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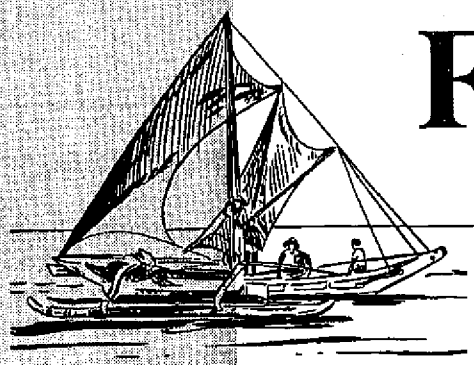

FISHERIES
Newsletter

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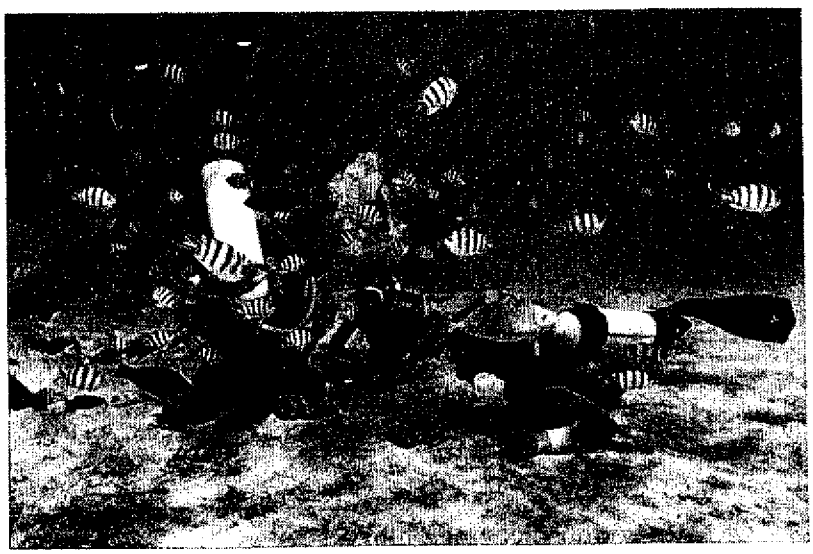


Photo: Martial Dosdane

South Pacific Commission
Prepared by Hamidan Bibi, Senior Fisheries Assistant (Information), Fiji Fisheries Division and Jean-Paul Gaudechoux, Fisheries Information Officer

TWENTY-FOURTH REGIONAL TECHNICAL MEETING ON FISHERIES (RTMF)

This annual meeting, which reviews the Commission's fisheries activities for the last 12 months and sets future directions for the programme, will be held from 3 to 7 August at SPC headquarters in Noumea, New Caledonia.

The draft agenda for the meeting, subject to modification, is shown below.

The meeting will host a one-day Workshop on Fisheries Education and Training. Both the 1991 Forum Fisheries Committee Technical Meeting and RTMF 23 requested proposals for improved fisheries training co-ordination and the introduction of a Fisheries Certificate Programme. The SPC Fisheries Training Project has been examining possible mechanisms for improved co-ordination and will be reporting on the results. A range of options for the implementation of a Fisheries Certificate Programme has been considered and debated over the past year and will be presented for consideration by the workshop.

The question of co-ordination and the certificate proposal arose from the report of the 1991 Human Resource Development (HRD) Survey which was formally presented to RTMF 23. The study produced a wide range of recommendations of interest to the training sector, concerning in particular future approaches to training requirements at both regional and national levels. It is hoped that more detailed discussion of the HRD survey report during the workshop will assist both countries and SPC to establish priorities for the training sector and develop appropriate activities.

The workshop will also include presentations on the Fisheries Training Directory and Database, the ASEAN/PINS Workshop on Training and Education and the USP Marine Studies Programme. A further item for discussion is assessment of the desirability of introducing a Regional Deckhand Certification Programme for Pacific Island fishermen serving the offshore fishing industry.

The workshop will give countries the opportunity to direct the priorities of the SPC Regional Fisheries Training Project. The agenda promises to be interesting. A summary of the workshop will feature in the next *SPC Fisheries Newsletter.*

The RTMF will be preceded by a meeting of the Pacific Island Marine Resources Information System (PIMRIS) Steering Committee on 30 and 31 July. PIMRIS is an agency project involving the South Pacific Commission (SPC), the Forum Fisheries Agency (FFA), the University of the South Pacific (USP) and the South Pacific Applied Geoscience Commission (SOPAC) which aims to provide a variety of information services to the region's marine resource workers.

Draft agenda — 24th SPC Regional Technical Meeting on Fisheries

3 August — *Opening formalities*

General introduction — SPC Fisheries Programme

Review of Western Pacific tuna fisheries and by-catch issues in the fishery

4 August — *Tuna and Billfish Assessment Programme review*

Tuna Research Project
In-country tagging projects
Albacore Research Project
Fisheries Statistics Project
Meeting reports
South Pacific Albacore Research Group

Western Pacific Yellowfin Research Group in fisheries studies
Western Pacific Fisheries Consultative Committee
RTTP Technical Aspects and Preliminary Results

5 August ***Coastal Fisheries Programme Overview***

Deep Sea Fisheries Development Project
Regional Fisheries Training Project
Fisheries Information Project
Quarantine protocols and introduced species
Fish Handling and Processing Project
Purse Seine Project/Offshore Fisheries Development Project
Collaboration in Pacific pearl oyster resource development
Design and interpretation of fisheries statistical programmes
Bait FADs and fishing techniques

6 August ***Workshop on Fisheries Training for the Pacific Islands***

7 August ***Role and future of RTMF***

Reports by other organisations

Other business/spillover

Adoption of Report.

REGIONAL FISHERIES TRAINING PROJECT (RFTP)

ASEAN/PINs Workshop on Fisheries Education and Training

On 12 and 13 April SPC hosted a Western Pacific Fisheries Consultative Committee-co-ordinated workshop designed to increase co-operation and co-ordination between the Association of South-East Asian Nations (ASEAN) and the Pacific region in fisheries education and training.

The workshop arose from recommendations of the ASEAN Pacific Island Nations International Fisheries Conference (Manila,1987), which suggested that there should be greater inter-regional co-operation in training and education. The Manila conference concluded that the major barrier to be overcome was a manifest lack of knowledge in the Pacific region of ASEAN fisheries institutions and vice-versa.

The workshop was seen as an opportunity to familiarise representatives of each region with institutional capacities and examine means of promoting closer working relations between the regions.

Opening addresses were presented by Dr Gordon Munro, Coordinator of the Pacific Economic Co-operation Council (PECC) Fisheries Task Force, Mr Atanraoi Baiteke, SPC Secretary-General, and Ambassador Jacques Le Blanc, representing the Government of France. The opening addresses commended the range of institutions represented and charged the workshop with devising an action plan in the areas identified as appropriate for greater inter-regional co-operation.

Thanks to the efforts of Chairperson Dr Chua Thia-Eng of the International Center for Living

Aquatic Resource Management, presentations and discussions at the meeting were both informative and constructive. It was generally agreed that despite the enormous differences in cultural heritage and demography, there is advantage to both regions in encouraging closer ties in education and training.

The ASEAN region has a total of 207 training institutions in the fisheries sector and the diversity of study or training opportunities is substantial.

Professor Robin South of USP'S Marine Studies Programme noted that, in view of the constraints of offering specialised training for small numbers of students in the South Pacific, ASEAN opportunities for such study should be encouraged and expanded. The possibility of initiating training interaction between the regions through the establishment of a TCDC (Technical Co-operation between Developing Countries) Programme was noted as a potential response to needs for specialist fisheries training.

Ways of improving information exchange between the regions were discussed. It was agreed that training directories and newsletters should be more widely distributed. High priority was given to the completion of SPC's long awaited Training Directory. A suggestion from SPC that a Training and Education Special Interest Group (SIG) should be established was welcomed by Pacific delegates, subject to endorsement from RTMF.

A report on a 1990 study tour by Pacific Island representatives to post-harvest institutions in Latin America noted the significant benefits that resulted. A similar study tour of ASEAN countries, to develop closer co-operation with ASEAN training institutions, was suggested. The suggestion was endorsed by Dr Munro, who, as chairman of PECC, played a large part in the organisation and funding of the Latin American study tour.

There was general agreement that, subject to wider discussion with regional fisheries bodies, the study tour be undertaken to coincide with the Asian Fisheries Congress and WPFCC/ Trans-Pacific Fisheries Consultative Committee Plenary Sessions in October 1992. The tour will give Pacific representatives a better knowledge of specific activities that could be undertaken with national and regional training institutions in ASEAN countries.

The workshop was jointly funded by the Canadian International Development Agency and the Government of France. It saw the presentation of 11 papers on various aspects of training and educational capacities to 36 delegates from the Federated States of Micronesia, Fiji, Indonesia, Malaysia, New Caledonia, Palau, Papua New Guinea, the Philippines, Singapore, Solomons, Thailand and Vanuatu.

Regional organisations were also represented and observers attended from Latin America and the Australian Maritime College.

(Contributor: H.Walton)

Extension training to be evaluated

The Regional Fisheries Training Project has been involved in the development and implementation of fisheries extension training since 1988 when the first 'Train the trainers' workshop was held. This enabled 16 participants to run a series of in-country workshops and produce a comprehensive extension manual.

Since that time the RFTP has been almost constantly involved in in-country and regional extension training programmes, funded by the International Centre for Overseas Development (ICOD).

The major objective has been to enhance the capacity of fisheries extension officers to operate effectively in the many and various tasks they are called upon to undertake in the line of duty.

The last activites under the ICOD-funded programme will soon be completed. It is therefore an appropriate time to evaluate programmes and attempt to ascertain on-going requirements for extension training support, at both regional and national levels.

The people who should ultimately benefit from extension training are the fishermen, the end-users of a fisheries extension officer's services. It is obviously almost impossible to ask fishermen region-wide about the details of their relationships with the local extension officer or to find out whether their particular fishing activities have been supported by the officer's services. However, it is possible to survey those who have attended extension training programmes, in an attempt to find out how effective the training has been and what more can be done to service

extension needs adequately at regional and national levels. It is also important to ascertain potential refinements to the extension training process and identify needs in countries which have yet to participate in an extension training programme.

The RFTP has prepared separate survey forms for senior fisheries officers, regional workshop participants, and national workshop participants. These will be circulated during the next two months, with the aim of receiving completed forms, collating data, and preparing a report to countries by year's end. Readers receiving questionnaires are encouraged to complete the forms and return them to SPC as soon as possible.

(Contributor: H.Walton)

INSHORE FISHERIES RESEARCH PROJECT

Well known scientist comes to SPC from Fiji

Tim Adams joined SPC in April 1992 to take up the post of Senior Inshore Fisheries Scientist (SIFS) formerly occupied by Garry Preston who is now the Coastal Fisheries Programme Manager. Tim is well known on the South Pacific fisheries scene, having spent the last nine years in Fiji, latterly acting as the Director of the Fiji Fisheries Division. As SIFS, he looks forward to resuming work at the pointed end (this allusion is obscure, but may possibly refer to the fact that Garry Preston will be standing behind him with a loaded speargun) and also anticipates shedding a few kilogrammes through a demanding fieldwork schedule.

After leaving the University of the South Pacific, where he was a visiting researcher on genetical speciation mechanisms, Tim joined the Fiji Fisheries Division to run the Fiji module of the Australian Centre for International Agricultural Research (ACIAR) International Giant Clam Project, under the dynamic leadership of Tony Lewis. Carefully emulating his guru only during working hours, Tim survived to take charge of the Fisheries Division's Resource Assessment and Development Section, covering a host of different tasks ranging from freshwater aquaculture development to deepwater snapper management.

The Fiji fisheries sector encountered several notable events during Tim's tenure, including a beche-de-mer boom, the establishment of a domestic longline/dropline fleet, rapid developments in traditional reef-tenure systems, and a shift in government policy from an import-substitution to an export-oriented economy.

Tim's experience in directly handling national fisheries management crises and seeing SPC services from the user-end will be of considerable benefit to the Coastal Fisheries Programme. It is complemented by the regional experience he gained from attending numerous fisheries meetings on behalf of Fiji. Tim was the chairman of the South Pacific Albacore Research Group from 1990 to 1992, has been spokesman for the South Pacific Nations in both U.S. multilateral treaty and albacore management meetings, and in 1991 chaired the SPC Standing Committee on Tuna and Billfish as well as the RTMF.

(Contributor: IFRP staff)

Fourth International Conference on ciguatera fish poisoning in Tahiti

Researchers studying ciguatera presented the latest research developments and exchanged information at the Fourth International Ciguatera Conference in Papeete from 4 to 7 May. Inshore Fisheries Scientist Paul Dalzell represented SPC.

Topics ranged from general country statements about ciguatera and the ecology of the dinoflagellate, *Gambierdiscus toxicus*, to the results of highly specialised physiological research on the mechanism by which ciguatoxins affect nerve and muscle cells.

Paul Dalzell and Richard Lewis of the Queensland Department of Primary Industry jointly chaired the session on the socio-economic impact of ciguatera. Paul presented summaries of data on fish landings in the Pacific Islands and incidence of ciguatera. He also introduced the new SPC Fisheries Programme/Health Programme Ciguatera Database and gave some preliminary results. Participants were also given a chance to see the new commercially produced ciguatect kits produced by Hawaii Chemtect International. These are based on the monoclonal antibody test devised by Dr Y. Hokama of the Hawaii University Medical School.

Two forms of test kit were demonstrated to the meeting: a small disposable kit containing a single test, and a larger more elaborate kit containing equipment and reagents for multiple testing. The single test comes in card form, contains all the re-agents, and is designed to be used to test one fish. The larger kit, which can be used for up to 50 tests, is designed for multiple testing on one fish or testing several fish.

About 100 persons attended the meeting. The pacific Islands were well represented, with people attending from the Cook Islands, the Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, New Caledonia and Solomon Islands. Participants also came from Australia, France, Germany, Japan, Mayotte, Martinique, Puerto Rico, Reunion and the United States.

The Inshore Fisheries Research Project supported the attendance of Edwin Oreihaka from the Solomon Islands Fisheries Division and Ahser Edwards from the Community College of Micronesia in the Federated States of Micronesia.

The conference proceedings, containing the papers presented at the meeting, will be published later this year. The venue for the next conference has yet to be decided. However, Dr Lewis is organising a ciguatera management workshop to be held in Queensland, Australia, in May 1993.

(Contributor: P. Dalzell)

Inshore Fisheries Research Project activities

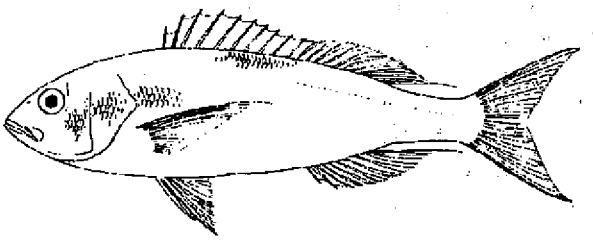
In May, Inshore Fisheries Scientist Paul Dalzell visited two Department of Fisheries and Marine Resources (DFMR) laboratories in Papua New Guinea to continue IFRP support for production of fisheries technical reports.

Paul went initially to Wewak, where he assisted Walai Ulaiwi to prepare reports on a fisheries resource assessment of Sissano Lagoon in the West Sepik Province and a report on the abundance and biology of the common carp in the Sepik River. Paul then went to Kavieng to assist Paul Lokani with the completion of two resource survey reports on commercial sessile invertebrates in Manus and West New Britain Provinces.

He also advised Mr Lokani on the production of annual reports for the years 1985 to 1991. No annual report of the activities of the Research and Surveys Branch of DFMR has been produced since 1984 and scientific staff are keen to see this publication revived.

Before returning to Noumea, Paul spent time in Port Moresby, looking at reports produced by Augustin Mobiha of the fisheries laboratory in Daru. The reports will be completed during a further visit by Paul to PNG later this year or early next year.

(Contributor: P. Dalzell)



DEEP SEA FISHERIES DEVELOPMENT PROJECT

Another look at *payaos*

It has long been acknowledged that the widespread adoption of fish aggregation devices (FADs) in the Pacific Islands owes much to the traditional use of anchored rafts by both artisanal and commercial fishing fleets in parts of South-East Asia, particularly the Philippines and Indonesia.

Early Pacific Island FAD programmes were largely modelled on the Filipino style of anchored rafts, known as *payaos*. However, extensive adaptation and technological improvement have made the rafts and moorings for most Pacific Island FADs a good deal more sophisticated than their original Asian models. Inevitably, they are also a good deal more costly.

In recent times some Island countries have expressed interest in looking again at the original *payao* model for specific purposes, particularly the well-developed use of *payaos* for tuna purse-seining.

While Filipino fishing interests have deployed, and actively fish, hundreds of *payaos* set in waters around Papua New Guinea, domestic *payao* purse-seining operations have also been developed or attempted in Fiji, Nauru, Solomon Islands and, most recently, in the Federated States of Micronesia (FSM). In response to requests from several member countries for up-to-date information on the technology and use of *payaos* the Project recently made contact with Filipino fishing interests.

We describe below the *payao* model currently employed by a Filipino tuna purse-seining company which actively fishes in the western tropical Pacific and which recently deployed *payaos*, under contract to a domestic fishing company, in FSM waters. Cost of material for this type of *payao* is reported to be about US$1800 for a 2500–3000 m site. Average life-span of 18 months is claimed, with some units surviving as long as five years. The figure on page 9 shows the arrangement of the components listed below.

Components

Primary float

This consists of an 8 ft x 3 ft x 2 ft (2.4 m x 0.9 m x 0.6 m) pontoon of 3/16 in (5 mm) steel plate, with two steel rings welded in place at either end. Bamboo cross-members for the raft platform are passed through these rings. Single half-rings at one end and the bottom serve as attachment points for the *habong* (appendage line) and mooring respectively. These half-rings have 2 inch-wide sections cut from the wall of steel-belted car tyres fitted before they are welded to the pontoon. The tyre sections serve as springs for the *habong* (1 tyre strip) and mooring (3 tyre strips). The pontoon is finished with marine-grade steel primer paint. The rectangular shape is chosen mainly because it is easy (and therefore not expensive) to build. It also provides for secure and space-efficient loading on board the deployment vessel.

Raft

A raft of bamboo is rigged around the primary float. Two sizes of bamboo are used: three 8 ft (2.4 m) sections of approx. 4 in (10 cm) diameter, to serve as cross-members, and eight 16 ft (4.8 m) sections of approx. 3 in (7.5 cm) diameter make up the body of the raft platform. The longitudinal sections are bolted to the cross-members with mild steel machine bolts. It is thought that the large raft area is an important factor in making a *payao* effective because of the large shade silhouette it creates.

Habong *line*

The *habong* line consists of a 30–40 m strip cut in a continuous length from a large truck tyre, with a weight at the lower end (10 kg of concrete poured in a paint can with tyre strip embedded for attachment) and nipa palm leaves tied on every metre. The *habong* is merely knotted to the tyre attachment point on the raft and thus easily detached during seining operations. Nipa palm is preferred for its durability over coconut palm frond.

Upper mooring

A 3/4 in (19 mm) wire rope extends from the raft down to 30 m; the wire rope discarded from the seiners is commonly used. All attachments are formed by Flemish eyes held in place with three or four cable clamps. As a back-up, a loose safety line of doubled polypropylene rope is run from the main raft mooring point to the upper eye of the main mooring line.

Main mooring

This is of 16 mm, 3-strand polypropylene, manufactured in the Philippines and costing only US$ 0.28/m. All connecting

points are formed by making eyes with a simple tuck-splice — the braid is opened and the rope-end passed through five times, in reverse direction on each pass. The splice is then secured by forcing a length of vinyl pipe of the same internal diameter over the splice (hot water may be used to soften the vinyl). The eyes are formed over oversize galvanised wire rope thimbles, but with a double thickness of vinyl pipe covering the rope where it contacts the thimble. In addition, the whole thimble assembly is secured by whipping with braided twine.

Counterweight

Because the main mooring is composed only of polypropylene rope, a counterweight is required to sink the floating polypropylene line away from the surface. This is fabricated by the fishing company and consists of a cylinder of concrete poured around a central mild steel shaft. Each end of this shaft ends in an eye, one of which incorporates a simple swivel device. Total weight varies from 30 to 50 kg. The point at which the counterweight is incorporated into the mooring line depends on the site depth. Calculation of this point is based on the principle that the main mooring line never comes closer to the surface than 100 m.

Lower mooring

Anchors are made of 200 l oil drums filled with concrete with a car tyre embedded. The number of anchors varies, depending on site depth, but three is average. The anchors are connected together with a loop of 19 mm steel wire rope. This is connected to the lower main mooring in the same way as the upper connection.

Deployment strategies

The fishing company's concept of tuna movement and *payao* association has it that the fish migrate along 'highways'. It is thought that by detecting these tracks (through fishing experience) and laying lines of *payaos* across them (with spacing of up to 50 nmi) fishermen can divert fish from their natural track and cause them to aggregate around *payao* concentrations at one end of the line. At the same time, the lines of *payaos* provide the company's seiners with potentially productive setting-points along the course of their tracks to various *payao* grounds.

Other deployment patterns are more speculative. Yet others are largely determined by the access or target zones, such as the concentric circles laid around two islands in FSM (1st circle set at 12 nmi from island, 2nd circle 2 nmi further out with *payaos* 5 nmi apart). In areas where *payaos* are newly set it is common practice to 'seed' the rafts with sacks of chum slung underneath. This is believed to speed up the aggregation process.

Final selection of deployment sites and calculation of mooring scopes is controlled by the company's fleet operations controller, who passes instructions to the skipper of the vessel deploying the *payaos*. In the same way, the status of each *payao* is updated on a master plotting board as skippers report in during fishing and maintenance.

Redeployments to plug gaps in the *payao* system are then directed by the fleet operations controller. Both the fishing fleet and a carrier vessel conduct maintenance and deployments, though the carrier vessel carries most of this load. It always leaves port with a large stock of all *payao* materials on board, particularly bamboo and palm leaves.

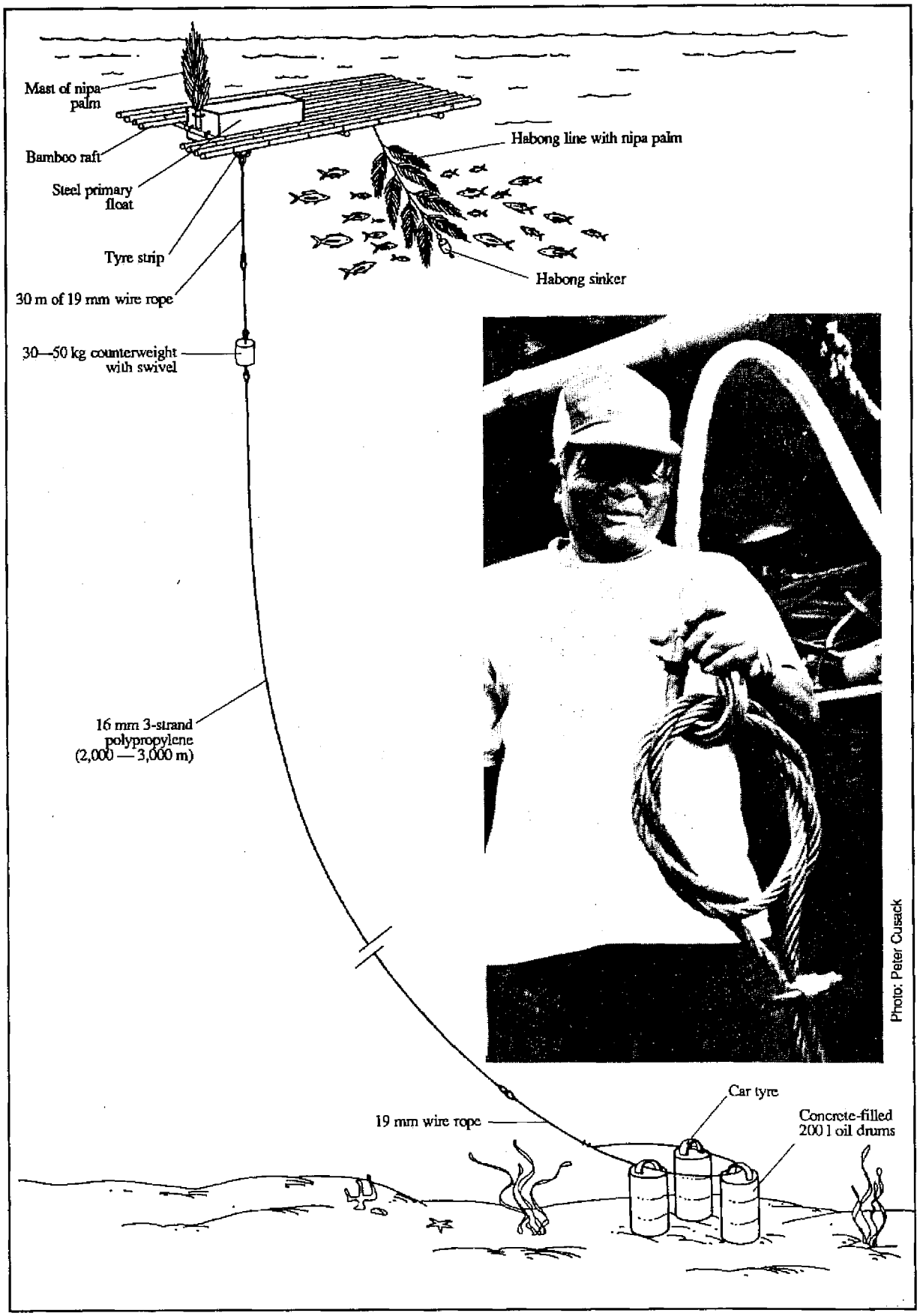
Inspection and maintenance

It is believed that inspection and maintenance are the key to a successful and cost-effective *payao* system. A strict maintenance schedule is adhered to in active fishing zones, as well, of course, as incidental maintenance. This maintenance is almost exclusively applied to the top 200 m of the mooring (moorings are occasionally lifted for redeployment and the company says that it has never noted any problems with the ground tackle).

The polypropylene rope used is believed to deteriorate under the effect of ultra-violet light, even at depths to 200 m. Such deterioration is exhibited as stiffening and brittleness. The top 100 m of rope are therefore routinely replaced after 4–5 months as a matter of course. After a similar period of time, the top 200 m are replaced. Thereafter, shorter sections will be replaced as required in the light of inspection during fishing.

The upper steel cable also deteriorates rapidly through corrosion and is replaced as indicated by inspection during fishing. Waterlogged or broken bamboo is also replaced, while the nipa palm on the *habong* lines is replaced most regularly of all, its presence being considered critical to the *payao's* effectiveness.

(Contributor: P. Cusack)



Payao **model currently employed in the Philippines. The photo shows all rope-to-wire connections formed with Flemish eyes and eye-splices over steel thimbles.**

FISH HANDLING AND PROCESSING PROJECT

Workshop helps improve fish handling and marketing

In many countries in the Pacific region fish landed by local fishermen or offered on sale on the domestic market is often in relatively poor condition. This is because fish is inappropriately chilled or not chilled at all. The results are that:

— domestic sales of fish may be slow and prices low;

— fish may spoil before it is sold and therefore be wasted;

— good quality fish may not be available for the domestic market which may then have to import fish;

— export opportunities for high-quality products, and therefore the chance to earn foreign currencies and create local employment, may be lost; and

— consumers may be poisoned by fish such as the tunas if these have been handled and stored improperly.

An ambitious training project to improve the overall quality of fish landed in and exported from the region has been launched jointly by SPC's Fish Handling and Processing Project and Regional Fisheries Training Project.

The project is designed to provide training in the fundamental problems of handling and exporting fish for people who, in turn, will be able to train and advise fishermen, processors, retailers and exporters in their own countries.

The project has two stages: a regional workshop to provide technical and extension/communications skills, and, an in-country follow-up stage.

The regional workshop was conducted in Suva at the University of the South Pacific between 16 March and 24 April. It was divided into two key elements: a technical component lasting four weeks, followed by a two-week extension and communications phase.

Technical topics included proper handling and storage of chilled and frozen fish for the domestic and export markets (with sashimi tuna and deep water species as standards); seafood packaging; causes of fish spoilage; quality control; buildings, distribution, equipment and materials requirements; seafood microbiology; hygiene and sanitation.

Tutors responsible for teaching the technical part of the workshop were Haniff Madakia from the Marine Institute in Newfoundland, Canada; Bruce Goodrick and David Milne from the International Food Institute of Queensland; Miguel Gallo from Instituto Tecnologico Pesquero (Institute of Fisheries Technology), Lima, Peru; and Steve Roberts, SPC's Post-harvest Fisheries Adviser, who was also the workshop coordinator.

The extension and communications workshop included principles of adult education; problem-solving and decision-making; programme planning; working with groups; two-way communications; etc. The participants also designed a set of six posters and wrote up in-country course notes on six broad topics suitable for workshops in their own countries. Such courses included one- or two-day workshops for fishermen and market staff, with longer courses of two to three days for processors and exporters.

Olga Gladkikh from the Coady International Institute, Nova Scotia, Canada, supervised the

Photo: Steve Roberts

Haniff Madakia, from the Marine Institute, Canada, demonstrating quality attributes of tuna to a group of participants

extension and communications course, with the assistance of Mel Ware from the National Fisheries College, Papua New Guinea, and Silika Ngahe, Ministry of Fisheries, Tonga.

Sixteen participants (from American Samoa, Cook Islands, Federated States of Micronesia, Fiji, Guam, Kiribati, Marshall Islands, Nauru, Northern Mariana Islands, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu) completed the workshop.

The participants also drew up action plans of their proposed activities on their return home. Stage Two of the project, which will take place over the next six to nine months, will be based on these action plans and will involve a visit by a tutor from the original regional workshop to the participants' country to coincide with their first training activity.

The tutor's role during this visit will predominantly be advisory, leaving the workshop participant to take the major organisational and teaching role.

It is hoped that following Stage Two visits the participants will be able to run other workshops with confidence and provide good technical advice to the post-harvest fisheries sector.

The overall project is funded by the Canadian Government through ICOD.

(Contributor: S. Roberts)

FISHERIES INFORMATION PROJECT

Fiji Fisheries Information Officer attached to SPC's Information Project

Hamidan Bibi, a Senior Fisheries Assistant (Information) from the Fiji Fisheries Division, is currently attached to the South Pacific Commission's Fisheries Information Project.

The attachment, which is for seven weeks beginning on 18 May, will enable Miss Bibi to gain experience of producing publications, such as newsletters and information bulletins on desktop publishing equipment.

The task will involve research, writing, editing and technical aspects of production and distribution.

Miss Bibi will also be working with the SPC Librarian, gathering information through various 'search for materials' computer programmes.

At the Fiji Fisheries Division, Miss Bibi is involved with the production of all publications including *Qitawa*, the Division's bi-monthly newsletter, and the Annual Report. She is also responsible for producing weekly press releases and radio programmes related to the fishing industry. Miss Bibi joined the Division in July 1987.

(Contributor: J.P. Gaudechoux)

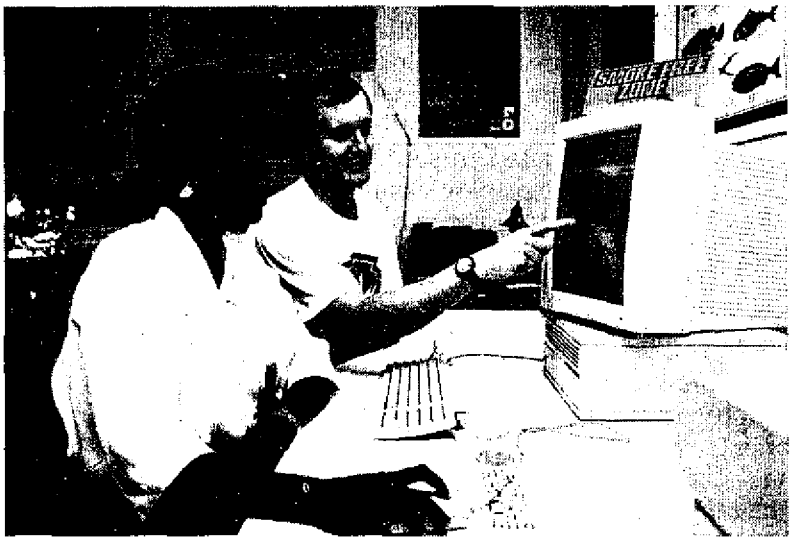


Photo: Marial Dosdane

Senior Fisheries Assistant (Information) Hamidan Bibi and SPC Fisheries Information Officer Jean-Paul Gaudechoux working on the design of the *SPC Fisheries Newsletter*

TUNA AND BILLFISH ASSESSMENT PROGRAMME (TBAP)

Philippines Tuna Research Project (PTRP)

Over the next two years, TBAP will be acting as a part-time consultant to the Philippines Government, lending its tuna tagging and analytical expertise to assess the yellowfin and skipjack stocks in Philippine waters under the auspices of the Philippines Tuna Research Project. This project is part of the Asian Development Bank-funded Philippines Fisheries Sector Programme.

In the first instance, TBAP plans to use the Tuvaluan pole-and-line vessel *Te Tautai* from July to October to tag in the Sulu Sea and Moro Gulf, which are heavily exploited areas, and in the Philippine Sea, which is only lightly exploited.

The *Te Tautai* has been an excellent platform for the SPC's Regional Tuna Tagging Project (RTTP), with 107,012 tuna tagged and released from the vessel to date, including over 6,000 in Philippine waters. The target for the PTRP is 25,000 releases (10,000 each in the Sulu Sea and Moro Gulf areas and 5,000 in the Philippine Sea). While most tagging will be done from the *Te Tautai*, some will also be undertaken from local fishing vessels such as ringnet boats (small purse seiners) and handline bancas (15–20 m double outrigger canoes).

Three fishing methods will be used to tag a representative size-range of fish captured in the various components of the Philippines tuna fishery. Ringnets usually catch small yellowfin and skipjack (15–30 cm in length), bancas take large yellowfin (over 100 cm) and pole vessels catch medium-sized tuna (30–70 cm). There is also a possibility of chartering small pole vessels from Indonesia if the need arises.

Bait supplies

Preliminary work began with a month-long visit to the Philippines by TBAP Fisheries Scientist Kevin Bailey this April. During an extensive tour of the country, Kevin and counterpart Noel Barut of the Bureau of Fisheries and Aquatic Resources (BFAR) visited and assessed various bait-grounds and baitfishing methods that are likely to provide sufficient quantities of good-quality live bait for the *Te Tautai* operation.

Previous visits of the vessel to the Philippines highlighted the difficulty of catching bait, primarily because of intense competition. This problem will hopefully be circumvented by purchasing bait directly from the people most experienced in fishing in local conditions.

Six bait-grounds and three baitfishing methods were assessed, including Burias Pass, Ragay Gulf, Mercedes and Lamon Bay, all of which are situated in south-east Luzon and employ basnigs (bagnets) launched from bancas; the Sulu Archipelago to the south-west of Mindanao using basnigs; and the north-west coast of Negros where beach seines and fish traps (corrals) are used.

Three basnig boats were visited in Burias Pass and two net hauls observed. The boats are anchored in 35–70 m (20–40 fathoms) over sand or mud bottoms, although mud is preferred for the favoured catch of anchovies. Twelve 1,000 watt surface lights are used to attract the bait, three each on bow and stern, and three along each side of the banca. Usually the first set is made around 2200 hours, followed by sets at 0200 and 0400. Near the full moon, only the last two hauls are made and catches are substantially reduced from the nightly average of 2 mt.

Before the basnig net is deployed, all lights except one on the stern are extinguished. The basnig, shaped like a box without a top, is then set and positioned with guide-ropes attached to its corners and sides. Once in position, the basnig lies 10–35 m above the sea floor, depending on the overall depth. All lights are then turned on and left for 15 minutes, before being extinguished slowly from bow and stern. A single dimmed light on starboard midships is left on.

The net is then hauled, initially with the guide-ropes set through pulleys at the end of bamboo booms, and then by hand-stacking on the port side of the boat. The starboard edge of the net is raised to prevent bait from escaping. Towards the end of retrieval, stacking changes to the starboard side by passing ropes and net under the boat, so that the bait is concentrated in a long section of net. The bait is then crowded to the bow, in a similar fashion to the stick-held bouki ami net used on the *Te Tautai*. The bait observed at the crowding stage was in excellent condition, with little scale loss, making this the obvious point to obtain the live bait required for the project.

As it will not be possible to position the *Te Tautai* close enough to the basnig for direct transfer to the bait wells, floating pens or transporters will have to be employed, with transfer firstly to the pens, followed by a period of hardening to give the bait time to recover from the trauma of capture, and then the final transfer to the pole boat. In this way, it is anticipated that the bait will be able to survive for up to five days.

A large basnig fleet based in Zamboanga fishes in the Sulu Archipelago throughout the year, catching sardines (*Sardinella fimbriata* and *Amblygaster sirm*) and round scad (*Decapturus macarellus* primarily). Most of this fishing takes place in the north-western part of the archipelago, between the large islands of Basilan and Jolo. Typically, three or four boats operate as a group in depths of 27–70 m, making this an ideal situation for the *Te Tautai* to purchase bait and also to use her own baiting gear.

Because of the activity of Muslim 'rebels' and 'pirates' around Basilan and the more southern islands in the archipelago, it is likely that one or two military personnel will be stationed on the vessel during baiting visits.

Fish traps and beach seining were assessed during a stopover on the island of Negros. Fish traps are common along the coast between Bacolod and the small town of E.B. Magalona, to the north. Two hauls were observed at a medium-sized fish trap at Bacolod early one morning, for a total catch of 20 kg of leiognathids, although this was an unusually low catch for the season. Traps are constructed of bamboo poles and fine mesh net, and consist of three chambers for holding the fish, a long bamboo fence called the tail that acts to direct the fish into the chambers on the receding tide, and a shorter fence (wing) also to direct fish.

The traps are situated 1–2 km from the shore, often within 500 m of each other. Fish enter the first chamber of the trap and move successively into the second and third chambers, whose entrances reduce in width from about 2 m to 0.5 m. Surrounding the third chamber is a 6–7 m high bamboo platform from which the net is deployed and hauled. It is roughly rectangular in shape and is lowered into the chamber with guideropes. Once the net has settled, it is dragged forward and bunched, so that the bait are concentrated for dipnetting.

For tagging purposes, the bait will have to be transferred at this point, and the only practical way is by bucket up and over the 3–4 m high walls and into a transporter. The entrance into the main chamber is too narrow to allow the passage of the transporter, but a small inflatable dinghy can probably be manhandled over the wall and into the chamber for a working platform, albeit with some difficulty.

Beach seining from large bancas occurs along the coast between the towns of Himamaylan and Tabao, to the south of Bacolod. The nets are 210 m long and 7–9 m deep (120 fm x 4–5 fm), and take about 30 minutes to set and haul. Sets are made throughout the morning from 0500–1000 and in the late afternoon from 1500–1800, usually in a depth of 4 m. The catch is dominated by anchovies (*Stolephorus heterolobus*) and sardines (*Sardinella fimbriata* and *Amblygaster* spp.). While it was not possible to observe a set during the visit because of a two-day long fiesta, discussions with seine operators verified that the bait is in relatively good condition and will certainly be easier to transfer than from the traps further up the coast.

It appears from these visits that a number of areas in the Philippines will be able to provide the *Te Tautai* with good-quality live bait for tagging operations in the July–October period. Basnigs in Ragay Gulf and the Mercedes–Lamon Bay area will be able to support activities in the Philippine Sea in August,

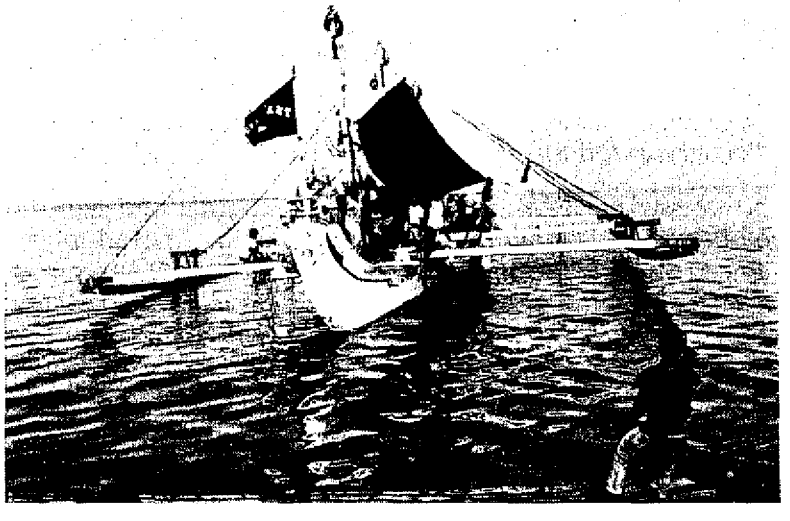
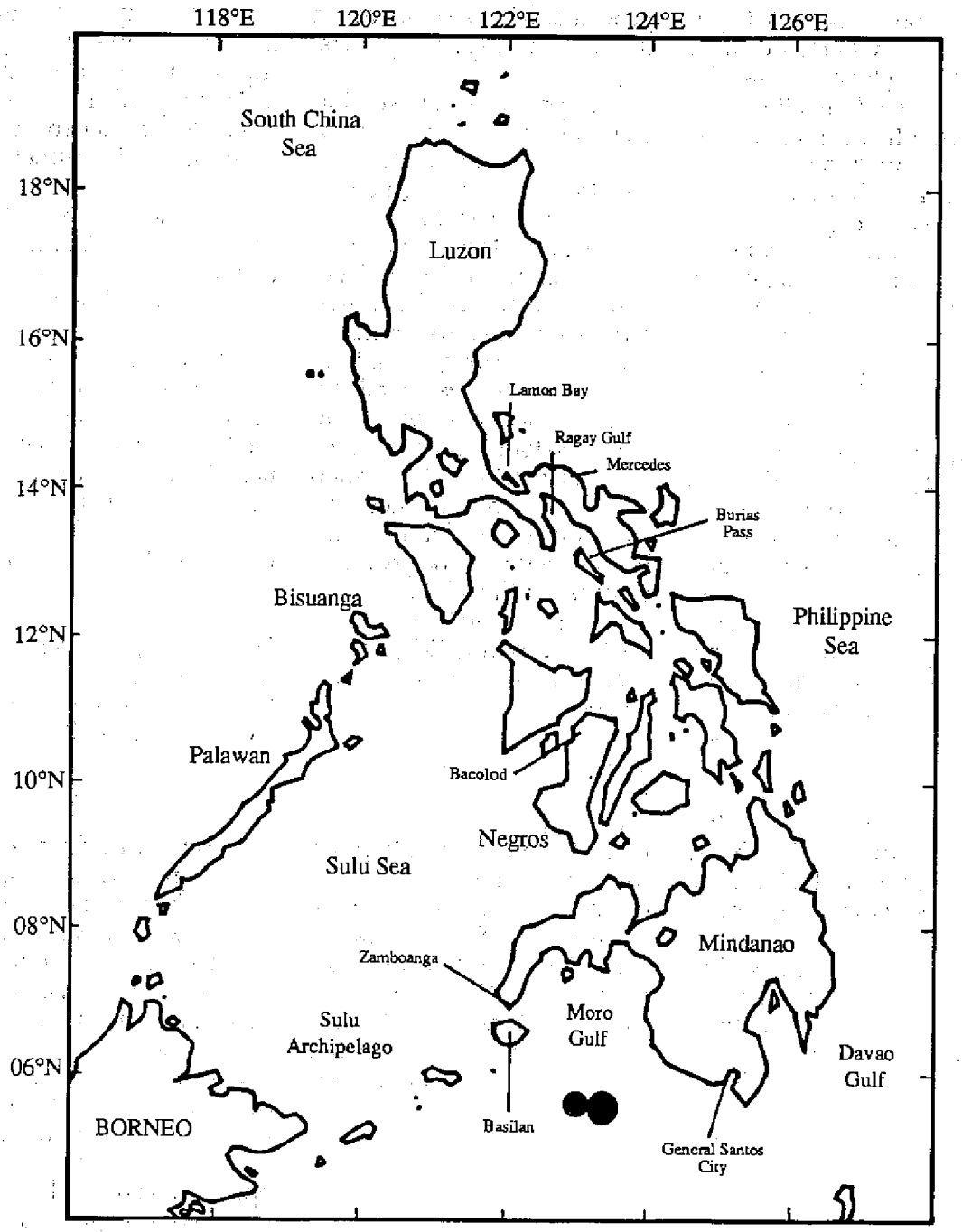


Photo: Kevin Bailey

A typical Philippine basnig banca in Ragay Gulf



The Republic of Philippines, showing locations visited and tag releases. The largest circle represents 100 releases and the smallest circle one release.

while basnigs in the Sulu Archipelago and large fish traps and beach seining operations in north-western Negros will be utilised during Sulu Sea and Moro Gulf activities.

Basnigs in the Bisuanga area of northern Palawan will probably also be available for Sulu Sea work once the area is visited and assessed by BFAR staff. The co-operation and interest experienced during the trip also mean that bait can probably be obtained on an *ad hoc* basis outside these areas.

Experimental tagging

During this visit, pilot tagging experiments were also carried out on ringnet and handline vessels. Experimental tagging of ringnet-caught tuna in the Moro Gulf was carried out from a small wooden dinghy positioned between the net boat and carrier boat and close to the catch, in order to reduce the time that the fish were out of the water and therefore improve their chances of survival. The

ringnet fishery is characterised by pre-dawn sets on payaos (anchored Fish Aggregation Devices), and exhibits a number of classic symptoms of overfishing, including catch rates that have only been maintained by towing more and more payaos together for each set and a steady decrease in the average size of fish caught. At present, four or five payaos are towed together during the day for the following morning's set and the tuna caught typically measure between 20 and 30 cm in length.

A total of 156 tuna (44 yellowfin, 103 skipjack, 9 bigeye) was tagged and released during two ringnet sets. Four people took part in the tagging operation: one tagging in the stern of the dinghy, with a modified SPC tagging cradle sitting across stern and starboard gunwales, one person in the carrier to pass tags to the tagger, one crew-member on the carrier to scoop fish out of the sac with a long-handled dip net and a second crew-member in the dinghy to sort the catch in the scoop and pass tuna to the cradle. On the second day, the sea roughened and an extra person was stationed in the dinghy to hold it in place against the net.

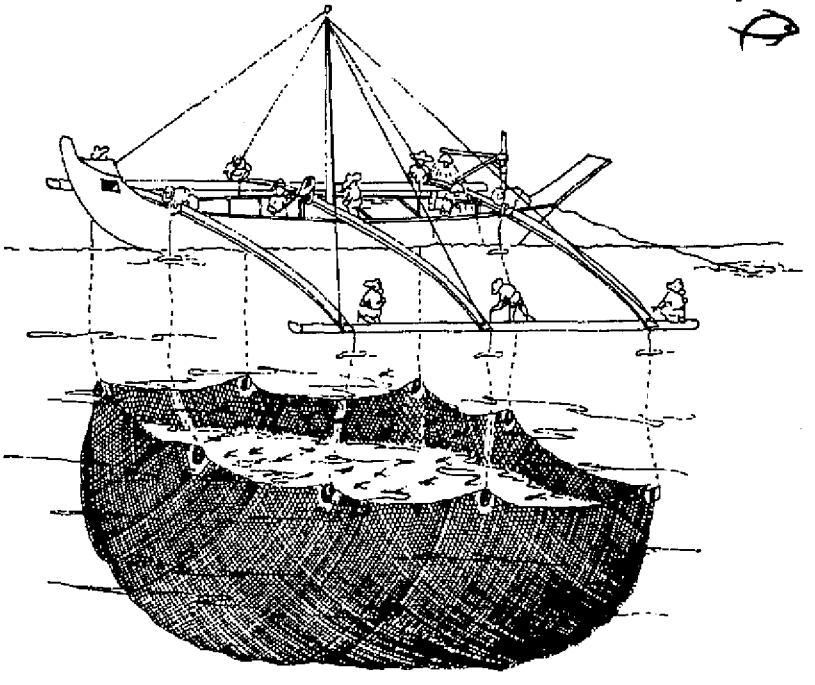
It is estimated that 200–300 releases per set are possible over a period of 30–45 minutes with some modifications to methodology (e.g. by using an inflatable dinghy, which is a more stable working platform than the wooden dinghy, and has the added advantage of flexibility when bouncing against the carrier boat; and tagging yellowfin and bigeye only in the first 10–15 minutes of the operation, when they are still in good condition). If other net boats are nearby, it may also be possible to tag from more than one set per day and bring the daily total to 400–900 releases. Whether further tagging is undertaken, however, will depend on the recovery rate of the present experiment. A BFAR ringnet tagging project in the late 1980s resulted in a particularly low recovery rate, two per cent from over 10,000 releases, presumably because of the poor condition of many of the releases. The present experiment has built on and improved that early work, and it is hoped that by tagging close to the water the recovery rate will be substantially higher.

A second tagging experiment targeting large handline-caught yellowfin in the South China Sea was not as successful because of limited time and poor catches experienced in the fishery. One night and morning were spent on a 20 m banca handlining around payaos off the north-west coast of Luzon. Bancas in this area normally operate as lightboats for a ringnet fleet based in the port of Masinloc, using 1,000 watt surface lights to attract tuna to the payaos selected for net setting. Crew on the bancas take advantage of this attraction and handline throughout the night for medium- and large-sized yellowfin. An average night typically yields one or two large yellowfin or 10–20 of medium size, while an exceptional night might produce three or four large fish.

During the present visit, catches were extremely poor, resulting in the ringnet fleet standing down for a week, and only four small yellowfin being tagged and released. In the future, it may be possible to combine the ringnet and handline experiments, as the vessels often operate together, thereby maximising the numbers of releases while keeping time to a minimum.

Further TBAP involvement with the Philippines Tuna Research Project will be featured in future editions of the *SPC Fisheries Newsletter*.

(Contributor: Kevin Bailey)



A basnig net in position (taken from de Jesus, A.S. (1982). *Tuna fishing gears of the Philippines.* Indo-Pacific Tuna Development and Management Programme, Colombo)

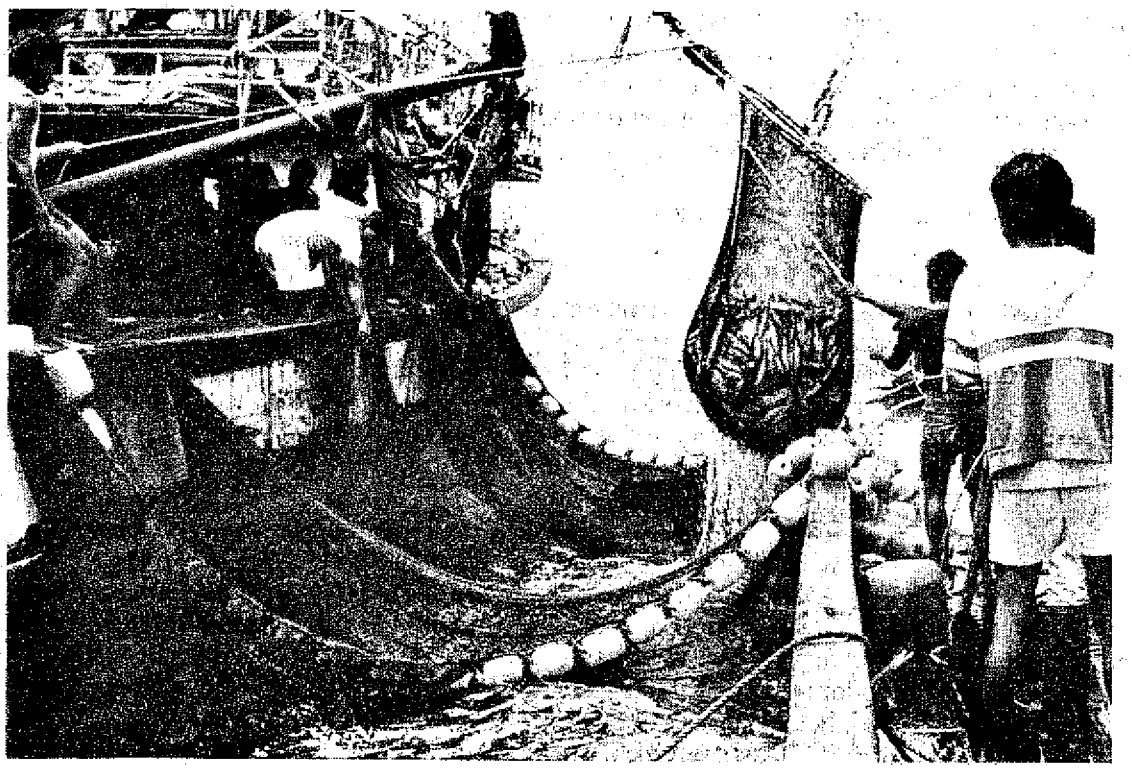


Photo: Kevin Bailey

A catch of small skipjack and yellowfin is brailed from ringnet sac to carrier boat in the Moro Gulf. Scoop nets were used to remove tuna from the sac for tagging in a dinghy positioned between the net and carrier boats.

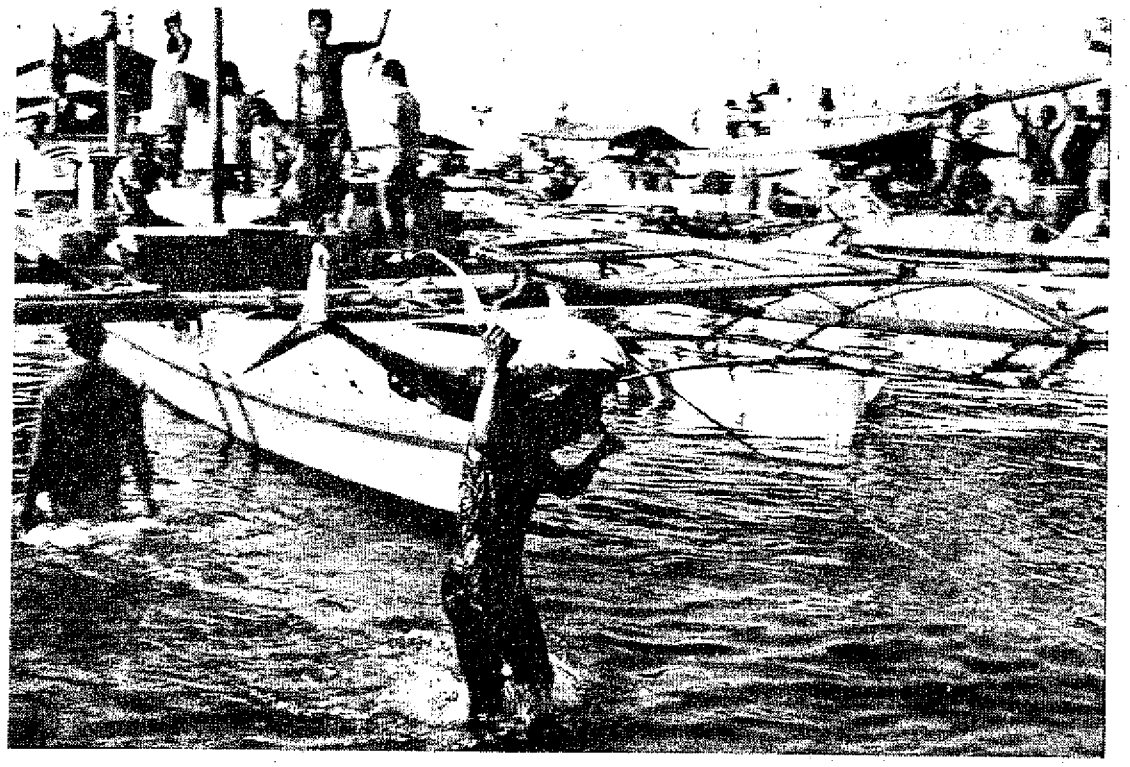


Photo: Kevin Bailey

A handline-caught yellowfin is unloaded from a banca at Lion Beach, General Santos City, prior to being processed for shipment to Japan.

Philippine researcher attached to RTTP

Miss Flerida M. Arce of the Bureau of Fisheries and Aquatic Resources in the Philippines was attached to the SPC's Regional Tuna Tagging Project from 7 to 20 May.

The attachment, which was funded by the Western Pacific Fisheries Consultative Committee, enabled Miss Arce to gain hands-on training on the RTTP tuna tagging database, reviewing and editing tag returns from the Philippines.

According to Miss Arce, the information derived from the RTTP project will help immensely in the proper management of the tuna resource in the Philippines.

Miss Arce said that the installation of a tuna database similar to that of SPC will enable analysis of a large volume of data and provide better co-ordination between SPC's RTTP project and the Philippine tuna industry.

Tuna forms the bulk of the fishery production, both commercially and in municipal markets in the Philippines. Commercial production during the year 1991 reached a total of 195,172 tonnes while the municipal production totalled 168,713 tonnes.

'The government is also contributing largely to the industry and hopes to see larger purse-seine vessels in operation in the near future', says Miss Arce.

(Contributor: H.Bibi)

Two months successful tagging aboard *Te Tautai*

After a ten-day trip to the remote atolls of the Phoenix Islands, the SPC tagging vessel *Te Tautai* was returning to Tarawa. Canton Island had provided an interesting break in the trip, but the lagoon had proved unsuitable for baiting and the *Te Tautai* only had two wells of bait left. The seas were as flat as a mill-pond, the sort of day that occurs on the equator when a ship's wake forms perfect little waves all the way to the horizon — a far cry from when we began the 1992 season one month earlier.

The ship had sailed from Suva on 4 March only to run into a series of hurricanes and rough westerly weather that had made life on board miserable for weeks.

The only commotion now came from Kepasi Tefau, the Tuvaluan fishing master of the *Te Tautai*, as he vigorously rang the standby bell and altered course to intercept a tuna school. One glance in the 25-power 'big glasses' confirmed the presence of several big tuna schools on the glassy horizon. The tuna were feeding frantically on small baitfish, churning the surface to roiling foam in areas that were as large as an Olympic swimming pool. This type of school is called a boiler, foamer or smoker by commercial fishermen, as it creates an area of boiling or frothing water on the ocean surface.

Boilers and foamers are eagerly sought by distant-water purse-seine captains, as the frenzied feeding behaviour distracts the tuna and makes them easier to encircle and trap in their mile-long seines. However, feeding shoals of tuna are notoriously difficult for pole-and-line boats to fish successfully as the tuna have an abundance of food in the water and are usually not interested in taking chum or the steel and feather lures. Nevertheless, the bosun, Pauna Pauna, brought out the fibreglass poles, rigged with barbless striker lures of various sizes. Other crewmen readied the tagging cradles and spare hooks and wet the decks and cradles in preparation for tagging. At the same time, the bait men repeatedly dipped a large brailing net into one of the baitwells in the belly of the *Te Tautai* until the chumming tanks were full. The taggers checked their battery-powered cassette recorders and went searching for gloves and spare recorders.

Fifty tonne schools were all around the ship now as she slowed and the chummers began tossing small scoops of milkfish along her course. Normally, the *Te Tautai* uses tropical anchovies, sardines and sprats that are lift-netted at night in bays and lagoons. However, wild baitfish is scarce during this time of year in Kiribati so the programme relied on purchasing cultured juvenile milkfish from Tarawa. This project was started some years ago to supply live bait to Kiribati-based pole-and-line tuna boats owned by the Kiribati national fishing company, Te Mautari Ltd.

As was expected, the tuna were gorging themselves on dense schools of ocean anchovy (*Stolephorus punctifer*) and diverted along the vessel's path

only briefly to feed on the shiny milkfish. Assistant Fishing Master Eroni Dolodai pointed out a school that looked better for poling and the next chumming pass fared better. A mixed school of yellowfin and skipjack fell in beside the coasting 39-metre ship and charged the closely thrown chum and feathered hooks. In seconds, a chorus of shouts and raucous yells signalled that the crew of the *Te Tautai* were doing what they love best, poling tuna as fast as they will bite.

The tagging cradles quickly filled as the tagging assistants deftly flicked the barbless hooks from tuna jaws and the taggers got to work. On this day, the actual tagging was done by Fisheries Scientists David Itano and Joel Opnai and Fisheries Experimental Officer Eti Palu (all of the SPC) and Iefata Paeniu. Iefata also happens to be the captain of the *Te Tautai* and leader of the 21 Tuvaluan fishermen and professional seamen who have manned the ship during the SPC's Regional Tuna Tagging Project. The number of taggers is kept to a minimum to maintain the consistently high standard of tag releases that is necessary during a large-scale mark and recapture study.

Not unexpectedly, the milkfish did not hold the attention of the school for long, and the tuna soon broke away to join their schoolmates that were still chopping into the frantic ranks of the ocean anchovy. Two more chumming passes on nearby schools fared worse, and the midday sun was now high and hot. The cruise leader put out the order for skiff tagging, and the crew readied the six-metre Yamaha skiff for trolling and tagging.

A vinyl tagging mattress and monofilament handlines were loaded in the skiff and two taggers and two crewmen boarded the small, outboard-powered vessel and headed toward the nearest boiler. Troll lines were rigged with plastic octopus lures on barbless hooks and the small boat was soon inside one of the massive schools and far from the *Te Tautai*. Skiff trolling is one way in which the project can keep tagging tuna while saving chum for later in the day when the schools may decide to bite on the regular gear.

In the small skiff close to water level, the fishermen could clearly see the panic-stricken anchovies leaping into the air as the tuna sliced through their ranks. Yells went up as the lines were taken and big yellowfin were coaxed to the padded mattress to be tagged and released.

The condition of these trolled fish was noted carefully, as the longer fighting time required to boat them meant that a higher percentage would be too stressed or tired to be tagged in good condition. It is pointless to tag fish that will die or be taken by sharks within a few minutes of release or soon die of tagging inflicted injuries.

As the skiff slowed to boat another yellowfin, the sound of the feeding tuna was surprising, much like a waterfall or torrential rainfall on a tin roof. The activity was actually causing a fine mist to rise from the sea surface over the feeding tuna. This is where the name *smoker* comes from to describe the most active type of feeding tuna schools.

Meanwhile, Kepasi had begun to manoeuvre on the schools again and the skiff and mothership were soon fishing on the same school. Small skipjack began to fly over the polers' heads on the *Te Tautai* as the school came to life and started to charge the lures again. Soon, medium-sized bigeye were being poled with such regularity that the two remaining taggers on the ship were having a hard time keeping up with the flow of fish. As Eti transferred from the skiff back to the ship, larger and larger bigeye were taking the lures and the yelling turned to a raucous din. The bosun

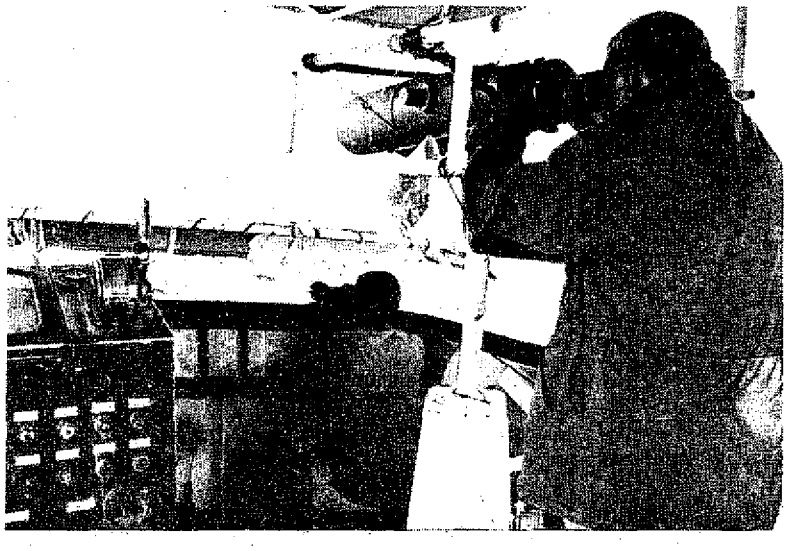


Photo: David Itano

Fishing Master Kepasi Tefau and Teokila Usia searching for tuna schools

hurried to trade his skipjack rig for a stout Australian bluefin pole rigged with a large # 5.5 lure. The rest of the crew quickly followed suit and bigeye over one metre in length were soon competing for space on the tagging cradles. Other fishermen swiftly snapped into two-pole fishing rigs or switched to heavy handlines and baited hooks that had been put to good use before on big yellowfin and bigeye. The bite developed so fast that fishermen on the raised bow deck were now straining to lift 35 kg fish the long distance from the water. Some of the big fish began to rip loose from the hooks, so the skiff was used to land and tag fish that were hooked from the bow of the *Te Tautai*.

The sight from the skiff working under the bow of the *Te Tautai* was impressive: fishermen quickly reacting to changes in the bite, bait boys running for more chum, the chummers keeping the schools under the sprays and the taggers working at top speed as their assistants landed and unhooked the big fish. I stood back a few times to admire the smooth teamwork and easy camaraderie that exists between fisherman and scientist on the *Te Tautai*.

The bite faded at dusk and the SPC team performed biological sampling on fish that had been too damaged during capture to tag, while the crew turned eagerly to salting down the spare tuna and cleaning up. That night, the ship drifted where the school had gone down, while data entry and verification proceeded in the SPC forecastle 'office'. Tape recorders were played back and the species, length, condition and capture method of each tagged fish were carefully recorded on paper and entered on computer databases.

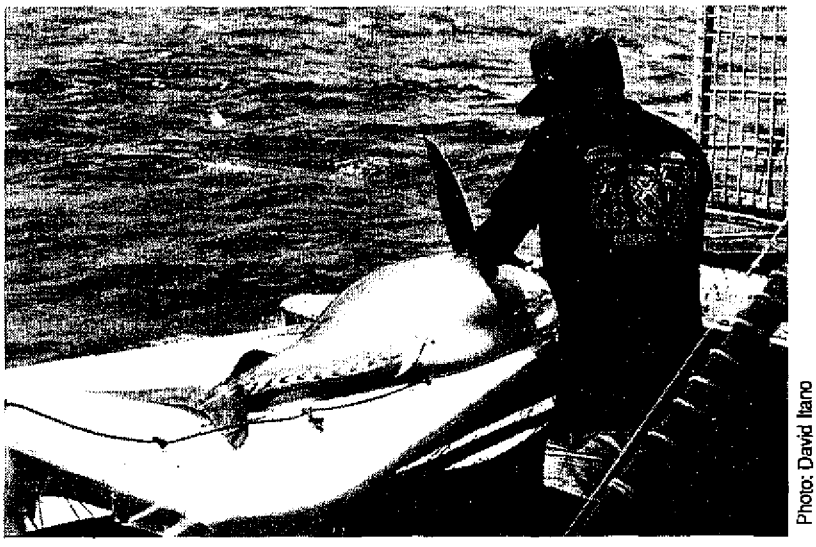


Photo: David Itano

Filipe Viala tagging large bigeye tuna

Meanwhile, the bigeye school had taken up residence under the ship, associating with the *Te Tautai* as tuna often associate with drifting logs or FADs. This was confirmed by the telltale marks on the depth sounder and the handlining of two bigeye from the stern. The handline gear was quickly deployed but a big tuna catch was not to be. Several oceanic whitetipped sharks moved in on the action, and it was soon impossible to get a bait below them or a live tuna through their ranks.

At dawn the next morning, the first few scoops of chum brought an instant response from the hungry bigeye. The anchovy schools were not to be seen, meaning that milkfish was now the flavour of the day. Poling, handlining and tagging proceeded at full speed until the baitwells were empty. Chopped frozen bait or chopped tuna was thrown to the hungry fish, but the bite ceased when the live bait ran out.

It was time now to work on the cruise report, repair fishing gear or just relax on the trip back to Tarawa where another load of milkfish could be taken.

The Regional Tuna Tagging Project has been tagging yellowfin, bigeye and skipjack tuna in the western tropical Pacific (WTP) since December 1989. The project has been very successful in releasing tagged tuna in good condition over a wide area and under some very trying conditions. The first cruises of the 1992 season were planned to visit some of the remote eastern portions of the study area that have proved difficult to visit during the past two years. These areas have become very important to distant water purse seine, pole-and-line and longline fleets, particularly to the U.S. purse seine vessels based in Pago Pago.

March and April of 1992 saw the *Te Tautai* passing briefly through northern Fiji and the Wallis and Futuna EEZs to work in Tuvalu, Kiribati and Marshall Islands waters. Milkfish are very hardy and can be held for weeks in standard baitwells with little care and low mortality. The use of milkfish chum allowed the *Te Tautai* to work in areas that

could not have been visited using more delicate baitfish species.

Long-range trips were made to Banaba, the Phoenix Islands, the Howland and Baker EEZ and the high seas zones to the east of Tarawa and Funafuti. The U.S. purse seine fleet was very active in these areas during the time of the *Te Tautai* visit to Kiribati. The number of releases was not high compared to more productive RTTP tagging cruises in Papua New Guinea and the Federated States of Micronesia, but filled some important gaps in the tagging study and may yield interesting results on the movement and exploitation of tuna within this sub-region.

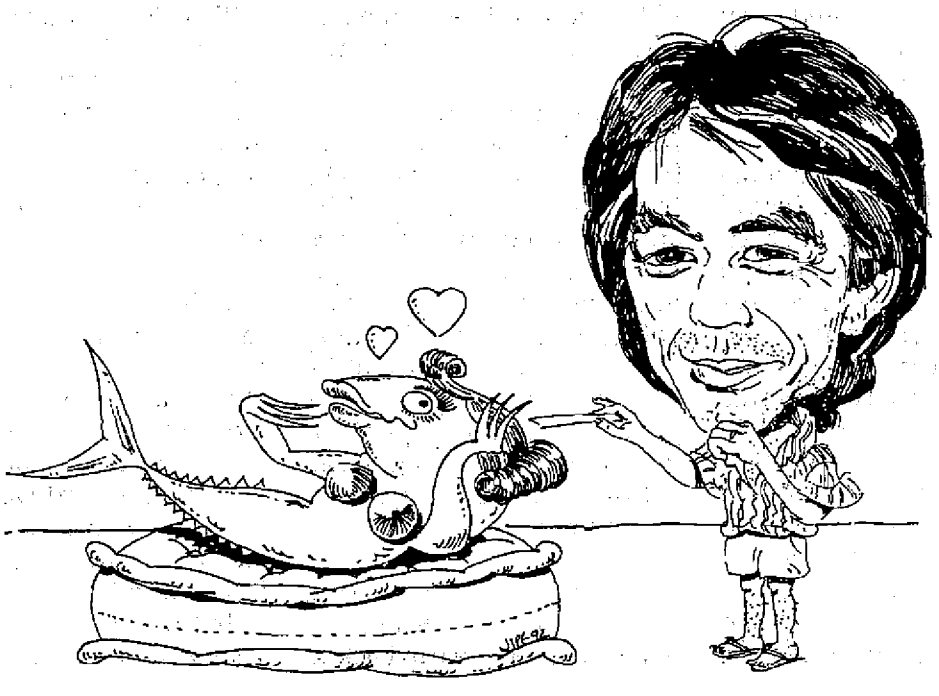
Large schools of surface-feeding tuna were found around Banaba, the southern Gilbert Islands and near the border of the Howland and Baker and Phoenix Island portion of the Kiribati EEZ. Other schools were found associated with drifting logs, a drifting steel payao, on current lines or near reefs and small atolls. One surprising finding from this cruise was the relatively high percentage of bigeye tuna found in the area. Generally, surface bigeye schools in the WTP are uncommon and usually found only in association with drifting logs or flotsam.

At the conclusion of this two-month cruise, the ship returned to her home port of Funafuti for a six-week break. During this period, the crew enjoyed some time at home while working to prepare the ship for the rest of the year. Fisheries Scientist Bailey and Fisheries Experimental Officer Viala will start the next cruise with tentative plans to work in the EEZs of Wallis and Futuna, Tuvalu, PNG, FSM, Palau, the Philippines, Australia and New Caledonia.

By the time the ship returned to Funafuti in May 1992, the *Te Tautai* had tagged and released a total of 107,304 tuna comprised of 29,551 yellowfin, 6,113 bigeye, 71,558 skipjack and 82 longtail tuna. Additional tagging projects related to the RTTP, including specific tagging studies for Solomon Islands, Kiribati and Fiji and experimental tagging on a Japanese purse seiner, raise the total number of releases to 123,924, of which 31 per cent are yellowfin and bigeye releases.

A total of 11,511 tags has been returned to Noumea, with tag return information entered into the RTTP tagging database and verified by Fisheries Research Officer Veronica Logez. This represents an overall return rate of 9.3 per cent, with more tags coming in all the time. Recaptures have come from purse-seine vessels of Federated States of Micronesia, Indonesia, Japan, Korea, New Zealand, Philippines, Solomon Islands, Taiwan, the United States and the USSR. Pole-and-line vessels from Australia, Fiji, Indonesia, Japan, Kiribati, Palau and Solomon Islands, and longline vessels from Australia, Japan and the Philippines have also returned tags. In addition, troll and handline boats from throughout the region and canneries and unloading ports from around the world have recovered thousands of RTTP tags.

(Contributor: D.Itano)



International workshops on tunas associated with floating objects

International Workshops on the Ecology and Fisheries for Tunas Associated with Floating Objects and on Assessment Issues Arising from the Association of Tunas with Floating Objects were held in La Jolla, California, from 11 to 14 February 1992.

The three-day Workshop on the Ecology and Fisheries for Tunas Associated with Floating Objects was organised under the following headings:

— Regional fisheries on floating objects, with presentations on the Eastern Pacific, the Central Pacific, the Western Pacific, the Eastern Atlantic, the Western Atlantic/Caribbean, and the Indian Ocean;

— Log communities, with presentations on pelagic communities associated with floating objects, tuna avifauna, the association of epipelagic fauna with floating objects, and associations between seabirds and sea turtles;

— Primary production, with a presentation on biological productivity in the Eastern Pacific;

— Sources and fate of logs, and continent—ocean interactions, with presentations on litter production and coarse woody debris turnover in tropical forests; sources of natural floating objects; mangroves and coastal vegetation dynamics; the use of dissolved organic carbon as a satellite-sensed tracer of river plumes; organic matter sources and riverine transport to the tropical oceans; the fate of wood at sea; and tropical river plumes and the ecology of scombrid larvae;

— Circulation of logs, with presentations on surface circulation patterns in the log fishing areas as inferred from drifting buoys; a simulation approach to study the drift of floating objects; drift simulation results for the Eastern Pacific; and recent developments in tropical Atlantic oceanography in relation to floating objects; and

— Schooling and other fish behaviour, with presentations on fisheries on floating objects and schooling behaviour; Sensory Integrated System (SIS) of schools; radio tracking experiments; the ecology and behaviour of tunas around payaos; behaviour inferred from repeated sets on the same object; diel changes in group size with regard to tunas and dolphin; the question of congregation or aggregation with regard to schooling behaviour and floating objects; and the food and feeding behaviour of fish associated with FADs and floating objects.

The one-day Workshop on Assessment Issues Arising from the Association of Tunas with Floating Objects included discussions on the following topics:

— Estimation of fish density when fish are caught in association with logs, with other 'living attractors' (dolphins, whales, whale sharks), with seabirds and in unassociated schools: the Generalised Linear Model (GLM) method;

— Fleet dynamics: development of models for estimation and prediction purposes;

— The effect on yield-per-recruit analysis of fishing on floating objects; and

— The effect on our understanding of the population dynamics of tunas (especially in relation to concepts of stock structure and spatial patterns) of fishing on floating objects and other modes of fishing.

Papers were provided for only about half of the presentations and, unfortunately, no record of discussion is available at present. While discussions focused largely on the Eastern Tropical Pacific, which, even with respect to log fishing, generally has a different situation from elsewhere, information from other ocean areas was also presented, such as the increasingly successful use of FADs by the Spanish and French fleets in the offshore Eastern Atlantic and, more recently, in the Indian Ocean.

The workshops were organised by the Inter-American Tropical Tuna Commission and sponsored by Bumble Bee Seafoods. Scientists attended from French Polynesia, Japan, New Caledonia, Philippines, Senegal, Seychelles, the United States and Latin American countries.

(Contributor: TBAP)

PECC Task Force on fisheries development and cooperation

The Pacific Economic Cooperation Conference (PECC) Task Force on Fisheries met in Mexico City from 24 to 25 February 1992.

The agenda included the following subjects:

— A review of the activities of the Task Force and the relations between the Task Force and the Asia-Pacific Economic Cooperation (APEC) Work Project on Fisheries;

— Inter-regional fisheries co-operation among Pacific developing coastal states, with progress reports on the Western Pacific Fisheries Consultative Committee (WPFCC) and the Trans-Pacific Fisheries Consultative Committee (TPFCC);

— Barriers to trade in Pacific fisheries products;

— Coastal state–distant water fishing nation relations;

— The management of trans-boundary and high seas fisheries resources; and

— The growth of aquaculture and the prospects for trans-Pacific co-operation.

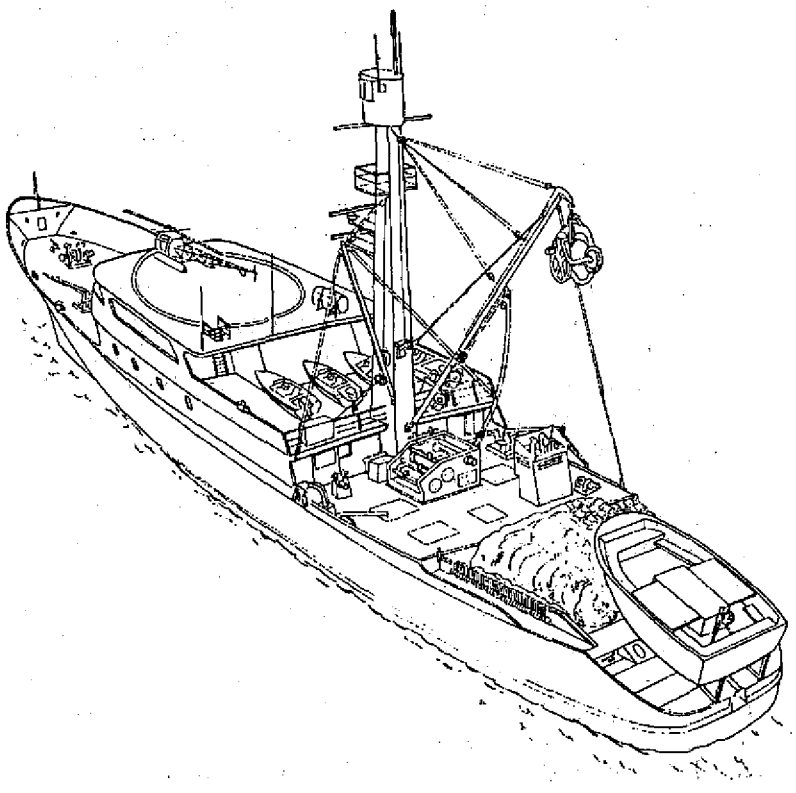
The director of WPFCC highlighted the work of the RTTP in the Philippines and Indonesia as an example of inter-regional co-operation. SPC's Principal Fisheries Scientist presented a summary of tagging results, which indicated a strong linkage of tuna stocks in eastern Indonesia and the adjacent Pacific island region. He and the director of WPFCC both spoke on SPC's involvement in the new Philippines Fisheries Sector Programme (which will include further tagging in the Philippines), stressing regional benefits of the proposed work.

Following a report on the Latin American study tour by fisheries officers from Fiji, Papua New Guinea and Tuvalu, led by SPC's Post-harvest Fisheries Adviser, substantial interest was expressed regarding the transfer of post-harvest technology from Latin American countries to Pacific Island nations.

The Japanese delegation prepared a paper on Western Pacific tuna management, which presented several models of the possible relationships between coastal states, distant-water fishing nations, a management body and a scientific advisory body. Some of the proposed models outlined in the paper were different from the previous Japanese position that a new management body should have all distant-water fishing nations and coastal states as equal members. It was agreed that PECC could provide a forum for continuing dialogue on this sensitive issue.

Participants attended the workshop from Australia, Canada, Chile, Colombia, Costa Rica, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, People's Republic of China, Peru, Philippines, Republic of China (Taiwan), Solomon Islands, Thailand and the United States. The Permanent South Pacific Commission, the South Pacific Forum Fisheries Agency and the South Pacific Commission were also represented.

(Contributor: TBAP staff)



THE MARINE TRAINING ANNEX AT TOUHO VOCATIONAL SECONDARY SCHOOL, NORTHERN PROVINCE, NEW CALEDONIA

by J.P. Gaudechoux
South Pacific Commission
Noumea, New Caledonia

During 1991, in my capacity as SPC Fisheries Information Officer, I came into contact with a teacher from the Poindimie Vocational Secondary School (LEP), Patrick Rolland. He enquired whether the South Pacific Commission could provide the school with technical documentation and curriculum materials for teaching purposes. The Fisheries Development Associate, Masanami Izumi, contacted some Japanese firms and from this source we were able to begin supplying the LEP with materials in the form of posters, videos and newsletters.

Until last year, the classes for the Certificate of Professional Aptitude (CAP) in Development (marine management and maintenance option) were all taught at the Poindimie LEP in rooms particularly ill-suited for courses on equipment used in a marine environment, especially maintenance of marine engines and hulls.

In the spirit of the Matignon Accords, the French Government wished to contribute to the construction of a completely new LEP at Touho for 400 pupils (including boarding facilities). The State also made the major financial contribution to the marine annex to this school, which, for practical reasons, was built alongside Touho port.

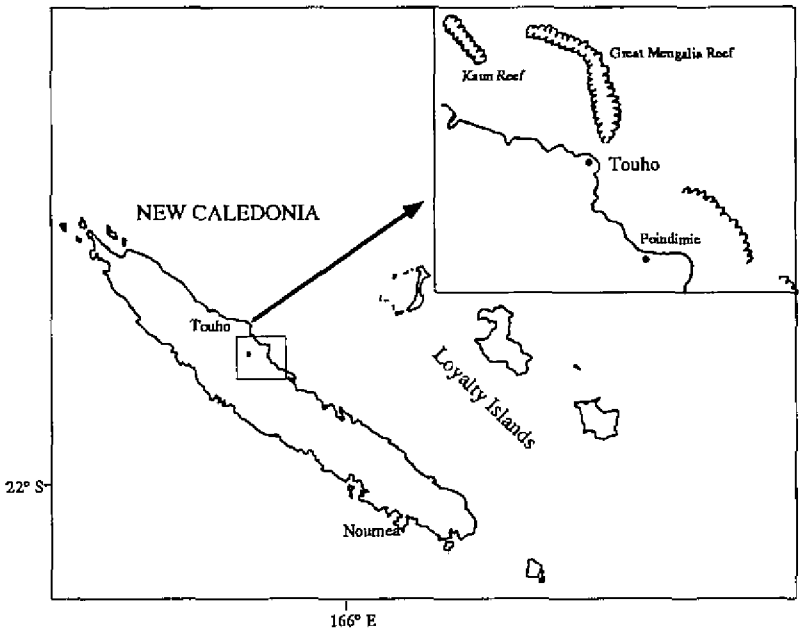
Touho, which means 'the insurgent' in the local Melanesian language, was founded in 1884. Situated between the Tiwaka river to the south and the Tipindje to the north, Touho lies 350 km from Noumea (see map below). Its main resources are coffee, agriculture, fisheries and tourism.

Izumi and I were invited to attend the opening ceremony for the Marine Annex and took advantage of this opportunity to appraise the students' new learning environment and familiarise ourselves with the curriculum, to get a better idea of the educational materials needed by schools of this kind.

The Marine Annex, located beside Touho port, required a capital investment of approximately 100 million CFP francs and comprises two large workshops, one for engine maintenance, the other for marine hull upkeep (see photos on next pages).

The school has two classrooms (one equipped with audio-visual equipment), two spare parts stores and some storage space.

The two- year course leads up to the CAP in Development (marine management and maintenance option). The various goals sought are the possible creation of small maintenance businesses, an input of qualified staff for existing companies in New Caledonia, continuing training for the local industry (engine maintenance, safety, conservation of the environment) and possible further study within the French merchant navy.



Map showing the location of Touho, Northern Province, New Caledonia

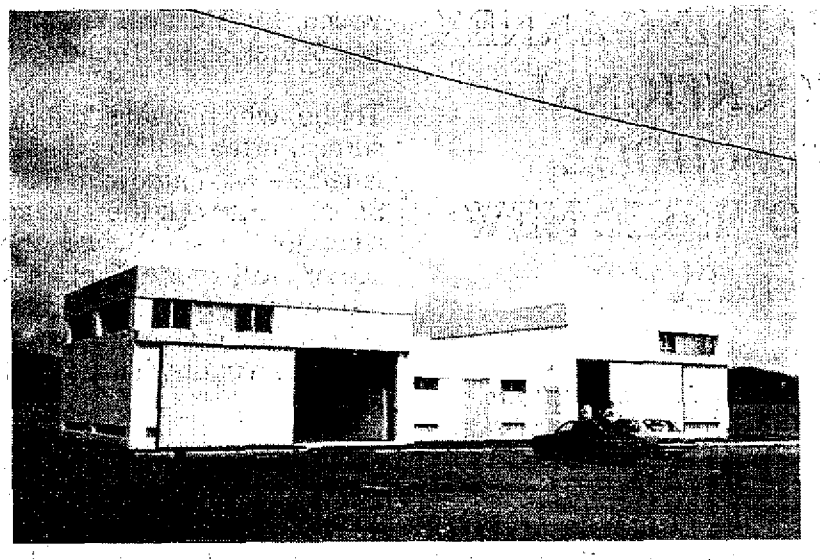


Photo: Masanami Izumi

The Marine Annex at Touho vocational secondary school, showing the engine maintenance shop (left) and the hull maintenance shop (right)

The purpose of this option is to prepare students for equipment maintenance in the marine environment, in particular marine engine and hull maintenance. Their professional tasks come under four main headings:

1. Propulsion: especially the maintenance, diagnosis, repair, testing, adjusting and fitting of petrol and diesel engines;

2. Extra training in general mechanical engineering, heat treatment and some notions of welding and design;

3. Maintenance of wooden or fibreglass hulls;

4. Introduction to the marine environment: safety, environment, rudiments of navigation and practical applications.

The teaching week consists of 36 hours of classroom work divided into 20 hours of general teaching and 16 hours of vocational training. The pupils are divided into two classes (Year 1 and Year 2), each accommodating 12 pupils.

One of the interesting special features of this kind of training is the vocational aspect. When a lesson concerns a particular subject (maintenance of the ignition system, for example), the pupils can apply their knowledge by repairing private fishermen's boats with ignition trouble. The school receives no financial reward from this service (it being up to the fisherman to purchase any spare parts required), but this is an excellent method because the students experience a real work situation.

Our discussions with the teaching staff revealed a real need for curriculum materials and showed what a positive contribution these make to the course. The South Pacific Commission has an important part to play in collecting and distributing documentation within and beyond the region (a list of the educational material available at SPC was published in the *SPC Fisheries Newsletter* #60).

The value of institutions of this kind is now widely recognized in New Caledonia and even beyond the Territory; some Tuvaluan education officials may soon be coming to the Territory to visit these LEPs and see how they operate.

Despite the recent opening of this major educational facility on the East Coast of New Caledonia, much remains to be done to coax this area out of its isolation and enable future successful students to find lasting employment in the region.

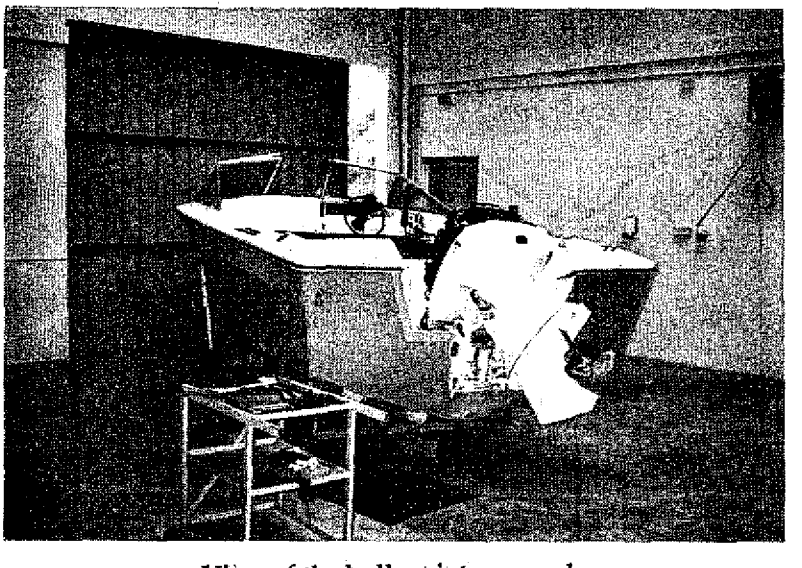


Photo: Masanami Izumi

View of the hull maintenance shop

Photo: Masanami Izumi

The engine maintenance shop has a full range of tools and a variety of functional work stations.

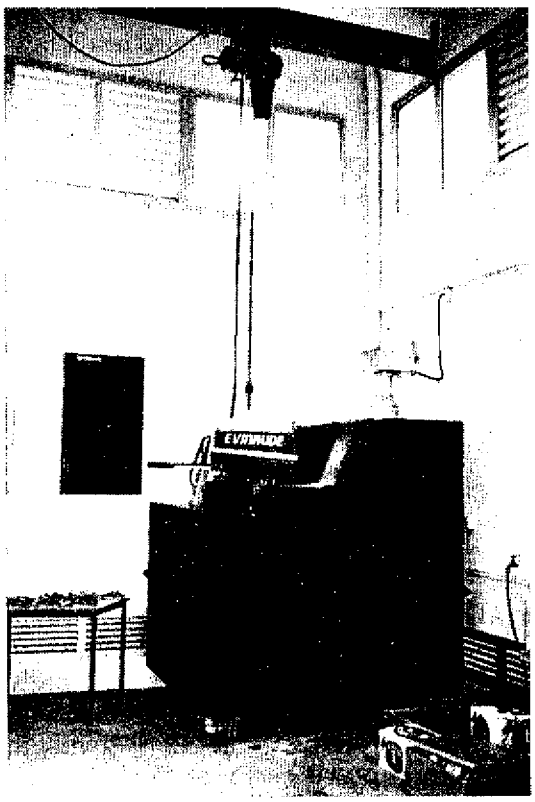


Photo: Masanami Izumi

This outboard motor test tank is the only one of its kind in the Territory.

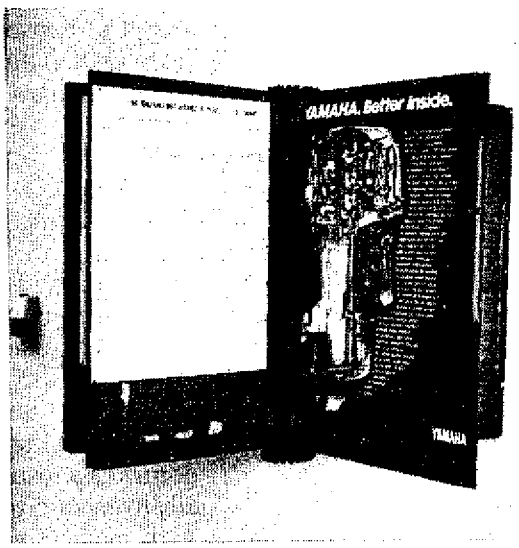


Photo: Masanami Izumi

An example of useful educational material: poster showing a cross-section of an outboard motor.

SCUBA DIVING IN PACIFIC ISLAND FISHERIES DIVISIONS: SAFETY LESSONS TO BE LEARNED

by L. Farnel and R. Gillett
FAO/UNDP Regional Fishery Support Programme
Suva, Fiji

Introduction

In recent years there has been a tremendous increase in SCUBA diving by the staff of the fisheries divisions in the Pacific Islands. National and regional training courses for fishery personnel have been sponsored by several donor agencies and have resulted in the training of a large number of staff. This has enabled local staff to perform tasks which previously were carried out by expatriate personnel.

As with the introduction of any new technology which contains some degree of physical danger, there have been problems. In some Pacific countries fisheries division staff have been involved in accidents. In others, unsafe diving practices could easily result in a disaster. Some equipment used is inadequate for the tasks, while other gear is in poor condition.

Because the United Nations fishing programmes in the Pacific have had a major involvement in SCUBA training for fisheries work, there has been an obligation to follow up the initial instruction. Accordingly, the FAO/UNDP Regional Fishery Support Programme has sponsored SCUBA safety workshops in the fisheries divisions of six Pacific Island countries, in which the diving practices of approximately 75 divers were reviewed.

With the experience gained from carrying out these workshops, a number of generalisations can be made. Although there are differences between countries with respect to SCUBA diving practices, there are many common hazards, concerns and dangerous situations. The following is an attempt to consolidate observations on unsafe practices in order to decrease the risks associated with fisheries division diving.

Rapid ascents

In the Pacific Islands the most serious common SCUBA problems are caused by rapid ascents to the surface. This is most often due to an unforeseen air depletion situation, but also occurs as a result of panic, usually from environmental threats such as sharks or strong currents. Correct ascent rates are between 40 and 60 ft per minute (12–18 m/minute), with a three- to five-minute safety stop on all dives at 15 ft (5 m) below the surface. This stop should be made regardless of how shallow or how short the dives are. Some divers feel shallow dives for relatively short times require no stop. This is not true.

Rapid ascents can create lung over-pressure problems caused by pressure differences between the air inside the lung and the water on the outside of the body. Rapid ascents, especially ones where divers do not exhale, can cause over-expansion and rupture of lungs because of trapped air. Air embolism is the most serious lung over-pressure disorder. It results in air bubbles being trapped in the circulatory system. This may produce central nervous system damage such as permanent paralysis, brain damage or heart attack.

Another serious problem associated with rapid ascents is decompression sickness, also known as 'the bends'. While there is always a risk of bends with any use of SCUBA, regardless of depths and times, rapid ascents greatly increase this possibility. Nitrogen bubbles occur in tissues, causing pain and numbness resulting in central nervous system disorders.

During the SCUBA safety courses, it was noted that a surprising number of former SCUBA divers were no longer able to dive because of ear damage. It is likely that many of these problems originated from rapid ascents or improper equalisation techniques.

Running out of air

As indicated above, a major cause of rapid ascents is simply that the diver has run out of air. Much more attention needs to be given to having properly functioning gauges and monitoring the gauges diligently to prevent serious injury.

Running out of air is not just bad for the diver, the equipment suffers as well. With the last breath of air from a tank, a vacuum is created and water enters the regulator and cylinder. It can damage seats, corrode hoses internally, cause

gauges to read incorrectly and produce corrosion in the cylinder which could result in air unsafe for breathing or cylinder failure. This could be prevented, firstly by taking measures not to run out of air or, failing that, having regulators cleaned, seats replaced, and cylinders cleaned each time the situation occurs.

Use of dive tables

The use of diving tables or other means of keeping track of nitrogen intake is very important for reducing the possibility of decompression sickness. In several of the fisheries divisions no tables or other methods are being employed. Either no training has been given or that which was has been forgotten. In some places tables are used incorrectly. Dive tables are based on comprehensive research, experience, and manufacturers' rules of operation and *must* be followed for safe diving. An additional problem relating to dive tables is that some divers are attempting to devise multi-level dive plans from tables designed for single depth dives.

It should also be noted that even the use of dive tables or a dive computer does not entirely eliminate risk. Many divers are at risk of bends if they stay down for long periods, even in shallow water. Multi-level dives in which divers start deep and gradually work up to more shallow water should only be undertaken with great caution. While a computer may indicate that they are theoretically possible, other factors, such as the diver being tired, dehydrated, hung-over or sick, cannot be considered by the computer and can increase the risk of decompression sickness. In fact, recent research indicates that up to 60 per cent of the people getting bends are using computers. Even more surprising is that 49 per cent of bends victims treated in Honolulu had been diving within the limits of the U.S. Navy tables, 29 per cent within the PADI (Professional Association of Diving Instructors) Recreational Dive Planner and 21 per cent within NAUI (National Association of Underwater Instructors) tables. The conclusion is that tables should be used, but they should be used conservatively together with consideration of factors affecting the diver's fitness.

Multi-day repetitive dives

Many fisheries division divers are doing work on clams, sponges, pearl oysters or fish stock assessment which involves diving long hours for several days in a row. At present there are no tables or dive computers that take this type of diving into account. Multi-day repetitive divers are at high risk of bends. Additional negative factors, such as getting cold because of ill-fitting wetsuits or lack of wetsuits, multiple ascents, tiredness and dehydration, which are common in fisheries-related diving, further increase the risk.

Many experts now recommend that no more than two dives per day should be undertaken for not more than three days in a row, and that divers wait 24–48 hours before going to a high altitude or travelling in a plane. It should be noted that this recommendation will modify many SCUBA work programmes in fisheries divisions.

Lung fitness

Lung over-expansion injuries, described earlier, can also be caused by air trapped in unfit lungs found in divers with asthma, bronchitis, chronic cough, colds, flu, lung cysts, history of punctured or collapsed lung, etc. Certain lung disorders should therefore preclude diving, either temporarily or permanently. These disorders can cause air trapping even when the ascent and breathing pattern of the diver is normal. Many divers interviewed in the Pacific Island dive safety courses were diving despite these lung conditions.

An annual SCUBA-oriented physical examination should be required for all divers. Directions to medical personnel for administering such examinations are available from the Regional Fishery Support Programme (UNDP, Private Mail Bag, Suva), PADI (1251 E. Dyer Road #100, Santa Ana, California, USA 92705), or Dive Pacific International (Box 1656, Lahaina, Hawaii, USA 96767).

Recreational drug use, smoking and drinking

In many areas divers use recreational drugs such as kava or betel nut before and after diving. No research has been done on their effects on divers. Impaired judgement is, however, a likely side-effect. In addition, it is not known what effect these substances combined with pressure and nitrogen may have on a diver. It has been determined that certain drugs, such as nitrous oxide, increase tissue loading. The use of kava or betel nut in conjunction with diving is therefore not recommended.

A surprising number of Pacific Island divers smoke and drink without knowledge of the SCUBA-related side effects. Drinking and smoking both cause peripheral vaso-constric-

tion, increasing the possibility of hypothermia and reducing proper release of nitrogen. Drinking also causes dehydration and, combined with a touch of seasickness, hangover and heat, increases bends risk. Many of the Pacific Island cases of the bends are listed as 'complicated by alcohol'.

Smoking increases the risk of lung over-expansion, due to a general weakening of the lungs and coating of alveoli which prevents proper gas exchange. Gas poisoning can occur as the partial pressures of the surface-inhaled carbon monoxide increase on descent. The possibility of heart attack (the number one killer of divers) is increased with smoking.

Divers should refrain from smoking and drinking before diving and for about four hours afterwards.

Many fisheries division divers were unaware that certain prescription and non-prescription drugs, such as those used for asthma and high blood pressure, can cause fatal side-effects when combined with SCUBA diving. Unless medical authorities have confirmed that a particular drug is safe, nobody taking medication should be allowed to dive.

Equipment problems

Although the cost of obtaining new gear was cited by fisheries officers as a major difficulty, many of the equipment problems observed could be easily avoided through preventive maintenance and proper storage of gear. Regular servicing by a qualified technician and records of this servicing are only done in a few fisheries divisions. Tanks stored on a wet cement floor (increases corrosion), wet suits dripping on tanks (corrosion), and regulators hanging so that hoses are bent (wear) were commonly observed (Figure 1). To avoid having debris accumulate, cylinders should never be completely drained, but stored with a minimum of 300 to 500 PSI (50 bar).

Wet suits that do not fit properly and inadequate buoyancy regulation were common equipment problems. Using a wet suit that is too large (or not using a wet suit in cool water) can cause a diver to become cold and subject to hypothermia, increasing the risk of bends. If a wet suit is too small,

Photo: Leslie Farnel

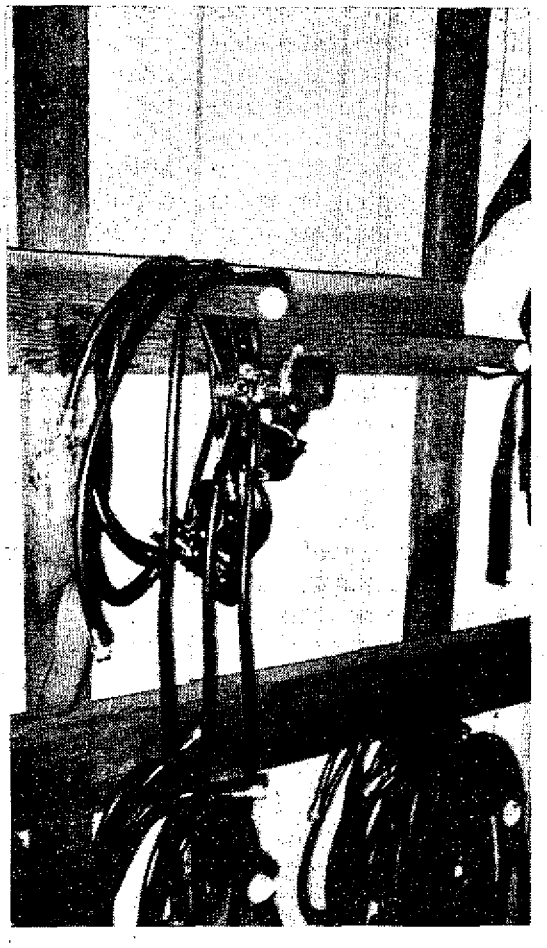


Photo: Leslie Farnel

Figure 1: Wet suits dripping on tanks (left), and regulators hanging so that hoses are bent (right) were commonly observed in fisheries divisions.

it can restrict blood flow, causing nitrogen accumulation in tissues. Buoyancy regulation problems noted included inadequate weighting, total absence of buoyancy control devices (BC), and BCs which would self-inflate, possibly causing a rapid ascent. Because of these buoyancy problems, many fisheries division divers complain of fatigue. Exertion increases the risk of bends, may cause panic and can result in an inability to maintain safe depths and perform safety stops when surfacing.

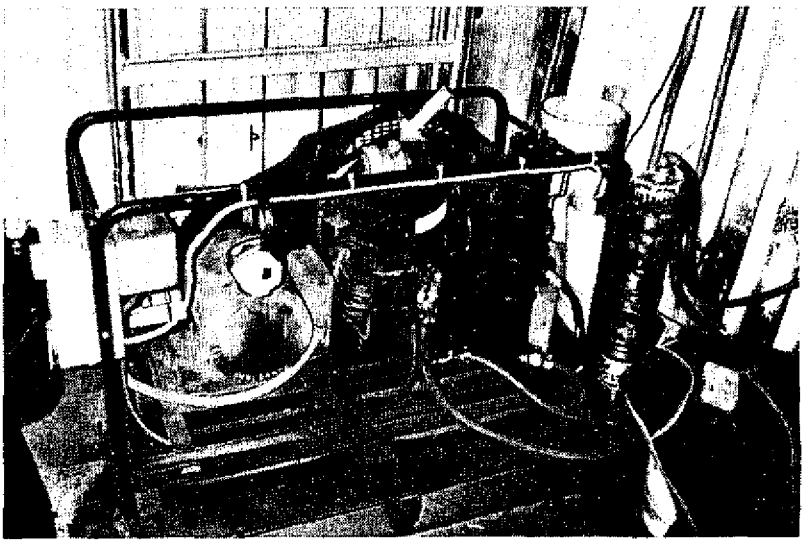


Photo: Leslie Farnel

Figure 3: Improper compressor air intake arrangements were very common in the fisheries divisions.

The condition of the SCUBA tanks causes some worry. Tanks containing dead wasps, water/oil, green algae or corrosion were noted in almost every fisheries division. The number of cracked/corroded/uninspectable tanks was also quite large. A SCUBA tank which explodes could easily destroy the building in which it is stored or knock over a large bus (Figure 2).

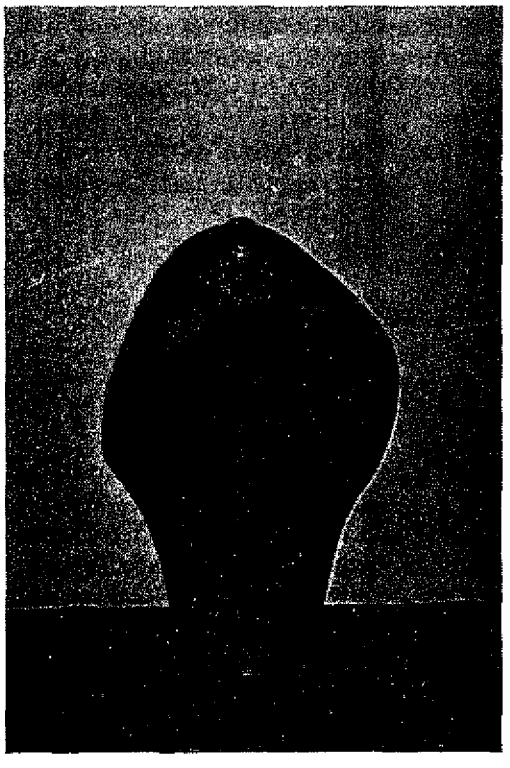


Photo: Leslie Farnel

Figure 2: SCUBA tanks do explode and can knock over a large bus.

The quality of air inside tanks is very important. Debris inside tanks, compressor filter problems and improper compressor air intake arrangements (Figure 3) were astonishingly common in the fisheries divisions. Bad air can cause headache, nausea, vomiting, breathing difficulty, blurred vision or even death.

It should be stressed that the most serious equipment-related problem in the Pacific Islands is misuse: specifically, not using gauges, paying no attention to dive tables/computers, and improper storage/maintenance of gear.

Shallow water black-out

Although shallow-water black-out is experienced by free divers and is not a SCUBA accident, a significant number of these accidents were noted during the safety work and mention is therefore made of them here. Extreme hyperventilation prior to descending alters the carbon dioxide to oxygen ratio in the body tissues and reduces the breathing triggering mechanism. This can cause unconsciousness on surfacing and subsequent drowning, heart attack or the loss of the diver in strong currents. This possibility is increased if the diver practises multiple descents in rapid succession.

Certain free divers who remain under water for long periods repetitively, especially those involved in pearl culture, can be subject to decompression sickness even though they are not using SCUBA. To reduce the possibility of this, divers should take a rest period between dives and no more than three hyperventilation breaths should be taken.

Shark attacks

It is somewhat ironic that the primary safety concern of the participants involved in the SCUBA workshops was one

SCUBA workshops was one that is not very important statistically. The 75 divers attending the workshops perceived shark attacks as the greatest safety hazard. Evidence of shark attacks on SCUBA divers was, however, non-existent in the countries where workshops were carried out.

Safety awareness of supervisors

The SCUBA safety courses sponsored by FAO were generally well attended by the mid-level staff of the fisheries divisions. The supervisors of the diving staff, however, were frequently not present. Although the divers may have become more safety-conscious, in some cases it appears that they were required to return to the same potentially risky environment because those directing work were unaware of unsafe conditions.

The effectiveness of the training is obviously limited if the trainees must go back to former practices. In addition, misunderstandings can occur when a supervisor unknowingly asks a worker to perform in a manner that he has learned is unsafe during training. It is therefore important that the diving supervisors be at least as well informed on safety aspects as the divers themselves.

Established habits

Many fisheries division divers, especially older ones, are reluctant to change their ways. Although they acknowledge the value of updated information and agree that some of the new practices pose less risk, they insist that their own practices have served them well in the past. Since they have experienced little difficulty from these habits, they see no need to change. Many older divers feel that the new guidelines are oriented to the casual expatriate sport diver and do not apply to those who dive much more often.

The problem with this philosophy is the cumulative long-term effects of diving, especially from multi-day repetitive dives over many years, combined with disregard for safe depths and times. This can place the older and more experienced divers at a higher risk of degenerative dive-related diseases such as bone necrosis; bone marrow cancer; retina, liver and neurological disorders; and various types of anaemias. Experience in the Pacific Islands has shown that a relaxed attitude towards established SCUBA safety practices can be very dangerous.

Lack of current information

A related problem is that some divers who attempt to adhere to updated diving standards have difficulty obtaining current information. Many divers were certified some years ago, but recently much research has been done. This new work, especially in the areas of nitrogen uptake and physiology, shows that many of the diving 'rules of thumb' are not valid. For example, the old theory that decompression sickness is not a problem in less than 10 m (33 ft) of water, or that bends cannot occur on only one tank of air, has been disproved.

Until recently, little research had been done on the effects of diving since the U.S. Navy's World War II work. With better data and superior ways of processing information, scientists are now reaching important conclusions on health and safety aspects of diving which are having a major effect on SCUBA practices. Examples of this are: the relationship between flying and diving in the same 24-hour period, dehydration and lack of sleep causing bends, the discovery that diving in water 8 m deep can cause the bends, and the increased risk of brain damage when multi-day repetitive diving is done.

It is unfortunate that little of this current information is brought to the attention of SCUBA divers in the Pacific Islands. In this region diving periodicals are expensive and difficult to obtain. Even qualified SCUBA instructors who are on mailing lists get their information irregularly. International agencies dedicated to diving safety such as the National Association of Underwater Instructors (NAUI), the Professional Association of Diving Instructors (PADI), the Divers Alert Network (DAN), and the Divers Emergency Service (DES), often feel the Pacific is a geographic nightmare to service and that there are not enough people in the area to warrant attention. There is clearly a need for some agency based in the Pacific Islands to obtain and disseminate current SCUBA diving information.

Conclusions

From the six SCUBA safety workshops sponsored by the Regional Fishery Support Programme certain common features are apparent. Serious accidents are most often caused by rapid ascents and disregard for time at depths. In almost all cases these are caused by diver error and therefore avoidable. A more diligent and conservative use of dive tables in conjunction with more rigorous monitoring of gauges could

eliminate many serious accidents. Improper maintenance of gear, rather than the lack of gear, appears to be the most important equipment problem.

A constant, on-going attempt should be made to stress safety aspects of diving and to prevent a relaxed attitude. In this regard, it may be useful to circulate the following notes to all fisheries division divers and to post them on a notice board.

Safe Diving Practices

1. Understand and adhere to your dive tables. Always do deeper dives first and successive dives shallower. Be conservative and build in safety factors.

2. Ascend at 18 metres (60 feet) per minute or slower. Always stop at 5 metres (15 feet) for 3 to 5 minutes. Avoid altitude or flying for at least 24 hours.

3. Never hold your breath while SCUBA diving. Never dive when under the influence of drugs or alcohol, when hung-over, dehydrated, or sick, especially if the illness affects circulatory or the respiratory functions. Always equalise ears early and often. Cancel dives that you consider unsafe.

4. Always maintain your equipment and check it before and after each dive. Have repairs done at minimum once a year. Never run your tank out of air.

5. Be aware of dive planning. Prior to diving establish the maximum depth, maximum time, minimum air, communications and a buddy system. Always follow your plan.

6. It is always wise to have oxygen available at every dive site. At the very least, divers and those who supervise diving operations should be aware of the nearest source of medical oxygen, as well as the nearest recompression chamber, nearest physician with experience in SCUBA disorders, and medical evacuation procedures.

7. Restrict dives to a maximum of two per day. Take 24 hours off from diving after every third day. Always allow one hour or more between dives.

8. Understand and control your buoyancy. Always use a BC and do not overweight yourself. Rest when you are tired.

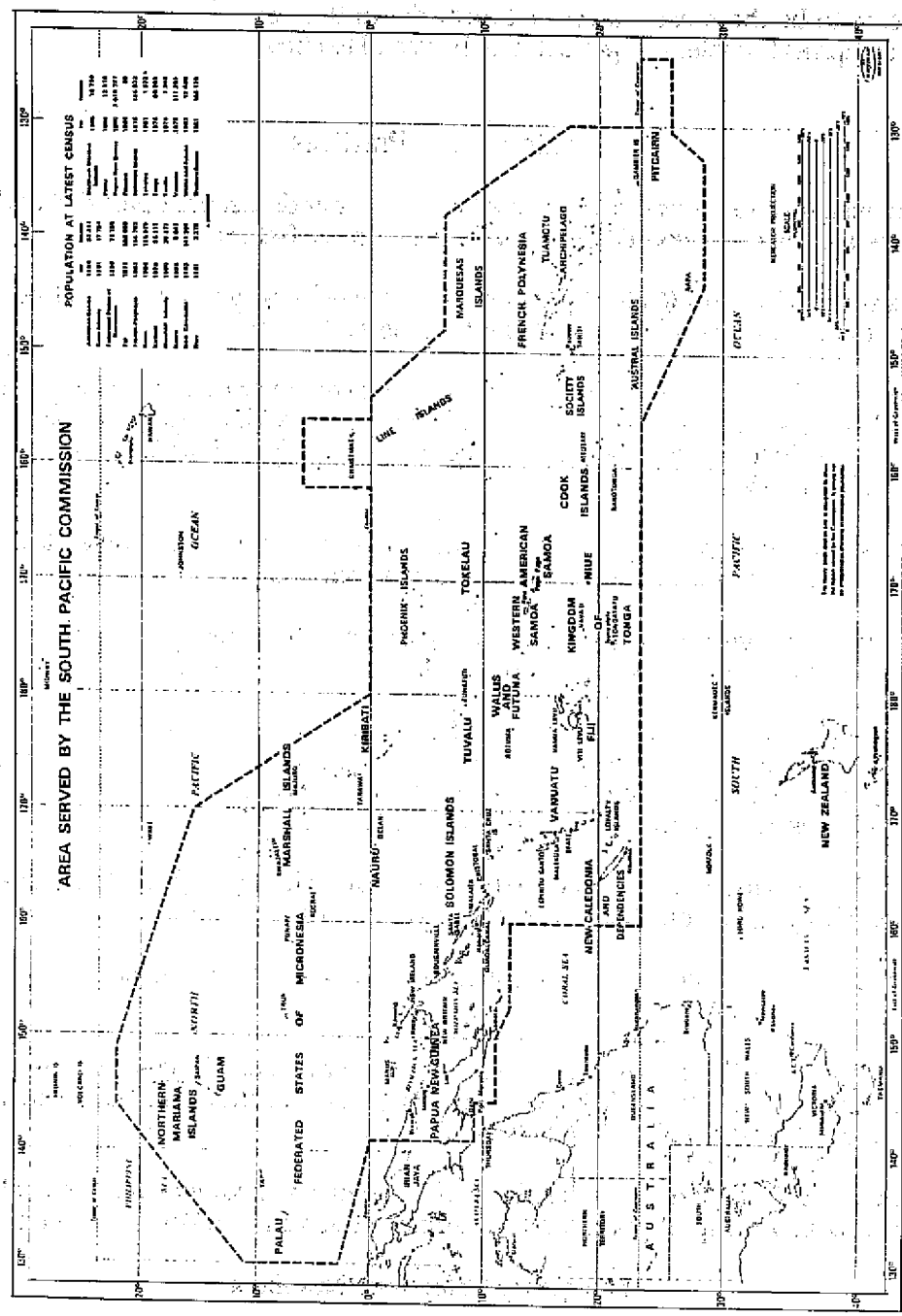
9. Always dive with a buddy. Never separate, even on ascents. Practise emergency procedures and dive skills together at least every three months. A boatman trained in emergency procedures should be at the surface during all dives.

10. Upgrade training whenever possible and keep current in knowledge and skills. Share your knowledge with appropriate local authorities, government officials and medical personnel.

Emergency Telephone Numbers

Australia: Divers Emergency Services
Tel: (61) 008 08 8200

United States: Divers Alert Network
Tel: 1-919-684-8111



Original text: English

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