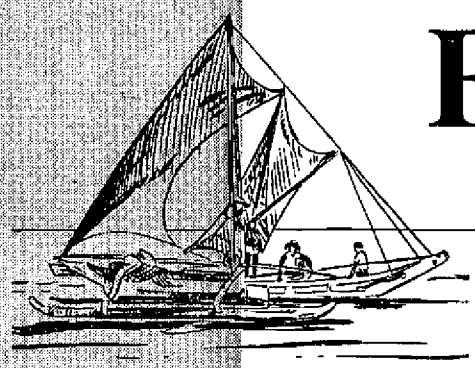
ISSN 0248-076X



FISHERIES

Newsletter

NUMBER 64
JANUARY — MARCH 1993

IN THIS ISSUE

Photo: Steve Beverly

Experimental longline trials are being conducted in New Caledonia to explore the potential of developing a broadbill fishery

South Pacific Commission
Prepared by Jean-Paul Gaudechoux, Fisheries Information Officer

FISHERIES PROGRAMME REORGANISATION

In the past the Commission's marine resource activities have traditionally been divided into two major components, the Coastal Fisheries Programme (CFP) and the Tuna and Billfish Assessment Programme (TBAP).

However, the overall Marine Resources Programme has grown and undergone several changes of emphasis in recent years, in response to direction from SPC member countries as expressed through various SPC Regional Technical Meetings on Fisheries, meetings of the Committee of Representatives of Governments and Administrations, and the South Pacific Conference.

While this dynamism ensures that the work of the programme retains its relevance to the needs of SPC member countries, it has also led to the programme itself developing in an unstructured way as needs arose. This, combined with the requirement for SPC as a whole to develop a Corporate Plan this year, has led to a need to revise the programme's organisational structure, a process which is presently under way.

The two principal components have now been subdivided into seven distinct 'sections', which correspond to the principal technical advisory functions of the Programme. The diagram below shows the revised Programme structure. The top level corresponds to the position of Fisheries Co-ordinator, while the next level represents the two major divisions, under the technical supervision of the Coastal Fisheries Programme Manager and the Chief Fisheries Scientist respectively. At the next level again are the seven newly-defined Sections, each of which corresponds to the duties and responsibilities of a senior professional position with the Programme.

The space available on this page does not permit full expansion of the diagram to show the eighteen projects and activity areas contained within the seven sections. However, enclosed with this *Newsletter* is an expanded version of the same diagram which not only shows individual projects but also gives an indication of the range of activities covered by each. In many cases, but not all, projects correspond to specific extra-budgetary funding arrangements. Although for ease of description they are presented separately in the diagram, the activity areas overlap and are fully integrated.

On the back of the diagram is a list of the positions and names of Programme staff members by section, to help ensure that enquiries or requests for technical information are directed to the right person.

Another reason behind the re-organisation is a feeling among Fisheries Programme staff that in recent years we may have 'over-projectised' the work programme in exchange for blocks of focused, short-term funding support that we would not otherwise have been able to secure.

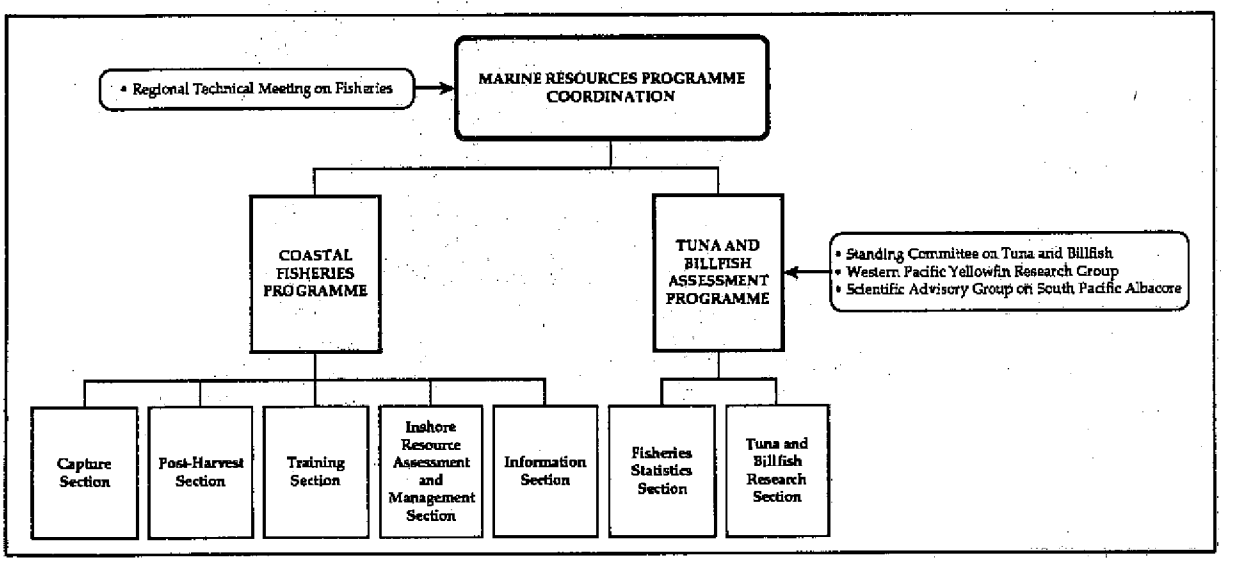


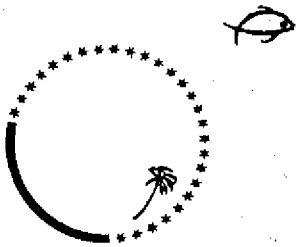
Diagram condensed showing the newly-established sections within the Marine Resources Programme

Funding donors often have a strong desire to see activities 'projectised' — that is, given a finite period over which to operate, and set specific targets to be achieved over that period — when in fact activities such as the collection of fishery statistics, the dissemination of information, and the provision of technical advice are things that really are not worth starting unless there is an open-ended commitment to keeping them going. Other components of our work — such as the running of a programme of training courses, a technical workshop, or an in-country assignment carried out in conjunction with national agencies or other bodies — 'projectise' very nicely and will continue to be presented to donors in this way.

However, we are becoming increasingly uncomfortable with being forced to treat as projects activities that would more correctly be viewed as services to member countries, and to projectise what are really ongoing functions. Part of the purpose of the reorganisation, therefore, has been to redefine our work in terms of 'services' and projects, as a tool to be used in future discussions with donors. In addition, of course, we hope also to provide a clearer picture of our organisational structure to our clients: the Pacific Island governments and administrations for whom the Commission works.

During 1993 the reorganisation will be extended to the Programme's administrative and financial structure, which will be revised to reflect the functional operation of the programme more closely. Some positions may also be re-titled for the sake of clarity. We hope that by mid-year our reorganisation will be complete and that the new Programme structure will help us convince the programme's financial supporters to consider the need for longer-term commitments as well as short-term projects.

(Contributor: Garry Preston)



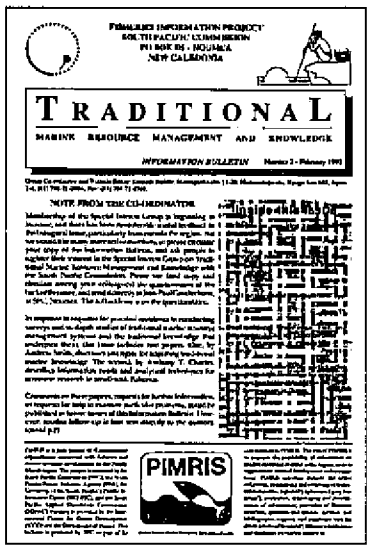
INFORMATION SECTION

Special Interest Group Information Bulletins

As most readers will know, the Coastal Fisheries Programme of the South Pacific Commission, through the Fisheries Information Project, has initiated several Special Interest Group (SIG) networks to establish links between groups and individuals interested in a particular fisheries-related subject area.

To date, SIGs have been established for Beche-de-mer, Ciguatera, Pearl Oyster, and more recently, Trochus and Traditional Marine Resource Management and Knowledge. These groups produce a twice-yearly bulletin of reports, studies, and comment based on contributions from group members. Each group has an appointed editor, usually outside SPC, who co-ordinates preparation of the bulletins and forwards completed copy to SPC for publication and distribution.

The second issue of the *Traditional Marine Resource Management and Knowledge Information Bulletin* has just come out of the SPC printery. Prepared under the technical supervision of Dr Kenneth Ruddle, it includes information on strategies for acquiring traditional marine knowledge. Information needs and analytical techniques for economic research in small-scale fisheries are also presented.



The SIGs are now well established as a very useful mechanism for the enhancement of information exchange in the region. The Fisheries Information Project will continue to make efforts to gradually increase their number. The Fisheries Education and Training SIG is now active and its first information bulletin is due out in April. A SIG on fish aggregation devices will be established in the second half of this year.

Anyone interested in becoming a member of one of these SIGs is invited to contact the SPC Fisheries Information Officer for details.

(Contributor: J.P. Gaudechoux)

TRAINING SECTION

New Special Interest Group taking shape

Readers with an interest in fisheries training and education will be pleased to learn that the Regional Fisheries Training Project (RFTP) has initiated a new Special Interest Group (SIG) specific to Fisheries Education and Training (see preceding article for more information about SIGs).

Establishment of more effective regional co-ordination of fisheries education and training and closer links between institutions and agencies working in this field were given high priority in the 1991 SPC 'Review of Human Resource Development and Planning in the Pacific Islands Fisheries Sector'. The Special Interest Group in Fisheries Education and Training will assist in meeting both these needs.

The Fisheries Training Section is keen to establish contact with institutions, administrations, groups and individuals interested in the subject area and to receive material for publication.

Although there are plans to identify an independent editor for the bulletin later, the Training Section staff, Hugh Walton and Michel Blanc, will be taking editorial responsibility for the first bulletin, which has been scheduled for publication in April. It will be published in close collaboration with Jean-Paul Gaudechoux, SPC Fisheries Information Officer.

In addition to editorial comment, the bulletin will contain feature articles and some regular columns. The latter will include reports on the training activities of SPC and FFA, reports from courses (national, regional or international), summaries of planned courses, and institutional profiles.

A 'Coming events' diary will provide advance notice of courses and workshops for the benefit of both trainees and institutions. We are particularly interested in receiving notification from institutional contributors of courses and workshops planned for 1993.

The success of the *Fisheries Education and Training Information Bulletin* will largely depend on the commitment of SIG members and other interested persons to provide articles and matters of interest for publication. Material intended for publication in the first bulletin should reach us at SPC as soon as possible. Ideally, we would prefer to receive disk copy, but hard copy or fax versions will also be acceptable. If you need more information before putting pen to paper, or simply want to receive the bulletin, please do not hesitate to contact us.

(Contributor: Hugh Walton)

Workshop on sashimi tuna preparation

During the past few years, the potentially lucrative Japanese sashimi tuna market has stimulated development of local tuna longline fisheries across the region. Navimon, a New Caledonian fishing company, is currently expanding its existing fishing operations with eight brand-new longliners, due to arrive in Noumea in 1993.

Navimon presently owns two boats, which traditionally fished for deep-sea snappers for the local market, but have recently turned to longlining for tuna using the Japanese method. Preliminary results have been encouraging, with more than 60 t exported to Japan in 1992.

The new longline vessels have been financed by France under the Pons Act, which gives tax relief on investments in French Overseas Territories. The 18 m aluminium vessels are being built by the Breton shipyard, Vergoz. They will be fitted with a monofilament nylon longline operated by a Lindgren-Pitman drum and shooter system, a 30 m^3 fish storage hold, a flake-ice machine and a 300 Hp engine. Each boat will be under the command of a captain from the French mainland, while the crew will be recruited locally.

The first two longliners are expected in Noumea in April 1993, with the remaining vessels arriving in pairs during the next 12 months. With new boats using modern techniques, rich underfished waters, and very convenient airfreight connections to Japan (2 direct flights to Tokyo with a capacity of 40 t of cargo weekly), the project has much in its favour.

The management of Navimon contacted the SPC Coastal Fisheries Programme in De-

cember 1992, requesting technical advice and assistance in aspects of crew training and fish handling.

In partial response to the request, the Regional Fisheries Training Project visited Navimon's offices on 12 January this year to run a workshop on preparing and storing fresh tuna for the sashimi market.

Using video cassettes, a poster and a handbook specially prepared for the occasion, as well as practical demonstrations, our two training officers, Hugh Walton and Michel Blanc, taught the eight crewmen present all the techniques required to turn out a quality product.

During the workshop, emphasis was laid on the importance of fish handling on board (gaffing, killing, bleeding, gutting and cleaning) and on the need to chill catches as quickly as possible in brine. The workshop came to a happy end with a product-testing session which all the participants enjoyed.

The Regional Fisheries Training Project is planning to follow this workshop with practical demonstrations on board the *Tania J* and other courses on land for future Navimon crewmen when they have been selected.

(Contributor: Michel 'Bernie' Blanc)

Fisheries Training Directory ready for circulation

The completion of the revised fisheries training directory is a saga dating back to 1986 when, under the guidance of then Fisheries Training Officer Alastair Robertson, a draft Fisheries Training Directory, listing some 243 pages of training opportunities available to the fisheries sector of Pacific Island countries, was circulated to participants at the 18th Regional Technical Meeting on Fisheries (RTMF).

The original directory contained information on courses available in 70 different institutions spread over 18 countries. Courses were listed by country and institution as well as by subject. For each institution a summary of relevant courses offered was presented and each course was outlined in terms of duration, entrance requirements, description, and contact points.

The directory resulted from a recommendation to the 17th RTMF in 1985 that the Fisheries Training Section review existing training arrangements and disseminate this information to member countries.

Those readers who had cause to use this directory in the selection or planning of education or training in aspects of fisheries, either individually or in conjunction with the development of a training plan, will recall that the directory more than adequately complied with the RTMF recommendation and proved to be a very useful tool for human resource development in the fisheries sector.

However, by 1987 many of the directory entries were outdated. The Fisheries Training Section had also collected a considerable amount of additional information on new courses and institutions which had not originally appeared in the directory.

Thus, in 1989, a proposal was formulated to seek financial

assistance to employ short-term contract personnel to undertake the updating, re-formatting, and re-writing of the directory. This task was originally envisaged to require 12 weeks of consultant time, combined with the professional and secretarial support of the Fisheries Training Section.

Unfortunately, we greatly underestimated the complexity of the task and it was not until March 1992 that a draft of the new directory was completed: this after almost six months of consultant time and considerable Training Section input.

Unfortunately the draft directory contained two major faults. It ran to well over 250 pages of double-column small print and, more seriously, some of the more important entries were found to be out of date by the time that all the other entries had been received. Rather than proceed with the publication as it stood, it was agreed that the directory should be re-constituted as a database prior to publication, and that an all-out effort should be made to update the questionable references. Another round of letters went to institutions and we had a sympathetic hearing from the project sponsors, ICOD, which allowed SPC to employ a consultant to convert the directory to a database.

The fisheries training directory database has been structured in a similar format to the original directory. Institutions and courses are coded by numbers; 740 different courses offered by 104 institutions in 25 countries are listed. The printed version of the directory, to be circulated in the region, lists courses by country and institution but also has a simple subject reference system that indexes courses by code number and country.

The database is maintained by the Fisheries Training Section staff in Noumea. It has been prepared using the CDS/ISIS software which will already be known to some Island countries through the PIMRIS project. The Fisheries Training Section will continue to update database entries as new information comes to hand and will undertake to circulate updated versions on an annual basis.

A Fisheries Training Database user manual is being prepared to assist users to install and run the database. The directory can also be made available on disk as a text or word processor file on request.

With more emphasis being placed in the Section on the co-ordination of training and the enhancement of human resource development planning, the directory will be a valuable tool for the selection of training and education opportunities appropriate to needs. Its availability both as a printed document and on disk should ensure circulation to the widest possible range of users. Maintenance of the directory database and the issuing of regular updates will ensure its ongoing relevance (and ensure that we do not have to repeat this exercise again for a long time to come!).

Anybody interested in further information on the directory (or with information to add to it) should contact the Fisheries Training Section at SPC Noumea.

(Contributor: Hugh Walton)

RESOURCE ASSESSMENT AND MANAGEMENT SECTION

In the first quarter of 1993, the Inshore Fisheries Research Project (IFRP) performed several national projects, including assistance to Palau in the review its coastal fisheries management system and preparation of its 1992 Annual Report, to Papua New Guinea in preparation of fisheries research reports, and to Pitcairn with advice on fisheries prospects. As always, this assistance emphasised the enhancement of national capabilities to accomplish similar work in future, by providing on-the-job attachment experience to national staff wherever possible.

Other work included analysis of the growing ciguatera fish poisoning case-history database (to be published in April); participation in a meeting of Micronesian fisheries heads on beche-de-mer resource development and management at the University of Guam; the entry of historical information into the Inshore Fisheries database which, at present, is concentrating on external trade statistics for invertebrate resources; and contributions to several of the Special Interest Group newsletters published in March.

The IFRP continued to provide advice on request, both to SPC member country researchers and to other projects and researchers working on inshore fisheries of the region.

(Contributor: Tim Adams)

CAPTURE SECTION

In August a new capture fisheries project was launched through SPC with funding support from UNDP. This new initiative, the Offshore Fisheries Development (OFD) Project, builds on the accumulated experience and expertise of the long-running Deep Sea Fisheries Development (DSFD) Project, with the particular aims of assisting the development of fish aggregation device (FAD) programmes and small-to medium-scale tuna fishing efforts. The goal of the OFD project is to assist fishermen in diversifying effort away from inshore resources, which are often under heavy fishing pressure, and to promote the increased participation of Pacific Island fishermen in tuna fisheries, presently dominated by foreign fleets. Eight field assistance projects were undertaken under the auspices of either the DSFD or the OFD project in the latter part of 1992, all of which involved the assignment of staff or consultant fishermen or FAD technicians.

National FAD programme planning and implementation — Vanuatu

Under a long-term commitment on the part of SPC to lend technical assistance in the planning and implementation of a European Community-funded national FAD programme, Masterfisherman Paxton Wellington was assigned to the Vanuatu Fisheries Department and based at the Fisheries Training Centre at Luganville on Espiritu Santo. From here, he conducted a wide-ranging assessment of village fishing community capacities and needs, and surveys of potential FAD sites, with the aim of determining a rational allocation of FAD resources.

Wellington supervised the rigging and deployment of four offshore FADs and of six FADs set in shallow inshore waters and designed to aggregate baitfishes. The offshore FADs proved to be very effective, and provided a very productive tuna fishing ground during the SPC/Nelson Polytechnic Pacific Island Fisheries officers' Training Course Practical Module held in Espiritu Santo in June. Two of the FADs were lost after a short time and examination of the retrieved trailing rope-ends indicated that the mooring failure was due to shark-bite.

With the collaboration of the Marine Resources Assessment Group of the University College of London, under British Overseas Development Administration funding, aggregation of fish to the inshore FADs and the community's inclination and ability to exploit them are being monitored to determine the type, number and distribution of future deployments off Espiritu Santo and elsewhere in the archipelago.

(Contributor: Peter Cusack)

Photo: Hugh Walton

Participants in the SPC/Nelson Polytechnic Pacific Island Fisheries Officers' Training Course with a catch of yellowfin taken at one of the Espiritu Santo FADs.

FAD-based offshore tuna fishery development — Palau

After deploying a series of five FADs to the east of Palau's main reef system late in 1991, and hoping that these units would support attempts to develop a local medium-scale sashimi tuna fishery, Palau's Marine Resources Division sought SPC assistance in developing gear and techniques that would enable local craft to target the large deep-swimming tunas known to associate commonly with FADs. Master-fisherman Peter Watt was assigned to this task. At the outset of the project most effort was given to designing and building a wooden hand-hauling drum to set vertical longline gear and to investigating local baitfish resources. When fishing commenced it was soon apparent that the FADs had not then aggregated even small tunas in any abundance. It was not clear, however, whether the absence of tuna at the FADs could be attributed to seasonality, the proximity of the sites to the reef system, or other factors.

Soon afterwards the FAD moorings began to fail; by June all five of the units deployed in 1991 had drifted off station. The focus of the project was subsequently shifted to attempting to determine the cause of these failures and to re-establishing a FAD system. An exhaustive series of site surveys was therefore conducted and a new deployment strategy arrived at, which saw two units deployed well offshore from the western reef. These units quickly aggregated large numbers of small tuna vulnerable to trolling. A local pole-and-line boat took 4 t of mixed yellowfin and skipjack in two days of trolling at one of the FADs, but as of June vertical longline sets had produced only sharks. Five further FAD deployments are planned, several of which will involve low-cost experimental rafts and moorings. Due to the onset of the cyclone season these have been postponed until April 1993. It is expected that Peter will return to Palau then to supervise this work.

(Contributor: Peter Cusack)

Training for rural fishermen — Fiji

To assist the Fiji Fisheries Division with its annual programme of training for rural fishermen in fishing techniques, Masterfisherman Tuainetai Rata was attached to the Division's Extension and Training Section between July and October 1992, at the request of the Government of Fiji. The programme catered to fishermen from the Western Division and covered fishing techniques, gear , safety at sea and aspects of seamanship and small-business management. Rata's main duties included skippering one of the training vessels and demonstrating gear rigging and fishing techniques both ashore and at sea. (P.C)

Initiation of national FAD programme (Phases I & II) — Wallis and Futuna

Following a request by the Territorial Administration of Wallis and Futuna the Section provided technical advice and assistance throughout 1992 in connection with the implementation of the Territory's first-ever FAD deployment programme. This involved the design of rafts and moorings, assistance with procurement, and the assignment of a consultant Masterfisherman to conduct site surveys. Once moorings had been delivered, the Section co-ordinated the collaboration of the French Navy, which provided a deployment vessel, and New Caledonia's *Service territorial de la marine marchande et des pêches maritimes*,which provided the services of Masterfisherman Aymeric Desurmont to supervise three deployments, two off Wallis and one off Futuna. It is expected that during 1993 the Project will join with the Training Section to provide a training programme for the Territory's fishermen in FAD-fishing techniques. (P.C)

Pilot FAD deployment, National Capital District — Papua New Guinea

Following a request by national Government on behalf of the Department of Fisheries and Marine Resources (DFMR), SPC provided assistance to national and provincial fisheries managers in assessing the site-by-site potential for initiating FAD programmes. DFMR

then decided to undertake a pilot FAD deployment in the vicinity of Daugo Island near Port Moresby, centre of an important small-scale commercial pelagic and demersal fishery.

Subsequently DFMR contracted the fabrication of a steel FAD raft to SPC design and landed requisite mooring materials. The Capture Section then assigned consultant Masterfisherman Steve Beverly to conduct an echo-sounding survey of potential sites, and to supervise the calculation and rigging of the mooring and the eventual deployment.

Photo: Steve Beverly

Daugo Island fishermen trolling near the new FAD

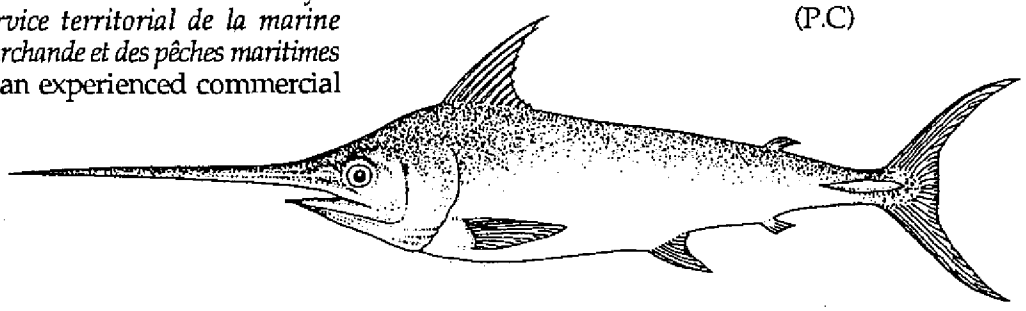
After four months in the water the FAD had aggregated large schools of skipjack and yellowfin tunas and had become the focus of most local trolling effort. Data collected by DFMR show that Daugo Island fishermen making two trips to the FAD each day were making an average of K 200 from catch sales at Port Moresby's Koki Market, with fuel expenditure of around K 17/day. (P.C)

Pilot tuna longlining project, East New Britain — Papua New Guinea

On behalf of the Government of East New Britain Province and in line with national policy of fostering a domestic industrial tuna fishery, the Government of Papua New Guinea requested the assistance of the OFD Project in implementing a pilot tuna longline fishing programme in East New Britain. If successful, the fishing trials will demonstrate to the local private sector the commercial feasibility of catching and landing high-quality tunas with export market potential. SPC, at Papua New Guinea's request, is exploring the possibility of securing external funding to extend this programme through to a test shipping and marketing phase. (P.C)

Broadbill swordfish longlining trials — New Caledonia

On the initiation of small-scale longlining trials targeting broadbill swordfish, the Section arranged the short-term attachment to the Territory's *Service territorial de la marine marchande et des pêches maritimes* of an experienced commercial broadbill fishermen. This assistance included the provision of advice on gear rigging and configuration, setting and hauling techniques, identification of potentially productive fishing areas, and on-board handling of the catch to export standard (see article page 30). (P.C)



FAD site survey and deployment — Fiji

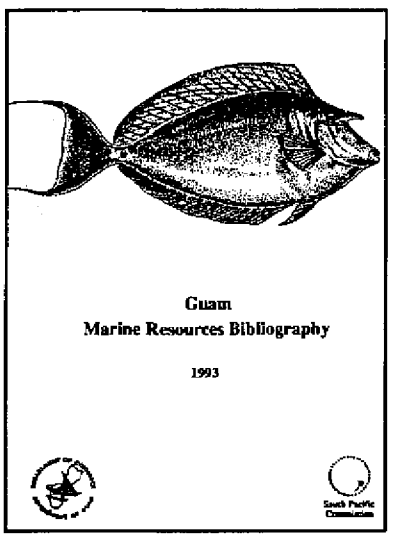
Following the loss of two productive FADs which had been the focus of the offshore small-scale commercial fleet supplying the Suva urban market, the OFD Project assigned a consultant Masterfisherman to the Fiji Fisheries Division to survey FAD sites using GPS equipment and to supervise the rigging and deployment of two replacement FADs. This work was a precursor to an extended programme of FAD assistance due to commence in Fiji's Western Division early in 1993. (P.C)

Photo: Steve Beverly

Fiji Fisheries Division's new FAD on the way to the wharf for loading on the deployment vessel; note the Philippine-style *payao* raft made from a steel primary float and bamboo.

PUBLICATION OF GUAM MARINE BIBLIOGRAPHY

Following the publication of the marine resources bibliographies of the Federated States of Micronesia and the Marshall Islands by the South Pacific Commission in 1992, the *Guam Marine Resources Bibliography* was published in February 1993 after a bibliographic survey had been carried out for Guam (see SPC *Fisheries Newsletter* #63)



During the survey of published and unpublished material in Guam and Honolulu from 12 to 30 September 1992, great assistance was received from people in government and fisheries-related offices, institutions and libraries. The information gathered was entered into a Pro-Cite library database. The bibliography contains 181 pages and 1,479 references. It should be very useful to people who are involved in fisheries development activities and marine biological and environmental studies in Guam and the region.

Izumi, M. and H. Jackson (1993). *Guam Marine Resources Bibliography*. South Pacific Commission, March 1993. 181 p.

(Contributor: Masanami Izumi)

TUNA AND BILLFISH ASSESSMENT PROGRAMME (TBAP)

Regional Tuna Tagging Project (RTTP)

The last period of RTTP field work began on 5 November 1992 with the arrival of the *Te Tautai* in Cairns, Australia, after a ten-day steam from the Philippines. Over the following two weeks the vessel worked in the north-west Coral Sea, targeting yellowfin and bigeye that regularly aggregate in the area during the October and November full moons. This work was carried out in co-operation with CSIRO Division of Fisheries and was funded by the Australian East Coast Tuna Management Advisory Committee. The visit was also a continuation of a highly successful cruise in the area in late 1991 that yielded 10,220 tag releases, consisting of 2,518 yellowfin, 3,993 skipjack and 3,709 bigeye (see *SPC Fisheries Newsletter 59*)

From 7 to 11 November the vessel searched unsuccessfully near the reefs and seamounts that had yielded the high catches in 1991. Aggregations were located on 12 November, one day after the full moon, and fished for two days for 372 yellowfin and 538 bigeye releases. Of these, 72 yellowfin and 105 bigeye were injected with strontium chloride and tagged with special orange tags as part of a CSIRO experiment to determine the stock structures of these species in the western Pacific. Five bigeye that had been tagged in the Coral Sea in 1991 were recaptured by fishermen on the *Te Tautai*, including one that had grown from 87 cm to 115 cm in fork length and increased 20 kg in weight.

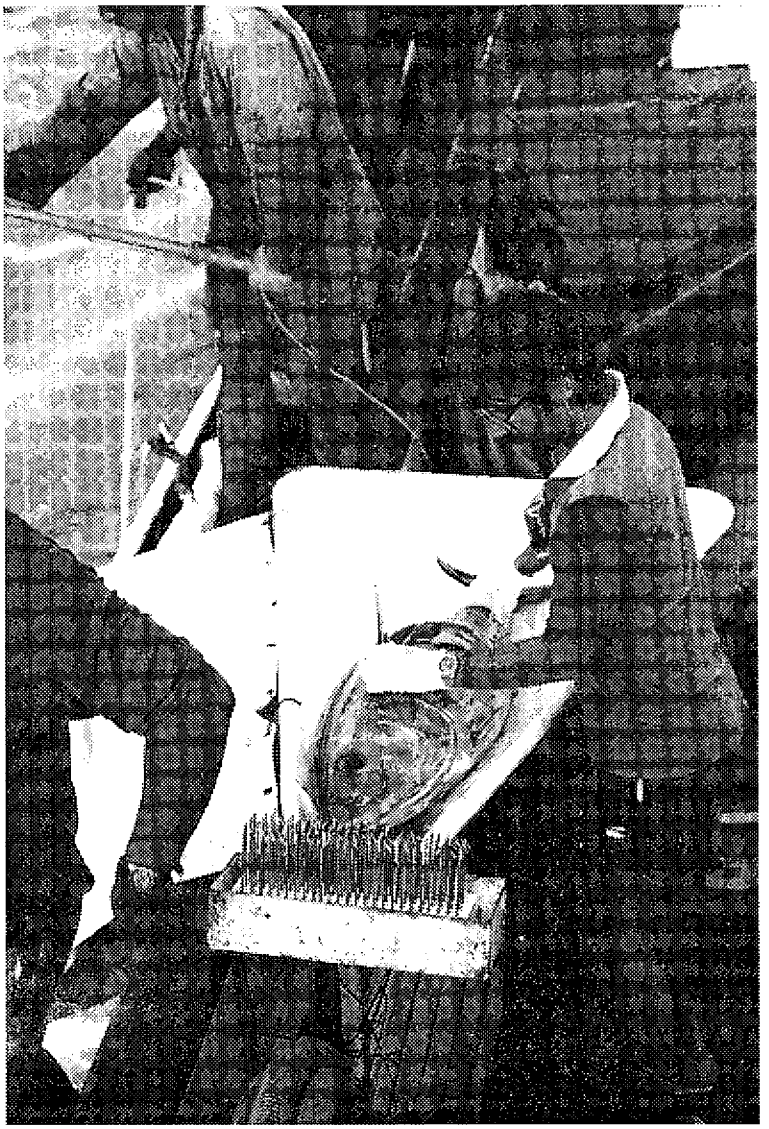


Photo: David Itano

A bigeye lines up for tagging in the Coral Sea.

During this period, an Australian scientist working on the local handline and longline vessel FV *Inquirer* tagged and released an additional 21 yellowfin and 23 bigeye.

Aggregation schools were fished on two further occasions by the Te Tautai. In both cases the school did not respond to the bait being used. The feeling amongst local tuna fishermen and fisheries scientists was that the aggregations in 1992 were not typical because of the absence of lanternfish (family Myctophidae) in the tuna's forage. As a result, the standard fishing methods, incorporating frozen rather than live bait, were not as productive as in previous years. Attempts to augment the *Te Tautai*'s bait supply with live bait were largely unsuccessful because of the full moon.

The *Te Tautai* departed Cairns on 18 December and steamed eastward to Chesterfield Reef, in the north-west part of New

Caledonia's EEZ. A number of schools were encountered near Lihou and Marion Reefs, in the easternmost part of Australian waters, and 542 skipjack subsequently tagged. After excellent baiting at the Chesterfields, the *Te Tautai* steamed toward Noumea, searching and fishing over seamounts and around reefs en route. A total of 781 tuna (26 yellowfin, 755 skipjack)

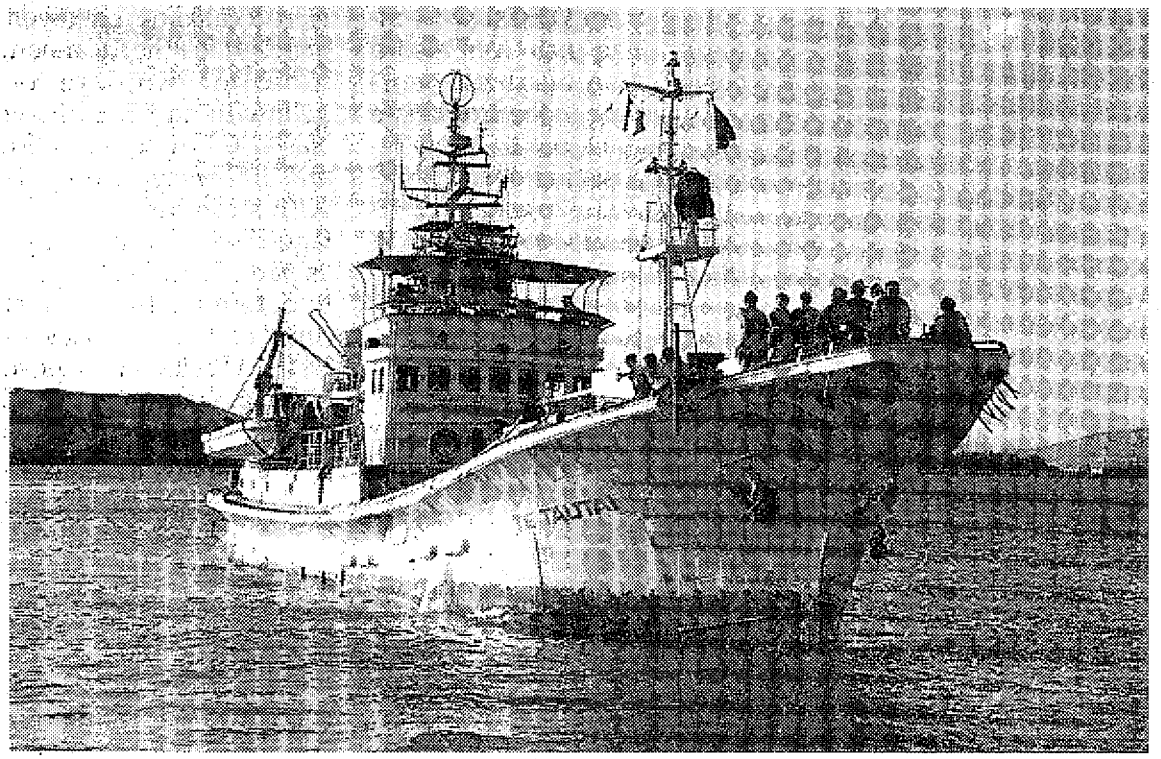


Photo: Kevin Bailey

The *Te Tautai* comes into Noumea for the last time.

Photo: Kevin Bailey

Jumbo skipjack from New Caledonia

was tagged during this transit. The vessel arrived in Noumea on 26 November.

The *Te Tautai* spent the next three weeks searching around the New Caledonian mainland and the Loyalty Islands, with excursions to Huon Atoll and the D'Entrecasteaux Reefs in the north and the Astrolabe Reefs in the east. Fishing was difficult during this period because the schools encountered were usually fast moving and unpredictable in behaviour.

The best catches were achieved to the south-west of the Isle of Pines, with three visits yielding 357 yellowfin and 801 skipjack, including a small number of yellowfin over 100 cm in length. Fishing was also productive between Ouvea Atoll and Beautemps-Beaupre Reef, with 235 yellowfin, 405 skipjack and one bigeye being tagged, and to the south of Huon Atoll, where 55 yellowfin and 178 skipjack were tagged. Releases around the mainland were limited to 22 yellowfin and 308 skipjack, with the majority (95 per cent) being made on the east coast.

During the New Caledonian cruise, a number of visitors were housed on the vessel for brief periods. These included SPC Director of Programmes, Hélène Courte, and a local television crew for one day of intense activity near the Isle of Pines, observers from territorial and provincial fisheries departments, and visiting Malaysian scientist Raja Bidin B. Raja Hassan.

RTTP stalwarts Filipe Viala (left) and Joel Opnai (right)

On the afternoon of 19 December the field work came to an end. The last, long farewells were made, gifts and addresses exchanged, and the ropes let go on a ship and crew that have become special to all involved in the RTTP. The moment was not without emotion. The *Te Tautai* reached her home port of Funafuti on Christmas Eve, amid, I imagine, much clamour and chaos at the main dock.

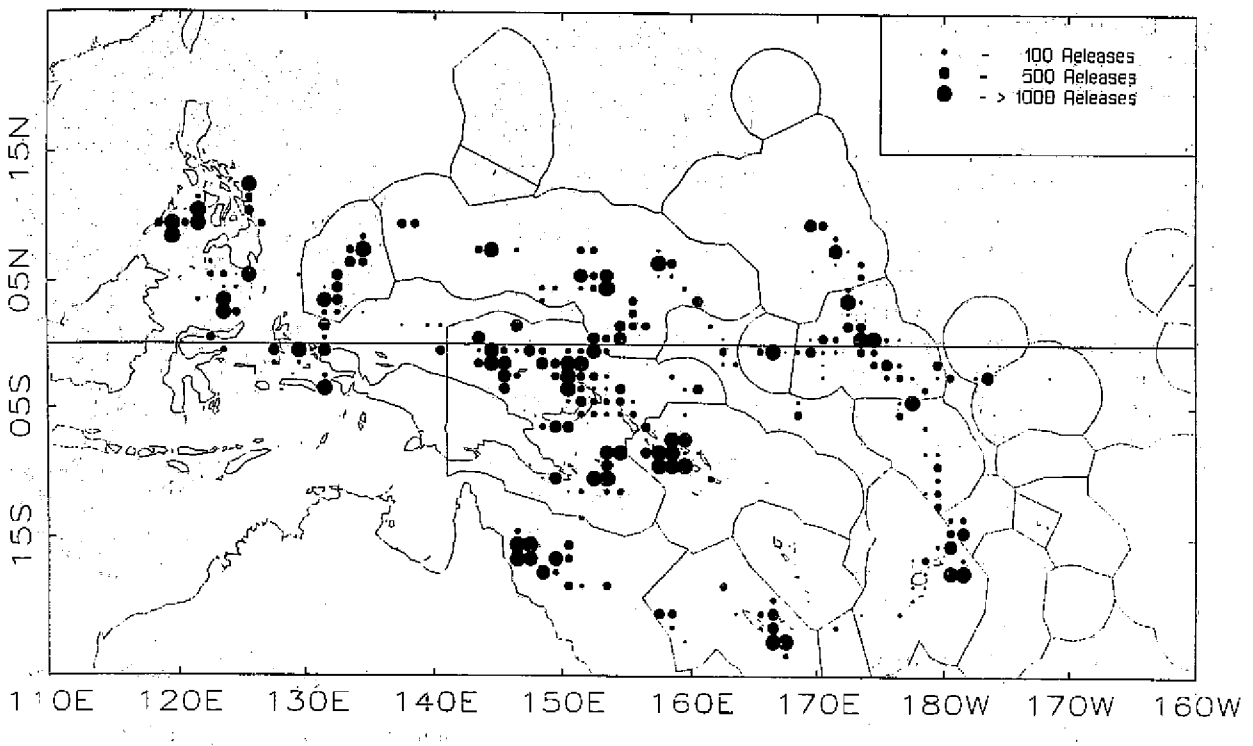
The total numbers of releases for the RTTP and associated in-country projects are detailed in the table below.

Releases of RTTP and in-country projects	Yellowfin	Skipjack	Bigeye	Others	Total
Soltai 6, 8, 12 (Solomon Islands)	574	7,729	1	0	8,304
Nei Kaneati (Kiribati)	1,058	3,165	43	0	4,266
Trapper & Sunbird (Fiji)	930	2,824	4	0	3,758
Inquirer (Australia)	21	0	23	0	44
Te Tautai (Western tropical Pacific)	30,799	78,541	6,693	82	116,115
Kotobuki 23 (Federated States of Micronesia)	144	118	30	0	292
Total	**33,526**	**92,377**	**6,794**	**82**	**132,779**

As the releases from the Philippines Tuna Research Project (see article this issue) will be combined with these figures in the analytical phase of the project, the grand total of releases is 146,635, consisting of 40,079 yellowfin, 98,402 skipjack, 8,072 bigeye and 82 longtail tuna. The geographical spread of all releases is shown in the map. Results of the analyses will be featured in future editions of this newsletter.

Earlier in the year, the Tuna Programme also farewelled two of the RTTP stalwarts, Joel Opnai and Filipe Viala, both of whom have seen the project through from its inception three years ago. Joel has returned to the Department of Fisheries and Marine Resources in Papua New Guinea as acting First Assistant Secretary (Research and Survey), and Filipe has rejoined the Fiji Fisheries Division to run the FAD project there.

(Contributor: Kevin Bailey)



Total number of releases for the Regional Tuna Tagging Project

Vale Kevin Bailey

Tuna and Billfish Assessment Programme Fisheries Scientist Kevin Bailey was tragically taken from us by a car accident in Noumea on Sunday 8 March. Kevin had worked with TBAP since February 1989, fulfilling many important roles, most notably as one of the two cruise leaders for the recently completed and very successful Regional Tuna Tagging Project, utilising the *Te Tautai*.

Born in Christchurch in 1959, Kevin obtained both his B. Sc. and M. Sc. from Victoria University, Wellington, in 1979 and 1983 respectively. All his working hours were dedicated to tuna fisheries and science – as a scientific observer on board vessels (1980–1982), tuna fisherman (1982–1984), and Technical Officer with NZ MAFFish (1985–1988) before joining SPC/TBAP. He thus had a rare combination of practical skills learnt at sea and the ability to write, analyse and organise his work with the clarity and excellence that are the hallmarks of a top-level scientist.

At the time of his death, he was completing a major review of by-catch and discard issues in western Pacific tuna fisheries, consistent with his concern for the environment balanced by a regard for objectivity and truth. He was also working with his colleagues towards the preparation of a scientific monograph summarising the results of the RTTP. This will now be dedicated by us to his memory.

Kevin was dear to us all – SPC staff, people in fisheries and industry throughout the Pacific, and his family and many others in New Zealand. He had already won our admiration and respect for his precision, dedication and attention to detail. He was poised to claim well-deserved stature as a scientist at international level when untimely taken from us. We shall miss his compassion, loyalty, grit and readiness to lend a hand.

Farewell, Kevin – no baiting this night. Rest in peace.

Antony D. Lewis

Philippine Tuna Research Project (PTRP)

The tropical waters from eastern Kiribati west to the Philippines are the scene of the most intense surface tuna fisheries in the western Pacific. Because of the importance of tuna recruitment and fisheries in Indonesia and the Philippines for neighbouring countries such as Papua New Guinea, Palau and the Federated States of Micronesia, the operational study area of the SPC Regional Tuna Tagging Project was expanded beyond the SPC region to include the Philippines.

Intensive handline, ring-net and purse seine fisheries exploit mostly skipjack and yellowfin in the Philippine domestic tuna fishery, which is based on thousands of anchored payaos strewn throughout the archipelago. These fisheries traditionally harvest large quantities of small tunas and the fishery has been perceived to be under stress due to over-exploitation. In order to assess the state of local yellowfin and skipjack stocks in the Philippines, the two-year Philippine Tuna Research Project (PTRP) was established. The PTRP was designed to use standard tagging techniques and catch and landing data to achieve programme goals. The project is being administered under the Philippine Government Department of Agriculture, Bureau of Fisheries and Aquatic Resources (DA-BFAR) and is being implemented by Pacific Rim Innovation and Management Exponents, Inc. (PRIMEX) and the South Pacific Commission Tuna and Billfish Assessment Programme (TBAP).

The SPC tagging vessel *Te Tautai* spent 56 days in Philippine waters during the Regional Tuna Tagging Project in 1990 and 1991, tagging 6,117 skipjack, yellowfin, bigeye and longtail tunas. In 1992, the *Te Tautai* was chartered for tagging and research work in support of the Philippine Tuna Research Project. The vessel worked in the southern Philippines, mostly in the southern Philippine Sea, Moro Gulf and Sulu Sea.

The tagging, baiting and data entry procedures used during PTRP cruises were identical to those developed for the RTTP. In this regard, the PTRP was very fortunate to charter the services of a fully functional tagging/research vessel complete with experienced Captain, crew and scientific staff. This allowed the project to make the most of the three-month charter period.

Tagging cruises were led by TBAP Fisheries Scientists Kevin Bailey or David Itano with a

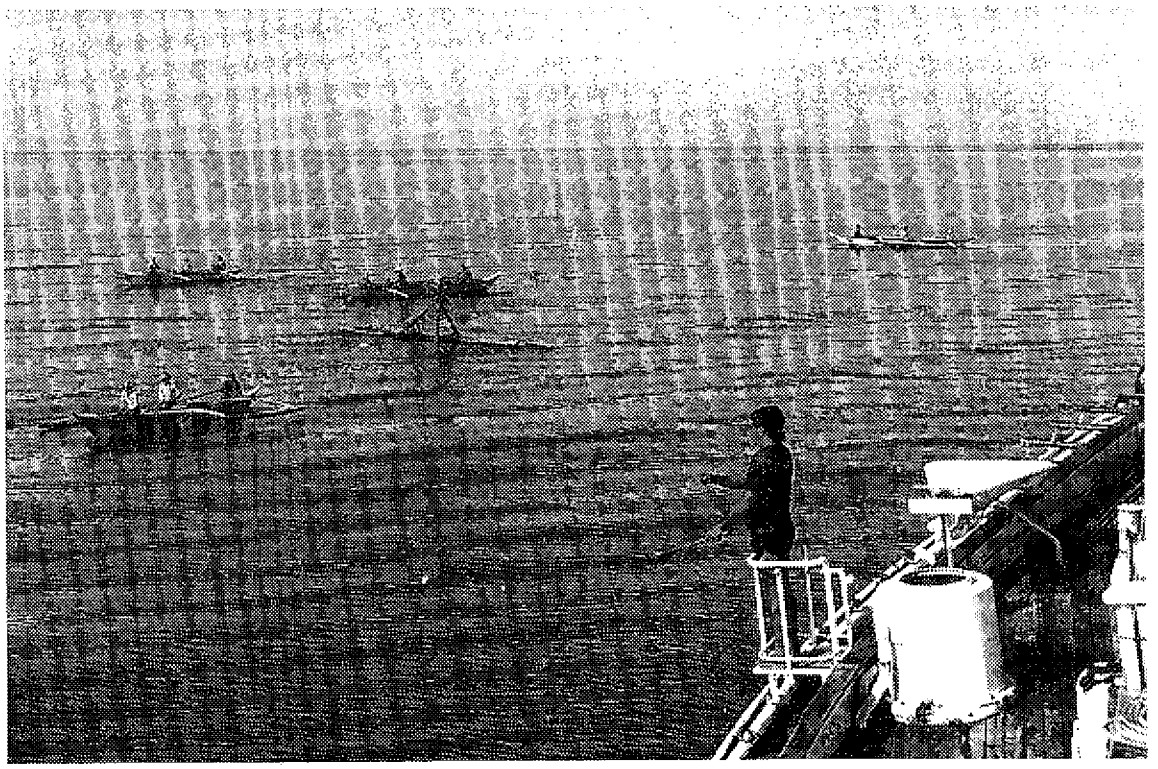


Photo: David Itano

The *Te Tautai* chumming a payao among Philippine handline boats

special appearance put in during one cruise by Chief Fisheries Scientist A.D. Lewis. The SPC tagging team was rounded out by Fisheries Experimental Officers, Filipe Viala and Etimoni Palu. Philippine counterpart assistance was provided by DA-BFAR staff Romero Alvarez, Noel Barut, Valeriano Borja and Homerto Riomales and PRIMEX staff Miguel Lopez and Ramon Miclat. Kevin Bailey had made an important visit to the Philippines prior to the arrival of the *Te Tautai* to assess baitfish availability and the feasibility of tagging ring-net, fish trap and handline caught tunas in the Philippines. Russell Price of TBAP also made a trip to Manila to set up the tagging database at PRIMEX necessary for keeping track of PTRP tag releases and recaptures.

The *Te Tautai* was engaged in PTRP work for three months from 25 July to 23 October 1992, basing operations on Zamboanga in south-west Mindanao. Every effort was made to distribute tagging effort evenly between the three principal study areas of the Philippine Sea, Moro Gulf and Sulu Sea. During the first month, a significant number of tag releases was made in the Philippine Sea between southeast Luzon and southeast Mindanao. The ship then moved into the Sulu Sea before returning to Zamboanga. During most of the second month of operations effort was concentrated within the Sulu Sea. Fishing and tagging operations were carried out around the Tubbataha Reefs and Cagayan Atoll in the centre of the Sulu Sea and along the east coast of Palawan. The central and southern Moro Gulf were surveyed during the second month, but tuna schools were scarce. In the third month effort was concentrated in the Moro Gulf and northern Celebes Sea.

Photo: David Itano

Malua Kilifi holding small handline caught yellowfin. Philippine tagger Noel Barut in the background.

A shortage of baitfish constrained project objectives throughout the period. This natural problem was made worse by the fact that many productive baitgrounds of southern Mindanao and the Sulu archipelago were off limits to the *Te Tatuai* because of potential problems from rebel forces or pirates. To compensate for these constraints, bait was purchased from Philippine lift-net boats and baiting trips were made to Helen Reef in southern Palau and to northern Indonesia. These long-range baiting trips allowed the *Te Tautai* to make a significant number of tag releases in the Moro Gulf and Celebes Sea.

Most of the schools fished during PTRP cruises were found in association with anchored payaos. On a number of occasions, handlines were fished on payaos to conserve the limited bait supplies or allow fishing to continue when live bait supplies for chum were completely gone. The three-

month period resulted in 13,695 tag releases from 6,505 yellowfin, 5,921 skipjack and 1,269 bigeye tuna. The tagged fish were small, with all three species ranging from about 20 to 55 cm in fork length. A large proportion of the yellowfin was very small, between 25 and 35 cm in length. The table below indicates the numbers of fish tagged, by species, during RTTP and PTRP cruises in Philippine waters.

Tag releases were lower than optimal for a tag-based assessment but should be adequate for the purposes of the project. This shortfall was due mostly a simple lack of tuna schools sighted in the study areas during the three-month period. After the tagging cruises had been completed, SPC Fisheries Research Officer Veronica Logez visited the PRIMEX office in Manila to train DA-BFAR and PRIMEX staff in database procedures for entering, verifying and safeguarding the all-important release and recapture data. Tag reward and reporting procedures were also established.

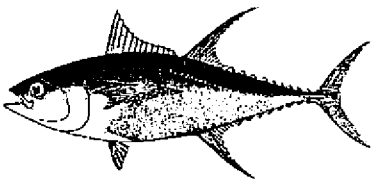
Recapture rates have been extremely high and tags are still being received in high numbers by PRIMEX. As of early February 1993, 3,160 tags had been returned to PRIMEX and entered in the tagging database. This already represents a 23 per cent return rate for the project, clearly indicating the intense nature of the Philippine domestic tuna fishery. Philippine government representatives and SPC staff hope that information generated by the PTRP will support meaningful and timely management of this important tuna fishery.

(Contributor: David Itano)

Project and cruise	Yellowfin	Skipjack	Bigeye	Longtail	Total
RTTP - Cruise 1	186	1,915	8	8	**2,117**
RTTP - Cruise 2	830	3,159	11	0	**4,000**
PTRP - Month 1	1,380	2,968	901	0	**5,249**
PTRP - Month 2	1,576	1,731	49	0	**3,356**
PTRP - Month 3	3,549	1,222	319	0	**5,090**
PTRP Total	**6,505**	**5,921**	**1,269**	**0**	**13,695**

International Conference on Economic and Legal Aspects of Tuna Fisheries Management

Under the auspices of the Western Pacific Fisheries Consultative Committee (WPFCC) and the Trans-Pacific Fisheries Consultative Committee (TPFCC), an International Conference on Economic and Legal Aspects of Tuna Fisheries Management was held in Manila from 12 to 13 October 1992. Participants attended from Chile, Colombia, Cook Islands, Costa Rica, Federated States of Micronesia, Fiji, Indonesia, Kiribati, Malaysia, Mexico, Palau, Papua New Guinea, Peru, Philippines, Solomon Islands and Tuvalu. The Food and Agriculture Organization of the United Nations (FAO), the Indo-Pacific Tuna Programme (IPTP), the Oceans Institute of Canada (OIC), the Permanent Commission of the South Pacific (CPPS), the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA), the South-east Asian Fisheries Development Centre (SEAFDEC) and the Latin American Fisheries Development Organisation (OLDEPESCA) were also represented.



The agenda included the following subject areas:

— A review and assessment of options for tropical tuna management: exchange of views and experiences between developing coastal states of the western and eastern Pacific;

— Needs and oportunities for collaboration in tuna management;

— Environmental impacts on tuna management;

— The straddling stocks issue; and

— Mechanisms for tri-regional co-operation in tuna management.

Areas of discussion included:

— The potential application of Minimum Terms and Conditions (MTCs) and a Regional Register of foreign fishing vessels which are currently utilised by Pacific Island Nations (PINs), and by Pacific Latin American Countries (PLACs);

— The status of the Pacific Tuna Commission (OAPO), which will be developed within the framework of OLDEPESCA and CCPS;

— Fisheries management policy among ASEAN member countries;

— High seas management of tuna and the forthcoming United Nations Intergovernmental Conference on Straddling Stocks and Highly Migratory Species; and

— Increased co-operation between the three regional groups of coastal states (PINs, PLACs and ASEAN) and a proposed study tour of ASEAN and PLAC fisheries officials to FFA.

(Contributor: TBAP staff)

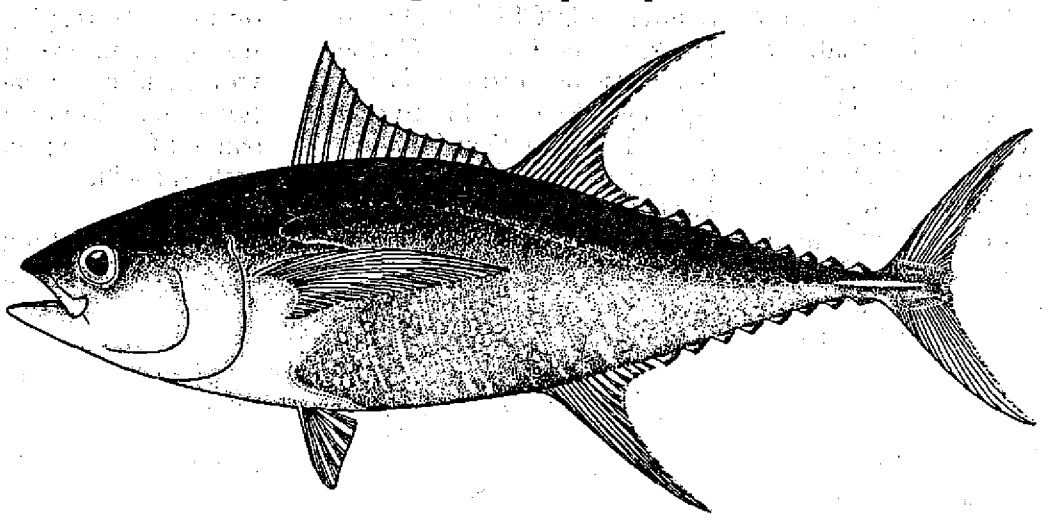
Western Pacific Fisheries Consultative Committee

The third plenary meeting of the WPFCC was held in Manila on 14 October 1992. The meeting was attended by participants from the PINs, ASEAN member countries and international organisations that attended the International Conference on Economic and Legal Aspects of Tuna Fisheries Management (see above).

A report was given on progress in co-operative tuna research over the past two years, notably the successful visits by the Regional Tuna Tagging Project to Indonesia and the Philippines. The major findings of the Fisheries Education and Training (FET) Workshop held in Noumea in March 1992 were outlined. Plans for the study tour of FET institutes in ASEAN countries were described; the three-week tour subsequently commenced on 16 October 1992 (see SPC *Fisheries Newsletter* #63). The WPFCC's regular activities were described, including publication of a quarterly newsletter, the organisation of workshops and conferences, and the provision of financial assistance to enable PIN/ASEAN participation in meetings and training courses. The assurance of continued funding of WPFCC activities until at least November 1996 by the Canadian International Development Agency (CIDA) was also reported.

Areas of future co-operation among WPFCC participants included the sharing of tuna research activities between SEAFDEC and SPC following the forthcoming termination of the Indo-Pacific Tuna Programme (IPTP) activities in eastern Indonesia and the Philippines; a proposed tuna industry workshop to be organised by FFA; a study tour of ASEAN officials to the South Pacific to discuss tuna management issues and approaches; several FET-related activities; a proposed workshop on the impact of fish aggregation devices (FADs) on tuna fisheries; and continuing discussion at WPFCC and TPFCC meetings on tuna management issues.

(Contributor: TBAP staff)



National fisheries assessments: a Papua New Guinea report in preparation

As a way of providing feedback from the logbook data which member countries of SPC provide to the Regional Tuna Fisheries Database, the Tuna and Billfish Assessment Programme (TBAP) has been developing national fisheries assessments which make use of the data in combination with all tuna resource information available from sources at its disposal. The first was prepared in 1988 for Papua New Guinea, and has since been followed by reports for Marshall Islands, Federated States of Micronesia, Kiribati and Solomon Islands. Albert Caton, a tuna biologist from the Bureau of Resource Sciences in Canberra, is currently working with the Tuna and Billfish Assessment Programme as a visiting scientist and preparing an updated and more comprehensive version of the Papua New Guinea assessment. He prepared the Kiribati report during a similar visit in 1991. Both of his visits have been funded by the Australian International Development Assistance Bureau.

The format of the first Papua New Guinea report was very different from that which has now been developed. The current assessments include summaries of the development of tuna fisheries and tuna research in the country concerned, a summary of the biology of each of the main species dealt with by the TBAP (skipjack, yellowfin, bigeye and albacore), a review of the oceanographic features of the country's fishing zone, a description of domestic and foreign fisheries in the zone and the time trends of their catches and catch rates, an examination of the trends relative to oceanographic trends, a review of the status of tuna stocks in the zone and the SPC region broadly, and from that a general assessment of the status of the tuna fisheries.

Results of the recently completed Regional Tuna Tagging Project, as well as in-country tagging projects in some cases, can now be added to make the assessments more specific and comprehensive. It is hoped ultimately to prepare such national fisheries assessments for all SPC member countries. This activity is in fact assuming high priority in TBAP work. Initially, precedence has been given to those countries with large proven tuna resources under significant exploitation.

(Contributor: Albert Caton)

Tag data show effect of FADs on tuna movement

Fishery Biologist Pierre Kleiber has returned to La Jolla from a one-year posting to the South Pacific Commission (SPC) in Noumea, New Caledonia. The posting was a collaborative arrangement between the National Marine Fisheries Service and the SPC's Tuna and Billfish Assessment Programme (TBAP), based on mutual interest in monitoring the status of tuna stocks in the central and western Pacific Ocean.

Kleiber's principal objective during his stay was to use a subset of the TBAP's tag return data to develop a skipjack population dynamics and movement model for Solomon Islands. The ultimate use for the model is to address concerns about fishery development and fishery interaction in the region. In particular, there are questions about the effectiveness of deploying more fish aggregation devices (FADs) in Solomon Islands to further develop a local purse-seine fleet. There are also concerns about the possible effects such development has had, and will have, on a previously established pole-and-line fleet.

Working in collaboration with SPC Fishery Scientist John Hampton, Pierre developed a model which incorporates natural mortality and fishing mortality by purse-seine and pole-and-line fleets. In addition, it deals with skipjack movement, which is affected by the presence of FADs and also by

the presence of islands. The effect of FADs on movement is implemented into the model by a two-parameter sub-model which is programmed to make the assumption that the existence of FADs in a half-degree (30-nautical-mile) square diminishes the tendency of skipjack to depart from that square. The effect increases with increasing numbers of FADs in a square but can approach a saturation level. The effect of islands also had to be considered: first, because the surface area of Solomon Islands is significant in the geographic scale of the model, and second, because the island archipelago appeared to have its own attractive effect on skipjack.

Fitting the model to the tag data allowed the two FAD parameters to be estimated along with five other model parameters. Disabling the FAD effect significantly diminished the fit of the model. It therefore appears that some signal from the FADs is inherent in the tag data and that the model is sensitive to it and captures at least some of that signal. Modification of individual tuna movement behaviour by FADs has been observed through sonic tracking (K. N. Holland, R.W. Brill, and R.K.C. Chang. 1990. Horizontal and vertical movements of yellowfin and bigeye tuna associated with fish aggregating devices. *Fish. Bull.* 88: 493-507). This is the first time it has been documented with ordinary tag release and recovery data.

During his stay at SPC, Pierre also established a computer connection between SPC and the La Jolla Laboratory through the Pacific-wide Peacesat system which makes use of the National Oceanic and Atmospheric Administration's GOES 3 satellite. This linkage should be helpful in further collaboration between the National Marine Fisheries Service and the TBAP, both for continued development of the above model and for other projects of mutual interest.

(Source: Southwest Fisheries Science Center)

SPC PUBLISHES TWO NEW SOUTH PACIFIC FOOD LEAFLETS

The South Pacific Commission's Community Health Services have just issued two new leaflets in the series on South Pacific foods: number 17 deals with fish and number 18 with seafood in the wider sense (excluding fish).

The fish leaflet shows how important many types of fish are for South Pacific communities. The nutritional value of fish flesh is stressed. Well-presented graphs compare the protein and fat contents of various species. Fish emerges as an excellent food because the protein in fish flesh is top-quality, easy for the body to absorb. The fat content is low compared to other foods and includes a type of fat that is beneficial to the blood vessels. Many fish dishes are described at the back of the leaflet. The editor of the *Fisheries Newsletter* valiantly tested all the recipes for you and highly recommends the Tahitian fish salad and the excellent fish curry with coconut cream.

Leaflet number 18 deals with other seafood, including crustaceans (crabs, lobsters) molluscs (shellfish, octopus, squid), sea cucumbers, marine mammals, turtles and seaweed. Here again, clear and precise graphs show the high protein value of these foods (particularly the sea cucumbers) and their high vitamin (vitamin B) and essential mineral (iron, iodine, fluoride) contents. The leaflet concludes with traditional recipes. Your humble servant was again equal to his duty and recommends the crab salad and the seafood kedgeree.

To obtain these two leaflets, write to the South Pacific Commission, Community Health Services, B.P. D5, Noumea Cedex, New Caledonia.

(Contributor: J.P. Gaudechoux)

PROCEEDINGS OF THE BOBP SEMINAR ON MUD CRAB PUBLISHED

In 1991 the Bay of Bengal Programme (BOBP), jointly with the Department of Fisheries of the Government of Thailand, organised a seminar to discuss the capture, culture and trading of mud crabs.

The proceedings of this seminar have now been published and are summarised below.

Biology and natural resources

The mud crab (*Scylla* sp.) is widely distributed throughout the BOBP region. The estimated total catch in the Bay of Bengal is between nine and ten thousand tons a year. Mud crab culture and fattening operations depend solely on seed collected from the wild. The lack of management controls on the indiscriminate collection of natural seed has led to a decline in mud crab landings in most of the countries in the region. There has also been a gradual reduction in the maximum landed size, another indicator of over-exploitation. These observations call for an immediate focus on the effective management of mud crab resources and their fisheries, as well as on speeding up efforts to improve the existing mud crab seed production techniques in order to support a continued and sustained mud crab resource in the region.

Wide differences observed in colour, maximum size and preferred habitat have led to the conclusion that more than one species of *Scylla* exists in the region.

Sexual maturity in females is reported to be attained at a carapace width of 9—11 cm. Females migrate offshore to spawn and the larval development occurs in the open sea, while juveniles, sub-adults and adults occupy mangrove biotopes, estuaries and channels.

Seed supply

Attempts to develop techniques for mud crab seed production in the Bay of Bengal region and elsewhere have been very limited. One of the principal reasons for this slow pace of progress has been a combination of fisheries management control on the collecting of female crabs (as in Australia) and the general lack of knowledge about certain aspects of larval and juvenile seed and water quality requirements.

Survival of up to 30 per cent from zoea to first crab stage has been obtained in the laboratory, but this has not been transferred to commercial practice. Continued applied research will be required if the technology is to become economically viable.

Culture

The culture of *Scylla* sp. is of two kinds: fattening and grow-out. In fattening, post-moult 'water' crabs of market size are held for short periods of time and fed until their meat content has increased. Grow-out operations stock small seed crabs, usually in ponds, and provide feed and water exchange until they reach market size.

Crab are held for fattening in a variety of floating cages and pens. Most operations are small-scale; crabs are sometimes kept in individual containers made of plastic or split bamboo and suspended from a raft. Pens can be erected in tidal areas and may even be found under the culturists' homes. Pens are usually quite small, measuring only a few square metres in area.

Trash fish is most commonly used as feed, but fish offal and slaughterhouse waste are also given when available. Feeding rates are around 10 per cent of estimated body weight, although schedules are not rigorously adhered to. Experiments with artificial feeds show promise for future development.

Seed stock for crab fattening is usually obtained from local markets and dealers where 'water' crabs have a relatively low value. Female crabs are particularly sought after. Most of these will become gravid during the fattening period and command a significantly higher price when bearing the bright red roe in their ovaries. In Malaysia, stocking material for fattening operations is imported from Thailand, Sri Lanka and Indonesia. The fattening period may vary from a few days to a month, depending on the condition of the seed stock.

Ponds may also be used for fattening. Such ponds are usually quite small, and are dug by 'trenching', leaving a mound of earth in the centre of the pond which can be used by the crab for burrowing and shelter. In Thailand, fattening ponds range from 500 to 800 m^2. Most fattening ponds in Malaysia are of a similar size, although a few may reach 1 ha in area. Indone-

sian crab-fattening ponds are around 1000 m². The bunds have to be protected with some kind of facing material to prevent burrowing by the captive crabs. Water exchange in this type of ponds is by tides and through simple concrete sluice gates.

Crab fattening is profitable because of the fast turnover and good survival rates. It is also very suitable for small-scale operations as an extra income source for fisherfolk. Its expansion will be constrained by shortages of seed as well as feed, principally trash fish.

Crab culture is much less widely practised than fattening. Where it is widespread, in central Java, it is along extensive lines. High mortality (over 50 per cent) often plagues crab culturists, but it can be alleviated by the provision of shelters placed on the bottom of the pond.

Trade

Mud crab trade in the region has increased consistently in the past few years. Malaysia and Singapore are the main markets in the region. Apart from local production, these two countries absorb about 10 t of live mud crabs a day, imported from Indonesia, India, Sri Lanka, Bangladesh and the Philippines.

The export of live crabs from India and Sri Lanka started in the early and mid-80s, respectively, but has been a recent development in Bangladesh.

The fact that mud crabs survive in air for about 4—5 days (under optimum conditions) has enabled their shipment to distant markets. Improved packaging and handling techniques have also contributed significantly to the increase in regional trade.

The preference for ovigerous female crabs and the high price they command (compared with immature females and males) in countries like Malaysia, Singapore, Thailand and Indonesia, are of serious concern because of their implications for recruitment to natural populations.

There seem to be significant fluctuations in the market price of mud crabs because of the wide seasonal variations in landings. Increasing production through culture and fattening could contribute to a more stable situation.

Extension credit and economics

Studies undertaken in the Philippines on the economic viability of mud crabs in ponds indicate that the operation is economically viable at a stocking rate of 5,000 crabs/ha, but not at higher stocking densities of 15,000 and 20,000/ha.

Reduction in investment costs and development of indigenous methods to suit local conditions, coupled with appropriate financing through institutions, would render crab culture and fattening operations a viable proposition and provide a reliable source of income to low-income groups.

Extension and training programmes aimed at popularising mud crab culture and fattening have been very limited in the region. The BOBP, in collaboration with the Department of Fisheries, Thailand, initiated trials in 1987 to transfer the technology of mud crab fattening and culture to small-scale fisherfolk in Ranong Province in southern Thailand. The project was beset with high investment costs, low availability of seed and the reluctance of financial institutions to provide funds. Most operations failed because of heavy mortalities resulting from cannibalism and wide salinity fluctuations.

(Source: Bay of Bengal Programme)

DROPPER LOOP MADE EASY

Tying a dropper loop with consistency requires exceptional dexterity, especially with a multi-hook bottom rig where it is important that the loops be of equal size and evenly spaced.

Mr J.T. Brown of Florida came up with a tool that helps him to make dependable dropper loops faster.

The key to the tool is the three pegs. They are positioned in an isosceles triangle (two equal sides).

The base of the triangle is about six inches (≈ 15 cm), and the height about four inches (≈ 10 cm). The way to tie the dropper is shown below:

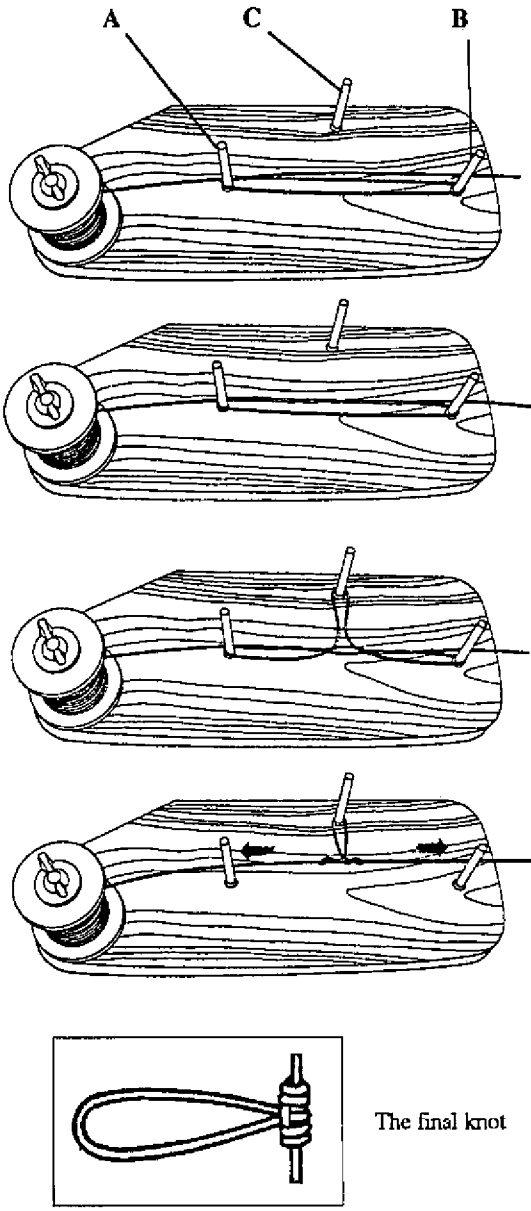
1. Thread the line inside (over) peg **A**, over and around **B**, back around **A** again, and finally past **B**. This will result in two lines inside the base pegs and one line outside them.

2. Wrap the two lines inside the peg around each other four or five times.

3. Pull the single line outside the pegs through a space in the two wrapped lines and loop it over peg **C**.

4. Now slip the line over pegs **A** and **B**. Pull the two ends to form the dropper loop.

Dropper loop system



(Source: *Saltwater Sportsman*)

SEVENTH PACIFIC SCIENCE INTER-CONGRESS

The Pacific Science Association, a regional, non-governmental scientific organisation, was founded in Hawaii in 1920.

The objectives of the Association are:

— To promote co-operation and communication in science and technology in the Pacific region;

— To review common scientific concerns and priorities in the Pacific Basin and provide a multi-disciplinary forum for discussion through Congresses and Inter-Congresses and other scientific meetings;

— To stimulate study of scientific issues of the Pacific region directly affecting the prosperity and welfare of its people; and

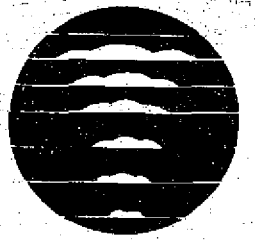
— To strengthen the bonds among Pacific peoples by promoting co-operation among the scientists of all the Pacific countries and areas.

The VII Pacific Science Inter-Congress will take place in Okinawa, Japan from 27 June to 3 July 1993. The theme of the 1993 Inter-Congress is 'The Pacific: crossroads for culture and nature' and the three sub-themes are:

— Cultural interchange among Pacific people;

— Speciation, dispersal and conservation of species in the Pacific;

— Towards appropriate technologies and policies for development and for the conservation of natural environments in the Pacific.



For more details, contact:

VII Pacific Science Inter-Congress Secretariat
c/o Section of International Affairs
University of the Ryukyus
1-Senbaru, Nishihara
Okinawa 903-01, Japan
Tel: 098-895-2221 Ext: 2126
Fax: 098-895-4586

(Source: Pacific Science Association)

THE JAPAN FISHERIES ASSOCIATION PUBLISHES A QUARTERLY FISHERIES NEWSLETTER

The Japan Fisheries Association (JFA) has released recently the first issue of a new quarterly English newsletter (first issue, October 1992, 7 pages) entitled *ISARIBI* (*fishing fire* in Japanese).

JFA was established in 1882 as a non-profit Japanese corporation and is the umbrella organisation for the entire Japanese fishing industry, with 322 general members and 47 patron members. JFA is engaged in a wide range of activities to promote the socio-economic development of Japanese domestic and international fisheries. The head office is located in Tokyo, with overseas branch offices in Canada, New Zealand, Papua New Guinea and the United States.

The newsletter provides information on Japanese fisheries. If you are interested in subscribing to this newsletter, please contact:

ISARIBI
Japan Fisheries Association
Sankaido Building
1-9-13 Akasaka
Minato-ku
Tokyo 107
Japan
Tel: (81)-3-3585-6683
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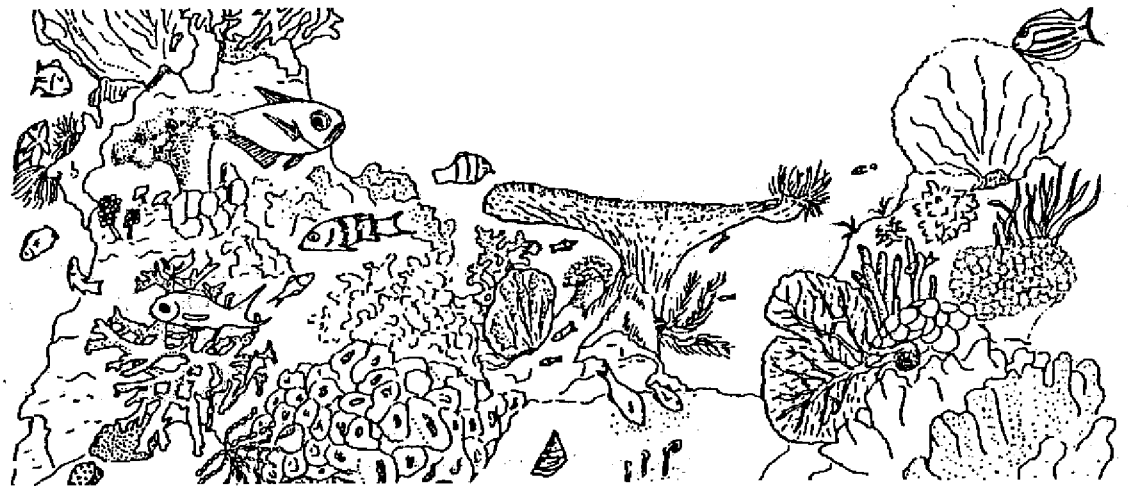
(Source: Masanami Izumi)



NUTRIENT CONTENT OF SELECTED MARINE PRODUCTS

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This paper provides information on the main nutrients (protein, lipids, minerals and vitamins) found in selected common species of marine products in the South Pacific. The information has mainly been sourced from reference material published in Japan.

Firstly, the composition of the main nutrients of fish in general is covered. Secondly, the effect of these nutrients on health is described. Thirdly, the nutrient composition of selected marine products is described. Tables are provided for easy reference. It should be noted that the species selected from Japanese publications are not exactly the same as those harvested in the South Pacific region. For reference purposes, scientific names are also given.

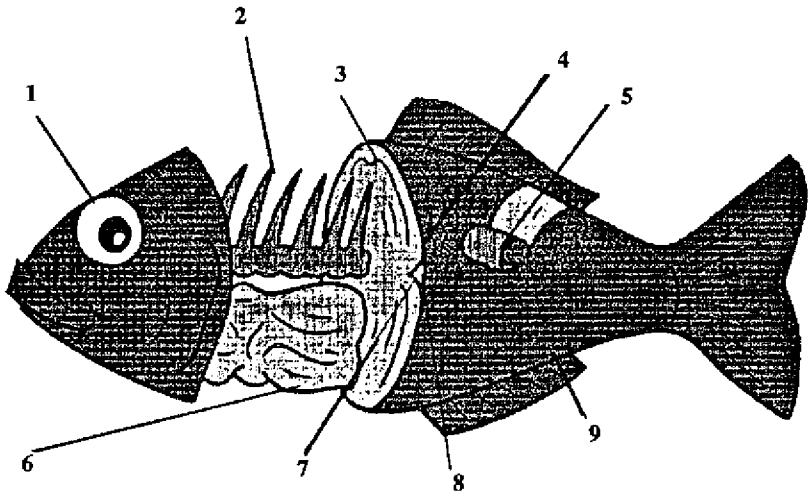
It is hoped that the information provided in this paper will be useful in the region. However, it should only be used as a general guideline. Further details about the role of particular nutrients in maintaining good health should be obtained from local doctors, nutritionists or dietitians.

Composition of fish nutrients

Generally, the composition of the nutrients found in 100 grams of fish is as follows:

Protein: 17–22 g; lipids: 1–6 g; available carbohydrates: 0.8–1 g; water: approx. 80 g.

The figure below shows the various parts of fish, and the table provides a breakdown of the nutrients present in each of these parts.



Nutrients in fish

	Part of fish	Nutrients present
1	Eyes and surrounding area	Rich in retinol (vitamin A), thiamin (vitamin B1), riboflavin (vitamin B2) and available carbohydrates. A semi-transparent (jellied) substance on the back of the eyes contains cyanocobalamin (vitamin B12), thiamin and docosahexaenoic acid (DHA).
2	Bones	Rich in minerals and connective tissues (collagen)
3	Sub-cutaneous fat	Rich in unsaturated fatty acids (DHA and eicosapentaenoic acid, EPA)
4	Fascia (tissue surrounding muscles)	Rich in calcium
5	Skin	More retinol, thiamin and riboflavin are found in the skin than in the flesh. Black skin is particularly rich in riboflavin.
6	Guts	Rich in cholecalciferol (vitamin D3), retinol, niacin and calcium
7	White meat	Protein, which contains all the essential amino acids, is of a high quality, and is particularly rich in the amino acid, lysine. The lipids EPA and DHA are also found in the flesh.
8	Red meat	Rich in vitamins (retinol, thiamin, riboflavin, cholecalciferol and cyanocobalamin). Taurine, calcium, zinc and iron are also found.
9	Cartilage and sinews	Chondroitin
10	Fish oil	Rich in DHA and cholecalciferol (vitamin D3)
11	Fish eggs	Rich in proteins, vitamins, minerals and DHA

Effects of nutrients

The effects of the main nutrients on the human body are outlined below.

Protein

Protein is essential for the building and repair of muscles, internal organs, skin and hair. In conditions of poor nutrition, protein becomes an energy source in the body (4 kcal per gram). Lack of protein in the diet lowers the body's resistance to illness and hinders growth, which is particularly detrimental to children.

Lipids

Lipids include saturated and unsaturated fatty acids, neutral fats, waxes and steroids. Fish meat is rich in high-grade unsaturated fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which can assist in the prevention of heart diseases and certain other diseases. Some years ago medical researchers noted that Greenland Eskimos ate a fairly high-fat diet but had arteries that were surprisingly free of the fatty deposits which afflicted much of the Western world. This is because the fish eaten by Eskimos has higher levels of EPA and DHA. The value of these fatty acids is in the effects they have on blood fats and the formation of blood clots.

EPA (eicosapentaenoic acid): EPA lowers the bad LDL (low-density lipoprotein) cholesterol value ('bad' because it deposits cholesterol in cells) of the blood while maintaining the good HDL (high-density lipoprotein) cholesterol value ('good' because it removes cholesterol from the artery walls, returning it to the liver). EPA is effective in preventing arteriosclerosis by its coagulatory and inhibitory actions. It is also thought to be effective in the prevention of rheumatism.

DHA (docosahexaenoic acid): DHA, which is absorbed directly into the system, helps prevent thrombosis by checking the cohesion of thrombocytes, and has an inhibitory action on serum cholesterol. Recently, it has been reported that DHA is related to the growth and development of the brain. Worthy of note is the fact that DHA is an effective component in the prevention and treatment of senile dementia, and is also effective in the prevention of asthma.

Lecithin: Lecithin is a main component in the formation of body cell walls.

Taurine

The human body has no specific requirement for taurine because it produces its own. Taurine decreases the total cholesterol value in the blood, and has an inhibitive action on the sympathetic nerves in the brain. Taurine is effective in lowering blood pressure and as an anti-depressant, and prevents cerebral apoplexy. Cephalopoda, Crustacea and Mollusca are rich in taurine, as is the red meat of fish.

Minerals

Calcium (Ca): Calcium forms teeth and bones and improves bone strength. The body also maintains some calcium in the blood so that the nervous system and muscles are able to function properly.

Phosphorus (P): Phosphorus is important for bone structure and is abundant in all tissues involved in the production of energy from fats, carbohydrates and proteins.

Iron (Fe): Iron is a very important component of the blood and its intake is therefore especially important for women and young children. Iron deficiency leads to anaemia.

Zinc (Zn): Zinc is an essential mineral for humans. Like many other minerals, zinc is part of many enzymes which catalyse various reactions in the body. Lack of zinc results in white spots appearing on the nails.

Sodium (Na): The consumption of sodium regulates water balance and helps maintain sufficient fluid volume in body cells. Too much sodium in the diet is strongly linked to high blood pressure, or hypertension.

Iodine (I): Iodine is necessary for the synthesis of thyroid hormones which regulate the metabolic rate in all cells. Iodine-deficiency goitre is treated with iodine.

Potassium (K): Potassium works with sodium to regulate the balance of water and acidity in the blood. A deficiency of potassium can alter the rhythm of the heart.

Vitamins

Vitamins are essential in the diet as they help maintain good health and produce energy.

Retinol (vitamin A): Vitamin A deficiency results in night blindness. A lack of vitamin A also leads to stunted growth, increased susceptibility to infections, and dry skin and hair.

Thiamin (vitamin B1): Vitamin B1 is important in the enzyme systems which work to release

energy from carbohydrates. It is also important for growth and in the digestive and nervous systems and the heart.

Riboflavin (vitamin B2): Vitamin B2 is important for the way the body uses proteins, and is required for the growth and repair of tissues, including skin and eyes. A lack of vitamin B2 results in cracks at the corners of the mouth and on the lips.

Niacin (nicotinic acid: vitamin B3): Vitamin B3 is needed by body cells as it plays a vital role in the release of energy from foods. Without vitamin B3, tissues begin to degenerate.

Pyridoxine (vitamin B6): Vitamin B6 takes part in the reactions in which amino acids are incorporated into body tissues. A lack of vitamin B6 leads to mental depression, convulsions, skin rashes, irritability, weakness, anaemia, a smooth sore tongue and weight loss.

Cyanocobalamin (vitamin B12): Vitamin B12 deficiency leads to megaloblastic anaemia and nerve damage, affecting the spinal cord and sometimes causing paralysis.

Cholecalciferol (vitamin D3): Vitamin D3, a vitamin peculiar to fish, assists in the metabolism of calcium.

Tocopherol (vitamin E): Vitamin E is an important antioxidant: this means that it prevents damage to cells from oxygen. Deficiency is rare as there are considerable stores in the body.

Nutrient composition of selected marine products

The nutrient composition of selected common marine products (fresh and processed) per 100 gram edible portion compared to other common meat products is shown in the table on pages 28—29 (data sourced from References 2 and 3 below)

References

(1) Japan Fisheries Association (Undated). *Healthy guide to fish* (in Japanese). 21 pp.

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Food	Energy	Protein	Lipids	Carbohydrates		Minerals					Vitamins						Taurine	Cholesterol	Fatty acids	
				Available	Fibre	Ca	P	Fe	Na	K	A	B1	B2	B3	D	E			EPA	DHA
	(kcal)	(g)	(g)	(g)	(g)	(mg)	(mg)	(mg)	(mg)	(mg)	(IU)	(mg)	(mg)	(mg)	(IU)	(mg)	(mg)	(mg)	(mg)	(mg)
Yellowfin tuna																				
Thunnus albacares	108	24.3	0.5	0.1	0	2	250	1.0	50	480	20	0.10	0.15	14.5	20	0.4		36	4	48
canned, oil	287	24.0	19.7	0.1	0	3	270	1.8	500	300	*	0.05	0.13	12.0	10	8.7		38	69	312
Bluefin tuna																				
Thunnus thynnus																				
lean meat	133	28.3	1.4	0.1	0	5	280	2.0	50	420	20	0.10	0.09	10.0	20	0.8		50	27	115
fatty meat	322	21.4	24.6	0.1	0	11	220	1.0	43	440	100	0.10	0.08	5.0	(1,300)	1.5		55	1,288	2,877
Striped marlin																				
Tetrapturus audax	127	23.4	3.0	0.1	0	7	200	0.4	70	490	10	0.01	0.08	8.0	250	1.0		55	44	413
Dolphinfish																				
Coryphaena hippurus	115	21.3	2.7	*	0	13	250	0.7	50	480	27	0.20	0.15	9.0						
Skipjack																				
Katsuwonus pelamis	129	25.8	2.0	0.4	0	10	270	1.9	44	410	17	0.23	0.16	19.0	420	1.2	164	65	78	310
canned, oil	283	28.0	17.5	0.1	0	24	250	2.5	800	330	*	0.12	0.11	15.0	600	3.4		41	48	210
katsuo-bushi (dried strip)	356	77.1	2.9	0.8	0	28	790	5.5	130	940	*	0.55	0.35	45.0	430	1.3		180	97	558
Frigate mackerel																				
Auxis thazard	121	21.5	3.1	0.3	0	35	210	5.0	65	400	17	0.10	0.25	18.0	330	1.2		75	203	520
Japanese Spanish mackerel																				
Scomberomorus niphonius	177	20.1	9.7	0.1	0	13	220	0.8	65	490	40	0.09	0.35	9.5	100	1.3		70	480	1,189
Mackerel																				
Scomber japonicus	239	19.8	16.5	0.1	0	22	160	1.5	80	300	100	0.16	0.54	9.7	330	1.8	168	55	1,214	1,781
canned, brine	264	18.7	19.6	0.1	0	25	190	1.6	500	290	*	0.15	0.40	8.0	190	3.2		85	1,717	2,371
canned, tomato puree	188	14.8	12.9	1.0	0.1	160	230	1.5	570	330	380	0.04	0.32	6.5						
canned, oil	323	17.6	26.4	0.1	0	25	170	1.2	450	270	140	0.03	0.28	7.1						
Mackerel scad																				
Decapterus muroadsi	144	18.7	6.9	0.1	0	65	190	0.7	150	270	20	0.12	0.16	4.4	0	0.9	229	70	408	748
Sardine																				
Sardinops melanostictus	213	19.2	13.8	0.5	0	70	200	1.7	360	340	60	0.03	0.36	7.7	530	2.0	176	75	1,381	1,136
canned, brine	188	25.6	8.3	0.4	0	270	360	2.0	600	290	30	0.03	0.30	8.5	400	2.6		80	905	950
canned, tomato puree	185	24.8	8.0	1.2	*	280	290	3.3	500	290	40	0.01	0.25	6.3	160					
canned, oil	342	20.1	27.2	0.2	0	400	410	2.1	400	300	85	0.08	0.32	7.8	50					
Pacific saury																				
Cololabis saira	240	20.6	16.2	0.1	0	75	160	1.3	60	140	120	*	0.33	5.2	340	1.9	187	60	844	1,398
Flying fish																				
Prognichthys agoo	96	21.0	0.7	0.1	0	43	200	1.4	65	320	10	0.01	0.10	4.0	20	2.3		60	25	153
Amberjack																				
Seriola dumerili	165	21.0	8.1	0.1	0	15	270	0.6	65	490	30	0.15	0.16	8.0						
Yellow sea bream																				
Dentex tumifrins	116	20.4	3.2	*	0	35	140	0.5	90	420	90	0.18	0.21	3.2	0		339			
Mullet																				
Mugil cephalus	137	22.0	4.7	0.1	0	42	220	4.0	70	420	150	0.23	0.06	3.7	100	1.6		65	348	553
Sea bass																				
Leteolabrax japonicus	105	19.3	2.5	0.1	0	30	290	3.0	90	390	180	0.13	0.11	2.4	290	1.3		75	202	275
Barracuda																				
Thyrsites atun	126	18.9	4.9	0.1	0	55	190	0.4	160	420	40	0.03	0.14	4.5	90	1.3		60	183	622
Bluefish																				
Scombrops boops	158	18.2	8.6	*	0	25	180	0.5	85	390	27	0.03	0.16	2.4	140	1.0		65	260	793
Alfonsin																				
Beryx splendens	118	18.0	4.4	0.1	0	15	220	1.0	110	360	50	0.15	0.20	3.0	30	1.7		60	133	424

Great blue shark																				
Prionace glauca	102	18.9	2.3	0.1	0	5	150	0.4	210	290	30	0.11	0.11	0.9	0	0.9		55	31	196
shark fin product	352	83.4	*	*		65	36	1.2	180	3	0	*	*	0.5	0					
Spiny dogfish																				
Squalus acanthias	165	16.8	10.0	0.1	0	6	200	1.0	100	450	700	0.04	0.08	1.0	0					
Spiny lobster																				
Panulirus ornatus	104	21.2	1.5	*	0	70	250	1.0	130	380	*	0.01	0.10	1.9	0	3.8		95	102	64
Great tiger prawn																				
Penaeus monodon	93	20.5	0.7	*	0	50	260	0.8	140	450	*	0.07	0.04	3.3	0	1.3	199	190	38	51
Mangrove crab																				
Scylla serrata	89	18.9	0.9	0.1	0	60	170	2.0	320	380	*	0.05	0.03	2.7	0	1.8		80	54	42
Octopus																				
Octopus vulgaris	76	16.4	0.7	0.1	0	16	160	0.6	280	290	*	0.03	0.09	2.2	0	0.7	1,670	90	42	71
Flying squid																				
Ommastrephes bartrami	76	15.6	1.0	0.1	0	18	170	0.2	200	290	10	0.03	0.05	2.9	0	2.1	526 (a)	300	56	152
Sea urchin																				
Hemicentrotus pulcherrimus	148	15.8	8.5	2.0	0	20	300	2.0	190	490	1,200	0.30	0.40	2.5	0	3.6		290	712	47
Sea cucumber																				
Stichopus japonicus	17	3.4	0.1	0.5	0	34	11	0.3	1,300	70	*	0.01	0.02	0.9	0					
salted viscera preserves	51	9.3	1.3	0.5	0	85	170	4.0	4,100	360	240	0.20	0.50	4.6	0					
Ark shell																				
Scapharca subcrenata	85	15.7	0.5	3.5	0	40	140	5.0	300	290	130	0.20	0.20	2.5	0					
Short-necked clam																				
Ruditapes philippinarum	49	8.3	1.0	1.2	0	80	180	7.0	400	230	60	0.01	0.15	1.5	0	0.9		55	21	34
Scallop																				
Patinopecten yessoensis	77	13.8	1.2	1.8	0	49	170	1.0	250	310	*	0.02	0.29	2.1	0	0.8		40	69	56
Abalone																				
Nordotis discus	61	13.0	0.4	0.6	0	30	85	1.3	480	250	*	0.12	0.09	0.9	0	1.1		140	8	
Mussel																				
Mytilus coruscus	70	10.3	1.4	3.2	0	43	160	3.5	540	230	110	0.01	0.37	1.4						
Oyster																				
Crassostrea gigas	78	9.7	1.8	5.0	0	55	130	3.6	280	230	55	0.16	0.32	2.0	0	1.2		50	160	92
Spiny top shell																				
Batillus cornutus	91	19.9	0.4	0.9	0	50	130	3.0	400	300	80	0.02	0.22	1.6	0	3.3	945	170	7	1
Wakame (seaweed)																				
Undaria pinnatifida		1.9	0.2	3.8	0.4	100	36	0.7	610	730	780	0.07	0.18	0.9						
Ceylon moss																				
Gelidium spp.		5.4	0.2	19.1	3.2	170	50	3.2	160	980	1,700	0.05	0.52	0.7						
Fish ham	164	13.4	6.7	11.1	0	45	50	2.0	900	110	*	0.20	0.60	5.0	0					
Fish sausage	167	11.5	7.2	12.6	0	100	200	2.0	810	70	*	0.20	0.60	5.0	0	0.2		30	19	50
Beef: sirloin, total edible	262	18.6	19.4	0.3	0	4	140	2.3	46	300	43	0.06	0.17	5.1		0.2	49 (b)	65		
fillet	155	20.7	7.0	0.4	0	3	160	2.3	45	390	17	0.12	0.32	5.1		0.2		55		
canned, corned beef	271	20.3	18.9	1.7	0	15	120	3.5	800	110	*	0.02	0.14	7.6	(0)					
Pork: loin, total edible	258	17.8	19.3	0.3	0	5	120	0.8	55	310	27	0.69	0.19	5.0		0.2	51 (c)	55		
fillet	121	20.9	3.4	0.3	0	6	140	1.6	55	410	*	0.84	0.31	4.9		0.2		60		
Goat	180	19.5	10.3	0.2	0	7	170	3.8	45	310	10	0.07	0.28	6.7						
Mutton: rib and loin	236	17.9	17.0	0.1	0	5	120	2.3	55	220	40	0.06	0.22	3.8		0.6		75		
Chicken: broiler, thigh	211	17.3	14.6	0.1	0	6	140	1.2	45	210	130	0.11	0.22	3.8		0.3	14 (d)	95	38	76
liver	111	18.9	3.1	0.6	0	5	300	9.0	85	330	47,000	0.38	1.80	4.5		0.4	129	370	37	178
egg	162	12.3	11.2	0.9	0	55	200	1.8	130	120	640	0.08	0.48	0.1	10	1.1		470		164

* small quantity; (a) Japanese common squid; (b) beef, chuck loin, total edible; (c) pork, Boston butt, total edible; (d) chicken, breast, flesh only.

Note: the scientific names refer to species found in Japanese waters, not necessarily in the South Pacific region.

POTENTIAL BROADBILL FISHERY FOR PACIFIC ISLAND COUNTRIES

by P. Watt
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A number of Pacific Island countries have recently shown interest in exploring the potential of developing a broadbill *(Xiphias gladius)* fishery. Experimental longline trials to assess whether there is a commercially exploitable resource are presently being conducted in American Samoa and New Caledonia. Catches to date are very promising.

Historically, broadbill were mostly commercially exploited in the Atlantic Ocean and Mediterranean Sea. Since at least the 1870s broadbill have been commercially fished off the coasts of the United States and Canada.

Until the mid-1970s the most common commercial fishing techniques used for catching broadbill were longlining, and harpooning fish while they were basking on the surface.

In 1977, shortly after swordfish were discovered off the southeast coast of Florida, a new sport fishing technique was developed. This consisted of drift fishing at night using large squids for bait, with a chemical light-stick attached to the leader, fished at varying depths below the surface.

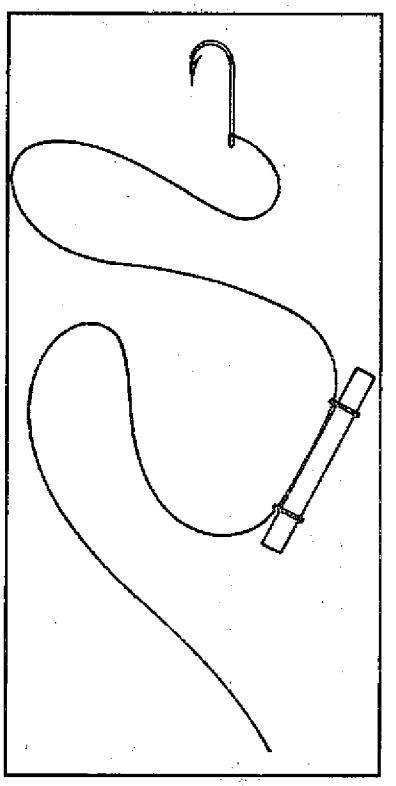
This new technique proved to be highly effective and was quickly adopted by the commercial longline fishing vessels. The success of the longline fishery attracted boats from the mid-Atlantic and New England. The harvest of broadbill soon grew to be one of the major fisheries of Florida State.

The longline gear and techniques for catching broadbill went through a number modifications until a standard method evolved.

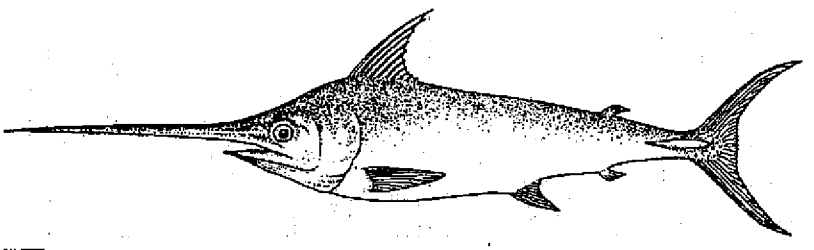
The introduction of the chemical light-stick was the major innovation. The lights are attached to 12 m snoods approximately 2 m above the hook and glow for up to 12 hours. The light-sticks attract the swordfish to the bait. Refinement of the gear led to the use of smaller hooks and a long, single-strand monofilament snood clipped to a monofilament mainline (see drawing).

A longline set is made at sunset perpendicular to the axis of the current. The mainline is usually from 28 to 75 km long; 500 to 1,000 hooks are set per night. The monofilament mainline is led off a hydraulically powered spool, over the stern, and the first high flyer (or marker buoy) is attached. Floats with 10 to 20 m lines are snapped to the mainline approximately every 500 m. Usually 6 to 7 snoods are clipped to the mainline between the floats at 75 m intervals. The hooks are baited and the chemical light-sticks are attached to the snood with rubber bands.

When the set has been completed the boat either drifts nearby or tends the line throughout the night, observing the buoys. If a float is pulled under the water, the nearest float is picked up and its line is pulled until the mainline is reached. The boat then moves along the mainline to the snood with the fish. The fish is gaffed on board, the hook is rebaited, and the boat releases the mainline. This procedure reduces shark damage and increases catch rates and quality of the fish. At first light the



Longline gear (note the use of a chemical light stick)



mainline is hauled back. The high flyers, floats and snoods are unclipped from the mainline and stored. After the mainline has been hauled aboard, the fish are dressed and packed in ice. Then the boat heads back to port.

Word of the success of the Florida broadbill fishery caught the interest of the tuna longline fishermen in Hawaii. Indications of a resource came from incidental catches of broadbill by tuna longline and **ika shibi** fishermen. In 1988 experimental trials were conducted by a Hawaiian fishing vessel, *Magic Dragon*. The catches were so productive that by the end of 1989 the number of vessels targeting broadbill had increased to 10, about 10 per cent of Hawaii's longline fleet.

Swordfish landings in 1989 totalled an estimated 320,000 kg, compared with landings of 22,000 kg in 1988. By 1991 the longline fleet had expanded to over 200 vessels and broadbill landings increased to an estimated 4,700,000 kg, valued at approximately US$ 22,000,000. The broadbill fishery is now the biggest contributor to Hawaii fishery landings.

In October 1992 SPC's Coastal Fisheries Programme was requested by the *Service territorial de la marine marchande et des pêches maritimes* (New Caledonia's Territorial Fisheries Service) to provide technical assistance and advice to a trial broadbill longlining project.

Under the Offshore Fisheries Development Project, masterfisherman Steven Beverly, who has had extensive experience longlining for broadbill in Hawaii, was brought to Noumea. He worked with Aymeric Desurmont, masterfisherman with the *Service territorial de la marine marchande et des pêches maritimes*, aboard F/V *Dar Mad* fishing in the waters offshore of Noumea.

Before leaving on the trip, Steve made some adjustments to the fishing gear and discussed the setting procedure. As this was a trial project inexpensive traditional 'basket-style' gear using tarred three-strand nylon line hauled by a hydraulic 'pinch puller' type of winch was used instead of an industrial monofilament reel system. Two sets were made, deploying a total of 96 hooks each, using squid for bait and a white or green lightstick.

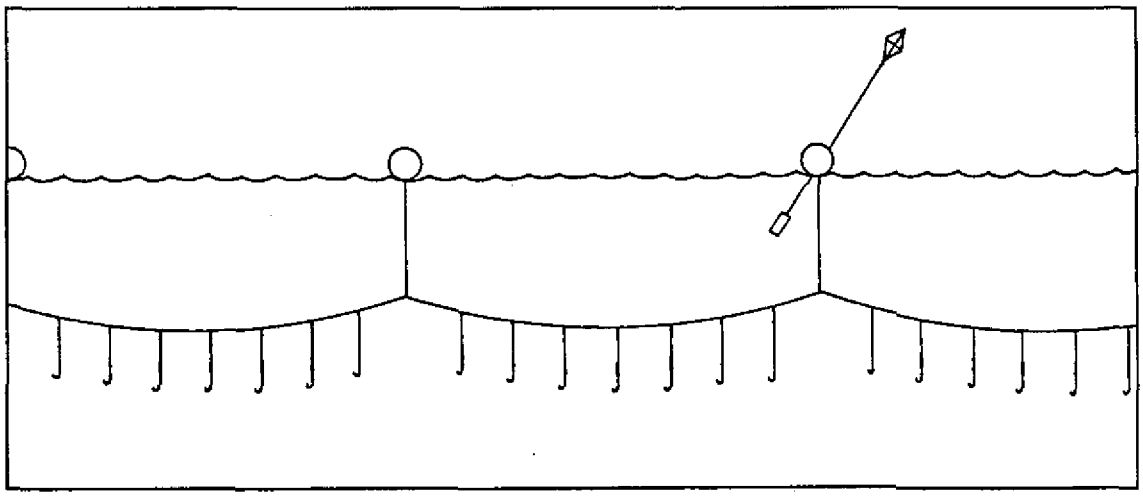
Seven broadbill weighing 212 kg (dressed) were caught in the two sets. This gives a catch per unit of effort (CPUE) of 3.6 fish per 100 hooks.

A report from the National Marine Fisheries Service in Hawaii indicated that a CPUE of 1.2 fish per 100 hooks was observed for a total of 61 sets by six vessels fishing from Hawaii. Needless to say everyone was surprised at the success of this first New Caledonian fishing trip. Aymeric has continued with the trials over the last three months and has caught a total of 37 broadbill weighing 1,470 kg.

Most Pacific Island countries have a limited local market, so the future development of a broadbill fishery would depend on exporting the product to other countries.

At present the local market in Hawaii is limited and most of the catch is exported to the U.S. mainland. Prices in Hawaii range from US$ 4.00 to US$ 12.00/kg.

But in considering U.S. markets for South Pacific broadbill, there are problems related to mercury content and seafood in-



Longline set used to catch broadbill

spections. Federal regulations call for import shipments to be inspected on a random audit basis at the port of entry. Randomly selected shipments are detained and sampled. If the samples pass inspection (laboratory analyses would be necessary for mercury content) the shipment is released to the importer. There are no facilities for laboratory analysis in Hawaii, so samples must be sent to the mainland.

The allowable mercury content level in the United States is 1 ppm. In Australia the regulations are even more stringent, especially as regards mercury content levels.

Japan is a possible alternative as there are not the same restrictions regarding the import of seafoods into the country. According to the *FFA News Digest* 3,454 metric tons of frozen and 4,430 metric tons of fresh broadbill were landed in Japan between January and August 1992. The average price was ¥659 (US$ 5.80) per kg frozen and ¥845 (US$ 7.80) fresh.

Although the broadbill resource looks promising in the South Pacific region, further research on the marketing aspects of the fishery is needed. If markets are established, development of the broadbill fishery should work hand-in-hand with the tuna longline fishery. The vessels and crews would then be capable of switching from one fishery to another according to seasons and markets.

Photo: Aymeric Desurmont

Steve Beverly gutting a broadbill (note 'doughnut' or ring cut around anal opening — split goes up to pectoral girdle but not through).

THE OFCF SUVA OFFICE'S ACTIVITIES IN THE PACIFIC ISLAND REGION

by Overseas Fishery Cooperation Foundation Suva, Fiji

Introduction

This article briefly reviews the activities of Japan's Overseas Fishery Cooperation Foundation (OFCF) in the Pacific Island region, with special focus on the implementation of a unique fisheries project launched in 1990: Fisheries Development Assistance for Pacific Island Nations (FDAPIN). The activities, training components, constraints on implementation and future considerations of the project are also described.

OFCF, established in 1973 as a non-profit organisation and funded by the Japanese Government, is primarily engaged in fisheries co-operation projects not only for the Pacific Island nations, but also for other nations of Oceania, Asia, North and South America, Africa and Europe.

OFCF's prime objective is to promote amicable relations with those countries which have close fishery ties with Japan by:

— Providing technical co-operation in fisheries, mainly to developing countries (but also to some developed countries such as the United States, Australia, New Zealand), through exploratory test fishing, project identification and evaluation, dispatch of experts, supply of equipment and materials, and receiving trainees;

— Extending invitations to fishery personnel such as ministers of fisheries and other senior fishery officers;

— Providing loans to Japanese fishery firms or organisations intending to carry out overseas fishery cooperation projects;

— Recruiting and training Japanese fisheries experts for overseas co-operation.

OFCF has been active in the south-western Pacific since the 1980s, when it started exploratory and test fishing development projects in Papua New Guinea, Vanuatu, New Zealand and Australia.

During this period, Japan also entered into some fisheries access agreements which included provision of goods and services, facilitated by OFCF.

There was also Japan's Fisheries Grant Aid programme, which commenced in the 1980s and provided fisheries facilities (vessels, refrigeration units, navigation and radio equipment, etc.) to the governments of Pacific Island nations. These facilities, together with other equipment from other foreign aid donors such as EEC, AIDAB (Australian International Development Assistance Bureau) and ICOD (International Center for Ocean Development) are now being repaired by OFCF.

OFCF also runs individual country projects. Current projects are in the Marshall Islands (Arno fishing project), Solomon Islands (Northern Malaita bottomfish project), Kiribati (Christmas Island marine export project) and the Federated States of Micronesia (Chuuk State longline bait project).

FDAPIN project

The FDAPIN project is implemented through OFCF's Suva Office, which is currently manned by one OFCF member of staff, two Japanese Fisheries Advisers, one Pacific Island Fisheries Adviser, and an office secretary.

FDAPIN is a five-year project, from 1990 to 1995, designed to enhance and assist in the fisheries development of those Pacific Island countries which have a fisheries access arrangement with Japanese industries. The project focuses on the maintenance of the basic fisheries infrastructure which is necessary to support fisheries development plans. It provides materials and technical experts from Japan to carry out the following:

— The repair and restoration of existing fisheries facilities left unused due to insufficient maintenance, damage caused by natural disasters, or other reasons; and

— The transfer of basic technology related to maintenance of fisheries facilities to local counterparts through on-the-job and formal training courses.

The programme is implemented annually in each of the countries concerned and the OFCF Suva Office co-ordinates the following initial tasks:

— The dispatch of fisheries advisers and engineers to review in detail the items requested by each country and formulate project cost estimates;

— The signing of a Memorandum of Understanding between the country and OFCF;

— The preparation of repair implementation plans, including on-the-job and formal training programmes and the selection of companies to implement the plan;

— The dispatch of a country coordinator and engineers with materials and machine parts to carry out repair work and on-the-job training; and

— Formal training in repairs and maintenance on one or two of the following topics: marine engines, refrigeration systems and navigational equipment.

Status of implementation

The FDAPIN project is now in the middle of its third year and has been implemented in: the Federated States of Micronesia, Kiribati, the Marshall Islands, Palau, Solomon Islands and Tuvalu.

A summary of repair work carried out in each country is shown below. As the table indicates 61 Japanese engineers have been dispatched to the recipient countries.

A considerable amount of repair work and maintenance has been carried out to date. Most of the maintenance work was on vessel engines and refrig-

Facilities repaired by Japanese engineers

Country	Phase/year	Facilities repaired by Japanese engineers	N° of Japanese engineers dispatched
Federated States of Micronesia	Phase I: 1990–1991	– Vessels: engine and navigational equipment A total of four vessels repaired in states of Yap, Chuuk, Pohnpei and Kosrae. – Cold storage and refrigeration units: Yap and Pohnpei.	10
	Phase II: 1991–1992	– Vessels: engine and navigational equipment. 12 fishing vessels repaired in Yap, Chuuk and Kosrae. – Cold storage and ice making machines, generator and refrigeration unit. Cold storage repaired in Pohnpei, ice making machines and generators in eight outer districts of Chuuk.	16
Marshall Islands	Phase I: 1991–1992	– Vessel: Fisheries carrier vessel repaired in Japan.	
Kiribati	Phase I: 1990–1991	– Vessels: one pole-and-line vessel repaired in Kiribati. One pole-and-line vessel repaired in Japan. – Cold storage: ice and brine facilities repaired.	8
	Phase II: 1991–1992	– Vessels: one fisheries extension vessel and one pole-and-line vessel. – Cold storage and ice making machine. – Fish farm. – Workshop facilities.	10
Palau	Phase I: 1992–1993 (in progress)	– Vessels (engine and navigational equipment): five vessels repaired. – Ice making machine and generator: three outer district facilities repaired.	5
Tuvalu	Phase I: 1991–1992	– Vessel (engine and navigational equipment): One research vessel, five training vessels and anchor buoy repaired. – Outboard engines.	5
Solomon Islands	Phase I: 1990–1991	– Machinery and ship repair equipment at Sasape Marina.	
	Phase II: 1991–1992	– Navigational equipment: School of Marine and Fisheries. – Cold storage and ice making equipment: facilities repaired at three outer provincial centres (Yandina, Tatamba and Gizo).	7
	Phase III: 1992–1993	– Cold storage and ice making equipment: facilities repaired at Auki, Kirakira and Lata.	

eration machinery. Most of the refrigeration facilities are located in remote districts or outer islands, and this form of assistance has been very popular.

Transfer of technology — training component

The FDAPIN project provides adequate opportunity for local counterparts to benefit from the transfer of technology during repair work through both on-the-job training (OJT) and formal training. These training components are incorporated in each phase of the project in each country to ensure that adequate maintenance of facilities continues.

During the first phase of the FDAPIN project, it was found that OJT was not very effective, because time available during the repair work was rather limited and certain communication problems existed, resulting from the degree of language skills of the Japanese engineers. It was also found that most of the counterpart engineers lacked a basic understanding of engineering systems.

Formal training courses cover the maintenance of three main facilities: diesel engines, refrigeration and navigation or radio systems. The training sessions, which are carried out in each country, are of seven to ten days' duration and cover one or two of these subjects depending on the repair work and OJT carried out at the time.

The main purpose of formal training is to offer counterparts the opportunity to increase their basic knowledge of the maintenance of fisheries-related facilities and equipment as well as to follow up on OJT carried out during repair work.

As shown in the table below, ten formal training courses have been conducted during the period of 1990 to June 1992. A total of 12 Japanese instructors were involved in this training; 92 counterpart trainees attended.

The training component of FDAPIN is now the focus of increasing attention from both OFCF and recipient countries. Fulfilling the training need has been the most demanding challenge to OFCF. It is a rare undertaking in which the Japanese engineering companies which take on the implementation of the project face the task of ensuring that the technology is satisfactorily transferred and language barriers overcome.

Constraints encountered

Like all new projects, FDAPIN has encountered problems in its implementation on both sides. From the Japanese point of view, there was a need to:

— Define a more precise design plan for repairs, to ensure that maintenance is carried out on time and the correct parts are used; and

— Find engineers capable of effecting the transfer of technology and addressing the inadequate engineering background of local trainees.

As far as the recipient countries were concerned, some of the following common constraints were noted:

— The lack of an engineer responsible for the equipment concerned and of records necessary for effective maintenance of the facility;

— The lack of review and analysis of major causes of deterioration of equipment (needed to enable improvement in future equipment and formulation of a good maintenance system); and

— Poor control of spare parts storage and lack of accurate inventories.

Despite these constraints, in general repair and restoration

Formal training courses conducted by Japanese instructors

Course type	N° of Japanese instructors	N° of trainees
1. At Micronesian Maritime and Fisheries Academy (MMFA), Yap State, FSM		
– Maintenance of marine diesel engines	1	6
– Maintenance of refrigeration systems	1	7
– Maintenance of navigational equipment	1	6
2. Second course at MMFA, Yap, FSM		
– Maintenance of marine diesel engines	1	8
– Maintenance of refrigeration systems	2	8
3. At Tarawa, Kiribati		
– Maintenance of outboard engines	1	16
– Maintenance of navigational equipment	1	8
4. At Gizo, Solomon Islands		
– Maintenance of refrigeration systems	2	14
5. At Funafuti, Tuvalu		
– Maintenance of marine diesel engines	1	8
– Maintenance of navigational equipment	1	11
Total	12	92

of required facilities have been very successfully implemented. The on-the-job training also improves each year as the same counterparts take part in repair work and OJT and formal training are implemented annually.

The constant review of each phase of the project by OFCF staff and the co-operation given by recipient countries has greatly assisted in improving the FDAPIN project.

Future considerations

The FDAPIN project experience has shown one common fundamental problem in the recipient countries: there is a lack of qualified engineers in the fisheries sector to attend to the maintenance of vessel engines, refrigeration systems and navigational equipment.

Countries intending to develop their fisheries will need to give careful consideration to the development of this area of expertise.

Advancement in the field of fisheries cannot be adequately achieved unless these countries address the need for education and training in engineering work in the fisheries sector.

With two and a half years to go before the FDAPIN project terminates, one of the real challenges facing OFCF is to ensure that the technology is successfully transferred.

It is also equally important that recipient countries review the project frankly at an early stage. They should clearly identify their future requirements for activities which would further promote mutual co-operation between Japan and the Pacific Island countries in the rational development of fisheries in the region.

Further information on the OFCF Suva Office's activities can be obtained from:

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