

ANNUAL REPORT TO THE UNIVERSITY COUNCIL

AND
THE FORUM FISHERIES COMMITTEE

1985

December, 1985

1. AIMS AND OBJECTIVES

The Institute of Marine Resources, established in January 1978, has continued to follow the following broad 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*

In order to fulfil these objectives IMR has been projected as:

- (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.*

The Institute has been set the task 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 developed, the Institute is expected to 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. However, mindful of the activities of other organizations, such as the South Pacific Commission (SPC), Forum Fisheries Agency (FFA), Committee for the Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC) and National Fisheries and other Marine Programmes of the member countries, the Institute has tended to avoid duplication of effort. Whereas IMR continues to develop and provide marine teaching programmes, as resources allow, other programmes have been governed by requests from member governments. All requests to date, by member governments, have been fulfilled.

2. FACILITIES

2.1 BUILDINGS

The main location of the Institute is on the valuable prime land at Laucala Bay foreshore, leased to U.S.P. by the Government of Fiji for this specific purpose. The Institute is accommodated in temporary, white-ant infested wooden buildings and a laboratory and lecture hall formerly occupied by the School of Natural Resources (floor area comprises 1700m²; teaching laboratories 20m²; research laboratories (3) 150m² workshop 100m²; stores 480m². No action has been taken on the detailed plans for permanent buildings, laboratories, aquarium, workshops etc., completed in 1980 by the Architect firm of John Rounds, Lee and Partners. A modified and more modest plan for new buildings and facilities was prepared by the Director, in 1985. The life of the present wooden buildings is very limited. Money spent on these buildings is regarded as wasteful.

The Institute has a field station at Dravuni Island, Kadavu, with a small laboratory and 14 bed dormitory (floor area: 103m²). The Dravuni station, funded by E.E.C., was completed in December 1981 and it was opened by Fiji's Prime Minister, Ratu Sir Kamisese Mara.

A second, smaller station has been constructed in Tonga, in 1982, at the Fisheries Division Headquarters in Nuku'alofa. The Institute, by arrangement, shares this facility with Fisheries Division, Tonga, which gives access to all its facilities to IMR in return.

The Institute developed an Atoll Research Unit (ARU) in Tarawa, Kiribati. This Unit comprises a laboratory, offices and storage area (floor area 182m²) and a three-bedroom cottage nearby. Since June, 1983, the management of this Unit and its assets have been transferred to the Kiribati Centre Director, Mr Roniti Teiwake, who has also been appointed ARU Director. IMR is now responsible for only specific research projects.

2.2

The Institute is well-equipped to undertake basic research in oceanography, marine and fisheries biology.

Miscellaneous laboratory glassware, ovens, precision balances, chemicals, photographic and darkroom equipment, fishing gear, nets, oceanographic instruments (salinity, temperature, pH etc., current meters, dredges, grabs, plankton nets etc.) and diving equipment (two high pressure compressors, 14 complete sets of SCUBA tanks and all gear) have been provided by EEC, French and other aid.

The Institute has two motor vehicles: one 4-wheel drive, short wheel base Landrover (30 months old) provided under EEC aid and a new Toyota Hilux pick-up utility provided by CCOP/SOPAC (a trade-in for former Datsun pick-up van).

2.3 BOATS

Nautilus: 13m G.R.P. (fibreglass) launch, powered by a V8 Caterpillar diesel. Hydraulic winch, pot haulers and fishing reels; radar, echosounders and radio. (Construction cost \$60,000, built in Canada and funded by CIDA, launched in 1973). It has berth for four persons.

Aphareus: 13.7m steel fisheries training and research vessel powered by a GM 471 diesel. Hydraulic capstan, hauler, and reels; radar; echosounder, recirculating aquarium for livebait well and storage hold. This multi-purpose vessel is well equipped for tuna baitfish and tuna studies, as well as for training. (Cost \$120,000, built in Suva and funded by EEC). The *Aphareus* was launched by Adi Lala Mara, the wife of Fiji's Prime Minister, in June, 1982.

Outboard craft: Three 4m rubber inflatable dive dinghies, three 4m alloy dinghies, three wooden punts of 5 to 8m.

3. STAFF

A summary of staff and their categories is given in Table 1.

3.1 ESTABLISHED STAFF

The Institute continues to operate with a very small core staff but draws upon specialized staff from project funding and affiliated overseas universities and institutes. Thus, in 1985, core staff consisted of 2 senior academic (one being the Director, fully funded by EEC) and one comparable administrative position, 6 junior intermediate staff and 3 hourly paid staff. One senior academic post remained vacant, following the departure of the incumbent in November 1984.

3.2 AID-FUNDED POSTS

Two graduate positions, 3 junior intermediate posts and 5 hourly paid staff are funded by EEC. One academic position (Physical Oceanographer) was provided by French Aid.

3.3 SHORT-TERM APPOINTMENTS, GUEST LECTURERS AND VISITORS

Victoria University of Wellington provided 1 marine geologist for 10 weeks and ORSTOM provided 2 fisheries biologists for one week to assist in running specialist courses. Several scientists from many institutions were based in IMR for field studies and research. Those who had joint programmes with IMR were:

1. Professor W.R.A. Muntz Professor of Zoology and Dean of Faculty of Science, Monash University, Melbourne, Australia

- Continuing research on vision in Nautilus

2.

- (a) Professor Y. Koshida - Professor of Zoology, College of General Education, Osaka University, Japan

- (b) Dr S. Horiuchi, - Research Associate of Biology Department, College of General Education, Osaka University, Japan

- (c) Dr K Tajika - Lecturer of Biology, Faculty of Medicine, Nihon University, Tokyo, Japan

- Study of histochemical properties and photosensitive chromoproteins in the Nautilus eye

- Study of Mesozoans found in the Nautilus kidney

- Study of intertidal and interstitial fauna in Fiji, especially of Turbellarian Platyhelminthes and Annelida.

TABLE 1: STAFFING

1. SENIOR ACADEMIC & COMPARABLE:

*U. Raj, B.Sc. Hons. PhD. (Otago)	Director, and Marine and Fisheries Biologist
vacant position	Fellow (Senior Lecturer)
* Luc Gendronneau	Fellow (Physical Oceanographer)
S. Singh, FTC (C&G) MIST	Laboratory Manager

2. GRADUATES

*J. Seeto, B.Sc. (USP)	Graduate Research Assistant
*S. Chandra, B.Sc. (USP)	Information Officer

3. JUNIOR INTERMEDIATE STAFF

Mrs S.L. Nath	Secretary
Mrs S. Sharan	Clerk typist
E. Ninokibau	Fisheries Assistant (Skipper "Nautilus")
*J. Maiwelagi	Skipper, "Aphareus"
*I. Burua	Engineer, "Aphareus"
A. Prasad	Maintenance Serviceman
I. Tuwai	Executive Officer (in charge of records and purchasing)
H. Thaggard	Technician

4. HOURLY PAID, UNESTABLISHED

R. Thaggard	Technical Assistant
S. Chand	Labourer
M. Prasad	Cleaner/handyman
A. Tumuacala	Cleaner/handyman
*F. Manuelli	Technical Assistant (and special assistant for Earth Science and Marine Geology Programme)
*M. Nautu	Deckhand
*S. Newton	Deckhand
*W. Rokosawa	Deckhand/boatman
*F. Lavelawa	Caretaker, Field Station

* EEC-funded (or aided) posts

3.

- (a) Dr T. Nishihara - Faculty of Pharmaceutical Sciences, Osaka University, Osaka, Japan
 - (b) Professor M. Kondo - Faculty of Pharmaceutical Sciences, Osaka University, Osaka, Japan
- Water and air pollution levels in Fiji.

4.

- (a) Professor Alan J. Kohn - Department of Zoology, University of Washington
 - (b) Mr Gustav Paully - PhD. student of Professor A Kohn - University of Washington
- Molluscan and other interstitial fauna of lagoons related to fossil records in Fiji

- 5. Mr Hitoshi Kasahara - PhD. student - Laboratory of Fishery Resources, Graduate School of Agriculture, Kyoto University, Kyoto, Japan

- Taxonomy of seaweeds from Fiji

- 6. Dr John E McCosker - Steinhardt Aquarium & California Academy of Science

- Describing the new species of moray eel collected from Fiji

4. TEACHING AND TRAINING PROGRAMMES

The Institute provides credit courses at all levels of the regular University programmes (i.e. postgraduate, undergraduate degree and certificate) and mounts short specialist courses when need arises.

4.1 POSTGRADUATE

- (a) Ph.D:

M.G. King - "The ecology of deepwater caridean shrimps (Crustacea: Decapoda: Caridea) near tropical Pacific Islands with particular emphasis on the life history patterns to depth".

The degree was awarded in September, 1984. It represents the first doctorate in science awarded by U.S.P. Dr M G King was a former lecturer in Dip. T.F. at IMR but now he is a lecturer and the deputy principal at Australian School of Fisheries, Launceston, Tasmania.

- (b) M.Sc:

- (i) M. Guinea - "The Biology of sea snakes of Fiji".

This thesis is in a final draft form. M Guinea is now resident in Australia.

- (ii) L.K. Bolton - "Biology of the marine clam, Anadara maculosa, in Kiribati".

L.K. Bolton has completed her field studies in Kiribati and now resides in her home country, New Zealand.

- (iii) S Choy and G Pillai who successfully completed their M.Sc. theses, under IMR supervision, are now staff of SNR, in Biology.

- (c) M. Phil:

R. Teiwaki - "The politics and administration of marine resources in Kiribati: (Study being co-supervised by IMR and Professor R Crocombe.

This study is in progress.

- (d) Postgraduate Certificate in Applied Science:

Lui Bell - W. Samoa

4.2 B.Sc. COURSES

The Institute provides 2 out of 4 (50%) 300-level Biology courses for the School of Natural Resources. Some teaching input was made to one of the courses (NR 337) by Dr P Bourne and Dr P Ryan, Biology staff of SNR.

- (a) Marine Biology (NR 335)

This course emphasizes tropical marine biology. An introduction to the physical, chemical and biological factors in tropical marine environment is given as a basis for discussion of marine organisms. The organisms studied include the plankton, nekton and benthos of lagoons and offshore waters. Coral reefs, mangroves, lagoons and tropical shores are studied in detail.

The course consists of three hours of lectures, five hours of laboratory work or work on individual projects, each week. Additionally, an 8-day intensive field course (usually during the mid-semester break) on coral reefs, mangroves, lagoons and tropical shores forms an integral part of the programme. In the past several students from Auckland University, under the supervision of Professor J E Morton (a former external assessor in Biology at USP) have jointly taken this study.

- (b) Fish and Fisheries Biology (NR 337)

This course provides an introduction to fish as aquatic vertebrates, a background of fisheries science and a treatment of population dynamics from the biological and management viewpoints. While few students may ultimately enter the field of fishery research, the course provides, both, for these and others, an understanding of the need for and the problems of fisheries management.

Practical work includes the study of fish by dissection and appropriate preparative methods, use of all forms of fishing gear, species identification, routine fisheries procedures, problem exercises and simulation-type population experiments.

TABLE 2: STUDENTS WHO HAVE TAKEN NR 335 AND NR 337 OFFERED THROUGH IMR, FROM 1978-1985, BY THEIR NATIONALITIES

COUNTRY	MARINE BIOLOGY (NR 335)										TOTAL	FISH & FISHERIES BIOLOGY (NR 337)										TOTAL
	1978	1979	1980	1981	1982	1983	1984	1985	1978	1979		1980	1981	1982	1983	1984	1985					
FIJI	10	5	9	5	3	4	7	4	7	5	5	5	6	8	5	17	47	58				
TONGA			1				1			1		1			2		2	6				
W. SAMOA		1			2		2	1		1		1	1		1	1	6	4				
SOLOMON IS.					1		1	1				1	1			2	3	4				
KIRIBATI					1	1		1					2		1	1	3	4				
TUVALU							2								1		2	1				
COOK IS.																	0	0				
VANUATU				1			2					1					3	1				
NIUE		1									1						1	1				
TOKELAU																	0	0				
NAURU																	0	0				
	10	6	11	6	7	5	15	7	67	7	6	7	8	10	8	23	67	79				

Several students from this programme are now Chief Fisheries Officers or hold senior fisheries positions in their respective governments.

4.3 DIPLOMA IN TROPICAL FISHERIES

The Institute has been providing this programme of 14 courses since 1978. The Diploma was suspended in 1984 as manpower requirements for the major client, The Fiji Government, were satisfied. At the request of Regional governments, the Diploma will be again offered from 1986.

Course Prescriptions

YEAR 1 PRELIMINARY YEAR (Biology, Physics, Chemistry and Mathematics - provided by SNR)

YEAR II

NR D51 Invertebrate Zoology

An introduction to the fundamentals of zoology, classification and morphology of marine invertebrates. Particular emphasis is placed on organisms important in tropical marine ecosystems, human and marine parasites, commercially important invertebrates of the Pacific and world's seas, and those traditionally exploited by the peoples of the Pacific. Principals include field excursions to nearby mangroves, coral reefs, lagoonal and offshore waters. Students are required to submit written assignments and marine collections.

NR D52 Ichthyology

This course covers fish and their relevance to world fisheries, fish taxonomy and the distribution as well as the biology of fishes. Biological aspects include morphology, senses, physiology, growth, reproduction and survival. Ecological aspects are also covered and field work and projects are part of the course. Emphasis is on tropical marine species.

NR D53 ^{*}Navigation, Pilotage and Boat Handling, Part A

The first part of this course introduces charts and their abbreviations and symbols. The use of basic navigation is taught. The student is given experience in handling small boats, rope work, the use of blocks and other aspects of basic seamanship. The course covers rules of the road and safety procedures.

NR D54 ^{*}Navigation, Pilotage and Boat Handling, Part B

The second part of this course continues with advanced work in coastal and deep sea navigation. Ship and seaman management and maritime law are introduced. The course continues with general seamanship related to the handling of larger vessels and the different fishing gear used.

NR D55 ^{**}Practical Fisheries and Fisheries Technology, Part A

This course outlines the current world commercial fishing, traditional fishing techniques and technology associated with fisheries. Emphasis is placed on practical aspects of fishing, construction, use and maintenance of gear. Topics include traditional and commercial traps, gill nets, long lines, handling pole and line, purse seine, trolling, etc.

*NR D53, NR D54, DR D64, NR D65 are provided with the assistance of the Fiji Institute of Technology, School of Maritime Studies which is located adjacent to IMR.

NR D56 ^{**} Practical Fisheries and Fisheries Technology, Part B

This essentially is a continuation of NR D55. Topics covered include specific types of fishing practised in South Pacific. Emphasis is given to fish operations, vessel technology and fish handling, marketing and processing. Guest lecturers from commercial and government fisheries sector are invited to give lectures on special topics.

ADDITIONAL: Swimming

Instruction in swimming and survival is given to all students with additional instruction in life-saving. Elementary diving techniques (use of snorkel, mask and flippers) may be taught. Instruction in SCUBA is optional but may be offered to interested students.

NOTE * courses together given one final grade

** courses together given one final grade

YEAR III

NR D61 Oceanography and Marine Ecology

Oceanography: An introduction to physical, chemical and biological oceanography with particular reference to the South Pacific. Topics include: origin of oceans, zones, sediments, physics and chemistry of sea water, currents and tides, and exploitation of seas. Emphasis is placed on basic practical techniques, the scientific method and reporting, and relevance to fisheries. Practicals are conducted on board r.v. Nautilus in nearby lagoonal and offshore waters.

Marine Ecology: A study of the principles of ecology with reference to tropical marine ecosystems and fisheries. Topics include: tropical productivity, plankton, coral reefs, mangroves and protected shores, lagoonal and reef slope benthos, and pollution. The programme is field orientated and students are encouraged to learn skin and scuba diving.

NR D62 Fisheries Biology and Management

The biology and management of exploited marine species (and tropical species in particular) are covered in this course. The size of exploited stocks is related to growth, recruitment and mortality. Other biological aspects such as reproductive strategies and migration are included. Techniques and practical exercises in estimating abundance, growth and mortality are part of the course.

Management objectives and measures relevant to the South Pacific region are discussed.

NR D63 Aquaculture

A study of aquaculture methods relevant to the geography and economy of the South Pacific region. The course covers the selection of suitable species and farming systems from simple open-circuit methods to more sophisticated hatchery techniques. Aspects of obtaining broodstock, control of spawning, larval maintenance, growing methods and nutrition are covered for several species of tropical invertebrates and vertebrates. Problems associated with economic viability, environmental alteration and the introduction of exotic species are discussed.

DR D64 Marine Engineering Knowledge

This course introduces the student to various marine engines (both inboard and outboard) and their operation, installation and maintenance. Marine electrics, electrolysis, fuel supply, pumps, hydraulics, steering

gear, stern gear and propellers are covered. Items such as fish storage insulation are also covered. The course includes instruction in the use of tools and safe engineering practices.

NR D65 Boat Designs and Boat Building

This course introduces the various types of boats and methods of construction (including wood, aluminium, G.R.P., foam sandwich, steel and ferrocement). Design aspects include small boat rudders, fittings and stern gear. Boat surveys, alterations and modifications are also included.

NR D66 Fisheries Economics and Management Principles

The course consists of two parts: Part A deals with the theory of demand and supply, market structure, production and cost functions and the determination of economic and technical return to labour, capital and management. Part B deals with record keeping for decision-making purposes. Students will be provided with the basic knowledge of the preparation of simple profit and loss statement, balance sheet, budgeting and cash flow projections and the interpretation of financial records and management controls.

NR D67 Fisheries Extension and Communications

This course introduces students to the role of effective communication and the social and economic techniques of fisheries extension work. The basic tools of socio-economy survey and programme planning for fisheries extension is examined. The application of some of the basic theories and principles of extension and communication is practised through a field trip to a rural fishing community.

TABLE 3: THE NUMBERS OF GRADUATING DIPLOMATES BY YEAR AND THEIR COUNTRIES OF ORIGIN

YEAR	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
<u>COUNTRY</u>										
FIJI	8	11	10	8	6	8	6	4	9	70
TONGA		1	1	0	1	1	0	0	0	4
KIRIBATI			1	1	1	0	2	1	3	9
SOLOMON IS.				0	3	1	0	0	4	8
TUVALU				1	0	2	0	0	0	3
VANUATU								2	0	2
TOKELAU								1	0	2
TOTAL	8	12	12	10	11	12	8	8	16	97

Note: USP has agreed to offer this programme to students of Micronesian countries, even prior to their formal association with USP.

4.4 CERTIFICATE OF EARTH SCIENCE AND MARINE GEOLOGY

The programme is one sponsored by CCOP/SOPAC, at the request of Regional Governments, for inservice training. It is the only non-living resources training programme offered through the Institute, in close co-operation with Victoria University, Wellington. It comprises of a 3-months basic course and four 6-weeks long second courses. The courses are mounted in summer vacation to enable inservice staff to attend. The courses are:

(a) Basic Earth Science and Marine Geology (Level 1):

An introduction to the geological time scale, geometry, plate tectonics and oceanography with discussions on mineral resources and exploration, energy resources in the south-west Pacific, the rock and mineral groups, their classification and recognition. Laboratory practicals include thin section cutting, use of the petrological microscope, sieving sediments, simple statistics, and topographic, bathymetric, and geological map interpretation. Geophysical surveying, marine surveying and navigation and geological mapping are introduced in field studies.

(b) Earth Material (Level 2) - Course 1)

This course includes mineralogy, hand specimen recognition, minerals and economics, optional mineralogy, thin sections and petrographic description. The petrography of igneous rocks (classification, chemical and mineralogical composition, grain size, texture and crystallization), sedimentary rocks (classification, mineralogy and description of terrigenous sediments, limestones and grain size, composition and sorting) and metamorphic rocks) roles of agents of metamorphism, textures, structures and mineral assemblages from contact and regional metamorphism) are examined. It reviews concepts of plate tectonics, island arc environments, Pacific Ocean evolution and the south-west Pacific arc plate boundary. Mapping of stock intruded into low-grade regional metamorphic rocks, volcanoclastic and sedimentary sequences is conducted and report writing outlined.

(c) Marine Geology and Earth History - (Course 2)

This course commences with principles of marine stratigraphy, correlation using fossils, paleomagnetism, rocks and radiometric dating. Sedimentary structure, facies concept, seafloor geology and deepsea environments, ocean circulation patterns, sea level and climatic history, coral reef environments, and fluvial, deltaic and inshore/beach environments are examined. The identification and morphology of major fossil groups and evolution, and paleoecology are outlined. Inshore marine surveys are conducted. Investigation of coastal erosion, delta formation, inshore sedimentation, reclamation and dune formation. Fieldwork includes mapping, project work and report writing.

(d) Resource Assessment/Mapping - (Course 3)

Construction materials including those for concrete road aggregate, cement making, dams and other free standing structures and building stones are discussed. Other topics include: a basic description of

soils and determination of soil properties, weathering processes and rates, causes, prevention and control of soil erosion, ore genesis, offshore mineral resources, structural geology and advanced geological map interpretation, and mining geology. Fossil fuels as a non-renewable energy (origins of coal, natural gas and petroleum, deposits and traps, exploration and exploitation), water (surface and ground water, artesian water) and hydro-electricity are discussed.

(e) Earth Science in Development Projects; Hazards - (Course 4)

This course outlines the elements of planning including the role and neglect of earth sciences in planning, air photograph interpretation, the use of geophysical surveys (particularly seismic refraction, magnetic and resistivity) and seismic hazards (faulting recognition and mapping active faults, earthquake magnitude scales, effects of earthquakes on rocks and soils, and quake zoning).

The numbers of students who attended the 1984 summer course and those who will attend in summer of this year are given in Table 4, by their country of citizenship:

TABLE 4:

COUNTRY	NO. OF STUDENTS IN 1984	NO. OF STUDENTS IN 1985
Solomon Islands	1	2
Vanuatu	2	1
W. Samoa	2	1
Tonga	1	-
Fiji	6	3
Papua New Guinea	1	1
Cook Islands	..	2
TOTAL	13	10

The first batch of students qualified and were awarded the Certificate in February 1985. This award is the only joint award which USP has with another University (Victoria University, Wellington, New Zealand).

5. SHORT SPECIALIST COURSES

As need arises, the Institute offers short inservice courses, jointly with other interested organizations. One such course theme has been on the Management of 200 mile EEZ. Participants' report of the first course run in 1983 has been circulated already. The programme of refresher course run in summer of 1984 is enclosed herewith. The participants' report for this course is still with the printer!

The success of these courses has led CIDA to fund a full credit course for B.A. and B.Sc. students at USP. This will be offered from 1986. It seems USP is contemplating offering this programme through units (departments) other than IMF

6. RESEARCH, CONSULTANCY AND ADVISORY SERVICE

A list of research, consultancy and advisory reports of IMR, in recent years, is given in Appendix I to illustrate the fact that IMR works throughout the USP Region and that on most occasions work done in one country is equally applicable in all member countries. To date, the Institute has accommodated all requests for services from member governments. Details of published material on work done at or in association with IMR are given in Appendix II.

The major research projects in 1985 were the continuation of the EEC-funded projects:

- A. Outer Reef Resources Survey
- B. Lagoon and Reef Fisheries
- C. Seafood Toxins
- D. Nearshore Communities

These project reports and technical papers are now being finalized for publication by mid 1986, when the budget runs out.

Consultancies undertaken in 1985 which are worth mentioning include:

- (a) Incidences of paralytic shellfish poisoning in Solomon Islands - for Helena Goldie Hospital.
- (b) Pollution of Namoli Creek, Lautoka - (study is still continuing) - for Lands Department, Government of Fiji.
- (c) Incidences of can-fish poisoning in Fiji - for Ministry of Health and Social Welfare, Government of Fiji.

Special lectures and demonstrations given in 1985 were:

- (a) Basic laboratory equipment maintenance course at Alafua Campus in July 1985.
- (b) Water pollution problems - for World Health Organization, Ministry of Health and Social Welfare (Fiji) and U.N.F.P.A. organized workshop on Human Population Growth and Environment at Lautoka - 20 November, 1985.

7. FUTURE DIRECTIONS AND PROJECTED WORK PROGRAMME

- 7.1 The Forum Fisheries Committee which guides the operations of the Forum Fisheries Agency (FFA) has agreed to act as the Advisory Board to IMR on programmes dealing with living resources. FFC required IMR work in March, 1985 and expressed satisfaction with its work programme. FFC is awaiting the outcome of a current review of regional research needs by its consultants before providing definite advice to IMR on future priority areas of research for regional governments.

The committee governing the work programme of the Committee for the Co-ordination of Offshore Prospecting in the South Pacific (CCOP/SOPAC) has been approached by the University to act as an Advisory Board to IMR in non-living resources programmes. This Committee at its last annual meeting in Honiara this year, expressed satisfaction with IMR work undertaken on behalf of CCOP/SOPAC.

- 7.2 The Institute has been given a guarantee of funding by EEC to mid 1986. Future funding is still uncertain. Detailed project document for Lome III funding by EEC will be prepared immediately upon the outcome of FFC review and advice.
- 7.3 A general submission from USP for further funding of IMR through EEC (Lome III) has been made.
- 7.4 While awaiting the outcome of aid negotiations and directions from Advisory Boards, the Institute is projected to undertake the following programmes:
- (a) TEACHING:
- (i) Postgraduate - continue to provide opportunities to Regional candidates through available fellowships; encourage non-regional students to undertake field studies in the region.
- (ii) B.Sc. - continue to service School of Natural Resources courses in marine sciences.
- provide additional options (e.g. the proposed marine affairs course was one of these courses!), with a view to offering a specialised degree in marine sciences, if resources allow.
- (iii) Diploma - the Diploma in Tropical Fisheries will be re-introduced from 1986.
- (iv) Certificate - continue to offer the Certificate in Earth Science and Marine Geology programme until demand is satisfied.
- careful consideration will be given to upgrade this programme to Diploma or even degree level.
- (v) Short courses - continue to provide specialized in-service courses, such as the Management of 200 mile EEZ.
- (vi) Other - Assist National teaching programmes in Marine Sciences (e.g. Fiji Government has plans to introduce Marine Biology and Fisheries Science in senior school curriculum).
- (b) RESEARCH AND CONSULTANCY:
- (i) The Institute will take advantage, by virtue of its unique locality, to strengthen and foster research on tropical ecosystems such as coral reefs, lagoons, outer reef slopes and mangroves. Related oceanography will form an integral part of ecosystems study. This will provide a basis for environmental management and protection.
- (ii) Mindful of the application of research to resource development and management, the Institute will be guided by its Research Advisory Boards to undertake appropriate studies.
- (iii) The Institute will continue to provide consultancy services, within its area of competence, when commissioned by the member governments.

The broad objectives of the Institute can be fulfilled if it is allowed an orderly development through a long-term planning. The present, year to year, planning is most frustrating and unsatisfactory. It provides no opportunity for careful staff development, and hence the development of Regional expertise. Also, attempts to diffuse marine-related programmes of the University through duplicate efforts in several units will not serve to build up the Institute as originally envisaged. It will, certainly, not provide additional technical staff so badly needed in the expanding programme of the Institute. It is pertinent to note that in 1986, IMR will be required to offer 2 300-level B.Sc. courses (with some assistance from SNR), 6 Dip.T.F. courses (with some assistance from F.I.T.), with a staffing establishment at senior academic level of only 2, one of these 2 staff being a full-time director, funded by external (EEC) grant. From 1987 IMR will be offering 16 full credit courses, each of 1 semester duration. Staffing level of IMR should therefore be given serious consideration.

APPENDIX I

RESEARCH, CONSULTANCY AND ADVISORY SERVICES
UNDERTAKEN BY IMR, IN RECENT YEARS TO USP
MEMBER GOVERNMENTS

C O U N T R Y

REPORT/CONSULTANCY/ADVISORY SERVICES

FIJI TONGA WESTERN SAMOA SOLOMON ISLANDS KIRIBATI TUVALU COOK ISLANDS VANUATU NIUE TOKELAU NAURU PAPUA NEW GUINEA MICRONESIA

29)	New Species of <i>Paracaesio</i> from Fiji Islands	✓																		
30)	New Species of Anthiine fish genus from Fiji Islands	✓																		
31)	Occurrence of Paralytic Shellfish Toxins in xanthid crab from Suva Barrier Reef, Fiji Islands	✓																		
32)	Ciguatera, Clupeotoxism & Other Seafood poisoning in Fijian Waters	✓																		
33)	Seafood Poisoning in Tropical Regions	✓																		
34)	High Waves at Makin in December - 1979																			
35)	Flow through Tarawa Channels																			
36)	Earthquakes at Arorae																			
37)	Lagoonal Fish & Fisheries of Dravuni, Fiji	✓																		
38)	Fish, Shellfish & Crab Poisoning in Fiji	✓																		
39)	* Botanical Survey of Tidal Forest (Mangal of Fiji, Tonga & Western Samoa)	✓																		
40)	Marine Food Processing - Simple Techniques for Island Needs	*																		
41)	Social Factors of Shore Colonization & Lagoon Usage	✓																		
42)	Beche-de-mer in waters of Tarawa Atoll	✓																		
43)	Examination of algal & fish samples from Kiribati	✓																		
44-47)	Analyses of canned fish (4 reports)	*																		
48)	Ecology of Gausative agents in Marine Food poisoning in Fiji	*																		
49)	Mass Mortality of Marine Life in the Kingdom of Tonga	✓																		
50-51)	Toxicity tests for ciguateric fish - from Pingelap, The Federated State of Micronesia (2 reports)																			
52)	Ciguatera incidence for Tokelau																			
53)	Scombrotaxism investigation - Solomon Is.	✓																		
54)	Turtle farming for South Pacific	*																		
55)	Fish Taxonomy - Niue																			
56)	Environmental Consequences and Management of Coral Sand Dredging in Suva Region	✓																		
57)	* Traditional knowledge of Marine Environment	✓																		
58)	* Shore Ecology of Suva & South Viti Levu	*																		
59-60)	Baseline Study of oil drilling in Bligh Waters Hole No 1 & 2	✓																		
61)	Investigation of Krmave Reef Platform	✓																		

C O U N T R Y

COUNTRY

REPORT/CONSULTANCY/ADVISORY SERVICES

	FIJI	TONGA	WESTERN SAMOA	SOLOMON ISLANDS	KIRIBATI	TUVALU	COOK ISLANDS	VANUATU	NIUE	TOKELAU	NAURU	PAPUA NEW GUINEA	MICRONESIA
89) Life history patterns in deepwater shrimps ^a	* ✓	*	*	*	*	*	*	*	*	*	*	*	
90) Living together in the Sea	*	*	*	*	*	*	*	*	*	*	*	*	
91) Subsistence Fisheries of Tuvalu						✓							
92) Fiji Modular Wave energy converter	✓												
93) Seawave energy survey in Western Samoa			✓										
94) Assessment of Seawave energy potential and development prospects for Tongatapu Is. Kingdom of Tonga		✓											
95) Artisanal fishery and fishing vessels of Tonga		✓											
96) Reef ecology and fish taxonomy - Cook Is.													
97) Inshore/Nearshore Invertebrate Fisheries - In Inshore/Nearshore International Workshop.	* ✓	*	*	*	*	*	*	*	*	*	*	*	
98) Deepwater shrimps of Tonga: a preliminary survey near Nuku'alofa		✓											
99) Fulbright-Hays research fellowship report: Interstitial Molluscs and Opisthobranchs of Fiji	✓												
100) Traditional Management and Conservation of Fisheries in Kiribati and Tuvalu Atolls					✓	✓							
101) Distribution, abundance and ecology of Blue Coral in the Pacific	*	*	*	*	* ✓	*	*	*	*	*	*	*	
102) Preliminary survey of fish consumption in Tokelau													✓
103) Preliminary survey of inshore fisheries of Upolu Island, Western Samoa		✓											

* Studies carried out in one country but applicable to all USP member countries
+ in press
✓ study carried out in a particular country

APPENDIX II

PUBLICATIONS RESULTING FROM WORK DONE AT
OR IN ASSOCIATION WITH IMR

Appendix II

PUBLICATIONS RESULTING FROM WORK DONE AT OR IN ASSOCIATION WITH IMR

INTERNATIONAL PUBLICATIONS AND PROCEEDINGS OF PAPERS PRESENTED

- (1) **Fiji Red Cross Society & J Seeto
Basic First Aid Handbook (1983)
- (2) Baldwin W J, B A Carlson & J Seeto (in press)
A checklist of the marine, brackish and freshwater fishes of Fiji.
International Seagrants, University of Hawaii/Institute of Marine
Resources, USP.
- (3)** Halapua, S 1982.
Fishermen of Tonga. 100 pp. IMR/IPS, USP
- (4) King, M G (1981).
Increasing interest in the tropical Pacific's deepwater shrimps.
Aust. Fisheries; Vol. 40 No. 6
- (5) King, M G & S A Shepherd (1982)
Food Webs; in Marine Invertebrates of Southern Australia, Part 1
Editors: S A Shepherd and I M Thomas
- (6) King, M G (1981)
Deepwater shrimp resources of Vanuatu. Marine Fisheries Review
43(12): 10-17
- (7) King, M G and R M Stone (1982)
Commercial Fisheries in Western Pacific Islands. In Proc.
Utilization and Management of Inshore Marine Ecosystems of Tropical
Pacific Islands, 1979. Seagrants. pp 72-84.
- (8) King, M G (1982)
A Preliminary trapping survey for deepwater shrimps (Decapoda:
Natantia) in Papua New Guinea. Report to S.P.C.
- (9) King, M G (1982)
Deepwater Caridean Shrimps in Southwest Pacific Islands. An
overview. Report to S.P.C.
- (10) King, M G (1983).
Deepwater shrimps of Pacific Islands. Pacific Science Congress,
Dunedin, N.Z., Jan. 1983.
- (11) King, M G (1984)
The species and depth distribution of deepwater caridean shrimps. (The
Decapoda; Caridea) near some southwest Pacific Islands. Crustaceana 47(2)
174-191
- (12) Kott, Patricia (1980).
Algal-bearing didemnid Ascidiaceans in the Indo-West Pacific Mem.
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- (13) Kott, P. (1981)
The Ascidiaceans of the reef flats of Fiji. Proc. Linn. Soc. N.S.W.
105(3): 147-217.
- (14) Muntz, W R A & U Raj (1984).
On visual system of Nautilus pompilius J. Exper. Biol. 109 253-263

- (15) Institute of Marine Resources, USP and Research Center for the South Pacific, Kagoshima University, Japan
The Prompt Report of the first scientific survey of the South Pacific (in press).
- (16) Institute of Marine Resources, USP and Research Center for the South Pacific, Kagoshima University, Japan
The Prompt Report of the second scientific survey of the South Pacific (1983).
- (17) Raj, U & J E Fergusson (1980)
Osmotic and ionic composition of a tropical freshwater mussel, Batissa violacea Lamarck (Lamellibranchia: Sphaeriidae). New Zealand Journal of Science, Vo. 23, 199-204.
- (18) Raj, U (in press)
The freshwater clam, Batissa violacea Lamarck (Lamellibranchia Sphaeriidae) of Fiji Islands. Veliger.
- (19) Raj, U (in press)
The distribution and morphometric variation in the freshwater clam, Batissa violacea Lamarck (Lamellibranchia: Sphaeriidae) of Fiji Islands. New Zealand Journal of Science.
- (20) 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.
- (21) 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., 11-23 Oct., 1981.
- (22) Raj, U (1981)
Inshore and Nearshore marine ecosystems of the South Pacific Islands Inshore and Nearshore International Workshop, July, Suva.
Abstracts in Proceedings.
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Outer Reef slope fisheries of Fiji. Inshore Nearshore International Workshop, July, Suva. Abstracts in Proceedings.
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A New species of Paracaesio (Pisces: Lutjanidae) from the Fiji Islands. Copeia, Vol. 2:450-453.
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A new species of the Anthiine fish genus, Plectranthias (Serranidae) from the Fiji Islands. Japanese Journal of Ichthyology, Vol. 30, No. 1: 15-17, Fig. 1.
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The occurrence of paralytic shellfish toxins in two species of xanthid crab from Suva Barrier Reef, Fiji Islands. Toxicon, Vol. 21, No. 4: 547-551.

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International Symposium of Seafood Toxins in Tropical Regions, Kagoshima University, Japan, Sept. 1983.
- (28) **Yasumoto T; U Raj & R Bagnis (1984)
Seafood Poisoning in Tropical Regions. Tohoku University, Japan.
- (29) **Zann, L P (1980)
Living together in the Sea. F.F.H. Publ., New Jersey. 415 pp.
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Traditional and Introduced Fishing Craft in the South Pacific. Proc. Fijian Soc.
- (31) Zann, L P (1981)
Inshore Nearshore Invertebrate Fisheries. Inshore Nearshore International Workshop, July, Suva. Abstracts in Proceedings.
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The Ecology and Fisheries of Fanga'uta Lagoon, Tonga. International Seagrants Report.
- (33) Zann, L P (1982)
The Energy Crisis and Pacific Island Fisheries Austr. Fisheries. 41:24-29.
- (34) Zann, L P (1982)
Traditional patterns of utilization. pp 31-34. In: Proc. Utilization and Management of Inshore Marine Ecosystems of the Tropical Pacific Islands, 1979 Seagrants.
- (35) Zann, L P (1982)
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- (36) Zann, L P (1983)
Subsistence fisheries in Pacific Islands. A paper presented at Pacific Science Congress, Dunedin, N.Z.: Jan., 1983.

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Intertidal fauna of Southern Tarawa Atoll Lagoon, Kiribati.
- (38) Bolton, L (in press)
The Introduction of Anadara maculosa ('Te Bun') to Tabiteuea North Lagoon
- (39) Bolton, L and L P Zann (in press)
Corals of Tarawa Atoll.
- (40) 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. 12pp, 6 Appendices.
- (41) 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. 99pp, 4 appendices.
- (42) Bott, A N (1980)
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- (43) Bott, A N (1980)
Fiji Modular Wave energy converter. 4pp. 9 figs.
- (44) Chandra, S; J Seeto; S V Smith; L Kwitko; R C Schneider; J Schoonmaker; T. Tebano & G W Tribble (1983)
Chemical Stoichiometry of Lagoonal Metabolism: Preliminary Report on an Environmental Chemistry Survey of Christmas Island, Kiribati.
- (45) Duphorn, K (1981)
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- (46) *Gawel, M and J Seeto (1982)
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- (47) *Gawel, M; P Kunatuba and S Vodonaivalu (1982)
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- (51) *Halapua, S (1981)
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The deepwater shrimps of Tonga: a preliminary survey near Nuku'alofa.
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- (57) **Morton, J & U Raj (in press)
The Shore Ecology of Suva and South Viti Levu. Vol. 1 & 2.
- (58) Munch-Petersen, S (1983)
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- (59) *Penn, N. (1982).
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For the Division of Lands and Mineral Resources, Government of Fiji.
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Baseline study of Pascoe Reef oil drilling operations - Hole No. 2, Bligh waters.

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- (63) *Raj, U; G Southwick & R Stone (1981)
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14 pp, 2 figs. & 58 plates.
- (64) *Raj, U; J Seeto, S Vodonaivalu & R Stone (1981)
Report on a preliminary investigation of Saweni Bay and the coastal environment. 30 pp, 10 figs. & 91 plates
- (65) *Raj, U; J Seeto and R Stone (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.

- (66) Raj, U; H Haq & T Yasumoto (1982)
Ecology of causative agents in marine food poisoning in Fiji. A technical report from the Institute of Marine Resources, USP. Presented to Toyota Foundation 1982.
- (67) *Raj, U; M Goulding & H Haq (1983)
An investigation on the suspected presence of toxins in canned fish.
- (68) *Raj, U; H Haq & S Chandra (1984)
Analyses of some canned fish imported into Fiji
- (69) *Raj, U; J Seeto; S T Puloka & S Fakahau (1984)
Mass mortality of marine life in the Kingdom of Tonga.
- (70) *Raj, U & H Haq (1984)
Toxicity tests for ciguateric fish from Pingelap, The Federated States of Micronesia.
- (71) Raj, U; J Seeto & R Stone (in press)
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- (72) **Raj, U; R Stone & J Seeto (in press)
A manual of deepwater fisheries of the Tropical Pacific.
- (73) Raj, U (in prep)
Common fishes and edible marine organisms of Fiji.
- (74) Ram, N and G. Southwick (1982)
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- (75) Seeto, J and S Singh (1982)
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- (77) Sullivan, K. & G Sullivan (1982)
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- (79) Vodonaivalu, S. (in press)
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- (80) Yasumoto, T (1981)
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- (88) *Choy, S C. BSc. (MSc.) (1981)
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- (92) Helfrich, P; U Raj; J Davidson & P Rappa (1983)
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A Preliminary Survey of fish consumption in Tokelau.
- (100) Zann, L P; L Bell & T Sua (1984)
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Island, Western Samoa.
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