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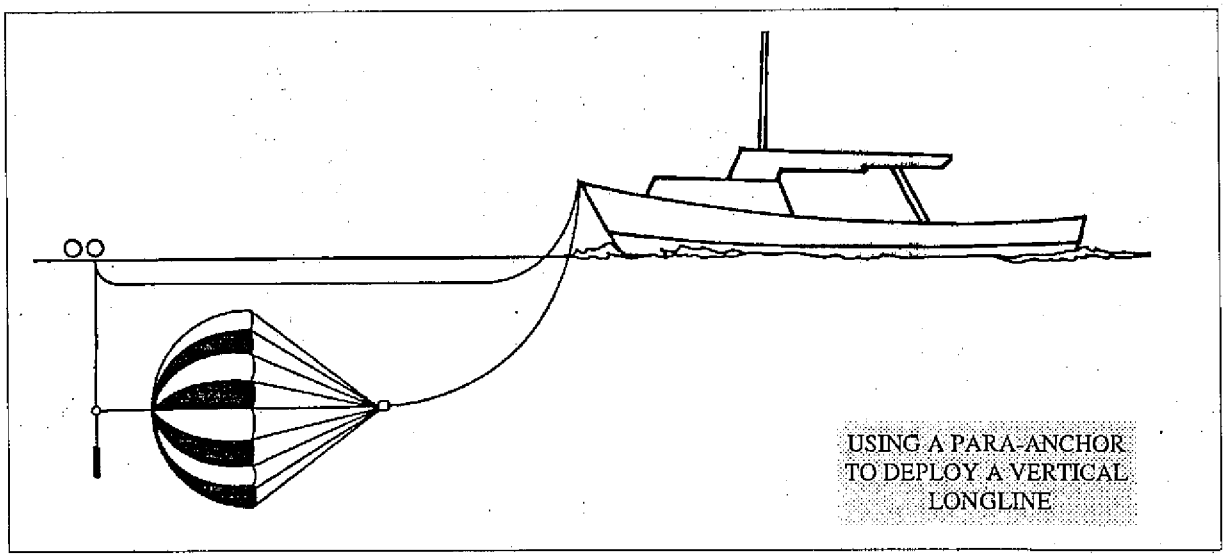

USING A PARA-ANCHOR TO DEPLOY A VERTICAL LONGLINE

Prepared by Jean-Paul Gaudechoux, Fisheries Information Officer

Original text: English

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BIBLIOGRAPHIC SURVEY IN MICRONESIA

Requests were received from the Government of the Federated States of Micronesia (FSM) in March 1991 and the Government of the Republic of the Marshall Islands in September 1991 for assistance in compiling a bibliography of material relating to FSM and Marshall Islands' fisheries and marine resources. Masanami Izumi, SPC Fisheries Development Associate, conducted a search for appropriate documents in Honolulu, Majuro, Pohnpei, Guam, Yap, Tokyo and Suva from 29 September to 13 November 1991.

During the survey trip, he examined more than 60 offices, libraries and collections for both published and unpublished materials appropriate to the bibliography. Outside FSM and Marshall Islands, he made a special effort to search at the University of Hawaii Pacific Collection, the University of Guam Micronesian Area Research Center, the Tokyo University of Fisheries Library and others.

The survey focused on the following three main points:

— Searching of unpublished materials such as project reports, project proposals, internal reports, trip reports, consultants' reports and others not available outside the country concerned, as well as published materials;

— Utilisation of the Trust Territory of the Pacific Islands' (TTPI) archives (about 5,000 rolls of microfilm) collected by the TTPI office in Saipan after World War II;

— Searching of Japanese materials on Micronesia at the University of Guam Micronesian Area Research Center and the Tokyo University of Fisheries Library, with special attention to research and experimental reports written in Japanese by research scientists of the Palao Tropical Biological Station and the Japanese Government South Seas Bureau's Fisheries Experiment Station in the 1930s during the Japanese mandated era. A historical translation of fishery statistical data on Micronesia is shown below.

The following information obtained during the trip may be useful for fisheries officers,

Marine resources production in Micronesia, 1922—1938

		Saipan	Yap	Palau	Truk	Ponape	Jaluit	Total
1922	Yen	4,961	410	35,234	23,046	41,165	8,780	113,596
1923	Yen	10,202	8,098	100,124	17,526	30,879	8,780	175,609
1924	Yen	15,192	13,355	37,171	32,914	7,142	9,404	115,178
1925	Yen	18,740	21,298	108,840	34,500	10,624	10,450	204,452
1926	Yen	27,817	22,599	146,568	28,070	18,379	10,939	254,372
1927	Yen	19,417	21,205	111,224	44,914	13,213	22,752	232,725
1928	Yen	24,490	24,157	169,170	26,202	14,760	19,154	277,933
1929	Yen	19,627	26,265	194,008	91,857	8,792	2,110	342,659
1930	Yen	70,296	23,569	116,329	269,134	17,739	13,700	510,767
1931	Yen	141,013	16,952	186,980	316,381	176,884	33,280	871,490
1932	Yen	374,564	9,410	226,985	366,497	163,580	125,830	1,266,866
1933	Yen	406,964	16,348	316,110	690,214	304,015	56,671	1,790,322
1934	Yen	570,130	38,921	1,249,782	454,948	267,587	63,435	2,644,803
1935	Yen	456,781	14,568	749,053	227,333	133,184	60,438	1,641,357
1936	Yen	309,676	14,424	2,337,360	604,751	287,273	31,537	3,585,021
	Kgs	1,997,080	35,783	6,200,858	6,215,750	2,801,439	189,174	17,440,084
	Shells (no.)					4,935	5,018	9,953
	Turtles (no.)		70	139		90		299
1937	Yen	463,998	17,988	4,970,784	950,778	431,710	27,330	6,862,588
	Kgs	3,998,198	33,556	18,357,054	12,950,846	4,187,398	106,334	39,633,386
	Shells (no.)	[395]		13,642		7,360		21,002
	Turtles (no.)	12		36	6	93		147
1938	Yen	394,902	34,771	2,861,406	506,635	220,308	8,262	4,026,284
	Kgs	2,828,624	202,468	9,229,848	5,572,582	1,716,582	29,406	19,579,510
	Shells (no.)			18,427		7,170		25,597
	Turtles (no.)			19	103	115		237

Turtles: Hawksbill turtle, sea turtle; Shells: Black pearl shell, other shells.

The value of the yen in the 1920s and the 1930s must be considered.

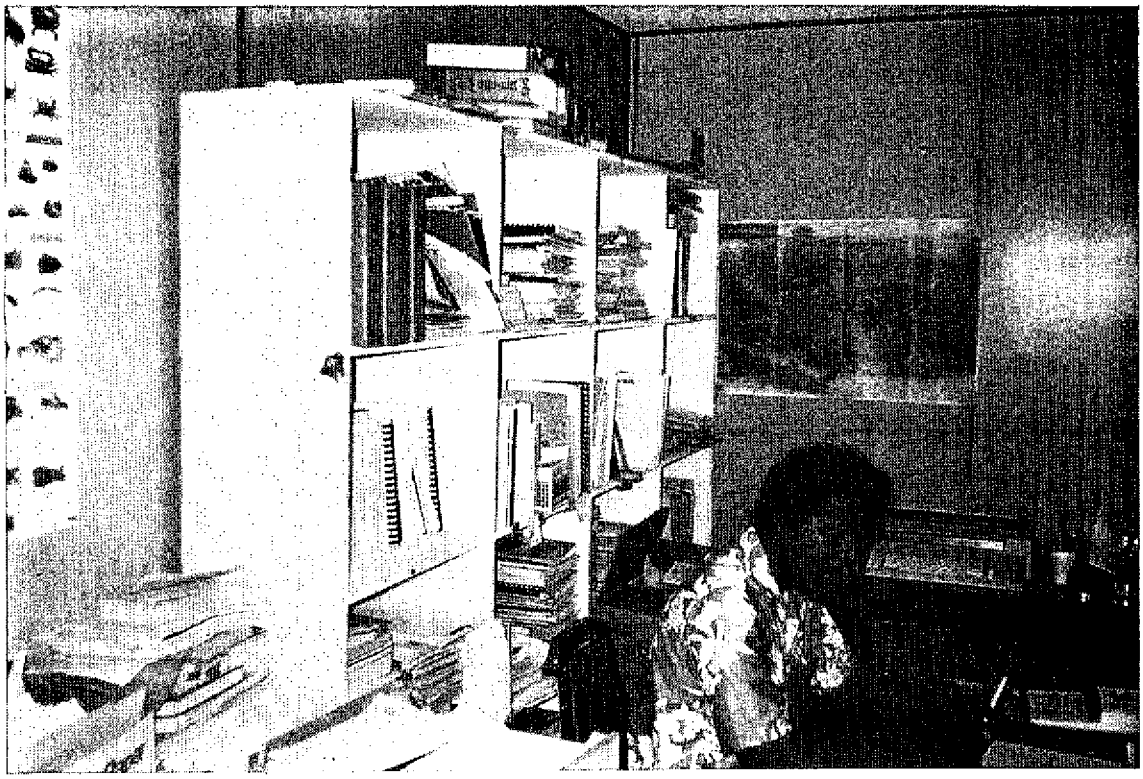
Translated by Masanami Izumi, Fisheries Development Associate from:

1. South Sea Bureau (1937). Fishery statistics from 1922 to 1934 [in Japanese]. *South Seas Fisheries News* no. 3, pages 23—27.

2. Takehisa, Isaku (1940). Prospects for South Sea Fisheries [in Japanese]. *South Seas Fisheries* vol. 6, no. 7, pages 36—47.

marine biologists and people involved in fisheries development and marine resources management:

—One complete duplicated set of the TTPI archives' microfilms was presented to each Government in Micronesia and the University of Hawaii by the former TTPI office in Saipan in 1988. These films are available at the University of Hawaii Hamilton Library in Honolulu, the Congress Library of the



Typical library of marine resources in (above) Marshall Islands and (below) Federated States of Micronesia

FSM National Government in Pohnpei and the Alele Library Pacific Collection in Majuro. The University of Guam Micronesian Area Research Center has also a limited number of microfilms titled 'economic development' which includes fisheries and marine resources. A computerised reference search and photocopy service is available at those institutions;

— Through the recent development of PEACESAT operations in the South Pacific, a computerised reference service, including the above TTPI archives at the University of Hawaii Library, is available through PEACESAT stations. Further information can be obtained from the PEACESAT operators at each station;

— A distinctive feature in Micronesia is that a great amount of environmental assessment work has been done. Technical reports on the coastal environment were produced by the U.S. Army Corps of Engineers, the University of Guam Marine Laboratory, the University of Hawaii and others. Especially in Marshall Islands, the environmental assessment reports on atomic bomb tests on Bikini and Eniwetak Atolls contribute to the fundamental study of lagoon ecosystems. These reports are available at the Hawaii Institute of Marine Biology of the University of Hawaii.

As a result of this survey in Micronesia, a marine resources bibliography of FSM and Marshall Islands is expected to be published in 1992.

INSHORE FISHERIES RESEARCH PROJECT

Fourth International Conference on Ciguatera Fish Poisoning

Ciguatera fish poisoning is a serious impediment to development of fisheries based on shallow water reef fish stocks and to the food security of islands where agriculture is limited.

The Fourth International Conference on Ciguatera Fish Poisoning will be convened in Tahiti during 1992. The conference is being hosted by the Institut Territorial de Recherches Médicales Louis Malardé from 4 to 8 May 1992. The Institut Malardé has a long association with ciguatera research through the work of Dr Raymond Bagnis and coworkers.

All aspects of ciguatera will be covered during the conference. Discussion of these will be organised under the following topics:

— Ecophysiology of toxic dinoflagellates associated with ciguatera;

— Chemistry of ciguatera toxins;

— Pharmacology of ciguatera toxins;

— Clinical aspects and epidemiology;

— Immunochemistry, detection of toxins;

— Socio-economical impacts and management of ciguatera;

— Coral reef disturbances and ciguatera;

— Studies on ciguatoxic fish.

The South Pacific Commission will be represented by Mr Paul Dalzell of the Fisheries Programme, who will focus on the problems of ciguatera and fisheries development.

During 1990, the Inshore Fisheries Research Project, in collaboration with the Health Programme, established a database at the Commission, with the intention of documenting in detail cases of fish poisoning and specifically ciguatera. Readers of this newsletter will remember that *Fisheries Newsletter* #54 introduced the SPC database and asked fisheries workers in the region to report case histories of ciguatera.

A specimen report form was included in the same issue, to be used as a template for generating copies for recording ciguatera case histories. Copies of the same form (in English and French) can be obtained directly from the SPC Fisheries and Health Programmes at the SPC.

The same article and form were reproduced in the South Pacific Epidemiological and Health Information Service (SPEHIS) monthly bulletin and circulated amongst health workers in the region. Over 150 case histories have been collected in the first year of this project, mainly from Tuvalu and New Caledonia.

It is hoped that fisheries workers will become increasingly aware of the importance of documenting correctly occurrences of ciguatera intoxications. The report form has been

appended to the back of this issue and colleagues in the region are once again encouraged to conduct interviews with persons afflicted with ciguatera and report to SPC using this form.

The success of this initiative depends largely on such co-operation.

Study of the Aitutaki trochus fishery

The SPC Workshop on Trochus Resource Assessment, Development and Management, held in May/ June 1991 (see SPC *Fisheries Newsletter* # 57) made four recommendations to SPC for further action in helping Pacific Island countries develop appropriate management plans tailored to local conditions.

One recommendation was that the Commission encourage the detailed study of the Aitutaki trochus fishery as a case study, in order to provide management-related information that will be applicable to the developing fisheries in other atolls of the region.

This recommendation, which was subsequently endorsed by the Twenty-third SPC Regional Technical Meeting on Fisheries (August 1991), and then by the Thirtieth South Pacific Conference (October 1991), was made because of the unique nature of the Aitutaki fishery.

Its uniqueness lies in the fact that the growth of the Aitutaki population following the introduction of 300 mature adults in 1957 (trochus are not native to Aitutaki) has been subject to research by MMR and there exists a body of historical data on the population.

Since the commencement of exploitation, good records have been kept of harvests and exports. In addition, there exist several SPOT satellite images of the Aitutaki reef, taken before and after periods of extreme environmental damage (cyclone), and at times that coincided with field trochus research. The Aitutaki trochus fishery is now tightly managed by the Island Council, following advice from MMR based on the research carried out so far. Harvests presently take place over a period of only one or two days, with each animal being landed live for size-verification before shucking. Large numbers of people participate in the harvest, which means that exploitation occurs very intensively and the instantaneous effects of fishing can be assessed. A system of individual transferable quotas permits every individual on the island to participate in the harvest, or to trade his quota.

The Aitutaki fishery thus presents opportunities for research that could provide answers to several key questions relating to trochus abundance estimation, a critical element in the development of any management plan. Through a well-designed study, timed to take place around the period of the harvest, field survey methods could be calibrated against actual takes, depletion experiments to estimate absolute abundance could be carried out in conjunction with actual fishing, and the subsequent population response to intensive harvesting, in terms of growth and recruitment, could be monitored. In addition, the correlation of intensive field survey data with the existing body of historical information would allow an exceptional understanding of the evolution of the population and its response to disturbance.

The data from a study carried out at Aitutaki would be of direct relevance to all areas where trochus populations exist, especially atolls and other environmentally similar areas. In all cases, data gathered could be used as a basis for predicting trochus population response to harvesting and mitigating against overfishing.

The Cook Islands Ministry of Marine Resources (MMR) and SPC have now jointly developed an approach to enable the study to be carried out as a regional project. The proposed approach is to constitute a field survey team, comprising about six scientists from Pacific Island countries (preferably selected from trochus workshop participants), including at least two from the Cook Islands as well as one from SPC and one from Australia.

The team will spend three weeks undertaking field-work on Aitutaki at the time of the next trochus harvest, with a further week being allocated to data analysis and reporting before the team disperses. The timing of the harvest is at the discretion of the Island Council and dates have yet to be fixed.

While on the island, the team will undertake transect surveys to estimate relative trochus abundance; depletion experiments, in conjunction with local fishermen, to estimate absolute abundance; and gathering of length-frequency data to provide demographic information on the population.

All activities will be carried out intensively before, during and after harvest, so as to assess the response of the trochus population to exploitation. Subsequently, monitoring of population recovery will be undertaken by MMR at three-monthly intervals . SPC will also try to arrange appropriate broad classification of SPOT images of Aitutaki to assist in field survey planning.

After the survey, more detailed processing will be carried out to relate field observations to features detectable on the satellite images that indicate habitat variation. This work, will help to verify and improve the reliability of trochus resource estimates based on the use of remotely sensed data.

Data analysis and interpretation will include estimates of relative and absolute abundance, catchability and population size structure, and changes in these in response to harvesting. Virtual population analysis based on length-frequency data will permit estimation of recruitment patterns, and these can be verified by subsequent monitoring.

The SPC and Australian scientists will be responsible for coordinating the production of a detailed preliminary report on the field study within a month of its completion, with inputs from all members of the field team.

A final report of the study will be produced by SPC following about eighteen months of monitoring. This will include results of the follow-up monitoring and of the satellite data interpretation as well as a recapitulation of the original field survey results.

A key output of the project will be in human resource development. The field survey will be an important extension of the training that the Pacific Island participants received during the trochus workshop, and will greatly reinforce their ability to carry out similar work effectively on their own after returning home.

Promoting the ability of Pacific Island countries to develop fishery management approaches using their own human resources is a mandate of the SPC fisheries programme. Experience has shown that participation of national fishery scientists in field activities such as this is an effective means of contributing to this end.

ARE FLYING FISH A POTENTIAL MONEY-EARNER FOR THE REGION?

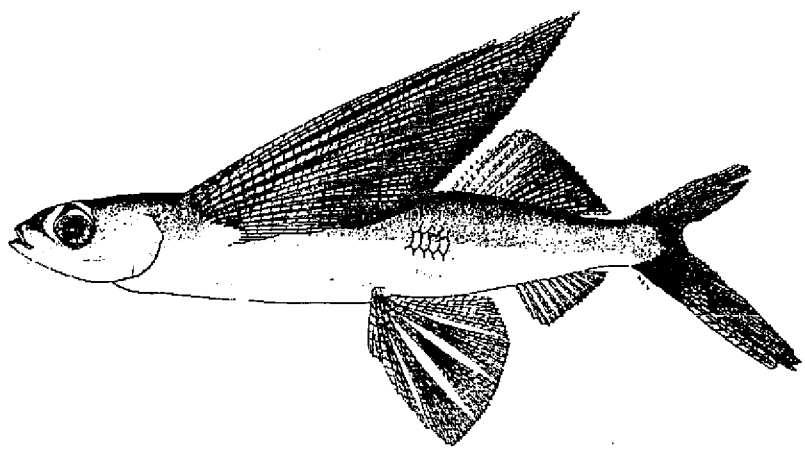
During the past three months, the Fiji Fisheries Division has been co-operating with the South Pacific Commission's Deep Sea Fisheries Development Project and the Food and Agricultural Organisation / UNDP Regional Fishery Support Programme to undertake trial fishing for flying fish in the waters around Suva (see SPC *Fisheries Newsletter* #58).

The trial programme, involving fishing on moonless nights before moonrise or after moonset and conducted by SPC masterfisherman Tuaine Rata, has been sufficiently successful to warrant interest from a commercial perspective and ongoing trials are planned.

According to Tuaine, the months when the water is warmest are the best for flying fish fishing. In his native Cook Islands, fishermen land up to 300 a night, selling the fish at the morning markets for NZ$ 1.25 each. They are considered a local delicacy and readily consumed.

Flying fish fishing is not new to the Pacific, with islands such as the Tokelaus having a proud tradition of catching flying fish from fast-moving sailing and paddling canoes.

Tokelauan FAO fishery programme officer Mose Pelasio has manned the scoop net throughout the trial to date and is optimistic that the fish could be caught in commercial quantities in Fiji waters. Operating costs for fishing are minimal and any fisherman with a boat and outboard can equip himself for flying fish fishing for under F$ 100.



Consumers in Tahiti buy the entire catch of up to 80 boats to grace the dinner table and there is no reason to doubt that fresh flying fish would find a place in the local market in Fiji.

They are considered by many ardent game fishermen to be 'the fish to catch' and a sure shot for a wahoo, mahimahi, tuna or marlin when properly rigged as a troll bait.

It is almost certain that local game fishermen would be prepared to pay for their pleasure if there was a whisper of a big fish in the offing.

A third possible market lies with the Fiji tuna longline fleet, which now purchases imported bait for as much as F$ 3.80 per kilogram and is more than willing to try flying fish as an alternative.

The trial programme is keen to contract commercial fishermen and boat-owners in the Suva area interested in assisting with ongoing evaluation. The programme is prepared to offer the fishing gear and light as well as initial guidance to fishermen willing to undertake further trials.

Studies show that although these species, regarded as beautiful in appearance and characteristic, are plentiful in the Pacific, for one reason or another not many locals are interested in catching them.

Research carried out by a UNDP programme some time back stated that in French Polynesia, more than 500 tonnes of flying fish were caught by 250 boats available there.

Traditional Pacific Islands methods for catching flyingfish

Location	Method
Southern Cook Islands	— Scooping fish at night using dipnet and torches.
	— Scooping fish at night using dipnet and torches, hooking using floating lines with baited hooks.
	— Catching fish by hand during occurrence of inshore spawning aggregations.
Northern Cook Islands	— Scooping fish at night using dipnet and torches.
Federated States of Micronesia	— Scooping fish at night using dipnet and torches.
Tuvalu	— Scooping fish during day, scooping fish at night using dipnet and torches, herding fish into apex of V-shaped net.
	— Scooping fish at night using dipnet and torches, using small hooks baited with coconut.
Tokelau	— Scooping fish at night using dipnet and torches.
Kiribati	— Night fishing with torches and scoop nets when moon is full, night fishing with torches and scoop nets when there is no moon, fishing with torches and scoop nets at sunset, fishing with hooks and floats, trolling.
	— Trolling using lure made of coconut mid-rib.
Palau	— Scooping fish at night using dipnet and torches.
Marshall Islands	— Scooping fish at night using dipnet and torch/lamps.
French Polynesia	— Scooping fish at night using dipnet and head-mounted lamps.
	— Catching fish by hand during occurrence of inshore spawning aggregations.
Solomon Islands	— Fishing with carved floats, coconut mid-rib hooks, and thin lines.
Mariana Islands	— Catching fish using small hooks, thin lines, and calabash floats.

Catches of flying fish in Fiji at the same latitude are almost zero.

Methods

The modern method of catching flying fish used in Tahiti and the Cook Islands is a modification of a traditional Polynesian technique.

Several techniques have been used in the Pacific Islands to catch flying fish. Documented traditional flyingfish catching methods are given in the table above. As in the case for many aspects of Pacific traditional fisheries, fishing methods have often not been adequately recorded.

The dipnet/torch technique is the most widespread, occurring from Palau to French Polynesia. In areas where flying fish fishing has developed beyond the subsistence level, such as Tahiti and Rarotonga, a modification of the dipnet/torch technique is used. A good description of the traditional method in Vaitupu Atoll, Tuvalu, is given by Kennedy (1930)*:

The canoes draw up in line (tamanga) facing north so as to sweep a front parallel with the reef on the lee side of the island. The

* Kennedy, D. (1930). Fishing for flying fish (fai isave). Pages 61—70 in: Field notes on the culture of Vaitupu, Ellice Islands. *Journal of the Polynesian Society*, Volume 39, No. 1, Avery Press, New Plymouth.

scene is one of indescribable splendor, the village fires in the distance making dots of light in the palm jungle. When all are ready the line commences to move forward at a steady rate of about two knots. In the bow of each canoe stands the bow-paddler with his dipnet held horizontally across his front so that the bag is to starboard. That member of the crew immediately behind the netter in the bow stands and holds aloft the blazing torch. It is his duty to keep the torch well-trimmed and burning brightly. The other members of the crew ply their paddles and keep a sharp lookout for flying fish lying or swimming near the surface in the vicinity of the canoe. These appear light grey in colour in the glare of the torches, and are easily seen at distances up to about forty feet. When the fish are running well the uproar is deafening. To the neophyte all seems chaos, but there is definite thread of order and arrangement. Each canoe keeps its place in line. Usually the netter scoops up one fish at a time and flings it into a basket. In the thick of a school a netter may capture as many as three fish, one after another, before emptying his net. When the fish is lying dazed on the surface or the water, the mouth of the net is brought down flat on the water with a resounding slap, and in such a manner that the periphery of the bag surrounds the fish which, startled into flight, leaps up into the sack of the bag. Immediately after the slap, the mouth of the bag is twisted quickly and lifted clear of the water with the fish inside. This is the quickest method of taking fish from the water, but can be used only with fish which are right on the surface. When the fish is swimming, the mouth of the bag is thrust under water a few inches in front of it, in such a manner that it will, unless it changes course, swim straight into the opening.

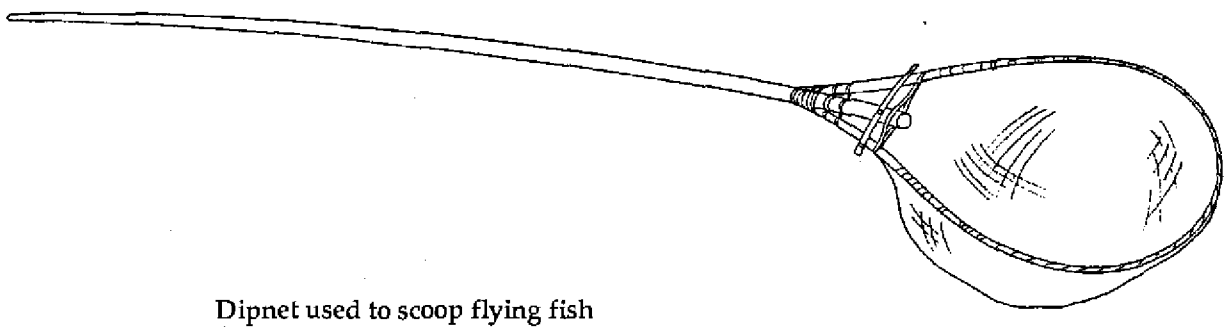
Nowadays, a battery-powered lantern is mounted on the helmet worn by the fisherman who fishes from a small boat powered by an outboard engine.

A light is attached to a helmet worn by the fisherman

Research indicates that there are about 25 species of flying fish in Fiji waters but little is known about their biology. Studies on flying fish from other parts of the world (mainly the Caribbean) show that these fish are capable of long-distance migration.

It appears that there exists a potential for the development of flying fish fisheries in the Pacific Islands. This contention is based on what is known of the biology of the fish, locations in the Pacific Islands where development has occurred, and comparison with other regions of the world. Development of a flying fish fishery for small-scale fishermen seems possible because of the relatively low technology required and, in many cases, the proximity and apparent abundance of the resource. Development is presently constrained by the difficulty in identifying flying fish species properly, the limitations of existing markets, and the lack of awareness of the flying fish resource and fishing techniques.

(Source: FAO/UNDP Regional Fishery Support Programme)



Dipnet used to scoop flying fish

FISHERIES INFORMATION PROJECT

Special Interest Group Information Bulletins

FISHERIES INFORMATION PROJECT
SOUTH PACIFIC COMMISSION
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NEW CALEDONIA

BECHE-DE-MER

INFORMATION BULLETIN Number 3 — November 1991

NOTE FROM THE CO-ORDINATOR

Inside this issue

The third issue of the Beche-de-mer Information Bulletin

As part of the Beche-de-mer Special Interest Group (SIG) activities, the Fisheries Information Project has just released the third issue of the Beche-de-mer Information Bulletin.

Since the last issue of the bulletin, many new members have joined the SIG. It is hoped that the new members will contribute to the content of future issues by keeping the Group informed of the evolution of the fishing and marketing activities in their countries and the latest developments in research.

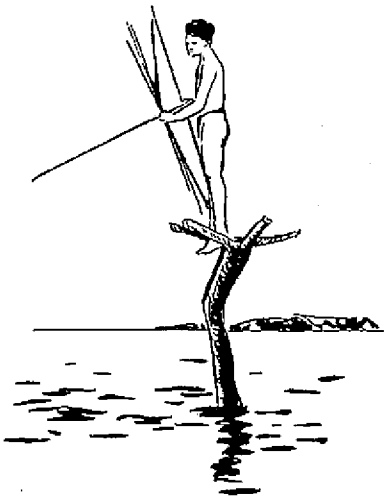
The latest issue includes information on research conducted on the dive fishery for *Parastichopus californicus* in Washington State, USA. A summary of a Japanese handbook on *Stichopus japonicus* is also presented and provides interesting data on the ecology of this particular beche-de-mer, artificial seed collection and culture experiments.

New Special Interest Groups established

Following a recommendation by the Twenty-third Regional Technical Meeting on Fisheries, a special interest group (SIG) has been established on traditional marine resource management and knowledge in the SPC region. Dr. Kenneth Ruddle has accepted SPC's invitation to be the co-ordinator of this SIG.

It is intended that the Information Bulletin of this SIG provide a forum for the collection, discussion and dissemination of information on traditional marine resources management and the underlying bodies of traditional ecological knowledge that sustain such systems. Material in the bulletin will focus mainly, but not exclusively, on the South Pacific region.

The inaugural issue is now being prepared. Persons interesting in receiving the bulletin and contributing information to future issues are urged to contact either the group co-ordinator (Dr. Kenneth Ruddle, Matsugaoka-cho 11-20, Nishinomiya-shi, Hyogo-ken 662, Japan, Tel. and FAX 81-798-71-2904) or Jean-Paul Gaudechoux, SPC Fisheries Information Officer.

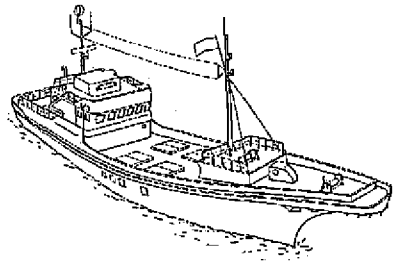


TUNA AND BILLFISH ASSESSMENT PROGRAMME (TBAP)

Regional Tuna Tagging Project (RTTP)

After a break in Funafuti, Tuvalu (see *SPC Fisheries Newsletter* #58), the *Te Tautai* continued operations in Kiribati, Solomon Islands, Papua New Guinea, Australia and New Caledonia.

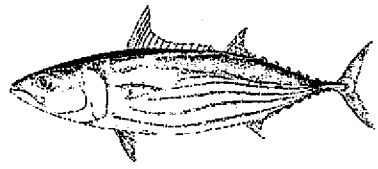
The *Te Tautai* steamed directly for Tarawa after entering the southern part of the Kiribati EEZ on 1 September, en route from Funafuti, Tuvalu. Approximately 180 buckets of pond-bred milkfish (*Chanos chanos*) were loaded at Betio. A long-range trip was then undertaken to the south-east for a period of seven days, with two baiting stops at Abemama to top up the bait wells. During this trip, 8 yellowfin and 1,053 skipjack were tagged, with releases being made on Maiana Bank, to the south-east of Abemama, and in the vicinity of Arorae.



The vessel then searched to the west, initially towards Banaba (Ocean Island), and found a group of logs and associated schools to the north of the island that yielded 309 yellowfin, 154 skipjack and 13 bigeye releases. Fishing close to Banaba on the morning of 13 September produced 7 yellowfin releases. A further 51 skipjack were tagged further to the west.

The *Te Tautai* tagged 4 yellowfin near the island of Nauru on 14 September.

A further 56 yellowfin, 6 skipjack and 22 bigeye were tagged to the north-west of Banaba. Fifteen yellowfin and 4 bigeye were tagged north of Banaba on 15 September. One yellowfin and 284 skipjack were tagged en route to Santa Cruz Islands, with most releases being made from a group of large, unassociated schools found in the international waters between the Kiribati and Solomon Islands EEZs.



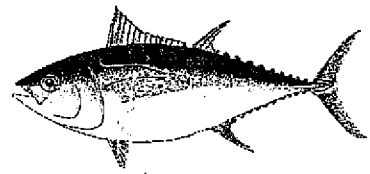
The vessel entered Solomon Islands waters on the morning of 18 September, and spent the next four days baiting and searching amongst the islands of the Santa Cruz group, unfortunately without success. Searching along the west coast of Makira, en route to Honiara, yielded 63 skipjack.

The *Te Tautai* arrived in Honiara on the morning of 24 September and stood down for a two-day full-moon break. The remaining four days of September were spent fishing the southern part of New Georgia Sound and to the south of Vangunu. A total of 2,044 tuna (163 yellowfin, 1,878 skipjack and 3 bigeye) was tagged during this time, of which 2.2 per cent (26 yellowfin, 18 skipjack and 1 bigeye) were also injected with oxytetracycline for age validation studies.

The *Nei Kaneati* , the Kiribati government-owned pole-and-line vessel, made two cruises from 3 to 20 September in Kiribati waters. A total of 2,203 tuna (485 yellowfin, 1,675 skipjack and 43 bigeye) was tagged. The baiting quality deteriorated somewhat due to the presence of large *Selar boops* and *Decapterus* (18—25 cm) in the bait composition.

The *Te Tautai* spent the first ten days of October tagging in Solomon Islands waters, concentrating efforts to the south of the New Georgia group of islands, off the west coast of Guadalcanal and along the north-east coast of Santa Isabel Island. A total of 1,382 tuna was tagged during this period, consisting of 238 yellowfin, 1,135 skipjack and 9 bigeye. Of these releases, 65 yellowfin, 28 skipjack and all the bigeye were also injected with oxytetracycline for age validation studies.

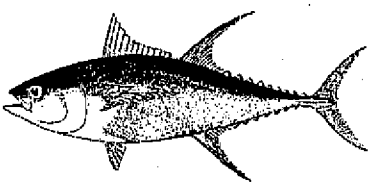
The next two days were spent in the south-eastern part of Papua New Guinea's EEZ, en route to Cairns, Australia. A total of 295 skipjack was tagged to the east of Rossel Island and south of Tagula Island before the bait supply on board was exhausted.



The vessel operated in the north-eastern part of the Australian Fishing Zone for the remainder of the month, working in an area immediately offshore

from Cairns where Japanese vessels have traditionally caught large yellowfin and bigeye with handlines over the full-moon periods of October and November. Strong winds, rough seas and lower than normal sea-surface temperatures were features of this period, hampering both fishing and baiting operations. During the days leading up to the full moon on 23 October, 412 skipjack were tagged, while no yellowfin or bigeye were sighted. After the full moon, however, and as weather conditions improved, aggregations of yellowfin and bigeye were found to the north of Bougainville Reef and fished successfully. Over three days of fishing, 1,483 yellowfin, 1,733 bigeye and 18 skipjack were tagged and released, with most of the yellowfin and bigeye measuring between 70 and 110 cm in length.

The vessel took a break in Cairns on 29 and 30 October, and left port the following day for baiting and further fishing in the area of yellowfin and bigeye.



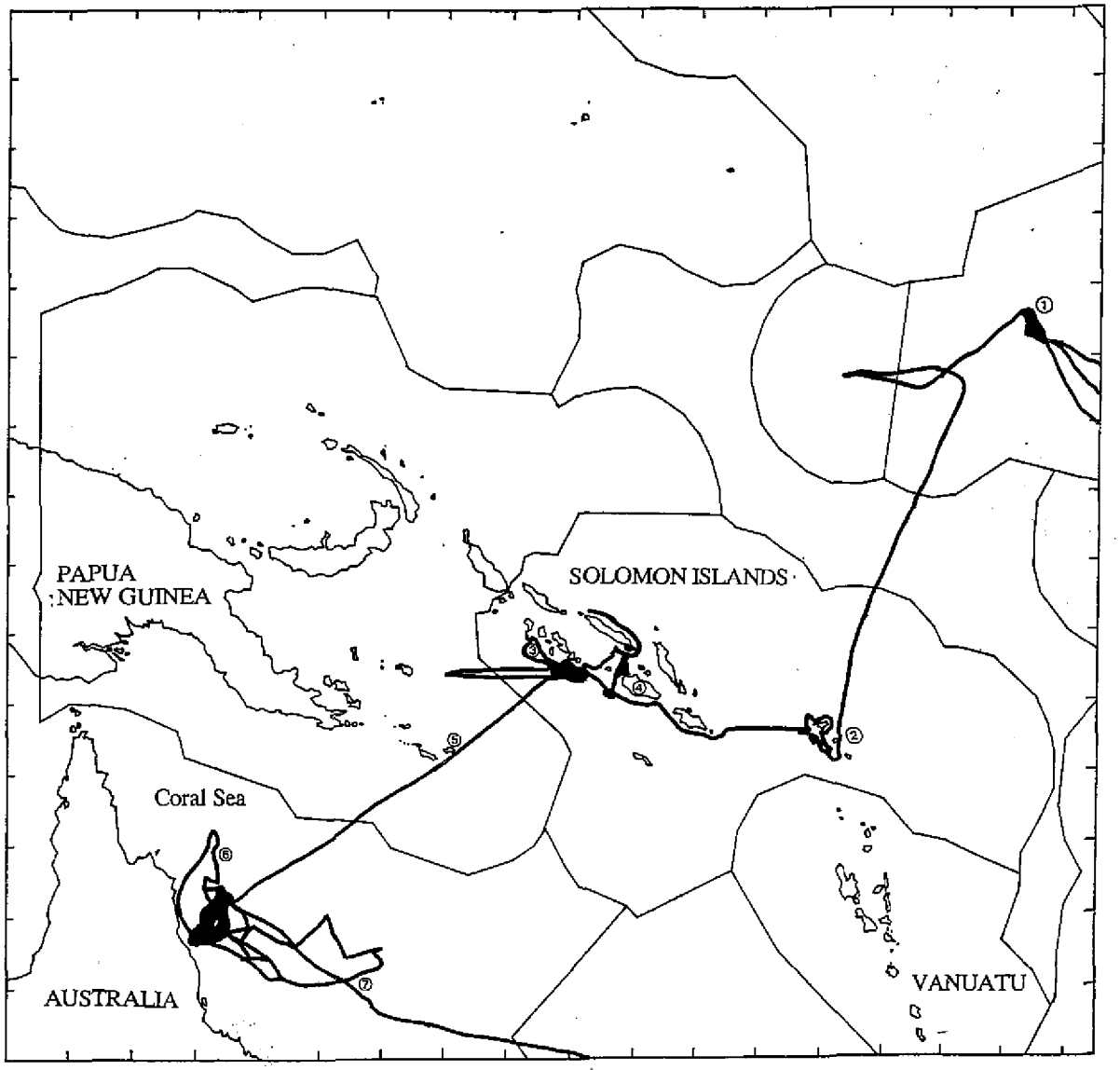
Tag recoveries to 31 December 1991, by country and fishing gear

Fishing nation	Gear type	Yellowfin	Skipjack	Bigeye	Total
Fed. States of Micronesia	Handline	5	1	0	6
Fed. States of Micronesia	Troll	2	11	0	13
Indonesia	Purse seine	36	31	2	69
Indonesia	Pole-and-line	411	742	7	1,160
Indonesia	Handline	25	28	1	54
Indonesia	Troll	0	1	0	1
Japan	Longline	0	0	1	1
Japan	Pole-and-line	1	80	0	81
Japan	Purse seine	388	1,136	34	1,558
Japan	Unknown	7	2	1	10
Kiribati	Pole-and-line	3	58	0	61
Kiribati	Purse seine	0	1	0	1
Kiribati	Troll	1	3	0	4
Korea	Purse seine	154	347	6	507
Palau	Pole-and-line	8	52	0	60
Palau	Troll	0	1	0	1
Palau	Unknown	1	0	0	1
Philippines	Purse seine	596	1,223	29	1,848
Philippines	Troll	9	119	0	128
Philippines	Handline	16	40	0	56
Philippines	Unknown	7	39	0	46
Solomon Islands	Pole-and-line	23	438	0	461
Solomon Islands	Purse seine	161	839	8	1,008
Solomon Islands	Troll	2	7	0	9
Solomon Islands	Unknown	1	0	0	1
Soviet Union	Purse seine	1	1	0	2
Taiwan	Purse seine	127	232	5	364
United States	Purse seine	221	665	56	942
Unknown	Handline	0	2	0	2
Unknown	Pole-and-line	39	133	47	219
Unknown	Purse seine	141	234	10	385
Unknown	Longline	1	0	0	1
Unknown	Troll	3	4	0	7
Unknown	Unknown	1	2	0	3
Total		2,391	6,472	207	9,070

The *Te Tautai* continued to work in the Coral Sea for most of November. The vessel returned to the area adjacent to Bougainville Reef where yellowfin and bigeye were successfully fished in late October. Over a three-day period, 872 yellowfin, 1,976 bigeye and 22 skipjack were tagged and released in moderate seas.

The aggregation then dispersed and the vessel returned to inshore waters to bait before fishing wide on the numerous reefs and cays on the Queensland Plateau. During an eight-day period, 159 small yellowfin and 2,879 skipjack were tagged and released over a wide area.

In the week prior to the November full moon, the Bougainville Reef area was again visited and searched, as was the Townsville Trough near Marion Reef where aggregations had been fished in some years. No aggregations were located, but four yellowfin and 662 skipjack were tagged and released before the vessel left the AFZ on 22 November 1991. Strong winds, rough seas and poor baiting at Chesterfield Reef prevented any fishing in New Caledonian waters on the way to Noumea, where the vessel arrived on 27 November. One day's fishing near Noumea produced 1,696 skipjack before the *Te Tautai* departed for Suva and the end of the second year's charter, on 7 December.



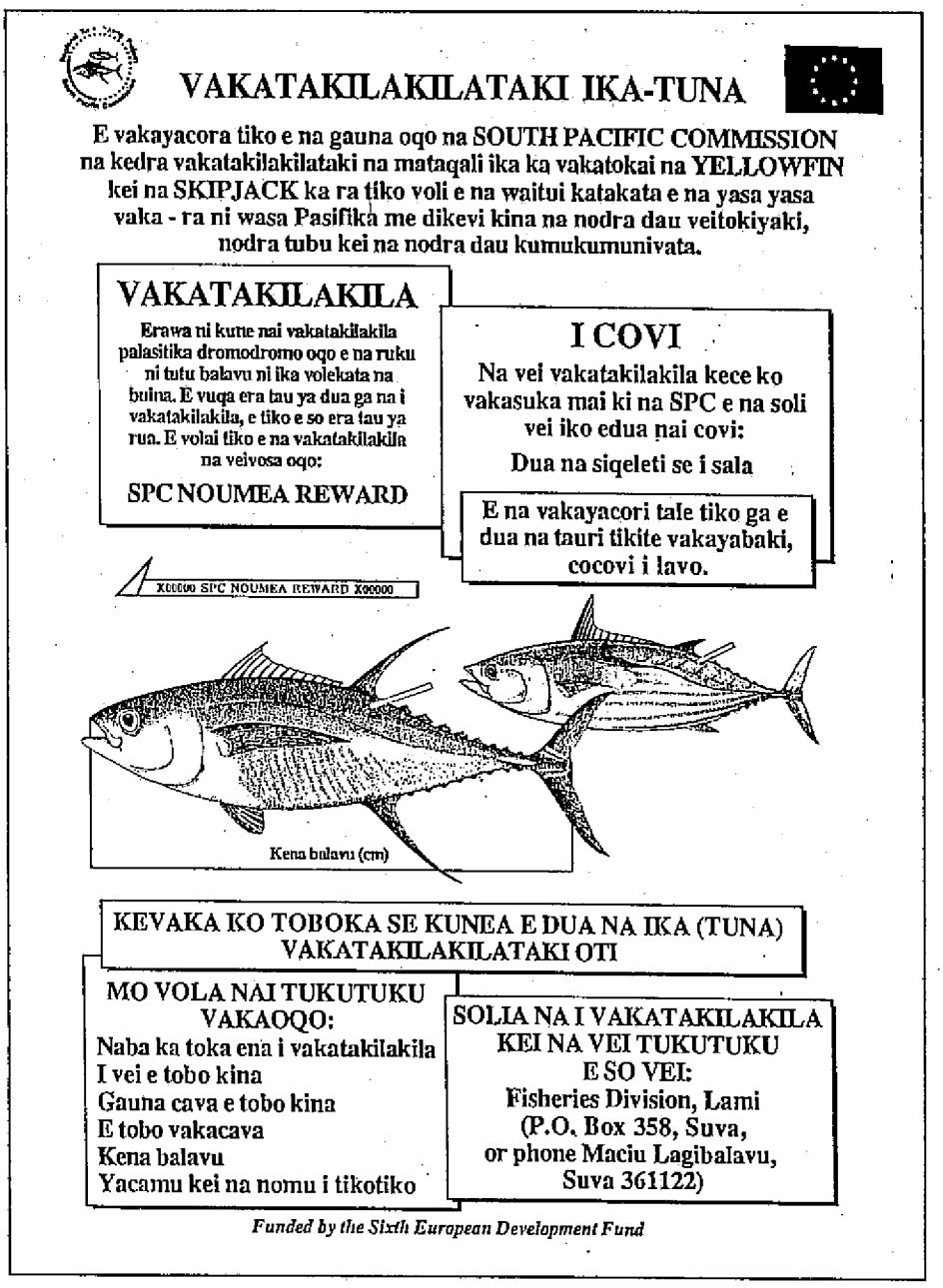
Places visited by Te Tautai during September — December 1991
1: Tarawa; 2: Santa Cruz Group; 3: West of New Georgia; 4: Guadalcanal; 5: Rossel & Tagula Isl.; 6: Bougainville Reef; 7: Marion Reef

In-country tagging project in Fiji

In January 1992 the TBAP plans to begin a small-scale in-country tagging project in Fiji, under the auspices of the RTTP. The aims of this project are to determine the size of the tuna stock within Fiji waters and the levels of interaction between the various fisheries targeting for tuna, particularly between the well-established pole-and-line and chartered longline fisheries, and the recently-established and growing longline/handline fishery.

The project will also provide information on movement patterns of tuna in Fiji waters and the extent of migration from Fiji to other parts of the western Pacific. The target is to tag and release 5,000 yellowfin and skipjack between late January and April from one or two local pole-and-line vessels.

These vessels will fish commercially, and SPC will pay for all tuna that are tagged. SPC Experimental Officer Filipe Viala and Specialist Fisherman Eroni Dolodai, both experienced taggers from the RTTP, will take part in the project. A Fiji language version of the well-known RTTP poster (shown below) has been prepared and will be distributed throughout the country to advertise the project and facilitate tag returns.



FAO Expert Consultation on Interactions of Pacific Tuna Fisheries

The FAO Expert Consultation on Interactions of Pacific Tuna Fisheries was held in Noumea, New Caledonia, from 3 to 11 December 1991. The meeting was organised by the Food and Agriculture Organization of the United Nations (FAO) and co-hosted by the Institut français de recherche scientifique pour le développement en coopération (ORSTOM) and the South Pacific Commission. Financial assistance was provided by an FAO Trust Fund Project funded by Japan. The meeting was attended by scientists from various countries.

The ultimate objective of the meeting was to enhance the capacity of the countries involved in tuna fishing in the Pacific, especially developing countries, to address scientific problems of interactions of tuna fisheries in order to optimise the benefits from these fisheries. Immediate objectives included:

— Identify major types of (1) interactions among tuna fisheries and (2) scientific problems related to these interactions that are of high relevance to Pacific tuna fisheries management;

— Review methods for addressing interaction problems, their applicability, experiences with using them and their effectiveness;

— Identify specific scientific problems related to interactions of Pacific tuna fisheries that are of high relevance to fisheries management;

— Review information on the specific problems of fisheries interactions and determine deficiencies in this information and the scientific understanding of interactions;

— Make recommendations for (1) improvements to the existing methods and development of new methods, (2) other future research, and (3) future activities of the Japan Trust Fund Project.

The meeting was organised into ten sessions to discuss methods for studying tuna fisheries interactions and species-specific problems (Pacific skipjack, Western Pacific yellowfin, Eastern Pacific yellowfin, South Pacific albacore, North Pacific albacore, Pacific bigeye, North Pacific bluefin, southern bluefin and Pacific small tunas). Working groups on these had been formed prior to the consultation.

The meeting noted that 338,868 mt of Western Pacific yellowfin were caught during 1990 by longline, purse seine, pole-and-line and artisanal gears of Indonesia and the Philippines. The rapid expansion of purse seining, which accounted for over 50 per cent of the catch in 1990, has raised concern over its possible effects on other components of the fishery.

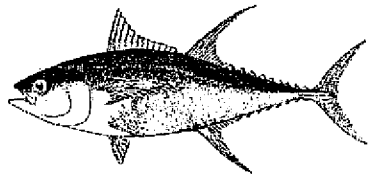
Identified scope for interaction includes purse seining affecting longlining; offshore activities affecting coastal activities; interaction among purse seine fleets; commercial activities affecting artisanal or recreational components; and coastal fishing affecting longlining.

Despite increasing fishing effort, there is no evidence yet of a decline in the abundance of yellowfin in the Western Pacific. Fisheries administrators are more concerned with possible interactions than with stock condition. The meeting noted that no-one was sure whether there was evidence of interaction in components of the Western Pacific yellowfin fishery.

Scientific problems concerning yellowfin interactions were identified as fishery statistics and abundance indices; stock structure and recruitment; movement patterns; analytical tools; and biological parameters. SPC's Regional Tuna Tagging Project is expected to add significantly to knowledge in several of these problem areas.

It was noted that the identification of problems and investigation of interactions depends to a large extent on the availability of catch, effort and size data. SPC and the Indo-Pacific Tuna Programme were urged to continue to establish data collection and validation systems for the activities of fleets of distant-water fishing nations.

The Western Pacific Yellowfin Research Group, which met for the first time in June 1991, will provide an important international forum for analysing data and providing advice on yellowfin, including yellowfin interactions.



SPREP (SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME) INVOLVED WITH TURTLE TAGGING

The conservation of migratory species such as marine turtles cannot be achieved solely by conservation measures at the national level. International and regional co-operative efforts are necessary to ensure the long-term survival of marine turtles.

Following the Fourth South Pacific Conference on Nature Conservation and Protected Areas, held in Port-Vila, Vanuatu, from 4 to 12 September 1989, a Regional Marine Turtle Conservation and Management Programme was proposed; its aim is 'to conserve marine turtles and their cultural, economic and nutritional values for the coastal peoples of the countries served by the SPREP'.

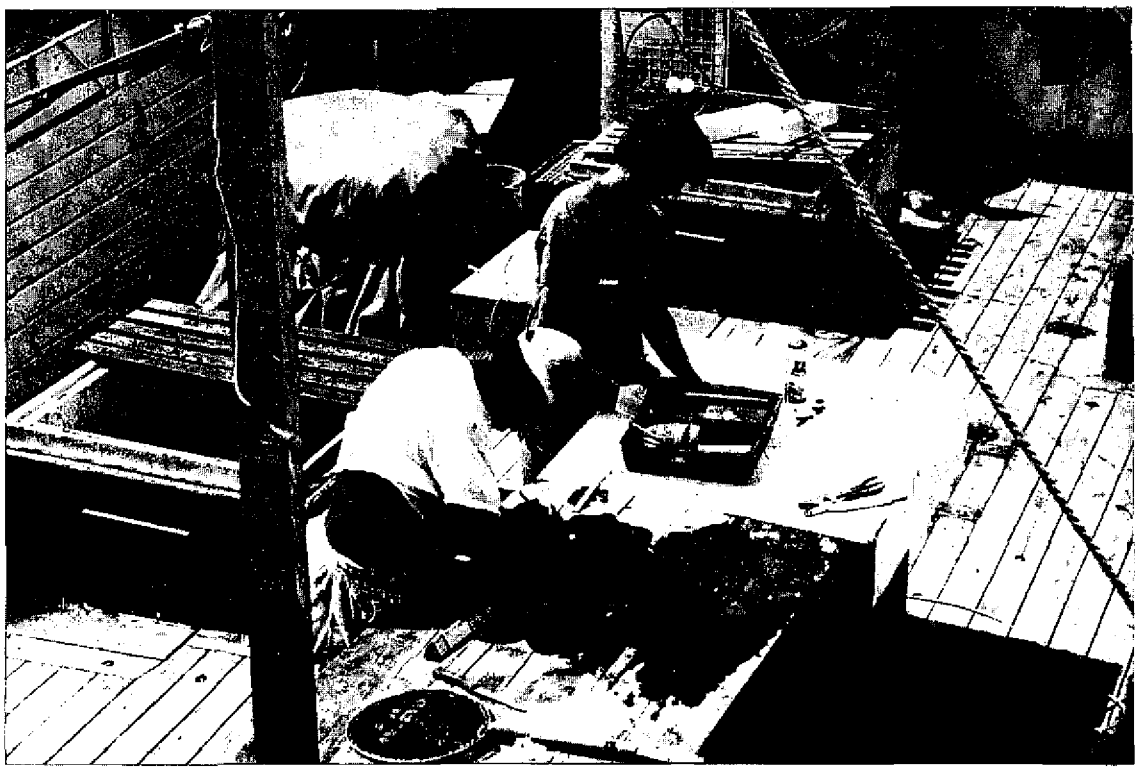
This programme has several objectives, including the encouragement, the financial support and the regional co-ordination of tagging programmes, including standardisation of tags, centralisation of return addresses, record-keeping and publicity (a poster explaining what to do with the recovered tags is attached at the end of this article).

Six of the seven species of marine turtles found in the world today occur in the South Pacific region. The most abundant, widespread and migratory marine turtles in the region are the Green turtle (*Chelonia mydas*) and the Hawksbill turtle (*Eretmochelys imbricata*).

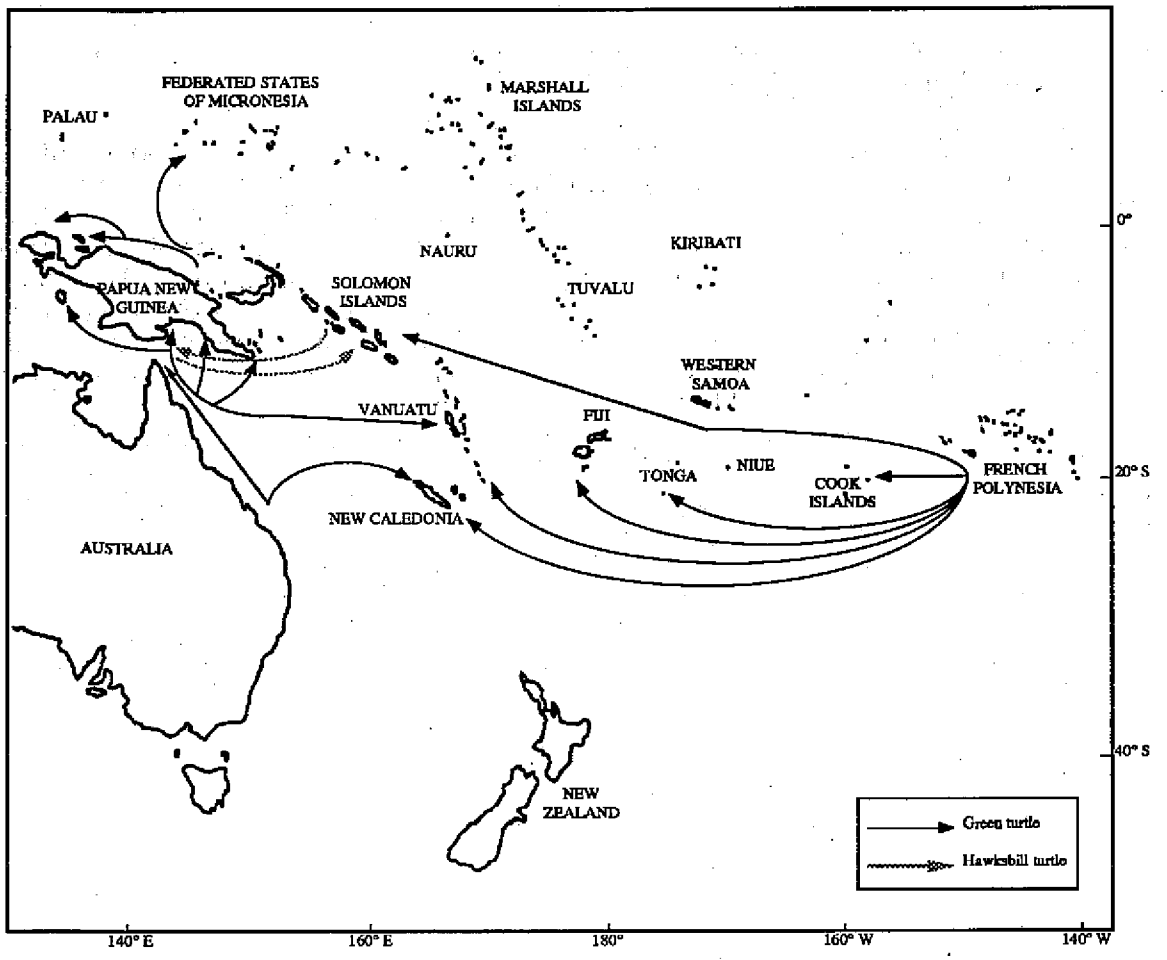
In many areas today, turtle exploitation is unregulated. Management mesures should make it possible to combine conservation goals with sustainable levels of harvest of marine turtles for the benefit of present and future generations.

Tag recoveries from existing mark-recapture programmes (see map next page) provide an indication of the movements of these two species.

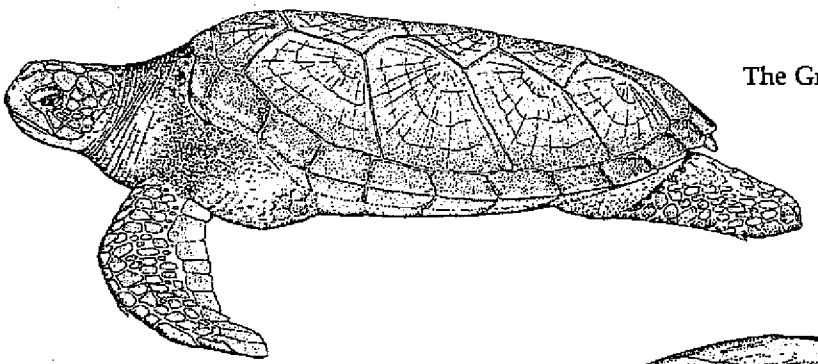
(Source: South Pacific Regional Environment Programme — *Marine Turtle Newsletter*)



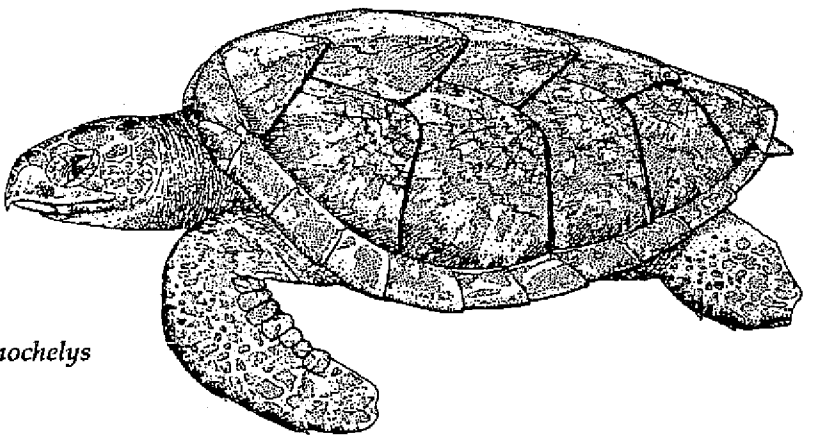
The Regional Tuna Tagging Project has also undertaken turtle tagging activities in support of the Regional Marine Turtle Conservation and Management Programme



Migrations of the Green turtle and the Hawksbill turtle in the South Pacific region

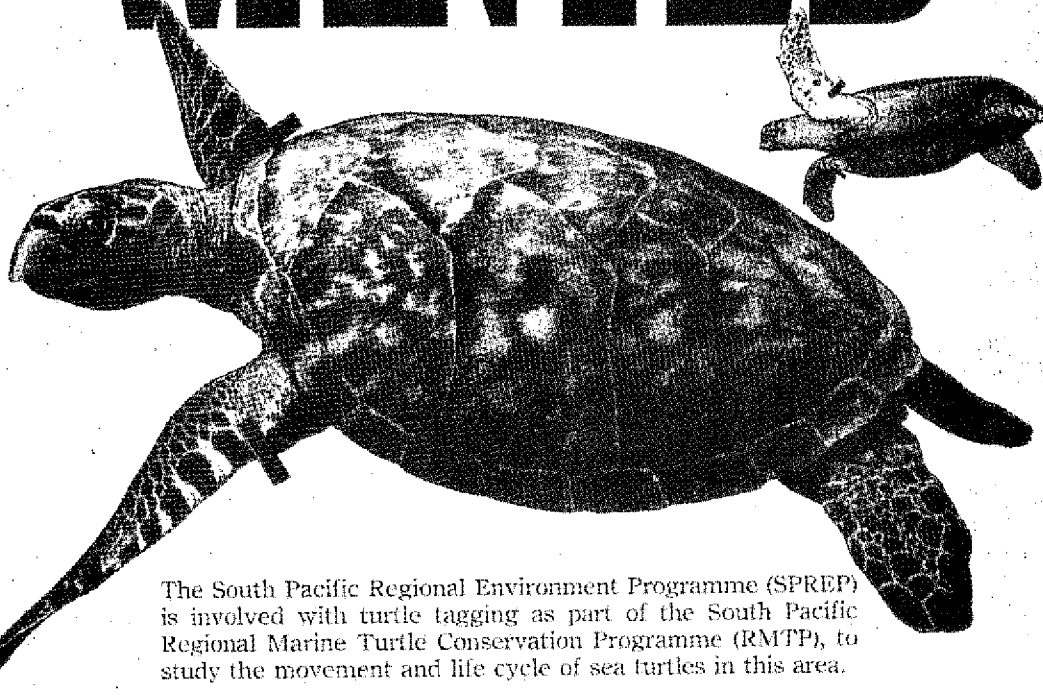


The Green turtle (*Chelonia mydas*)



The Hawksbill turtle (*Eretmochelys imbricata*)

TAGS WANTED



The South Pacific Regional Environment Programme (SPREP) is involved with turtle tagging as part of the South Pacific Regional Marine Turtle Conservation Programme (RMTP), to study the movement and life cycle of sea turtles in this area.

IF YOU FIND A TAGGED TURTLE,...WRITE DOWN...

* tag numbers
* when, how and where the turtle was caught
* what happened to the turtle
* your name and address

GIVE THIS INFORMATION, OR SEND THE TAG TO...

1. SPC/SPREP, BP D5, Noumea Cedex, New Caledonia... or
2. Your local Fisheries Office.

FOR EACH TAG RETURNED, **SPREP** WILL GIVE A REWARD OF A T-SHIRT, OR CAP.

The South Pacific Regional Marine Turtle Conservation Programme is supported by the International Centre of Ocean Development, the Australian National Parks and Wildlife Service, and the Queensland National Parks and Wildlife Service.

FISHERIES DEVELOPMENT PROJECT FOR MARSHALL ISLANDS

The Asian Development Bank approved in September 1991 an US$ 6.95 million-equivalent loan and a US$ 300,000 technical assistance grant to Marshall Islands for a Fisheries Development Project.

The loan will help the Government of Marshall Islands to initiate a domestic commercial fish production and marketing capability and establish the technical, administrative and resource management services needed to support private sector development of fisheries as a means to gain economic self-reliance. Fisheries constitute one of the most important productive sectors in the country's economy.

The project is designed to upgrade human resources, use the private sector as the engine for economic growth, strengthen institutions to establish environmentally and economically sustainable development of the fisheries sector and provide infrastructure to support the required production investments.

The two major components of the project are Integrated Pilot Fisheries Development and Institutional Strengthening and Training. The first part includes the construction of 12 fishing vessels, a fish processing facility, and a retail fish market. The second part will lead to institutional strengthening of the Marshall Islands Maritime Resources Authority (MIMRA), the construction and operation of a fisheries training centre, an expanded mariculture programme, and upgraded boat building and repair facilities.

The fish catch from project vessels is expected to be 2,615 mt a year, worth US$14.5 million, at full project development. More than 250 new jobs will be created as a result of the project. The executing agency for the first part will be Ebje Ruktok Rukjenlein Fishing Company (ERRFC). The executing agency for the second part will be MIMRA. The Ministry of Transportation and Communications will be the executing agency to support vessel construction and repair needs of vessels to be provided under the project.

The technical assistance grant, to be provided from the Japan Special Fund, will be used to assist ERRFC in implementing the private sector approach of the project and to strengthen MIMRA.

(Source: Asian Development Bank)

FAD TRIALS IN DOLPHIN WATERS

Drifting fish-aggregating devices (FADs) are being deployed in the eastern tropical Pacific in a joint project between the Inter-American Tropical Tuna Commission (IATTC) and the U.S. National Marine Fisheries Service (NMFS).

According to IATTC, the majority of tuna landed from the eastern tropical Pacific by the international purse seine tuna fleets is yellowfin tuna (*Thunnus albacares*) caught in association with dolphin herds.

The goal of this project is to evaluate the capacity of artificial floating objects to attract and aggregate mature yellowfin and bigeye (*Thunnus obesus*) tuna in areas where they are usually associated with dolphins, or in areas where naturally-occurring floating objects are scarce.

It is hoped that FADs will enhance fishing opportunities by supplementing or replacing catches of dolphin-associated tunas, and thus reduce dolphin mortalities incidental to purse-seine fishing operations.

An initial experiment designed to test durability at sea and the feasibility of tracking and relocating such FADs was conducted. Two identical units were deployed off Costa Rica and their movements were tracked via satellite. Later, 30 FADS in 10 groups of three identical units each were deployed.

These FADs were of four experimental designs; some were surface units only, while others included also underwater arrays up to 90 m (≈ 50 fathoms) deep. They were equipped with various tracking and locating devices.

One FAD in each group was equipped with a satellite transmitter, which enables the FAD's position to be pinpointed to within a kilometre; the other two FADs in the group were equipped with selective calling medium-wave radio buoys, which operate only when activated by a fishing vessel's signal generator. These buoys can be tracked by vessels at distances up to 200 km. Several FADs were also fitted with radar re-

flectors and/or flashing lights which activate at night.

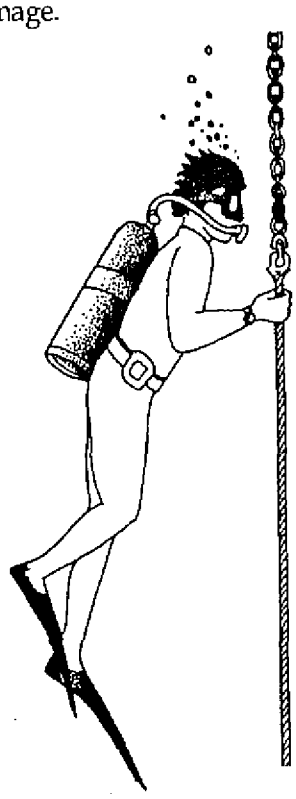
According to the Tuna Commission, the intention is to have as many vessels of the international tuna-purse seine fleet to participate in this project as is possible. The positions and direction and rates of drift of these FADs are being monitored at the NMFS Southwest Fisheries Science Center (SWFSC) in La Jolla, California. This information is being provided on a daily basis to vessel managers and to IATTC offices in Latin America.

(Source: *Fishing News International*)

OXYGEN FIRST AID IN DIVE ACCIDENTS

Increasingly, knowledgeable diving physicians agree that emergency oxygen is the single most effective first-aid measure for decompression sickness, air embolism and near-drowning.

Dive Alert Network's (DAN) 1989 *Report on diving accident and fatalities* indicates that emergency oxygen was used in only 33 per cent of recorded diving emergency situations. Data from previous reports reinforces this finding. With oxygen therapy, nitrogen elimination from the surrounding tissues is significantly increased, which may help the injured diver recover more rapidly and reduce the likelihood of permanent residual damage.



The recommended diving accident management protocol for all suspected cases of decompression sickness (DCS), or near-drowning should always include maintaining the diver's ABCs - (A)irway, (B)reathing and (C)irculation; and continuing to provide emergency oxygen first aid while en route to the nearest available medical facility for evaluation and treatment.

Support for using oxygen as first aid throughout the diving community has been positive. However, until recently access to instruction in the use of oxygen equipment for the general diving public had been seriously lacking. All SCUBA instructional organisations address the benefits of on-site emergency oxygen administration in their textbooks and instructional programmes. In an effort to alleviate this situation, DAN has initiated a major effort to provide training for the general diving public in the administration of emergency oxygen in the field.

The key to this programme was the development of an oxygen unit which allows qualified personnel to provide oxygen first aid easily to dive accident victims. The new entry-level DAN course, Oxygen First Aid in Dive Accidents, includes both lecture and practical training experiences. The student-to-instructor ratio is kept low in order to maintain maximum comprehension.

The lecture portion of the course addresses recognition and first aid for major diving emergencies and the benefits and safety practices of oxygen administration. The extensive hands-on portion of the classes encourages familiarity with all components of the easy-to-use DAN Oxygen Unit.

Participants learn how to resuscitate breathing and non-breathing divers using specially designed equipment from this oxygen unit. Practice sessions involve the use of live 'buddies' and mannequins in a variety of simulated scenarios.

The course concludes with a written examination. All successful participants receive a DAN Oxygen First-Aid Provider wallet card and recognition materials.

This training is valuable for divers of all certification and experience levels, especially diving leaders (instructors, dive-masters, skin-diving leaders) who are responsible for the safety and welfare of others.

For divers with training in oxygen administration, DAN offers an eight-hour oxygen instructor's course (ITC). This course familiarises the certified SCUBA instructor or qualified health care professional with the standards and procedures required to qualify students as DAN Oxygen First-Aid Providers.

All divers wishing to teach DAN's Oxygen First-Aid in Dive Accidents course must attend an Oxygen ITC unless they are currently certified as an oxygen instructor through a recognised agency. However, these individuals must still participate in a crossover-orientation programme which emphasises differences in approach, philosophy, standards and procedures.

Divers interested in learning how to administer oxygen for first aid in dive accidents may take advantage of this new opportunity by contacting :

DAN's Training Division
P.O. Box 3823
Duke University Medic. Center
Durham, NC 27710, USA

or by calling (919) 684-2948

(Source: *DAN Alert Diver*)

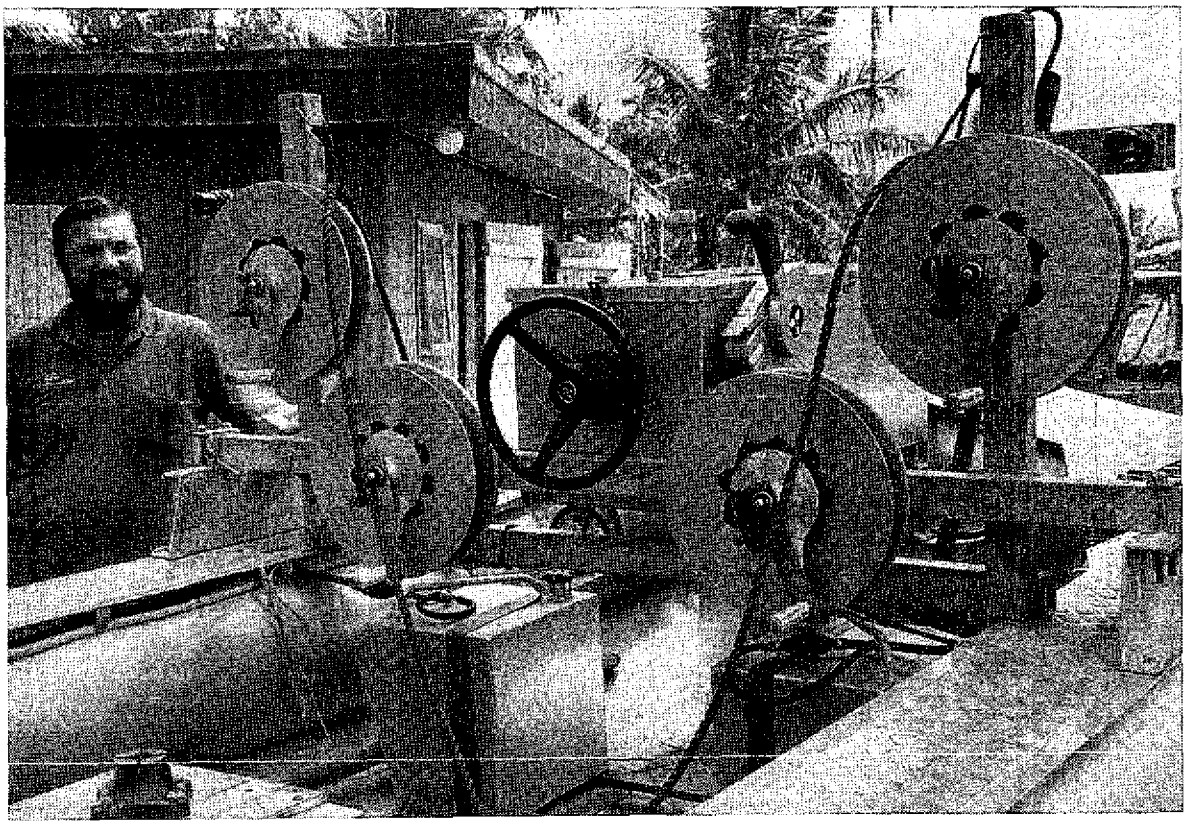
TURNING MOTORCYCLE WHEEL HUBS INTO FISHING REELS

When Graham Marsh, Kiwi Chairman of the Niue Fishermen's Association, became tired of tangles in his fishing line on the bottom of his dinghy, he thought that there must be a better way to avoid tangles when fishing with two handlines.

He had seen several of the FAO/Western Samoa-designed wooden reels fly apart on big strikes, and consequently considered them quite dangerous. After making some designs with pencil and paper for the purpose of constructing a fishing reel from scratch, his imagination produced the idea of using a motorcycle wheel hub as a basis for a fishing reel (old motorcycle wheels were common on Niue). He then used a lathe to turn down the aluminium sides of the reel, made from 5 mm aluminium plate.

The hubs also had to be turned down on a lathe in order to make a smooth surface to fit against the two aluminium plate sides of the reel.

The two sides of the reel were then bolted together with stainless steel bolts through the spoke-holes of the wheel, creating a very solid fishing reel. The original brake mechanism is still intact inside the hub, and acts to tension the fishing line with a variable-tension screw

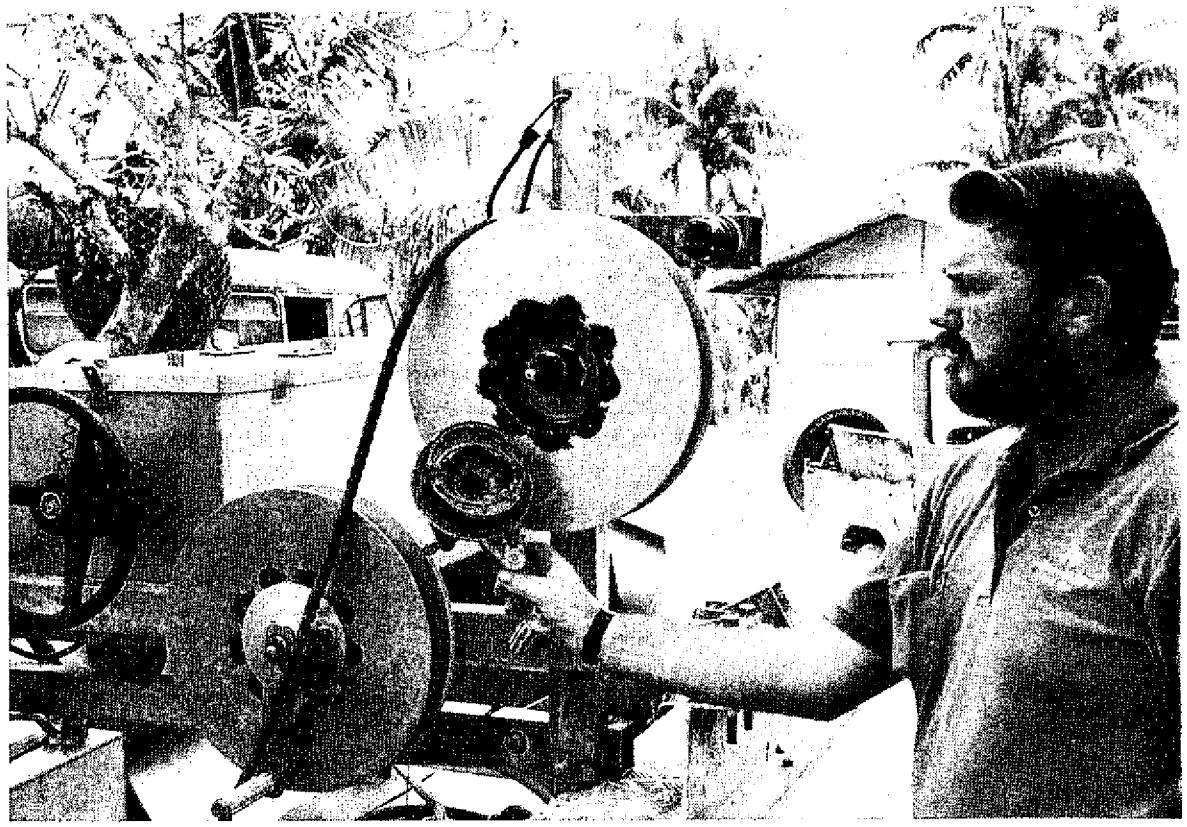


Graham Marsh and his 4.5 metre aluminium Stabicraft boat with four of the fishing reels described

on the original brake cable fitting.

The design has proved successful and is virtually maintenance-free. Several Niuean fishermen have made similar reels since Graham conceived the original design.

(Source: S. Coffen-Smout, Fisheries Development Officer, Niue)



Graham Marsh holding the brake drum and crank of fishing reel on boat.

ECOLOGY OF MANGROVE AND RELATED ECOSYSTEMS

An International Symposium on the Ecology of Mangrove and Related Ecosystems was held from 24 to 30 September 1991 in Mombasa, Kenya. The meeting was organised by the Department of Zoology of the University of Nairobi in collaboration with the Kenya Marine and Fisheries Research Institute and the RECOSCIX-W10 Regional Dispatch Centre.

The unanimous conclusion of the 110 participants was that 'the mangrove, seagrass and coral reef ecosystems are of paramount ecological and economic importance but have already undergone great degradation which is advancing at an alarming rate. If present trends continue, the natural resource basis of the economy and ecology of tropical coastal regions will soon be ruined. This assembly concluded that much can be done to stop the degradation of these dam-aged ecosystems and to rehabilitate them. But new techniques must be found to use them on a sustainable basis for long-term economic returns and for the well-being of coastal human settlements and a healthy environment'.

The symposium also recommended establishment of national coastal management plans with the following components:

— Survey of both natural and human resources and their present uses;

— Identification of the problems affecting these ecosystems;

— Adjustment of the legal frameworks with regard to the uses of these ecosystems and enforcement of existing management regulations;

— Provision of technical assistance and training (agriculture, forestry, fisheries, land use) for the introduction of economically and ecologically viable activities in these ecosystems;

— Rehabilitation of damaged areas;

— Creation of natural reserves both for tourism and for the recuperation of natural plant and animal populations; and

— Education and creation of public awareness on the value and problems of these ecosystems.

The proceedings of the workshop will be published as a single issue of the International Journal *Hydrobiologia* with the sponsorship of the Commission of the European Communities. Another meeting will take place in1992/1993 in Mexico. The EPOMEX Program of the Autonomous University of Campeche, Mexico, has offered to host this workshop.

(Source: *Fishbyte*)

THE ICOD (INTERNATIONAL CENTRE FOR OCEAN DEVELOPMENT) OCEAN FORUM

The International Centre for Ocean Development has sponsored the Ocean Forum, a significant step towards understanding how the principles of sustainable development can be used to protect the world's oceans and their resources and use yhem more effectively. The Ocean Forum was held on 20 and 21 November 1991, at the World Trade and Convention Centre in Halifax, Nova Scotia, Canada.

The Ocean Forum brought together leaders in the field of sustainable development to:

— Increase public awareness about the contribution of the oceans to sustainable development;

— Consider how emerging ideas about economic and environmental linkages can be employed to define sustainable ocean development;

— Identify cases of sustainable development related to marine and coastal use;

— Provide recommendations for development agencies and countries to develop strategies, policies, and programmes for sustainable ocean resources development;

— Identify elements for a sustainable ocean development preliminary action plan to be submitted for international review.

Forum participants were drawn from the ocean community in Canada and abroad, including the private sector, governments, universities, non-governmental organisations, and international development agencies.

Special attention was given to representatives and scholars from countries in the four regions where ICOD is active: the South Pacific, Caribbean Basin, South and West Indian Ocean and West Africa.

(Source: *Fishbyte*)

SOUTH PACIFIC WATERS GET CLOSER STUDY

A new regional maritime surveillance network announced in November 1991 will connect South Pacific countries to an extensive communications network set up to collect, collate and disseminate marine surveillance information, according to an Australian official. The network, initially to be sponsored by Australia, will operate in 10 Pacific countries.

The central database will give all countries access to information about fishing and boating activities in their own and other countries' waters. It will also allow them to monitor fishing, fish stocks, immigration, shipping and customs, as well as helping in search and rescue operations.

Under the Pacific defence cooperation agreements, started in 1983, Australia gave 15 patrol boats to Papua New Guinea, Tonga, Cook Islands, Western Samoa, Vanuatu, Marshall Islands and the Federated States of Micronesia. The 31-metre boats, often replacing small pleasure crafts are used to patrol territorial waters and for search and rescue.

(Source: *Fiji Times*)

ICLARM'S SELECTIVE FISHERIES INFORMATION SERVICE

ICLARM's Selective Information Service is designed to provide in-depth information on research areas related to ICLARM's areas of expertise:

— in finfish aquaculture, especially of tilapias, carps and mullets, and integrated fish farming;

— in resource management especially in tropical and multispecies fisheries;

— in small-scale or traditional fisheries; and

— in tropical coastal zone management.

The service is multidisciplinary and includes biology, economics, and social aspects of fisheries and aquaculture.

ICLARM's information specialists are also available to help other institutions to develop their own information capability.

Selective Information Service products include copies of important documents, lists of references to previous research and usually indications of other current research in the requested subject area.

For frequently-requested and/or especially important topics, the Service undertakes a 'mini-review' of the literature to highlight prominent researchers and institutions, point out any deficiencies in the coverage of the literature by the databases searched and offer advice to new researchers in the field on the most useful articles and contacts.

Fees for service

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— research reports;

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Makati, Metro Manila, Philippines

(Source: *Fishbyte*)

USE OF ARTIFICIAL SHELTERS TO ENHANCE ROCK LOBSTER FISHERIES

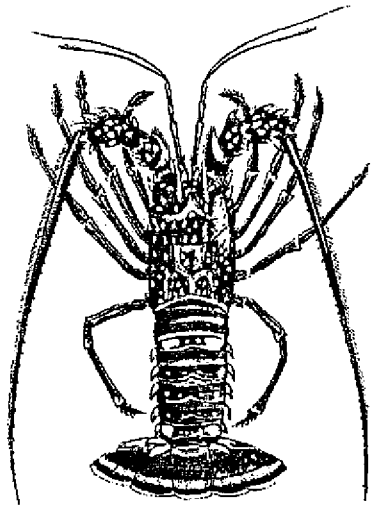
During the Twenty-third Regional Technical Meeting on Fisheries, held in Noumea from 5 to 9 August 1991, Dr R.E. Johannes of CSIRO presented a paper which described a technique used in the Caribbean region (Cuba and Mexico) for enhancement and capture of rock lobsters. The September 1990 issue of Western Fisheries Magazine *published an article on Caribbean lobster, which is presented below, with minor modifications.*

by Chris Chubb and Rhys Brown, Western Australian Marine Research Laboratories, Australia

A number of spiny (rock) lobster species inhabit the waters of the Caribbean. However the lobster fisheries of the region depend almost entirely upon a single species, *Panulirus argus*, the Caribbean spiny lobster, for the majority of their landings.

P. argus has an extensive distribution, from Bermuda, to southern Florida, Mexico, Cuba and the other Caribbean countries and as far south as Brazil.

This lobster has a life-history pattern very similar to that of the Australian western rock lobster. It spawns in the spring—summer period, the mature females breeding in deeper water. Deep water in this region is usually not more than about 40 m, as the shelf drop-offs are steep.



Panulirus argus

The eggs hatch within a few weeks and the larvae spend six to eight months drifting in the sea at the mercy of currents and eddies before settling as pueruli in shallow nursery areas of sea-grass, seaweed and sponge.

Growth in *P. argus* is rapid due to the high water temperatures, commonly 25 to 30°C; a carapace length of 76 mm may be reached in as little as two and a half to three years of age (from hatching). Sexual maturity in females is reached at 80—90 mm carapace length and an age of about four years.

Before breeding, older juveniles migrate from the shallow nursery areas out into the deeper water, where the cycle continues.

The spiny lobster fisheries at Ascension Bay in the Mexican state of Quintana Roo, Cuba and the Florida Keys (see map on next page) were visited by the authors to gain first-hand experience of the operation of these fisheries.

The lobster fishery at Ascension Bay, on the east coast of the Yucatan Peninsula, is relatively undeveloped. Fishing villages such as Punta Allen are connected by dirt roads and transport and communication are often difficult.

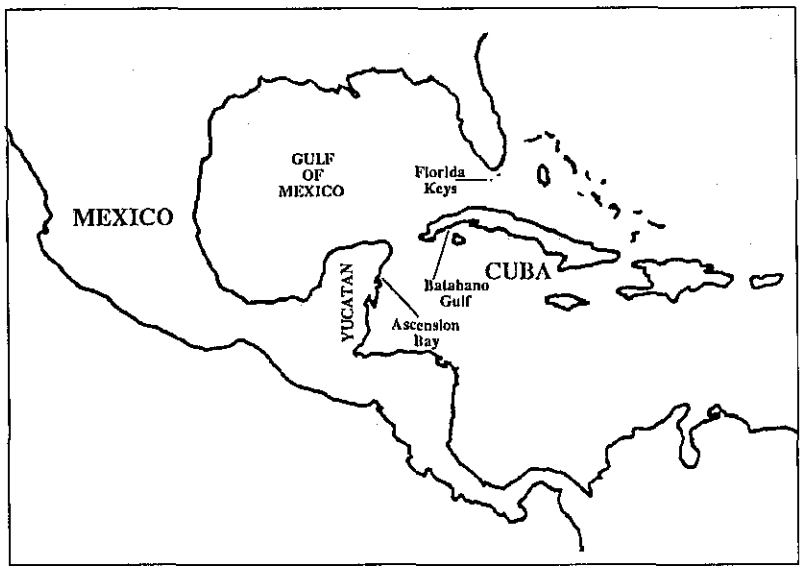
Lobster fishing occurs in the area's large, shallow (2—5 m deep) bays which are sheltered by a fringing coral reef and harbour extensive seagrass beds. The bay is divided into fishing areas for individual fishermen, all of whom must belong to the local fishing co-operative.

The vessels used in this fishery are open dinghies from five to six metres in length, of solid fibreglass construction and powered by outboard motors.

The fishermen do not use traps or pots. Instead they use artificial shelters called *cassitas* which are laid out on the seagrass beds. The cassitas are about 2—2.5 m long by 1.2 m wide and stand approximately 0.3 m high. They may be made entirely of wood or may have a concrete or iron roof.

Lobsters accumulate under the shelters, making capture a simple process. Firstly a small net with a pocket is placed around the cassita. Next the cassita is lifted up and the lobsters shepherded towards the pocket in the net. Once all the lobsters are in the pocket the net is lifted into the boat where the lobsters are sized.

The minimum legal size, which varies from area to area, is a tail rather than a carapace length measurement and in Ascension Bay it is equivalent to about 74 mm carapace length. Other regulations include a closed season of a few months over the



breeding period and a ban on the capture of berried females.

The fisheries in the area are still developing and reliable catch and fishing effort statistics are difficult to obtain. Nevertheless, the Ascension Bay Co-operative, covering an area of about 1,000 km^2, produces annually about 63 t of spiny lobster tails, equivalent to about 200 t of landed live lobsters.

Lobster production is small and fishermen are involved in other fisheries, such as netting finfish, to provide an acceptable level of income for each family.

Occasionally hurricanes sweep through the region, causing extensive disruption and massive damage to property. In addition coral reef and seagrass habitat and many cassitas may be destroyed, causing loss of production and financial hardship for the fishermen.

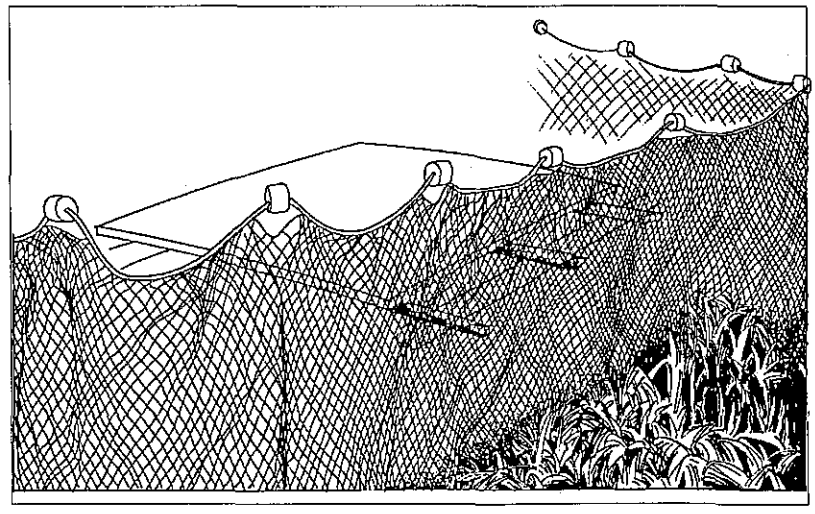
Cuba's spiny lobster industry is much more developed, with about two thirds of the island's 5,700 km of coastline having shelf suitable for lobster fishing. There are four main fishing zones, with Batabano Gulf by far the largest and most productive. Each zone is further subdivided into fishing areas controlled by 'enterprises' (co-operatives) which employ all 1,286 fishermen and own the 286 boats from which they work.

The commercial fishery for spiny lobsters commenced in the 1920s and up to about 1955 produced between 200 and 1,000 t annually. In 1956 the catch was 4,000 t and in 1965, 9,000 t were landed. Since then catches have risen steadily to a level of about 10,000 to 11,000 t, after peaking at 14,000 t in 1985. Batabano Gulf accounts for about 60 per cent of the total production.

Three methods are used to capture spiny lobsters in Cuban waters. As in Mexico the principal method is the placement of artificial shelters, in Cuba called *pesqueros*, on the sea-grass beds in the shallow shelf waters. There are believed to be some 227,000 pesqueros in use in Cuba, an average of about 1,000 per boat. This is a conservative estimate and the actual number in use is unknown.

Haul traps are used in the deeper waters of the fringing reef and shelf break and set-net traps are used in shallower water during lobster migrations. The long wings of mesh net attached to the set-net traps guide migrating lobsters into them. Approximately 74,000 haul and set-net traps are used in the Cuban spiny lobster fishery.

Cuban research scientists have watched the catch rate of each method decline over the past eight or so years, particularly since the recent rapid increase



Underwater cassitas (artificial shelters) used in the seagrass beds of Ascension Bay, Mexico

in the number of pesqueros. The number of vessels operating in the fishery has already been restricted and the scientists are now seeking to restrict the number of pesqueros. The fishery has a March-to-May closed season while breeding takes place, and a ban on the capture of berried females. A legal minimum size of 69 mm carapace length applies to lobsters caught in this fishery.

The capture of lobsters from pesqueros is done by teams of men working in dinghies from a 'mother ship' up to 60 km from shore. The men use the larger round-bilge timber or ferro-cement vessels to eat and sleep on as they remain at sea for a number of days. The lobsters are held in floating cages until the catch is sufficient to warrant a return to port where the catch is processed at the enterprise's facilities.

The mother ships bring the lobsters back in plastic crates, stacked one on top of the other and covered with wet hessian sacking. The journey back may take anything up to six hours. At the open air receival depot/processing establishment the crates are off-loaded and weighed. Next the lobsters are visually graded into different size categories and thrown into other containers. Finally they are tailed and the product washed and frozen for export to Europe, Canada, Japan and South-East Asia.

Stern view of the living quarters on a Cuban commercial lobster vessel

VARIOUS USES OF THE PARA-ANCHOR

by Peter Watt,
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1991 saw the introduction to Western Samoa of the vertical longline method developed by SPC masterfishermen to catch deep-water tunas. Experimental trials were conducted by deploying the vertical longline gear and tying it to a FAD. This method was used because the majority of deep-water tunas remain near the thermocline at 238—274 m (130—150 fathoms) depth in close proximity to the FAD (see SPC *Fisheries Newsletter* #58 for more details).

The major limitation of this technique was that only one vessel at a time could deploy its gear and tie it to a FAD. Recently, after six months of successful vertical longline trials with the Western Samoa Fisheries Division's research vessel, the *Tautai Matapalapala*, many of the local fishermen geared up their boats to exploit the new resource. With over 15 vessels competing for the use of a limited number of FADs, another method of controlling the drift of the vertical longline gear out of the target zone had to be developed.

A para-anchor was designed and constructed for this purpose. A fishing vessel could set its vertical longline gear near a FAD, tie the surface rope to the bow, then deploy the para-anchor and drift slowly downwind from the FAD. By using para-anchors a number of fishing vessels could deploy their gear around an FAD at the same time. The use of the para-anchor also made it possible for the fishing fleet to expand its fishing effort to areas where deep-water tunas tend to aggregate naturally on reef drop-offs and depressions.

A commercial para-anchor is very expensive (between US$ 2,000 and 2,500), which is far too much for the average fisherman in the region. This necessitated designing an inexpensive para-anchor that could be constructed on-island, using materials that could be purchased locally, and could be deployed and retrieved easily from a small vessel.

The components of the para-anchor are listed below:

1. Float
2. Trip line
3. Float rope
4. 3-way ring joint
5. Release rope
6. Sinker rope
7. Sinker
8. Parachute
9. Shrouds
10. Dome swivel
11. Anchor rope

Detailed drawings are shown in the figure on next page.

Construction

Step 1

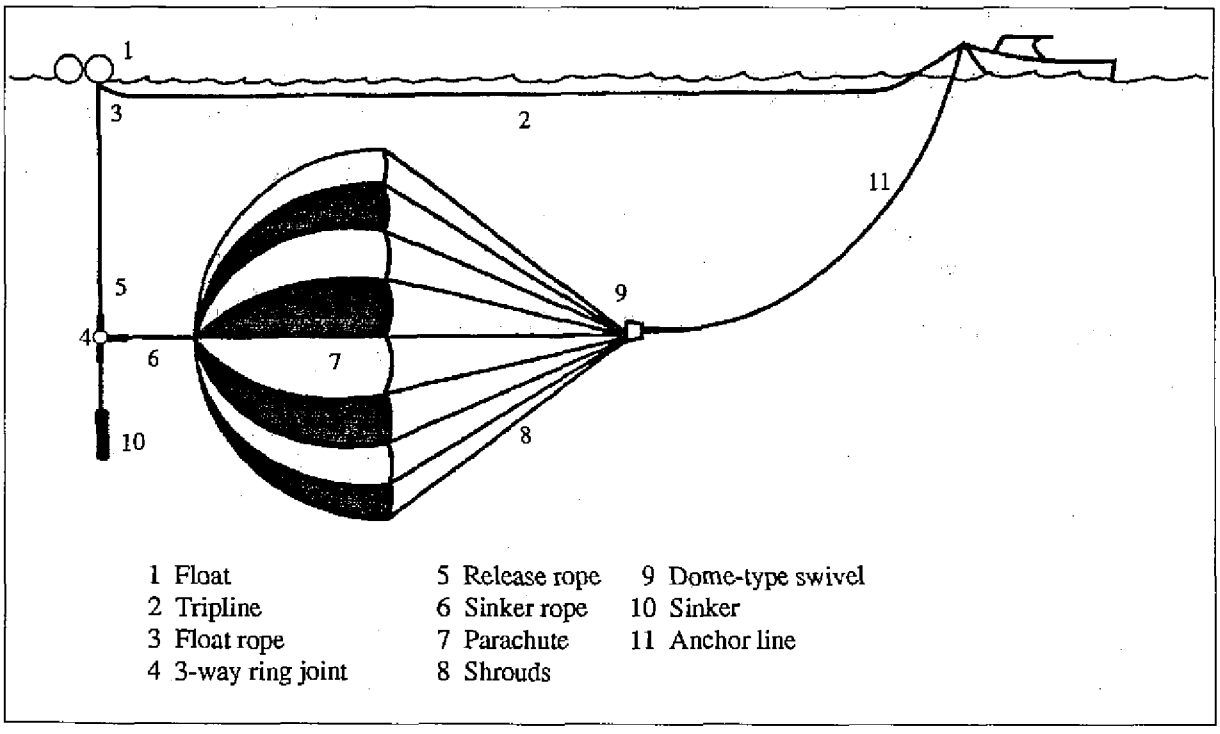
Cut 12 sections of plastic woven cloth, such as tarpaulin material, discarded sails or canvas, 183 cm (72 in) long by 81 cm (32 in) by 15 cm (6 in). Cut 12 pieces of kuralon rope 7.7 m (4.2 fathoms) long. Lay out the 12 sections of plastic-coated cloth, placing all the 15 cm (6 in) ends at the top and all the 81 cm (32 in) ends at the bottom. Lay a piece of kuralon rope where each section joins another, with 5.5 m (3 fathoms) extending out from the 81 cm (32 in) ends and 45.7 cm (18 in) extending out from the 15 cm (6 in) ends.

Step 2

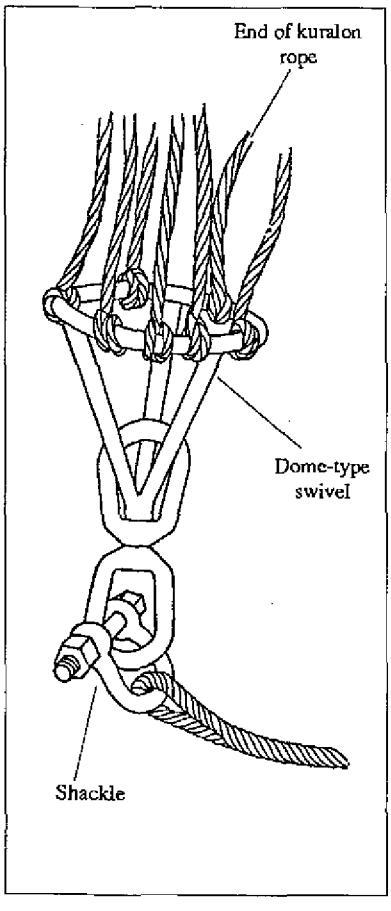
Sew the sections together by folding the edges back 2.5 cm (1 in) on each section. Wrap the kuralon rope inside the fold of each section that is being sewn together. When sewing run the

Materials required for the para-anchor

Item	Quantity/length
Plastic woven cloth (tarpaulin, discarded sails, canvas)	12 pieces 183 cm (72 in) long, 81 cm (32 in) wide at one end and 15 cm (6 in) wide at other end
Kuralon rope	93 m (51 fathoms)
8 mm polypropylene rope	98.7 m (54.2 fathoms)
2.5 cm (1 in) re-bar	4 pieces 30 cm (12 in) long
0.95 cm (3/8 in) brass rod	105 cm (3 ft 6 in)
Extra large stainless steel longline swivels	3
1.9 cm (3/4 in) galvanised swivel	1
0.95 cm (3/8 in) shackle	1
300 mm (12 in) plastic float	1



Para-anchor



Details of the para-anchor

thread up and down the seam of each section, for added strength and also to hold the kuralon rope in place. Re-inforce the ends of each section by sowing the seam at each end repeatedly. After the basic parachute has been sewn together, lay out the 12 pieces of kuralon rope that extend from the top of the parachute; each should extend 45 cm (18 in). Lay them out so that the ropes opposite each other on the parachute are placed together. Splice the ropes opposite each other together. Take a 0.60 m (2 ft) piece of kuralon rope and tie together the six spliced loops to make one large loop.

Step 3

Fabricate a 3-way ring by sliding three extra large stainless steel longline swivels over a piece of 0.95 cm (3/8 in) brass rod 37.5 cm long. Bend the brass rod into a triangular shape and weld the two ends together.

Step 4

Fabricate a dome-type swivel by cutting a 0.95 cm (3/8 in) brass rod into three 12.5 cm (5 in) sections and one 30 cm (12 in) section. Bend the 30 cm (12 in) section into a circle and weld the two ends; place the three 12.5 cm (5 in) sections so that one end of each is spaced equally apart on the circle. The other ends of the three sections are placed on either side of the top shaft of a 1.9 cm (3/4 in) galvanized swivel. The top ends are welded to the brass circle and the bottom ends are welded to the galvanized swivel.

Step 5

Splice the 12 ends of the kuralon rope extending out 5.5 m (3 fathoms) from the bottom of the parachute to the ring of the dome-type swivel. Make sure that the kuralon ropes are spliced onto the dome-type swivel in the proper sequence;

fasten a 0.95 cm (3/8 in) shackle to the top end of the swivel.

Step 6

Cut 5 pieces of 8 mm polypropylene rope, 2 pieces 45.7 m (25 fathoms), 2 pieces 1.8 m (1 fathom) and 1 piece 3.7 m (2 fathoms). Take a 45.7 m (25 fathom) piece, make an eye splice at one end and attach a plastic longline float. Take the other 45.7 m (25 fathom) piece, pass one end through the shackle at the end of the dome-type swivel and make an eye splice. Take the 3.7 m (2 fathom) piece, make an eye splice at one end and attach it to the plastic float, then pass the other end through one of the longline swivels on the 3-way ring and make an eye splice. Take one of the 1.8 m (1 fathom) pieces, pass one end through one of the longline swivels on the 3-way ring and make an eye splice; take the other end, pass it through the large loop of kuralon ropes fastened together at the top of the parachute and make an eye splice. Take the other 1.8 m (1 fathom) piece, pass one end through the last longline swivel on the 3-way ring and make an eye splice. Make an eye splice on the other end ready for attachment of the sinker.

Step 7

Attach the sinker, made up of 4 pieces of 30 cm (12 in) re-bar tied together to the end of the 1.8 m (1 fathom) rope attached to the 3-way ring.

Deploying and hauling the para anchor

The following steps are required when deploying the para-anchor:

— Check the shrouds are free of entanglement;

— Attach the swivel to the anchor line and the dome-type swivel;

— Attach the release rope to the release vent section, then to the float and sinker ropes. The lengths of rope should be adjusted according to the wind strength, the height of the waves and the strength of the current;

— Attach the float to the trip line;

— Lower the float and then the sinker into the water from the bow of the boat facing the wind;

— Lower the para-anchor into the water; release the vent section first;

— When the para-anchor has opened completely, lower the dome swivel into the water in such a way as to avoid tangling the shrouds. The para-anchor will open out more quickly if slight reverse throttle is used when lowering it into the water.

The following steps are required when hauling the para-anchor;

— While using slight forward throttle, haul in the trip line and pull in the float;

— Pull in the parachute, release vent first, then the shrouds, ensuring that the later do not get entangled;

— Store inside a canvas bag for future use.

Deploying and hauling vertical longline gear using para-anchor

The method of deploying a vertical longline with a para-anchor is exactly the same as that used when tying to a FAD, except that the gear is tied to the bow of the boat instead of the FAD. Vertical droplines are lowered into the water and suspended with plastic longline floats. The droplines are tied together in a series 50 fathoms apart with a polypropylene surface rope.

Once all the droplines have been deployed and tied together, the end of the surface rope is tied to the bow of the boat. The para-anchor is then lowered into the water and fastened to the bow. Another vertical dropline can be deployed and fished directly from the side of the boat.

When a fish is caught on one of the droplines floating forward of the bow, the dropline at the side of the boat can be released to free-float with the current. The para-anchor is then hauled aboard the boat and the surface rope connecting the droplines is released from the bow.

The boat motors forward to the dropline with the fish and unclips it from the surface rope. The dropline is then pulled a short distance away from the now free-floating longline to avoid drifting down-wind into the other droplines. It is then hauled up. To re-deploy the dropline, the boat motors back to the free-floating longline to the place where the dropline was removed from the surface rope.

The line is then lowered back into the water; some skill with the engine is required by the

skipper to keep the boat in position so that it does not drift down-wind and tangle with the other droplines. It is not advisable to set more than two or three droplines from the bow of the boat in strong winds or currents.

Other uses of the para-anchor

Bottom fishing

The para-anchor has many advantages over the traditional grapnel anchor for bottom fishing.

— A para-anchor can be deployed and retrieved in a matter of minutes with minimal effort. A grapnel anchor requires time to sink to the ocean floor and then has to be set with the proper amount of scope. Often the anchor does not hold, because of steep bottom contours or strong winds and currents. Hauling the anchor is time-consuming, the boat having to motor forward dragging two plastic longline floats that slide along the anchor line and force the anchor to the surface.

— When there is a strong current and the boat is anchored to the bottom, the fishing lines are pulled in the direction of the current. The drag on the line alters the proper fishing depth, sometimes so dramatically that the baited hooks are beyond the targeted species habitat when they reach the bottom, or never reach the bottom at all. Also the drag on the lines make it difficult for the fisherman to feel the fish biting and increases the amount of effort required to haul a caught fish from the bottom. When using a para-anchor, the boat drifts slowly with the current, reducing the amount of drag on the droplines.

— An anchored boat is only capable of fishing a limited area. The anchor rope can be adjusted on steep slopes to fish at different depths, but still the area is minimal. With a para-anchor the boat can drift slowly over an extensive fishing area. If the boat drifts into water that is either too deep or too shallow, the para-anchor can be re-set at the proper depth without effort.

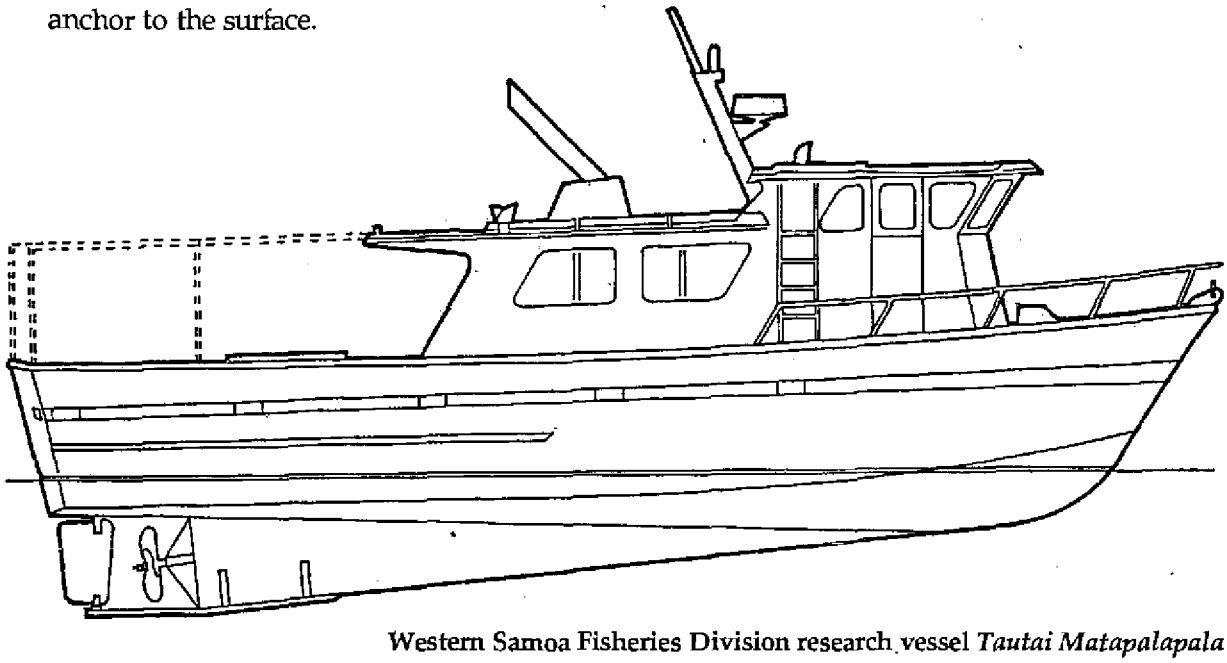
— Steep contours on the outer-slope, where it would be impossible to set a grapnel anchor, can be fished.

— Anchors and anchor ropes can be lost when a grapnel anchor will not release from the bottom or the rope is chafed off by coral. This does not happen with a para-anchor.

Safety

Often when an engine fails aboard a boat there is no spare. Many fishermen have been lost at sea due to the boat drifting rapidly away from land. In an emergency situation a para-anchor can be deployed to reduce a boat's drift rate. Lives could be saved and the expense of search and rescue reduced if more boats carried a para-anchor.

A boat caught in a storm with strong winds and high seas can deploy a para-anchor to point the boat into the wind and reduce drift.



Western Samoa Fisheries Division research vessel *Tautai Matapalapala*

EXPERIENCES WITH THE YANMAR DIESEL OUTBOARD ENGINE: OUTER ISLAND FISHERIES, KIRIBATI

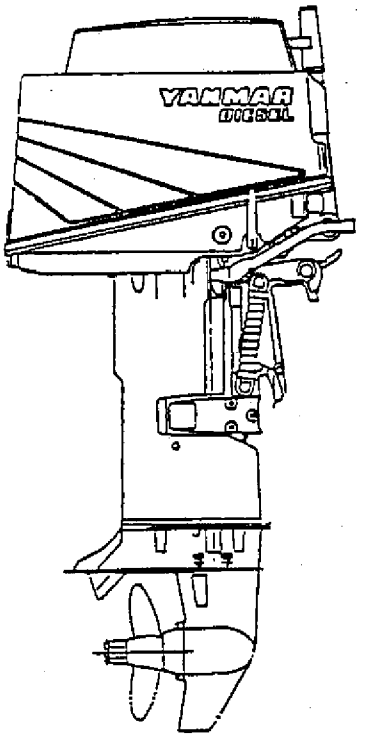
by Simon Diffey,
Manager,
Outer Island Project,
Tarawa, Kiribati

The Outer Island Commercial Fisheries Trial, or Outer Island Project (OIP), has been operating since mid-1988 on two islands in Kiribati: Butaritari in the north of the Gilbert Group, and Abemama to the south of Tarawa, the capital island. Each of these two islands has a project centre, comprising a blast freezer, ice-makers, cold stores, and two generators.

Fish, primarily tuna, are landed at each centre from a fleet of 15 boats; ten are 7.1 m KIR-4 canoes (fitted with 15 hp Yamaha outboards) and five are 5.0 m skiffs (with 25 hp Yamahas), plus other locally-owned artisanal craft. A review of the project in late 1989 concluded that catch rates had to be increased if the centres were to become financially viable and self-supporting.

As the project planned to develop a third centre on the island of Abaiang just north of Tarawa, it was felt that catches could be maximised if large boats (11.0 m KIR-5 canoes and 6.0 m KIR-10 skiffs), all fitted with Yanmar diesel outboards, were used. Consequently, 10 Yanmar D27Y diesel outboard engines (27 hp, standard shaft model with 26.7 cm x 25.4 cm propellor) were purchased directly from Japan and delivered to the project in mid-1990.

For a number of reasons, the centre on Abaiang has yet to be built. If it eventually is, it will be a scaled-down and simplified form of the two existing centres. Emphasis will be placed on supporting the existing artisanal catching sector rather than on large-scale capital investment.



The Yanmar diesel outboard motor used by the Outer Island Project

The centre is likely to be serviced by only two or three larger boats, fitted with Yanmar outboards, for fish transportation to market and for hire.

Before committing these Yanmar diesel outboards to use on an outer island, it was decided in late 1990 to send one engine to each of the existing centres for evaluation; in the case of Abemama, fitted to a KIR-5 canoe, and Butaritari, to a 9.5 m PNG-11 canoe.

All the boats are constructed of marine ply and built locally at the Betio shipyard. One diesel outboard is fitted to a KIR-10 planing-hull skiff, currently based in Tarawa. To date, four of the ten new 27 hp outboards are in use, with one under repair awaiting spare parts from Japan.

The Outer Island Project has so far amassed a total of just over 2500 hours of engine time using these outboards. Initial trials on the PNG-11 indicated very favourable fuel consumption figures (boat load nine persons, no cargo, sea calm with light winds — see table below):

The longest journey so far undertaken using one of these engines also clearly demonstrated its fuel efficiency advantage. Last October, the KIR-5 canoe was delivered by myself and three I-Kiribati from Tarawa to the island of Abemama, a distance of 82 nautical miles.

The journey, motor-sailing, took 12 hours 45 minutes at an

Fuel consumption of the Yanmar diesel outboard

Throttle	Speed (knots)	Fuel consumption (l/h)
Full	13.88	7.34
Three quarters	10.25	3.76
Half	6.45	1.13

average speed of 6.5 knots. Total fuel consumption was 62 litres, or an average of 4.98 litres/hour. More recently, a comparison has been made, using a KIR-10 skiff, of the operational costs of a Yanmar D27Y compared with a Yamaha E40G 40 hp petrol outboard engine. The analysis of operating costs is based on a number of assumptions: as well as the ones stated, they assume equal boat payload (2 persons, fishing gear plus safety equipment) and a 33 per cent longer fishing trip time when using the Yanmar outboard because of the boat's slower speed through the water.

	Yanmar D27Y	Yamaha E40G
Capital costs (A$)	6,500	2,520
Fuel cost — retail (A$/l)	0.50	0.75
Fuel consumption (l/h) (three quarters throttle)	5	15
Maintenance costs (A$) (5% capital cost/year)	325	126
No. engine hours/day	8	6

Note: Fuel cost is based on the price for a litre on 1/7/91

The graph shows that the Yanmar outboard needs to be used for more than 85 fishing days per year before the operating costs become less than for the Yamaha. These calculations do not, however, take account of the following factors that influence the introduction of the diesel outboard to outer island fisheries:

— *Capital costs:* the Yanmar outboard costs almost three times as much as a Yamaha. This cost is a considerable barrier to individual fishermen contemplating investment in a boat and engine;

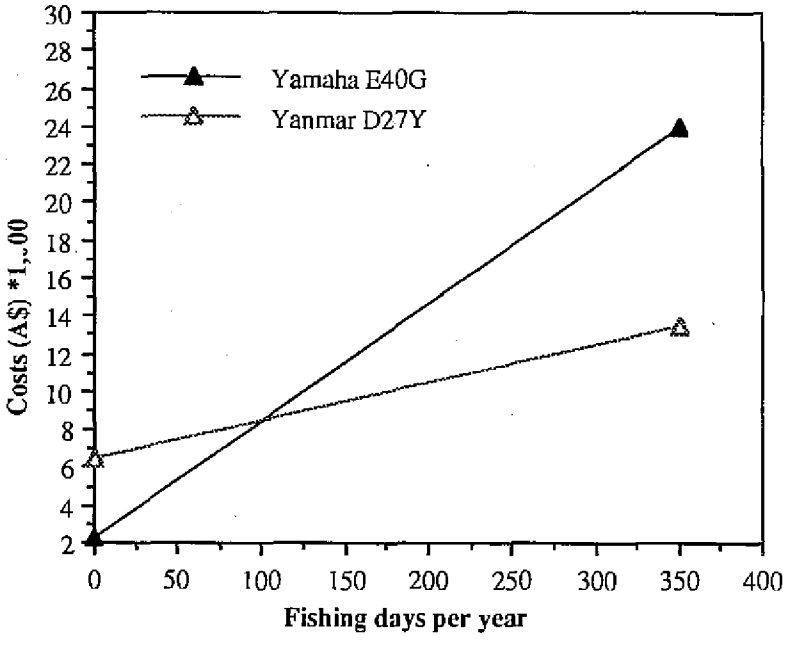
— *Operation and maintenance:* whilst fishermen are very familiar with Yamaha engines, the Yanmar engine is both innovative and new to Kiribati. Consumer reaction to an expensive machine that has yet to stand the test of time is therefore not inconsiderable. The skills and equipment required to maintain Yanmar engines are at present only to be found on Tarawa;

—*Fishing practices:* a number of opportunity costs exist for fishermen on the outer islands. In the OIP's experience, the maximum fishing effort is 145 days per year, and the mean for both centres is only 100 days per year. Such a pattern of fishing effort also means that loan repayments are irregular, which further discourages fishermen from investing heavily in capital items such as a diesel outboard engine.

All of these factors conspire to make the Yanmar diesel outboard unsuitable at present for large-scale introduction to outer island fisheries in Kiribati. In addition, the engine's relatively large size and weight (82 kg) mean that the engine has to be bolted through the transom, which in turn requires strengthening. Boats in Kiribati are traditionally pulled up onto the beach when not in use; the extra weight of a diesel outboard makes this more difficult.

So far, the Yanmar engines in use have been very reliable. The main operating and design problems encountered have been as follows:

— The fuel-tank cap has no air-bleed port. On one occasion this resulted in a vacuum building up in the tank, collapse of the fuel-line priming-bulb and stalling of the engine. Air



can be bled from the fuel lines by loosening the fuel filter and priming the engine. The fuel-tank cap should be opened once every 30 minutes.

— The tilt mechanism does not lock properly. When the engine is in the tilt-up position, the engine is kept in place only by its weight acting through a 'tilt-lock lever' which sits on the engine bracket. Pitching of the stern of the boat, either under sail or in a seaway at anchor, is often enough to lift the engine slightly, unlocking it from tilt.

— The engine is bolted through the transom, using four bolts and locking nuts provided by the manufacturer. The four locking nuts (two either side of the engine bracket, one above the other) are very close together and the bottom pair cannot be tightened without taking out the top pair. This is particularly irritating because the extra transverse strengthening to the transom runs just below the lower pair of locking nuts.

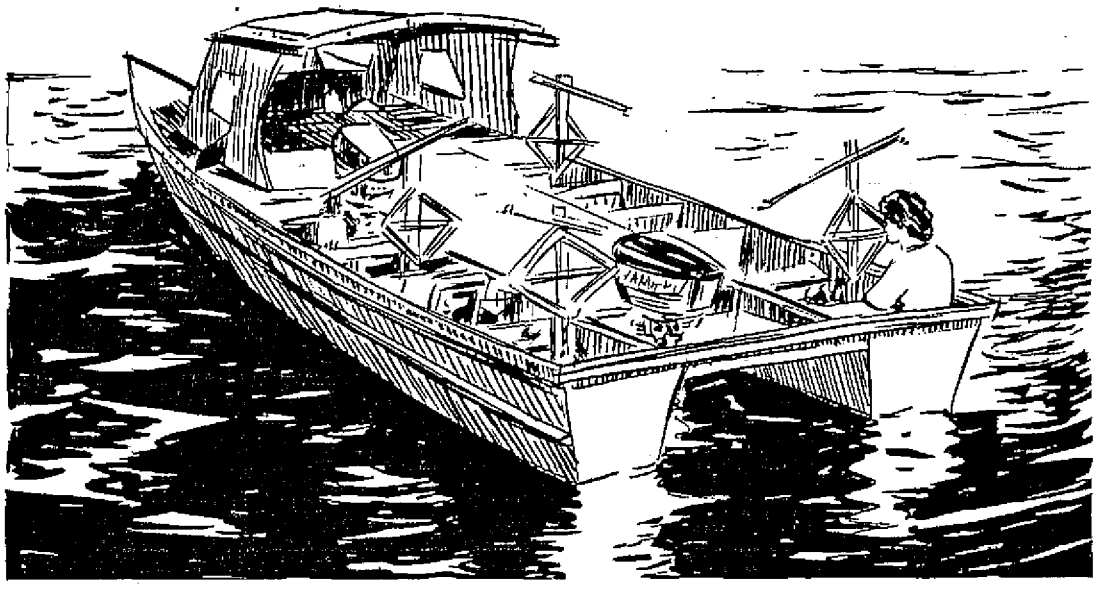
Despite the operational problems, cost and minor design faults of the Yanmar diesel outboard engine, it can have a significant effect on the profitability of a boat's operation if used on a regular basis.

Although highly variable, due to the seasonality of the tuna fishery, the average CPUE (kg tuna per litre fuel consumed) for the 30 Yamaha-powered canoes and boats landing catches to the project is 1.5 kg per litre. Translated into cash terms, this is A$ 0.83 (income) per A$ 0.75 (fuel cost). This is clearly not a good return for the outer island fisherman, bearing in mind that he also has to make loan repayments, maintain his engine and boat, and purchase fishing gear.

By contrast, the KIR-5 fitted with a Yanmar engine, which has been operational on the island of Abemama since November 1990 and is rented out to fishermen for A$ 20.00 per day (plus fuel costs), has achieved an average CPUE of 1.56 kg per litre, or A$ 0.86 (income) per A$0.50 (fuel cost). Including the hire charge revenue, this level of CPUE allows the project to employ a boatman full-time to run the boat, provide for maintenance costs, and also attempt to allow for depreciation of boat and engine over a five-year period.

The project intends to continue using the Yanmar diesel outboard engines on a small scale, fitted to boats belonging to, and operating from, each of its centres, and available on hire to church groups, schools, the island councils, outer island fishermen, etc.

In this way, the project can afford both to operate and maintain these engines, and maximise their use; in Abemama since last November this has averaged 20 days per month, or 240 days per year. Only in this way can the introduction of the Yanmar D27Y diesel outboard engine to outer island fisheries in Kiribati be technically and financially justified.



South Pacific Commission
SEAFOOD POISONING REPORT FORM

Please fill in the answers to the questions completely. Tick the boxes where appropriate.

Details of person filling in report form:

Name _____ Job/ Position _____

Contact address _____

Date: _____ Signature _____

Poisoned person's details:

Name _____ Sex (M/F) _____ Age (yrs) _____

Address _____

Details of the seafood that caused the poisoning: *(tick all the boxes that apply)*

Type of food	Where caught	How preserved	What eaten	How eaten
Fish ☐	River ☐	Fresh, no ice ☐	Head ☐	Unprepared (raw) ☐
Crab ☐	Mangrove ☐	Fresh, iced ☐	Flesh ☐	Marinated ☐
Lobster ☐	Beach ☐	Frozen ☐	Skin ☐	Cooked ☐
Other crustacean ☐	Reef patch ☐	Salted ☐	Liver ☐	
Gastropod* ☐	Lagoon ☐	Dried ☐	Roe ☐	
Bivalve* ☐	Outer reef ☐	Smoked ☐	Other organs	How many others
Other mollusc ☐	Open sea ☐	Pickled ☐	(specify)	ate this meal? _____
Other (specify)	Other (specify)	Other (specify)	_____ ☐	felt sick? _____
_____ ☐	_____ ☐	_____ ☐	_____ ☐	were admitted _____
Unknown ☐	Unknown ☐	Unknown ☐	Unknown ☐	to hospital? _____

What is the local name of the seafood? _____

What is the English name of the seafood? _____

Name of vendor or restaurant (if bought) _____

Name of place it was caught (if known) _____

When was the food eaten? Date _____ Time _____

When did you first feel sick? Date _____ Time _____

* *Gastropods are one-shelled seafoods like snails, trochus, conches, etc.*
Bivalves are two-shelled seafoods like clams, mussels, cockles, oysters, etc.

Symptoms: *(tick all the boxes that apply)*

Burning or pain when touching cold water ☐	Pin pricking sensation on touching water ☐	
Tingling or numbness sensations ☐	Strange taste in mouth ☐	
Difficulty or pain in urinating ☐	Skin itching or redness ☐	
Difficulty in breathing ☐	Excessive salivation ☐	Fever or chills ☐
Difficulty in walking ☐	Excessive sweating ☐	Headache ☐
Difficulty in talking ☐	Diarrhoea ☐	Joint aches ☐
Eye irritation ☐	Vomiting ☐	Muscle cramps ☐

Medical data:

Pulse _____ Blood pressure _____ / _____ Pupils _____

In case of death:

Date of death _____ Autopsy findings _____

Other information _____

Please return this form to: *South Pacific Commission, P. O. Box D5, Nouméa CEDEX, New Caledonia*

THANK YOU