SOUTH PACIFIC COMMISSION

REPORT ON A FIELD TRIP TO FIJI

by

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LOUIS MALARDE
MEDICAL RESEARCH INSTITUTE

REPORT ON A FIELD TRIP TO FIJI
(October 21 - November 8, 1975)

by
Dr R. Bagnis (1)

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1 - INTRODUCTION

1.1. The field trip was one of the series of epidemiological surveys scheduled under the Special Project on Fish Poisoning (502 i). The mission, which was requested by the Government of Fiji, was originally intended to determine possible causal relations between the biological phenomenon locally known as "Balolo" and outbreaks of ciguatera poisoning. However, with the agreement of the Fijian Permanent Secretary for Health, it was decided that attention should rather be focused on an assessment of the true incidence of fish poisoning, from the general standpoint of public health.

1.2. Five main channels of investigation were covered:

1.2.1. - Consultation with officials from the various departments and bodies concerned with the problems raised by fish poisoning.

1.2.2. - Examination of the literature on existing fish poisoning research in Fiji.

1.2.3. - Compilation of official information at Suva and in various health centres at Vanua Levu, Viti Levu and Ovalau in order to determine morbidity rates in these areas.

1.2.4. - An epidemiological sample survey of areas in which ciguateric morbidity has recently been officially acknowledged, or which, alternatively, have a long-standing reputation of being affected, in order to define species involved and apparently toxicogenic areas.

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(1) SPC Consultant

1.2.5. - Identification and preparation, for subsequent biochemical toxicity tests in Tahiti, of a number of species banned from the Suva market.

1.3. In connection with the above activities, a number of trips were made around Suva (in the south-east of Viti Levu), to Levuka and around the island of Ovalau (25-28 October), to Labasa and along the northern and western coast of Vanua Levu (4-6 November).

2 - OFFICIALS CONSULTED

21 October 1975: Nadi and Lautoka:

- Dr Minus - Chief Airport Dispensary Quarantine Health Office, Nadi
- Dr Sorokin - Medical Superintendant of Lautoka Hospital

22 October 1975: Suva

- The Honourable T.S. Singh - Minister for Health
- Dr Ramrakha - Permanent Secretary for Health
- Mr Rao - Principal Inspector for Preventive Health
- Dr Hirshman - WHO Regional Representative
- Mr Brookfield - UNESCO Project Manager; Pilot Study on Population and Environment on the Eastern Islands of Fiji
- Mr Robinson - Chief Fisheries Officer
- Mr Surendra Sewak - Fisheries Officer for Management

23 October 1975: Suva

- Mr Uday Raj - Marine Biologist at the University of the South Pacific
- Mr Apisalome - Director of Medical Archives, Ministry for Health
- Mr Levey Underwood - Chief Market Officer for Suva

24 October 1975: Suva

- Mr Baines - Marine Biologist, University of the South Pacific

25 October 1975: Levuka

- Mr Teua - Agricultural Officer

26 October 1975: Levuka

- Dr Hawley - Hospital Physician, Acting Division Medical Officer

- Mr Vermar - Health Superintendant

27 October 1975: Levuka

- A number of patients, comprising fishermen and inhabitants of the island of Ovalau

28 October 1975: Levuka

- Mr Ashley - General Affairs Manager of the Pacific Fishing Company Ltd.

28 October 1975: Suva

- Dr Mataitoga - Director of Preventive Medicine Services

29 October 1975: Suva

- Mr Dekel - Director of WHO Environment and Health Programme in the Pacific

- Dr Ganga Ram - Division Medical Officer, Central Division

29 October 1975: Nausori

- Dr Bavadra - Subdivision Medical Officer

30 October 1975: Suva

- Dr Masome - Subdivision Medical Officer

- Dr Bathik - Principal, School of Medicine

- Mrs Chand - Superintendant Dietician

4 November 1975: Labassa

- Dr Alexander - Division Medical Officer

- Dr Bera - Medical Officer at Wainunu

- Mr Nolly - Chief of District Nurses

- Mr S. Nair - Divisional Health Officer

5 November 1975: Northern and western coasts of Vanua Levu

- Dr Pramassaran - Medical Officer, Naduri

- Dr Narayan - M.O., Dreketi

- Dr Mudaliar - M.O., Lekutu

- Dr Vakawaletabua - S.D.M.O., Bua Nabulevu

6 November 1975:

- Mrs Richmond - Soil Biologist, University of the South Pacific

3 - EXISTING DATA ON FISH POISONING IN FIJI

3.1. The first exhaustive study of toxic fish in Fiji dates back to 1963 (Cooper). It was based on interviews with inhabitants of the islands.

3.2. This unpublished investigation was completed with further information obtained from questionnaires, written exchanges and occasional interviews; the technical report thus formed was published in 1964 by the Hawaii Institute of Marine Biology (1).

3.3. An information sheet for use within the University of the South Pacific was then drafted by Uday Raj (2).

3.4. More recently - in 1974 - Dr Lomani (Medical Department, Ministry of Health, Suva) in a general article on fish poisoning published in the Fiji Medical Journal, described five cases of puffer-fish poisoning, two of which were fatal, in the province of Ra, and thirty-one cases of poisoning by barracuda observed at Labassa Hospital (3).

3.5. Following this, in June 1975, Dr Sorokin, a consultant physician at Lautoka Hospital, published the results of an examination of 131 cases covering a period of one year (November 1973-October 1974) in the districts of Nadi, Lautoka, Ba and Tavua. This article provided detailed clinical and epidemiological information on the incidence of ciguatera poisoning in the north-western region of Viti Levu (4).

4 - INFORMATION GATHERED DURING THE FIELD TRIP

4.1. Statistical Information

Sources: The information obtained from the central archives concerns cases reported under the heading "Food poisoning" in weekly returns of notifiable diseases. The cases quoted are those which have occurred over the past five years, and of which a fish was suspected of being the cause. Results were as follows:

- aggregate average yearly morbidity over the last five years of 1 in 10,000
- aggregate morbidity rate from November 1974 to October 1975 of 3.4 in 10,000
- annual breakdown of cases (Figure 1)
- geographical distribution with morbidity rates for each island (Figure 2)

4.2 Results of epidemiological investigation

4.2.1. - Sources

(a) Heads of medical and health services (physicians or nurses), who were contacted either directly (Nadi, Lautoka, Naqali, Nausori, Navua and Galoa on Viti Levu; Naduri, Nareketi, Lekutu, Vaimunu, and Nabulawu on Vanua Levu; Levuka on Ovalau) or by telephone (Ba, Ra, Tailevu, Sigatoga, Korovousilou on Viti Levu; Savusavu and Natewa on Vanua Levu).

(b) Inhabitants of a number of villagers under the jurisdiction of the health centres mentioned above. Attention was focused on individuals having previously shown symptoms of fish poisoning.

4.2.2. - The interviews provided reliable information on other areas in the Fiji Islands, in particular the districts of Lomaiviti and Kadavu, the Lau and Yasawa Island group, and several minor islands near Viti Levu and Vanua Levu.

4.2.3. - Taken as a whole, this information provided a clearer picture of clinical aspects, and suspect species and areas.

(a) Clinical Aspects:

The main clinical features, in varying degrees and regularity, are:

- mild digestive disorders; diarrhea, vomiting, nausea, abdominal pains;

- nervous, predominently sensory disorders; (dysesthesia, paresthesia, myalgia, arthralgia, pruritus), with occasional motor disturbances (paresia);

- cardiovascular disorders; irregular heartbeat, low blood pressure;

- impairment of the general state of health; asthenia, giddiness, sweating, chilliness, disuria, oliguria.

Symptoms generally abate and disappear within a few days. Only the neurosensory sequels tend to persist for several weeks.

(b) Suspect Species:

In 185 cases of fish poisoning over the past two years, the local name of the fish concerned was discovered. Vernacular names for the same species often vary from island to island, and there may even be several different versions within the same island. Thus, while it was impossible to obtain absolute confirmation of the scientific identification of the fish concerned, the use of photographic reference documents made it possible, in most cases, to establish the species or genus with reasonable certainty. In Table 1 may be found a list of fish known to have caused clear cases of fish poisoning, together with the proportion of overall morbidity ascribed to each species.

The following points emerged:

- Nearly 94% of all cases involved ciguateric syndromes.

- Cases of poisoning by puffer-fish, box-fish and sardines, which often involve different toxins, and are known to have been serious on many occasions, are very rare.

- Snappers and barracudas each represent more than 40%, emperors, groupers and jacks are responsible for 3 to 4% of all cases, while mullet and morays play a very reduced role indeed in overall morbidity.

It is interesting to note that these findings, which are based on scattered and incomplete information from varied islands within the group, confirm Sorokin's observations in the north-western part of Viti Levu.

(c) Ciguateric areas:

Whenever it was possible to accurately determine the place at which the above-mentioned fish were caught, the suspect area was found to be in the vicinity of the coral reefs adjacent to most of the higher islands. On no occasion, however, were we able to identify areas which were either permanently free of ciguatera or permanently affected. Furthermore, most fish is sold in the commercial circuit, with the result that it is difficult to trace.

A further cause of confusion is the fact that the majority of suspect species are scavengers and fish-eaters. Thus, it is impossible to imagine them remaining in a limited toxicogenic area.

Areas reputed to be highly toxic are, in point of fact, often places through which potentially toxicogenic species move in large numbers, and in which they grow to a fairly considerable size. There are always coastal zones with a high coral density. However, mangroves and their immediate vicinity are free of ciguatera.

Figure 3 lists islands and coastal towns and villages where the presence of toxic fish has been noted, either in official reports or by reliable informants, over the last two years.

5 - PREPARATION OF POTENTIALLY TOXIC FISH

Approximately twenty Lutjanidae, Serranidae and Lethrinidae belonging to species alleged to be toxic were placed in cold storage at the Suva Fisheries Department, then photographed for identification purposes, weighed, and steam-cooked. They were despatched to Papeete deep-frozen.

Initial biochemical ciguatoxin assays showed extremely low toxin content - generally sub-pathogenic in man - in most of the fish examined.

6 - GENERAL ASPECTS

6.1. Official information on ciguateric morbidity is far from complete. Only eleven of the 64 clinics under the leadership of physicians or health officials providing weekly reports are covered, and statistics make no mention of cases observed in nursing stations. Comparing the official figures from the archives of a given region to those provided by its local health officers, it may be seen that a considerable number of overt cases are omitted. For Viti Levu for example, 27 cases were officially recorded in 1973 and 1974; of these fourteen occurred in the districts of Lautoka and Ba. On investigation however, Dr Sorokin and the Central Division Health Officials in Nadi, Lautoka, Ba and Tavua noted 131 cases for only half this period. On the basis of this discrepancy, it might well be claimed that the records of the Ministry of Health Archives in Suva cover at the most 5% of the undeclared cases actually seen in consultation. The same extrapolation does not necessarily apply to the whole of the country, as is readily apparent in the fact that for Levuka, Labassa, and Nabulawu, the official morbidity figures almost exactly matched our own.

6.2. Consultation records and declarations often failed to distinguish between fish poisoning and other complaints. A number of cases of food poisoning of unspecified origin may well have been caused by toxic fish; however, doubtful cases were ignored. Conversely, some of the cases which we labelled as fish poisoning may in fact have been food poisoning. Furthermore, it is disturbing to note that there is absolutely no information on the Suva City area. Amongst the notifiable diseases, no cases of fish poisoning, or of any type of food poisoning for that matter, have been recorded since 1972. Although it seems unlikely that no such cases justifying medical consultation should have occurred in three years, it must be noted that all potentially dangerous species undergo a thorough check on the arrival of the fishing boats which provide the major part of the Suva Market input.

Furthermore, no restrictions have been placed on the sale of Oqo, the fish responsible for most cases of fish poisoning in the Dominion. However, this is entirely justified, since the percentage of toxic specimens is negligible in terms of the quantity of this fish consumed daily in the Fiji islands.

6.3. To fill out the scanty epidemiological information in the official records, we had to provide follow-up material through interviews. This method is never entirely accurate, with the result that errors may have found their way into the details thus obtained. Confusion may also arise when people describe clinical or epidemiological occurrences which did not concern them directly. Others continue to consider as toxic fish from places and species which were declared taboo 15 or 20 years ago, when they were known to have been involved in an outbreak of fish poisoning, although in some cases they have never tasted the suspect fish.

6.4. Our biochemical findings are based on too small a sample to be of any real use in assessing actual endemicity, even in the areas to which they refer specifically.

7 - PRELIMINARY CONCLUSIONS

Although our information is piecemeal, scattered and somewhat arbitrary, a number of salient conclusions concerning fish poisoning in Fiji may be inferred from it.

7.1. While ciguateric morbidity has undeniably risen over the past two years, it is generally speaking less pronounced than in French Polynesia. A wide variety of fish is consumed - ocean, reef and mangrove fish. The third group is entirely free of ciguatera, and is also the most convenient prey for family fishing; in addition, fish from the mangroves are usually fairly small.

7.2. There are only a small number of potentially toxic species. In over 90% of all cases, the culprits are carnivorous, primarily fish-eating; of this group, large specimens of Oqo and Damu, which affected several families at a time, were the most frequently involved.

7.3. While symptomatology varies greatly, severe cases requiring hospitalisation are a minority. When these occur, they are often the result of the ingestion of ungutted fish. It is likely that many rudimentary forms go unnoticed, although the idea of medical consultation for fish poisoning is making headway. Syndromes of hypersensitivisation to fish flesh following an initial intoxication are rare.

7.4. It is surprising to note the absence of surgeon fish, parrot fish and trigger fish from the list of species having proved toxic over the last two years. This was confirmed by our inquiries for Viti Levu and Vanua Levu. On the other hand, cases of Balagi poisoning (Ctenochaetus striatus or C. strigosus) at Kadavu and on some of the islands in the Lau group were brought to our attention. A physician who had recently worked at N'Gau reported having been consulted by six patients; in this instance, the Balagi, a black surgeon fish, had been caught near a wrecked ship. In this confined area, fish which is edible everywhere else in the island seems to be toxic, from which it can be inferred that there are qualitative or quantitative differences in the food chain from one region to another.

One fact seems to be established: in most coral ecosystems primary production of toxins is low. The accumulation of toxin in fish at a low level in the food chain - parrot fish and surgeon fish for example - is insufficient to generate clinical disorders in man.

A further point worth noting is that daniva, which are particularly abundant along certain stretches of coast line during the hot season, are eaten regularly with complete immunity, although reputed to be dangerous.

7.5. There appears to be no direct causal link between the increased number of cases of fish poisoning reported during the Balolo season and the phenomenon itself. We must surmise that the sudden releasing of a large amount of nutritive matter in a particular place attracts large numbers of predators; this greatly improves fishing during such periods, but at the same time increases the likelihood of fish poisoning.

If the Balolo phenomenon were one day to play a part in the make-up of ciguatoxicity, it would be as a result of trophic alterations in the environment, following the sudden release of sometimes considerable quantities of organic matter. Under these circumstances, a ciguateric cycle would develop, as have other natural, mechanical, physical, chemical and biological aggressions.

7.6. Our biochemical findings apply to fish caught before the Balolo season. The Suva Fisheries Department has since been requested to keep samples of the same species, caught in the same places, but after the two Balolo spawning periods. These specimens will be sent to Tahiti for comparative chemical analysis, making possible a better understanding of the influence of the reproductive process of these annelids on the development of ciguateric endemicity.

8 - PROSPECTS AND RECOMMENDATIONS

We had neither the time nor the terms of reference to draw up a comprehensive report on fish poisoning in Fiji.

However, thanks to the determination of the authorities of the Ministry of Health and their unceasing assistance, to the collaboration of the physicians, health officials and nurses with whom I worked, and also to the application of methods which have been tried and tested in French Polynesia, the objectives laid down by Dr Ramrakha and myself have to a large extent been achieved.

In the various fields investigated, the information collected and interpreted is now sufficient to convey a general idea of the pattern of ciguateric morbidity in various parts of the Fiji islands. Although the current incidence of ciguateric poisoning is low, there has been an undeniable increase over the last two years. (Whether the upswing is genuine, or merely the result of improved official reporting is, however, uncertain.) The rise in the number of pathological symptoms in some parts of northern Australia and the publishing of four cases of syndromes comparable to that of ciguatera in the southern region of New Zealand (5), demonstrate the mobility, both in time and space, of the phenomenon. For this reason it is even more vital than before to have up-to-date epidemiological information.

It was with this in mind that we drew up a simple (for general use) epidemiological and clinical questionnaire for all Health Services in Fiji (a copy is appended). Copies have been sent out, via the senior physician of each medical district, to all islands, including the most remote parts of the Lau group. Such a questionnaire is a prerequisite for an up-to-date appraisal of fish poisoning in this part of the Pacific.

Furthermore, the recommendations which follow have been drafted in such a way as to convey the need for the most exhaustive possible compilation of basic data.

1. Fish poisoning should be added to the list of notifiable diseases. Cases should be reported under a separate heading from food poisoning, and include where possible the local name of the fish and the place where it was caught. For example, a sufficient indication would be "Damu poisoning - Nabulawu".

2. In monthly and annual reports, it would be desirable to distinguish cases of fish poisoning from unidentified gastro-intestinal syndromes by quoting reference N 988 of the international nomenclature currently used by SPC and WHO.

3. Clinical and epidemiological questionnaires should be collected every 3 - or at the most 6 - months and sent to me with the agreement of SPC. Even when there are no cases of fish poisoning to report, this should be stated so as to preclude any misinterpretation which could arise from omission.

4. To follow the development of "in situ" ciguateric endemicity, it would be advisable for samples of fish banned from sale on the Suva market to be placed in cold storage at the Fishery Department, and to be prepared and sent twice yearly to the Louis Malardé Institute for toxicological analysis, which at the present time cannot be conducted at Suva.

5. Advice on the risks involved in eating certain types of fish during certain seasons is already provided; it should be accompanied by further information on food hygiene, emphazising that some parts of the fish are particularly toxic (digestive and genital viscera, peridigestive fatty tissues, liver, head).

6. Lastly, a follow-up survey could be undertaken in 1976 with the following main objectives:

- carry out a specific epidemiological assessment of the areas which were not covered in 1975. Combined with the information obtained from questionnaires, the resulting data would give a fairly accurate picture of the ciguateric risk factor in the whole of Fiji today;

- contribute to a better understanding of the problem, and report on progress in research, both at the Health Department and at the University of the South Pacific; this could be done with conferences or courses adapted to the level of the audience.

9 - ACKNOWLEDGEMENTS

My thanks go firstly to all those who contributed to the success of this first mission, but whom space does not permit me to mention individually.

I am particularly indebted to the Honorable T.S. Singh, Minister for Health, and to Dr Ramrakha, Permanent Secretary for Health, who enabled the project to run so smoothly.

I also wish to express my gratitude to Mr Rao for his unceasing assistance during the whole of my stay in Fiji.

10 - REFERENCES

1 - A.H. Banner and P. Helfrich - The distribution of ciguatera in the Tropical Pacific. Hawaii Institute of Marine Biology - Technical Report No. 3 - 1964.

2 - Uday Raj. Fish poisoning (Unpublished data).

3 - S. Lomani. Fish poisoning - Fiji Medical Journal 1974.

4 - M. Sorokin. A note on ciguatera poisoning in North West, Viti Levu, Fiji Islands - Hawaii Medical Journal - 34, 6, 201-210, 1975.

5 - R.C. Begg. Food poisoning; Four unusual episodes. New Zealand Med. Journal - 82, 52-54, 1975.

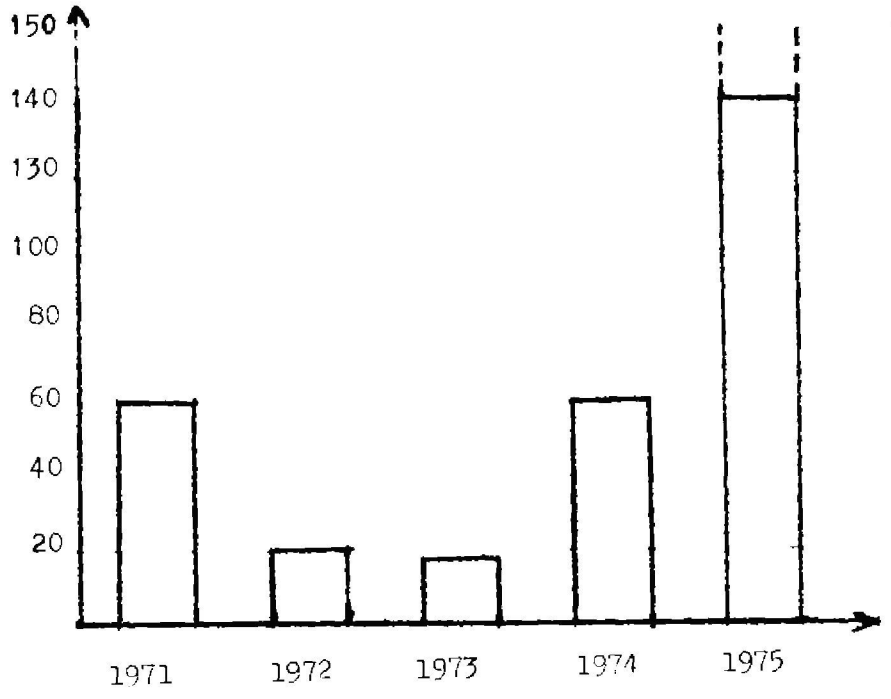

Figure 1. Annual case distribution

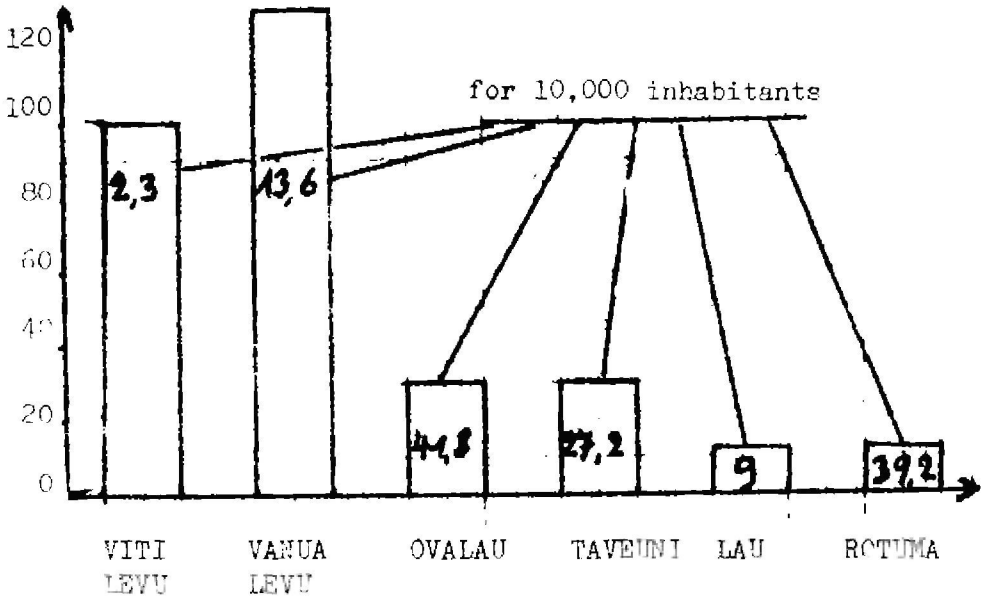

Figure 2. Geographical distribution and morbidity rate

TABLE I. Case distribution by species and family in 1974 and 1975

SPECIES/LOCAL NAMES	NUMBER OF CASES	%	FAMILY	%
Lutjanus bohar: Damu, Bati, Batidamu	43	23,2		
Lutjanus monostigmus: Kake, Tinanisarau	4	2,2		
Lutjanus gibbus: Sabutu, Sabutu damu	13	7,2	Lutjanidae	40,7
Lutjanus rivulatus: Rega, mesa	9	4,9		
Lutjanus sp.: Tabulolo	6	3,2		
Lethrinus sp.: Dokonivodi	6	3,2	Lethrinidae	3,7
Lethrinus sp.: Kacika	1	0,5		
Sphryraena barracuda: Oqo	30	16,2	Sphryraenidae	40,5
Sphryraena forsteri: Oqo	45	24,3		
Epinephelus sp.: Delabulewa	2	1,1		
Cephalopolis sp., Epinephelus sp., Variola sp., Ectropomus sp., Donu	5	2,7	Serranidae	3,8
Caranx sp.: Saqa	6	3,2	Carangidae	3,2
Crenimugil crenilabis: Kanace	2	1,1	Mugilidae	1,1
Arothron sp.: Suma-sumu, Vocivoci	9	4,9	Tetrodontidae	4,9
Clupea venenosa: Daniva	2	1,1	Clupeidae	1,1
Ostracion sp.: Toatoa	1	0,5	Ostraciontidae	0,5
	185			

FISH POISONING

Name of Clinic or Nursing Station: .....

Name of patient (F/n if applicable): .....

Address: .....

	Day	Month	Year
Date of consumption of fish			
Date of first symptoms			

Clinical Features (Tick appropriate column)

	Yes	No
Vomiting		
Diarrhoea		
Abdominal pain		
Tingling, numbness: lips, nose, tongue		
Pin-prickling hands, feet		
Burning when contact with cold water		
Joint and muscle pains		
Sweating		
Body chilliness		
Giddiness, vertigo		
Itching		
Weakness of the legs		
Difficulty to urinate		
Difficulty to breath		
Paralysis		
Eruption or rash		
Other symptom or signs		
Previous history of fish poisoning		

Epidemiological Data

Local fish name: .....

Area of catch if known: .....

Part of fish eaten: .....

Number of people having eaten same fish: .....

Number of poisoned people: .....

Name of the investigator: .....

Place: .....

Date: .....

.....
(Signature)