

INSTITUTE OF MARINE RESOURCES

ANNUAL REPORT TO THE COUNCIL

1981

by

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INTRODUCTION

The Institute of Marine Resources was established in January 1978, with the following objectives:

- (a) research into regional marine resources, including fish stocks and stocks of other kinds of marine life, undersea minerals and exploration of the seabed.
- (b) the development of consultancy services for regional governments.
- (c) development of educational programmes in marine sciences.
- (d) the dissemination generally of information on tropical marine environment.

The task of the IMR is to fulfil the above objectives by being:

- (a) an advisory body for Governments in all questions of the exploration of Marine Resources inside and outside of 200 nautical mile economic zone, and in problems of the protection of the environment.
- (b) a scientific institute carrying out applied scientific study in living and non-living resources of the sea for the island countries of the U.S.P.
- (c) an educational institute, through direct research and indirect means.

In order to fulfil these tasks the Institute is attempting to develop expertise and resources in the following areas:

- marine biology
- fisheries biology
- aquaculture
- food technology as applied to marine products
- marine geology and marine geophysics
- physical, chemical and biological oceanography and related marine meteorology
- marine pharmacology
- coastal marine engineering

When fully established the Institute must have a broad capability in all spheres of marine sciences relating to the exploitation and management of the resources of the 200 mile economic zone of the member countries of USP.

CURRENT FACILITIES

The main location of the Institute is on the Laucala Campus, Suva, Fiji. The Institute is accommodated in a temporary two-storey building (47m x 7m) which is a converted airforce hangar,

with laboratories, and other general facilities. The second wing of the hangar, of the same size and formerly occupied by SNR is being converted for IMR use. Similarly, other buildings vacated by SNR are now available to house IMR staff and equipment. The Institute has one 42 feet fibreglass boat fitted with radar, ecosounder and a hydraulic winch. In addition, there are six small boats ranging from 12 to 26 feet in length and driven by outboard motors. Scientific equipment ordered from EEC grant are now beginning to arrive. These will greatly enhance IMR capability and work programme. Longterm development planning for IMR was completed in 1980 (see references) on a commission by the USP and funded by EEC, but no action seems to be in sight towards implementation of the development proposals. If we are to meet the challenge of developing our marine resources at a pace to match the increasing demand and desire of our countries then no time should be lost in implementing the planned proposals arrived at through careful study.

The Institute also has an Atoll Research Laboratory and two houses in Tarawa, Kiribati. A field station on Dravuni Island, in Fiji, is nearing completion.

STAFF

A summary of categories of staff in IMR is given in the accompanying table. It is noteworthy that apart from the regular USP appointments, staff in IMR are largely funded by special projects, such as EEC, International Seagrants programme and bilateral aid schemes. In addition the Institute derives services of associate lecturers, on part-time basis, from the Ministry of Agriculture and Fisheries, Fiji and Fiji Institute of Technology. Short-term visiting scientists and staff of other Universities are encouraged to spend their sabbatical leave in IMR.

PROGRAMME

(a) TEACHING

1. Ph.D:

M.G. King - "The Biology of Natantian Decapods of Fiji, with special reference to *Heterocarpus* spp. and *Parapandalus* spp."

Principal Supervisor: Dr. Uday Raj.

This thesis is expected to be completed in 1982.

2. M.Sc:

1. G. Pillai - "The Biology of the mud lobster ("Mana"), *Thalassinia anomala* (Herbst).

Principal Supervisor: Dr. Uday Raj.

This study will be completed in early 1982.

2. S. Choy - "The Biology of Penaeid prawns in Fijian coastal waters".
Principal Supervisor: Dr. Uday Raj
This thesis will be completed in 1981.
3. M. Guinea - "The Biology of sea snakes of Fiji".
Principal Supervisor: Dr. Uday Raj
The study is expected to be completed in 1982.
4. Lesley Bolton - "Biology of the marine clam, *Anadara maculosa*."
Principal Supervisor: Dr. Uday Raj
This thesis will be completed in 1982.

3. B.Sc.

Marine Biology (NR335 - final year B.Sc.) - Dr. Raj &
Dr. Zann

Fisheries Biology and Management (NR337 - final year B.Sc.) -
Dr. Raj, Dr. Zann & Mr. King

B.A.

Applied Macroeconomics; Monetary Economics (SE311- final year
B.A.) - S. Halapua.

4. in Fisheries

Dip. T.F. (Year 1) Courses

Semester A:	Chemistry)	
	Physics)	
	Mathematics)	SNR, USP
	Biology)	
Semester B:	Refrigeration and)	
	Operations of National)	
	Marketing Authority)	
)	
	Fish Identification)	
	and Basic Statistics)	
)	
	General Research)	
	Library)	
	Licence and Fish)	M.A.F., Fiji
	Processing)	
	Outboard and Boat)	
	Building)	
)	
	Laboratory Work)	
	Aquaculture)	

Dip.T.F. (Year 2) Courses

Invertebrate Zoology	L.P. Zann, IMR
Ichthyology	M.G. King, IMR
*Navigation, Pilotage and Boat Handling, Part A	Capt. Figgess, IMR
*Navigation, Pilotage and Boat Handling, Part B	Capt. Figgess, IMR
**Practical Fisheries and Fisheries Technology, Part A	Stone/Southwick, IMR
**Practical Fisheries and Fisheries Technology, Part B	Stone/Southwick, IMR
Swimming	Optional

Note: *courses together given one final grade
**courses together given one final grade

Dip.T.F. (Year 3) Courses

Oceanography and Marine Ecology	L.P. Zann
Fisheries Biology and Management	M.G. King
Aquaculture	M.G. King
Marine Engineering Knowledge	A. Rajalingam, FIT
Boat Designs and Boat Handling	P. Bukarau, FIT
Fisheries Economics and Management Principals	S. Halapua, IMR
Fisheries Extension and Communications	S. Halapua, IMR

This Diploma has been streamlined and re-organized to give greater emphasis on the changing needs of the Fisheries divisions to which the majority of the diplomates go on completion of their studies.

Unless there is an added increase and support for this diploma, the resources required to run the programme for a small number of student intake are clearly unbalanced. The Governments of the USP region should now indicate clearly the level of support for this diploma. This was brought to the notice of the Council last year but there seems to be little response from the Regional Governments. The Institute has suggested the following new diplomas of 1 year duration:

(i) Diploma in Fisheries Economics and Management

Dip. F.E.M.

(ii) Diploma in Practical Fisheries and Fisheries Technology

Dip. P.F.F.T.

- (iii) Diploma in Maritime Studies
Dip. M.S.

(This should be offered through F.I.T., School of Maritime Studies)

- (iv) Diploma in Fisheries Extension and Communications
Dip. F.E.C.

IMR has regularly invited Fisheries Divisions of the member countries to advise on training requirements to assist us in establishing programmes to suit the needs. The response has generally been poor.

5. Other

- (a) Annual lectures/laboratory on "Marine Animals in Medical cases" for graduating class of medical doctors of Fiji School of Medicine - Dr. Raj
- (b) Various seminars/workshops relating to marine resources. The most recent being on inshore and nearshore resources (details reported in later section). Regular early morning broadcast on marine life in the programme "Focus on Fiji" produced jointly with INR has been highly commended by schools and public at large.
- (c) IMR is encouraging fisheries divisions and other marine-related departments of USP member countries to release staff for attachment to the Institute for further training, particularly in applied research projects. To date Solomon Islands Government and Ministry of Agriculture of Fiji have taken the opportunity offered.

(b) RESEARCH

Research programmes of the Institute are many and varied. Together with visiting scientists the staff research includes the following aspects:

1. Mangrove, lagoon, reef and outer reef community studies.
2. Biology of freshwater clam, ("Kai) *Batissa violacea* (Lamark) in Fiji rivers.
3. Biology of marine bivalves, particularly *Donax* spp.
4. Fish species composition of inshore waters.
5. Traditional fisheries methods and utilization of marine resources.
6. Coral sand studies with particular reference to foraminifera distribution and chemical composition in co-operation with Hanover and Hamburg universities.

7. Deepwater corals, in co-operation with University of Hawaii and CCOP/SOPAC. The effects of depth on settlement of benthic organisms. Marine fouling and borers of Fiji.
8. A major Institute research has been underway on a study of the deepwater (offshore) fisheries and the related environment.

(c) SPECIAL PROJECTS

In addition to the above projects the Institute has been involved in several programmes:

(I) EEC MARINE RESOURCES DEVELOPMENT PROJECT

This project is being executed on behalf of the Governments of Fiji, Tonga and Western Samoa with a funding of \$1.2 million from EEC. The main research projects under this program are:

1. Deep Sea prawns and snappers
2. Tuna baitfish biology (for livebait and pole fishery)
3. Sedimentary mineral deposits
4. Traditional knowledge on marine fisheries and environment
5. Gear technology development for tropical fisheries
6. Sea Wave Energy potential.

Regular six-monthly reports compiled on this project have already been circulated. All research projects will yield technical reports before January 1981.

(II) HANNS SIEDEL FOUNDATION SURVEY

The Institute has carried out the following surveys on behalf of the Hanns Siedel Foundation:

1. Survey - Training and Technology in Fisheries
2. Small vessels in the South Pacific
3. Manpower Training Requirements in Fisheries
4. Survey of traditional fish processing methods

Reports of all surveys have already been published this year as technical reports and scientific papers except on training requirements. This is owing to the changing requirements of the member countries, in fisheries training.

(III) INTERNATIONAL FOUNDATION FOR SCIENCE PROJECT ON
FRESHWATER CLAM

The tropical freshwater clam, *Batissa violacea* (Lamarck) is being experimented on with a view to seeding the higher reaches of the rivers, outside its normal range of distribution.

(IV) IMR/UNIVERSITY OF HAWAII INTERNATIONAL SEAGRANTS PROGRAMME

The Institute now has been operating an arrangement with University of Hawaii with the following objectives:

1. To conduct a joint faculty exchange program between USP and UH designed to achieve improved tropical marine science course offerings and overall professional improvement within the programs.
2. To establish a functional marine extension service with offices at the University of South Pacific-Institute of Marine Resources (USP-IMR) and one other USP regional centre:
 - a) To train two local people to serve as marine advisory agents.
 - b) To conduct a pilot technology transfer project using a multidisciplinary team of UH and USP personnel after the extension agents have identified a high priority solvable problem.
 - c) To develop specialized expertise within the USP-IMR marine extension agents through the technology transfer project and through exposure to the UH Marine Advisory Program which will retrieve and disseminate information to the agents.

Several regional graduates have benefited from this training opportunity and a number of regional applied research projects have already been completed under the arrangement.

3. To evaluate the program and develop a follow-up plan to complete the advisory network and professional improvement programs.

Through the program several publications have been disseminated to fisheries divisions of member countries.

(V) IMR/UNITED NATIONS UNIVERSITY PROGRAMME

The Institute has carried out a first joint programme, together with CCOP/SOPAC, UH/USP Seagrants and UNDP support - Inshore and Nearshore training workshop.

This workshop, planned by CCOP/SOPAC and the University of the South Pacific, was held in Suva from 13-17 July 1981 and was attended by 80 participants, almost half of them representing the geological and fisheries organizations of member countries. A report on the workshop is in press. The workshop consisted of expert lectures and informal discussions in about equal parts. Six of the 21 lectures were on fisheries and precious corals, and the remainder on mineral resources, including

construction materials, and the management of nearshore resources.

Two field trips followed the workshop. The first, to Viti Levu's Coral Coast, studied the fringing reef, the beaches and the iron-rich dunes of Sigatoka, with special emphasis being placed on management problems. The second was a four-day field course on previous coral, led by R. Grigg of the University of Hawaii, during which the collection of black coral by SCUBA diving, and of deep water corals by tangle-netting from a university vessel, were demonstrated.

Sponsors of the workshop were UNDP, ESCAP, CCOP/SOPAC, Institute of Marine Resources, University of the South Pacific, United Nations University and International Seagrants Programme.

Abstract of papers presented have been published in the proceedings.

(VI) FISH AND SHELLFISH POISONING - IMR & TOYOTA FOUNDATION

Toyota Foundation has recently provided \$F10,000 for purchase of equipment to facilitate Dr. Raj co-operatively with Professor Yasumoto of Tohoku University to further research into fish and shellfish poisoning. Work to date has involved extracting pure toxins, determination of the chemical structures for development of antidotes and finding quick and unsophisticated methods of separating toxic from non-toxic fishes.

(d) CONSULTANCY

Several consultancies have been carried out. These are reported in the publications list.

(e) ADVISORY

Advisory services were provided on numerous occasions to Fiji National Trust, Fisheries Division of MAF (Fiji), CCOP/SOPAC and several private firms.

(f) ATOLL RESEARCH UNIT

The Atoll Research Unit created in late 1979, is located on Tarawa, Kiribati. The facilities include a modestly equipped laboratory and two houses at Tanaca base. A vehicle and an aluminium boat powered by an outboard motor are also part of the equipment available at ARU.

The unit is staffed by a senior oceanographer and head of ARU, Professor Gordon Groves; a VSA, Miss Lesley Bolton; a technician and a secretary.

The work programme of ARU was envisaged to encompass special problems of living on Atolls. Because of the largely marine

orientation of IMR the studies begun at ARU have been largely in that area. Research projects initiated after consultation with an Advisory Board of ARU, include the following:

- (i) Circulation of water mass in Tarawa lagoon
- (ii) Beach profiles and coral sand budget of Tarawa
- (iii) Study of long-period changes in atoll morphology
- (iv) Ecology of Tarawa lagoon
- (v) Biology of the marine clam, *Anadara maculosa*, including experimental seeding and propagation.

The output of ARU has been somewhat disappointing and steps are being taken to monitor more closely the progress being made in each of the projects initiated. This is being done by sending IMR staff more regularly to Kiribati on research missions. Additionally new projects of greater significance in the development of Atoll resources is being considered. More funds will be necessary to increase the expertise and resources available at ARU to fulfill the expectations and objectives of ARU but the present ARU staff must also bear testimony of their own performances to date.

FUTURE DIRECTIONS AND DEVELOPMENTS OF IMR

1. The Institute is anxiously awaiting the outcome of submissions made for a continuing funding by EEC, under Lome II arrangement. Apart from enabling the Institute to extend its work programme more regionally the grant will enable us to buy, install and test a new proto-type seawave energy plant of 1-3 megawatts which could herald a new era in supply of renewable energy resource for Pacific Islands.
2. A recent delegation of French scientists representing the French Government has resulted in the provision of:
 - (a) \$50,000 grant towards marine geology and related equipment, although there has been considerable delay in effecting this grant.
 - (b) provision of an electronics technician to IMR, who at present is housed in SNR.
 - (c) promise of a short-term sediment geologist to assist in the study of offshore sediments.
 - (d) assistance with development of oceanography, marine geology and geophysics, aquaculture and energy from the sea. IMR has heard no further on the actual type of assistance to be made available in these very important areas projected for our development to assist USP member countries.

3. A recent tentative agreement (awaiting final endorsement) between Kagoshima University in Japan and the Institute will enable both the universities to exchange students, staff and carry out joint research programmes utilizing the Kagoshima research vessels. One such multi-disciplinary research programme is planned for January-February, 1982, in Fiji waters.
4. The Institute has been attempting to make progress in non-living marine resources area but owing to delays in recruiting a senior marine geologist from EEC member countries little progress has been made to date. Currently we are negotiating the return of Professor Dr. Wolfgang Schott from W. Germany to provide us the additional expertise required in the development of this important area of our endeavour.
5. In order to fulfill research requirements towards the full utilization of marine resources for major economic development of USP member countries, it is absolutely necessary that the Institute has access to or owns an ocean-going vessel. Without such facility we will continue to struggle and work on the fringes of our resources. It is quite clear that major economic development potential is almost exclusively offshore. To determine the extent of such resources and suggesting means of utilization and management of such resources it is imperative that we are able to carry out the field investigations. Council's attention is drawn to our requirements to equip us to carry out such investigations.
6. In many international joint exploration and research in the South Pacific ocean covering 200 mile economic zones of USP member countries, the Institute is not invited to participate. Council is urged to press their respective governments to facilitate participation of the Institute and consequently the USP member countries in such important research and exploration of our own sea and seabed.
7. Given the desire and the necessary support of the USP member countries to establish the Institute as a major centre of excellence for exploration and exploitation of the marine resources of the South Pacific Ocean, little difficulty is foreseen in IMR handling very major projects which at present are monopolised by agencies controlled from outside of the region.
8. Finally, the Council's advice was sought last year, in defining the role and extent of involvement of IMR in the marine resources development of the countries of the USP

region. In light of points raised here we will very much be guided by our Council and hence the governments of our members countries. Obviously, the full development and operations of a major centre of excellence will always be expensive. However, if such centre is absolutely necessary in realising our main resources, the costs will need to be weighed up against the projected benefits. We are very hopeful that provided member countries are agreeable, a large proportion of such costs may be met from outside sources.

PUBLICATIONS

A. INTERNATIONAL & SYMPOSIUM PAPERS

- 1) Kott, Patricia (1980)

Algal-bearing didemnid Ascidians in the Indo-West Pacific.

Mem. Qd. Mus. 20(1) 1-47, pls. 1-4.

- 2) Raj, U. & Fergusson, J.E. (1980)

Osmotic and ionic Composition of a tropical freshwater mussel, Batissa violacea Lamarck (Lamellibranchia: Sphaeriidae)

New Zealand Journal of Science, Vol. 23,199-204

- 3) Zann, L.P. (1980)

Living together in the Sea.

F.F.H. Publ., New Jersey. 415 pp.

- 4) Zann, L.P. (1981)

Traditional and Introduced Fishing Craft in the South Pacific

Proc. Fijian Soc.

- 5) Zann, L.P. (1981)

The energy Crisis and Pacific Island Fisheries.

Australian Fisheries (Dec.).

- 6) King, M.G. (1981a).

Increasing interest in the tropical Pacific's deepwater shrimps.

Aust. Fisheries; Vol. 40. No.6.

- 7) Raj, U. (1981)

The incidence of Ciguatera poisoning in the Region - Current status - Country report for Fiji.

WHO Final Report: Working Group on public health aspects of marine food fish poisoning, Suva, Fiji; 23-25 Feb., 1981. pp 3-4.

- 8) Raj, U. (1981)

Conservation strategy for Fiji: A country profile.

Paper presented at, the 15th General Assembly, International Union for Conservation of Nature and Natural Resources, Christchurch, N.Z., 11th - 23rd Oct., 1981.

- 9) Raj, U. (1981)

Inshore and Nearshore marine ecosystems of the South Pacific islands.

Inshore Nearshore International Workshop, July, Suva. Abstracts in Proceedings.

- 10) Raj, U. (1981)

Outer reef slope fisheries of Fiji.

Inshore Nearshore International Workshop, July, Suva. Abstracts in Proceedings.

- 11) Zann, L.P. (1981)

Inshore Nearshore Invertebrate Fisheries.

Inshore Nearshore International Workshop, July, Suva. Abstracts in Proceedings.

B. TECHNICAL AND CONSULTANCY REPORTS, COURSE TEXTS

- 12) Bott, A.N. (1980)

The results of a reconnaissance stage survey into the potential and development of seawave energy along the Coral Coast of Viti Levu - the main island of Fiji.

12 pp, 6 Appendices.

- 13) Bott, A.N. (1980)

A report on the results of a reconnaissance stage survey into the potential and development of seawave energy in Western Samoa.

99 pp, 4 appendices.

- 14) Bott, A.N. (1980)

Preliminary assessment of seawave energy potential and development prospects for Tongatapu Island Kingdom of Tonga.

9 pp, 4 appendices.

- 15) Bott, A.N. (1980)
Fiji Modular Wave energy converter.
4 pp, 9 Figs.
- 16) King, M.G. (1980)
The water hyacinth, Eichhornia crassipes in
the Ba river, Western Viti Levu, Fiji.
Tech. paper Instit. Mar. Resources, USP.
- 17) King, M.G. (1980)
A trapping survey for deepwater shrimp
(Decapoda: natantia) in Western Samoa.
Tech. paper Instit. Mar. Resources USP.
- 18) King, M.G. (1980)
A preliminary trapping survey for deepwater
shrimp (Decapoda: natantia) in Vanuatu.
Tech. paper Instit. Mar. Resources. USP.
- 19) King, M. G. (1981b).
The deepwater shrimps of Tonga: a preliminary
survey near Nuku'alofa.
Rep. Inst. Mar. Resources; Univ. South Pacific,
Fiji. 29 pp.
- 20) King, M.G. (1981) & D.T.F. III Students (1981).
Aspects of the ecology of the intertidal
bivalve Atactodea striata on Nukulau Island, Fiji.
- 21) Morton, J.E. and Raj, U. (1980)
The Shore Ecology of Suva and South Viti
Levu.
NR 335 Text, 1980 Ed. 182 pp, 16 pls.
- 22) Raj, U. & Bröck, R. (1980)
Baseline study in the vicinity of oil
drilling in Bligh Water - Hole No. 1.
For the Division of Lands and Mineral Resources,
Government of Fiji.

- 23) Raj, U.; Southwick, G. & Stone, R. (1980)
Baseline study of Pascoe Reef oil drilling operations - Hole No.2, Bligh Water.
For the Division of Lands and Mineral Resources, Government of Fiji.
- 24) Southwick, G. (1980)
Deep Sea Shrimp - Commercial feasibility Study.
7 pp, 1 pl.
- 25) Zann, L.P. (1981)
The Energy Crisis and Pacific Island Fisheries.
IMR Tech. Report 12pp.
- 26) Zann, L.P. (1981)
Artisanal Fishing Fleet of Funafuti, Tuvalu
IMR Tech. Report 18pp.
- 27) Zann, L.P. (1981)
Subsistence Fisheries of Tuvalu.
IMR Tech. Report. 21 pp.
- 28) Zann, L. P. (1981)
Canoes of Tuvalu
IMR Tech. Report 20 pp.
- 29) Zann, L.P. (1981)
Artisanal Fishery and Fishing Vessels of Tonga
IMR Tech. Report. 34 pp.
- 30) Raj, U,; Southwick, G. & Stone, R. (1981)
Report on a preliminary investigation of Komave Reef platform.
14 pp, 2 figs. & 58 plates.

- 31) Raj, U.; Seeto, J., Vodonaivalu, S. & Stone, R. (1981)
Report on a Preliminary investigation of
Saweni Bay and the coastal environment.
30 pp, 10 Figs. & 91 plates.
- 32) Raj, U.; Seeto, J. and Stone, R. (1981)
A preliminary Biological study of the
Naselai back-reef area: in the vicinity of the proposed
new channel.
21 pp., 3 figs & 178 plates.
- 33) Ram, N. & Southwick, G. (1981)
Design, construction and use of some fishing
gear for Tropical waters.
22 pp. and 26 figs.
- 34) Zann, L. P. (1981)
Fiji's Artisanal Fisheries and Fishing Vessels:
Recommendations in Development and Training.
IMR Tech. Report. 45 pp.

IN PRESS

A. INTERNATIONAL

- 35) Kott, Patricia
Algal-bearing didemnid Ascidians of Fiji
Mem. Qd. Mus.
- 36) King, M.G.
Deepwater shrimp resources of Vanuatu: A
preliminary survey off, Port Vila.
Marine Fisheries Review.
- 37) King, M.G.
Foodwebs - in "Seashore life of Southern
Australia .
(S.A. Shepherd, ed.) Roy. Soc. Sth. Aust.

- 38) Raj, U. & Seeto, J. (1981)
A new species of Paracaesio (Family: Lutjanidae) from Fiji Islands.
Copeia
- 39) Raj, U. (1981)
The distribution and ecomorphic variations in the freshwater clam, Batissa violacea Lamarck (Lamellibranchia: Sphaeriidae) of Fiji Islands.
New Zealand Journal of Science.
- 40) Raj, U. (1981)
Description of a new deepwater Lutjanid fish from Fiji Islands.
Japanese Journal of Ichthyology.
- 41) Raj, U. (1981)
The freshwater clam, Batissa violacea Lamarck (Lamellibranchia Sphaeridae) of Fiji Islands.
Veliger
IN PREPARATION
- 42) Boulton, L. and Zann, L. P.
Corals of Tarawa Atoll.
- 43) Boulton, L.
The Introduction of Anadara Maculosa ('Te Bun') to Tabiteuea North Lagoon.
- 44) Groves, G. W. & Yee, B.
Flow through Tarawa channels.
- 45) King, M. G.
The distribution and abundance of deepwater shrimps (Crustacea: decapoda: natantia) in some Pacific Islands.
- 46) King, M. G.
Growth and reproductive strategies in relation to depth of distribution in several species of caridean shrimps (Crustacea: decapoda: caridea).

- 47) Raj, U.; Stone, R., Southwick, G. & Prasad, J. R.
Abundance distribution and aspects of the
Biology of Tuna baitfishes of Fiji: A preliminary report.
- 48) Raj, U.; Seeto, J. & Stone, R.
Technical report on the deep sea bottom
fishes of Fiji.
- 49) Raj, U.; Stone, R. & Seeto, J.
A manual of Deepwater Fisheries of the
Tropical Pacific.
- 50) Raj, U.
Common fishes and edible marine organisms
of Fiji.
- 51) Hassal, D.; Vodonaivalu, S. and Raj, U.
Flora and Fauna of Mangroves of Fiji,
W. Samoa and Tonga.
- 52) Zann, L. P., Kimmerer, W. and Brock, R.
The Ecology of Fanga'uta Lagoon, Tongatapu,
Tonga.
USP/UH Seagrants Report (Publication Dec. 1981)
- 53) Zann, L. P. and Bolton, L.
The Distribution and Abundance of the
Blue coral Heliopora coerulea in Kiribati and Tuvalu
Archipelago.
- 54) Zann, L. P.
Canoes of Kiribati
Report 6.
- 55) Zann, L. P.
Subsistence Fisheries of Kiribati
Report 7.

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1. Institute of Marine Resources (1980)

Feasibility study on the proposed development of the Institute of Marine Resources, The University of the South Pacific, Suva, Fiji Islands.

John rounds, Lee & partners. Architects,
pp 76, 20 illus.
2. Raj, U. (1980a)

A review of the Diploma in Tropical Fisheries Programme at the University of the South Pacific. 9 pp.
3. Raj, U. (1980b)

Development of Marine Resources Centre, Fiji. Progress Report for the first six months, August 1980, 14 pp.
4. Raj, U. (1981)

Development of Marine Resources Centre, Fiji. Progress Report for the second six months, April 1981, 20 pp.

ADDENDUM

TECHNICAL AND CONSULTANCY REPORTS

56) Halapua, S. (1981)

The Islands of Ha'apai: Utilization of land
and sea.

Consultancy report for the Central Planning
Department, Kingdom of Tonga. 42 pp.

57) Duphorn, K. (1981)

Interim report on Applied Coral Sand
Investigations in and off Tongatapu. 19 pp., 3 figs.

IN PREPARATION

58) Fishermen of Ha'apai: A study of their
Socio-Economic Conditions.