

FISHAD



SOUTH PACIFIC COMMISSION



FISHERIES NEWSLETTER

NUMBER 33 - JUNE 1985

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Original text: English.

SPC ACTIVITIESDeep Sea Fisheries Development Project Notes--Marshall Islands--

SPC Master Fisherman Pale Taumaia continued his assignment to Majuro in the Marshall Islands, where he has been training government counterparts in deep-bottom fishing using wooden handreels. A number of logistical problems, including difficulties in obtaining bait, bad weather, and vessel breakdowns, have prevented the commencement of the second phase of the assignment, in which the training programme will be extended to outer-island areas. However, this is expected to go ahead within the next few weeks.

--Tonga--

Master Fisherman Paul Mead travelled to Nuku'alofa, Tonga, in April to start a new assignment in which he will mainly be involved in training local fishermen. The Tonga Fisheries Division boatyard is currently producing several sizes and designs of fishing boats, which can be purchased by bona fide local fishermen with assistance from the Tonga Development Bank. Paul's training programme is directed towards these buyers, many of whom have not owned or operated boats of this nature before. The training covers various fishing methods, boat handling, care and maintenance, and related areas such as basic safety.

--New Caledonia--

Master Fisherman Lindsay Chapman commenced his assignment in New Caledonia in June. He will be working with the 'Service de la Pêche Maritime et de la Marine Marchand' from their vessel 'Dar Mad,' a 35-foot aluminium motor-sailing catamaran. The programme includes experimental fishing on a recently deployed fish aggregation device, and several one- or two-week training trips to rural or outer-island areas.

17th SPC Regional Technical Meeting on Fisheries

Formal announcement of this meeting, which will be held in Noumea from August 5th-9th 1985, was made in June. The meeting, held annually, allows discussion of all aspects of fisheries development in Pacific Island countries, and provides important guidelines as to the directions in which SPC fisheries-related activities should move. The preliminary agenda for this years meeting includes the following items:

1. Review of SPC Coastal Fisheries Work Programme
2. Consideration of report on SPC/UNDP Regional Refrigeration Assessment and Training Project
3. Regional Fisheries Training Project:
 - i) Project outline and report of progress to date;
 - ii) Consideration of regional training needs and priorities and development of a core programme of training activities for 1986-87 period.
4. Oceanic Fisheries
 - i) Progress on priority items of the Tuna and Billfish Assessment Programme;
 - ii) Status of western pacific yellowfin fishery;
 - iii) Report on artisanal fisheries statistics;
 - iv) Report on development of alternative institutional arrangements for Tuna and Billfish Assessment Programme.
5. Fish Aggregation Devices:
 - i) Further design improvements to FAD mooring systems with particular emphasis on shallow and moderate water depths;
 - ii) Biological and behavioural studies of fish aggregations associated with FADs;
 - iii) Proposal for research on optimal FAD development and management.
6. Workshop: Management of Deep Bottom Fish Resources in the South Pacific.
7. Discussion of recent developments in mariculture within the region:
 - i) Seaweed culture;
 - ii) Pearl and pearl shell culture;
 - iii) Giant clam, trochus and other molluscs.

Delegations from most Pacific Island governments are expected to attend, as well as representatives of the private sector and several international organisations.

Fish Handling and Processing Officer Post Advertised

Recruitment procedures for the newly created post of SPC Fish Handling and Processing Officer were initiated in May with the advertisement of this position in SPC Savingram No. 19/85. The Officer will be responsible for the operation of the SPC Fish Handling and Processing Project, which has been funded by the Government of New Zealand following approval by the 24th South Pacific Conference in October 1984 (see SPC Fisheries Newsletter No. 31, p2).

The project is based on, and will be closely linked to, the SPC Deep Sea Fisheries Development Project, which employs roving Master Fishermen who undertake in-country assignments related to the development of the harvest sector of national fisheries. The Fish Handling and Processing Officer will undertake similar fieldwork, in the post-harvest sector. The emphasis of the project will be on training aimed at upgrading fish handling practices in all sectors of the fishing industry, and on simple product and processing technique development to increase the ease of distribution and marketing.

NEWS FROM IN AND AROUND THE REGION

Another Taiwanese Clam-Boat Arrested in Palau

(Source: Rengel Belau/G. Heslinga)

Following the arrest of the Royal No. 1 in November (see Fisheries Newsletter No. 32, p10), a second Taiwanese boat was arrested in Palau in late March on suspicion of illegal entry. The boat was arrested by state conservation officer Ngiraberenges Omelau and a team of police officers after it had several times been seen lurking around the reefs. On examination, the boat was found to be loaded with a staggering 7,500 lbs (3.4 tonnes) of giant clam adductor muscle.

While the contraband was being removed, a person connected with the vessel attempted to bribe High Chief Tutaka Gibbons, who had himself first alerted Mr. Omelau of its presence. A well-dressed Taiwanese man, obviously not one of the crew, approached the High Chief, who was watching the unloading operation, saying that he was sorry and asking if US\$3,000 in cash would be sufficient to have the whole matter forgotten. The Chief commented later that he was shocked to be approached in this manner when, apart from being the Chief Executive of Koror, he is also one of the most concerned with the environment and natural resources of Palau and their protection against this kind of person.

New Boat Design on Trial in Tuvalu

(Source: M. Batty/Government of Tuvalu)

The Tuvalu Fisheries Division is evaluating a new design of diesel-powered launch, which it hopes will meet the requirements of the artisanal fishery. Much of the fishing around Funafuti is presently carried out from 12'-16' aluminium or plywood skiffs powered by outboard motors, but high fuel costs and the short life of the engines make this operation economically marginal.

Trials of a Fijian-built FAO 28-foot dory in 1983-84 demonstrated the greater economy and reliability of diesel power, but the boat was a little slow for skipjack trolling and larger than needed for the relatively short 6-8 hour fishing trips that are usual. Fisheries Division staff therefore selected a commercially available design from Australia, for local construction. The new launch is made of marine plywood over Dakua frames, sheathed with epoxy glass-reinforced plastic. It has an overall length of 19 feet, and has a diesel engine which delivers 25 s.h.p. at 3,000 r.p.m. The first boat was built by the Save the Children boatyard on Funafuti with technical assistance from the Fisheries Division, and Canadian Aid funding. The new launch has performed well in sea trials, being very stable and seaworthy, and with a top speed of 11 knots is felt to have the necessary performance for trolling for surface tunas. Funds are now being sought for the construction of three more boats for the commercial fishery.

'STURDY' LAUNCH -- Specifications

Length-Overall:	19'
Length-Waterline:	16' 6"
Beam:	6' 9"
Draft:	27"
Freeboard:	30"
Engine:	Marine-diesel; 25 shp at 3000 rpm; 2.4:1 reduction gear; 17" x 14" propellor.
Speed:	Maximum 11 knots; Cruising 9 knots.
Cost:	A\$11,000 (US\$7,300)

Fifth International Coral Reef Congress Held in Tahiti

(Source: SPC)

The Fifth International Coral Reef Congress was held in Tahiti in French Polynesia between 27 May and 1st June, and was attended by about 600 participants from marine-research oriented bodies worldwide.

The theme of the Congress, 'The Reef and Man,' stressed human interactions with the coral reef environment, via fishing, tourism, environmental degradation and other means. Numerous papers and posters presented the results of recent research in these and other areas, and these will be published in the Congress proceedings before the end of the year.

Fijian Company Promotes Beche-de-Mer Production
(Source: Fiji Ministry of Primary Industries)

A newly formed Fiji company, Jona Qio Marine Products Limited, held a beche-de-mer quality control demonstration for fishermen in May to launch its drive to increase output of this product. The Lautoka-based firm won the tender to purchase locally produced beche-de-mer for a period of one year with effect from May 6.

Managing Director Mr. Jona Qio says the aim of the demonstration was to show fishermen the quality of beche-de-mer that his company wants. He pointed out that quality is not only important to satisfy overseas buyers, it is also important to the fisherman. Top quality product means more demand and more money for the fisherman, while poor quality products have the opposite effect, and can lead to the buyers losing interest altogether.

At the demonstration, Senior Fisheries Officer Saimoni Tuilacala said there is no reason why beche-de-mer cannot become a major income earner for the local fishermen. Comparing the commodity with another big-money earner, yaqona (kava), he said that while it took farmers three to four years to earn income from the crop, fishermen processing beche-de-mer could realise cash returns in a matter of weeks. He cited a group of fishermen from Yava on the island of Batiki in Lomaiviti as an example of how much money fishermen can make from processing and drying beche-de-mer. The group from Yavu made more than \$2,000 from the sale of beche-de-mer they collected and processed in a 24-day period, he said.

As an added incentive to fishermen to enter the business, Jona Qio are offering higher prices for beche-de-mer than in the past. The new prices, which are fixed and binding for one year, are up to F\$2.50/kg higher than last year's prices, ranging from F\$11.50/kg for grade I product to F\$5.50/kg for grade IV.

Mr. Qio said that his company has overseas orders for 300 tonnes of beche-de-mer, compared to Fiji's exports last year of between 45 and 50 tonnes. "This seems a long way from our 300 tonnes target," he said. "That is why we will be putting a lot of effort into encouraging the local fishermen to try and increase their catch. If we can get 100 tonnes, that will be more than enough."

Mr. Qio said they were thinking of extending their operation to other South Pacific Island countries to fulfil the 300 tonnes per year target. Presently, they have company representatives in Tonga and Samoa looking into the possibility of tapping into the two countries' resources.

Snapper-Grouper Workshop Held In Hawaii
(Source: National Marine Fisheries Service/SPC)

A three-day workshop was held in Honolulu in May, on the biology and fisheries management of snappers (family Lutjanidae) and groupers (family Serranidae) in the tropical Pacific, Australia, Southeast Asia, and southeastern U.S.A. The purpose of the workshop was to examine the biological and management aspects of this resource from an international perspective, and to indentify resource-specific relationships.

Doctors Jeff Polovina and Steve Ralston, of the National Marine Fisheries Service, Honolulu Laboratory, convened the workshop and identified biological and fishery-related topics to be addressed. These included snapper and grouper taxonomy, reproductive biology, early life histories, growth, mortality, and community-trophic interactions. Several scientists also presented papers on assessment and management in their own countries or regions, and on fishery economics and directions for future research. The collected papers will be published in 1986 in a volume entitled 'The Biology and Fishery Management of Snappers and Groupers in the Tropics.'

The discussions and findings of the workshop are of very direct relevance to many countries in the SPC region. In consequence, Dr. Ralston will be summarising the main topic areas addressed during the workshop at the 17th SPC Regional Technical Meeting on Fisheries to be held in Noumea in August 1985 (see article on page 2).

Industrial Fisheries Development In Kiribati
(Source: South Sea Digest)

The British Government, the European Economic Community (EEC) and the Japanese Government will between them contribute about \$A10 million towards a major fisheries development project in Kiribati. The British Government will give more than A\$3 million for the construction of a fisheries jetty; the EEC will provide four fishing vessels worth about A\$4 million under the Lome II and III conventions; and the Japanese Government will fund construction of cold storage facilities.

Meanwhile, Te Mautari Ltd., the Government's fishing company, is looking for the 'right type' of purse seine vessel able to operate economically in Kiribati waters, particularly around the Line and Phoenix islands. The government has earmarked A\$5 million for the purchase of a vessel.

There has been some recent controversy among neighboring Pacific nations concerning the Kiribati Government's consideration of granting fishing licences to Russian vessels. The Russian state-owned company SovryeFlot has offered about A\$2 million for a 12-month licence to operate with 16 vessels in the Kiribati 200-mile fisheries zone, but outside the 12-mile territorial limit. If granted a licence, the Russian ships would not be allowed to call at any islands other than Tarawa.

International Symposium On Scientific Diving To Be Held
(Source: N.C. Flemming)

The American Academy of Underwater Sciences and the Confédération Mondiale des Activités Subaquatiques are to jointly convene a Symposium on Scientific Diving at the Scripps Institution of Oceanography, La Jolla, California, between 31 October and 3 November. The symposium has been organised to bring together scientists from different parts of the world and to provide the opportunity for sharing information on many aspects of underwater science and research.

Topics to be covered include archaeology, biology, medicine, technology, conservation, diving safety, geology, education, and deep-sea research. Presentations are invited from all members of the scientific diving community. For further information, contact Mike Lang, Department of Biology, San Diego State University, San Diego, California 92182, U.S.A.

Clam Farming Project Commences in Marshall Islands
(Source: Marshall Islands Journal)

May 23 signalled the start of a giant-clam farming project in the Marshall Islands, which the Marshalls Community Action Agency (MCAA) hopes will ultimately develop into an important cash-earner for residents of the nation's outer islands. 1,000 seed clams were shipped to Majuro from Palau for on-growing in a newly established clam nursery, and if no problems arise with the initial batch a further 10,000 will be purchased next year.

The nursery has been set up by MCAA staff member Nena Kilma, under funds provided by the Pacific Fisheries Development Foundation (PFDF). Mr. Kilma had previously taken a three-month training course at the Micronesian Mariculture Demonstration Centre (MMDC) in Palau, where he learned to scuba dive, construct fibreglass rearing trays, select suitable rearing sites, handle juvenile clams, and identify and eliminate predators.

Once the introduced clams are growing successfully, the second phase of the project, the construction of a hatchery, will begin. MCAA estimate that six fibreglass tanks with a saltwater pumping system will be adequate to produce 5,000 to 10,000 clams a month from natural spawning. These will be grown on for two years before farming out to lagoon waters, where a further three to five years of growth will be required for the clams to reach marketable size.

MCAA is confident that clam farming could become a major economic asset to the Marshall Islands. Clam muscle currently fetches prices of up to US\$65/lb in Taiwan because of its supposed aphrodisiac qualities, and the rest of the meat could be marketed locally. Since the Marshallese people have by tradition transplanted young clams into 'clam gardens' for growing-on, MCAA is hopeful that the project will be well accepted in outer-island communities.

French Company Markets Shark Leather
(Source: Les Nouvelles Caledoniennes)

1984 saw the appearance on the market of French-produced de luxe shark leather products, under the brand name 'Sea Kid.' These initial marketing trials followed several years of research into shark leather products by the French society Gordon-Choisy, who have traditionally manufactured goods from snake, crocodile, and even ray skins. The company is attempting to develop markets for shark leather products to replace those for reptile skins, which are decreasing in availability due to conservation measures being progressively implemented in many countries of the world. However the company expects to have to wait at least another five to six years before it can begin marketing shark leather goods on an international scale.

Business Management Courses for Fiji's Fishermen
(Source: Fiji Ministry of Primary Industry)

The importance to fishermen of business management skills was emphasised by the Acting Commissioner of Fiji's Central Division, Mr. Fred Achari, speaking at the end of a week-long course on the subject held in May at the Navuso Adult Training Centre.

The course dealt with basic business management skills such as record-keeping and financial control, and was run by Fiji government's Business Opportunity and Management Advisory Service (BOMAS) and coordinated by the Nausori Fisheries Department. The 13 participants were rural fishing operators, some from cooperative groups, in the Central Division.

Fisheries Development Meeting Planned
(Source: Mers des Hommes)

The French organisation 'Mers des Hommes' (Seas for Mankind) is planning to hold a meeting entitled 'The European Economic Community (EEC) and the Development of Maritime Fisheries in the Africa-Caribbean-Pacific (ACP) Associated Countries.' The meeting, scheduled to be held in Vannes, France, from 26-28 September, immediately follows a formal EEC-ACP meeting in Luxembourg, and official representatives of countries from both groups will discuss a range of fisheries developmental issues. The organisers are also eager to encourage technical representation by national Fisheries Officers. Further information from Mr. J.L. Labarriere, President, Mers des Hommes, Jardins du Port, 3000 Vannes, France.

A Fable
(Source: 'Questioning Development' by Glyn Roberts)

The Experts arrived at the fishing village. For years the natives had used primitive techniques in their work. True, they caught fish, but they had to paddle out to sea every day, maybe even on feast days. It was a hard life, though well-tried over the years.

The new nets were rather dearer than the old, and the method of fishing was different too. But in a single net they caught a whole week's supply. Fantastic! You could work one day and be free for the rest of the week! The village folk had a great feast, several feasts ... in fact, so many that they had to fish two days each week to pay for the celebrations.

This is no good, thought the Experts, they should be fishing six days a week and making money out of it. We haven't come here to witness endless parties. Surely it's enough with one feast a month. This is an underdeveloped country; they must produce more proteins. Fish!

But the village favoured fiesta. Fishing two days, and free the rest of the week.

The Experts were annoyed. They hadn't travelled from the distant North to watch natives drum, dance and dream. They had come to fill hungry stomachs, to lessen the threat of the undernourished against the overfed. Yet the villagers danced late into the night. Why shouldn't they? They were rich now, almost as rich as the Maharaja, though he had never done a day's work in his life....

And then the Project Director had a brilliant idea. (Not for nothing had he taken an evening course back home in economics.) These lazy fisherfolk were not actually lazy; they were simply weak on motivation, motivation to work harder. They had not discovered their needs.

He bribed a villager to buy a motorbike. Bribery was distasteful, but sometimes necessary. True, there were no roads as such, but the wet sand along the water's edge was hard and smooth....

The motorcycle roared back and forth. What a toy! And soon every young man wanted one of his own. The village elders warned them: "What use is there in riding far off and back again on the sand?" But the young men replied: "We can race. We shall see who is the fastest. And you grey-beards, you can place bets on us!"

The Project Director's idea proved a brilliant success. At last the men fished almost every day. The capital city got the fresh fish it needed. (Indeed, a large part is now turned into fish-meal and exported to Europe where it makes excellent pig food and helps keep down the price of bacon.)

But probably most pleased of all was the Maharaja, for it so happens that he was the sole agent for the motorcycle firm in the country. He also owned the main fish market in the city, while his uncle's family built and ran the fish-meal factory. When the Experts flew home he raised the price of a motorcycle, so that to buy one a man must work three years, instead of a single season.

And the fishermen fished on. They had discovered a need.

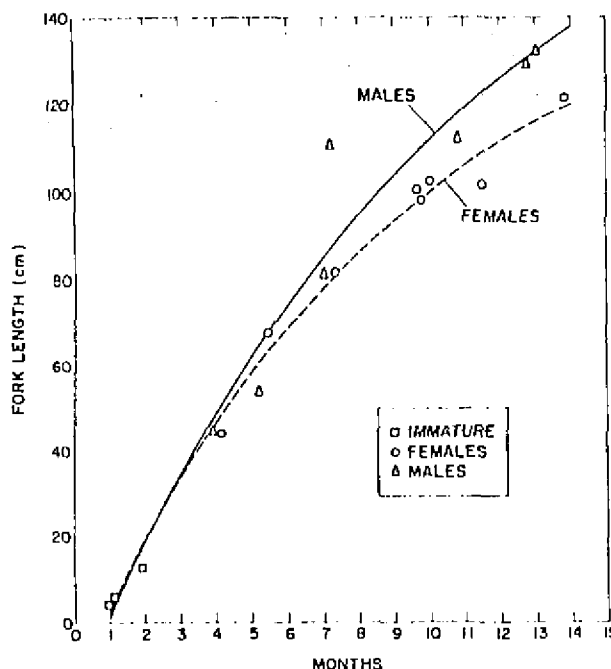
FISHERIES SCIENCE AND TECHNOLOGY

Age and Growth Study on Mahimahi Completed

(Source: National Marine Fisheries Service, Honolulu)

Research workers in Hawaii have recently completed a study on the age and growth of mahimahi (*Coryphaena hippurus*), based on fish of known age that were maintained at the Waikiki Aquarium and the National Marine Fisheries Service (NMFS) Honolulu Laboratory's Kewalo Basin Research Facility. The research work aimed to validate methods of measuring the age of mahimahi captured from wild populations using counts of daily growth rings in bony parts of the fish, particularly the otoliths.

James H. Uchiyama of NMFS Honolulu Laboratory reports that the first daily growth ring forms on the first day after the mahimahi larvae hatch, and additional growth rings continue to form daily for at least the first 261 days of the fish's life, including during spawning periods. This was validated on examining a nearly 9-month old captive mahimahi, which died after a two-month period of spawning on alternate days. Averages of 10 direct counts by two independent readers, 260.1 and 262.0, agreed very closely with the known age of the fish of 261 days. It thus appears that the stress of repeated spawnings did not interfere with the formation of growth rings. Validation will be continued as other known-age specimens die in captivity.



Growth curves of male and female *Coryphaena hippurus*
in Hawaiian waters.

Also of great interest was the very rapid growth rate of mahimahi (see figure). A male mahimahi is estimated to grow 126 cm (fork length) and 20 kg in its first year of life. Similar growth rates have been observed in wild mahimahi specimens off Taiwan and specimens in captivity elsewhere. The mahimahi reached sexual maturity and began spawning in its fourth month of life. This fast growth rate is highly desirable for aquaculture species, and other agencies in Hawaii are investigating the possibility of mahimahi culture.

New Type Of Ice Machine Marketed
(Source: Infofish)

The Sunwell Engineering Company of Canada has recently put on the market an ice machine based on a new ice-making principle. The machine cools a brine solution to about -10 deg. C, at which temperature ice begins to form in small crystals. These are then separated from the brine in a centrifuge, forming a loose slurry of fine grained ice, which is stored in an integral ice bin until it is used. The slurry is free flowing and can be shovelled or even hosed onto the product, which it cools very rapidly due to the high contact achieved by the small particles. Because of its nature, it will not bruise delicate produce, and forms a good insulating blanket. The ice slurry also resists bridging better than other forms of particulate ice.

The manufacturers claim that the manufacture of ice by this method reduces power consumption by 50 per cent compared to conventional ice machines. The Sunwell systems are also said to be eight times smaller than other ice machines of comparable capacity, and come in units capable of producing from 250 kg to 30 tons/24 hours. The machines can be supplied with or without integral ice storage bins, and for operation on mains electricity or direct drive from a diesel or similar engine.

SPC Fisheries Newsletter No. 33 - June 1985

The Incidence of Tuna Schools Suitable for Purse Seining
in the Central and Western Pacific
from Skipjack Programme Records

by

Robert D. Gillett and Samuelu T. Taufao
South Pacific Commission
Noumea, New Caledonia

In the 1970s purse seining in the central and western Pacific was targeted on tuna associated with floating objects. Most of the purse seined tuna were caught by the Japanese fleet which relied almost exclusively on the technique of setting at dawn around logs. As the incidence of floating logs in the SPC area is highest in the region adjacent to large land masses in the west, the purse seine fishery developed first in that area. In the early 1980s a large portion of the United States purse seine fleet entered the western Pacific fishery and more effort was made to catch tuna which were not associated with logs. Deeper, faster sinking nets, and more powerful pursing gear used in conjunction with increasing experience in the region gradually resulted in a large portion of the catch originating from "school fish", that is, tuna not associated with floating objects.

All surface schools are not suitable for purse seining. Usually fishermen will only consider setting their nets on those schools which are foaming at the surface and relatively stationary. Other schools are thought to be too "wild" and will usually escape in the course of a set.

The distribution of foaming schools does not appear uniform throughout the region. Observer trips undertaken by SPC scientists on purse seiners have shown that Japanese fishermen have been aware for several years that foaming schools are especially common in the area to the north of Papua New Guinea during October to December. Little information on the incidence of foaming schools has been made available for other areas. Although there have been a multitude of tuna surveys in the central and western Pacific, rarely, if ever, has the incidence of schools suitable for purse seining been quantified and documented.

The South Pacific Commission's Skipjack Survey and Assessment Programme surveyed the tuna resources in the waters of 26 Pacific countries from October 1977 to August 1980 (Figure 1). During this period 5,556 hours were spent searching and 4181 schools of tuna were encountered. Although this work was carried out before there was widespread interest in purse seining, all of the schools spotted were classified by type. These data can therefore be used to give some indication of the vulnerability of the sighted schools to purse seine gear.

Table 1. School sightings by country and month

NAME OF AREA	YEAR/MONTH	NO. HOURS SPENT SIGHTING	NO. SCHOOL SIGHTED	NO. SCHOOLS SIGHTED/HOUR	NO. FOAMING SCHO. SIGHTED	NO. FOAMING SCHOOLS SIGHTED/HOUR
AMERICAN SAMOA--	78/ 6	52	46	.88	4	.08
AMERICAN SAMOA--	80/ 2	26	8	.31	0	0.00
NEW CALEDONIA---	77/12	114	88	.77	11	.10
NEW CALEDONIA---	78/ 1	115	77	.67	7	.06
FIJI-----	78/ 4	215	185	.86	51	.24
FIJI-----	80/ 5	180	130	.72	18	.10
GAMBIER-----	80/ 2	31	6	.19	0	0.00
GUAM-----	78/10	18	1	.06	0	0.00
INTERNATIONAL---	79/12	84	29	.35	0	0.00
INTERNATIONAL---	80/ 5	25	20	.80	0	0.00
JAPAN-----	78/10	9	5	.56	2	.22
JAPAN-----	79/11	24	1	.04	0	0.00
GILBERT-----	78/11	114	157	1.38	20	.18
GILBERT-----	79/12	52	47	.90	15	.29
GILBERT-----	80/ 7	20	66	3.30	2	.10
KOSRAE-----	78/11	38	19	.50	3	.08
KOSRAE-----	79/11	43	24	.56	0	0.00
KOSRAE-----	80/ 7	9	10	1.11	0	0.00
MATHEW-HUNTER---	80/ 3	12	6	.50	0	0.00
MARQUESAS-----	79/ 1	65	60	.92	20	.31
MARQUESAS-----	79/12	72	75	1.04	26	.36
MARQUESAS-----	80/ 1	101	96	.95	60	.59
NORTHERN MARIANA	78/10	34	9	.26	0	0.00
NORTHERN MARIANA	79/11	27	10	.37	2	.07
MARSHALL-----	78/11	81	30	.37	0	0.00
MARSHALL-----	79/11	10	14	1.40	2	.20
NAURU-----	80/ 7	33	44	1.33	4	.12
NORTHERN COOK---	78/12	93	125	1.34	21	.23
NORTHERN COOK---	79/12	24	26	1.08	3	.13
NIUE-----	80/ 3	27	19	.70	2	.07
NORFOLK-----	80/ 3	43	14	.33	1	.02
NEW SOUTH WALES--	79/ 4	159	97	.61	19	.12
PALAU-----	78/10	44	12	.27	3	.07
PALAU-----	80/ 8	100	96	.96	11	.11
PHOENIX-----	78/11	11	16	1.45	1	.09
PHOENIX-----	79/12	37	58	1.57	8	.22
PITCAIRN-----	80/ 2	26	17	.65	1	.04
PAPUA NEW GUINEA	77/10	182	125	.69	93	.51
PAPUA NEW GUINEA	79/ 7	415	347	.84	153	.37
PONAPE-----	78/11	114	72	.63	20	.18
PONAPE-----	79/11	50	42	.84	4	.08
PONAPE-----	80/ 7	59	50	.85	12	.20
QUEENSLAND-----	79/ 5	160	99	.62	23	.14
SOUTHERN COOK---	79/ 2	28	6	.21	3	.11
SOUTHERN COOK---	80/ 2	24	12	.50	0	0.00
SOCIETY-----	78/12	120	87	.73	16	.13
SOCIETY-----	79/ 2	58	33	.57	8	.14
SOCIETY-----	79/12	19	12	.63	1	.05
SOCIETY-----	80/ 2	31	9	.29	1	.03
SOLOMONS-----	77/12	295	142	.48	37	.13
SOLOMONS-----	80/ 6	222	186	.84	47	.21
TOKELAU-----	78/11	35	71	2.03	4	.11
TONGA-----	78/ 5	106	51	.48	6	.06
TONGA-----	80/ 3	52	66	1.27	4	.08
TRUK-----	78/10	57	30	.53	5	.09
TRUK-----	79/11	22	7	.32	1	.05
TRUK-----	80/ 7	12	16	1.33	0	0.00
TUAMOTU-----	78/12	84	66	.79	23	.27
TUAMOTU-----	79/ 1	123	84	.68	20	.16
TUAMOTU-----	79/12	11	7	.64	1	.09
TUAMOTU-----	80/ 2	119	100	.84	4	.03
TUVALU-----	78/ 7	96	95	.99	36	.38
TUVALU-----	80/ 7	38	43	1.13	14	.37
VANUATU-----	77/12	37	15	.41	5	.14
VANUATU-----	78/ 1	40	22	.55	3	.08
WALLIS-FUTUNA---	78/ 6	145	125	.86	10	.07
WALLIS-FUTUNA---	80/ 5	43	30	.70	4	.09
WESTERN SAMOA---	78/ 6	63	112	1.78	27	.43
WESTERN SAMOA---	80/ 2	17	14	.82	0	0.00
YAP-----	78/10	57	12	.21	2	.04
YAP-----	80/ 8	27	21	.78	1	.04
NEW ZEALAND-----	79/ 3	345	180	.52	32	.09
NEW ZEALAND-----	80/ 3	82	49	.60	1	.01

School classifications used by the Skipjack Programme were: subsurface, breezer, finner, rippler, jumper, splasher, boiler, and smoker. For the purpose of this report, the final three categories have been combined to approximate what fishermen would consider a foaming category. Results are presented in Table 1 and summarized in Table 2. More precise information on the areas covered within each country is published in the Tuna Programme Final Country Report series available at the SPC.

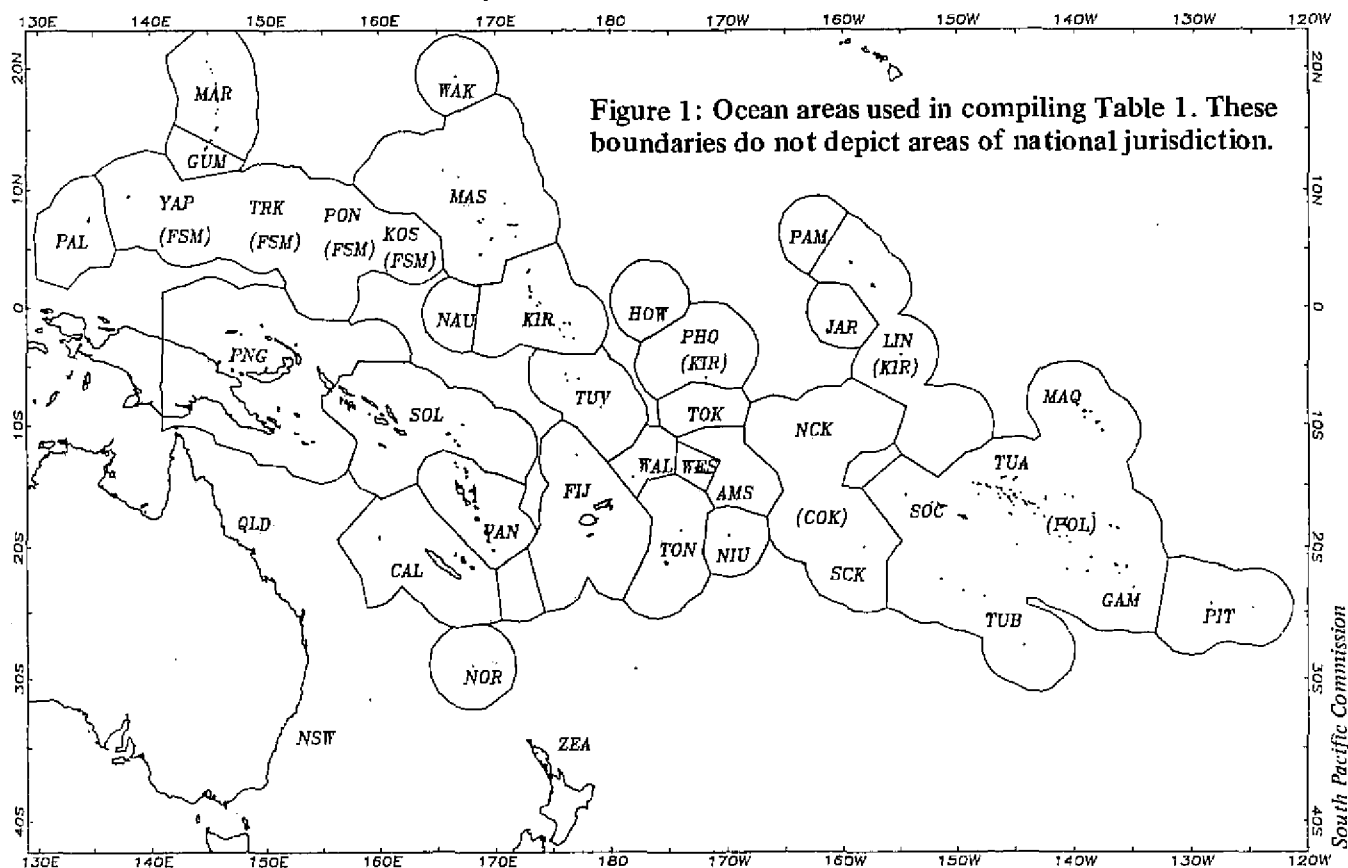


Table 2. Summary of sightings

Total no. of hours spent sighting	=	5556
Total no. of schools sighted	=	4181
Total no. of foaming schools sighted	=	938
Total no. of schools sighted per hour	=	.75
Total no. of foaming schools sighted per hour	=	.17

The amount of ocean surface covered during each hour of spotting from the SPC research vessels is difficult to quantify and is affected by such factors as cloud cover, sea surface conditions, intensity of bird activity and alertness of the crew. Bearing this in mind, it is thought that an approximation of the coverage would be in the order of 60 to 70 square nautical miles of ocean surface per hour of sighting. Searching from a modern purse seiner, especially one equipped with a helicopter, would obviously result in the location of more schools.

The results listed in the tables should not be considered definitive as the number of hours sighted and area covered within each country was quite limited. The information, however, should prove useful especially in the cases where a high incidence of foaming schools was recorded.

SPC Fisheries Newsletter No. 33 - June 1985

This article is based on the transcript of the 'Pacific Sealink' PEACESAT session on 'Illegal and Destructive Fishing Practices.' The 'Pacific Sealink' series is jointly organised by the University of Guam, University of Hawaii, University of the South Pacific, and the Federated States of Micronesia Marine Resources Division.

BLAST FISHING IN THE PACIFIC

by

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Introduction

The use of dynamite and other explosives for fishing is commonplace throughout the tropical Pacific, although usually illegal. There is much anecdotal information on the impact of underwater explosions on fishery resources and their habitat, but little real data can be found in the existing literature. The most complete account was found in Wood and Johannes' book entitled Tropical Marine Pollution, published in 1975.

It is clear that dynamite or blast fishing in a habitat such as a live coral reef can be devastating, although destruction of the habitat by explosives in coral reef communities and rates of recovery have never been adequately evaluated. The depth at which a charge is exploded and the size of the charge have an important influence on the extent of damage to the benthic habitat in an area.

History of the Problem

Blast fishing in the Pacific Islands began in earnest during and immediately after World War II, particularly in those islands touched by the war. In Palau during the war, fishermen were provided with hand grenades and other explosives to fish for the occupying Japanese troops. After the war many islanders became munitions experts and were able to defuse mines, bombs and other ordnance. In the 1960s one could still see huts in the jungles of Palau built over a single large piece of ordnance to keep the powder dry for use in constructing fish bombs.

When World War II vintage powder became rare, fishermen began to use commercially available explosive compounds. A common form of powder used in the Philippines consisted of 75 per cent potassium chlorate, 15 per cent charcoal, and 10 per cent sulphur or cornstarch (Ramas, 1969).

The most recent type of explosives used are those stolen or taken from construction companies. Dynamite and blasting caps are commonly utilized by both civilian and military construction teams in the many projects underway throughout the Pacific Islands and can be readily utilized as fish bombs.

Another interesting development has been the recent use of seal bombs in blast fishing, particularly in Guam and the Northern Mariana Islands. These explosives originate from the California-based purse seine tuna fleet and are used to herd tuna and dolphins in the large purse seine nets. They have become readily available in Guam and are reportedly in common use for blast fishing on the reefs.

Direct Impacts of Blast Fishing

The most obvious detrimental impact of blast fishing is the devastation that can occur to living coral reef communities. Maragos (personal communication) reported the complete destruction of living reefs in Indonesia where blast fishing has been extensively employed. Ramas reports that on some nearshore reefs in the Philippines formerly teeming with life, blast fishing has reduced the habitat to dead coral debris occupied by only a few small fish. Personal observations have confirmed the loss of coral reef habitat from blast fishing in Guam, Truk and Palau.

The most pronounced damage is seen in areas of calm water with many delicate, branching corals. Examples can be seen in Truk lagoon where reefs formerly rich in Acropora coral thickets have been reduced to rubble. Lesser damage can be seen at blast fishing sites such as Double Reef, Guam, where the reef is composed of robust coral forms associated with the conditions of a high-energy environment and large ocean swells.

Another substantial impact from blast fishing is the large quantities of fish that can be killed during a single blasting operation. This is particularly true when an area is chummed with bait until a high biomass of fish has accumulated. Charges are then thrown or pre-set, and a tremendous fish kill can result. In these cases often the fishermen only harvest the larger or more desirable species and leave the rest. The great reduction of several species of fish in Palau has been attributed to blast fishing, particularly during seasonal spawning migrations when the fish are densely aggregated (Johannes, 1981).

Blast fishing on surface schooling fish or fish attracted away from the bottom by chum, although resulting in high mortality of fish, is much less destructive to the habitat than detonation of charges directly on the reefs. Personal observations have confirmed this in Palau.

Indirect Impacts of Blast Fishing

Other more subtle impacts can result from blast fishing. In Indonesia, Maragos reports a complete community change on those reefs heavily blasted by fishermen. Fish communities changed from typically reef-associated species to herbivorous species, which graze on filamentous algae growing on dead coral rubble.

In Fiji, Owens (1971) attributes blasting, along with other human activities, as combining to eliminate most of the predators at all stages in the life cycle of the crown-of-thorns starfish, Acanthaster planci. This could lead to the current Acanthaster coral predation problem affecting reefs in urban areas throughout the Pacific.

Blasting may also contribute to another serious problem associated with coral reefs, that of outbreaks of ciguatera fish poisoning. The relationship between disruption of reefs by man, such as during blast fishing, and the subsequent development of ciguatera in the immediate area seems too frequent to be coincidental.

A problem that has never been dealt with seriously (except by blast fishermen) is the actual physical damage and death of fishermen that can result from use of explosives in fishing. In Palau, the Philippines and other Pacific islands, it is not uncommon today to see older men with missing fingers, hands or even arms from making and using explosives for fishing. Blast fishing was particularly dangerous in the post-World War II era when live ordnance had to be defused and unstable, homemade explosives were made. Today the use of commercial dynamite and other explosive products renders blast fishing much safer.

Management and Enforcement

It is clear that blast fishing is extremely destructive in most cases and should be illegal, as it is in the vast majority of the Pacific Islands and coastal countries. The big problem appears to be enforcement of the laws. Blast fishing can be so lucrative, and the probability of being caught so low, that it is rampant in many areas.

In some areas local enforcement by village chiefs keeps the problem in check, at least near the villages. Wass (personal communication) reports this as being the case in areas of American Samoa. Most of the blast fishing occurs in the remote areas away from villages.

For enforcement purposes it is important to be able to recognize fish killed by explosives. Recent inspection of fish shipped from Truk to Guam for sale clearly indicated they were taken by blast fishing (Hamm, personal communication). Ronquillo (1950) summarized anatomical damage observable in fish by explosives as follows:

1. The air bladder, if present, is almost always ruptured and blood clots are found in the lumen.
2. The vertebral column may be fractured in any part along its length.
3. Localized haemorrhages are present around the area of fractured parts due to the destruction of the blood vessels and tearing of the adjacent tissues.
4. Parts or all of the contents of the body cavity may be damaged or crushed with haemorrhages, depending upon the size, shape, position and distance of the fish from the explosion.
5. Fracture and/or dislocation of the abdominal ribs from the vertebral column may be found especially in spiny fishes, with accompanying haemorrhages present in the area of the fracture.

6. The blood vessels below the vertebral column may break and cause haemorrhages of varying degrees along that region.
7. Rupture of the parietal peritoneum, especially that attached to the abdominal ribs may occur.

Dislocation and/or fracture of the vertebral column and ribs, if present, are clearly shown in an x-ray. The air bladder, if ruptured, will be filled with blood and will be obliterated in the negative. If not ruptured and, therefore, filled with air as in normal fish, it occupies a definite shape and position in the abdominal cavity.

Many Pacific Island governments are recognizing the serious nature of blast fishing and are increasing the penalties for those caught conducting this illegal activity. In Guam there was a change in the law in 1981 making the use of fishing with explosives (as well as chemicals and electricity) a felony. Two men were recently convicted of this felony. The Palau House of Delegates is currently reviewing a bill that, if passed, will increase the penalties for fishing with environment-damaging materials such as explosives.

Resource managers are recognizing the importance of coral reefs, not only as fishery resource habitats, but for their recreational and aesthetic value. Managers are beginning to take into account the uniqueness of a particular reef and its proximity to, and use by, various interest groups. This approach is especially important in those Pacific islands where tourism is becoming, or has the potential to become, an important industry. The problem is recognized in Truk where local scuba diving operators watch closely for anyone blast fishing. They recognize the damage that can be done, not only to fish populations, but to the beautiful reefs and historic shipwrecks in the lagoon, which are the base for tourist industry development in Truk.

Education

Education is undoubtedly the key to the problem. The coastal populations of Pacific Island countries have to be made aware of what they have to lose. They must recognize that corals are the foundation species on which tremendous numbers of other organisms depend. So central are corals to the integrity of the reef community that when they are selectively killed, migration or death of much of the other reef fauna results. The tragedy of destroying a section of living coral reef by blast fishing, merely to harvest a few pounds of fish, must be understood. Fisheries Officers can and should play a key role in educating the public, particularly the fishing public with which they have daily contact.

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SPC Fisheries Newsletter No. 33 - June 1985

A PRAWN CULTURE VENTURE IN THE SOLOMON ISLANDS

by

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Introduction

Solomon Islands is a nation composed of an archipelago of mountainous islands and low-lying coral atolls which extend over some 1,400 km of ocean in the south west Pacific Ocean, about 1,500 km north east of Australia. Large-scale commercial fishing activity began in the early 1970s with the formation of a joint venture tuna fishing company between the governments of Solomon Islands and Japan, and since then fisheries development in the country has rested heavily on commercial fisheries for skipjack tuna and longlining for larger, deeper swimming tunas, such as yellowfin and bigeye.

Since 1975, increasing attention has been paid by Government to the development of the rural fisheries sector, which is primarily concerned with reef-based fisheries. These reef fisheries were until recently of a mainly subsistence nature; most of the catch was used for home consumption, with relatively little available for sale to the larger urban markets. In an attempt to increase production from these reef-based fisheries, Solomon Islands government has improved holding, transport and marketing facilities and is now promoting the development of aquaculture in the country as a means of creating cash-earning opportunities for local rural populations and also in order to diversify the types of fisheries activity in the country.

Aquaculture is not a traditional practice in Solomon Islands; the highly productive reefs of the country have historically provided a ready source of food. Although there have been past introductions of various Tilapia species, these were never managed in any way. However, development of a cash economy in the country has stimulated interest in the culture of commercially valuable species, such as the giant freshwater prawn, Macrobrachium rosenbergii. This species is ideally suited to culture in Solomon Islands, where high ambient temperatures, copious supplies of high quality fresh water and suitable soil types combine to provide the setting for potentially prosperous prawn farming.

South Pacific Aquaculture Ltd. (SPAL)

One commercial company has set up operations some 30 km west of the capital Honiara, on the north coast of Guadalcanal. South Pacific Aquaculture Ltd. (SPAL) is a company which is fully incorporated in Solomon Islands, and began operations in October 1983. The General Manager, Mr. Geoff Mitchell, has extensive experience in the construction and operation of irrigation systems, and this background has made an important contribution to the company's present success.

The Site

SPAL's pilot prawn farm is situated close to the sea on the site of an old coconut plantation. The land is on longterm lease from Solomon Islands Government. The total area currently under cultivation is 10 hectares with plans to expand to 80 hectares. The soil at the farm is a sandy loam, which is typical of the coastal plain of Guadalcanal Island. All ponds are earthen and have Bermuda grass planted on the bunds (edges) to help consolidate the sides. To date, two nursery ponds (350m² each) and nine grow-out ponds (0.5 hectares each) have been constructed, and the company has plans to increase the number of grow-out ponds to 80 when land becomes available. Water is supplied by a nearby river. A water off-take was constructed, which is designed to provide unimpeded supply even when the level of the river is low during the dry season. This water flows through an open channel to the farm; there it passes through a series of distribution channels and over a number of weirs, which assist in oxygenation. At the pond, the water passes through a sieve system to remove debris and any large predators before actually entering the pond. Each pond has its own sluice gate so that water flow can be controlled by the removal or addition of wooden slats. The entire water course has been designed so that water flow is gravity fed all through the farm. Mr. Mitchell's background as an irrigation engineer proved invaluable in the initial design stages and construction of the farm.



(Photo: P. V. Nichols)

Figure 1: Harvesting one of SPAL's 9 grow-out ponds.

Each pond has an effluent water outlet which adjoins to a single main drainage channel, which in turn joins back with the Sasaa river. Each outlet device was designed and constructed from local materials by SPAL and allows water to be drained from the ponds to any desired level; water may be drained from the shallow or deeper levels of the water column.

Continuous monitoring of water flow rate, chemical composition and oxygen content of the water is carried out on a daily basis by the company. No problems with water quality or quantity have occurred to date, although a slight buildup of filamentous green algae in one of the grow-out ponds has led to some harvesting problems.

Operations

Macrobrachium rosenbergii post-larvae from Tahiti for the pilot project are airfreighted in polythene bags, which contain water supersaturated with oxygen, to the Solomons. At the farm, the bags are allowed to float on the surface of the nursery ponds until temperature equilibrium is reached. The contents of the bags are then released, and the small post-larvae (around 7mm length) settle on the bottom. Stocking rates in the nursery pond range between 140 and 150 post-larvae per m².

The post-larvae take a day or two to settle into the pond environment, and then begin to feed voraciously and moult. Seed supply from Tahiti causes certain logistical problems: the time factor is crucial when transporting such small prawns by air in plastic bags; mortality rate appears to be more related to buildup of waste products than with decline in oxygen level in the water. Berried females for hatchery purposes can now be obtained from the farm ponds, and SPAL plans to construct its own hatchery in the near future.

Transfer of juveniles to the grow-out ponds occurs when the prawns are approximately 45-60 mm long, a length which is achieved within 6-8 weeks of placement in the nursery pond. Each grow-out pond is approximately 1.1 m deep in the middle. The water in these ponds is characteristically turbid, which helps to reduce cannibalism and aggression-related mortality. Many adult prawns are observed after sunrise on the sides of the pond shedding their shells under the cover of the vegetation, and coconut fronds are also placed around the edge of ponds for this reason. Feeding rates are calculated on estimates of prawn biomass in each pond, and generally 15-18 kg feed/pond/day is broadcast in the late afternoon. Stocking densities in these ponds are generally around 60,000 individuals/pond. Prawns reach marketable size (150 -180 mm length from tip of rostrum to tip of tail) in five months, at which time they weigh approximately 50-60 gms each.

Feed

SPAL initially imported pelleted prawn feed for out-growing the prawns, costing around SI\$1,000 per tonne, but, after trials with locally available raw feed materials, commenced producing pellets in Solomon Islands at a cost of SI\$250-300 per mt. The locally produced feed has not been inferior in promoting growth and has proved to be more water stable because of the addition of a binder.

Harvesting

A pond is usually harvested once every three weeks, which means with nine ponds three are harvested each week, and by the fourth week it is time to start the rotation again. A large seine net (25 mm mesh size) specially designed for the job is used. The net has an extra heavy ground rope which ensures that good contact is made with the bottom of the pond, reducing the chance of prawns escaping capture in the mud. The float line is polypropylene which is light and floats, yet is stiff enough to minimise sagging. Sufficient floats are used to prevent line sag because otherwise prawns are able to crawl over the net. The net has a special 'bag' in the centre, which will hold 200 kgs of live prawns. The whole harvesting operation is carried out by five SPAL local staff.

After hauling, prawns are removed and placed into mesh baskets, washed, and then put into a large water bath which is artificially aerated by an air pump. The harvest is then transported by truck to the Honiara market alive.



(Photo: P. V. Nichols)

Figure 2: The prawns are transported live to Honiara market.

Markets

SPAL's prawns are sold in the local market of Honiara to various retail outlets such as supermarkets and restaurants, and fetch around SI\$10.00 per kg. The prawns are simply packed in locally produced containers. Overseas market opportunities are currently being examined by SPAL, predominantly in Australia and South-east Asia. As production levels rise, it is anticipated that an increasing quantity of prawns will be sold on overseas markets.

Future developments

Plans to build and operate a Macrobrachium hatchery have already been mentioned, and this is a priority in the short term for the company. Such a facility, together with the planned expansion of grow-out ponds, will enhance productivity of the project. The possibility of polyculture of prawns with freshwater fish is also being examined as is the culture of marine penaeid prawns, once land and finance are available.

Further information on this project and other developments in aquaculture in the Solomons can be obtained from the author.

