-6 OCT. 1977

THE SOUTH PACIFIC COMMISSION FISHERIES NEWSLETTER

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No. 14 July 1977

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EDITORIAL

The last Fisheries Newsletter, No. 13, was published in June 1975. It was edited by the late Dick Baird, at that time SPC Fisheries Adviser, who passed away in March 1976 after a sudden illness. The post was not filled again until September; the main task of the new Fisheries Adviser, once the most urgent outstanding matters had been disposed of, was to visit current SPC projects, and to make preparations for the Fisheries Conference held in Noumea from 24-28 January this year. During the meeting, the wide interest shown in the Fisheries Newsletter was confirmed, and it was decided to continue publication.

Many different formats and cover types were used in earlier issues. This one is different again, but, for the sake of continuity, we shall in the future attempt to retain it.

The contents of these Newsletters are of course dependent upon the type of information available. For the most part, our information will be of regional interest, and we rely on you all to forward it to us. Thus, we are more than willing to accept any document of relevance to fisheries development in the area. Indeed, we may in some cases have to call upon your goodwill; and we are confident of receiving an affirmative response. I would remind contributors that the interest of the information is not necessarily in proportion to the length of the article. Thanks in anticipation for your understanding and assistance.

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At a time when the possibility of supranational control of the oceans, especially the 200-mile exclusive economic zone, is arousing keen interest in all Pacific countries, we felt that it would be appropriate to publish an article on skipjack, since the as yet poorly identified stocks of this essentially migratory fish are of economic significance throughout the Pacific. This issue contains a report, for 1976, on the Papua New Guinea fishery.

Over the last few years there has been a marked increase in fishing of outer reef slopes and shallows near the coasts. The Lamap fishing school in the New Hebrides, which grew out of the SPC project, provides a good example of the efforts made by the authorities concerned. Nonetheless, it is still extremely difficult to estimate potential long-term yields; it is for this reason that we are publishing an article in which Professor N. Marshall of the University of Rhode Island (USA) voices his concern on this subject.

The development of small-scale cash activities is also of constant concern to fisheries departments throughout the area. With prices continually rising in the Asian market, the Fijian bêche-de-mer experiment is of great significance. One of the aims of the Fijian project is to estimate the growth rate of this animal; the importance of such information is enormous, as it is impossible to determine post-fishing replenishment rates when nothing whatever is known of the growth rate. The knowledge thus gained is vital to bêche-de-mer development projects.

The phenomenon of toxic fish in coralline waters is having alarming effects on both public health and the economy of some areas. The report of the last meeting (15-18 February, Tahiti) of the working group on ciguatera gives an account of progress achieved by the teams of scientists working together under the aegis of the SPC. Although some technical terms may seem discouraging to the layman, we did not consider alterations necessary, since the context generally provides a full and easily understandable explanation.

In March, two conferences were held at Noumea. For the first, dealing with environmental issues, we include the SPC press release prepared on that occasion; for the second, that of Heads of Agricultural, Livestock and Fisheries Services, verbatim extracts of the part of the conference report concerned with fisheries.

Today, the wealth of information published throughout the world is such that bibliographical research is increasingly difficult. As in many other fields, computerisation is proving indispensable. Hawaii now offers a special, free service whereby full bibliographical references on a specific subject are provided on request.

In January 1977, ICLARM moved to Manila in the Philippine Islands. Dr John Marr has taken over the post of Director-General from Dr Philip Helfrich. With its new structure, the organisation should be able to make an even more decisive contribution to the growth of certain centres of activity throughout the Pacific and South-East Asia.

Finally, we thought it only natural to mention the new structure of the SPC Secretariat adopted at the Sixteenth South Pacific Conference (Noumea, 20-29 October 1976). One of the major innovations is the replacement of the three former Programme Directors - Economic, Social and Health - by a single Director of Programmes whose primary task is to prepare integrated programmes geared to the policy objectives determined by the Nauru Review Committee (3-6 May 1976).

THE SKIPJACK TUNA FISHERY IN PAPUA NEW GUINEA, 1976

A.D. Lewis and B.R. Smith*

Following the relatively poor catches experienced during 1975, which had precipitated the withdrawal of one of the four companies from the tuna fishery, it was important for the continuing development of the Papua-New-Guinean skipjack fishery that 1976 prove to be a more successful year. With an annual catch of 33.000 tonnes and a daily catch rate of 4.2 tonnes/day, these hopes have been realized.

I. VESSELS BASED IN PAPUA NEW GUINEA

(a) Total catch

Table 1 compares the annual catch, daily catch rates and species composition for the years 1971-76 for all companies combined. Although the May-June period again provided good catches, fishing was generally good throughout the year, and the absence of distinct seasonality continues to be a feature of the fishery.

(b) Distribution of effort

Over half the catch was again taken in the vicinity of New Hanover, but with increased fleet mobility imposed on two of the companies by intermittent bait shortages in their allotted areas, good catches were experienced for varying periods in West New Britain (August-October), Manus Island (September-October) and the Solomon Sea (November-December), as well as the established Cape Lambert grounds.

(c) Vessels

Okinawan catcher vessels of the fifty-nine tonne class continued to form the bulk of the 38-vessel fleet, operating on a daily basis i.e. baiting each night. One company made an effort to have some of its larger vessels operate on an extended range basis. In view of the Government's stated aim of phasing out the mother-ship type of operations in favour of dependence on shore bases, these efforts can be expected to increase.

Two vessels in the fleet took more than 1500 tonnes during the year (0/47 in 1975 and 7/47 in 1974). The catch of eleven vessels exceeded 1000 tonnes (0/47 in 1975 and 12/47 in 1974).

(d) Composition of the catch

The high percentage of yellowfin, both in the total catch (25.9%) and in the monthly catches (16.0-36.2%) was an unusual feature of the fishery. Previous contributions by weight to the annual catch have ranged between 0.8% and 10.0% (Table 1). It is not known whether this reflected increased abundance

* Kanudi Fisheries Research Station, Port Moresby.

in the Papua New Guinea area. As yellowfin and bigeye are not separated in the catch, the figures would include an unknown percentage of juvenile bigeye.

Skipjack average size was below that of previous years (2.6 kg vs. 3.1-3.5 kg in 1971-75), and this is attributable in part to the virtual cessation of fishing in areas which have accounted for most of the larger (> 4 kg) skipjack. Even allowing for this, however, average size has shown a slight real decrease.

(e) Fishing conditions

Fishing masters of two fleets reported during the year that fishing schools associated with floating objects (typically logs) and whale sharks were providing good catches fairly regularly. In the past, associated schools have provided little of the Papua New Guinean pole boat catch and this increased reliance on such schools may partially account for the smaller average skipjack size and the increased percentage of yellowfin in the catch.

(f) Baitfishing

The total 1976 bait catch of approximately 380,000 buckets (an estimated 950 tonnes) barely exceeded the 1975 figure, despite a significant increase in baitfishing effort. The average daily load of bait carried by the fishing vessels was the lowest on record (48.6 buckets compared with 55.1-67.2 in previous years). Nine percent of available fishing days were lost because of insufficient bait, this loss being mainly sustained by a single company in its exclusive baiting area.

The possibility that ceiling catch levels are being approached in the established baiting areas, small in both number and area, cannot be completely discounted. As a safeguard until such time as better information becomes available, an upper limit was placed on the number of baiting units allowed into the Ysabel Pass and Cape Lambert areas and the companies were actively encouraged to seek out alternative baiting grounds. To ensure a more equitable distribution of the currently exploited resource amongst the companies existing exclusive areas were further reduced in size.

2. OTHER VESSELS

(a) Long range pole boats

During January and February, there was considerable fishing activity along the equator, particularly in the area 0°-3°S, 155°-162°E, but no activity in the Solomon Sea, as in previous years at this time (Tanaka, undated). Little is known of the activities of the long range pole boats in the latter half of the year, although some were sighted in the Solomon Sea in December. An estimate of the catch by these vessels is not available.

(b) Purse seine vessels

Up to nine Japanese purse-seiners enjoyed good fishing during the January-April period on log-associated fish in an area adjacent to Papua New Guinea (1°S-2°N, 139°-142°E). It is possible that 5,000 tonnes were taken by these vessels. After April, most returned to the homewater fishery, but the Fukuichi Maru continued to make fair catches into August.

During August and September, the three large purse-seiners engaged in the Pacific Tuna Development Foundation (USA) charter apparently had some success with log fish in this same area (550 tonnes approx.), and the future of a limited fishery for smaller purse-seiners (500 tons or less) appears moderately good.

3. DEVELOPMENTS WITHIN THE INDUSTRY

(a) Establishment of shore bases

Early in 1976, the Government laid down guidelines for the future of the tuna industry in the country. Pre-eminent amongst these was a requirement that shore bases be established as soon as practicable, and economic aid was requested from the Government of Japan to facilitate development of these bases. At the time of writing, feasibility studies have been completed and commitment to the project made in principle.

(b) Fisheries treaty

The Australia-Japan Agreement on Fisheries (1968), to which Papua New Guinea was a party, lapsed in November 1976. Papua New Guinea decided not to negociate a bilateral treaty with Japan at this time.

(c) Extension of privilege

The agreement between the Papua New Guinea and Japanese Governments on fishing rights within the Declared Fishing Zone and port calls for longline vessels, due to expire in November 1976, has been extended to April 30, 1977.

(d) Charter of alternative pole vessel type

As the Okinawan-type pole vessels have, in spite of their obvious success, some features not entirely suited to Papua New Guinean conditions, the Government and the companies agreed to charter the low-stern Hawaiian vessel Anela for a period of up to four months. For several reasons, to be discussed in a separate report (Wilson, in preparation), the venture met with limited success. The vessel did, however, capture quantities of suitable bait during the daylight hours on several occasions. The present companies have since shown some interest in exploring this possibility.

4. RESEARCH

With the curtailment of tagging and other aspects of field research, emphasis has been redirected to baitfish studies, with the aim of

(a) improving the quality of management - related data from the baitfishery;

(b) gaining a better understanding of aspects of the life history of the major species;

(c) investigating the possibility of establishing a separate bait-fish facility able to supply bait in good condition to fishing vessels (this programme is based in Kavieng).

Papua New Guinea is nevertheless keenly aware of the need for further studies on skipjack stocks, particularly with regard to

(a) cooperative tagging and genetic studies (active involvement in this field continues)

and

(b) collection and compilation of catch statistics on a regional basis.

Any effort to coordinate skipjack research on an international level will receive full support.

Table 1. - Annual catch, daily catch rates & species composition of the Papua New Guinea fishery, 1971-76

	1971		1972		1973		1974		1975		1976	
	Total	Avge/Boat/ Day	Total	Avge/Boat Day	Total	Avge/Boat Day	Total	Avge/Boat Day	Total	Avge/Boat Day	Total	Avge/Boat Day
Jan	918	3.54	681	1.75	411	1.13	1,529	5.08	575	1.97	411	2.83
Feb	992	3.49	744	2.09	294	1.02	1,808	7.69	546	2.22	64	1.38
Mar	1,461	4.40	1,359	2.69	678	1.66	1,625	3.47	769	2.61	573	4.62
Apr	1,512	4.27	966	2.51	839	1.48	3,259	4.59	1,066	4.02	2,163	4.21
May	1,884	5.51	1,633	2.78	2,906	3.58	5,722	5.56	2,282	3.75	4,051	4.68
Jun	2,039	6.43	793	1.69	3,011	3.67	5,485	5.80	2,496	3.21	4,917	5.57
Jul	1,952	5.52	846	2.17	4,038	4.50	5,215	4.80	2,238	2.55	3,671	4.22
Aug	2,027	4.23	748	2.24	4,373	4.70	4,351	4.29	1,792	2.70	3,565	3.84
Sep	1,490	3.55	345	1.36	4,719	5.26	3,367	3.57	1,454	2.64	3,779	4.32
Oct	1,065	3.78	1,336	3.42	1,782	2.85	3,833	3.88	1,689	2.20	4,965	5.15
Nov	962	2.86	2,243	5.11	2,571	4.53	3,373	3.57	964	1.72	2,773	3.03
Dec	700	2.33	1,430	3.44	2,647	5.14	2,216	2.99	1,509	2.71	2,103	3.10
Total	17,002	4.19	13,124	2.67	28,269	3.68	41,780	4.4	17,322	2.69	33,035	4.23
Percent skipjack	99.0		89.3		95.5		96.2		89.8		73.8	
Percent yellowfin	0.8		9.7		3.5		3.3		10.0		25.9	
Percent Other Species	0.2		1.0		1.0		0.5		0.2		0.3	

ARTISANAL FISHERIES IN THE NEW HEBRIDES: THE LAMAP FISHING SCHOOL

J.P. Hallier

As a follow-up to the SPC Outer Reef Artisanal Fisheries Project, which operated in the New Hebrides from July 1974 to February 1975, the French Residency decided to set up a fisherman training centre at Lamap, on the island of Malekula, in May 1975.

1. EQUIPMENT

+ a 27-foot plywood boat built locally with plans from American Samoa;
+ two 40-h.p. outboard motors;
+ a 10-foot flat-bottomed aluminium dinghy;
+ a 6-h.p. outboard motor;
+ three oil-fired deep-freezers (70 kg of fish each);
+ an electric deep-freezer (200 kg of fish);
+ ten 100 m x 2 m seine nets;
+ a small-meshed casting net;
+ six bamboo poles for tuna fishing;
+ seven trolling lines;
+ four hand winches for deep fishing;
+ "Circle-hooks" of varying sizes;
+ assortment of lures for trolling and pole-and-lining for tuna and skipjack.

2. TRAINING

+ given by a Tahitian master fisherman;
+ duration 10 to 12 months;
+ intended for young (age: 14-18) Melanesians from coastal villages throughout the island group;
+ the objective is to teach trainees to:
    - make and mend fishing nets;
    - haul in bottom lines, trolling lines and mackerel lines, and make poles for skipjack and tuna fishing;
    - maintain fishing gear and boat;
    - fish by set net, seine and casting net, trolling, bottom line, pole-and-line and fixed traps;
    - identify, clean and store fish.
+ The trainees for the year 1975-76 were six Melanesians, four of whom are now independent professional fishermen in their respective villages.

+ The 1976-77 class, comprising five new trainees, is under way.

On leaving the school, the young fishermen take with them fishing gear, and are also entitled to extremely low-interest loans from the Caisse Centrale de Coopération Economique.

3. FISHING RESULTS

Catching fish for marketing purposes is not the aim of the school; however, the breakdown of the quantities and species landed provides valuable information.

3.1. Catch and fishing effort

In 1976, the product of the school's fishing activities was sold at Lamap, Norsup (administrative centre of Malekula) and, in particular, to the Syndicat des Coopératives Autochtones Françaises (S.C.A.F.) at Vila, the latter organisation taking responsibility for distribution.

Thus, the overheads of the school were partially offset by the sale of the catch. Crustaceans (prawns, mangrove crabs and lobsters) taken by local fishermen were also sent to Vila by the school.

Table 1: Amounts (in kg) of fish landed by the Lamap Fishing School and crustaceans taken by villagers: breakdown for 1975 of consignments and sales

	Fish	Crabs	Prawns	Lobsters
Vila	6741	1112	496	564
Lamap	4300	-	-	-
Norsup	594	-	-	-
Total	11635	1112	496	564

The total catch of 11.6 tonnes of fish is the result of only ten months work. The school was unable to function normally all year round, firstly because of a shortage of packaging material, which interrupted consignments to Vila for over a month, and secondly because of the annual overhaul of the boat and motors, which was also carried out at Vila. The average monthly catch was 1160 kg with the number of trips varying from 13 to 16, hence catches ranging from 72 to 89 kg per trip.

3.2. Main species caught

- Trolling

Little tuna	Euthynnus affinis (Cantor)
Yellowfin tuna	Thunnus albacares (Bonnaterre)

Skipjack	Katsuwonus pelamis (Linn.)
Dogtooth tuna	Gymnosarda unicolor (Rüppell)

- Set net and seine

Mullet	Mugil macrolepis Smith
	Mugil seheli Forsskål
Rabbitfish	Siganus lineatus (Valenciennnes)
	Siganus corallinus (Valenciennes)
	Siganus punctatus (Schneider)
	Siganus sp.
Mackerel	Rastrelliger kanagurta (Cuvier)
Jack	Caranx melampygus Cuvier
	Seriola dumerili Risso
	Gnathanodon speciosus (Forsskål)

- Bottom-line and hand reel

Deep snappers	Pristipomoides flavipinnis Shinohara
	Pristipomoides multidens Day
	Etelis oculatus Cuvier
Snappers	Lutjanus gibbus (Forsskål)
	Lutjanus argentimaculatus (Forsskål)
	Lutjanus bohar (Forsskål) (highly toxic)
	Lutjanus rufolineatus (Valenciennes)
Sweet-lipped emperor	Lethrinus chrysostomus (Richardson)
Spangled emperor	Lethrinus nebulosus (Forsskål)
Yellow-tailed emperor	Lethrinus mahsena (Forsskål)

The monthly variations appearing in the catch breakdown (Table 2) are the result of differing weather conditions. During the month in which the trade winds blow hardest it is impossible to fish tuna and deep-swimming species, but there is a corresponding increase in mullet catches in sheltered areas.

Table 2: Catch breakdown (in kg): monthly variations

	Skipjack & tuna	Mullet	Mackerel	Deep Snapper	Snapper	Rabbit-fish	Total
July	49.0	137.8	16.5	-	-	-	203.0
August	-	307.9	35.0	25.0	22.5	-	390.4
September	-	-	29.0	215.5	18.5	83.0	561.0
October	83.0	262.1	-	20.0	25.0	359.1	749.2
November	370.8	17.9	0.7	31.9	-	527.6	948.9
December	209.0	14.0	-	54.6	-	188.6	466.2
Total	711.8	954.7	81.2	347.0	66.0	1158.3	3319.0
%	21.4	28.8	2.4	10.4	2.0	35.0	100%

From September to January inclusive, at Lamap, reproductive migrations of rabbitfish occur four or five days after the new moon, causing the good catches shown for the latter part of the year.

Bottom-fishing is carried out at depths ranging from 120 to 180 m. At greater depths, catches are low, while in shallower water the fish are of a smaller average size, and there is a higher proportion (up to 30 per cent) of potentially toxic specimens.

4. CONCLUSIONS

The New Hebrides feature a wide range of fish which may be taken either seasonally or all year round, with a low capital outlay, by local fishermen having a command of a few simple methods, and using unsophisticated construction and maintenance materials.

Nonetheless, the potential profitability of small fishing within the peculiar socio-economic structure of the New Hebrides remains to be proven. The New Hebrideans are by tradition more inclined to farm than to fish, and consequently it must be determined whether they should be encouraged to fish from canoes near the coast, which would require no capital outlay, or whether they should opt for a method likely to be more effective but entailing a loan.

ASSESSMENT OF THE CARRYING CAPACITY OF THE OUTER REEF FISHERY : SOME THOUGHTS ON THE IMPORTANCE OF AND ON UNDERTAKING A PRELIMINARY ASSESSMENT

Nelson Marshall *

PROBLEM:

Tropical fisheries on high coral reefs and inshore therefrom are commonly fished to levels below optimum yields. For some time it has been apparent to those involved with such fisheries that a whole new resource can often be tapped by working offshore of the reef and harvesting from off the bottom, considerably below the zone of active coral growth.

Though the participants in and proponents of such outer reef fisheries share a scattering of formation as to the biological community being tapped, basic fisheries management questions have received little attention, for the energy expended has been directed largely toward exploratory fishing, appropriate fishery technology, designing and building suitable small boats, and generally promoting an interest in the resource. Thus, at least a first appraisal of the fundamental management questions is long overdue. Furthermore, since so little of the work has been done, the return on a minimal effort is bound to be great even though, as many observers will stress, a thorough mastery of many of the key questions involved will be difficult to achieve.

To tackle these questions, work should concentrate on at least one, and preferably two or three, representative areas. Proposing this thrusts us immediately into one of the basic dilemmas of outer reef fisheries development and management; namely, that no two areas are alike. Even so, a start should be made and, for reasons quite obvious to those who work with fisheries population information, the return for any given level of effort is likely to be greatest for locales where there is an active fishery.

QUESTIONS INVOLVED:

Listed herewith are a number of questions, readily answered in the main, which would help in trying to think intelligently as to the potential sustainable yield of any given outer reef fishery that might be studied and might even lead toward some general insights into these fisheries:

What is the species composition of the catch? Obviously this is fairly well-known within the fishery and known on a general basis to those who have been keeping up with the development of this type of fishery. Equally obvious is the fact that this is the first bit of information anyone studying a given fishery intensively will wish to compile (some recourse to taxonomy specialists may be needed).

What are the feeding habits of the fish taken? Gut analysis work should quickly shed light on this.

* Professor of Oceanography and Marine Affairs, University of Rhode Island

What are the age composition and rate of growth of the fish taken? Though one may despair of using a length frequency approach, this may have more promise than expected, when modern analytical methods are used. Also, by considering otoliths and other hard parts, the age and growth problem may be unlocked.

When, at what age, and under what conditions do the contributing fishes reproduce?

What kind of habitats and biotic communities, including fish below catchable size, are involved? Underwater photography might help here; it might be expensive, but perhaps very practical if, in the South Pacific, it were pursued in conjunction with CCOP/SOPAC.

What are the supporting components of the habitat's trophic regime, i.e., does productivity depend on a rain of detritus from the high reef, population migration to the fish or their prey to and from the high reef, or direct or modified updwelling regimes..? Deep water-sampling and perhaps some simple current work might help unravel these questions.

From studying one or more representative outer reef fisheries, what generalizations might be applied in considering other potential sites, the development and management thereof?

UNIT HELPS IN BECHE-DE-MER FISHING *

Suliasi Vatoga **

The Fisheries Division in Fiji has established a Fish Processing Unit as another arm of its Extension Services.

The Unit is helping villagers in outlying islands to process bêche-de-mer and salted fish using basic technology.

The Principal Fisheries Officer, Mr Travis, said that one of the main tasks of the Unit was completed when a physical survey of bêche-de-mer resources in the Lau Group waters was finished recently.

The Fisheries Division has temporarily abandoned the old fisheries development programme in which fishing schemes in the group were regularly provided with ice fishing equipment and marketing of catches.

Mr Travis said that the programme was costing Government too much money and that the reefs and lagoons were reaching the stage where they were in danger of being fished out.

When the Fisheries Division embarked upon the original development programme in 1968, it helped to establish the schemes, by providing catching and fish-holding facilities, and also trained local fishermen in more advanced fishing techniques.

The schemes were conceived to help overcome two problems; the lack of income at the village level and the need for a source of protein for the large population centres. The two problems are in fact related, for the lack of jobs at the village level has led to a population drift towards the town, thus increasing the need for protein.

Mr Travis said that the operation became too expensive and was not worthwhile when items such as ice and labour were charged at their true cost. Looking at other marine resources, he said that beche-de-mer and salted mullet were viable propositions for which operating costs would be kept to a minimum. Both items were priced commodities and bêche-de-mer was in demand by Chinese all over the world. A recent indication was the presence of a company representative from Singapore at the last bêche-de-mer auction at Lami.

Mr Travis said that bêche-de-mer processing and sun drying of fish could give island people productive employment and should stop the drift of island people to urban centres. This drift is a strain on Government resources and will create housing problems, a need to build more schools and more work for the police.

Last year one village in the Lau Group, Ogea, earned a net profit of $F 7,220 from

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* Farm Press Story

** Information Section, Ministry of Agriculture, Fisheries and Forests, Suva, Fiji.

bêche-de-mer. Another village, Buliya, in Kadavu, earned $F1,998 in only six weeks of work involving 30 people. This compares well with copra from which 89 people in the same village earned $F2,516 for a period of 12 months. During an auction early in 1977 the villagers of Buliya, Vatoa and Yadua earned $F4,513 from the sale of bêche-de-mer.

The last two auctions were a success. The normal buying price of bêche-de-mer has been 90c per lb. During recent auctions, bidding price of bêche-de-mer skyrocketed to as high as $3.00 a pound. Mr Travis said that 100 tons of bêche-de-mer could easily be auctioned at Lami.

Four teams from the Food Processing Unit will spend six weeks on different islands teaching people how to process bêche-de-mer. The Unit will supply the villages with goggles, sacks and even outboard motors, fuel and spare parts, charged to the accounts. Each team will take with them portable smoke houses and supervise the processing, with the villagers doing the work.

The Unit will transport the catches to Suva and carry out the auction on behalf of the villagers. Mr Travis said that the Unit is trying to study the growth rate of bêche-de-mer, on which no information is available. Diving for bêche-de-mer will not be carried out throughout the year. Each village will dive and process twice or three times a year under the close supervision of the Food Processing Unit staff.

So far villagers have shown a very good response and keen interest in bêche-de-mer fishing and processing.

AD HOC ADVISORY GROUP MEETING ON FISH POISONING*

(Papeete, Tahiti, French Polynesia, 15-18 February, 1977)

I. INTRODUCTION

This meeting, held at the library of the Institut de Recherches Médicales "Louis Malardé", Papeete, Tahiti, had as its goal the sharing of recent results of studies on ciguatera which have been supported, in part, by the South Pacific Commission. The institutions where this work is being conducted include the Tohoku University, Sendai and Kagoshima University, Kagoshima, Japan, the University of Hawaii, Honolulu and the Institut de Recherches Médicales "Louis Malardé" (IRMLM), Papeete, Tahiti.

2. PARTICIPANTS

Dr J. Laigret, Director, IRMLM, Papeete.

Dr A. Bourre, Medical Officer, South Pacific Commission, Noumea.

Dr A.H. Banner, Principal Investigator, Studies on Ciguatera, University of Hawaii, Honolulu.

Dr L.R. Berger, Professor of Microbiology, University of Hawaii, Honolulu.

Dr Y. Hokama, Professor of Pathology, University of Hawaii, Honolulu.

Dr T. Yosumoto, Professor of Food Hygiene, Tohoku University, Sendai, Japan.

Dr A. Inoue, Associate Professor of Marine Botany and Environmental Science, Kagoshima University, Kagoshima, Japan.

Dr R. Bagnis, Head, Unit of Medical Oceanography, IRMLM, Papeete.

Dr F. Parc, Pathologist, IRMLM, Papeete.

Mme E. Chungue, Biochemist, IRMLM, Papeete.

Mme S. Chanteau, Biochemist, IRMLM, Papeete.

M. J.H. Drollet, Biologist, IRMLM, Papeete.

3. AGENDA

STUDIES ON DIPLOPSALIS

Historical perspective.

Comparative toxicity of food chains.

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* Organised by the South Pacific Commission

Evidence for Diplopsalis as a likely cause of Ciguatera.

Biochemical properties of various toxins from Diplopsalis recovered from coral surfaces.

The culture of Diplopsalis.

Establishment of a survey method for Diplopsalis.

Distribution of Diplopsalis around Tahiti.

OTHER MICROBIOLOGICAL STUDIES ON CIGUATERA

BIOCHEMICAL AND PHARMACOLOGICAL STUDIES

Toxins of parrot fish.

Pharmacological studies of toxins involved in Ciguatera.

Research on possible antidotes for the ciguateric intoxication.

IMMUNOLOGICAL STUDIES

Radioimmunoassay for the detection of ciguatoxin.

Preliminary immunofluorescence data on Diplopsalis.

Hypersensitivity to Ciguatera in cats and epidemiological incidence in various territories of Pacific area.

4. RESULTS

4.1 RECENT EPIDEMIOLOGICAL DATA FROM THE SOUTH PACIFIC AREA

4.1.1. Health incidence

An attempt has been made to discover the present state of ciguatera in the South Pacific area from the official number of fish poisoning cases reported to the South Pacific Commission. From December 1975 to November 1976, inclusive, approximately 2,000 cases were officially recorded. This number shows a 10 per cent increase over the 1975 figure, but after other studies made in Fiji, Niue, Tonga, Samoa, New Caledonia, New Hebrides and Loyalty Islands, we can certify that this number is minimal. Nevertheless, thanks to these data, we can get a general view of the disease in the various regions. It thus appears that the most affected territories are Tuvalu, French Polynesia, New Caledonia, Trust Territory of the Pacific Islands and Gilbert Islands.

4.1.2. Clinical aspects

The general scheme described in French Polynesia can be easily extended to the other areas of the South Pacific. The ciguateric syndrome shows two major clinical pictures which seem to proceed from different physiopathological mechanisms. In the first, the food poisoning shows more or less severe digestive, nervous and cardio-vascular symptoms. These are undoubtedly due to a pharmacological effect of ciguatoxin, when this product reaches a high concentration in the fish. In the second clinical form, the neurological syndrome is often isolated (including primarily disesthesia, pains and itching), and sometimes associated with diarrhoea. It appears to be related to some antigenic properties of ciguatoxin and involves hypersensitization to fish. It primarily affects individuals who continue to eat fish following intoxication with true fish poisoning.

Most of the time, this syndrome occurs in remote places where islanders have not the opportunity or the goodwill to vary their diet (Gambier, Marquesas and some atolls of Tuamotu archipelago). This allergy-like condition may become chronic and constitutes a true public health problem which is initiated by consumption of normally edible sea products. In Tahiti the number of cases apparently correlated with hypersensitization has increased in the last few years. It accounted for 30 per cent in 1975. An inquiry on patients treated at IRMLM has revealed that only 32 per cent were poisoned for the first time. The others came for treatment of recurrences. In these patients there is often an overlap between the pharmacological (direct or cumulative) and immunological effects. On the other hand, in the hospital, during a severe state of shock, it is sometimes very hard to distinguish the part of each pathogenic pattern in the severe clinical picture.

The hypothesis of an immunological participation associated with the toxicological effect is also supported by various instances of asthma, urticarian reaction eczema sprouting,vitilago. started by typical fish poisoning.

4.1.3. Etiological "in situ" patterns of ciguatera

Two kinds of etiologic patterns for ciguatera can be distinguished in the Pacific area. The first is of an outbreak type. It implicates the complete benthic food chain, involving microphagous and detritivorous fish (surgeonfish, parrotfish) and their predators (groupers, snappers, emperors, moray eels, jacks,barracudas) primarily. It is observed only in the areas suddenly affected by strong, limited, repeated disturbances (direct or secondary human agressions). This picture, noted in the past decade in French Polynesia, is not too common. It is even rarer in many other territories. The second etiologic type implicates only the ichtyophagous fish, leaving the first trophic levels of the food chain entirely edible. It is commonly encountered in all areas only when natural mechanical diffuse and episodic disturbances occur. It produces a low toxicity in the reef ecosystem. This has been supported by tests of a few specimens of high trophic level fish from New Caledonia and Fiji which do carry little or no ciguatoxin.

4.1.4. Studies on Diplopsalis

A. Discovery of the etiological agent of ciguatera

An investigation of food chains of ciguatera revealed the presence of strong toxicity in a mixture of algae and detritus scraped off the surface of dead corals collected on the Gambier Islands. A large number of dinoflagellates tentatively identified as Diplopsalis sp. nov. was present in this toxic sample. This organism is detected only in toxic samples but not in samples of low toxicity. This suggested a correlation between the organism and toxicity. Mechanical fractionation of the toxic sample by sedimentation and sieving enabled us to obtain a fairly uniform sample of this organism. Subsequent biochemical experiments based on various chromatographic methods showed the presence of two toxins which are very close to, or identical with, ciguatoxin and maitotoxin. Pharmacological and immunological tests done by Professors Rayner (Pharmacology) and Hokama at the University of Hawaii also offered evidence that the organism produces a toxin which is indistinguishable from ciguatoxin. All these data indicate that Diplopsalis sp. nov. is the cause of ciguatera.

B. Ecological survey

A rapid and practical method for surveying Diplopsalis sp. nov., the probable causative organism of ciguatera, was developed. The test was done by shaking 10 leaves

of a brown alga, Turbinaria ornata, in a test tube containing 10 ml of sea water. After centrifugation of the liquid content the precipitate was re-suspended in 0.5 ml of sea water and two drops of the suspension were transferred on a slide glass. The number of Diplopsalis cells was counted under a microscope. If T. ornata was not available, one gram of another species of alga was used instead.

By using this method, the distribution of Diplopsalis was surveyed around Tahiti and Gambier Islands. A wide distribution of this organism in the surveyed areas was confirmed; also marked regional variation was observed. Periodical observation of numbers of this organism on a small reef indicated a remarkable rise and fall during the observation period. It is expected that this survey method will be applicable to other areas to assess the ciguateric endemicity.

C. Culture

Culture of Diplopsalis sp. nov. was achieved in enriched sea water medium by a micropipette procedure. The cell division was calculated to occur approximately once every three days. Essential vitamins for its growth were presumed to be vitamin B_{12}, biotin and thiamin.

4.1.5. Other microbiological studies

Only one bacterial culture, "Bacillus 18", of the hundreds brought back in 1975 from French Polynesia and subsequently tested, reacted with anticiguatoxin sera. Anti-"Bacillus 18" rabbit sera reacted strongly with toxic reef fish, weakly with edible reef fish flesh from Hawaii and insignificantly or not at all with pelagic fish. The conclusions were confirmed by Professor M. Rayner using the above two sera and with sera modified by absorption with the non-homologous antigens, as blocking agents for the effect of ciguatoxin in a specific membrane test.

The establishment of whether "Bacillus 18" contains an antigenic determinant identical to the one in ciguatoxin is our current priority goal. An assay required to test fractions of "Bacillus 18" for anticiguatoxic reaction has been set up.

The identification of "Bacillus 18" as a member of a known but unnamed phenotypic group of marine bacilli is near completion.

4.2. BIOCHEMICAL ASPECTS

4.2.1. Studies on scaritoxin

The occurrence of a new toxin tentatively named scaritoxin (SG_1) besides a ciguatoxin-like toxin (SG_2) in a parrotfish, Scarus gibbus, led us to investigate the distribution of these toxins in other species of parrotfishes and in other ciguateric fishes belonging to various genera. Abstracts of the results follow:

- Scaritoxin is present in all the parrotfishes studied: Scarus harid, Scarus niger, Bolbometopon bicolor, Scarus mus, Scarus ghobban and Scarus frenatus in significant amounts in addition to ciguatoxin-like compound (SG_2).
- Scaritoxin is absent in the following species: Epinephelus microdon, Plectropomus leopardus (both ichtyophagous carnivorous), Lutjanus bohar, Monotaxis grandoculis (both eclectic carnivorous) and Naso unicornis (herbivorous). Only ciguatoxin-like toxin was found in these fishes.

Furthermore conversion of ciguatoxin into scaritoxin is possible. The conversion does not take place in the liver but may occur in the muscle.

4.2.2. Toxicity of biodetritic layer covering dead corals

To study the distribution of ciguatoxin-like and maitotoxin-like toxins on dead corals from Gambier Islands dead corals were scratched and fractionated by particle size by sieves and centrifugation. The highest number of Diplopsalis counted were in the fractions between 500 μ and 36 μ. The fractions obtained were extracted and two kinds of toxins were found: the maitotoxin-like (MTX) and the ciguatoxin-like (CTX).

In total toxicity, the MTX represents 71.9 per cent while the CTX represents only 28.1 per cent.

4.2.3. Comparison of MTX Diplopsalis - MTX Ctenochaetus striatus and CTX Diplopsalis - CTX Gymnothorax javanicus

The comparison between the two toxins of Diplopsalis and the toxins MTX of C. striatus (maito) and CTX of G. javanicus (moray eel) shows great similarities which have to be investigated in the future.

4.2.4. Relation between toxicity of C. striatus and the population of Diplopsalis on the reefs of Tahiti and the Gambier Islands

In six stations around Tahiti and one station on the Gambier Islands we found good correlation between the toxicity of C. striatus and the number of Diplopsalis. The highest toxicity in the fish corresponds to the highest number of Diplopsalis.

4.3. PHARMACOLOGICAL STUDIES

4.3.1. Muscle membrane actions of ciguateric toxins

Both liver and flesh ciguatoxins from Gymnothorax javanicus produce a characteristic series of effects at muscle membranes. Initial addition of toxin to the bathing medium produces rapid depolarization of muscle membranes. Membrane potential can be restored to normal resting levels by an increase in Ca^{2+} concentration of the bathing medium.

This recovery is due to an antagonism of the toxin effect (rather than displacement of toxin from the membranes) since depolarization returns when the muscle is returned to normal saline solution. That these actions are mediated by effects on sodium permeability is indicated by the recovery of resting potential following the addition of tetrodotoxin.

This same pattern of effects is also produced by the non-water soluble toxin from Diplopsalis, providing substantial evidence that this toxin should be regarded as pharmacologically identical to ciguatoxin isolated from moray eels. By contrast the water soluble toxin from Diplopsalis and both water and solvent soluble toxins from parrotfish did not show this marked sensitivity to either tetrodotoxin or to high calcium concentration. We conclude that the Diplopsalis "maitotoxin" and the Scarus gibbus toxins are pharmacologically distinct from the principal moray eel toxins.

4.3.2. Effects of various drugs on death times of poisoned mice

To look for possible antidote effects against CTX we have tested different drugs injected intraperitoneally into mice. The injection took place one hour before, concomitantly, or one hour after the CTX injections. Various dosages of drugs and toxins were tested. Most of the time we have used methanolic residues of S. gibbus muscle as CTX. The experiment drugs have been atropine sulphate (anticholinergic type), calcium gluconate and glutamate (cell membrane stabilizing type), pralidoxin (cholinesterase reactivator), dexchlorpheniramine (antihistaminic type), betamethasone (corticoid type), diethazine chlorhydrate (parasympatholytic type), tetrodotoxin (specific experimental CTX antagonist).

From the results that we have obtained, the calcium glutamate at a dosage of 0.02 g per 20 g mouse has slightly delayed the death time. But the most significant effect has been involved by tetrodotoxin. This drug, at a 1/2 ml dosage, has not only delayed the death time but has also given a 30 per cent protective effect against lethality when the totality of controls die. Atropin sulphate has been shown to decrease the diarrhoea exhibited by poisoned mice.

All the other drugs, including cholinesterase reactivator, antihistaminic and corticoids, were inactive.

4.4 IMMUNOLOGY

4.4.1 Radioimmunoassay

A practical, sensitive, simple, and relatively specific radioimmunoassay test for the assay of ciguatoxin directly from natural sources has been developed. The radioimmunoassay test has been utilized to distinguish the toxic fishes identified in human ciguatera poisoning outbreaks from the non-toxic fishes. The radioimmunoassay test showed a fair correlation with the mongoose assay in the analysis of eel tissues ($r = 0.54$). It is suggested that further studies should aid in the development of a practical, sensitive, simple and specific immunological test for routine examination of ciguatoxin in fishes and for the analysis of ciguatoxin structure.

4.4.2. Experimental hypersensitivity in ciguatera

Several cats were hypersensitized by successive oral fish poisoning and tested by localized passive cutaneous anaphylaxis. Hypersensitivity reaction was demonstrated only following several intoxications. A large amount of homologous toxin was required.

5. INTERNATIONAL EXCHANGES

5.1 SPONSORED BY THE SOUTH PACIFIC COMMISSION

Ad Hoc Advisory Group Meeting on Fish Poisoning (Papeete, 5-9 January, 1976).

Ad Hoc Advisory Group Meeting on Fish Poisoning (Papeete, 15-18 February, 1977).

5.2 SPONSORED BY WORLD HEALTH ORGANIZATION

Dr T. Yasumoto (University of Tohoku, Sensai, Japan) acted as World Health Organization consultant in biochemistry from 30 December, 1975 to 20 February, 1976 at the IRMLM, Papeete, Tahiti. He has just completed another co-operative study with the IRMLM from 30 November, 1976 to 11 February, 1977.

6. CONCLUSIONS AND PERSPECTIVES

During the past three years the support of the South Pacific Commission has catalysed research on the widespread disease, ciguatera, by three independent but co-operating groups: those in Hawaii headed by Dr Banner, those in Tahiti headed by Dr Raymond Bagnis and those in Japan headed by Dr Takeshi Yasumoto. Because of this support the three groups have been able to obtain additional funds from their various national and international agencies.

Their combined research has produced results that will be far-reaching in the health and economics of the South Pacific Islands. Research at the University of Hawaii has given investigators two immunological tests to find and follow ciguatoxin on the coral reefs and in laboratory study. One of these tests, a radioimmunological assay, will also enable laboratories to test with small expense all potentially toxic fishes in commercial fisheries so that the Island people may eat with safety the fishes of their waters. Probably more important for the future is the isolation and cultivation of the toxigenic species on the coral reefs. This one-celled organism known as Diplopsalis releases into the food chain of the reef those quantities of ciguatoxin and other toxins that finally occur in both herbivorous and carnivorous fishes. It was discovered in the toxic reef areas of the Gambier Islands by Dr Bagnis' and Dr Yasumoto's groups, working together. The understanding of the ecological requirements of this toxigenic species can be expected to lead to the prediction of outbreaks, the confirmation of the limits of toxic areas, and possibly even the control of outbreaks.

While these advances have been great, further work must be done in the present year and possibly three or more years to come. The active research groups will continue to seek the bulk of their research support from other sources, but their studies will be facilitated again by the aid of the South Pacific Commission in certain co-operative aspects.

7. RECOMMENDATIONS TO THE PROJECT PARTICIPANTS

7.1 Establishment of a testing programme of potentially toxic commercial fish by radioimmunological assay

Dr Hokama of the University of Hawaii will lauch a programme for the testing of the amberjack (Seriola dumerili), a fish now banned from the market, in co-operation with the Hawaii State Board of Health. Concurrently, he will apply the test to samples sent from Tahiti. After the programme is established, he will train in the procedure a technician sent from Tahiti.

7.2. Initial exploration of methods of treatment of patients with ciguatera

Dr Parc, of the Institut de Recherches Médicales "Louis Malardé" in Papeete will explore recently discovered leads in immunology for the treatment of the disease.

7.3 Development of techniques for pure culture of Diplopsalis

Drs Yasumoto and Inoue will complete development of techniques for pure culture of the dinoflagellate when they return to Japan. They anticipate this will be done within the year. When they are successful they will culture the form for points 7.4 and 7.5 below.

7.4 Study of ecological requirements of Diplopsalis

Through different culture media and laboratory conditions, the Japanese will study the effects of light, heat, salinity, nutrients, trace organics and inorganics etc. upon both the growth and toxin production of the cultures. Concurrently, the Bagnis group in Tahiti will monitor sea conditions and growth of the micro-organism on local reefs. Dr Hokama in Hawaii will do these investigations by testing samples with his radioimmunoassay. These two sets of observations when combined, should lead to the ability of scientists to predict, delimit, and possibly control outbreaks, as mentioned in the introduction.

7.5 The mass culture of Diplopsalis

Fundamental studies on the toxin heretofore have been limited by the extremely small amounts of pure toxin produced at great effort and expense. Through modern mass culture techniques, the micro-organism and the toxin it produces can be harvested at little effort. The mass produced toxin, when purified, will be used for:

(a) Immunological tests

The availability of highly purified toxin will permit very specific immunological assay needed for research.

(b) Structural chemistry of the toxin

There now appears to be at least four toxins, and probably more, in the ciguatoxin complex, all interrelated and having varying pharmacological actions. Dr Yasumoto hopes to isolate enough pure ciguatoxin to establish the structure of the complex molecule, possibly in co-operation with Dr Paul Scheuer of the University of Hawaii.

(c) Pharmacological studies

Dr Martin Rayner of the University of Hawaii also has been severely limited in his studies of the action of ciguatera on the nervous system, and has not been able to initiate studies on the related toxins because of the lack of adequate amounts of the toxins. Should the toxins become available, he will continue his work.

8. RECOMMENDATION TO WORLD HEALTH ORGANIZATION

To date there exists no nomenclature at the World Health Organization which precisely defines cases of ciguatera. Yet each year several thousand cases occur in the Indo-Pacific area and the Caribbean Islands. Although the clinical symptoms are very varied they are well known to all medical personnel in endemic areas. The importance of the disease would be better understood if the Health Services would report precise data.

Already the South Pacific Commission has placed ciguatera on the list of reportable diseases. Unfortunately the rubric employed, E 868, encompasses diverse intoxications such as toxic berries, poisonous mushrooms, and venomous stings and bites. That is why we propose that the World Health Organization establish a special designation which could be universally employed. Accordingly, the Committee of Experts recommends that the best way to report ciguatera would be as: No. 988 "Toxic effect of noxious foodstuffs". Within this category we recommend a label exclusively reserved for ciguatera fish poisoning, as follows:

No. 988.3 Oral intoxication by toxic fish.

COMPREHENSIVE ENVIRONMENT MANAGEMENT PROGRAMME PLANNING MEETING

(Noumea, New Caledonia, 9-11 March 1977)*

The need to develop the resources of the Pacific Islands in a manner that will not destroy the often fragile environment was one of the main themes of a Comprehensive Environment Management Programme Planning Meeting jointly sponsored at SPC Headquarters from 9 to 11 March 1977 by SPC and SPEC (South Pacific Bureau for Economic Co-operation).

Some 20 participants attended the Meeting, which was chaired by Mr B. Rongap, Principal Environment Management Officer of Papua New Guinea. They included Government representatives, specialists in a wide range of scientific fields and representatives of international agencies.

The purpose of the Meeting was to draw up a comprehensive environmental management programme for the region for a period of five years, for submission to meetings of SPC and the South Pacific Forum later this year.

The Meeting noted that any such programme should be concerned both with the abatement of existing problems and the prevention of new problems likely to arise in the future.

Three working groups were formed to define problems and propose possible solutions in three broad areas - terrestrial resources, marine resources and human settlements.

Among the many problems considered was the need to improve the lot of rural dwellers by providing basic sanitation facilities at the village level, and developing new systems of agricultural management suitable for the hot humid rain-forest areas. Attention was given to the complicated network of factors involved in large scale development and engineering projects (commercial plantations, mining, power schemes, tourism, building) and to safeguards which might be established at both the planning and development stages of such projects. Sound methods of forest exploitation and protection and rational use of water resources were discussed, and the rehabilitation of degraded land areas and attendant problems of erosion were considered.

In the field of marine resources, two main problems were raised: management and restoration of species exploited in small-scale and coastal fisheries, and oceanic fisheries. In the area of coastal fisheries, a number of fields of action likely to assist in efficient use of coastal resources were identified. The Meeting noted that oceanic fisheries management problems, which are becoming increasingly important in the light of the potential establishment of 200-mile exclusive economic zones, will fall within the purview of the proposed regional fisheries agency on which both SPC and SPEC are working.

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* Organized by the South Pacific Commission

On the recommendation of the Meeting, a preliminary draft of the proposed five-year programme will be drafted by SPC's Regional Ecological Adviser for submission to Forum and SPC meetings later this year, and consultations will be held with Governments and Administrations in the region to discover details of the problems on which they feel action is required.[1] A study will also be made of existing resources which might be mobilised for the programme. In the light of this information, the draft programme will be revised and a final proposal submitted to a Conference on the Human Environment which is to be held during the second quarter of 1978.

1. Since this was written, the programme has been drafted and submitted to Governments and Administrations for comment.

FIFTH REGIONAL CONFERENCE OF PERMANENT HEADS OF AGRICULTURAL, LIVESTOCK PRODUCTION AND FISHERIES SERVICES

(Noumea, New Caledonia, 21-25 March 1977)*

Section of the report dealing with fisheries

1. REVIEW AND EVALUATION OF ON-GOING PROJECTS

Outer reef artisanal fisheries

After operating in the New Hebrides, Western Samoa, Cook Islands and Tuvalu, the Project Team is now about to move to Gizo, in the Solomon Islands. The primary aim of the Project is to investigate the outer reef slope in order to collect evidence of any as yet undeveloped resources, and to introduce local fishermen to the most effective techniques of capturing the commercially valuable species found there. The Project employs one Master Fisherman and two fishermen and uses three boats, an ice-making machine and assorted fishing equipment.

Despite the serious difficulties encountered from time to time, the Project has, in many places, shown sufficient resources to be present, that could be fished with a relatively small outlay of capital and simple techniques.

In accordance with the recommendations of the Ninth Technical Meeting on Fisheries, it was decided to terminate the Project at the end of 1977. However, it has been proposed that it be followed by a programme of lesser scope, closely adapted to local conditions in each country.

Inshore fisheries development: turtles

The Turtle Project is split into two sub-projects, one based at the University of the South Pacific in Fiji, the other at Rarotonga, in the Cook Islands. The Fiji-based part is focusing on the biological aspect of breeding in captivity (bacterial and fungus diseases, nutrient deficiencies, influence of temperature, water quality, etc.). The Cook Islands part is concentrating more on its economic aspect, i.e. is attempting to show whether turtle breeding is an economically worthwhile venture.

Results have indicated that such projects are not economically feasible and it was therefore decided as recommended by the Ninth Technical Meeting on Fisheries to discontinue them once the on-going trials have been completed.

Fish poisoning project

Fish poisoning has serious repercussions on the health and economy of a territory and adversely affects the development of reef fisheries. The SPC is funding a research project conducted simultaneously in Hawaii, Japan and French Polynesia. This research is aimed at determining the causes of ciguatera, detecting toxic fish, developing means of identifying and preventing fish poisoning, and if possible, finding ways of making toxic fish safe for consumption. It comprises biochemical, immunological and microbiological work and has, in recent months, produced two very promising results: the development of an inexpensive test which can be used to detect toxic fish in commercial catches, and

* Organised by the South Pacific Commission

the discovery of a micro-organism, Diplopsalis, strongly suspected of being responsible for the releasing of toxins in the food chain. This discovery is of the utmost importance, for laboratory culture of the organism will yield toxins in sufficiently large quantities to allow analysis to be undertaken with a view to determining their chemical structure, an essential stage in the development of antidotes. In addition, it will henceforth be possible to detect in the field the presence of and any changes in the Diplopsalis population, and thus to establish in which areas and seasons ciguatera is most likely to occur.

Skipjack

A summary of the development of the Skipjack Survey ans Assessment Programme was presented by the Programme Coordinator. Since the last Conference of Directors of Agriculture a detailed programme proposal had been prepared by the Second Meeting of the Expert Committee on Tropical Skipjack and given the highest recommendation by the Eighth and Ninth Regional Technical Meetings on Fisheries. Efforts to have the Programme funded are now being rewarded; pledged contributions from New Zealand, the United Kingdom and Australia already represent more than half of the Budget estimate and favourable responses are anticipated in the near future from the other nations from which funding was requested (France, Japan, USA). The Programme should be put into operation in the latter part of 1977.

The increasing importance of skipjack fisheries to all countries of the region was noted and the need to ensure the co-operation of all countries of the region in planning the development of fisheries for this species was stressed.

The Conference endorsed the three recommendations from the Ninth Regional Technical Meeting on Fisheries which relate to skipjack but noted that SPC could find it difficult to create an extra staff position in accordance with recommendation 3. It was agreed that is indeed timely for SPC to be undertaking a major skipjack venture as the problems associated with the assessment and management of the highly migratory fisheries resources of the region are presently highlighted by the imminent declaration of 200 mile zones of extended jurisdiction by the countries and territories of the region.

The need to ensure that adequate consideration is given to the regional implications of the outcome of the 3rd Law of the Sea Conference by member countries and territories of SPC was stressed.

2. REPORTS OF EIGHTH AND NINTH TECHNICAL MEETINGS ON FISHERIES INCLUDING REPORT OF EXPERT COMMITTEE ON TROPICAL SKIPJACK (1975)

On account of the extensive changes occurring in the field of fisheries, the report of the Eighth Technical Meeting was not discussed in detail. The Conference did however endorse all the recommendations of the Ninth Technical Meeting (24-28 January 1977). The future of the Outer Reef Artisanal Fisheries Project was thoroughly discussed, as well as the setting up of a clearing-house service to provide territories with the information they require for the drawing up of adequate regulations pertaining to some of their coastal resources. The Conference also stressed the need for a regional approach to problems connected with the establishment of 200-mile exclusive economic zones.

INFORMATION SERVICES: COMPUTERIZED BIBLIOGRAPHIC SEARCHES

Bess Lovett *

A bibliographic retrieval service using the computerized data bases of the U.S. National Agricultural Library (CAIN), BIOSIS (Biological Abstracts), Chemical Abstracts, and Food Science and Technology Abstracts is now available without charge to people and institutions in the SPC area working in the area of tropical agriculture - broadly defined to include agricultural economics, nutrition, ecology, entomology, forestry, water management, as well as all plant and animal sciences. This includes fisheries, with a bias towards pure research studies.

Citations can be supplied regularly from current literature or as a result of a search of literature published during the last few years. The South Pacific Commission for example has received a long bibliography on bêche-de-mer and now receives every fortnight details of articles noted in the abstracting services above.

For further information write to:

Ms. Barbara K. Bird
Department of Agronomy and Soil Science
College of Tropical Agriculture
University of Hawaii
3190 Maile Way
HONOLULU, Hawaii, 96822 USA,

giving your name, affiliation, mailing address, topic and any restrictions such as languages, authors, geographic areas, etc.

The bibliographic service provides references to the literature, not the literature itself, which would normally have to be obtained through the nearest large library. Finding periodical articles should become easier during 1977, following publication of union lists of periodical holdings in libraries in Papua New Guinea, Fiji and New Caledonia. Pending publication of these lists, the Librarians of the Papua New Guinea University of Technology (Box 793, Lae, Papua New Guinea), the University of the South Pacific (Box 1168, Suva, Fiji) and the South Pacific Commission (B.P. D5, Noumea Cedex, New Caledonia), may be contacted for help in obtaining wanted articles not locally available.

The Librarian of the University of the South Pacific will also supply details of the library's "Contents Page Awareness" service, whereby they will supply regularly, to people and institutions in the South Pacific, contents pages of any periodical received. This service would be useful to many Fisheries Officers because it would allow them to see what is being published in periodicals to which they do not have access, and then to request a photocopy of any article of particular interest.

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* Librarian, South Pacific Commission

NEWS FROM THE INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT (ICLARM)

In November 1976 Dr John C. Marr was appointed Director General of ICLARM, a position previously occupied by Dr Philip Helfrich. Formerly based in Hawaii, ICLARM has recently been incorporated as a non-profit scientific institution in the Philippines and has moved its headquarters to Manila (1). Following the move, an external Programme Advisory Committee has been convened to review programme plans for 1977 and 1978.

According to the ICLARM Development Statement (September 1976) ICLARM will concentrate its programme initially in South-East Asia where the need to increase aquatic food production is greatest. ICLARM proposes to concentrate the major part of its resources on an aquaculture programme, including applications to aquatic ranching, but also to concern itself with small-scale capture fisheries and special projects.

Whereas the South-East Asian Fisheries Development Center Aquaculture Department (referred to as SEAFDEC), based in Manila, has excellent research facilities but a shortage of senior scientific staff, and ICLARM has access to scientific staff but lacks research facilities, an agreement was signed on 14 April 1977 between the two organisations in view of their common interests and needs.

Following the establishment of ICLARM headquarters in Manila, Dr Marr has been travelling extensively in the South-West Pacific and South-East Asia to discuss the continuing relationship between various organisations and countries and ICLARM, and to initiate further co-operation.

(1) ICLARM, P.O. Box 1501, MAKATI, Metro Manila, Philippines.

THE SOUTH PACIFIC COMMISSION: NEW STRUCTURE AND FUNCTIONS

The Commission's purpose is to promote the economic and social welfare and advancement of the peoples of the South Pacific region for whom it works. The region contains approximately 4½ million people, scattered over some 30 million square kilometres. Less than two per cent of this area is land.

MEMBER COUNTRIES AND THEIR TERRITORIES

Australia
- Norfolk Island

Fiji

France
- French Polynesia
- New Caledonia
- Wallis & Futuna Islands
- New Hebrides*

Nauru

New Zealand
- Cook Islands
- Niue
- Tokelau

Papua New Guinea

United Kingdom
- Gilbert Islands
- Pitcairn Island
- Solomon Islands
- Tuvalu
- New Hebrides*

United States
- American Samoa
- Guam
- Trust Territory of the Pacific Islands

Western Samoa

Associate: The Kingdom of Tonga

* The New Hebrides is a Condominium jointly administered by France and the United Kingdom.

ORGANISATION

The South Pacific Commission was founded on 6th February 1947, when representatives from six Governments signed the Agreement Establishing the South Pacific Commission. The Agreement, usually known as the Canberra Agreement, was signed in Canberra, Australia, by the Governments of Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America.

Since the signature of the Agreement, the Netherlands have withdrawn from the Commission (in 1962, when they ceased to administer the former colony of Dutch New Guinea, now known as West Irian), and independent Pacific states have been admitted to membership. Western Samoa became a member in October 1965, the Republic of Nauru in July 1969, the Dominion of Fiji in May 1971 and Papua New Guinea in September 1975.

The Kingdom of Tonga has always worked in close liaison with the Commission; it makes a voluntary contribution to the Commission's budget and benefits from its services.

SOUTH PACIFIC CONFERENCE

Until 1974, Commissioners from the eight Participating Governments met in annual Session. The South Pacific Conference, attended by delegates from the Pacific territories, first met in 1950: it provided an opportunity for representatives from the Pacific Islands to make known to the Participating Governments their territories' special needs and problems. In 1967, the Conference became an annual event; it met immediately before the Session and made recommendations to it.

At the Thirteenth South Pacific Conference, which met in Guam in 1973, proposals were put forward by the Government of Australia for changes in the functioning of the Commission. These proposals were studied by the Thirteenth Conference and by a meeting of Participating Governments held in Wellington, New Zealand, in March 1974. The result was a Memorandum of Understanding which was formally signed by representatives of the eight Participating Governments in Rarotonga, Cook Islands, on 2nd October 1974, during the Fourteenth South Pacific Conference.

The Memorandum provides for the South Pacific Commission and the South Pacific Conference to meet once a year in a joint session to be known as the South Pacific Conference. The Conference examines and adopts the Commission's work programme and budget for the coming year, and discusses any other matters within the Commission's competence. Each Government and Territorial Administration has the right to send to the Conference a Representative and Alternate, each of whom has the right to speak. Each Representative, or in his absence an Alternate, has the right to cast one vote on behalf of the Government or Territorial Administration which he represents.

To assist the Conference in its work, the Memorandum provides for a Planning and Evaluation Committee which meets in April or May each year to evaluate the preceding year's work programme; to examine the draft work programme and budget for the coming year; to agree on two themes of regional interest (one social, one economic) to be discussed by the Conference; and to report to the Conference. The Memorandum also provides for a Committee of Representatives of Participating Governments which approves the Administrative Budget, nominates the Commission's Principal Officers, and reports thereon to the Conference. Until 1976, each Participating Government was entitled to one vote in the Committee in respect of itself and one in respect of each territory administered by it. A new Memorandum of Understanding signed on 20 October 1976 by representatives of all Participating Governments abolished this multiple voting procedure and gave each Government one vote in the Committee.

ROLE OF THE COMMISSION

The Commission's role is advisory and consultative. Its programmes are closely co-ordinated with those of the countries and territories of the Pacific for which it works. The Commission does not concern itself with the politics of the states and territories within the region, nor does it attempt to control their development programmes.

The Sixteenth South Pacific Conference, which met in October 1976, adopted a recommendation made by a Review Committee that met earlier in the year, which reads as follows:

The South Pacific Commission, with the objective of encouraging and promoting the economic and social welfare and advancement of Pacific peoples in accordance with the Canberra Agreement as amended, should undertake the following functions:

(a) to provide a common forum within which the Island peoples and their Governments can express themselves on issues, problems, needs and ideas common to the region, with a view to maintaining the opportunity for all Islands to be heard, viewed, considered and assisted on equal terms to one another;

(b) to be a vehicle for the development and implementation of the concept of regionalism;

(c) to assist in meeting the basic needs of the peoples of the region;

(d) to foster and develop means to facilitate the flow of indigenous products, technical know-how and people among the islands;

(e) to serve as a catalyst for development of regional resources that are beyond the capability of individual Island Governments to develop;

(f) to serve as an aid-organizing machine for Islands which are otherwise unable to reach aid sources outside the Islands or outside the region itself;

(g) to act as a centre for collection and dissemination of information on the needs of the region and also as a depository for such information;

(i) to undertake such other appropriate activities as may be determined by the South Pacific Conference.

LANGUAGES

The official working languages of the Commission are English and French.

FINANCES

The Commission's budget is derived from proportional contributions from the Participating Governments. The agreed proportions are:

Australia 30%; United States 20%; United Kingdom 16%; New Zealand 16%; France 14%; Fiji, Nauru, Papua New Guinea and Western Samoa 1% each.

Voluntary contributions are also made to the budget by territorial administrations and through special grants from international organisations and institutions working in the Pacific region.

Australia, France, Nauru and New Zealand made additional voluntary contributions to the Commission's budget for 1974, 1975 and 1976 which enabled work to be undertaken on a number of special projects of interest to the region as a whole. For 1977, Australia

and France again gave voluntary contributions to the budget, and New Zealand indicated that full government approval would probably be given for its voluntary contribution to the 1977 budget.

The Commission's total budget for 1977 is provisionally estimated at $Aust. 2,871,022.

PUBLICATIONS

South Pacific Bulletin quarterly; English and French editions. Orders are taken at the Commission's Noumea and Sydney offices.
Technical Publications are published as the need arises and include the following series: Technical Papers; Handbooks; Information Documents; Information Circulars; Reports of Meetings; Newsletters on various topics. These publications disseminate information on recent developments in the Commission's field of work. Prices vary.
South Pacific Conference Proceedings
Annual Reports

SECRETARIAT

Permanent Secretariat Headquarters: Anse Vata, Noumea, New Caledonia
Telephone: 26.20.00 and 26.20.11
Postal Address: B.P. D5, NOUMEA CEDEX, New Caledonia
Office hours: Monday-Friday: 7.30 a.m. - 11.30 a.m.
1.00 p.m. - 5.00 p.m.

Holidays: 6th February: SPC Anniversary
Good Friday
All official New Caledonian holidays

MANAGEMENT COMMITTEE

Since November 1976, the Secretariat has had a Management Committee which has a supervisory and advisory role over all Commission activities. Committee members are the Principal Officers of the Commission:

Secretary-General	:	Dr E. Macu Salato
Director of Administration	:	Dr Frank Mahony
Director of Programmes	:	Dr Guy Motha

BRANCHES

Fiji

SPC Community Education Training Centre
P.O. Box 5082
Raiwaqa
SUVA, Fiji

SPC Regional Media Centre
P.O. Box 5086
Raiwaqa
SUVA, Fiji

SPC Regional English Language Teaching Centre
P.O. Box 5082
Raiwaqa
SUVA, Fiji

Australia

SPC Publications Bureau
P.O. Box 306
Haymarket
SYDNEY, Australia

STAFF

Seventy-two in Noumea, seventeen in Fiji and six in Sydney totalling ninety-five in all.

ACTIVITIES

The Sixteenth South Pacific Conference adopted a recommendation by the 1976 Review Committee that the Commission should carry out the following specific acticities:

(a) rural development

(b) youth and community development

(c) ad hoc expert consultancies

(d) cultural exchanges (in arts, sports and education)

(e) training facilitation

(f) assessment and development of marine resources and research;

and that special consideration should be given to projects and grants-in-aid which do not necessarily fall within these specific activities, but which respond to pressing regional or sub-regional needs or to the expressed needs of the smaller Pacific countries.

The Review Committee also recommended that the three main sectors (health, social development, economic development) into which the Commission's work programme was formerly divided be abolished, and an integrated work programme, incorporating all activities, be established.

SOUTH PACIFIC COMMISSION

ORGANIZATION CHART