assembled through group buying.

Possible suppliers

For large quantities:

Union Carbide N.Z. Ltd.
7-9 Fanshawe Street
P.O. Box 1040
Auckland
New Zealand

Phone 796080. TX 2737 UNICARB

For small quantities:

A. Foster and Co. Ltd.
P.O. Box 1951
Auckland 1
New Zealand

Phone 33744. TX 60885

If you know of other suppliers, please inform the SPC Fisheries Programme which will forward the information to others who are interested. If you have technical questions regarding these products we will pass them on to the experts.

SPC WORKSHOP ON PACIFIC INSHORE FISHERY RESOURCES

by

G. L. Preston

Introduction

In March 1988, the South Pacific Commission (SPC) held a major workshop on Pacific Island Inshore Fishery Resources, which brought together fishery specialists and marine biologists from throughout the tropical Pacific to discuss questions of inshore fishery management in the region. The workshop, the first of its kind to be organised by the Commission, was the inaugural activity of the newly-established SPC Inshore Fisheries Research Project, which aims to provide assistance to the small island countries of the region in assessing and managing their fisheries.

The two-week workshop was organised according to resource topics, with separate sessions covering most of the important fisheries of the region, including those for deep-water snappers, reef fish, beche-de-mer (sea cucumbers), trochus shell, pearl oysters, crabs, shrimps and lobster. For each topic, a selected specialist gave a keynote address which presented participants with a summary of the main biological and fishing characteristics of the resource in question. Following this, other participants gave brief summaries of aspects of their own research and management work, experiences, or problems. Questions and discussions followed and these allowed participants, particularly those representing Pacific Island government fisheries bodies, to share experiences and discuss many common fishery management problems. Some of the main points emerging from these sessions are contained in the summary session notes on the following pages.

Interspersed with the resource topics were theme sessions that enabled advances or new findings about resource assessment methodology to be explored. These sessions focused on areas such as survey techniques, the use of remote sensing to assess coastal resources, traditional systems of fishery management in the region, and coastal zone management. Again, summaries of the most important sessions are given later in this article.

The meeting finished with a half-day session which aimed to identify specific fishery research and management problems in the region, and areas where programmes such as the SPC Inshore Fisheries Research Project could make the biggest impact. The gathering and evaluation of statistical information on fisheries was identified as an area requiring attention, as was the conduct of baseline field surveys and the standardisation of survey methodology so that the changes resulting from fisheries development could be assessed by repeat sampling. Lack of usable taxonomic guides and difficulties in access to scientific literature and information in general were raised as important problems for many scientists working in remote parts of the region. Staff training, shortages of research funds, conflict between fishery scientists and political decision makers, and other broad perennial problems, by no means confined to the Pacific region, were also raised by many participants.

The following paragraphs outline some of the more important issues discussed.

Stock assessment methodologies and techniques

This session focused mainly on some of the analytical methods used to measure changes in fish populations, the data required for these analyses, and the ways in which it could be gathered — by collecting statistics from existing fisheries, by carrying out surveys and experimental fishing, or, preferably, by a combination of both. The archipelagic nature of the Pacific Islands region allows many opportunities for the collection of comparative data from local fish stocks at different levels of exploitation. Although both statistical information and survey information have their shortcomings, the combination of both can often allow reasonable predictions of the response of a fish population or stock to changes in levels of exploitation.

Some of the shortcomings of conventional stock assessment wisdom were underlined during the discussions. In particular, the concept of maximum sustainable yield — the maximum total catch that can be repeatedly taken from a fish stock at optimum levels of fishing effort — is not necessarily the best target for Pacific Island countries to aim for in developing inshore fisheries. When maximum sustainable yield is achieved, catch rates for individual fishing units may have declined from the higher levels that would have prevailed in the earlier, less exploited period of the fishery. Optimising catch per unit of effort for individual fishing units may be a more appropriate goal.

The point was made that, if Pacific Island countries make the effort to draw from experience gained elsewhere in the world, they need not repeat the mistakes made by 'developed' countries in managing — or mis-managing — their fisheries. In particular, attention was drawn to the difficulties of a government — any government — taking politically unpopular steps to reduce the number of fishermen in a fleet, or to limit their catches in some way, once it is discovered that the level of fishing effort is too high for the fishery to sustain. This is a lesson that has been repeated many times in fisheries in Europe, the Atlantic, the Americas, Japan and elsewhere. One alternative may be to 'think small' and act to discourage overcapitalisation of fisheries, particularly in the early stages of development — which is where many Pacific Island fisheries are. There is no doubt that initial catches and catch rates drop after the fishery becomes established and this needs to be recognised by realistic development planning. The conflict between this 'conservative' approach to fisheries development, and the wishes of Pacific Island countries to get the most from their fishery resources as quickly as possible — in many cases coupled with the eagerness of aid organisations to help them do so — is clear. Steps to increase awareness of the vulnerability of fishery resources, which in the Pacific are often small and vulnerable to rapid over-exploitation, are needed, particularly at the level of public administrators, political decision makers, planners and development funding agencies.

An important question to be asked concerned this basic problem, faced by fishery scientists world-wide: if the political will-power to make unpopular management decisions is lacking, what is the point in expending energy and resources in collecting data and using it to make stock assessments and forecasts that will not be acted on? The answer is that all fisheries that are not effectively managed sooner or later reach a crisis in which some action, however unpopular, must be taken to regulate fishing. At this time, the availability of historical information on the fishery's development is fundamental to the formulation of a sensible management programme. The mistake made in many fisheries has been that of not collecting data until a crisis occurs, at which point there is no comparative information available from the more productive periods of the fishery's history, and so minimising the effects of the crisis becomes largely a matter of guess-work.

The collection and use of fishery statistics

This session drew mainly on country experience of fishery statistics programmes in the region to underline both the difficulties in maintaining long-term commitments to the gathering of fishery statistics, and — perhaps more importantly — the importance of clearly establishing why the statistics are being collected in the first place. It is all too easy to try to set up an ambitious statistics programme with no clearly defined objectives or output, only to find that

after several years of data collection no really useful information has emerged. In the Pacific at least, the real uses of fishery statistics are to gain an idea of fishery production and to provide a basis for economic analyses used in development planning. In these cases, the type of information needed is a lot less sophisticated than that required for stock assessment purposes, which was the primary interest of this workshop. In this region, it is often more appropriate and cost-effective to look at using one-off surveys or experimental fishing programmes to gather the information needed for stock assessment work.

Deep-water snappers, groupers and allied species

Stocks of deep-water snappers, groupers, emperors and associated species have been the focus of more fishery development attention than perhaps any species group in the region other than tuna. Work by the South Pacific Commission and by national governments has now led to the establishment of several small but economically important fisheries in countries of the Pacific region, mainly involving fleets of small local vessels fishing by relatively unsophisticated techniques. In some areas, exploitation now appears to have reached levels that may exceed what is sustainable on a long-term basis.

In a new fishery, initial catch rates are high because of the presence of large fish such as big groupers. However, catch rates soon fall as the large individuals are fished out.

Like many other resources, deep-water snapper fishing gives high initial catch rates that drop down to an equilibrium level (which may be only half or a third of those at the start) after a few years as larger, older fish become fished out. The importance of planning development around the catch rates that will be experienced in the long-term — and not those that are observed during the fishery's very early stages — is of paramount importance if these fisheries are to provide their potential long-term economic and social benefits.

Deep-water fishes are difficult to study. They cannot be readily observed, either in the wild or in aquaria, because the changes in pressure that occur during capture usually kill them. For this

reason they cannot be studied using mark-and-recapture methods, and as their stomachs are usually everted by pressure drops when they are brought to the surface, even their feeding habits are not well known. The reproductive biology of these species, and in particular the mechanisms that enable eggs to survive to the size of fish that can be taken in the fishery — the process of recruitment — are equally poorly known.

Most information that enables us to predict the response of these stocks to fishing comes from experimental fishing trials, both in remote unexploited areas and in areas that are being commercially fished at different intensities. The results of this work indicate that deep-bottom fish are relatively slow-growing and recruitment of juveniles to the adult population may be irregular or low. These findings support the observed fact that deep-bottom stocks seem to be easy to overfish at low levels of fishing effort, particularly those species that do not reach reproductive age until after they become susceptible to fishing. The bottom line, therefore, as with so many of the fishery resources of the region, is to take a step-by-step approach to development and be prepared to manage the fishery at low levels of effort to ensure productivity over the longer term.

Shallow-water snappers, emperors and allied species, and reef fish

This group of fish forms the basis of most of the small-scale subsistence, recreational, commercial and semi-commercial fisheries in the region. Relatively easy access to the resource with only basic equipment means that at least certain members of this group are easy to overfish. A particularly important point brought out in this session, and one that is often overlooked, is the level to which subsistence fishing activities can contribute to overfishing. In a commercial fishery, overfishing causes catches to fall to a point beyond which commercial fishermen can still make money. As overfishing occurs, unless the government manipulates the economics of the fishery (by subsidies, etc.), many fishermen will be driven out of fishing by the falling catch rates. In a subsistence fishery, this is not the case: the economic cost of fishing is extremely low, and a subsistence fisherman has to catch a certain amount in order for his family to eat. Subsistence fisheries therefore have the capacity to keep on fishing even when overfishing is occurring at a serious level.

Another point brought out was that many tropical fisheries are made up of a large number of species, which have different biological and fishing characteristics — growth rates, reproductive periodicity or capacity, feeding habits, susceptibility to fishing, commercial value, etc. Because of these differences, some species are fished at a higher level than others as a fishery develops. Since higher-value species tend to be the ones targeted — and since these species are often predators that are quite high in the food chain — these are usually the first to be overfished, even though other species stocks within the same fishery may be in good condition.

Once a species is driven to low levels in a multispecies fishery, it may be impossible for it to ever return to its original level of abundance even if fishing is subsequently restricted or even stopped altogether. The recruitment process in the coral reef environment, which is still only poorly known, seems subject to unpredictable fluctuations that influence the adult species composition very strongly. If the stock of a commercially important species is depleted, it may come to be replaced by competitor species that have little or no value to the fishery.

Reef resources: survey techniques and methods of study and telemetry, remote sensing and the use of environmental data

These sessions covered both ways of planning surveys within existing budgetary or other restrictions, and some of the survey methods and techniques appropriate to the marine resources of Pacific Islands. In particular, discussions focused on simple, relatively low-cost

survey methods such as experimental fishing, and visual resource assessment, particularly of fish species, by underwater observation.

An important source of supplementary information can be the collection of data (such as landings, species composition, length-frequency information, etc.) from commercial or subsistence harvesting activities. While this data has its limitations due to fleet mobility, improvements in gear efficiency, and fishing selectivity, fishery information nevertheless has its place in an integrated resource assessment programme.

A survey technique that appears to show a great deal of promise, particularly for the more remote or inaccessible parts of the region, is the use of remote sensing data (from satellites) to estimate the extent of the habitat of various types of marine resource. Several presentations during this session explained the ways in which geographical and oceanographic (e.g. sea surface temperature) data gathered by satellite could be applied to the assessment of marine resources and coastal processes. However, one of the most important points to emerge was the need to evaluate carefully whether the same results could not be achieved using cheaper and more accessible technology. In particular, aerial photographs — already available for many island groups at relatively low cost — can provide the same or greater detail on reef and coastal morphology that is required for habitat estimation.

Tropical lobsters

The tropical lobster, or crayfish, resources of the Pacific Islands are small but can be economically very important due to the high value of the product. Harvesting, usually by hand (most species do not readily enter traps), can nevertheless be intensive and local populations may be subjected to high fishing pressure. The consequences of these potentially high levels of exploitation were discussed in the light of current information on tropical lobster biology.

Because of their high value, tropical lobsters are small but locally important 'cottage-industry' fisheries. Protection from spearing is probably one of the most appropriate management measures for these animals.

From a management viewpoint, an important biological feature of the lobsters occurring in the region is the extended larval life. Lobster larvae go through a long series of metamorphoses and may spend as much as a year in their planktonic stages before settling as juveniles. During the planktonic phase, ocean currents may carry them far from their birthplace. As a result, it has been speculated that stocks of lobster in one location may not necessarily depend on recruitment that originates in the same location. In the case of isolated oceanic reefs and islands, particularly those influenced strongly by the system of ocean currents located on and around the equator, lobster recruitment may be largely dependent on distant populations in remote, up-current locations. The established regulations of some countries, which protect berried female lobsters, may thus be meaningless for the health of the local fishery, although a fishery somewhere else may be influenced by such regulations.

The workshop was not able to clarify this question much further, but country experience did indicate that, with one or two exceptions, local stocks appeared to be healthy as a result of a relatively large average size at first capture. A conservative approach to management might be to set minimum size limits in those locations where they can be enforced. Additionally, some countries noted the deleterious effects of spear-fishing. Spearing adds greatly to fishing efficiency while often reducing the product value, and speared undersized lobsters cannot be released as they will die. The active discouragement of spear-fishing — by restricting the sale of speared lobsters — was therefore considered an appropriate management measure.

Trochus and green snail

These two species, while taxonomically quite different, have many common features, including distribution, habitat, feeding habits, harvesting methods and end utilisation, which justify their being considered together. Both species are valued for the manufacture of pearl-shell buttons and for decorative inlay work, and both — particularly trochus, which is now widely distributed as a result of widespread introductions — have for many years formed the basis of small but locally important fisheries in the Pacific Islands region. The fact that the end product — the shell — is non-perishable is an important consideration in remote islands and rural areas where the infrastructure for preserving fresh fishery produce does not exist.

Because of their sessile lifestyle and shallow-water habitat, both species are extremely vulnerable to overharvesting by simple hand-gathering activities. Various measures are required to protect trochus and green snail fisheries in all areas where they exist. A wide range of regulatory measures have been implemented in different locations, including minimum and maximum size limits, closed seasons, closed areas, and the establishment of breeding reserves, and these have been effective to varying degrees. In most countries, the main problem — which is common to all fishery management programmes world-wide — has been in enforcing the regulations and convincing fishermen of their necessity. Most countries are developing management regimes that involve local communities in the control of fishing effort, and in which enforcement can be carried out at a convenient point in the post-harvest chain. In the case of trochus and green snail, this is with the exporters, whose activities can be monitored far more easily than those of a large number of fishermen.

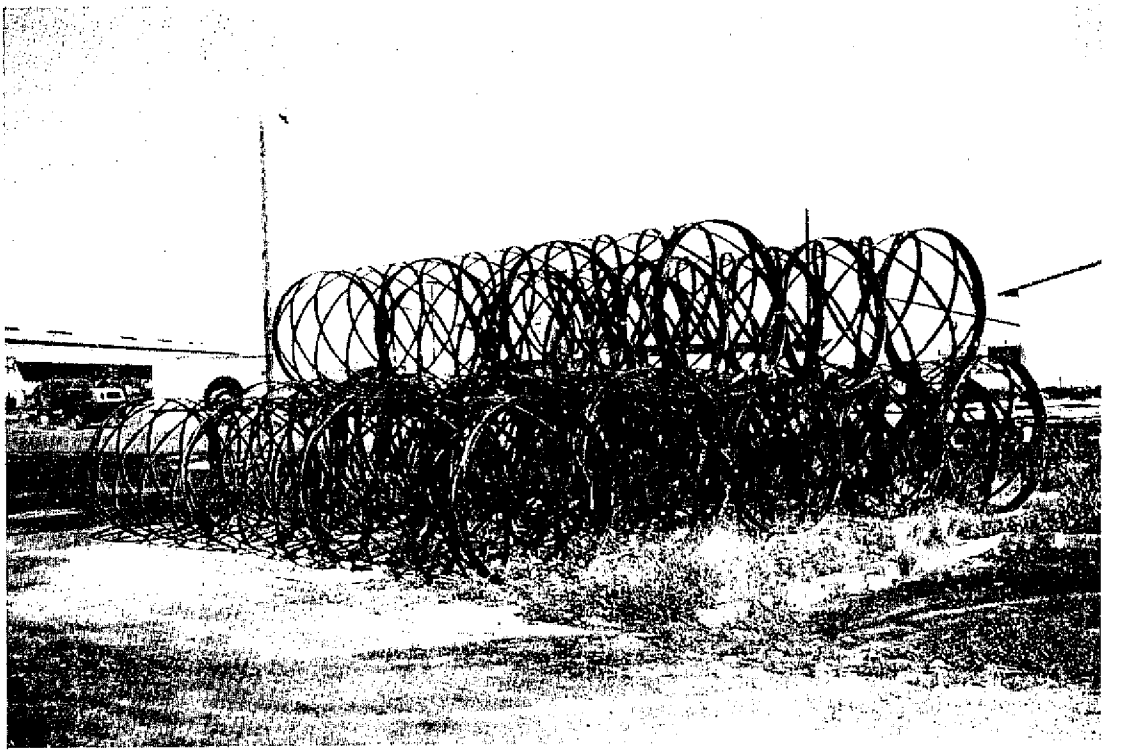
There also appears to be some potential for enhancing natural trochus populations by ranching — the rearing of captive-bred trochus larvae to a juvenile stage beyond which survival rates will be reasonably high, followed by the release of these juveniles into the wild where they will grow and enter the commercial fishery.

Stock and habitat enhancement

This session covered several related topics, in particular the enhancement of natural fish or shellfish populations by reseeding, ranching and the introduction of new species, and the use of artificial reefs and fish aggregating devices (FADs) to enhance fishery production. Except in the

field of FADs, country experience in each of these areas was relatively limited, but a good deal of relevant experience from outside the region was presented and discussed.

The reseeding or release of ranched juveniles of species already present in a country or area was seen as a potentially useful means of enhancing natural populations of some resources, particularly sessile types (such as giant clams and trochus), that have been depleted by heavy fishing pressure. A great deal of exploratory research is still needed, however, into the survival rates that can be expected from juveniles released into the wild at different stages in their lives.

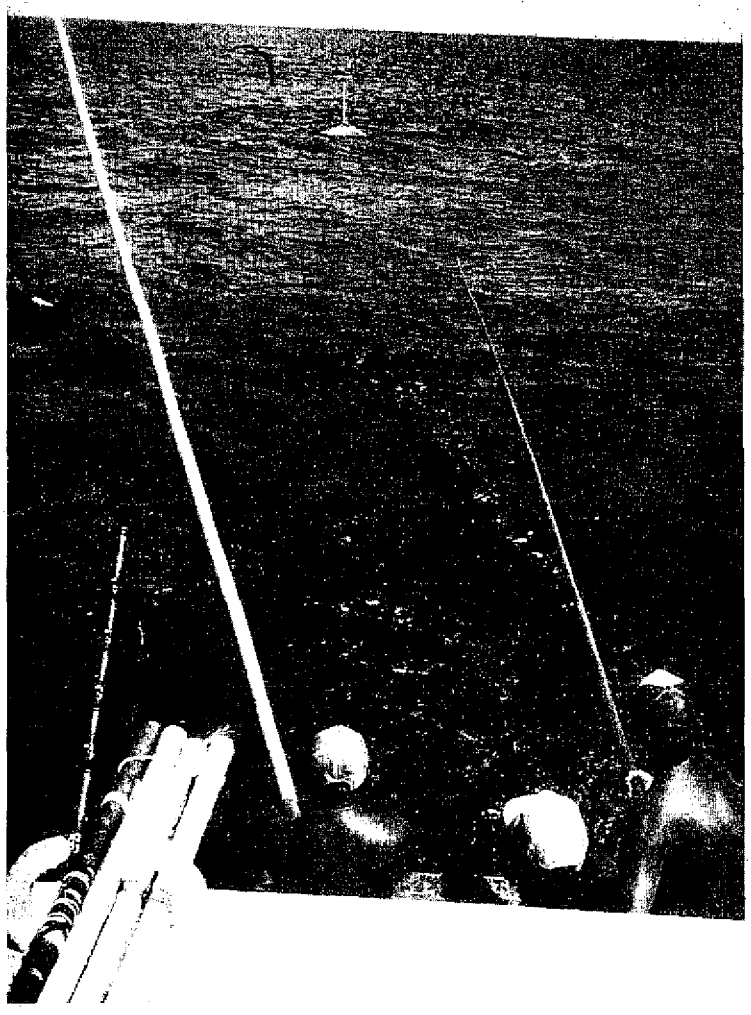


This artificial reef module is now deployed in Hawaiian waters for study purposes. The basic question still has to be answered: how much do artificial reefs increase production, and how much do they just aggregate fish that are already present ?

Introductions, on the other hand, are a lot less desirable as a means of improving fishery production, and this includes the re-introduction of native species that have been made extinct by over-fishing. The characteristics of an apparently desirable species may change as a result of the new environmental conditions it finds itself in, and by competition, predation, or some other means of interaction, it may have an unpredicted adverse effect on other native species that outweighs any benefits expected from the introduction. The dangers of introducing unwanted pests, parasites or diseases along with the desired species cannot be over-emphasised. If introductions are to go ahead, the individuals to be introduced should have been bred through at least one generation in captivity in disease- and parasite-free conditions. If a disease or parasite is inadvertently introduced, as well as possibly affecting native species, it will eliminate forever any possibility of having a disease-free stock of the introduced species.

Artificial reefs are a means of increasing the amount of suitable habitat available for reef-associated fish and other species, and thereby — hopefully — increasing both fishery production and, in some cases, the amount of shelter or protection available for juveniles. However, the question of aggregation versus production — do artificial reefs really generate increased fish production, or do they just aggregate fish that are already present? — remained unresolved. The true extent of increased production on an artificial reef depends on many

factors, including its location relative to natural bottom features (and other artificial reefs) and the intensity of fishing on it. If an artificial reef is sited close to natural reefs, the apparent enhancement effect may in fact consist only of drawing fish away from other areas. Likewise, if fishing is quite intensive, an artificial reef may act to concentrate an otherwise dispersed population and render it more vulnerable to fishing. There is thus a need for more research into the best locations and fishery situations in which artificial reefs should be used.



Fish aggregating devices such as this one in French Polynesia give Island governments the opportunity to divert fishing pressure away from fragile inshore resources. But little is known about what makes fish aggregating devices work.

The use of fish aggregating devices (FADs) is widespread throughout the Pacific Islands region, but very little research has been done to investigate how they aggregate fish and how this can be improved or maximised. The questions of aggregation/ production that apply are similar to those asked about artificial reefs. In fact, FADs are very variable in terms of productivity and it is so far not possible to state with certainty what factors are important in determining whether a FAD does or does not consistently aggregate fish. Distance from competing habitats, the location of FADs in areas of known natural productivity, and water depth are some of the considerations that appear to play a part, but the extent of each is not known. However, where FADs are productive, they appear to be a cost-effective means of enhancing small-scale fishery production and, importantly, represent for many countries a way

of diverting fishing effort from reef and lagoon resources that may already be suffering from over-exploitation.

Beche-de-mer

Beche-de-mer, or sea cucumbers, represent an important cash crop for many remote or rural areas where alternative earning opportunities may be limited.

A curing stage in the processing of beche-de-mer, one of the most valuable inshore fishery resources for the Pacific Islands. The beche-de-mer trade is presently undergoing a boom that is causing concern to fisheries managers.

The final product, which is cooked, smoked and sun-dried, is a high-priced delicacy in many South-East Asian markets and is therefore a valuable export earner for many Pacific nations. The last three or four years have seen a boom in production from the Pacific region associated with drops in supplies from major producing countries elsewhere in the world together with rapidly expanding levels of imports into mainland China. The rocketing Pacific production has led to fears — probably justified — that small local resources may be unable to sustain the present high, and increasing, levels of fishing pressure.

The major biological features of this group of animals were discussed and the difficulties of studying the animals underlined. Sea cucumbers, having highly changeable body shapes, are difficult to measure accurately and, as they reject most types of external tag after a short time, their movements are difficult to study. The juveniles of most commercial species are cryptic and

very rarely found, and little is known of the processes of reproduction or recruitment. Laboratory or aquarium observations of growth yield unreliable results because the animals are able to utilise bodily reserves for feeding and are as liable to undergo a reduction in size as an increase when removed from their normal habitat.

Management of the beche-de-mer fishery to date has been haphazard in the Pacific Islands, with exploitation levels and strategies being largely determined by market forces. These have resulted in periodic booms in production, interspersed with lulls during which the resources have been more or less left alone. In many countries a more considered approach to management now appears to be necessary. Meaningful management strategies, which will probably need to be different for each exploited sea cucumber species, need to be developed, in some countries as a matter of some urgency.

Inshore fishery management and regulation and fisheries and coastal zone management

The first of these two sessions covered several linked themes — the biological bases for fisheries management, legislative approaches to implementing management regimes, and the ways in which responsible fisheries management can be linked to, and benefit from, existing traditional and cultural systems and values. The second session examined the extent and importance of destructive fishing practices in the region, and the management of fisheries as an issue within the broader concept of management of the coastal zone as a whole.

The pros and cons of a number of fisheries management options were discussed in broad terms and some examples of their applications presented. These included closed seasons, closed areas, size limits, catch quotas, and various licensing and limited entry alternatives. Different resources have their own management requirements, but the main point to emerge was that management applies to fishermen, not to fish, and that any regulatory approach needs to be developed in co-operation with the fishermen or other social group that it is intended to benefit. In this context, there was much support for the concept of preparing educational materials, posters and other informative articles, for general public consumption, on fisheries management and conservation.

In many Pacific cultures, traditional marine resource management concepts exist and by reinforcing the desirable aspects of these, 'modern' fisheries managers can sometimes achieve their ends with a maximum of co-operation and a minimum of conflict. In this context, it is important for fisheries scientists, many of whom have gained their knowledge by exposure to western models of fisheries management, to overcome the ingrained tendency to regard free access to marine resources as a fundamental human right. The existence of various forms of ownership, tenure or exclusive access to marine resources is well-established and is a deeply-rooted concept among Pacific Island cultures, whereas open access is a foreign idea introduced from outside. Traditional systems of marine resource ownership provide an effective mechanism for regulating access to those resources, one of the most powerful and controversial of fisheries management tools. Additionally, fisheries management regimes can sometimes be designed to fit around local preferences, customs, beliefs and taboos, and may be able to benefit, in terms of co-operation and acceptance from local people, from doing so.

Several destructive fishing techniques common to the region, including fishing with explosives and the use of natural and chemical poisons, were highlighted and the extent of this problem in different Island countries discussed. Although it can be extremely effective, this type of fishing is unselective and results in massive damage to the habitat and to fish larvae, juveniles, and other organisms, which is out of all proportion to the economic benefits to be gained. Most countries have legislation which bans the use of these styles of fishing, but enforcement is difficult (and often dangerous for those carrying it out) and convictions, when secured, result in penalties that do little to deter offenders from repeating their activities. No easy solution to the problem could be seen, but a campaign to improve public awareness of the real damage caused by this type of destructive fishing may help to reduce its incidence.

Traditional fishing canoes in Daru, Papua New Guinea. Making use of the fishermen's knowledge of their local resources, and consulting with them in developing fisheries management systems, were two of the strongest points to come out of the workshop.

The session on coastal zone management focused on fisheries as just one aspect within the broader context of managing the processes of development and change in the coastal environment. Many other development activities can have an effect on, or be affected by, fisheries issues. These include: construction, which may require dredging of fill and result in the reclamation of important habitat or nursery areas; forestry or watershed development, which may affect runoff and sedimentation; urbanisation, which leads to increased subsistence and recreational fishing pressure by a growing population; and tourism, which may lead to conflict of interests between fishermen and other marine resource users. Communication among the different agencies and bodies responsible for the diverse array of development activities that may occur in the coastal zone is the first step towards integrating development so that the maximum total benefit is obtained.

Other sessions

A number of other sessions, not reported in detail here, covered resources that were less important, at least on a regional basis, because of their restricted distributions or more limited economic potentials. These included: inshore baitfish; open-water baitfish; large coastal pelagic fishes; sharks; deep-water shrimps; penaeid shrimps; crabs (including coconut crabs and mangrove or mud crabs); pearl oysters; giant clams; other molluscs; commercial seaweeds; semi-precious corals; and reef-building corals.

Future Pacific Island inshore fishery research requirements

This last session of the workshop drew on the discussions held during two previous evening working group sessions to refine ideas on those subject areas which require further research work. While many research and management problems identified were country-specific, others reflected regional concerns or were common to several countries. The universal problems of lack of research funding, difficulties in motivating staff involved in fisheries research work, and the problems of persuading local administrators and decision makers to implement management decisions based on sound fishery science, were raised many times. Common technical problem areas included a general shortage of trained local staff who could combine a familiarity with local fishery conditions with a background of scientific training, poor communications, and difficulties with access to advice and information within the region. Some country-specific problems included the lack of good taxonomic guides, problems in interpreting or gathering fishery statistics, and the need to carry out baseline resource surveys in both fished and unfished areas.

As was intended, this final session gave important guidance to the newly-established SPC Inshore Fisheries Research Project, which is intended to help SPC member countries develop their own national capacities to deal with these problem areas. The Project now has a clear indication of the priority areas requiring attention, and in the coming months will be developing and implementing its work programme to address them.

Pacific inshore fishery resources can support small, productive fisheries indefinitely, providing that development proceeds cautiously, with realistic production targets based on scientific advice. The SPC Inshore Fisheries Research Project is working to increase the capacity of South Pacific Island countries to manage their fisheries rationally.