

FISHERIES

Newsletter

NUMBER 78
JULY — SEPTEMBER 1996

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The development of sustainable domestic tuna longlining operations in Pacific Island countries and territories has become an important component of the SPC Capture Section's work programme. The photo, showing the unloading of the catch at the wharf onto a carpeted metal fork-lift pallet, was taken during an SPC Masterfisherman assignment.



South Pacific Commission
Prepared by the Fisheries Programme Information Section
Printed with financial assistance from the Government of France

SPC ACTIVITIES

■ 26TH REGIONAL TECHNICAL MEETING ON FISHERIES

The Twenty-sixth Regional Technical Meeting on Fisheries (RTMF) was held at the South Pacific Commission's headquarters in Noumea, New Caledonia from 5 to 9 August 1996, bringing together 58 participants from 22 SPC member countries and territories and 21 international or other organisations.

In accordance with the procedure of rotating the Chairmanship alphabetically between member countries and territories, Mr Tukabu Teroroko of Kiribati was appointed Chairman of the meeting, while Mr Danny Jack of the Marshall Islands was appointed Vice-Chairman and Chairman of the Drafting Committee.

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

The meeting assists the work of the Commission's Fisheries Programme by reviewing and commenting on existing or proposed activities, formulating new initiatives where required, and making recommendations for Secretariat action to the Committee of Representatives of Governments and Administrations (CRGA) and, ultimately, the South Pacific Conference.

As a result of this regular process of review and discussion, the work of the SPC Fisheries



Programme is able to retain its relevance to the evolving needs of Pacific Island countries and territories.

The guidance provided over the years by successive Regional Technical Meetings on Fisheries has been an essential element in developing the wide range of activities that are undertaken by the Fisheries Programme, which for some time has been the South Pacific Commission's largest work programme.

As usual, the morning sessions were devoted to consideration of programme activities, and afternoons to technical discussions on such topics as the stock status of the Western Pacific tuna fishery, an overview of the South Pacific Regional Tuna Resource Assessment and Monitoring Project (SPRTRAMP), regional implications of Hazard Analysis and Critical Control Point (HACCP), a progress report on the Integrated Coastal Fisheries Management Project (ICFMaP), and the use of live milkfish as longline fishing bait.

First on the agenda was an overview of the SPC Fisheries Programme by its Manager. He outlined the possibility of attachment training for Pacific Island fisheries officers, and felt that these attachments were extremely useful; he also mentioned that SPC would endeavour to maintain funding for this type of on-the-job training.

Funding issues were then raised, with the Fisheries Programme Manager stressing that multi-year project funding was preferable to make the administration of the work programme easier.

The Oceanic Fisheries Coordinator then summarised the recent work of the Oceanic Fisheries Programme.

The main development since RTMF 25 had been the implementation of SPRTRAMP, through which the Oceanic Fisheries Programme had been able to implement much more comprehensive and continuous monitoring of regional tuna fisheries.

Through SPRTRAMP, information is now available for research and management, and considerable progress had been made since RTMF 25 towards a better understanding of regional tuna stock structure and dynamics. Participants expressed their full support for the work of the Programme.

The activities of the Coastal Fisheries Programme were then reviewed and discussed, in particular the Capture Section. The

Fisheries Development Adviser emphasised that there was a clear growing interest and demand by Pacific Island countries and territories in developing their own domestic commercial offshore fisheries (tuna longlining, FAD deployment and associated fishing techniques, and deep-water snapper fishing), as part of their overall fisheries development plans.

The meeting, as a matter of top priority, strongly supported the continuation and the strengthening of the Capture Section, and recommended that the number of Masterfishermen be increased to ensure that the growing demands for the services of this Section by Island countries and territories are met.

During discussion of the Training Section, participants stressed the importance that national fisheries training institutions play in the implementation of in-

country training programmes, and the Meeting recommended that the South Pacific Commission further assist with the strengthening of national training capacities. This assistance could include activities such as tutor training and planning of staff development, the production of resource materials and the development of new programmes.

The Meeting considered the activities of the Resource Assessment Section at some length. The Integrated Coastal Fisheries Management Project (ICFMaP) is the major focus of activity in the Section.

Although there are still three national sub-projects to accomplish, the project will terminate in August 1997. The Meeting was very impressed by the range of work done by the Section, and hoped strongly that SPC would be able to continue its advisory and edu-



Some participants at the Twenty-sixth Regional Technical Meeting on Fisheries



cational role in this very important and developing area for Pacific Island government decision-makers.

During the presentation of the work done by the Post-harvest Section, the Meeting recognised the importance of complying with the new health regulations of major seafood importing countries, such as the United States and the European Union countries, and the need to take urgent action to upgrade quality-assurance procedures for the Pacific Island seafood exporters, based on the HACCP (Hazard Analysis and Critical Control Point) quality-assurance system.

The Meeting recommended that the South Pacific Commission take all necessary action to bring about these improvements to ensure that access to these markets can continue, and to allow the smaller states the opportunity to develop export industries.

The Meeting felt that the Food and Agriculture Organization of the United Nations (FAO) should be approached to provide funding for a Technical Cooperation Project to assist member states to meet the requirements of major importing countries.

The Women's Fisheries Development Officer then made a

presentation to the Meeting describing both the situation of women in fisheries in the region and the work of the Section in trying to address some of their problems, including the lack of basic quantifiable information about the involvement of women in fisheries in general.

The Meeting recognised the important contribution of women in fisheries development, and recommended that the Secretariat pursue every avenue to secure funding for the continuation of the Section.

Last but not the least, the activities of the Information Section were reviewed. The participants were unanimous in recognising the quality of work done by the Section, particularly the integration with other sections of the Coastal Fisheries Programme.

The participants also expressed their appreciation for the Special Interest Group Information Bulletins. As a result of this, the Meeting recommended that a Special Interest Group be set up on Women-in-Fisheries.

The Information Bulletin would serve as an information and communication network, covering those activities of interest and concern to women in the fisheries sector.

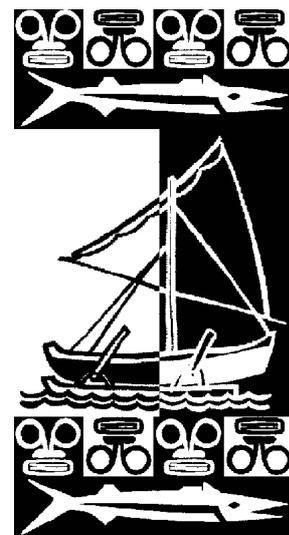
Participants were also invited to hear the coordinator of the Pacific Islands Marine Resources Information System (PIMRIS) presenting the deliberations and the recommendations of the Eighth PIMRIS Steering Committee, which was held in Suva from 1 to 2 July 1996.

Several information and working papers were then presented, including the Regional Institutional Review in the Marine

Sector, the future regional arrangements of the FAO South Pacific Aquaculture Development Project, a report on the ACIAR-sponsored Pacific Island pearl oyster resource development research project, and a report on the trochus markets.

Finally, the participants listened to statements by other organisations involved in fisheries development in the region: the South Pacific Aquaculture Development Project, the FAO Fishery Industry Division, the ICLARM Coastal Aquaculture Centre, Nelson Polytechnic, The Nature Conservancy, The World Bank, and the University of the South Pacific.

The Meeting was interesting and productive, covered a wide range of topics and provided important guidance for SPC's future work in fisheries. As always, much business was conducted outside the meeting room, and many delegates benefited from the opportunity to establish personal contacts with representatives of other countries, territories, institutions and organisations.



■ INFORMATION SECTION

The Information Section has recently published a booklet entitled *Some acronyms useful to Pacific Islands fisheries workers*. Mainly intended for government fishery officers in Pacific Island countries and territories, this booklet presents more than 500 acronyms, and

has been designed for use by both anglophone and franco-phone readers. Each acronym appears with its full name and its translation.

Also, when the acronym refers to an organisation, some basic information (type of organisa-

tion, location of headquarters, etc.) is included. We hope that this publication will find its place alongside the well-known *Fisheries Address Book* on all fisheries officers' desks.



■ TRAINING SECTION

Training action programme for FSM's tuna longline fishery

In June and July this year, SPC's Fisheries Training Officer worked together with fisheries managers in the Federated States of Micronesia and with the Head of Nelson School of Fisheries to prepare a proposal for a manpower development action programme for FSM's tuna longline industry.

Since the later half of the 1980s several training programmes in marine, maritime and fisheries subjects have been implemented in FSM. Many of those trained in such programmes are now employed in positions in the government administration, in schools and in small enterprises. In general it can be said that these training programmes have increased awareness of the complexity of many of the issues in the fisheries sector.

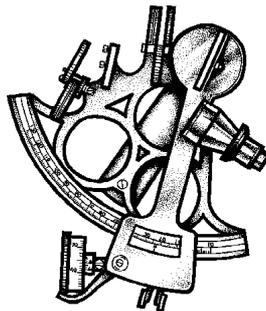
Likewise, the efforts made over the last seven years to train people in the operation of fishing vessels and onshore fisheries installations of different kinds have contributed greatly towards creating an awareness of the opportunities in the FSM tuna fishery.

When the government decided to support the creation of a domestic tuna fishing fleet, it also opened the Micronesian Maritime and Fisheries Academy (MMFA).

Since then, MMFA has graduated around 200 individuals in mainly three categories: fishing deckhands, engineering and navigation cadets. The goal of the training has been to produce a pool of trained people to be available as and when the sector needs them, in order for the sector to develop without any manpower constraints.

Many of those trained have remained in the longline industry. Because of the shortage of well-experienced crews, they have however often been assigned tasks for which many were not sufficiently experienced.

They may have had the appropriate theoretical education and in-school training on the issues, but because of a limited number of apprentice jobs available with qualified supervision, some have not had the right opportunities to develop the skills required to run a longline operation profitably.



Others have been attracted to immediately-available jobs with better incomes outside of FSM, rather than trying to make a career in the FSM fisheries. In many cases, they are gaining good relevant commercial fisheries experience, and if they were to come back to FSM, could make valuable contributions to the fisheries operations there.

That said, a great amount of credit has to be given to NFC for availing its vessels, providing job opportunities for inexperienced crew members. That, to a large extent, is the reason why FSM now has a group of vessel crew with in-school training and some sea-going experience.

Graduates from MMFA have now in many cases accumulated 1 to 4 years of work in the industry. A review of where they have spent their time after graduation shows that in fact 65 to 80 per cent of them have spent time in the FSM fisheries sector, in jobs where their training could help them to better performance. In terms of support to training, it is therefore very clear that the objectives set in the beginning of the 1990s have been met.

However it also requires qualified, close and intensive supervision on the job to train new

graduates in the work habits necessary to make a longline operation commercially viable.

Unfortunately, it was not always anticipated how close this supervision would actually have to be. In fact, it is just not possible to operate a longline fishery successfully if everyone is a newcomer. The same is true for the shore-based segments of the sector.

The fact that there have been too few senior crew members to foster the junior ones has been part of the problem, and has cost all vessel operators money. Given that there is now a group of somewhat experienced crew available, it would be appropriate at this point in time to consider if the training strategy can be changed.

A fisheries training action programme now seem to be the best way of progressing the manpower development in close collaboration between

training deliverers and fisheries operators. To this end, during 1996 the Government of FSM has taken up a dialogue with SPC and the Nelson School of Fisheries on how to best formulate and embark on such an action programme.

This resulted in joint work by FSM National Fisheries Corporation, FSM Department of R&D, SPC's Fisheries Training Section, and Nelson School of Fisheries, in a five-week mission in June/July to formulate an action programme proposal for the training of manpower for the FSM domestic tuna industry development.

The exercise started with discussions with all training deliverers and all fisheries operators in FSM including vessel operators, transshipment, shore services and exporters, to collect information and assess the situation and difficulties, in terms of manpower qualities, experienced by the different entities.

The first phase of the work then culminated in a workshop in Pohnpei, where the different options to resolve the present situation were discussed.

During the discussions in this workshop, it became clear that most people involved had experienced very similar problems, and in fact had quite similar ideas or opinions on what needed to be done. Towards the end of the workshop it was agreed that the actions required could be put into nine to ten groupings.

Based on this, the SPC Fisheries Training Section is now working together with Nelson School of Fisheries to finalise a report on the issue and a proposal for a manpower training action programme to assist in the FSM domestic tuna fishery development. The programme proposal will be presented to the FSM Government later this year. 

Training courses for fisheries enterprise management and for fisheries officers now announced for early 1997

Two Savingsgrams have recently been distributed by SPC concerning fisheries training programmes; one being the annual Nelson course for fisheries officers, and the other a new course in fisheries enterprise management. Here are some details:

The Nelson Polytechnic 1997 course for Pacific Islands fisheries officers will start in Nelson on 10 February 1997, and continue there until 6 June 1997. The field module of five weeks at a Pacific Island venue will follow directly after, during the period 9 June to 11 July.

As usual, the course intends to give fisheries officers compre-

hensive training in relevant skills at a very practical level, which they need to use in the day-to-day operation of an extension station, and in turn may pass on to their staff and the local community.

Closing date for applications is 15 November 1996.

Furthermore, a two-week course will be held in management practices for operators of medium- to large-size fisheries enterprises. It is designed to build on the participants' existing skills and assist with areas where individual participants may lack expertise.

The course will focus on the skills which can give the participants the most immediate benefits, such as principles of enterprise management, commercial ethics, accounting practices, personnel management, and sales and marketing principles. Topics covered will also include book-keeping practices, time management and quality management.

The participants should have a position of responsibility including some aspects of management of a commercial fisheries enterprise.

Closing date for applications is 15 December 1996. 

In-Country Workshops on Business Management for Small Boat Operators

As follow-up to the regional workshop organised earlier this year by SPC on business management for small boat operators, several countries are now arranging national workshops on the same topic. A couple of them have already been held, some are being implemented while this magazine is being printed, and others are at the planning stage.

Two of the first ones that have reported on their results are Niue and Solomon Islands. In general the reports are very positive. Here are some extracts:

In Niue, Course Coordinator Mr Charlie Tohovaka organised a two-day workshop that was then held from 15 to 16 August. In planning the workshop, a review was made of over 50 small fishing-boat operators, and a group of about 15

were identified as full-time, small-scale commercial fishermen. Invitations to the workshop were then sent out to these, a select group of part-time fishermen and a few others.

The programme was designed to be similar to that of the SPC regional workshop. Of particular interest to the 17 participants, according to the report, were the feasibility studies that helped in understanding the requirements for starting a business. Furthermore, the report also especially mentions the significance of understanding operating costs.

In Solomon Islands, the Fisheries Division held the first follow-up workshop from 17 to 19 July this year. It was attended by 11 Senior Fisheries Officers and two lecturers from the

School of Maritime Studies. The purpose of this workshop was to provide skills for fisheries officers to run the provincial fisheries centers. It was conducted by Mr Nelson Kile, Chief Fisheries Officer for Extension and Development, Solomon Islands Fisheries Division.

The first day of the workshop had lectures on business management in general and the need for it in commercial fishing. The second day involved analysing why a business might fail, and also brought lectures on how to manage a fishing business and control operations costs. The third and last day demonstrated record keeping and a case study. The participants were also presented with a certificate.



■ CAPTURE SECTION

The development of sustainable and viable domestic tuna longlining operations in Pacific Island countries and territories has become an important component of the Capture Section's work programme. In line with this focus, a country assignment has commenced in New Caledonia, and the SPC Masterfisherman, Steve Beverly, has participated in a tuna longlining seminar held in the Solomon Islands.

Country assignment

Masterfisherman Steve Beverly commenced fishing with the New Caledonian tuna longline company Navimon in August. Navimon has four 16-metre tuna longliners, purpose-built by the Chantiers Vergoz shipyard in Concarneau, France.

The vessels have a beam of 5.6 m, draft of 2.4 m, fish hold capacity of 38 m³ (plus a bait freezer of 6 m³), fuel capacity of 10.2 t, and fresh water capacity of 1.3 t. Two of the vessels have been fishing in New Caledonian waters for several years, while the latest two have been

in operation for twelve months. Navimon has a fifth vessel from Australia, that has been in operation for several years.

The vessels are equipped with Lindgren-Pittman hydraulically-powered longline reels, with up to 40 nautical miles of 4.0 mm monofilament mainline. The purpose of the current assignment was for the Masterfisherman to work with the skippers of each vessel to assist them in refining their fishing techniques and gear, with the hope of increasing their catch rates.

On-board fish-handling techniques and quality of the catch will also be focused on during the assignment.

A normal fishing trip started with the loading of 25 kg cartons of frozen bait, and half a tonne of fresh-water flake ice (Figure 1).

The vessels are equipped with salt-water ice machines for producing ice for chilling and storage of the catch. Steve's work so far has been on board the F/V *Ca Pakhade*, skippered by Patrick Fievet.



Figure 1: Loading bait and ice at the start of a fishing trip

Steve has introduced the skipper and five crew to the new 3.0 mm tarred red polyester three-strand line being used in Hawaii for making up branchlines instead of 1.8 to 2.5 mm monofilament. The red polyester line is much easier to grip when pulling in a fish, and does not twist and tangle as much as monofilament when in use.

Setting of the gear usually commenced around 04h00, and took three hours to complete. The direction of set was based on the weather and current conditions, usually setting with the wind.

A hydraulic mainline thrower (Figure 2) was used to increase the depth that the gear fished.

All five crew were involved in the setting, with two getting bait, floats and floatlines ready, while three crew were needed for attaching the branchlines to the mainline.

The first person removed the clip and hook from the branchline bin, handing the clip to one person and the hook to the other. The baiter then baited the hook and threw it to the port side on the beep of the timer, while the snapper snapped the clip onto the mainline.

The gear was generally allowed to soak for 6–8 hours, with hauling commencing around 14h30, starting at the end of the line that was set last. Line hauling took 8–11 hours, depending on the amount of fish caught and the number of tangles and line breaks encountered.

Hauling was controlled from the outside control panel on the starboard side of the vessel (Figure 3). As each branchline came up during the haul it was usually obvious if a fish was on it.

If there was no fish, the branchline was unsnapped by the operator, and passed to the crew

member directly behind him. The branchline was then pulled into the branchline bin, with the clip attached to the rail of the bin and the hook placed through the clip for storage.

When a fish was on the branchline, it was either left snapped to the mainline, or the clip removed and snapped to a 'playline', while the fish was pulled to the side of the vessel.

The fish was then gaffed in the head and lifted on-board onto a piece of carpet (Figure 4) to avoid damage to the fish. Once the fish was on-board, hauling continued while the fish was killed by spiking the brain, the hook removed from the fish, and the fish processed if required, before it was placed in the ice hold for storage.

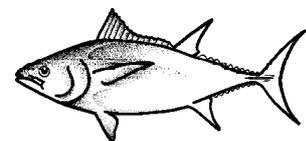




Figure 2: Setting the gear using a line thrower to increase the fishing depth of the gear



Figure 3: Operator hauling the gear off the starboard side of the vessel

Fishing trips last for 7–12 days depending on the areas being fished and the flight schedules

for exporting the catch. The catch is unloaded from the vessel at the wharf onto a carpeted metal

fork lift pallet and transported into the factory for weighing and packing into export cartons.



Figure 4: Landing a 20 kg albacore tuna onto the carpet for killing before placing it on ice for storage

The Fisheries Development Adviser, Lindsay Chapman, also accompanied the F/V *Ca Pakhade* on one fishing trip. The

aim of this trip was to allow Lindsay to familiarise himself with the Lindgren-Pittman longlining equipment, whilst in

the role of Observer for the South Pacific Tuna Resource Assessment and Monitoring Project (SPRTRAMP). 

Longlining seminar

The South Pacific Project Facility of Sydney Australia, an agency devoted to promoting and financing fisheries projects in the South Pacific, recently sponsored a tuna longline seminar that was held at the Forum Fisheries Agency in Honiara (15–18 September).

Participants included about thirty local entrepreneurs, investors, and fishermen. The seminar began on Monday morning with an opening statement from the Minister for Agriculture and Fisheries, the Hon. Rev. Brown Beu. Father Beu stated that the tuna long-line industry in Solomon Islands was still in its infancy but that there were opportunities for development.

Further, he said that Solomon Islands could benefit from what other Pacific Island countries have learned; that Solomon Islands' goals should be to maximise local participation in the development of the domestic tuna industry, as tuna is an important source of foreign exchange earnings, employment, and protein; and that the resource is healthy but should be developed in a sustainable manner.

There were a total of twelve presentations given during the seminar, including those given by SPC's Oceanic Fisheries Coordinator, Dr Antony Lewis, and SPC's Masterfisherman, Steve Beverly. The semi-

nar was chaired by Peter Cusack, former SPC Fisheries Development Adviser.

Dr Lewis started the proceedings off with a presentation on 'The Resource'. He told the participants that Solomon Islands has a good resource of the three main species of tunas fished by longline in the South Pacific (bigeye, yellowfin and albacore) and that there was room for expansion in developing a tuna industry.

Other presentations included: 'Policy issues' by Peter Tong, FFA Project Economist; 'The Japanese market' by Hiro Mori, FFA Tuna Industry Adviser; 'FFA initiatives in support of

domestic tuna fisheries' by Tony Kingston, FFA Manager Economics and Marketing; 'Airfreighting fresh fish from the Solomon Islands' by Gary Clifford, Pacific Air Express Managing Director; 'Licensing' by Kitchener Collinson, Ministry of Agriculture and Fisheries Chief Licensing Officer; 'Longline fishing and choosing a longline vessel' by Steve Beverly; 'The business of longline fishing' by Garry Preston, Fisheries Consultant with Gillett, Preston & Associates; 'Foreign investment procedures' by John Maneniaru, Deputy Director of Foreign Investment Division, Ministry of Commerce, Industry and Employment; 'Investment support' by Peter Philipson, Fisheries Specialist of the South Pacific Project Facility (the sponsors of the seminar); and 'Closing remarks' by Albert Wata, Ministry of Agriculture and Fisheries Under-Secretary.

The Masterfisherman's presentation included a talk on 'Longline vessel parameters for Pacific Island countries'. Recom-

mended parameters for a generalised longline vessel included: steel construction, displacement hull with a single (hard) chine, 20 m length overall, 300–400 horsepower (single engine), fuel capacity to give the vessel an operating range of 6,000 nautical miles (7,000 US gallons or 25 t), freshwater capacity for a crew of six for three weeks (1,200 US gallons or four tonnes), one large fish hold for icing fish with a capacity of at least 15 t (40 to 50 m³) of product, and equipped with a compact monofilament longline system using one large hydraulic reel and a hydraulic line setter. (The paper presented at the seminar by the Masterfisherman will be revised and included in the next *SPC Fisheries Newsletter* [Number 79, October – December 1996].)

At tea breaks and after lunch each day of the seminar, the Masterfisherman did a brief workshop on longline fishing gear with demonstrations on how to make up branchlines using 3.0 mm tarred red polyester three-strand line.

SPC video productions including *On-board handling of sashimi-grade tuna* and *air-freighting of fresh chilled fish* were also available for participants to view during these times.

All presentations were well received by the very interested audience, but the presentation given by Mr Gary Clifford of Pacific Air Express was especially important.

Pacific Air Express is a dedicated air freight service company carrying fresh fish from Honiara to Cairns and Brisbane, Australia, to be transhipped to Japan via Japan Airlines or Qantas.

The nature and scope of PAE's and Mr Clifford's capabilities and understanding of the special problems involved in airfreighting chilled tuna gave all future longline fisherman and entrepreneurs a feeling of confidence that Solomon Islands is well on the way to 'getting on the map' of domestic longline fishing in the Pacific.



■ OCEANIC FISHERIES PROGRAMME

Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment

The Technical Consultation on the Collection and Exchange of Fisheries Data, Tuna Research and Stock Assessment was held at the headquarters of the South Pacific Commission from 15 to 19 July 1996.

The Consultation was held in response to a recommendation made at the Multilateral High-level Conference on South Pacific Tuna Fisheries, held in Honiara, Solomon Islands, in December 1994.

The Consultation was attended by representatives of American Samoa, Australia, Chinese Taipei, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Japan, Kiribati, Korea, Marshall Islands, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, United States of America, and Western Samoa. Representatives from the Forum Fisheries Agency (FFA) and the South Pacific Commission, and observers from the Food and Agriculture

Organization of the United Nations (FAO) and the Inter-American Tropical Tuna Commission (IATTC) also attended.

The agenda included statements by participants; a review of data requirements for stock assessment; a review of current data holdings; specification of agreed minimum requirements; a review of current arrangements; and future arrangements for data exchange, tuna research and stock assessment.

SPC presented a review of methods and data requirements for stock assessment of tuna in the western and central Pacific Ocean (WCPO). Data for the four main target species of interest, skipjack, yellowfin, bigeye and albacore, have been compiled for use in assessments with reference to specific areas: east of 150°W longitude and between 40°N latitude and 40°S latitude in the case of skipjack and yellowfin, throughout the whole Pacific between 40°N and 40°S for bigeye (although an alternative hypothesis is currently being assessed), and throughout the Pacific in the southern hemisphere for South Pacific albacore.

The various stock assessment methods used can be categorised as indices of abundance based on catch per unit effort (CPUE), surplus production models, tag-recapture models and length-based age-structured models.

Each of these methods requires access to catch and effort statistics, and complete operational level (i.e. logbook) data would provide the best and most flexible data resource to support stock assessments using these methods.

The United Nations Implementing Agreement on Straddling and Highly Migratory Fish Stocks provisions with respect to the collection and provision of information and cooperation in scientific research were briefly reviewed.

The probable future data needs of WCPO tuna fisheries were then reviewed. This review made four conclusions regarding future data collection and provision. These conclusions referred to the collection and provision of operational level data,

the establishment of a length-frequency data repository to consolidate the collections of such data that exist in various fishery agencies, cooperation in the development and implementation of a scientific observer programme, and cooperation in other scientific research programmes of relevance to stock assessment.

After a review of data holdings, a drafting group, consisting of Representatives of Japan, Korea, New Zealand, Papua New Guinea and the United States, assisted by SPC and FFA staff, was appointed to draft recommendations for cooperation in data collection and exchange and research cooperation under some future regional fisheries management organisation or arrangement. The recommendations, as modified by the Consultation, follow:

In recognition of the need to progress the development of scientific support for future conservation and management of highly migratory species in the WCPO, the Consultation affirmed its support for:

- *Collection by flag states of catch (target and non-target species), effort and other data at a vessel operation level, i.e. logbook data;*
- *Provision of such data for both waters under national jurisdiction and the high seas at a degree of detail and at a level of resolution to be agreed upon to enable effective stock assessment; and*
- *Cooperation in scientific programmes to generate other data required for effective stock assessment.*

Regarding the future data needs of WCPO fisheries, the Consultation recommended that any future co-

operative scientific data collection in the WCPO be consistent with the guidelines and requirements of the UN Implementing Agreement, especially as set out in Annex I of that agreement, and be established pursuant to a regional fisheries management organisation or arrangement, taking into account the nature of the stocks and the fisheries involved.

Regarding the specification of agreed minimum requirements of any future scientific data collection programme, the Consultation also recommended that the following elements be included in any such future programme:

- (1) *Flag states should compile annual catch statistics by species, covering all fishing activities for each fleet.*
- (2) *Flag states fishing for tuna in the WCPO should collect catch, effort and other data at the fishing operation level (i.e. logbook data in a format to be agreed upon) for all commercial tuna fishing activity, regardless of whether such activity takes place in waters under flag state jurisdiction, other national jurisdiction or on the high seas. The logbook data should be validated with landings or other information.*
- (3) *Annual catch statistics should be made available as soon as possible to all parties involved in the arrangement. Agreement should be reached on how to consolidate logbook and other data for all fleets in a confidential database. Access to such data should be under conditions determined by international agreement.*
- (4) *A data repository system for length-frequency and associated data should be established so that such data can be used under agreed condi-*

tions for stock assessment and other tuna research projects. A coordinated sampling plan for all major species should be developed and implemented through the cooperation of the parties involved in the arrangement.

- (5) A scientific observer programme, based on a regionally coordinated sampling design, should be developed and implemented through an agreement among the parties involved in the arrangement. Observers should collect data on fishing operations, including by-catch and discards; they should also conduct biological sampling of both the target and non-target catch, and collect other operational data as appropriate.
- (6) All parties involved in the arrangement should cooperate in developing and implementing scientific research programmes of relevance to stock assessment of target and non-target species caught by tuna fisheries in the WCPO.

The Consultation recognised that the provision of assistance to developing countries was an important principle which is reflected in the text of the UN Implementing Agreement.

It was also recognised that this principle is relevant to the issues which concern the Consultation, namely the collection of tuna fisheries data in the western and central Pacific.

The Consultation therefore encouraged that consideration be given to providing assistance to the developing countries in the region, as appropriate, to enable them to fulfil their responsibilities with regard to the collection of tuna fisheries data.

The Consultation also recognised that for certain fleets, the collection of tuna fisheries data could be enhanced through the cooperation between the fishing nation and the coastal states with which the fishing nation has an access agreement. In this respect, the Consultation encouraged coastal states to provide information, as appropriate, to enable fishing nations to fulfil their responsibilities with regard to the collection of tuna fisheries data.

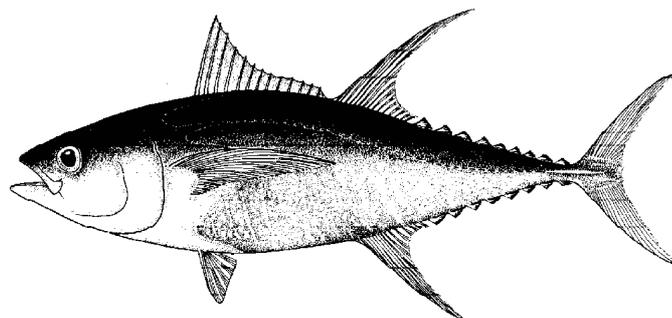
Following a review of current arrangements for conducting tuna research and stock assessment, and after consideration of a scientific structure proposed by SPC in support of a regional fisheries management organisation or arrangement, the Consultation identified a number of issues of importance. These are as follows:

- The timing of the development of a scientific structure, in relation to the development of a regional fisheries management organisation or arrangement, was identified as an important issue. There was a tendency in the discussion to favour the concurrent development of the scientific structure.
- A scientific secretariat model that involves a significant research, data collection and data management role for the secretariat, along with consid-

erable national scientist involvement, was seen as an appropriate model.

- The incorporation of the SPC Oceanic Fisheries Programme into a proposed scientific structure raises several issues. These issues include the continued provision of services at the national and regional level to Pacific Island countries and territories, and the administrative relationship of the OFP and the established SPC structure to the future scientific structure.
- The overall organisation of the scientific structure will require the consideration of issues such as membership, functions, operation and the relationship to a regional fisheries management organisation or arrangement, and funding, at some higher order.
- Involvement of scientists from developing states in the scientific structure was seen as highly desirable, in particular, to build much needed national capacity in stock assessment and fisheries research generally.

The report of the Consultation will be considered at the Second Multilateral High-level Conference on South Pacific Tuna Fisheries, which may be held in June 1997.



■ RESTORING CORAL REEFS IN AUSTRALIA

The results described in this article are preliminary, and are therefore not the final word on the matter. The main technique used is to dig a hole for each coral fragment in the reef matrix about 2 cm in diameter x 2 cm deep.

I then collect the fragments by tapping a colony branch at the right length with a chisel. I have used fragments in the range of 8–18 cm, which allows for reasonable survivorship and ease of transplantation. Large fragments are difficult to work with but increase survivorship and initial growth rate. I transport the fragments in plastic bins full of water to the transplant site.

Corals can survive quite well out of water for up to two hours, but they get stressed if they get too hot, so they should be kept in water. I place the corals in baskets and place these on the site. I then mix up a two-part underwater epoxy on the boat.

I take this down in an ice-cream container. It takes 70 minutes to set. I select a fragment and check that it will fit in the hole that I dug earlier. It is best if the

fragment will stand in the hole without support, as placing rocks around each fragment to support it just wastes time. I press some epoxy in the hole and wrap some more about the base of the fragment, place the coral in the hole and press more epoxy around the base if necessary.

With this technique, a team of two divers can transplant about 200 fragments per day. The process could be accelerated for commercial purposes if you use a pneumatic drill for making the holes. The questions that I am attempting to answer are:

What species are most suitable for transplantation?

Generally, most species are suitable, but have different characteristics. Depending on what you are after in restoring a reef you would choose different species.

The branching acroporids are very fast growing (about 5 cm a year) and have quite good survivorship, and most authors agree that these are the best species to transplant. Corymbose acroporids are slower growing

and have slightly poorer survivorship, but add diversity to a system.

Plating corals (*A. hyacinthus*, *A. cytherea*) also transplant well using the above technique. Pocilloporids (*Pocillopora damicornis*, *Stylophora pistillata*) had the poorest survivorship. They also had poor growth rates.

Branching Porites, *Porites cylindrica*, had the best survivorship but an extremely slow growth rate. Porites has the advantage that it is not prone to attacks of crown of thorns starfish, while acroporid fragments seem to attract them from over five metres away. Average survivorship is about 85 per cent after 12 months on Lizard Island. There is generally little partial mortality of fragments.

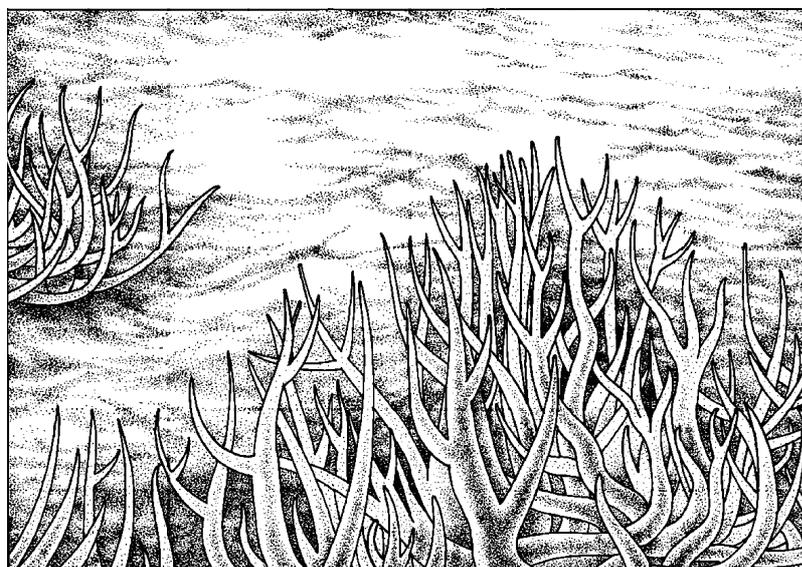
What colonies are best to collect fragments from?

Fragments were collected from a number of colonies of *A. millepora*, and I found that there was little variation in the success of fragment transplantation from one colony to the next.

I also recorded many physical variables of each colony—size, colour, branching, partial mortality, etc.—and early results suggest that these variables are not very important. Large ones weren't better than small ones, pink ones weren't better than green ones. Conclusion: one colony is as good as any other.

What is the effect of damaging a colony while collecting fragments?

There is little use in transplanting to a site if you are only going to destroy the site you are collecting from. I monitored colonies damaged from collect-



ing fragments in the above two experiments, and found that it had little impact on the mortality of these colonies when compared to undamaged controls. I usually removed about 30 per cent of each colony.

What time of the year is best?

I have transplanted fragments every three months and found little variation in the time of year on Lizard Island. Other authors have found that summer is unsuitable for transplan-

tation, possibly due to heat or light increases. Also, it may be that time of year doesn't matter at Lizard Island, but may matter closer to the equator.

(Source: *Sea Wind 10 (1) — Ocean Voice International*) 

■ FIRST LARGE-SCALE TRANSPLANT OF LIVE CORALS TAKES PLACE IN HAWAII

In the first large-scale coral transplant ever conducted, nearly fourteen tonnes of live coral transplant have been successfully transplanted from one location to another in Kawaihae Bay, Hawaii. The project was recommended by NOAA's National Marine Fisheries Service and funded by the US Army Corps of Engineers to mitigate coral loss during proposed harbour construction and to restore nearby reefs.

'The Kawaihae project has been an unprecedented success, with 99 per cent of the coral surviving relocation,' said Hilda Diaz Soltero, Director of NMFS' Southwest Region. 'This study proves that large quantities of these animals can survive the trauma of transplant.' The coral was transplanted from areas that will be disrupted by harbour construction that begins next week, and will be moved from holding areas to reefs damaged during past harbour construction in the bay.

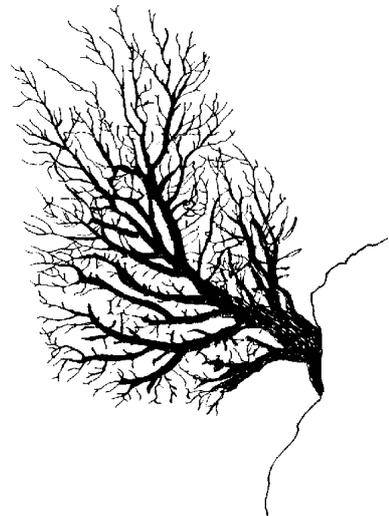
Since September 1995, live corals have been taken from the 'footprints' of three proposed new breakwaters and relocated to a large stockpile site and seven experimental sites ranging from 10 to 50 feet of water, all within a half mile of the proposed small boat harbour at Kawaihae.

'Volunteer divers from the Science Department of Hawaii Preparatory Academy have been instrumental in the transplant effort,' said John Naughton, Pacific Island Environmental Coordinator for NMFS' Southwest Region. Coral heads were carefully detached by divers and gently placed in large wire trays which were then lifted up off the bottom and transported while still submerged to transplant sites by boat.

'We will continue to monitor coral transplant sites during and after the nearby harbour construction to see how they fare,' said Naughton. Students

and staff from University of Hawaii Institute of Marine Biology are under contract to monitor the transplant sites for three years to obtain data on the growth rate and mortality of the coral. Restored coral reefs should provide new habitat for many species of fish and sea turtles.

(Source: *Sea Wind 10 (1) — Ocean Voice International*) 



■ BIOLOGISTS HOPE TO RESEED REEFS

'Homegrown' colonies — by growing colonies in lab, biologists can use them in experiments without damaging reefs.

Armed with new information, scientists hope to help Guam's reefs recover from the effects of human activity and natural

disasters. University of Guam marine biologist Dr Bob Richmond said that information about the young coral larvae's settlement preferences could prove particularly useful in reef restoration and reseeded programmes. When free-floating coral larvae are ready to

settle down permanently, finding the right spot can mean the difference between survival and doom.

'There is a very active selection going on,' Richmond said, and research has shown that the larvae settle on just one type of

algae. By placing the larvae in a holding container over the right kind of algae, he said, scientists can get up to 70 per cent of the larvae to attach. Larvae then could be used in reseeded efforts, such as projects in Tumon Bay and the Fapci Point area [Editor's note: Tumon Bay and Fapci Point are situated respectively on the northwest and southwest coast of Guam]. Scientists tried out a device to help the

larvae settle at the two sites about one year ago [this article was written in August 1996]. 'After seedings, we can actually see beautiful little corals,' Richmond said.

The Tumon Bay and Fapci Point sites were last checked about eight months ago, he said, and they will be checked soon to determine how many of the corals survived their first

year. The settlement process is also important for larvae being raised in the laboratory. By growing coral in the lab, Richmond said, biologists can use the 'homegrown' colonies in experiments, allowing them to conduct experiments on live coral without damaging the reef.

(Source: Pacific Daily News)



■ AUSTRALIA AND JAPAN SIGN A NEW AGREEMENT

Australia and Japan recently signed a new bilateral fishing agreement which will allow limited tuna fishing by Japanese longliners in the Australian fishing zone (AFZ).

Federal Minister for Resources and Energy Senator Warwick Parer said the agreement would benefit both countries and would ensure that tuna fishing in Australian waters by Japanese vessels is conducted under strict management controls. 'It reinforces the close and important relationship between Australia and Japan in the fisheries area,' Senator Parer said.

'The agreement is great news for ports like Hobart and Fremantle that supply the Japanese fishing fleet. In 1994-95, there were 417 visits by Japanese vessels to Australian ports, pumping A\$ 40 million into their local economies.' The main features of the new agreement are:

- ☞ The Australian Government will be paid an access fee of A\$ 3,450,000, which will mainly be spent on fisheries management and research. This is a very good result for Australia, given that the agreement will only be in force until 31 October;

- ☞ Japanese longlining off the east coast will be limited to a maximum of 2,100 fishing days, compared to 2,575 days last year. Only 55 Japanese vessels will be licensed to operate off the east coast, the same as last year;

- ☞ Only 20 Japanese vessels will be allowed to operate off the west coast, also the same as last year;

- ☞ Japanese vessels will be allowed to catch a maximum of 400 t of southern bluefin tuna (SBT) in the waters off Tasmania. Japan has retained its voluntary quota of 200 t of SBT in the east coast area. These tonnages will be acquitted against Japan's global SBT quota of 6,065 t;

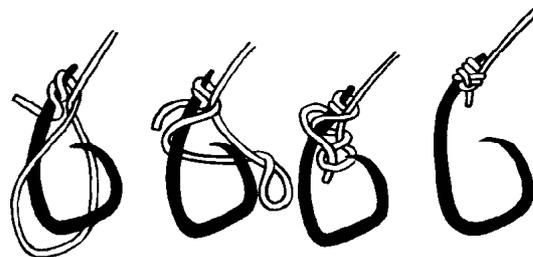
- ☞ All Japanese vessels operating south of latitude 30°S will be required to use tori poles to reduce the incidental catch of albatross. Tori

pole devices have been mandatory on Australian longline vessels operating south of this line since 1995;

- ☞ All Japanese vessels will be required for the first time to have satellite data transmission and monitoring equipment fitted. This will help ensure Australia has the necessary information to manage and conserve the marine resources in a sustainable and responsible manner; and

- ☞ Japanese vessels will be banned from fishing in the area off the north coast known as 'Area E'. Japanese vessels have previously handlined in Area E for bigeye and yellowfin tuna. The Government is of the view that the area is now fully exploited by domestic longliners and by the gamefishing industry.

(Source: Professional Fisherman, July 1996)



■ NOTES ON THE DRIED FISH TRADE IN FIJI

This article is written by Bob Gillett and presents some aspects of the dried fish trade in Fiji.

During the week beginning 31 June, I spoke to a number of individuals and visited several commercial establishments to learn more about the trade of dried fish in Fiji.

This included the Fisheries Division (S. Tuilacala, M. Tuiloa, K. Swami, S. Sharma, F. Koroi), two visits to the main Suva market, a sampling of the major bulk food stores in central Suva, and a trip to a store outside Suva where dried fish was reported to be sold.

In addition, I had a meeting with one of the major Chinese food importer/exporters (Yon Tong), and discussions with two Fijian housewives, a nutritionist, an owner of a chain of Indian restaurants, and an Indian businessman who had expressed interest to SCP Consultants in distributing dried fish from Tuvalu (B. K. Reddy).

The most informative of these activities was the discussion with K. Swami and that with Yon Tong. These two tended to reinforce each other, whereas the information obtained from B. K. Reddy was both different and more optimistic.

The present trade in dried fish in Fiji appears oriented to the Indian community, especially south Indians. Historically, the Indian cane farmers had limited access to fresh fish (distance to the sea) and frozen fish (lack of electrification), and therefore consumed dried fish. Although popular in western Viti Levu, the main area of production and consumption appears to be Vanua Levu.

This was probably because of productive mangrove areas in the east for capturing the desired species, ample sunshine for drying the fish, and a large population of cane farmers.

Although dried fish sold in Suva may originate from various locations, the vast majority appears to come in from Labasa on Vanua Levu. An inspection of retail outlets in Suva indicated that very few stores carry the product.

The central market was often cited as a retailing location, but visits during the week and on Saturday morning, and discussions with fish vendors, indicate that only smoked fish is regularly sold.

Several large bulk-type food stores in the vicinity of the market were visited (MH Market Store, J. Santa Ram, Bulk Store, Rajendra Prasad, Food for Less) but none carried dried fish. These merchants felt that in Suva only the Chinese food stores carry the product. Accordingly, all those stores in central Suva were visited (Yon Tong, Yuen Sing, Fong Yuen, Peter Fong).

Yon Tong was the only store to have a stock of dried fish, although the Peter Fong store occasionally carried the product (last supply was sold in December 1995). Because B. K. Reddy had indicated that he sells dried fish to B. Kumar supermarkets, I visited a B. Kumar store in Raiwasa outside Suva. They did not have any in stock, but stated they sometimes sell dried fish and that it comes from Labasa. Reddy also indicated that 'Nausori market' sells the product.

The owner of a chain of Indian restaurants indicated that, al-

though Indians eat dried fish in curries at home, he has never sold dried fish in curry, nor has he ever heard of other restaurants using dried fish in any dish. Two Fijian housewives said they have never purchased or consumed dried fish, although they occasionally eat smoked fish. The Fisheries Division also confirmed limited or no demand for dried fish among ethnic Fijians.

The product carried by Yon Tong is a single split and dried mullet sold in a clear plastic bag which is closed by a knot (one sample obtained). Prices ranged from F\$ 2.30 to F\$ 5.00 per bag. This appears to correspond to about F\$ 12 per kg.

The B. Kumar store in Raiwasa said they sell dried mullet for about F\$ 16 per kg. The Peter Fong store on Renwick street in Suva last sold dried mullet for F\$ 12 per kg (December 1995). B. K. Reddy assured me that the normal price is about F\$ 9 per kg and that the high prices I noted were due to the poor weather.

Reddy also stated that his normal wholesale buying price is F\$ 5 to F\$ 6 per kg. N. Yuen of Yon Tong (who I know from previous work to be a reliable source of information) indicated he buys dried mullet from Labasa at F\$ 6 to F\$ 7 per kg.

The Fisheries Division annual reports give information on dried fish imports and exports. Dried fish could conceivably fall into one of two categories: (1) 'dried fish salted but not smoked' or (2) 'fish fillets dried, salted or in brine but not smoked'.

Recent imports in these two categories combined in 1992, 1993, and 1994 are 17.6, 9.6, and

0.6 t respectively. Recent exports in these two categories combined in 1992, 1993, and 1994 are 25.9, 15.5, and 9.3 t respectively. These figures may, however, be misleading.

Shark fin, a major export of Fiji, probably represents most of the 'dried fish' exports. An examination of a detailed listing of the 1995 export-permit database revealed that there were no permits issued for exports of non-shark fin dried fish during the entire year. Products other than conventional dried fish (e.g. salted anchovies for pizza) may distort the imported quantities.

The species involved in the Fiji dried-fish trade is quite important to the Tuvalu project. The trade in Fiji is largely oriented to mullet and, according to K. Swami, three large species belonging to the genus *Mugil* account for the majority of sales.

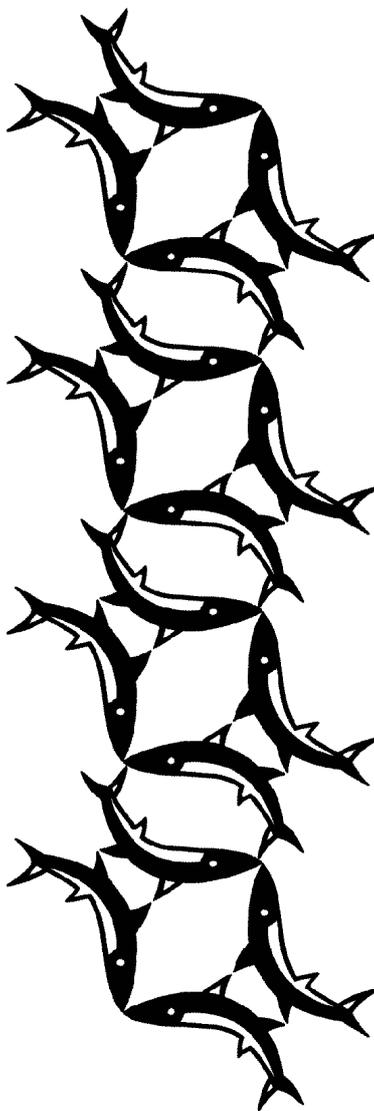
The opinion was expressed that these fish, being oily, dry well. Two Indians interviewed indicated that mullets are the preferred species in the area of south India where the consumers' families came from, and for traditional reasons there was preference for mullets.

Although other species may be occasionally dried and sold in Fiji (e.g. *Rastrelliger*), they are definitely not preferred, and the price would be substantially lower.

The one buyer who has expressed any interest in the purchase of Tuvalu dried fish, B. K. Reddy, has indicated a willingness to consider other species, but is unable to give even an indication of the price until he does some market testing.

With respect to species composition and the Tuvalu project,

work done by the Fiji Fisheries Division on two islands in Lau in the mid-80s is especially relevant. As part of a cyclone relief effort, the Fisheries Division encouraged the production of dried mullet on Ogea and Fulanga islands.



One major problem encountered was a marked decrease in the abundance of mullet, and one biologist concluded that failure to realise the limited production potential of mullet from small islands was a major fault of the project.

There are two processes for preparing dried mullet in Fiji, both of which involve salting.

Wet drying consists of dipping the fish in a brine solution and then sun drying, a technique being promoted by the Fisheries Division.

Dry drying involves smearing salt into the flesh, and this appears to be the technique most appreciated by consumers. Dried mullet with a slight reddish colour and an oily-like shine receives the highest price. Also, larger fish receive a greater price. A white powdery coating on the fish is considered undesirable, and is caused by excess moisture inside the plastic bag. It was mentioned that re-hydration of fish is sometimes a problem in Suva's wet climate.

Other dried fish products besides mullet are sometimes sold in Fiji. 'Whitebait' are small baitfish-type species (e.g. *Spratelloides*, *Amblygaster*, which, according to K. Swami, are often sold in dried form.

The Fisheries Division annual reports for 1992, 1993, and 1994 report 9.2, 15.8, and 2.36 t of whitebait respectively were sold in non-municipal markets, mostly on the roadsides in the Western Division. Biologists of the Fisheries Division say that much of these fish are caught on Viti Levu from Ba to Momi Bay. Some Chinese shops sell packets of small dried fish imported from mainland China.

Yon Tong store sells a 60 g pack of what appears to be dried *Stolephorus* anchovies for F\$ 2.50. The owner stated they sell about 40 kg of this per year. Some Indians, especially the Gujarat, enjoy eating 'Bombay duck' which actually is made from dried fish 'about the size of a toothbrush'. The owner of a chain of restaurants in Suva says that this product is imported from India.

K. Swami of the Fisheries Division and H. Yuen of Yon Tong feel that there is a declining market for dried fish. They base this opinion on sales records, high cost of dried fish relative to fresh fish, and the fact that the traditional consumers (cane farmers) now have access to fresh fish, freezers, and canned fish.

They refer to dried fish as a 'nostalgia food' of the older generation. H. Yuen, an owner of apparently the only store in Suva that now has dried fish, indicated he sells perhaps 200 kg of dried mullet per year.

B. K. Reddy, however, feels that all Fiji Indians (even those from the north of India) now have acquired a taste for dried fish in their curry. He (and his accountant) indicated that there are eight towns in Viti Levu with a substantial Indian population.

The 200 small shops of these towns would (after an introductory period) sell about 50 kg per month or a total of 10 t. The 32 supermarkets of these towns would probably only sell the product if the smell could be contained, and then maybe 3.2 t could eventually be sold.

In mid-March, letters of enquiry were sent by SCP Consultants to seven importers of fish products in Fiji. These letters were to ascertain the interest of the firms for importing dried fish from Tuvalu. To date, only one importer has replied, Continental Marketing Pty. Ltd. I made nine attempts to contact B. K. Reddy, the 'Fiji Director'. Finally on the morning of 7 June I managed to speak to him and an appointment was arranged for that afternoon in the office of N. Mudliar Accountants. It was explained that N. Mudliar was the company secretary and

provides advice for all new business endeavours to Reddy.

I explained the Tuvalu project and asked for information on the type of product and quantities they would be willing to purchase.

They explained that Reddy purchases dried mullet from Labasa, but that production cannot fulfil demand. He stated that he normally purchases in lots of 200 to 500 kg but he has not made a major effort to develop the market due to lack of supply.

He also stated he has exported substantial quantities to the Indian community in Australia and New Zealand. He confirmed to me that he had exported dried mullet in 1995, but retracked a bit when I told him I had access to the 1995 export database which showed no dried fish exports in 1995.

As indicated above, Reddy feels that he could eventually distribute about 13 t of quality dried large mullet each month to the eight towns in Viti Levu with large numbers of Indian residents.

He was uncertain as to the prospects of marketing non-mullet species, and indicated that marketing work would be required. He would want the dried mullet individually packed in a plastic bag, and also some in 10 kg and 20 kg loose packs. He would pay F\$ 5 to F\$ 6 per kg for quality large dried mullet, but would only consider doing business with the Tuvalu project if he is to be the exclusive Fiji distributor.

My impression of the meeting with Reddy is that he probably has been in the dried fish business for a considerable length of

time. Because he uses the offices of other firms and apparently travels much around Fiji, there may be problems in contacting him, especially from Tuvalu.

I was concerned over his claim to have exported substantial amounts of dried fish in 1995, as I know there were no legal exports of dried fish that year. The supposed large demand for dried mullet does not entirely accord with the total absence of the product in the restaurant trade.

This also contradicts the opinion of a reliable Chinese distributor of the product. His stated buying price for mullet is probably low. I also feel that Reddy has nothing to lose (but possibly something to gain) if he exaggerates the demand for dried fish. A critical but as yet unanswered question is what price, if any, Reddy would pay for non-mullet species.

I also attempted to ascertain air cargo rates on Air Marshall Islands (AMI). I spoke to Vili in the AMI Suva office, Liti in the AMI Nadi office, and then Rudolf of another section of the Nadi AMI office (telephone 722-192). The impression I received is that air cargo is not a priority of the airline and, especially from Funafuti, cargo (and even passenger baggage) is often off-loaded due to insufficient capacity on the Saab aircraft.

I was quoted a price of A\$ 1.70 per kg and a minimum of A\$ 20 per shipment. I was told that the main AMI cargo man from Majuro would call me to negotiate a concessionary rate, but he failed to do so.

(by Bob Gillett of Gillett, Preston & Associates)



■ THE FISHERIES OF THE EUROPEAN UNION: CAN FISHERMEN LEAD US OUT OF THE CRISIS?

Over the last 20 years, it is difficult to recall even one occasion when the fisheries of the European Union (EU) have captured the headlines conveying a message other than crisis or conflict, or, more often than not, both.

The major fish stocks upon which the EU depends have slipped beyond the brink of serious overfishing to the point where they are no longer sustainable. Despite intense regulation, unofficial sources suggest that maybe the equivalent again of the tonnage of fish caught in the 'common pond' of the EU is thrown away at sea and that a substantial proportion of illegally-caught fish (50 per cent of that landed?) finds its way into the supply network.

Concomitantly, the fishermen, the food industries that use fish and the maritime communities dependent upon fishing as a source of income and employment have all suffered. This is manifested in a sharp decline in the numbers of full-time fishermen, shortages of certain prime fish species and the depression or even disappearance of fishing as an occupation in some communities in our coastal waters. What we are witnessing is an institutional crisis in which the resource users (the fishermen) and regulator (government) relationship has broken down.

Despite the relatively small size of fishing as an industry in the EU (especially in relation to the agriculture sector), the European Commission has made serious efforts to address the crisis, and a variety of regulatory schemes have been tried in an effort to rescue the fish

stocks. Unfortunately, despite often determined, and sometimes original, approaches to the problems of over-exploitation, it is not possible to point to the introduction of any one regulatory measure and state that it has been even a qualified success, stemming the tide of decline.

Indeed, more often than not the implementation of regulatory measures has exacerbated the problems; the stock crisis continues and associated 'social fall-out' has had adverse effects upon the resource users and the communities dependent upon fishing for their livelihood.

Clearly there are problems in the structure of the EU's fisheries that are deep rooted and not easily remedied. The structure of the Common Fisheries Policy (CFP), established on the principles of the Treaty of Rome, has been much criticised and singled out as the main source of difficulties.

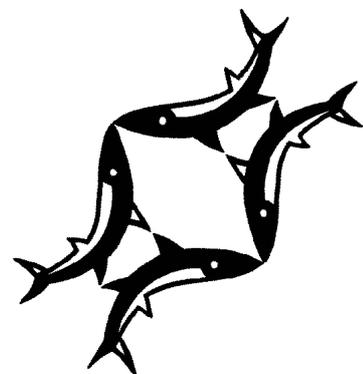
Indeed, to date, the CFP has failed to achieve its objectives: there has been little reduction in fishing effort, no evidence of stabilisation—let alone recovery—of major food fish stocks, and as a result, no improvement in the economic returns to the fishing industry.

The fundamental assumptions and basis of the CFP are in question, and many within the fishing industry call for the policy to be scrapped. Which raises a number of questions. Is it really possible to manage the fisheries sector using strategies based upon bio-economic theory? Bio-economic theory fails to model in an appropriate way the true,

unpredictable behaviour of fisheries in an uncontrollable, if not chaotic, ecological system. Instead, it substitutes a false notion of predictability for stock behaviour (and economic returns) upon which basic working principles of the CFP, total allowable catch (TAC) and quotas, are predicated.

The problems are compounded by the underlying political principles of the EU: non-discrimination between member states, political neutrality and the application of policy measures which inevitably tend towards stalemate.

The Treaty of Rome calls for non-discrimination between member states, but how can fish stocks be managed in the free-for-all of equal access? The deployment of regulations (and yet more regulations) is not having any significant positive impact, furthermore the fishermen seem to feel justified in ignoring them, pointing out that their livelihoods are threatened and, contentiously, that they were not adequately consulted before the laws were introduced.



All in all it appears that the CFP is a policy designed only to maintain the *status quo* in a sector beset by intractable problems, and seemingly forever threatened by adverse economic and environmental conditions.

So where do we go from here? There is a growing recognition, at least among social scientists, that we must look beyond bio-economic theory to lay the foundations of a workable management policy.

They argue that the support of the fishermen (and their fish organisations) is essential if we are to make progression in management. Put another way, any policy dedicated to the 'solution' of fisheries problems will fail if it does not embrace the aspirations of the fishermen and their dependants.

There are many examples of this in EU fisheries; we have only to look at the failure to conserve fish stocks, despite the deployment of a complex body of licensing, quota and technical measures, to appreciate the validity of this statement.

Evidence from other fisheries in the world, and even from the past history of some of the EU member states, has shown that where legitimate and recognised fishermen's institutions exist, then their involvement in the policy and decision-making processes can lead to the adoption of more successful resource-exploitation strategies.

The examples are characterised by institutional structures in which management is devolved from government to the resource user groups. In return for the greater autonomy provided by government, the fishing communities have, in most instances,

demonstrated a more responsible attitude towards resource utilisation and self-regulation, and have shown the ability to rationalise internal conflicts.

More specifically, there are some interesting examples from the oceanic island states of the Pacific, where the coastal communities have for centuries presided over well-organised fisheries exploitation systems that have achieved, at least until recent times, the elusive goal of sustainability.

This has been due, in no small measure, to the existence of a resource exploitation policy that conferred responsibility for fisheries planning, development and management to the local fishermen, usually through the allocation of property rights, often on a territorial basis.

The system is ancient, and reflects a culture and customary legal system quite different to that associated with European institutions. It is interesting to note also that the territorial rights system has, in some locations of Oceania, been destroyed, apparently as a result of contact with modern exploitation strategies and resource management regimes.

The many positive features of the resource management systems of the Pacific Island states are not confined to Oceania.

There are examples from the coastal states of the European Union in which fishermen's organisations have in the past played a key role in resource management; although most of them seem to have been neutered by a combination of over regulation and contact with adverse economic and environmental forces.

Are there lessons then that might be applied to the future development and management of EU fisheries? Is it not the time for the policy makers to recognise the fisheries dependent regions of the EU and empower the coastal communities to help find a way out of the crisis in which we are in?

The indications are that the Commission is leaning towards the development of a social dimension to the CFP, and that the devolution of management responsibility to fishermen's organisations is being taken seriously. There are elements within the current structure of the EU that might be enlisted to support this shift of emphasis.

The recognition of the concept of subsidiarity and the identification of fisheries dependent regions indicate that the concept of devolved management responsibility is not out of place.

If the positive elements of the current policy were to be harnessed to the appropriate policy instruments, such as the structural and regional funds (e.g. the PESCA programme), then the pieces would be in place to begin a policy shift to take account of the needs of the fisheries dependent coastal communities.

However, time is short, and it is up to all parties concerned to force the pace of change with regards to the radical policy and institutional restructuring that has to take place.

(Source: *Fish*: 43, July 1996)



■ FISHING INTO THE FUTURE

With its 80 islands stretching across 800 miles of the Western Pacific, Vanuatu has abundant coastal fishery resources with significant economic potential. Current estimates set the total catch of inshore fin fish at a mere 2,000 t, however the importance of fishing is probably not fully recognised. Fishing is already an important subsistence—and in some cases commercial—activity for many coastal villages on the outer islands.

Many village chiefs have realised the detrimental effects of the over-use of monofilament gillnets and other gears on their fishery resources, and are now closing the village grounds in order that the resources can naturally generate.

With the population of Vanuatu set to double in the next 25 years the demands on marine resources, both for subsistence and for commercial purposes, will increase.

Although there are large areas of coastline with little or no fishing pressure, the majority of ni-Vanuatu fishermen do not possess the expensive boats and engine necessary to exploit the more remote fishing grounds. This highlights the importance of the sustainable management of fishing grounds close to coastal communities.



However, the costs and practical difficulties involved in monitoring the status of inshore resources are enormous, while fishermen often resent being told what to do by a central government. One approach to reducing the costs and making management work for the community's benefit is to develop 'co-management', whereby the responsibility for management is shared by the resource custodians and the Government.

The Vanuatu Fisheries Department are already actively involved in assisting fishing communities in the management of their resources, particularly of trochus and green snails.

The Marine Resources Assessment Group (MRAG) based in London has recently commenced a project to investigate the role of customary ownership in the conservation of finfish resources in Fiji and Vanuatu. The two-year project is funded by the British Government's Overseas Development Administration (ODA).

MRAG, in cooperation with the Fisheries Department, will undertake field-work with locally-recruited staff to see how community management is working here. A number of villages will be asked to cooperate in the project, and assessments of their finfish resources will be undertaken to provide customary owners with additional information to assist them in their management.

The project also has wider implications. In many countries in the region, traditional customary ownership has been unsuccessfully replaced by centralised management. The research undertaken here and in Fiji will be used to contribute to the development of community-based co-management in the region as a whole.

(Source: *Vanuatu Weekly*, 24/8/96)



■ EIGHTH PACIFIC SCIENCE INTER-CONGRESS

The Eighth Pacific Science Inter-Congress will take place at the University of the South Pacific, Suva, Fiji from 13 to 19 July 1997.

The theme of the 1997 Inter-Congress, 'Islands in the Pacific Century', has been chosen to

focus attention on islands and their development in the 21st century. The Inter-Congress will provide an interdisciplinary forum to address specific issues relating to the role of science and technology in the development of islands; review progress and share research

findings in key areas in natural and social sciences relevant to islands; and review development, achievements, problems and prospects of Pacific Islands.

One symposium will be dedicated to fisheries and marine resources. Fisheries and marine

resources development present for most Pacific Island states their most promising opportunity for sustainable economic development. To achieve this goal there is a need to understand the current state of marine resources and factors that affect their use. There is also a need for scientific research and socio-cultural understanding if marine resources are to be developed in a sustainable way.

The symposium will examine the state of fisheries and marine resources in the South Pacific, including the role of regional organisations and

institutions in the development of sustainable fisheries. Trans-boundary issues in sustainable marine resources development will be discussed.

Other topics will include: the importance of the development of sustainable management strategies for inshore resources, the need to develop an appropriate trading and marketing environment, and social considerations in the sustainable development of marine resources.

The symposium will conclude with an overview of the roles, opportunities and responsi-

bilities of the State in the sustainable management of marine resources.

For further information on this symposium, please contact: Professor Robin South, Director and Professor of Marine Studies, The University of the South Pacific, Suva, Fiji. [Tel: 679 313900 ext 2386, Fax: 679 301490, E-mail: south_r@usp.ac.fj or Mr Peniasi Kunatuba, Deputy Permanent Secretary, Ministry of Agriculture, Fisheries and Forests, P.O. Box 358, Suva, Fiji. [Tel: (679) 315109; Fax: (679) 302478].



■ CTSA PUBLISHES A MANUAL ON GIANT CLAM SHELL CRAFT

The Center for Tropical and Subtropical Aquaculture (CTSA) has recently published 'Clams to cash—how to make and sell giant clam shell products'. This 88-page manual, produced as a component of the CTSA-funded project entitled 'Aquaculture extension and training support in the US-affiliated Pacific Islands—year six', was written by Gerald Heslinga [Heslinga managed the Micronesian Mariculture Demonstration Center in Palau from 1984 to 1994].

The manual contains the following sections:

- Shell storage;
- Where 'value-added' begins;
- Post-harvest processing;
- Shell craft;

- Setting up your first gift shop: a case study;
- In conclusion;
- Sources of supplies and equipment for giant clam shell crafting; and
- A transcript of the companion videotape.

The manual includes 40 photographs, and describes in detail how to craft shells as ornaments, serving bowls, soap and sponge dishes, wasabi dishes, ash trays, two types of night lights, candlestick holders, planters and garden ornaments, shirt pins, two types of earrings, several possible styles of necklaces, magnetic memo holders and key rings, aquarium ornaments and base substrate. It also provides a discussion of pricing considerations and hints on getting started in the giant clam shell marketing business.

The book is available free of charge to individuals within the CTSA region. Other US residents may obtain a copy for US\$ 5 to cover shipping and handling.

Those outside the United States can obtain a copy for US\$ 18 to cover shipping and handling. The book will be available for downloading from AquaNIC's Worldwide Web by early fall. AquaNIC's URL is <http://www.ansc.purdue.edu/aquanic>.

For more details, please contact:

Center for Tropical and Subtropical Aquaculture
The Oceanic Institute
41-202 Kalaniana'ole Highway
Waimanalo
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Ph: (808) 2597951
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(Source: CTSA Regional Notes)





THE AUSTRALIAN GIANT CRAB HAS A BRIGHT FUTURE ON ASIAN TABLES

The Tasmanian giant crab, which till now has not been very popular with Australians, could take a lion's share of the export market to South-East Asia, according to a researcher at the University of Tasmania.

This crab has an impressive size, frequently growing as large as the width of a man's chest and weighing up to 20 kg. The export market for Tasmanian crab

(*Pseudo carcinus gigas* or Tasmanian king crab) has been estimated over the past year at about A\$ 4 million .

Since 1995, this market has become a very tangible reality with initial exports going to South-East Asia, especially Taiwan. The idea of sending a few crabs to Taiwan as samples came from an Australian business leader in Tasmania. The response was immediate; in contrast to Australia, where this dish has never found a following, it already appears very popular in Asia. For that reason, the relative peace from human interference which the crab has enjoyed for thousands of years is now definitely ended.

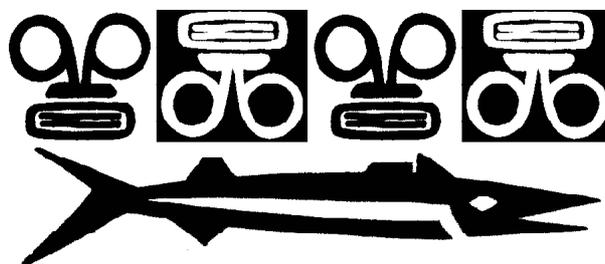
For the past few years, Caleb Gardner, a research assistant at the University of Tasmania, has been specialising in the study of

the Tasmanian giant crab as part of a joint project between his university and the Australian Department of Primary Industries. One bright spot for the future of this crab is that now, thanks to Caleb Gardner's research, the Tasmanian King can be raised in captivity, something which was not before possible.

'While barely a metric tonne was harvested in 1990, over the past five years, production has really taken off. It is now one of the most sought-after seafoods in South-East Asia, where its delicate flesh is a sign of wealth at banquets,' he explained.

In order to satisfy demand in Asia, Australian farmers can now begin large-scale exploitation, which could prove to be a veritable gold mine: While the current price for the largest specimens is about AU\$ 100, crabs can bring double that price at their final destination in an Asian restaurant.

(Adapted from *Les Nouvelles Calédoniennes*, May 1996)



GILLNET FISHING IN MACUATA, FIJI

INTRODUCTION

The purpose of this trip to Fiji was to review the effectiveness of the banning of commercial gillnet fishing in Macuata Province on Vanua Levu. We were also asked to make recommendations on whether the ban should be maintained, and to advise on any other management measures relating to commercial and subsistence fishery in Macuata Province.

The gillnet fishing ban was imposed by the Macuata chiefs in 1990. Unfortunately, there was no survey conducted at this time, so no estimates of stock abundance were available for future assessment and comparative analysis.

In 1995, the chiefs of Macuata requested Fiji Fisheries (through the Macuata Provincial Office) for an assessment of the effectiveness of the ban. Fiji Fisheries then requested technical support from the South Pacific Commission through the ICFMaP project. The Commission agreed to this request, and the ICFMaP team left for Fiji in February 1996 to conduct this work.

The ICFMaP personnel that took part in this survey include Tim Adams, Paul Dalzell, Sione Matoto and Esaroma Ledua. Paul, Sione and Esaroma left Noumea for Fiji on the 6th of February, and were joined by Tim two weeks later.

After meeting senior Fisheries Officials in Suva on the 7th and 8th of February, the team travelled to Labasa, Macuata on the

by Esaroma Ledua,
Integrated Fisheries
Management Associate,
South Pacific Commission
Noumea, New Caledonia

9th of February for the start of the survey work. Three Fiji Fisheries Research Officers were assigned as full-time counterparts to this project. They were Apisai Sesewa (team leader), Saiyasi Yabakivou and Jovesa Korovulavula.

Considerable support was received from the Fisheries Division, especially the provision of support staff, fishing gear and vessels. Apart from the three research staff, Extension Officer Matai Kolinisau spent two full weeks with the ICFMaP team.

The Research Officer based at Labasa, Mr Indar Dev Raj, was also assigned to the team to assist in collecting information on commercial landings. The Fisheries vessel *Gonedau*, with nine crews, was assigned to this project for a full four-week period.

The commercial fishery operation in the Macuata Province has a lot of things to offer to other countries in the region. It is organised in a simple professional way, which has the potential to be successfully duplicated by other neighbouring countries.

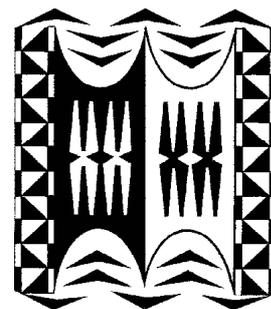
This includes the marketing system, the storage system, the contract system of catching fish and the system of paying wages. All these aspects of the fishery should be of interest to neighbouring countries in the region.

BACKGROUND OF MACUATA

The land and coastal boundaries of the Macuata Province lie between latitude 16°5'S to 16°35'S and longitude 178°50'W to 179°45'W, on the second largest island of Fiji, called Vanua Levu. The island of Vanua Levu is composed of three large provinces: Macuata, Bua and Cakaudrove. Macuata is made up of the northern portion of Vanua Levu and five other small islands to the north. Labasa Town is the capital of Macuata Province.

Since Macuata is a dry area (average rainfall of 4,050 mm/year), it has a climate favourable for growing sugar cane, and Macuata is one of the leading sugar producers in Fiji. The province of Macuata is also known for its timber and fishery resources. Sugar is the main source of income, followed by timber and fish respectively.

Fish resources in Macuata coastal waters appear to be more in abundance compared to other areas in Fiji, especially Viti Levu. This may be attributed to the establishment of good traditional management systems, the presence of large areas of mangroves, an extensive shallow lagoon and the Great Sea Reef that provides shelter to the whole of Macuata's coastal zone (important as a source of nutrients, refuge and spawning grounds for many fish species).



Management of fishery resources in Macuata is jointly controlled by the Fisheries Division office in Labasa, as well as the chiefs in the various districts. The Labasa Fisheries Office is the headquarters for the Northern Division of the whole of Vanua Levu.

A total of twelve officers are currently serving the province of Macuata. The Fisheries Officers provide resource management and development advice to provincial councils, district councils and village councils.

They also provide fishermen with services such as sales of gear and ice, vessel licensing, hull and engine repairs, preparation of bank loan applications and law enforcement. The chiefs, through traditional management systems, may declare and enforce bans or taboos, in most cases through prior consultations with the Fisheries Division.

GILLNET BAN

The chiefs of the Macuata area imposed the ban on gillnet fishing in 1990. Although this is technically illegal due to government ownership of all resources and the seabed, the chiefs used their traditional powers to impose the ban. The government recognises the traditional systems in Fiji, and therefore endorsed the ban on gillnet fishing.

Among the reasons why the government endorsed the gillnet ban were the numerous complaints about the negative effects of commercial gillnetting on subsistence-fishery catch requirements. Subsistence fishermen were experiencing difficulties meeting their subsistence requirements.

Though the chiefs were receiving and benefiting from substantial amounts of money as goodwill payments from commercial fishermen, strong opposition from the people forced the chiefs to declare the ban on gillnet fishing.

MACUATA SUBSISTENCE FISHERY

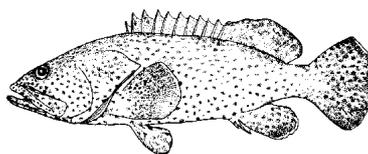
Villages along the Macuata coast rely on fish as their main source of protein. Handline fishing is the most common method of catching fish. Free diving, using rubber-propelled spears, seems to be the second most popular method of catching fish in Macuata.

Reef gleaning is also common, combined with the use of hand nets. This type of fishing method is practised mainly by women. Some fishers use hand spears or knives to fish on reef flats at low tide.

Spear fishers and reef gleaners prefer to go out at low tide. They try to reach selected or favourite spots before the flow of the incoming tide. They wait for fish which come in schools with the tide to feed in shallow water.

Fishermen prefer early morning tides or late afternoon tides. Our observations while visiting villages in Macuata showed that invertebrates, mainly molluscs, constitute about 17 per cent of the subsistence landings.

Groupers and coral trout accounted for about 30 per cent of the total catch, with other significant contributions from



surgeonfish (18 per cent), trevallies (10 per cent), emperors (6 per cent) and parrot fish (5 per cent).

Subsistence fishers fish harder when there are village functions such as church gatherings, district meetings, weddings, the birth of a first-born baby, deaths in the village, or other festivals. Subsistence fishers in Macuata prefer to do handline fishing at night, especially when the tide is turning on the ebb tide.

Handline fishing is mostly conducted in deep areas of the lagoon or reef channels during dark nights, targeting rock cods, snappers and other bottom fishes. When the moon is full, subsistence fishers prefer to use handlines in the shallow sandy areas of the barrier reef, targeting Lutjanids and Lethrinids.

Subsistence fishing trips in Macuata usually last for 8 to 12 hours at sea. On special occasions, fishing trips may last more than 12 hours. In such cases, fish are smoked or cooked in earthen ovens on uninhabited islets nearest to the fishing grounds.

This is done to preserve fish in order to allow fishers to stay longer at sea. Ice is rarely used in Macuata for subsistence needs. This is due mainly to the unavailability of proper ice boxes and the problem of accessibility to ice plants.

Although gillnet fishing has been banned in Macuata since 1990, the chiefs continue to grant exemptions to subsistence fishermen whenever there is a big village function, particularly when large volumes of fish are required.

It is estimated that gillnets are deployed in each village on an

average of about 10 times per year only. Subsistence gillnet fishing in the Macuata area does not, therefore, appear to be excessive.

Gillnets used by these subsistence fishermen are usually around less than 300 m in length, and therefore much shorter in length than those used by commercial fishermen, who deploy nets of more than a kilometre in length. It was also noted that nets used for subsistence purposes were much shallower in depth compared to the ones used by commercial fishermen.

The frequency of subsistence fishing is variable and dependent on the weather conditions, social occasions in the villages and seasonality of targeted species. For example, people fish harder for their subsistence needs when mackerel (*R. brachysoma*) aggregate in coastal zones to

prepare for spawning. At this time it is not unusual for fish to be served for all three meals in most village homes.

COMMERCIAL FISHERY

Since gillnetting is banned in Macuata, commercial fishermen have shifted to handline fishing for demersal reef stocks on the Great Sea Reef. There were a total of 289 commercial fishermen licensed in 1995 and a similar number is expected for 1996.

Most of the commercial fishermen use the FAO-designed 28-foot (8.5 m) wooden launches for fishing. These boats were built by the Fisheries Division when their boat yard was operational. Fishing periods usually last 4–7 days for this type of boat.

The commercial fishermen in Macuata are quite satisfied with

handline fishing and are generally not in favour of lifting the ban on commercial gillnet fishing. This is due mainly to economic reasons, as the commercial fishermen have converted their operations to handline fishing.

It would be costly to convert back to net fishing, and they believe that if commercial gillnetting was permitted again, it is most likely that it would again be banned in a few years' time.

The average catch rate of commercial handline fishermen using FAO launches was about 342 kg/trip during the month of February. Overall, all vessels landed an average of 260 kg/trip with landings ranging from 12 to 500 kg/trip. It was observed during the survey that the commercial handline fishery is usually dominated by



Figure 1: The above picture shows three subsistence fisherwomen catching fish using handlines in Nukunuku lagoon, Macuata. Handline fishing is the most common subsistence fishing method in the Macuata Province.

barracuda, trevallies, spanish mackerel, groupers and coral trout, snappers and emperors. Current trends in the fishery suggest that there is no resource limitation at the current level of fishing.

The commercial fishery operation and set-up in Macuata is simple but effective. The fish catching systems are based on contracts that require boat captains of the FAO-designed vessels to catch a minimum of 300 kg/trip.

Therefore, the boats only return to port after exceeding this target. Fishermen catch sardines at night using lights placed on the side of the boat to attract them, and fish are then hauled into the boat using small mesh nets. This idea of catching bait originated from the tuna pole-and-line baiting techniques.

The wages given to the captains and crews by boat owners differ between boats, and are dictated by the fishing skills of the captains. Boat captains select their own crews, and every fifth trip is the captain's trip: that is, the profits from the trip belong to the captain and crew. Rations, fuel and kava are paid for by the boat owners, except for the fifth trip which the captain himself provides, but marketing of fish is conducted by the boat owners. The majority of boat owners sell their catch to fish buyers or middlemen.

In 1995, a total of 21 middlemen were licensed by the Fisheries Division for Macuata. The same number is expected again for 1996. Of interest was the organisation of the fish marketing system. When the boats come into port, boat owners inform the middlemen who send in a truck to collect fish.

The fish are then graded, weighed, cleaned and iced at the storage facility of the middlemen. The boat owner is then paid after the fish are weighed. Of the 21 middlemen in Macuata, four were selling most of their fish to Suva, whereas the rest retailed their fish in Labasa Town.

Middlemen selling fish to Suva are very well organised. They have trucks loaded with ice boxes, as well as freezers and ice bunkers for storage. Ice is normally purchased from the Fisheries Division Ice Plant, but one of the middlemen also has his own ice plant. Fish transported fresh to Suva are preserved in ice.

The trucks travel from Nabouwalu landing to Suva by ferry once a week with 2 to 5 tonnes of fish. The volume of fish sold to Suva markets constitutes approxi-



Figure 2: Picture of Mr Ali's storage facility at Labasa. Bags of fish are being offloaded from the small truck on the right. The big truck loaded with the ice box is for transporting fish to Suva. The ice bunker on the left, with bags of ice on top, is for storage purpose.



Figure 3: Three FAO-designed vessels offloading fish at Mr Khalil's storage facility. On the left is his storage house and ice plant. Further back is his bouser, which supplies fuel to the boats.



Figure 4: Mr Khalil (centre) holding a bundle of fish at his storage facility and helping in sorting fish landed by fishermen. On the right are the ice bunkers and at the back is his house

mately 91 per cent of the total landed catch in Macuata.

Markets in Suva are fixed, and therefore Macuata fish dealers merely offload, get paid and travel back to Labasa. Fish buyers in Suva include restaurants, butcher shops, supermarkets, and other middlemen.

The middlemen in Suva may then sell their fish at road-side stalls, or sell it to hotels and restaurants or the Nabukalou creek, whereas butchers and supermarkets have set up facilities to retail their fish.

MACUATA GILLNET SURVEY FIELD ACTIVITIES

It was not an easy task for the ICFMaP team to review the effectiveness of the banning of commercial gillnet fishing in Macuata Province from 1990–1996. This was mainly due to the absence of information on

the fish stocks prior to the imposition of the ban.

Field activities during this survey involved trial gillnet fishing between 16 February and 6 March 1996 to obtain accurate estimates of catch rates and selectivity of gillnets used in the former commercial fishery. Collection of catch-and-effort data from commercial and subsistence fisheries in Macuata Province was also conducted.

We held discussions with fishermen and villagers on the effectiveness of the commercial gillnet ban to try and gauge opinions about lifting or keeping the ban in place.

The ICFMaP team also tried to find whatever historical data was available on gillnet fishing in Macuata Province prior to the ban, for comparison with trial fishing conducted during the survey.

The Fisheries vessel *Gonedau* was used as the base for the gillnet fishing during this survey. Gillnets of mesh sizes 2, 3, and 4 inches were used (dimensions of each mesh size were 360 m x 50 mesh x 75% hanging ratio) to investigate catch rates, selectivity and species composition. Three fishing teams were formed and each team was briefed on netting procedures. The nets were deployed at high tides during both nights and days and soaked for six hours, and when nets were hauled in, the fish were separated in buckets according to mesh sizes. As soon as fish arrived on-board the *Gonedau*, they were sorted into species, identified, lengths measured and then weighed.

We were blessed with good weather in the first two weeks of the survey, but the third and fourth weeks were very wet and windy.



Figure 5: Fisheries staff helping the ICFMaP team in sorting, weighing and measuring fish onboard the *Gonedau*.

Though the wet conditions made life miserable on board *Gonedau*, the field activities continued as planned.

The *Gonedau* has only 9 bunks, but unfortunately there were 14 of us on-board the vessel. Sleeping was not so bad in the first two weeks because people without bunks were able to sleep outside on deck, but in the third and fourth weeks, life was difficult at night because of the wind and rain.

The team was no longer able to sleep outside but was forced to crowd into the small wheel house. I managed to secure a good spot between the sounding machine and the boat compass. Fisheries Officer Apisai Sesewa grabbed the chart table to sleep on, but unfortunately the table was only half the length of his height. Sione Matoto and two others shared the floor of the wheel house which is only about 9 x 3 feet in size.

OUTCOME OF THE SURVEY

Information from villagers in the Macuata area obtained from interviews conducted during this survey supports the conclusion that coastal fish stocks have improved markedly since the imposition of the ban on commercial gillnet fishing in 1990. Villagers do not need to travel far or fish for very long to obtain good catches. They also noted an increase in abundance of mullets and mackerels, which had previously been seriously depleted by commercial fishermen.

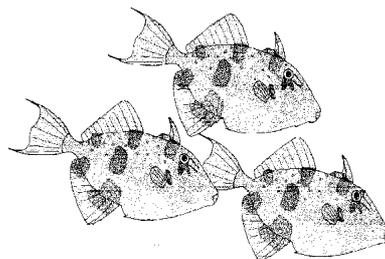
Though we managed to retrieve some catch data collected between 1982 and 1983 by the Fisheries Division, it was difficult to compare the catch data from this survey with previous

information on catch rates from commercial fishing. However, these records from the early 1980s show that average daily catch rate per vessel ranged between 53 and 97 kg, with an average of 73.1 kg/day. The average catch from this survey during February 1996 was 75.6 kg/day.

In terms of weight of fish caught, the principal components of gillnet catches were sharks and rays which collectively formed about 34 per cent of the catch. This may be indicative of low fishing pressure, as predatory species such as sharks are usually among the first group of fishes to be depleted when fishing pressure is high. Snappers and travellies each constituted about 9 per cent of the catch, while mullets and mackerels each contributed about 8 per cent of the total weight.

The current ban on gillnet fishing has had very little effect on the people of Macuata. The people most affected by the ban were commercial fishermen from outside the Macuata area, particularly those from Viti Levu. Commercial and subsistence fishermen in Macuata are not in favour of relaxing the ban on commercial gillnetting.

On selectivity tests, it was observed during the fishing trial that 2-inch-mesh-sized nets were catching a large number of juvenile fish.



This would, therefore, mean that the use of 2-inch mesh size should be restricted. It was also observed in this survey that 3-inch mesh size was the most appropriate minimum mesh to be used by subsistence fishermen with a hanging ratio of no less than 75 per cent.

RECOMMENDATIONS

In summary, it was recommended to Fiji Fisheries that the ban on gillnet fishing be extended, because of the marked improvements in subsistence catches and because commercial fishermen in Macuata have adopted handline fishing on the Great Sea Reef. Since subsistence gillnet fishing in Macuata does not seem to be excessive, there was no reason to seek any limitation on subsistence fishing, apart from discouraging the use of 2-inch mesh.

Concerning handline fishing, the Fisheries Division was advised to continue collecting information on fishing effort, notably catch composition, trip length, days spent fishing, hours fished per day and crew size.

FISHERIES DIVISION RESPONSE TO SURVEY OUTCOME AND RECOMMENDATIONS

The Fiji Fisheries Division was very pleased with the success of this survey. The recommendations were well received by the Fisheries officials, especially key people like Mr Apolosi Turaganivalu (Senior Fisheries Officer – Northern), Mr Krishna Swamy (Acting Principal Fisheries Officer – Resource Assessment & Development) and Mr Maciu Lagibalavu (Acting Director of Fisheries).

The report will be used to advise the Provincial Council

and Tikina Councils in the Macuata area.

CONCLUSION

The support given to us by the Fiji Fisheries Division greatly contributed to the success of

the field activities during the four weeks in Macuata. We were pleased with the professionalism of Fiji Fisheries staff who were involved in the survey, including boat crews and Resource Assessment & Development staff, especially the

leadership of Mr Apisai Sesewa. The support from the Labasa Fisheries office in terms of provision of rations, boat preparations, net repair, vehicle provision for field trips and many other activities were similarly excellent.



Figure 6: Happy faces of Sione Matoto and Esaroma Ledua during the first field trip on the *Gonedau* deck, with little expectation of what is coming in the next two weeks.

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Original text: English

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