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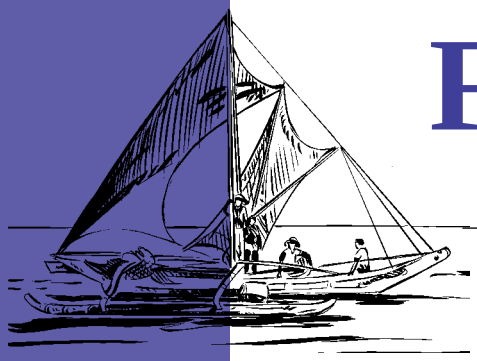


FISHERIES

Newsletter

NUMBER 83
OCTOBER–DECEMBER 1997

IN THIS ISSUE

In Majuro (Republic of the Marshall Islands), it is quite common to find mothers and their daughters selling seafood by the road side. Here the women sell bottled octopus

Secretariat of the Pacific Community
Prepared by the Information Section of the Marine Resources Division

CAPTURE SECTION

Technical assistance to Nauru

The Republic of Nauru had requested technical assistance in the area of fish aggregation device (FAD) construction and deployment from the Capture Section in April 1997. However, the FAD materials for the construction of three FADs did not arrive in Nauru until August 1997.

Moreover, the Section's deep-water echo-sounder was inoperable, with repairs taking several months. The echo-sounder was freighted to Nauru in late October and assistance provided to Nauru in November 1997.

Contract Masterfisherman Peter Watt was employed for 14 days in November 1997, to travel to Nauru to assist the Nauru Fisheries and Marine Resources Authority (NFMRA) staff in the construction and deployment of three FADs. The sites for the three deployments had been identified during previous work conducted by the Capture Section in 1993. The site depths for the three deployments were 2600 m, 2500 m, and 1500 m. These are the deepest FAD deployments the Section has assisted with to date.

Site surveys were conducted at the three locations from the NFMRA's new 7.0 m aluminium vessel, F/V *Dogua* (Figure 1).

This vessel was powered by twin 115 horsepower outboards and came complete with a full range of electronic devices, including a JRC GPS (global positioning system) unit. The echo-sounding equipment on the vessel was limited to depths of 1000 m, so the SPC echo-sounder was used for all site surveys and later deployments. This echo-sounder was rated to 3000 m, however, it was difficult to get accurate reedings in depths over 2600 m.

Construction of the three FADs was carried out by a marine crew from the Nauru Phosphate Company (NPC) and followed the SPC recommended designs (Gates et al, 1996). The first two mooring lines were spliced before Peter arrived, the third done with his assistance. All splices were checked by Peter and were found to be satisfactory.

One spar buoy and two Indian Ocean style buoys were to be used, with the spar buoy selected for the shallower mooring (1500 m). Old large-link chain from NPC mooring buoys was used to anchor each of the three FADs. The three lengths of chain weighed 1200 kg, 1000 kg and 960 kg.

An NPC cargo barge (8 m by 12 m) and vessel, M/V *Erinimon* (11 m), were rented for the FAD deployments. Loading of the barge with the FAD materials

Figure 1: F/V *Dogua* on its trailer outside the NFMRA office

(Figure 2) occurred at the NPC boat harbour using their 20 t overhead cranes. The NPC marine crew was also used for the assembly of the FAD mooring systems on the barge under Peter's supervision, with additional assistance from NFMRA staff.

Once the FAD mooring systems were fully assembled, the barge was towed (Figure 3) out of the boat harbour to the FAD deployment site. NFMRA's vessel, F/V *Dogua*, met the barge at the deployment site. Peter directed the deployment from F/V *Dogua*.

Once the vessels were in position, F/V *Dogua* headed off in a wide arc around the deployment site as there was over 3 km of rope to be paid out and Peter wanted to keep everything close to the deployment site.

The buoy was launched from the barge and M/V *Erinimon* towed the barge while following F/V *Dogua* until all of the rope had been paid out and the site for deploying the anchor reached. The chain anchor was dropped and

Figure 2: Loading the barge with materials for the two Indian Ocean style FADs

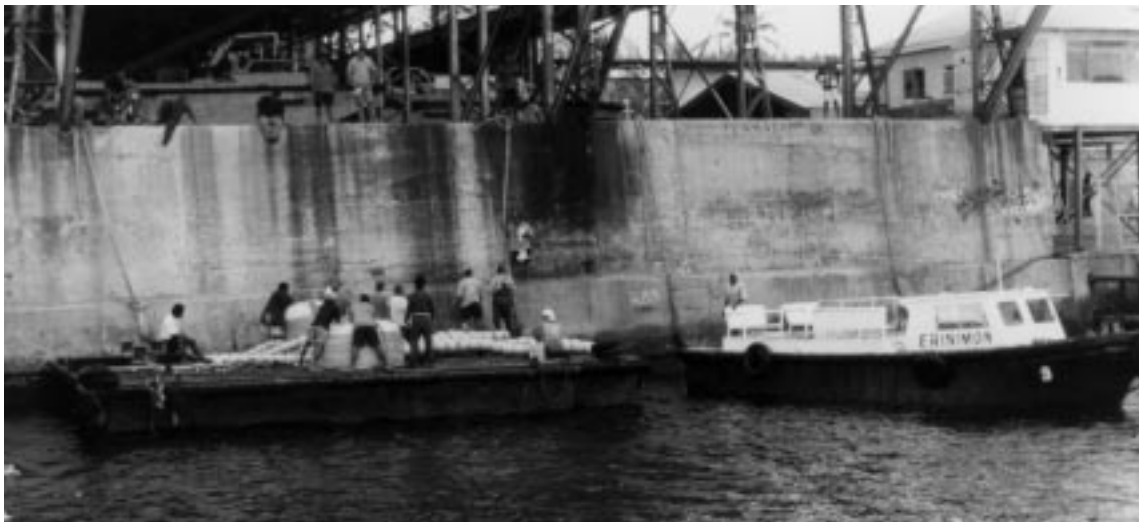


Figure 3: M/V *Erinimon* ready to tow the barge to the deployment sites

the vessels stood by until the FAD settled in its final location (Figure 4).

All three FADs were deployed satisfactorily. Reports from Nauru at the end of February 1998 showed that one FAD was working very well while the other two were only producing small numbers of fish as shown in Table 1. This valuable data is being collected by NFMRA through having staff stationed at the three main launching ramp sites seven days a week to meet fishermen when they return from fishing. The fishermen are interviewed and the data recorded. It is estimated that around 90 per cent of the catch is being monitored through this system.

NFMRA have also initiated a rigorous maintenance programme with weekly checks of the FADs. The flag pole on one FAD had broken free (although still attached by a safety line) within 3 months. This was immediately fixed by NFMRA staff.

Figure 4: Indian Ocean style FAD on station in 2450 m and around 3.5 miles from the island of Nauru

Table 1: Catch by species and month for tuna landings in Nauru since the three FADs were deployed in November 1997

Month	Species	FAD #1 (kg)	FAD #2 (kg)	FAD #3 (kg)	Open water (kg)
Dec-97	Yellowfin tuna	77	0	0	453
	Skipjack tuna	0	0	0	0
	Bigeye tuna	0	0	0	0
	Other	17	0	0	73
Jan-98	Yellowfin tuna	2295	2	0	478
	Skipjack tuna	2506	22	0	178
	Bigeye tuna	156	0	0	24
	Other	50	0	0	54
Feb-98	Yellowfin tuna	4486	0	0	655
	Skipjack tuna	10683	48	594	121
	Bigeye tuna	3315	4	135	228
	Other	216	0	42	369
Total by species	Yellowfin tuna	6858	2	0	1586
	Skipjack tuna	13189	70	594	299
	Bigeye tuna	3471	4	135	252
	Other	283	0	42	496
Total catch		**23801**	**76**	**771**	**2633**

RECRUITMENT OF TRAINEE ASSOCIATES

The Capture Section of the Secretariat of the Pacific Community (SPC) is seeking to employ two Pacific Island trainee associates for a period of 12 months each.

These positions were established to provide short, practical and focused training for Pacific Islanders in areas where they may not normally receive training in their own country. The training will be structured to expose the trainees to administrative, planning, management, computer and publication skills, as well as hands-on practical field experience with the SPC's Masterfishermen, and will require a lot of travel. Given this, all applicants will be treated as single people.

Qualifications for these positions include:

- at least two years professional experience in a commercial capture fishery (preferably a Pacific tuna fishery) or as a fisheries extension officer in the Pacific,
- a knowledge or understanding of artisanal and commercial fishing methods, particularly for tuna and small and medium scale tuna operations,
- some practical at-sea experience,
- basic writing skills as will enable the production of coherent technical reports,
- a willingness to be trained, and
- a basic qualification in a fisheries related discipline would be an advantage. Fluency in English (spoken and written) is essential; fluency in both English and French would be an advantage.

The salary for the trainee associate positions is 220,000 CFP per month (110 CFP = approx US $1.00) plus free housing for the full 12 month period (utility expenses not covered by SPC). An establishment grant of 40,000 CFP will be paid for each relocation over one month duration. Leave is accrued at 2.5 working days per month with 30 sick days for the 12 month period. Six per cent of salary will be paid into the SPC's provident fund, with a matching contribution by the SPC, and 1.5 per cent of salary is paid for medical cover (for trainee only). Moving expenses will be covered for personal effects, up to 150 kg, to each assignment station. Project equipment, if required, will be additional to the appointee's personal effects.

For more information and a copy of the full position specifications, qualifications and terms and conditions, please contact the Fisheries Development Adviser, Lindsay Chapman on telephone +687 260168, fax +687 263818 or e-mail <Lindsayc@spc.org.nc>, or at the SPC's address.

Applications close on 30 April 1998

Other project activities

NFMRA, formerly the Department of Fisheries and Marine Resources (and which was formed around October 1997), had also requested assistance from both SPC and the Forum Fisheries Agency (FFA) to conduct a joint project to review fisheries policy and a feasibility study on tuna longline fishing in Nauru. Fisheries Development Adviser Lindsay Chapman went to Nauru for one week in November 1997 to review the infrastructure for a tuna longline vessel to be stationed in Nauru. NFMRA were also seeking guidance on appropriate tuna longline vessel designs that would be suited to the Nauru fishing situation. FFA's component of this work will be completed in early 1998.

In Noumea, work continued on reports during the last quarter, with two in the published series and four in the unpublished series being completed. Other re-

ports in both series are being finalised, and 1998 is shaping up to be a very busy year.

Masterfisherman Steve Beverly spent October and November on home leave. In December, Steve worked on an article on safety at sea, following the problems he has encountered in recent projects where vessels have not been equipped with adequate or in-date safety equipment. This will be an area that the project will focus on in 1998, as the safety of vessels and those who work on them is paramount to any fishing operation.

Reference:

GATES, P., P. CUSACK, & P. WATT. (1996). South Pacific Commission fish aggregating device (FAD) manual. Vol. II: Rigging deep-water FAD moorings. South Pacific Commission, Noumea, New Caledonia. 43 p.

New masterfisherman recruited

Recently the Secretariat of the Pacific Community's Capture Section recruited, Peter Watt, for the new Masterfisherman post. Peter is quite well known throughout the region as he worked before as a Masterfisherman for SPC from August 1989 to December 1994. Since leaving SPC, he and his Filipino wife Pia resided on Palawan Island located in southwestern Philippines. For three

years they have been constructing and operating a small ecotourist beach resort adjacent to St. Pauls National Park. In November 1997 Peter was recruited as a consultant by SPC to provide technical assistance to the Nauru Fisheries and Marine Resources Authority in fabricating and deploying three fish aggregating devices (FADs) offshore from the island.

■ WOMEN'S FISHERIES DEVELOPMENT SECTION

Documenting the activities of women in the Fisheries Sector

One of the services provided to SPC members by the Women's Fisheries Development Section (WFDS) is the production of national assessment reports documenting the participation of women in fisheries activities. An in-country survey is carried out to determine how women are involved in the fisheries sector, identify areas where assistance is needed, identify national services available to them (government and non-government), and collect information as the basis for determining the type of support required from the WFDS.

In 1997 the Women's Fisheries Development Officer visited the Republic of the Marshall Islands, and the Republic of Nauru to collect information for the production of the national reports. Below is an excerpt from the report, 'An assessment of the role of women in fisheries in the Republic of Nauru'.

The harvesting of fisheries resources by women in Nauru

'During low tide women harvest on the reef flat, collecting octopus using their hands, steel hooks or sticks to scoop them out of holes in the reef, catching eels using traps, and collecting periwinkles by hand. Low tide reef gleaning is carried out during the day when the tide is very low.

Reef fishing at night includes the same activities as those carried out during the day, with the addition of the collection of crabs and lobsters (when in season) by

hand, the netting of fish trapped in holes in the reef after the tide has gone out, and the use of rod fishing from the edge of the reef into deep gullies.

Some women use chlorine bleach to paralyse fish so that they can be easily harvested. Although there are abundant stocks of sea urchins and beche de mer, the women do not collect these as they are not favoured in the Nauruan diet.

During high tide, the women fish from the beach using a fishing rod and line, or the line by itself. The second method is preferably carried out at night.

Depending on the area being fished, women use different skills and nets when netting for fish. Groups of women set long nets in the inshore area to trap fish.

Although not common, one Nauruan woman has used the throw net method of fishing, casting her net in different ways from fishing in the boat harbour (where she stands on a higher level and throws the net vertically downwards into the sea), to fishing in the reef area (where she throws the net horizontally out into the sea).

Women use the set net and the scoop net when collecting fish from their traditional rock FADs (Fish Aggregating Devices). The set net is anchored around the base of rock pilings. The rocks are then lifted one at a time and set elsewhere. The scoop net is then used to scoop up any fish that remain behind as their rock shelter is dismantled.

It is not usual for women to travel on boats beyond the reef for deep sea fishing. However those who do so tend to accompany menfolk.

Although not a common practice, a few women dive for periwinkles……..”

Publication of both the Marshall Islands and Nauru reports is scheduled for early 1998. Follow up work in both countries includes in-country workshops. For Nauru, the WFDS will be funding the production of a video and booklet on the fishing techniques of women.

In 1998, the WFDS has plans to visit Tuvalu and Niue to document the activities of women in the fisheries sector.

WOMEN'S FISHERIES DEVELOPMENT OFFICER

Applications are invited from suitably qualified and experienced persons to fill the above position within SPC's Marine Resources Division. The successful applicant will be based within the Women's Fisheries Development Section and will be required:

- to work closely with SPC member countries to develop programmes of support to women in the fisheries sector. This will include the provision of technical information and advice, the delivery of workshops to meet specific requirements, and assistance in the development of income generating activities for women.
- to produce reports and publications arising from the work of the Women's Fisheries Development Section.
- In liason with the Editor of the Women in Fisheries Special Interest Group Bulletin, to gather and collate materials for inclusion into the Bulletin, assuming responsibility for the Bulletin's timely production on a bi-annual basis.
- to collaborate with SPC staff members in allied fields. In particular, to work in close consultation with the SPC Pacific Women's Bureau to ensure that there is proper integration between the Section and other regional women's development initiatives.

Applicants should have proven practical experience in fishing techniques, gear technology, and post harvest activities employed by women in the fisheries sector. Extensive experience in working with women in fisheries, particularly in the development of training programmes, and the setting up of income-generating ventures is essential. A formal qualification in an appropriate fisheries field would be an advantage. Fluency in spoken and written English is important, while fluency in French or a Pacific Island language would be advantageous. Please note that preference will be given to applications from Pacific Islanders of member governments and administrations.

The position is offered for a one-year term and will be based at SPC Headquarters in Noumea, New Caledonia. The salary for the position is 373,212 CFP (≈US$ 3300) per month. Benefits for one person include housing at SPC rates, medical insurance, provident fund membership and fares and removal expenses.

Applicants should detail their education and employment backgrounds, with particulars of three referees. All applications should be addressed to the Director-General, Secretariat of the Pacific Community, B.P. D5. 98848 Noumea, Cedex, New Caledonia. Phone: +687 262000, Fax: +687 263818.

The deadline for applications is 30 April 1998

Juanita, a Nauruan fisherwoman, sets her net around a rock FAD before using a scoop net to collect fish that have used the rocks as their home.

■ TRAINING SECTION

The long-awaited PIQFD teaching materials have now been mailed to all the fisheries training institutions in the region

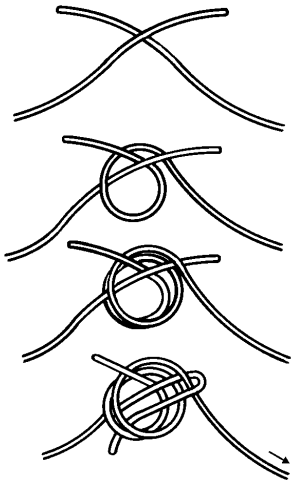
The syllabus for the Pacific Island Qualified Fishing Deckhand (PIQFD) certificate was adopted as a regional standard, by the Workshop on Standardised Certification for Fishing Vessel Crews (Suva, Fiji, September 1994).

In support of the development and promotion of the PIQFD certificate, the workshop also recommended the preparation and distribution of a teaching-resource package which would provide institutions with materials in line with the approved syllabus and guidance for the delivery of the course. With funding provided by the UNDP, the training section initiated the development of the PIQFD package in 1996. It was only in December 1997, that the long-awaited materials were mailed to all the fisheries training institutions in the region.

The resource materials have been designed for use by both tutors and students. Each of the 22 syllabus items is covered in one separate manual consisting of the learning content, overhead sheets and some teaching notes.

The learning content, a graphic referenced text explaining the subject matter, can be given to students as copied hand-outs. The teaching notes are intended to provide tutors with advice on lesson planning, delivery methods, materials and teaching aids required, suggested exercises and competencies. In addition, a suggested examination procedure is included in the package to assist training institutions with the assessment of their students.

Although the PIQFD course is intended for the certification of fishing-vessel crews, most of its syllabus is focused on the safe operation of vessels (only three items are fisheries-specific). It is therefore envisaged that, if modules specific to the merchant service are added, then qualified



fishing deckhands who meet these additional competencies, would be able to work as merchant- vessel ratings.

It is hoped the PIQFD qualification, which meets the standards of the 1995 STCW-F convention, will be adopted by Pacific Island countries and territories as a statutory requirement. Training institutions wishing to introduce the PIQFD certificate should be aware that SPC Fisheries Training section can further assist in this respect.

If necessary, the section would organise the attachment of an experienced overseas tutor to help local tutors running the initial PIQFD course. Limited funds are also available for the purchase of essential demonstration and teaching equipment such as liferafts or signalling devices.

Women break new ground

Four women have braved the SPC-Nelson Fisheries officer course. This year, out of the 22 nominations submitted, the Section has received four women candidates for the 1998 course, and they have met the selection criteria very well.

This is the first time, since the course began in 1979, that we have received nominations from females. Eleven candidates have been selected (3 women) from SPC member countries, namely: Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Samoa, Tonga, and Vanuatu.

The purpose of the course is to train Pacific Island fisheries officers or fishers in those practical skills required to operate a small fish-receiving station or extension centre in a remote location.

The training offered covers a wide range of technical skills and knowledge of value to a fisher or a fisheries extension officer responsible for providing support facilities and advisory services to local fishermen.

While orientated towards government fisheries officers and extension agents (including female officers), the course is open to private fishers provided they are nominated by their government.

This course has been run annually since 1979, except for 1982. With the completion of the 18th course in 1997, 212 persons from 18 Pacific Island countries and territories have taken the course.

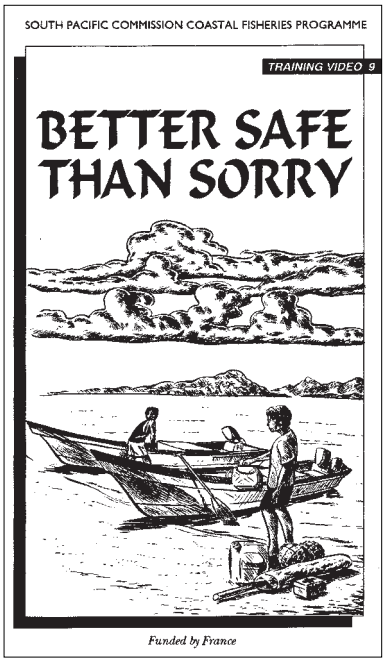
This year, the course will be run from 9 February to 12 June at the Nelson Polytechnic School of Fisheries in New Zealand, followed by a practical module, probably in New Caledonia, from 15 June to 17 July 1998.

Funding for the course is provided by New Zealand Official Development Assistance (NZODA), the Commonwealth Foundation and the Commonwealth Secretariat. In addition, UNDP has contributed partial funding towards the 1998 course.

Better safe than sorry! Rambo stuffs it up again!

Eight TV clips have been produced, focusing on important safety aspects for small-boat users.

In July 1997, Pasifika Production, the now famous video production company based in Fiji started the production of eight TV clips on small-boat safety. The characters filmed by Pasifika were those who appeared in the section's training video 'Better Safe than Sorry'. No doubt most TV viewers will recognise Rambo and his careless attitude at sea! The clips were produced in standard duration (15, 30 or 60 seconds) to make them user friendly for TV stations.



Each clip focuses on one important safety aspect including: the importance of spare fuel, the need to carry safety gear on board, the use of an auxiliary sail, floating devices, distress signals, outboard maintenance, the cost of search and rescue operations. The idea of the clips was to follow-up on the safety-at-sea campaign that SPC launched in 1994. The campaign had included the production and wide distribution of resource materials such as four posters, two videos, some stickers, an audio-tape programme and a teaching manual for trainers of small-boat operators.

Although it is difficult to assess the benefits of this campaign, section staff feel it is successful — the safety-at-sea posters are dis-

played where they should be (schools, communities, police and fisheries departments), the videos are regularly broadcasted in most countries, and some workshops are held to provide fishers with basic safety principles. Because safety-at-sea is an issue that can only be tackled through a long-term effort, the SPC Coastal Fisheries Programme continues to be active in this area. The eight TV clips are the latest achievement.

The eight clips were combined in one master Betacam tape that was copied to all the TV stations in SPC member countries and territories in December last year. The French version will be produced early in 1998. Hopefully the TV stations will back up SPC's efforts by broadcasting these clips as often as possible.

If you see the clips on TV and want to improve your safety on board or that of your fisherfolks, do not hesitate to contact the section to obtain our safety gear check list which is available on poster, sticker or laminated card.

Skippers – a course tailored to suit your needs and increase your profits!

Regional course on vessel operation management and electronic aids for commercial fishing skippers.

Fishing enterprises in the Pacific are changing from small-scale inshore to larger-scale offshore ventures. This change requires experienced personnel at all levels, especially in those areas which rely on an understanding of commercial business practice. It is important that these new fishing enterprises succeed, not only for the employment they generate, both at sea and ashore, but also to demonstrate that a fishing enterprise is a good investment of time and capital.

A workshop for managers of Pacific Island fishing enterprises, held in March 1997, was well received by the participants who recommended that this training should also be conducted for other staff within their enterprises.

In addition, they identified a need for the training of their skippers to give them a better understanding of the finances of boat operation and to expose them to new ideas and new technology which could improve their catching performance.

Section staff believe that the profitability of any fishing venture will be increased by the skipper having an understanding of the financial structure and costs involved in the vessel operation, how these affect the vessel's profitability and how the skipper can influence these costs during the fishing operation. Increasingly, the profitability of the fishing operation depends on the skipper's ability to use a variety of electronic equipment for position finding, communication, fish finding and vessel safety.

Late in 1997, Section staff have secured UNDP funds to run a two-week regional course on vessel operation management and electronic aids for commercial fishing skippers. The course was held from 16 to 27 February at the New Zealand School of Fisheries in Nelson. Twelve candidates have been selected from SPC member countries and territories namely: Solomon Islands (2), Tonga (2), Kiribati, French Polynesia, Samoa (2), Federated States of Micronesia, Fiji, Marshall Islands and Cook Islands. A detailed report on the course will be given in the next issue of the *Fisheries Newsletter*.

Course content

The topics covered during the course have included vessel operation and economics, vessel maintenance, port infrastructure, ship master's business, international law, record-keeping, personnel management, salvage and electronic aids (Inmarsat C, GPS and track plotter, fish-finding echo sounder, ARPA radar, weather track, sonar and ship-stability software).

Follow-up to this workshop

As a follow-up to this workshop, the section's Masterfishermen from the SPC Fisheries Capture Section will spend 10 to 12 days working with each participant in their country on the vessel on which they are working. This will give each participant on-the-job training specific to their needs and individual situation. It will reinforce the skills and knowledge gained on the course.

First come, first served!

In 1997, the SPC's Fisheries Training Section secured additional funding from the Republic of Taiwan/ROC to continue sashimi-tuna training in the region. This funding made some workshops happen in Samoa in May 1997 and enabled section staff to advertise the possibility of SPC running more national workshops in 1997–98. We sent a letter to our fisheries contacts informing them that the funding would be used on a 'first-come-first-served' basis.

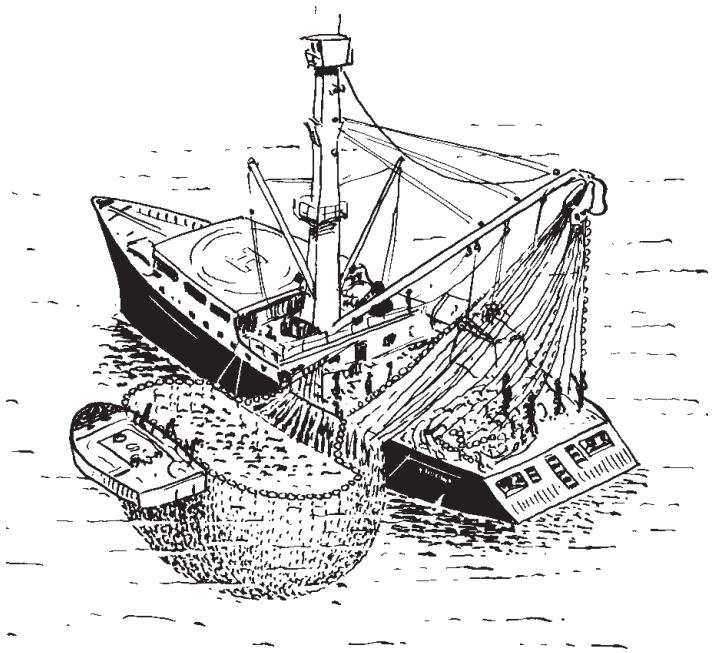
Tuna handling and grading is an area in which the SPC Coastal Fisheries Programme has been involved for the last three years. An initial regional workshop was run in August 1995 in Chuuk, FSM, followed by a similar programme in May 1996 in Tongatapu, Tonga.

During this time, several countries and territories have requested and received SPC's assistance to address the needs of their domestic tuna fleet. To date, national workshops have been run in Papua New Guinea (December 1995), French Polynesia (May 1996) and Samoa (May 1997).

The training in Samoa consisted of two one-day workshops targeting boat-owners and fishermen (first workshop) and tuna exporters (second workshop) (see article in *Fisheries Newsletter* n°80 and 81). A similar approach was recently used in Papua New Guinea in January this year (one workshop for longliner crew and a second one for on-shore staff).

These workshops were hosted by the PNG Fishing Industry Association and run by SPC Fisheries Training Adviser and Masterfisherman, Steve Beverly.

Additional workshops are tentatively planned in Tonga and French Polynesia for the first quarter of 1998.



NEW TAGGING PROGRAMME UNDER WAY

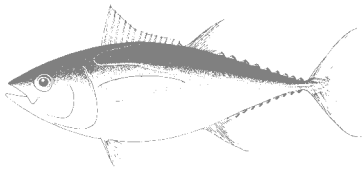
The Pelagic Fisheries Research Program of the University of Hawaii will be tagging bigeye and yellowfin tuna throughout the Hawaii EEZ for the next two years. While most recaptures will likely occur close to the point of release, some long-range and long-term recaptures are expected, particularly for bigeye tuna. University of Hawaii fisheries scientists are using 11 cm orange plastic dart tags manufactured by Hallprint that bear the message:

Hawaii Tagging Program
For Reward Call: 1 (800) 588-8066

Please send tags and recapture information to:

David Itano
E-mail: ditano@soest.hawaii.edu
fax: 1 (808) 956 4104, or
Kim Holland
E-mail: kholland@hawaii.edu
fax: 1 (808) 2367443
Hawaii Institute of Marine Biology,
P.O. Box 1346, Kaneohe
Hawaii 96744

As with any tagging programme, scientists must verify recaptures with receipt of the tag and with information giving the tag number, fish species, fork length, fishing gear type and the date and location of the catch with finder name and address.



Any additional information, such as vessel identity and fish condition would be appreciated. We are offering an attractive programme T-shirt as reward for all recaptures and will supply the finder with information on the distance traveled, time at liberty and growth rate if sufficient recapture details are provided.

This project is funded by Cooperative Agreement #NA67RJ0154 from the National Oceanic and Atmospheric Administration with the Joint Institute for Marine and Atmospheric Research, University of Hawaii.

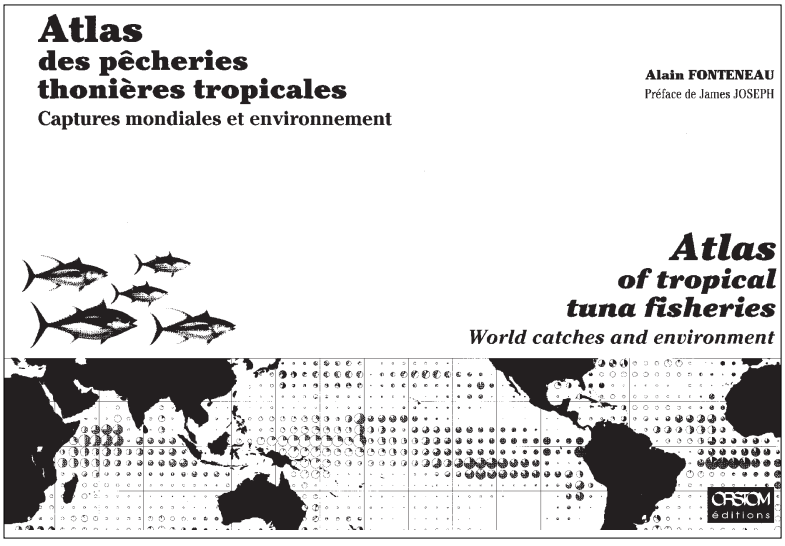
(Source: Hawaii Institute of Marine Biology)

FIRST ATLAS OF TROPICAL TUNA FISHERIES

Fishing industry professionals, national and international organisations responsible for managing marine resources and fisheries scientists can now consult an invaluable reference work, the Atlas of Tropical Tuna Fisheries, which has just been released by the French Scientific Research Institute for Development in Cooperation (ORSTOM).

The first work of its kind covering a fishery on a world-wide scale, this atlas contains a compilation of the principal statistical data available on tuna fishing in the world's three oceans during the 1952-1993 period, together with almost 200 maps and graphs produced by the ORSTOM-Ile de France Applied Cartography Laboratory. These data came from the logbooks of international tuna fleets and were provided by ICCAT (International Commission for the Conservation of Atlantic Tuna), IPTP (Indian Ocean Tuna Project), FAO (Food and Agricultural Organization of the United Nations), IATTC (Inter-American Tropical Tuna Commission) and the Pacific Community (formerly the South Pacific Commission).

The primary points of interest of this bilingual (French-English) atlas are a general overview of tropical tuna fisheries over the last 40 years and a comparative view of these fisheries in four ocean areas, i.e. Western Pacific, Eastern Pacific, Indian Ocean and tropical Atlantic. This type of general review had not previously been attempted, given the dif-



ficulties linked to the heterogeneous nature of the information available and the diversity of tuna research agencies in each ocean or oceanic region.

Going beyond a simple map of current catches, this atlas shows how large-scale tuna fisheries have evolved and are developing, in both space and time. From a historical point of view, significant changes appear, especially in the fishing techniques used and in the fleets' target species.

Bluefin tuna fishing, for example, which accounted for most catches (longlining) in the Indian Ocean up until the end of the 1960s, gradually declined over the next decade, and has disappeared everywhere except in South Australia and South Africa since 1979. In the same way, some maps clearly show that tuna purse-seiners began exploiting the Indian and Pacific Oceans in the 1980s.

A number of maps show readers how strongly seasonal tuna fishing is, this being one of the main characteristics of the exploitation of this resource. Fisheries activities do greatly depend on the movements of tuna, most species of which migrate large distances each year between areas rich in food and their spawning grounds.

This atlas also provides a global-scale synopsis of some parameters of the ocean environment (e.g. temperature, dissolved oxygen contents, depth of the thermocline, primary productivity) which affect tuna species' biology and migrations. These maps of environmental parameters are at the same scale as those for catches and, through simple superimposition, make it possible to correlate fishery performances to those parameters.

The graphs present a statistical review of catches by species in relation to the various environmental factors. It is demonstrated that the water temperature where species are caught varies widely depending on each oceanic region.

For example, more than 40% of skipjack catches (surface fisheries) in the Western Pacific occur in waters whose temperature is higher than 29°C, while in the Eastern Pacific, the biggest catches come from colder waters (i.e. under 22°C on average). This is the first time that a work presents information on both tuna fisheries and their marine environment.

The publication of the atlas, which highlights the merit of making available information on a global scale about tuna fisheries, raises some interesting prospects; in particular, further progress could be made through the creation of a data bank on world tuna fisheries accessible on CD-ROM or from an Internet website in collaboration with FAO and the many different tuna commissions.

While this project is not without a certain number of difficulties (e.g. regular updating of the data, confidentiality of certain information), it is, nevertheless, true that such a data bank would be an invaluable tool for those responsible for exploiting, managing and preserving tuna resources worldwide.

(Source: ORSTOM, *Fiches d'actualité scientifique* No. 56)

NEW SAMOAN BOAT SET SAILS

Faivaimoana I, the first longline fishing boat owned and operated by Samoans, sailed from Pier 35 for Pago Pago recently, after being outfitted in Honolulu. It marked a major development for Samoa's fishing fleet, a big boat that can compete with foreign longline fishing vessels. The US$ 1 million vessel, the newest among nearly 300 longliners operating in the South Pacific, gives Samoa's fishing fleet a toehold into this market.

'People in Samoa are very proud of this boat', said Luciano Giorgini, a San Francisco investor with business interests in the South Seas and a part-owner of the *Faivaimoana I*. 'Foreign longliners have fished in Samoan waters for years. The *Faivaimoana I* will be the first big (90 ft [≈ 30 m]) longliner of our own'.

Giorgini added that officials at Pago Pago's StarKist cannery have promised to buy his catch. He and his partners hope to build a second boat. Though it was built on the mainland USA, Giorgini noted that Honolulu-based Pacific Ocean Producers, a supplier of longline fishing gear outfitted the boat with such gear as a reel with 45 miles of line that can trail more than 2000 hooks at a time.

"This is indicative of what's happening in the South Pacific," said Pacific Ocean Producers' Tony Costa, who deals with the company's South Sea clients.

Costa, noting that Samoans began longline fishing out of 28 to 30-feet (8.5 to 9 m) long aluminium catamarans known as alia, called the *Faivaimoana I* the first large local boat to take advantage of tuna in Samoan waters. The boat also will be equipped to process frozen albacore and fresh fish for sashimi.

The boat will carry a crew of five and, with a range of about 12 000 miles, will be able to stay at sea for up to two weeks.

Costa said Pacific Ocean Producers, which exports US$ 5 million in longline fishing gear and expertise to the South Pacific annually, has opened a warehouse in Samoa, through which fishing crews can order goods by telephone and pay the company through a Bank of Hawaii branch in Pago Pago.

Though Hawaii's longline fishing fleet has dropped from 143 boats during a 1993 peak to about 113 currently, the boats make up the largest fleet in the state, according to Pacific Ocean Producers partner Jim Cook, and play a critical role in the state's economy, with fleets spending about US$ 23 million annually for gear, bait, ice and fuel.

(Source: *The Honolulu Advertiser*)

THE IMPORTANCE OF TUNA TO THE PACIFIC ISLANDS

The following article is a summary of a presentation made by Tony Kingston (Forum Fisheries Agency) at the Pelagic Fisheries Research Programme Principal Investigator's Meeting Workshop on 12–13 November in Honolulu.

Industrial-scale tuna fishing

The tuna catch from the Pacific Islands is globally significant. Having increased tenfold in the last 25 years (Figure 1), it currently averages 996 000 tonnes annually and makes up about one-third of the 3.1 million metric tonnes of tuna caught each year worldwide.

In comparison, the other major tuna fishing areas of the world (the eastern Pacific, west Africa and the western Indian Ocean) land 450 000 t, 335 000 t and 350 000 t annually, respectively (Figure 2).

The importance of the region's tuna harvest to the island nations is equally significant. The current US$ 1.7 billion value of the annual catch represents about one-tenth of the approximately US$ 16 billion combined gross domestic product of all of the nations of the region and more than one-third of the US$ 4.3 billion value of all exports from the region. The Pacific Island tuna fishery also produces more than nine times the amount of fish as all of the other fisheries in the region combined and is worth more than six times that of all others fisheries combined (see Table 1 on next page).

One of the major financial benefits from the Pacific Islands tuna resource is the access fees that are paid by foreign fishing vessels for the privilege of fishing in the region. During the 1995–1996 licensing period, a total of 1332 foreign fishing vessel were listed on the FFA Regional Register of foreign fishing vessel eligible for licensing (Table 2). The US$ 66 million of revenue received (Table 3) represents a sizable portion of the total government revenue. For example, access fee amounted to about 25 per cent of government revenue in both the Marshall Islands and the Federated States of Micronesia (FSM).

Another crucial benefit of the tuna fishery to the Pacific Island countries is in job creation. More than 10 000 jobs are directly related to the industry (i.e. on fishing vessel and in fish processing op-

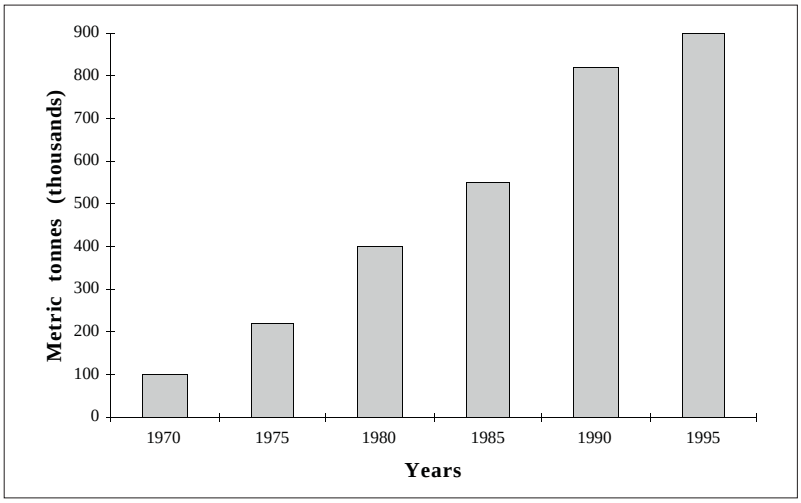


Figure 1: Tuna catches in the Pacific Islands area

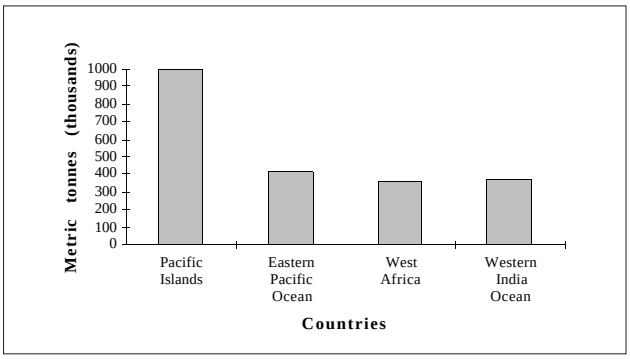


Figure 2: Relative volumes of the major tuna fishing areas

Table 1: Annual volume/values of categories of Pacific Island fisheries

Category	Volume (t)	Value (US$ million)	Source
Industrial tuna fishery	996 000	1 700	SPC (1996), FFA (1996)
Industrial prawn fishery	594	5	NFA (1995)
Subsistence fisheries	83 914	180	Dalzell et al. (1996)
Small-scale commercial fisheries	24 327	82	Dalzell et al. (1996)
Total	**1 104 835**	**1 967**	

Table 2: Numbers of fishing vessels on the regional register (licensing period 1/9/95 to 31/8/96)

Flag	Small longliner (< 100 grt)	Large longliner (> 100 grt)	Purse seiner	Pole/line	Total
Japan	179	298	35	58	570
Korea	0	105	29	0	134
Taiwan	91	36	43	0	170
China	159	149	0	0	308
USA	1	5	48	0	54
Pacific Island	1	3	11	0	15
Philippines	0	0	13	0	13
Other	19	46	3	0	68
Total	**450**	**642**	**182**	**58**	**1 332**

Table 3: Estimates of 1996 access fees paid to FFA member countries (US$ million)

	Longline	Pole/line	Purse seine	Total
Total	17	4	45	66

erations), and an additional 11 000 to 21 000 jobs are estimated to be either connected to the tuna industry (e.g. those at the purse-seine net repair facility in Yap) or indirectly linked to it (e.g. those that provide service and goods (such as shoes, food, transportation and entertainment) to employees in the tuna industry). With only 370 000 wage earning job opportunities available in the Pacific region (1991 estimates), tuna-related jobs represent between 6 and 8 percent of the total number of wage employment in the Pacific Islands.

Although job generation is often the most visible and appreciated benefit to the local economies, there are many other gains provided by the 30 purse seiners, 40 pole and line vessels and about 320 longliners based in the region. A tuna seiner reportedly spends US$ 300 000 to US$ 450 000 on each visit to the home port (four to five port calls would be the usual).

A locally based sashimi longliner doing short trips would spend US$ 13 000 each trip, and a fleet of 60 such vessels would generate US$ 8 million annually in home port expenditures. A Pacific Island based pole and line vessel would normally spend about US$ 425 000 locally each year. A rough approximation of expenditures by all tuna vessels based in FFA member countries would approach US$ 100 million. The portion of this figure which is actually benefiting Pacific Island economies could be expected to increase as more local businesses develop to cater to the tuna vessels.

In addition to the economic benefits from locally based tuna vessels, substantial gains accrue from vessels that occasionally visit ports in the region to tranship fish. After FFA member countries introduced a ban on transhipment at sea, port activity at transhipment points increased remarkably, particularly in the FSM, Solomon Islands and Papua New Guinea (PNG). The benefits of transhipment in the FFA member countries in the first full year of operation (1994) are estimated at US$ 1.5 million in charges and US$ 10 million in expenditure. As local businesses grow to cater for this trade, it is likely that the local expenditures would increase and a greater percentage of those expenditures would be retained within the countries.

Other benefits of locally-based and transhipping vessels to the economies include the acquisition of foreign exchange and the generation revenue from fines. Tuna exports represent a substantial portion of all exports in Fiji, Kiribati, FSM, Marshall Islands and Palau The benefits from industrial-scale tuna fishing to FFA Pacific Island member economies are large: US$ 66 million in access fees; 21 000 to 31 000 jobs; expenditures by locally based vessels approaching US$ 100 million; and expenditure of approximately US$ 11.5 million from vessels visiting ports to tranship fish, as well as other substantial miscellaneous benefits.

Small-scale tuna fishing

Without a doubt, fish is extremely important in the diet of the average Pacific Islander. The regional per capita consumption is about 55 kg per year, while the world average is 13.32 kg. Tuna makes up a substantial portion of all fish consumed, especially in the most vulnerable countries of the region, several of which are categorised as low income food deficit countries: PNG, Kiribati,

Tuvalu, Solomon Islands, Vanuatu and Western Samoa.

Tuna forms a substantial component of the catch of both the subsistence and artisanal fisheries in the Pacific Islands. About 30 per cent of the 80 000 t of fish caught annually by subsistence fisheries in the region are pelagic species, with the vast majority being various tunas.

Virtually all tuna caught by small-scale fisheries is consumed within the Pacific Islands. In addition, tuna caught by the industrial fishing fleets also enters the local food supply. For example, about 20 per cent of the production of the tuna cannery at Noro in the Solomon Islands is consumed domestically and about 11 per cent of the tuna from the Levuka cannery in Fiji is sold on the local market.

The emergence of medium-scale tuna longline operations in most Pacific Islands countries has resulted in damaged tuna, undersized tuna and by-catch being sold on domestic markets, with weekly sales of such fish in Fiji estimated at greater than 10 t.

In addition to its importance as food, tuna has cultural significance on many islands, where it provides recreation, status in the community and cultural heritage.

The future importance of tuna

For various reasons, it is inevitable that tuna will assume a much larger profile in the Pacific Islands in the medium and long-term future. It is likely that the significance of tuna will rise in a number of sectors, especially in the food security and economic development sectors.

Between 1990 and 2010, the population of the region will increase by 46 percent. This will result in a demand for fish of 166 776 t in 2010, or 58 535 t more than at present.

Given the fully exploited nature of many of the region's inshore and coastal fisheries, especially in areas where population increases will occur, major increases in fish from those areas is not likely. In fact, increased fishing effort, destructive fishing practices and degradation of coastal zone environments are likely to lead to a reduced amount of fish from inshore and coastal areas. The most likely scenario is that, in order to maintain nutrition standards, Pacific Island countries would have to make greater use of the region's tuna resources as food for their people.

For the Pacific Islands as a whole, economic growth during the past decade was almost nil. When this is combined with high population growth rates, the resulting outlook is gloomy. To make matters worse, the economies of the region will be facing additional difficulties due to severe shocks.

Many countries will face the loss or diminishing benefits from preferential trade arrangements. In addition, it is likely there will be a winding down of development assistance to the region (currently US$ 1.2 billion), reduction in remittance income from relatives overseas, reduced opportunity for emigration, termination of Compact Funds in Micronesia, depletion of forests in Melanesia, economic disruption from difficulties related to land tenure in Fiji and loss of phosphate income in Nauru.

To further complicate the economic situation, the future employment prospects are not promising. It is estimated that there are currently four to seven workers for each formal sector job. By 2011, there will be between five and nine workers for each formal sector job available.

In the future Pacific Island climate of very high population growth, economic stagnation, severe shocks and massive unemployment, it is inevitable, that the presently under-exploited tuna resources of the region will assume an importance very much greater than at present. Quite simply, in most countries there are few, if any, alternatives.

SOLOMON TAIYO TO EXPORT NEW PRODUCTS

Solomon Islands fish cannery, Solomon Taiyo, has begun exporting three new products to the United Kingdom. Company Manager (Commercial) Hiroshi Nishi confirmed the first shipment has left Honiara on 26 December 1997.

He added that the new products were ginger-flavoured, hot chilly tuna, and smoked barbeque flavoured tuna. He said currently the company exported only tuna in brine and oil, which were both very popular in the UK.

Nishi said that the giant supermarket chain in the United Kingdom, Sainsbury, recently asked that the three products be included in the next exports. He says Solomon Taiyo currently exported 530 000 cartons of canned tuna annually to the United Kingdom, and the first shipment of the new product has consisted of 1 700 cartons of each flavour.

(Source: Pacnews)

UNDP APPROVES FUNDING FOR THE MARSHALL ISLANDS

The United Nations Development Programme has announced the approval of a grant totalling US$ 230 000 for the Republic of the Marshall Islands. The money is to be used to assist the Ministry of Resources and Development prepare a biodiversity strategy action plan.

The project, entitled National Biodiversity Strategy Action Plan Enabling Activity will be executed by the Environmental Protection Authority of the Marshall Islands, and undertaken over an eleven month period. The Marshall Islands have an interesting diversity of plants and animals.

Of 31 species of seabirds recorded in the Marshall Islands, 12 are known to be solely from the Marshalls. Forty-nine genera and subgenera of stony corals have been recorded from Marshallese waters. A total of 817 species of fish are known to exist in these waters, as well as five species of turtles, two of which—the hawksbill turtle and the green turtle—are listed as endangered by the World Conservation Union (IUCN).

(Source: Pacnews)

INSTITUTE OF MARINE RESOURCES BUILT IN HONIARA

Construction work on the University of the South Pacific's Institute of Marine Resources in Solomon Islands' capital, Honiara, started in October 1997.

The SI$ 1.6 million (US$ 445 000) project is funded by the Solomon Islands government. Ministry of Education Under Secretary and Project Coordinator Moffat Ramoni said that the first buildings were due to be completed within 10 months. These will include lecture theatres, director's residence and storage facilities.

(Source: Pacnews)

TUNA LONGLINING OUT OF CAIRNS

by Lindsay Chapman,
Secretariat of the Pacific Community
Noumea, New Caledonia

Introduction and background

Tuna fishing in the temperate waters off Australia's East Coast has been well established by Australian operators. However, tuna fishing in the tropical waters off Cairns is a relatively new fishery to Australians. Commercial fishing trials were conducted off Cairns with government funding assistance in the early 1980s.

These trials used five prawn trawlers converted for pole-and-line fishing and handlining, with the yellowfin tuna (*Thunnus albacares*) caught being frozen for shipment to a cannery. The trials were not successful due to the low catches, the high operational costs, the price paid for canning tuna and the freight cost involved in trucking the catch to the cannery, around 3 000 km away.

In 1988, the Lamason family moved to Cairns from the south coast of Western Australia. Bob Lamason commenced tuna longlining trials in 1989 using his vessel F/V *Inquirer*. The trials were proving to be successful, with good catch rates for yellowfin tuna and bigeye tuna (*Thunnus obesus*) and export markets being developed. However, the pilot strike of 1989–90 put an end to these fishing trials as there were no flights to take the catch to export markets and there was basically no domestic market in the Cairns area for tuna.

After the pilot strike was over, Bob Lamason recommenced his fishing operation. It took time to re-establish and expand export markets and create domestic markets for his catch. Fishing was good, so Bob started to expand his fishing operation in 1992 with the purchase of his second tuna longline vessel, F/V *Vision* (Figure 1). As good catches continued and markets expanded, Bob Lamason founded 'Great Barrier Reef Tuna' in 1993, with the purchase of a modern processing plant at Portsmith, Cairns and the purchase of his third vessel, F/V *Return*. From 1994 to 1997, Bob continued to expand his operation with the purchase of another five vessels, most of them purpose-built fibreglass tuna longliners in the 18–20 m length range, built in Fremantle, Western Australia and sailed to Cairns, all fitted with the most recent electronic technology.

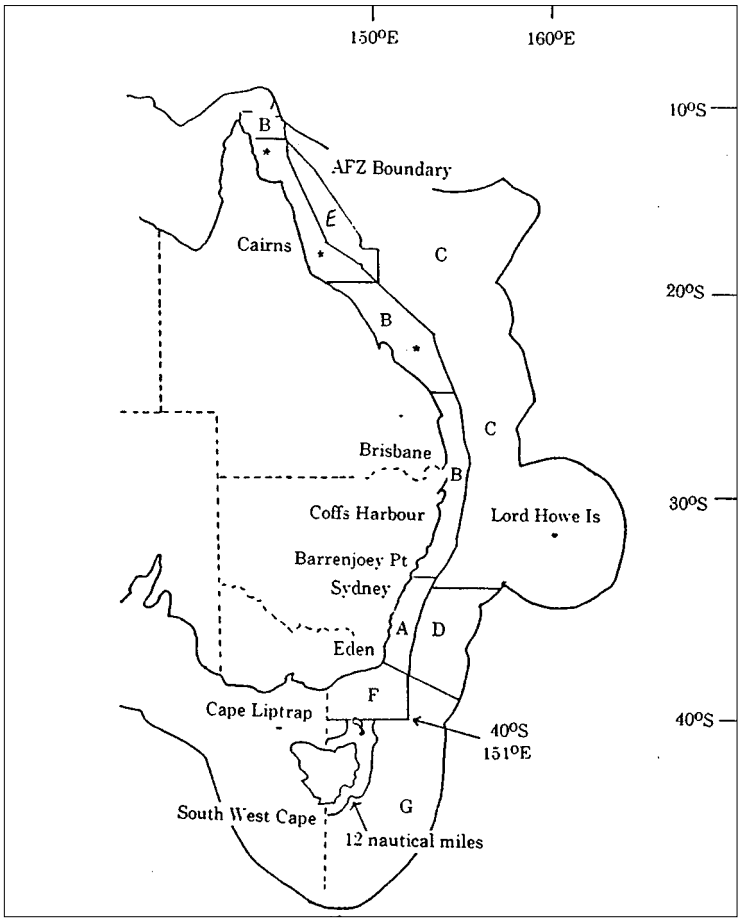
Figure 1: F/V *Vision*, the second vessel in Bob Lamason's fleet

There have been a number of other operators tuna fishing in the Cairns area over the past few years, which have stayed in the fishery for varying lengths of time.

Management and licensing arrangements

Management and licensing of commercial operators in Australia's tuna fisheries falls under the jurisdiction of the Australian Fisheries Management Authority (AFMA). For the Eastern Tuna and Billfish Fishery (ET&BF—Figure 2), a Management Advisory Committee (ETMAC) provides management advice to AFMA. The committee comprises representatives of the commercial sector, recreational sector, scientists, managers and state governments under an independent chairman, with observer status given to a conservation representative and a charter vessel representative. The main focus of ETMAC at present is to work with AFMA in the development and finalisation of a Management Plan that will give stability to operators in the fishery.

The main fishery off Cairns falls within the boundaries of 'Area E' (Figure 3) in the ET&BF. Only



13 licences are issued by AFMA for this area as it is an important recreational and game fishing location as well. Marlin is the main species targetted by the game fishing charter vessels, and they are concerned that the commercial by-catch of these species during tuna longlining operations could have an impact on the marlin stocks.

Resource sharing between the different fishery sectors has been promoted by AFMA in its management approach, especially in relation to marlins. However, the ET&BF has implemented a voluntary non-retention of marlin scheme for the entire fishery as a means of demonstrating to the game-fishing sector that it is not interested in retaining marlins, except broadbill swordfish (*Xiphias gladius*) and in some locations further south, striped marlin (*Tetrapturus audax*). In addition, a mandatory ban has been

Figure 2: Map of the East Coast Tuna and Billfish Fishery showing different zoning for licensing purposes

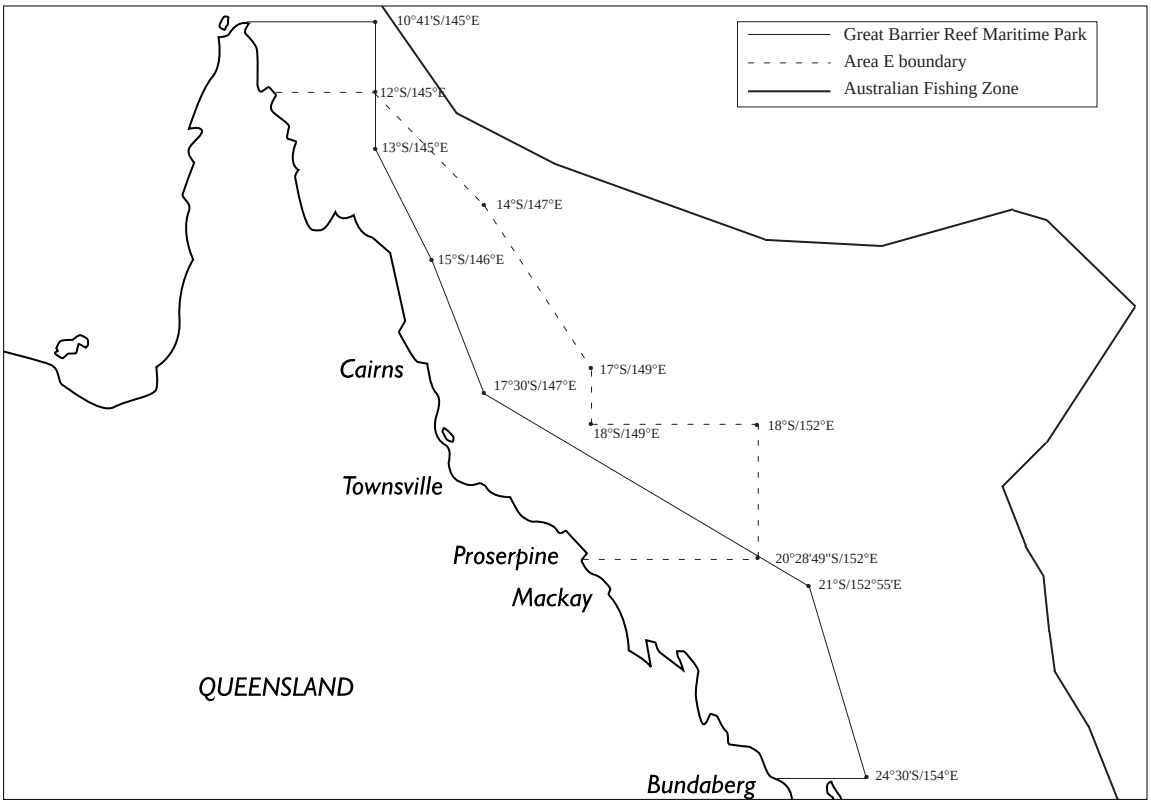


Figure 3: Area E of the ET&BF off Cairns

placed on the take of black marlin (*Makaira indica*) during their spawning season (September to January inclusive) in Area E only.

To try to fully understand the fishery in Area E, substantial research efforts have gone into looking at fishery interaction (between recreational/charter and commercial operations), gear performance in terms of targetting (or not targetting) marlins with certain longline configurations and independent observer coverage of domestic longline operations (i.e. marlin by-catch).

AFMA's approach to management of Area E has been to implement a tight reporting schedule where each vessel has to report two hours before departing port the intended location. Whilst at sea, a maximum of 500 hooks can be set at any one time, as a mechanism to reduce the by-catch of marlin, and when one is caught the chance of it being released alive is greater. At the end of fishing, each vessel must report two hours before entering port. In addition it is a mandatory requirement that the AFMA 'Australian tuna longline fishing logbook (ALO3)' be completed accurately for all fishing activities.

Great Barrier Reef Tuna—fishing operations

Bob's fishing operations have expanded from two vessels in 1992 to seven operational vessels in mid 1997, and the delivery of an eighth vessel, F/V *Total*, in July 1997. The main species caught are yellowfin tuna and bigeye tuna, with the mix varying from year to year, and albacore tuna (*Thunnus alalunga*). The main by-catch species include mahi mahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), broadbill swordfish, and moonfish or opah (*Lampris regius*).

The vessels have to travel at least 50 nm through the Great Barrier Reef to get to the fishing grounds and can fish up to 250 nm from port. All vessels have a hydraulically powered mainline reel with 3.5 mm monofilament mainline. Four radio beacons with flashing lights attached (Figure 4) are spaced equally along the mainline with the 500 hooks on individual 20 m branchlines, set around 40 m apart on the mainline.

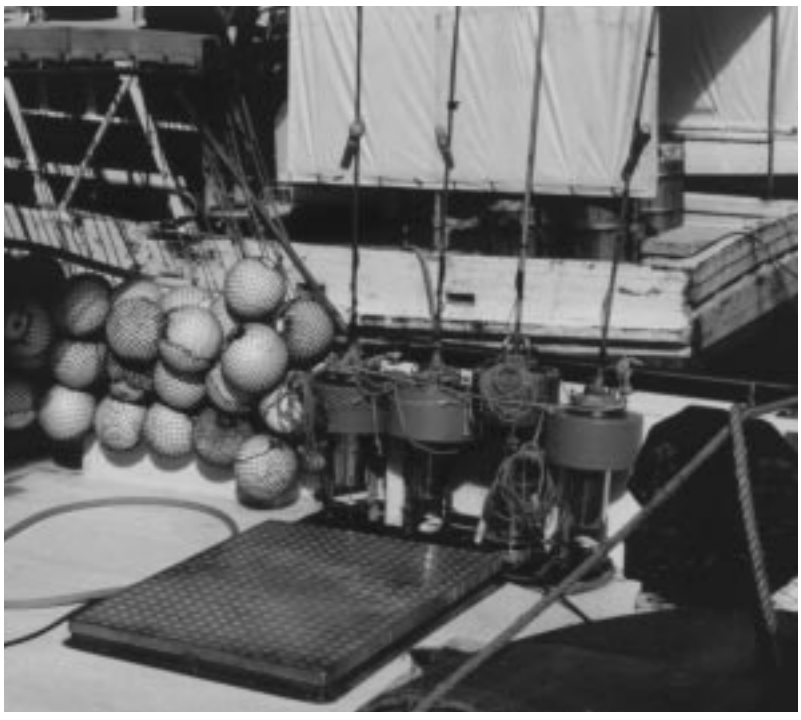


Figure 4: Radio beacons with lights and floats used in longlining operations

Setting takes 1.5–2 hours. The gear is then left to soak for several hours before hauling, which takes 3–4 hours. Two sets are made per day, with a fishing trip lasting 4–5 days and the return to port usually coinciding with flight schedules for marketing.

Handling the catch is very important to maintain the highest quality. When fish are landed, they are immediately spiked and bled. When bleeding is complete, the fish are gilled and gutted, the gut cavity scrubbed clean of blood, the fish rinsed, placed in a plastic bag, and then immersed in a RSW (refrigerated sea water) tank for chilling to 0°C.

All of Bob's vessels use RSW as the chilling medium for the catch—no ice is carried at all. Bob believes that RSW chills the fish quicker, saves handling time and effort (no need to ice the catch), saves space on the vessel, and reduces the operation cost of the vessel (no need to buy or handle ice at all). To avoid abrasion and rubbing of the fish, each fish needs to be protected. In Bob's case, plastic bags are used. The bags can be rinsed and re-used over and over again.

Great Barrier Reef Tuna—processing operations

Great Barrier Reef Tuna's processing plant is a 'Grade A' accredited Australian Quarantine and Inspections Service self assessment establishment. The design of the facility allows all processing to occur in a 'production line' style with no double handling, ending with the fish being cartoned and stacked on pallets

next to the door through which they entered. Attached to the processing facility is a retail outlet that is well patronised by locals and tourists wanting fresh tuna or other pelagic species, usually sold in fillet or steak form.

When the vessels come in to unload, they tie up at their berth at a marina, less than one kilometre from the packhouse. As the vessel deck is lower than the wharf area, a ramp is used to unload. The catch is taken from the RSW tank, the plastic bag removed and the fish pulled up a ramp (Figure 5) and placed in a tub in the back of a refrigerated truck for transport to the packhouse. The tub has RSW in it to maintain the temperature of the catch during transportation to the packhouse.

Once at the packhouse, the tubs of fish are unloaded by fork lift and placed beside the stainless steel processing and packing tables (Figure 6). The fish are then placed on the tables, with each fish checked for cleanliness with any remaining blood removed from the gut area (Figure 7).

A trigger-operated spray unit with chilled water is used in this operation. Chilling of the water used in processing is achieved by having coils of copper pipe mounted in one of the chill rooms (Figure 8) with the water coming from a tap, through the pipes in the chill room to the trigger operated spray unit. This is a cheap, easy way to maintain the coolness of the fish during final processing and checking of the product before packing.

Once the fish has been checked, a cut is made in the tail so that the flesh can be seen for grading. The fish is then slid onto a 'table scale' for weighing (Figure 9), the weight recorded and the fish slid off to the packing end of the 'process line'. The grade of the fish and its size will dictate the market the fish will be sent to. Fish are packed into cardboard 'coffins' inside plastic liners with several 'ice packs' added, one in the gut cavity of each fish and others loose in the carton. Several fish are placed in each carton, so the weight is around 80–100 kg. The cartons are then well sealed, well labelled with number, weight and species of fish as well as destination, and either stored on a pallet in a chill room or placed in an air-freight cargo container, ready for transporting to the airport.

Figure 5: Unloading the catch by hauling the fish up a ramp from the vessel to a refrigerated truck

Marketing the catch

The main aims in marketing are to provide the buyer with the quality of product they want, and to be in a position to supply it when they want. Having a fleet of seven (now eight) vessels staggered in their landing times allows the above marketing criteria to be met. The selection of markets to send each fish to is also a part of the marketing strategy. Over the four years of operation, the customer base for product has increased to over 130 clients, intrastate, interstate and overseas. From 5 to 25 t of fish are processed each week with around 65 per cent exported and 35 per cent sold domestically (including retail sales).

The main markets for Great Barrier Reef Tuna are in Japan, and product is air-freighted on direct flights from Cairns International Airport. Great Barrier Reef Tuna uses a marketing strategy of selling some product at a fixed price to buyers, with the balance placed on the auction floors in Tokyo, Sapporo, Nagoya, Osaka and Sendai.

The species and size of fish dictate which market in Japan each fish or carton will go to. Although the fixed-price buyers do not pay the same rates that can be

Figure 6: Fish in tanks of RSW waiting for processing, grading and packing

Figure 7: Inspecting each fish with final trimming being conducted when necessary

achieved on the auction floor, a greater range of sizes and grades can be sold. Also these buyers will take some albacore, a fish not usually exported. Nominal quantities of tuna are also supplied to the Hawaii market at times.

The domestic market for product continues to expand as the palates of Australian consumers change. Sales intrastate and interstate continue to increase for tunas, mahi mahi and wahoo. Low-value species such as skipjack tuna (*Katsuwonus pelamis*) and some albacore tuna are frozen and sent for canning, while some go to the crocodile farms for feed. This means that virtually nothing is wasted from the Great Barrier Reef Tuna processing operation. Retail sales through their shop continue to increase as locals and tourists experiment with the different species on offer. Tuna loins, fillets of mahi mahi, wahoo and moonfish are on offer. The offcuts from filleting are chopped and sold to the crocodile farms, or to local companies that take tourists to the reef, so they can feed fish in the wild. The retail shop also buys in other marine

Figure 8: Copper piping mounted in chill room to provide chilled water to processing area

Figure 9: Weighing each fish on a 'table scale' and recording the weight

products of a high quality so that customers have a wider selection to choose from.

The latest vessel in the fleet—F/V *Total*

Bob Lamason's latest vessel, F/V *Total,* was delivered to Cairns in July 1997 ready to be fitted with tuna longlining gear. The vessel was built by New Westcoaster Pty Ltd in Western Australia. This fibreglass vessel is 20 m long with a beam of 6.5 m and draws 1.9 m (Figure 10).

The main engine is a 640 HP 6 cylinder Yanmar diesel with 3:1 reduction gearbox, and a 4 cylinder Perkins auxiliary driving a 37.5 KVA generator. The hydraulic system is driven from a power take-off on the main engine. The vessel holds 10 000 l of fuel in four tanks in the engine room and 4 000 l of fresh water stored in two tanks under the forward bunks.

F/V *Total* has 8 berths including a captain's cabin, toilet, shower, and spacious galley area. Six

Figure 10: Bob Lamason's latest vessel, F/V *Total*

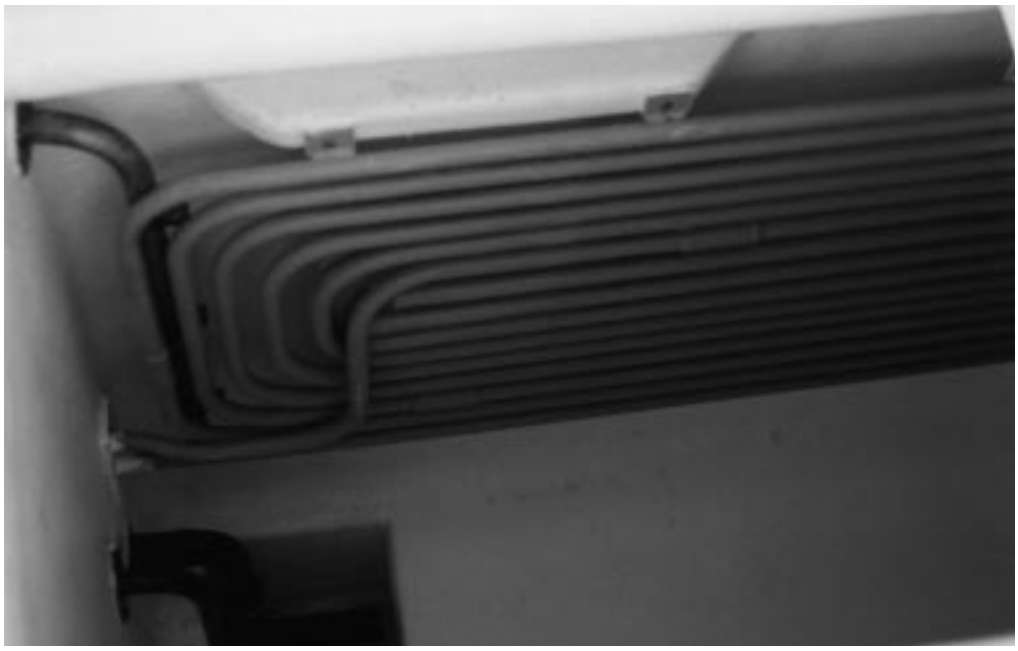


Figure 11: Refrigeration coils and sump in one of the six RSW tanks

large RSW tanks are located below deck with a total holding capacity of around 20 t of chilled product.

Each tank has its own thermostatically controlled refrigeration coils mounted on one side (Figure 11) with a sump for draining. A circulation pump is also used to move the RSW around the tank and across the coils to maintain the desired temperature of 0°C.

The vessel also has an outside steering position with engine and hydraulic controls on the port side (Figure 12) for use during hauling operations.

Summary

The development of a tuna longlining industry out of Cairns by Bob Lamason has been very successful. Great Barrier Reef Tuna has expanded annually since 1993 and has generated employment for over 45 people on the fishing vessels and in the processing plant.

Future expansion will depend on the management controls implemented by AFMA as a new Management Plan for the ET&BF is finalised and introduced.

Reference

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Figure 12: Outside steering position with Bob Lamason (left) showing other fishermen over his new vessel

CIGUATERA HITS HONG KONG LIVE REEF FISH TRADE

by Yvonne Sadovy
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The demand for live fish for the South East (SE) Asian food market has grown rapidly in the last 10–15 years (Johannes & Riepen, 1995), especially in Hong Kong, Taiwan and China where retail prices for the most favoured species can exceed US$ 100 per kg.

Originally, most of the fish included in this trade came from the South China Sea but, as demand increased and stocks close to the major importing nations became depleted and could no longe supply the market, fish were increasingly sought from further afield.

By the 1990s, live food fish entering Hong Kong, the major importer and accounting for 60 per cent of the trade, came from as far west in the Indian Ocean as the Maldives and as far south and east as the Marshall Islands, Solomon Islands, the Great Barrier Reef of Australia, and adjacent areas (Johannes & Riepen, 1995).

So valuable is this trade that market prices can accommodate the long and expensive transportation costs from these more distant locations to Hong Kong where the total annual wholesale value of the live reef fish trade exceeds that of the entire traditional (i.e. chilled fish) capture fishery (Lee & Sadovy, unpubl. ms.)!

The growing trade in live reef fish for food has spawned a number of concerns which relate to both resource use and to issues of human health. Overharvesting of resources is obvious in some areas, for example, from the fishing of spawning aggregations, the taking of large numbers of juveniles and worrying declines of certain particularly vulnerable species such as the humphead (Maori or Napoleon) wrasse.

The use of sodium cyanide to catch fish for this market is also of concern since sodium cyanide is toxic to reefs (Jones, 1997) and reef communities, and may be used to take a significant proportion of fish marketed (e.g. Barber & Pratt, 1997). The consequences for humans of consuming fish caught with sodium cyanide are not known.

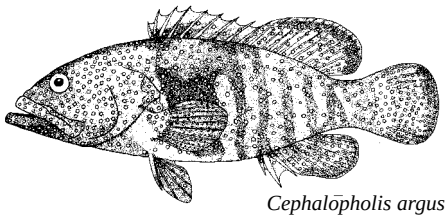
What is evident, however, is that there is a growing risk to consuming nations in SE Asia of ciguatera fish poisoning because of the species being marketed, i.e. a number of top reef predators species often implicated as ciguatoxic:

- *Cheilinus undulatus*,
- *Lutjanus argentimaculatus*,
- *Lutjanus bohar*,
- *Symphorus nematophorus*,
- *Cephalopholis argus*,
- *Epinephelus fuscoguttatus*,
- *Epinephelus lanceolatus*,
- *Epinephelus merra*,
- *Epinephelus polyphekadion*,
- *Epinephelus tauvina*,
- *Plectropomus laevis*,
- *Plectropomus leopardus*,
- *Plectropomus oligacanthus*,
- *Plectropomus pessuliferus*, and
- *Variola louti*

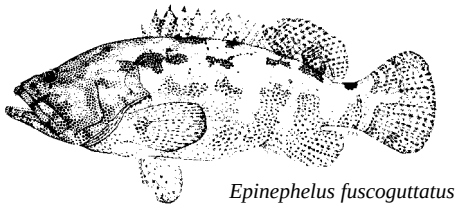
and the expansion of the trade into areas known for producing ciguatoxic fish of some of these key desired species. As a consequence, there is a growing likelihood of ciguatoxic fishes being imported into major consuming nations.

Ciguatera fish poisoning is recognised as a serious health problem in the tropics and subtropics (Chan et al., 1992) and is likely to grow with increasing international trade in reef fishes. Ciguatera poisoning has not historically been a problem in SE Asia (ciguatoxins have rarely been reported in fish from the northern South China Sea) and so the general public is largely unaware of ciguatera. However, with many potentially poisonous species of live fish brought in Hong Kong from known hot spots of ciguatoxic fish in the Indo-Pacific (e.g. Lewis, 1986; Glaziou & Legrand, 1994), ciguatera is expected to represent an increasing problem for Hong Kong, and for other importing nations, as demand for live fish grows.

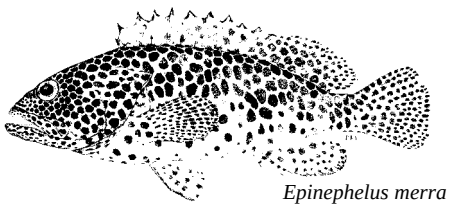
Indeed, available figures indicate a marked increase in confirmed ciguatera poisonings in Hong Kong from the 1980s into the 1990s. Although evidently little known prior to 1984, between 1984 and 1988, inclusive, there were 23 cases of ciguatera poisoning reported affecting 182 people (Hong Kong Standard



Cephalopholis argus



Epinephelus fuscoguttatus



Epinephelus merra

27/5/88). In the last decade, the number of reported cases has increased from 7 cases, between 1988 and 1990, inclusive, to 31 cases and 245 victims in 1991–92, and 39 cases with 182 victims, in 1993–94; in 1995 13 cases and 53 victims were recorded (Hong Kong Department of Health).

Doctors, however, believe that the actual number of cases is much higher and that most are either unreported, or misdiagnosed as food poisoning (Chan et al., 1992).

The Hong Kong Department of Health is aware of ciguatera as a health issue and has periodically issued warnings of the risk. It also carries out a number of tests on imported fish, including one for ciguatera.

However, these tests are only carried out on dead, chilled, fish since live fish are not, surprisingly, classified as food in Hong Kong under current legislation. This means that the species most likely to carry ciguatoxins, the larger reef fishes imported live, are not currently screened for ciguatera on import into Hong Kong.

Moreover, since monitoring of the live food fish trade in general is incomplete, it would not, at present, be possible to determine the sources of most live reef fish coming into Hong Kong, and thereby to identify fish most likely to be of risk in harbouring ciguatoxins. Representations have been made to the government to address this human health issue by improving monitoring and by testing of live fish on import, especially those fish coming in from high risk areas.

Ciguatera is a significant health and resource problem in tropical areas because of its erratic and often unpredictable spatial and temporal distribution (Lewis, 1986). This is a problem for those nations where ciguatoxic fishes occur that wish to develop their demersal marine resources (Dalzell, 1992).

It is also a problem for places, like Hong Kong that are largely naïve to the risk of ciguatera poisoning, which do not have a monitoring or testing programme with which to tackle the issue and which have overfished their own resources and hence rely on those from elsewhere.

Moreover, importers themselves appear to be largely unaware of, or simply unconcerned about, the potential risks of importing ciguatoxic fishes.

There is also a broader issue that should be considered. Sodium cyanide is used to catch a significant proportion of live reef fish for food (it is also used to catch fish for the aquarium trade and to take juveniles for mariculture).

Cyanide has been shown to be damaging to the reefs themselves (Jones, 1997). Bearing in mind that there are already links between cyanide and habitat damage and that habitat damage has been associated with providing surfaces for the settlement of dinoflagellates implicated in ciguatera fish poisonings in French Polynesia, Pacific, and in the Caribbean's Virgin Islands, (Bagnis et al., 1988; Kohler & Kohler, 1992), it would be prudent to address the various problems of the live reef fish trade as a whole, rather than piecemeal. Such an approach is necessary to ensure a sustainable and healthy fishery of live fish that continues to be lucrative well into the future and for as many countries as possible.

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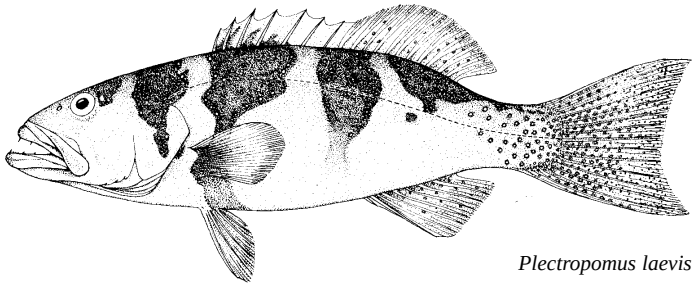
Addendum

Since this article was written, in the first few weeks of 1998, one or more shipments of fish came into Hong Kong from the western Pacific containing ciguatoxic fish. So far this year, 113 people have suffered from ciguatera. There have been no mortalities to date but there is a lot of public concern. The suspected species of fish is the tiger grouper although the source of the fish has not been officially confirmed. At the date of writing, the Hong Kong Government has not decided what measures to use to reduce the probability that ciguatoxic fishes will enter the local markets. Until now, public health warnings have simply suggested that the public avoid eating reef fish larger than 1.8 kg and to reduce fish intake in general.

A recommendation was also made to select cultured fish where possible. Demand for live fish has fallen along with prices. Problems have been encountered with an estimated hundreds of tonnes of imported fish piling up due to poor sales. Moreover, large shipments will have arrived arrive in Hong Kong prior to the Chinese New Year period, starting on 28th January, when fish consumption usually increases. The government and industry are looking for ways of dealing with this problem which has been a major blow to the live reef fish trade.



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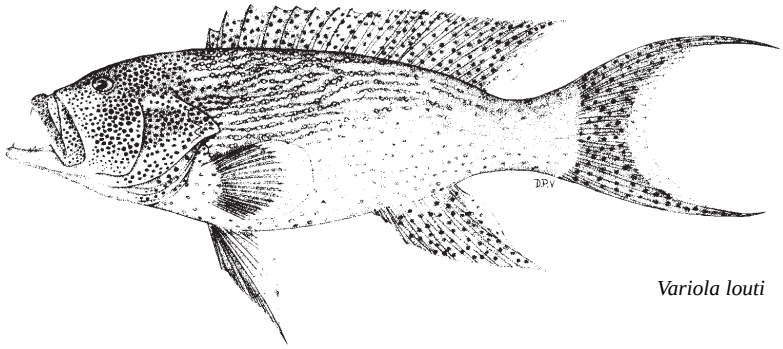

Variola louti

SAFETY ON FISHING VESSELS IN PACIFIC ISLAND COUNTRIES

by Stephen Beverly
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Safety on fishing vessels in Pacific Islands countries came to the forefront of fisheries development issues during 1996 and 1997. Two of four long term SPC Masterfisherman assignments in member countries were severely curtailed during this time period because of safety issues.

In 1996, while in Pohnpei, FSM, the Masterfisherman spent most of his time ashore upgrading NFC's vessel, F/V *NFC Waab* (see *Fisheries Newsletter* #77), so that he could go out on just two longline trips during a four month project.

The vessel was found to be grossly deficient upon the Masterfisherman's arrival in Pohnpei. All of the safety appliances and equipment were either missing or out-of-date. Almost the exact same scenario unfolded in Tonga during 1997 with the Ministry of Fisheries vessel, F/V *Ekiaki*—refer to *Fisheries Newsletter* #82.

The Masterfisherman went on only two trips during a four month assignment. He was unable to go out on any private longline vessels in Tonga as most were not safe or seaworthy during the time of the project.

Also during 1997 ten crew members of a Fiji based longline vessel, F/V *Wasawasa*, lost their lives at sea during Cyclone Gavin; and around twenty Samoan fishermen were lost at sea while longline fishing from Alia catamarans.

Some SPC member countries have improved their situations in the last few years, such as Cook Islands, but others still lag far behind.

A recent article in *National Fisherman* (May 1997) stated that:

> *Stastically, a higher percentage of people die in commercial fishing than in any other occupation in America. According to Bureau of Labor Statistics, you're 20 times more likely to get killed fishing than mining coal.*

In America, new safety regulations came into effect in 1991. Since then, the number of people who have died while fishing has dropped from a high of 102 in 1989. Sixty-seven people lost their lives in 1991 and the number has not gone over 95 since then.

The new regulations in America require fishing vessels to not only have the usual array of safety appliances and equipment, but to conduct monthly safety instruction, drills, and orientation. Required drills and instructions include abandoning the vessel, fire fighting, man overboard recovery, stabilising the vessel after unintentional flooding, launching survival craft, recovery of life and rescue boats, donning immersion suits and PFDs (personal flotation devices), radio and visual distress calls and signals, activating the general alarm, and reporting of all inoperable alarms and fire detection systems.

At least one person onboard must be trained to conduct drills or be licensed for inspected vessels over 100 gross tons. The US Coast Guard has published a pamphlet titled 'Federal Requirements for Commercial Fishing Industry Vessels' that is a guideline for all commercial fishermen in America.

In America—including Hawaii—the US Coast Guard has the authority to board fishing vessels at any time—at sea or at the wharf—for safety inspections. Usually, warnings are issued for first offences, but violaters can be fined and imprisoned for going to sea in an unsafe fishing vessel. Vessels are usually boarded and inspected at least once a year.

All of this paid off for two fishermen who were rescued after spending 28 days adrift off the Island of Niihau in Hawaii during December 1996 (*National Fisherman*, August 1997, p. 27).

In spite of the fact that their EPIRB (emergency position indicating radio beacon) did not work, that they did not have time to send out a Mayday, that they ran out of food and water, and that the US Coast Guard had given up on them, Richard Enslow Jr. and David Summers survived 28 days in a six person liferaft after their 15 metre bottom fishing vessel, F/V *Lady Aud* sank on 9 December. Eventually they were picked up by a Kauai fisherman, Kevin Yamase. Ultimately, the liferaft saved them but, consider this, two men found the size and the supplies of food and water on a six person liferaft inadequate.

Safety appliances and equipment

The array of safety appliances and equipment required on a fishing vessel depends on a number of factors: the size of the vessel, the operating range of the vessel, the number of crew, and the laws in force in the country where the vessel is operating.

The following is a general list of safety gear that should be the minimum required on a small to mid-sized fishing vessel—15 to 24 metre—that operates within a Pacific Island Country's EEZ—out to 200 nautical miles:

1. Liferaft suitable for number of persons on board—this should be an offshore model with double flotation rings, stabilizer pouches or ballast bags, and canopy—and should contain distress signals, food, water, a torch or flashlight, a bailer, a knife, a patch kit, an air pump, a sea anchor, a heaving line, a water distillation kit, a medical kit, and a fishing kit. The liferaft should be self launching—i.e. it should have a hydrostatic release mechanism.

2. Offshore life jackets or Type 1 PFDs—one for each person on board—these should have lights, whistles, and reflective tape.

3. Lifering with lanyard, lifering with light—these should be marked with the vessel's name and should be mounted properly, not stored away.

4. Distress signals—2 rocket flares, 2 smoke signals, 6 hand flares, in a water tight container.

5. EPIRB—this should be a 406 MHz model although 121.5–243 MHz models are acceptable in some areas. EPIRBs should have self launching capabilities—hydrostatic release mechanism.

6. Fire extinguishers—CO_2 and dry chemical are best on boats as they are suitable for all types of fires including electrical fires. It is best to have more than the minimum number of extinguishers required, especially on a fibreglass or wood vessel.

7. Pumps—bilge pumps and washdown pumps can be used to fight fires but it is good to have a hand operated pump as a backup.

8. Fire hoses and metal fire buckets.

9. Medical kit—at least one person on board should have some first aid training including CPR–cardio-pulmonary resuccitation.

10. Two water proof torches—flashlights.

11. Binoculars.

12. Up-to-date charts.

14. Navigation tools dividers, parallel rule, and the like.

15. Wheelhouse books—Light List, Pacific Sailing Directions, International Regulations for Preventing Collisions at Sea, IALA System of Buoyage, Chart Symbols and Abbreviations, Ships Medical Book.

16. VHF radio and SSB radio—these should have a power source that is independent of the main power source from the engine room, i.e. an isolated backup battery bank. 2182 MHz on the SSB and Channel 16 on the VHF should be monitored 24 hours a day while at sea.

17. GPS or global positioning system.

18. Engine room alarms including main engine and generator oil pressure and coolant temperature alarms, bilge high water level alarm, and high heat and fire detection alarm—the galley should also have a fire detection alarm.

19. General alarm.

20. Anchor and anchor chain or cable and rope suitable for the vessel's size.

One thing to keep in mind about the above safety gear list is that it represents the **minimum** requirement for keeping you alive. It is a good idea to have backups and even more equipment and supplies than is required by law.

Two good examples of this are fire extinguishers, and the food and water supplies provided on liferafts by the manufacturers. The minimum number of fire extinguishers usually required on a fishing vessel would not be adequate on, say, a fibreglass vessel with an engine room fire. To be safe it would be better to have more than the required number of extinguishers.

As for the equipment and supplies that come with a liferaft—the food and water are usually only enough for about seven days. What do you do if you are drifting in a liferaft for several weeks? You could survive on fish—but the fishing kits provided in liferafts have been described by more than one person as a joke.

The fishing kits typically include light test line with no wire leader or trace, and very small hooks. The type of fish that are associated with liferafts are often game fish like mahi mahi (*Coryphaena hippurus*) or mako or white tip sharks (*Isurus oxyrhincus* and *Carcharhinus longimanus*). Any one of these three species would soon destroy the fishing gear packed in even the best liferaft.

Another thing to keep in mind is that many of the items in the list above have limited shelf lives and have to be renewed or inspected regularly.

A liferaft that is ten years out of service would probably not inflate upon deployment. The food ration in such a liferaft would undoubtably be rancid. Fire extinguishers that are empty will not put out fires. An EPIRB with dead batteries will not send a signal. It is essential to service and renew all safety appliances and equipment by the expiration dates.

There are several good books written about heroic tales of survival at sea on liferafts after sinkings. One mariner, Dougal Robertson—who survived for 37 days in a liferaft in the Pacific along with five others after his sailboat was sunk by killer whales in the early 1970s—wrote a book entitled *Sea Survival a Manual* (Praeger Publishers, New York 1975).

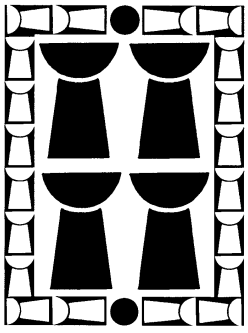
This book should be required reading for all fishing boat captains and should be in all wheelhouses along with the books listed above in 15. A more recent book, *Survivor* (Blue Horizon Press, San Diego 1986), by Michael Greenwald, is also good reading for fishermen. Survivor is part anthology and includes several harrowing stories including that of a man and wife who survived 117 days at sea drifting in a liferaft and dinghy after their sailboat sank near the Galapagos Islands in 1973. Greenwald also updates and expands on much of the valuable survival information given in Robertson's book.

One thing that Robertson and Greenwald both emphasise is that in addition to all of the required safety gear, a vessel should always take along some backup supplies. It is a good idea to have an emergency supply of water in portable containers. Plastic bottles or containers work fine for this. They should be water tight and should be filled about 80% full so that they will float—the air space will float them. The water jugs should be stowed so that they are readily accessible.

Also, a vessel should always have an emergency supply of food. One or two weeks supply of tinned food—fish, corned beef, fruit—and biscuits should be on board. Food that requires no preparation is best and tins with key openers or ring openers are very convenient—they don't require an opener or knife. Emergency food should be recycled every few months so it doesn't go beyond the product shelf life or expiration date.

Emergency food should be stowed in a cloth or canvas bag and should be readily accessible in the event of sinking or abandoning ship. The emergency food supply can also be very useful if the vessel breaks down and is adrift for an extended period and the regular food supply becomes exhausted.

An emergency fishing kit made up of medium and heavy duty gear is also recommended. A good supply of various sizes of monofilament, wire leader, hooks, sinkers, and jigs—for hand line fishing and hand casting—should be packed in an emergency water tight container. A good knife and a small gaff should be included in the kit.



Some tricks of the trade

Fishermen have to be inventive. Here are some tricks of the trade that could save you money or your vessel or life.

How to fix a leaking main shaft packing gland

The number one cause of engine room flooding on fishing vessels is the main shaft packing gland (*National Fisherman*, May 1997, p. 33), also sometimes called the stuffing box. The shaft gland is where the shaft enters the stern tube. The shaft exits the stern tube at the Cutlass bearing to supply power to the propellor.

A main shaft gland operates exactly like a pump shaft gland. The shaft tube—or stern tube—is a large hole in the hull of the vessel leading directly to the engine room. Keeping the joint between the shaft and the hull from leaking poses a special problem because the shaft is always rotating when he vessel is moving.

The problem is solved by packing the engine room end of the shaft with rings of silicon or graphite impregnated fibre—the packing. Packing comes in coils and is square shaped in cross section. It has to be cut in lengths equal to the circumference of the shaft. One piece makes one ring.

Usually about six to ten rings of packing are stuffed into the sleeve around the shaft—the stuffing box—and then they are packed down with an adjustable gland. The diameter of the sleeve is larger than the rest of the stern tube and the packing butts up against the back end of the stuffing box where the diameter is smaller—often at a bearing or a bushing. Pressure on the gland can be increased or decreased by adjusting the nuts on the packing gland studs.

The gland compresses the packing so that it increases in thickness around the shaft and keeps water out while allowing the shaft to rotate.

In most systems, a little sea water is allowed to trickle into the engine room from outside. This water cools the packing and the shaft, and actually acts as a lubricant. Sea water is allowed to pass into the engine room, in this case, via the Cutlass bearing—at the other end of the shaft—or by means of water scoops on the outside of the stern tube, which is usually imbedded within the skeg. These scoops are usually designed so that water is scooped into the stern tube as the vessel moves forward in the water.

Some packing glands are designed so that grease or oil can be dripped or pumped into the stuffing box to lubricate the packing and to keep water out. Others have water pumped directly into the stuffing box—usually engine coolant water—and out the Cutlass bearing. Shaft gland packing is usually renewed at annual dry docking.

In any case, if the packing fails, water can enter the engine room at an alarming rate. Packing can fail by simply wearing out, or as is more often the case, by burning up because of lack of lubrication—if the gland was too tight. The gland is usually tightened as a first measure when flooding starts.

However, if too much packing is worn or burnt, the gland will bottom out. At this time more packing rings are needed or the packing needs to be changed completely. If the packing completely fails, water can enter the engine room faster than the bilge pump can remove it.

If this happens, the vessel is in immediate danger of sinking. If the gland is loosened to put in more packing, flooding will increase. If the vessel is at the wharf, auxillary pumps can be brought in and the boat can be saved, but what can be done at sea to repair a leaking packing gland or to completely change the packing?

The solution is fairly simple and should be known by all fishermen—it could save your life. All that is needed is spare packing, some air conditioner putty (putty that is waterproof and will not harden), skin or scuba diving gear, and a few tools. It is a good idea to have a packing removal tool on board at all times—this is a tool that resembles a corkscrew on a long Tee handle.

First, a chunk of putty is formed into a large worm. The length of the worm should be three times the diameter of the shaft so it will go all the way around. Additional putty is needed if there are water scoops on the skeg. A diver goes down under the stern of the vessel and presses this 'worm' of putty around the shaft where it exits the Cutlass bearing.

Next, balls of putty are stuffed into the water scoops on either side of the skeg. The stern tube should now be temporarily watertight. Water pressure keeps the putty in place.

Working quickly, the captain or engineer can now loosen the packing gland, remove all of the worn or burnt rings of packing—using the packing removal tool—and add additional or all new rings to the stuffing box.

Rings should be cut so that they are about one millimeter smaller than the circumference of the shaft. The packing should be cut at a 45° angle so that the cut ends overlap eachother. The cuts on the rings should be alternated so that one ring is placed with the cut facing up and the next placed with the cut facing down and so on.

After all of the packing has been replaced and the gland tightened, the diver should dive under the vessel again and remove all of the putty. The gland should be adjusted so that a trickle of water flows into the engine room while the shaft is turning.

Often, one more ring has to be added after the packing has seated itself. The packing gland should be watched carefully for the first two or three days after the packing is changed to make sure that it is not overheating or leaking too much.

A vessel and the lives of those aboard can be saved with just a few dollars worth of putty.

How to fix a leaking pipe and a leaking hose

A leaking pipe can be fixed with a piece of rubber sheeting—or inner tube rubber—and two hose clamps. Cut a piece of rubber sheeting large enough to overlap the leak and go all the way around the pipe. Attach two hose clamps to the pipe so they apply pressure to the rubber sheet on either side of the leak. Tighten the clamps until the leak stops. If the leak is particularly bad, you may need to use four hose clamps. If there is no rubber sheeting in the vessel's stores, cut a piece from a diver's wet suit or from a gum boot. If there are no hose clamps, use bailing wire.

If there is hose available that has an inside diameter the same as the outside diameter of the leaking pipe, then the same method as above can be used to fix the leak except that hose is used instead of rubber sheeting.

First, cut the pipe with a hacksaw so that the leaking section is removed and you have two clean cut pipe ends. Next, cut a length of hose long enough to fill the gap in the pipe and overlap the cut pipe ends. There should be

enough room on either end for one or two hose clamps. Then, slip the hose clamps over the pipe. Slide the hose onto one end of the pipe.

Then, slide the hose over the gap in the pipe and over the other cut end of pipe. Tighten the hose clamps on either side of the gap. If two hose clamps are needed on each side, alternate the direction of the tightening screws—one facing left, one facing right—so that the hose does not pucker.

Similarly, a leaking hose can be fixed using a short length of pipe and two hose clamps. First, cut a short length of pipe that has an outside diameter the same as the inside diameter of the leaking hose. Next, cut the hose all the way through where it is leaking.

You may have to trim off a bit of hose if it is damaged. Insert the small piece of pipe half way into one of the cut ends of hose. There are commercially made male-to-male hose inserts with ribs made specifically for this job, but a scrap piece of pipe will do in most cases. Slip both hose clamps over the hose and insert the other end of the small pipe into the other cut end of the hose.

Now tighten the hose clamps, one on either side of the cut in the hose. If the hose is being used for pumping liquid at too high a pressure for your patch to hold, try adding two more hose clamps.

Hydraulic hoses can not be fixed using the above method. Hydraulic systems operate at very high pressures and hose clamps would not hold. If a hydraulic hose springs a leak, it is time to replace the hose.

However, if there are no spares aboard, a temporary repair can be done if you have some spare fittings. You will need two re-usable female swivel hose end fittings and a male-to-male nipple—either JIC, BPT, or NPT—as long as they match, a hacksaw, and two adjustable wrenches.

First cut the hose with the hacksaw on either side of the damaged portion so that you have two clean hose ends with straight 90° cuts. Next, attach a re-usable female swivel fitting to each hose end using the adjustable wrenches.

Then join the two hoses by tightening each of the female hose ends over the male nipple. This repair can also be done using one female swivel hose end fitting and one male hose end fitting.

If no spares are available, it is often possible to 'borrow' a hydraulic hose from another system on the vessel that is not being used. For instance, you could borrow a hose from a longline fishing reel to make the steering work. Just remember to loop the circuit back together where you borrowed the hose so all of the hydraulic fluid does not leak out.

In each of the cases above, the temporary repair should be fixed properly the next time the vessel returns to port. Makeshift repairs do not usually last long. Do not depend on them.

How to make a box patch

A vessel that is holed as a result of a collision or of striking the reef—or from rotten planking or hull plates—can sink if repairs are not carried out quickly. Large, irregular holes are often very difficult or impossible to plug up with round or wedge shaped wood plugs. A box patch is a good way to temporarly plug up an irregular hole in the hull of a vessel. A box patch consists of four parts:

1. A stiff piece of plywood, steel plate, or aluminium plate with a hole drilled in the centre—this piece should be larger than the hole in the hull;

2. A smaller stiff piece of wood or steel or aluminium that is longer than the hole in the hull is wide, but not necessarily larger than the entire hole;

3. Some sort of sealing material like foam rubber or rubber sheeting that is roughly the same size as the first piece (1); and

4. A large bolt with nut and flat washers, that is long enough to pass from the outside of the vessel, through all three pieces of the patch and be tightened from the inside of the vessel.

The box patch can be made from almost anything on the vessel if no material is available as spares. Cupboard doors or engine room deck plates would do for the first piece (1); a length of four by two timber or a piece of angle iron would do for the second piece (2)—this could be 'borrowed' from some other part of the vessel; and a lifejacket, seat cushion, diver's wet suit, gum boot, or foul weather gear would do for the sealing material (3).

Some crude measurements have to be made before the pieces are all cut but nothing has to be pretty or precise in a box patch. After the pieces are cut and holes are drilled or cut into the three pieces, the bolt and one flat washer are put into the holes on pieces (1) and (2). Piece (3) and the nut and one washer for the bolt are left on board.

The patch—parts (1), (2), and the bolt—must be taken outside the vessel, usually by a diver or someone in the water, who can reach down to the level of the hole. Sometimes this can be done from the inside of the vessel as in the case of a rectangular patch that will fit through the hole in

one direction—don't drop it! The patch is then pulled up tight to the hole and piece (3) is placed over the bolt so that the ends of piece (3) extend beyond the hole in the hull. The washer and nut are then screwed onto the bolt and tightened. As the bolt is tightened, the outside of the patch will be pulled tightly to the hole, compressing the sealing material around the edges of the hole and, hopefully, sealing it and stopping the leak.

If the hull is rounded where the hole is, the sealing material—if it is thick enough—will conform to this shape. Otherwise, piece (1) may have to be bent as in the case of a steel or aluminium patch, or two bolts will have to used to bend the patch as in the case of a wood patch.

There are commercially available box patches that look like umbrellas. These can be put in place from inside the vessel, as they collapse and then expand again when tightened. They work exactly like a butterfly bolt that is used to hang paintings on a wall with no studs.

Spanish windlass

A Spanish windlass is a device that acts like a block and tackle or chain fall, only it doesn't have any fancy parts and can be made from what is available on any vessel.

Only two things are needed to make a Spanish windlass: a length of rope and a piece of timber or pipe. A Spanish windlass can be assembled in a matter of minutes and enables one man to move or lift large objects, to open or to seal hatches, to hold a breaking up vessel together, or to secure shifting cargo.

A Spanish windlass could also be used to secure a box patch. A vessel could be saved by a piece of rope and a stick of wood.

It is very simple to make a Spanish windlass. First, find a piece of rope that is a little over twice as long as the distance between the two objects in question. The two objects in question are usually one stationary object like a bulkhead, frame, or stringer, and one object that needs to be moved or secured like an engine block, a loose hatch, or a bulky piece of shifting cargo.

Next, tie the rope into a loop so that the doubled length is now just a little bit longer than the distance between the two objects. The rope may have to be slipped around the two objects before the knot is tied. A good knot to use is a lover's knot—or any other knot that will not slip.

Then, insert the piece of timber or pipe between the two parts of the loop near the middle. Lastly, start rotating the wood or pipe so that the rope is twisted. As the rope twists, it becomes shorter and pulls the two objects together. If the wood or pipe 'handle' is long enough and the rope strong enough, one man can exert a force equivalent to several tonnes.

Care must be taken not to release the handle or it will spin around and could cause serious injury. If the windlass is to be left in place, as when securing a hatch or deck cargo, then the handle should be tied down to prevent it from spinning.

Care must also be taken that the object being moved is not heavier than the breaking strength of the rope being used. If only small rope is available, it could be doubled to form two loops. Spanish windlasses can be used routinely

to secure cargo on deck, before setting out on a voyage, if chain and chain binders are not available. They can also be used to move heavy cargo around on deck, before securing it.

How to make an electrical fuse

Almost all electronic devices are protected from current surges by fuses. A fuse contains a tiny strip of wire or metal foil that burns or melts when the current flowing through the circuit exceeds the limits set by the manufacturer.

Usually, a technician will try to solve the problem that blew the fuse before applying current to a new fuse. Often, this takes more than one try. The supply of fuses can become exhausted quickly, even before the electrical problem is sorted out. What do you do when you are 200 miles at sea and you just blew the last 20 amp fuse for your SSB radio, or for your main engine starting system?

There are two or three ways to fix a blown fuse. The easiest method is to remove the old fuse and wrap it with a small piece of aluminium foil. On a glass or ceramic cartridge buss fuse, the foil must make good electrical contact with the two metal ends of the fuse.

Next, re-install the fuse in the fuse holder and turn the appliance on. If the foil burns out quickly, you either did not put a large enough piece of foil on the fuse or you have not yet solved the original electrical problem. There is some danger that you could fuse the device with an over-rated fuse and burn out the appliance. In an emergency situation you may not have any other choice but to try.

Another way to fix a blown fuse is to solder a short piece of wire between the two metal ends of the old fuse. You will need solder and a soldering iron. There is

fuse wire available for doing this that comes in various ratings—marked in amps on the wire spool. Fuse wire is made for rewireable fuses but can be used to fix blown cartridge fuses. If fuse wire is not available, any wire will do as long as the diameter of the wire strand used is similar to the wire inside the fuse that blew. If you do not have a soldering iron, it is possible to wedge the wire between the fuse and the fuse holder. You could also try twisting a piece of wire between the two ends of the fuse holder.

As a very last resort, bypass the fuse altogether. However, this could cause electrical shock or fire. Do not do this unless all other possibilities are exhausted. In no case should a makeshift fuse be left in an electronic device longer than is necessary. Such fuses should be used only in emergency situations or for returning home.

How to make hydraulic oil

Hydraulic hoses and fittings on fishing vessels often break, causing hydraulic oil to leak out on deck or into the bilge or lazerette. If the leak is noticed right away and the hydraulic system stopped, then repairs can be made and the tank can be topped off with reserve hydraulic fluid.

What do you do, however, when the leak is in the engine room bilge or lazerette and it is not noticed right away? What if you have already used up all the spare hydraulic oil? Even if you can repair the leaking hose or fitting, you still need hydraulic oil.

If this means you can no longer fish, you may go broke but at least you will still be alive—but what if the hydraulic hose that broke goes to your steering ram in the lazerette and you have no more hydraulic fluid? You can stay off the reef and make it back to port using other supplies on the vessel.

Hydraulic oil is easy to make on a diesel vessel. Mix motor oil and diesel fuel in a ratio of about 80% oil to 20% diesel. Fill the hydraulic tank with this mixture. Test run the system. If the hydraulic pump starts to overheat or appears to be running sluggishly, add a little more diesel to the mixture. If the hydraulic pump is racing or is not supplying enough power to run the fishing reel or the steering, whatever the case, add a little more motor oil.

Return to port as soon as possible and replace the homemade hydraulic oil with proper hydraulic oil. Do not run the system on the mix of motor oil and diesel longer than is absolutely necessary. Also, the hydraulic system should be flushed out with hydraulic oil before it is refilled.

How to start a diesel engine when the batteries are weak

If you are at sea and your diesel engine is not starting because the batteries are nearly dead, and you have no starting fluid and no means of charging the batteries, there are two things you could try.

One, lead-acid batteries will sometimes retain a little bit of charge on the plates in the form of lead sulfate, that can be knocked back into solution in the electrolyte. It is not a good idea to ever do this to a battery, but in an emergency situation, one more engine crank can sometimes be gained from a battery if you strike the battery posts with a hammer.

The posts are connected directly to the plates, and striking them will often shake some lead sulfate loose. This may give you just enough power for one more crank. Do not strike the posts hard enough to break the battery and do not hit each post more than two or three times. If you do not get results right away, give up and try the following trick.

Another way to help start a diesel engine in emergency situations—when the battery bank has little charge left—is to dump the compression on the cylinders. Some diesel engines, particularly those with hand crank starters, have special valves built into each cylinder to dump compression during starting.

When the engine is being hand started, all of the valves are in the open position so the crank is fairly easy to turn—as there is no compression. When the hand crank has reached top speed, one valve is closed and that cylinder should fire. The remaining valves are then closed one at a time as the engine speed increases to full idle with all cylinders firing.

Even if there are no dumping valves on your engine, you can duplicate the procedure by shorting out each cylinder at the exhaust valve. This is done by wedging a screw driver or coin under the exhaust valve tappets so that the exhaust valves are stuck in the open position. This is not good for an engine and should be done only as a last resort. When all of the exhaust valves are open, the engine will be relatively easy to crank, as there will be no compression in the cylinders. The low battery may now be able to do the job.

As the engine begins to crank, remove the wedge from one tappet and that cylinder should fire. At this time the wedges should be removed from the remaining cylinders one at a time until all are firing.

Usually you have to remove the valve cover to get at the tappets—it should be no problem to run the engine at idle speed for a short time with the valve cover off. Replace the valve cover after

all cylinders are firing. The engine should not be shut down again until after returning to port. At that time, it may be a good idea to re-adjust the valves and closely examine all tappets, valve stems and push rods for damage.

Rules to live by

A safe fishing vessel is one that is managed properly. Here are some ideas that will help you manage a safe and seaworthy fishing vessel.

Pre-departure check list

'Alatini Fisheries Company in Tonga has developed a 'pre-departure check list'. All of their vessel captains are required to fill out the check list prior to leaving on a fishing trip. Any deficiencies have to be remedied beforehand. The check list is an idea that could save your life. A pre-departure check list should be used by all commercial fishing vessels (see check list on page 37).

Watchkeeping

Watchkeeping is important to insure that the vessel steers a true course and does not collide with other vessels, floatsam, or with the bottom. Someone should be on watch at all times while the vessel is underway—some vessels do not have autopilots so a helmsman is always on duty to steer the vessel when the vessel is moving—this person may be the watchman as well, but in some cases can not be.

Rule 5 of 'Rules of the Road' International Regulations for Preventing Collisions at Sea says that every vessel shall at all times maintain a proper look-out by sight and hearing...so as to make a full appraisal of the situation and the risk of collision. A helmsman may or may not be capable of being a look-out. It depends on the individual situation.

In foul weather, when visibility is restricted, when there is a nearby reef or shoal, or when there is nearby vessel traffic, someone should be on watch even if the vessel is anchored or drifting. According to the 'Rules of the Road' a vessel that is drifting is underway. Radar alarms, echo sounder alarms, and GPS alarms should not be depended upon.

The watchman should not be reading or listening to loud music while he is responsible for the vessel, nor should he be drinking alcohol or smoking marijuana or using other drugs. All watchmen should know the 'Rules of the Road'.

Watchkeeping should include monitoring the vessel's position, course, and speed, as well as all engine room gauges and bilge water levels. The vessel's position and course should be noted on the chart periodically to insure that the vessel is on course and that no reefs or islands lie in the vessel's path.

The watchman should be on constant vigil for other vessels by watching the horizon and looking for vessels or lights—at night—and by monitoring the radar. The watchman should look behind the vessel every ten or fifteen minutes. An overtaking ship may not be able to see a smaller fishing vessel. If the vessel is close to land or reefs, then the distance from land or the reef and the depth of the water should also be watched closely.

Both the SSB and VHF radio should be monitored at all times while at sea. The engine room should be checked at least every hour unless there is an engineer on engine room watch.

The watchman should also take a look around the deck at least once during his watch, as long as it is safe to do so. He should check that all navigation lights are operating, that there is no loose cargo or unsecured gear, and that all hatches are secured or dogged tight.

Every vessel that operates beyond territorial waters—past the twelve mile limit—should have a watch alarm. A watch alarm is an electronic wheelhouse device that is set up to ring or beep at regular ten, twenty or thiry minute intervals.

Each time the beeper goes off it must be reset by the watchman. If it is not reset after one minute, a very loud general alarm will sound. The main function of the watch alarm is to insure that the watchman stays awake and alert. Watch alarms are usually set and locked by the captain, and cannot be turned off without a key.

A watch list should be made, showing who is on watch during each block of time. Watches should be rotated either three hours on–nine hours off basis, or two on–four off, for example. If the watchman is tired and cannot stay awake, he should wake another crew to relieve him. Changing of the watch is very important.

The following procedure should be learned by all crew on fishing vessels:

Ten minutes or so before your watch is over, wake the next watchman.

Return to the wheelhouse and wait for him. This gives him time to adjust—use the toilet and have a cup of coffee. If he does not arrive within five or ten minutes, attempt to wake him again.

When he does arrive, talk to him to make sure he is alert. Tell him what course you are on and show him your position on the chart.

Make sure he is aware of any possible dangers like reefs in the vicinity or approaching vessels.

PRE-DEPARTURE CHECK LIST

Vessel Name:				Departure Date:	
Engine hours before departure:				Trip number:	
			Signed	Checked	Action taken
Fuel					
Engine oil (# of litres)					
Fresh water (# of litres)					
Spare oil filters	Yes	No			
Spare fuel filters	Yes	No			
Spare alternator belt	Yes	No			
Spare cooling pump belt	Yes	No			
Engine oil level checked	Yes	No			
Gear oil level checked	Yes	No			
Battery water level checked	Yes	No			
Cooling water level checked	Yes	No			
Bilge water level					
Bilge pump working	Yes	No			
Life raft on board	Yes	No			
Life ring on board	Yes	No			
No. of smoke flares					
No. of red flares					
Medical kit					
No. of parachute flares					
EPIRB tested	Yes	No			
Compass light working	Yes	No			
Torch checked and working	Yes	No			
Spare torch battery on board	Yes	No			
VHF working	Yes	No			
SSB working	Yes	No			
Navigation lights working	Yes	No			
Echo sounder/GPS working	Yes	No			
Fire extinguisher full	Yes	No			
Any electrical problems	Yes	No			
Any electronic problems	Yes	No			
Any engine problems	Yes	No			

Captain:	Crew:
Crew:	Crew:
Crew:	Crew:

I certify that the above information is true to the best of my knowledge and that the vessel is equipped according to company guidelines and ready for departure.

Signed: …… ……

Captain **Engineer**

Tell him when the engine room was last checked and the bilge last pumped and let him know if there are any problems.

Stay in the wheelhouse with him for at least five minutes to make sure he is awake and alert. This is particularly important if a long hard day of fishing has just been completed and everyone is exhausted.

If there is any question about the vessel's safety during your watch, wake the captain immediately. A captain would much rather be disturbed than be told later—when the vessel is broken down—that there was a 'funny noise' coming from the engine room during your watch.

If you hear anything on the radio that sounds like a distress call, write down the name of the vessel and the position; and, again, wake the captain immediately. If there is a fire or the engine room is flooding or there is some other immediate danger, wake the captain and sound the general alarm.

Some other things should be checked daily by the captain or engineer while the vessel is underway. These include: the shaft gland—or stuffing box—for leaks, the lazarette—or rudder room—for leaks on the rudder post and for leaks in the hydraulic lines, and any holds or other compartments for leaks.

Engine sump oil levels and service tank fuel oil levels should also be checked daily. Oil pressure alarms and bilge high water alarms are good warning devices but they should not be depended upon.

Fishermen in Fiji have a saying that there are only two kinds of fishermen, those who have been on the reef and those who have not been on the reef...yet. A captain can avoid encounters with the reef if he follows this advice—keep an alarm clock in your bunk and wake up before you arrive at the reef. This is fairly easy to do.

Before changing watches, look at the nearest possible reef or land on the chart that your vessel could hit, even if the course was accidently altered by 90° or 180°. Next, calculate the time necessary to arrive at that reef based on your present speed.

Then, set your alarm clock to go off ten or fifteen minutes before you would hit the reef. Last, get up when the alarm goes off and check your course and position. Before going back to sleep, re-set the alarm clock for the next hypothetical collision. This method has kept the Masterfisherman off the reef...so far.

Be prepared

Be prepared for eventualities. There are no markets or shopping malls at sea. If something breaks or wears out and you need a replacement, the time to buy it is before you leave on a fishing trip. Some spares are essential on a fishing vessel.

They include: oil filters, engine and hydraulic oil, grease, fuel filters, shaft and pump packing, refrigerant (if the fish hold is refrigerated), fuel lines, belts, gasket material, spare water pump for engine, spare bilge pump, spare pump impellors, hoses and hose clamps, hydraulic hose and fittings.

A good thing to have is two reusable hose ends and a male-to-male nipple for each size hydraulic hose on the vessel, this combination can patch most leaks.

Other spares you need are wire and fuses, spare engine starter, light bulbs, torches and torch batteries, valves and pipe fittings, spare pipe, and tools. None of the spares will be of value without tools.

Aside from spare parts, there are other useful items on a fishing vessel that should always be on hand. These include: duct tape, electrical tape, bolts, nuts, wood screws, machine screws, flat washers, lock washers, nails, bailing wire, stainless steel seizing wire, shackles of various sizes, rope, chain, nylon cable ties, glue, waterproof two-part epoxy, waterproof putty—the kind that does not harden such as air conditioner putty, silicon caulking, skin diving gear, anti-seizing spray (WD-40, LPS, or CRC), silicon spray, aerosol electrical cleaner, engine starting fluid, and lots of rags and dish detergent to clean the mess—serious injury can occur if a hydraulic oil spill is left on deck. If any of these spares or supplies are used on a trip, replace them when you return to port.

What may seem like junk on land may be useful on a fishing vessel. Bits and pieces of timber, steel, aluminium, perspex, rubber (including old inner tubes from automobiles) can save the day on a fishing boat.

A chunk of wood can be used to plug leaks if it is carved into a wedge or plug, and a plank of timber or piece of plywood can be used to patch a larger leak or replace a broken window. Old discarded pieces of machinery may have useful fittings and attachments that can be salvaged.

Unless the junk pile gets ridiculously large and poses a threat to safety and comfort, don't throw anything away on a fishing boat—you'll never know.

Don't be afraid to say, 'NO'

Vessel owners, investors, fishing fleet operations managers, fish buyers, and government fisheries officers are always eager to see fishing vessels heading out to sea, loaded with fuel, bait, ice—

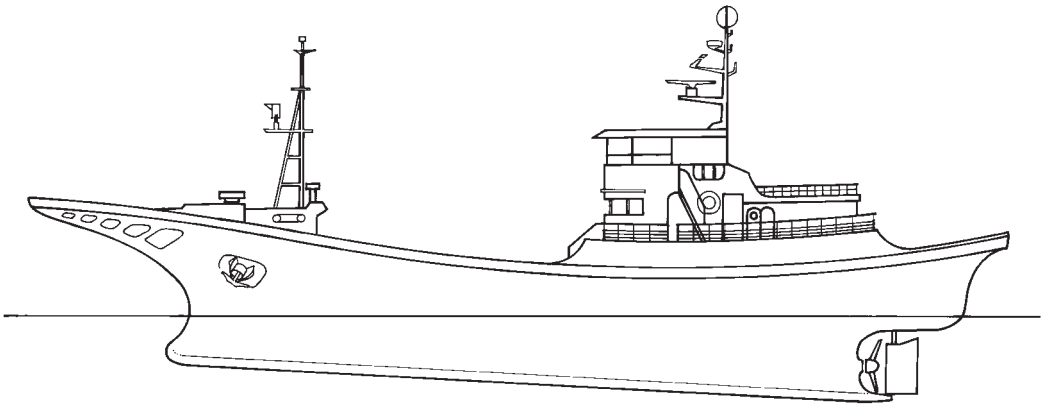
and food for the happy crew—who will return in a few days or weeks with a fish hold full of top quality export grade fish worth a small fortune. The owners and investors are risking their property and money, the managers are risking their reputations and livelihoods, the buyers and fisheries officers are risking nothing—but the happy crew are risking their lives.

Owners, managers, and fisheries officers are not always concerned whether a fishing vessel has a recently serviced liferaft, an EPIRB, distress signals, fire extinguishers, or a medical kit. They should be concerned. Vessels often go to sea when they should not. The reasons for this are usually 'cost savings' but, irresponsibility, ignorance, laziness, and stupidity also play a role. New fortunes can be made and new fishing vessels can be built, but a fisherman only has one life.

If you are asked to go to sea in a vessel that does not have up-to-date safety appliances and equipment, or is for any other reason unsafe or unseaworthy, tell the guy who is going to stay safe and dry and warm at home, 'NO'.

Do not risk your life or the lives of others by going to sea in an unsafe vessel. Fishing is already one of the riskiest businesses in the world.

Why make the odds even worse for yourself? The Masterfisherman has said, 'NO' to several boat owners and fisheries officers in the last two years, and will continue to say, 'NO' if he is asked to go to sea in an unsafe or unseaworthy fishing vessel.



On 6 February 1998 the South Pacific Commission (SPC) changed its name to the **Pacific Community**, as the South Pacific Commission leaders had decided at their conference held in Canberra in October 1997.

It is now possible to distinguish by name between the Pacific Community and the organisation which administers its programmes, now called the Secretariat of the Pacific Community. The Secretariat in particular will continue to use the acronym SPC. The names have changed, the organisation and the functions continue.

Definitions

The Pacific Community is the consortium of Pacific states and territories, meeting as a conference and serviced by a secretariat. 'Pacific Community' refers to the whole organisation including the Conference of the Pacific Community, its Committee of Representatives of Governments and Administrations, and the Secretariat of the Pacific Community.

The **Conference of the Pacific Community** is the new name for the governing body of the whole organisation called the Pacific Community. It replaces the South Pacific Conference. Its first meeting will be in Papeete, November 1999. As in the past, it will still be referred to in shortened form as the Conference. (The South Pacific Conference held its last meeting in Canberra in October 1997.)

The Conference's committee of the whole, the Committee of Representatives of Governments and Administrations, known as the CRGA, continues and remains in that form. Its 28th meeting will be held in November 1998, in Noumea.

The **Secretariat of the Pacific Community** is the name of the organisation which services the Pacific Community and which administers its programmes. The acronym remains SPC. This organisation may be referred to as the Secretariat in documents or in discussion where it is obvious that the SPC is the subject.

Practical notes

The logo and flag belong to the Pacific Community. The November 1998 meeting of the CRGA might choose a new logo. Publications carry the name and logo of the Pacific Community with due acknowledgement to donors. Publications are managed by the Secretariat.

A reference to the South Pacific Commission in the past, could refer to what is now the Secretariat of the Pacific Community, or to the Pacific Community as a whole.

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