

Department of Scientific and Industrial Research

**DIVISION OF MARINE
AND FRESHWATER SCIENCE
ANNUAL REPORT**

1983-84



D.E. HURLEY
Director

DIVISION OF
MARINE AND FRESHWATER SCIENCE

ANNUAL REPORT

1983-84

Division of Marine and Freshwater Science

D.S.I.R.

Wellington

1985

Edited by
Dennis P. Gordon

Layout and typing by
Rose-Marie Thompson

CONTENTS

	Page
INTRODUCTION	5
OBJECTIVES OF THE DIVISION	7
RESEARCH PROGRAMMES	
New Zealand Oceanographic Institute	10
Biological Oceanography	10
Marine Geoscience	11
Physical Oceanography	12
Taupo Research Laboratory	13
RESEARCH SPECIAL REPORTS	
Ocean Research Vessel	15
Ocean Currents	16
The Making of a Continent : New Land from the Ocean on the East Coast	16
Deterioration of Lake Rotoiti	18
RESEARCH ADJUNCTS	
Charting the Sea	19
R.V. <u>TANGAROA</u>	20
FACILITIES AND SERVICES	
Library	24
Editorial and Publications	24
Public Relations	24
WORKSHOPS	
West Coast Programme	26
Zoological Record	26
IN-HOUSE SEMINARS	28
OVERSEAS TRAVEL	30
HONOURS AND AWARDS	31
VISITING WORKERS	31
OTHER VISITORS	32
RESEARCH CONTRACTS	33
OBITUARY	33
OFFICES HELD	34
RESEARCH PROGRAMMES AND PROJECTS	38
Project Index	83
Completed Projects	88
Terminated Projects	89
PUBLICATIONS	91
STAFF DIRECTORY	98

INTRODUCTION

Each year has its own particular landmark. This year will be remembered for the unfortunate and ill-timed necessity to pay off R.V. Tangaroa, after eleven years of continuous service.

Tangaroa represented the hopes and achievements of the Institute. She was acquired in 1972 in an atmosphere of disbelief that we had finally graduated to a research vessel of our own. We felt New Zealand oceanography had come of age. Previously, we had relied on vessels of opportunity such as the frigates HMNZS Pukaki and Hawea (1956-57); HMNZFA Tui - precursor to the present Tui which we shared with Naval Research Laboratory from 1956 to 1958; Isa Lei; Ikatere, by courtesy of Marine Department; and HMNZS Endeavour - previously the John Briscoe already with a history of research in the Falklands (1957-61); and her successor, the USS Nemakagon, also renamed Endeavour (1963-67).

Then followed the charter period. M.V. Viti (1959-61), originally built for the Governor of Fiji, was the first of our charter vessels. She was owned by the Tasman Shipping Company Vila, famous as the "Shoe-string Shipping Line", founded by ex-servicemen and directed by Clough Blair, with whom we were to become very familiar. Clough's order-of-the-day to his company marking this new departure set the scene by giving them a "Time" article on oceanography to read, and, in true orders-of-the-day fashion, grandly exhorting them to: "Let us do our utmost by performing our duties efficiently and diligently, to prove that we can do the job as well as the members of other nations. The scientists on board "Viti" will need the practical and willing assistance of all crew members." And that we received.

Although only chartered for four months of the year at £250 per day, Viti represented the first "real" vessel which we could in some sense call our own. Viti was followed by M.V. Taranui (1962-71), owned by the South Pacific Shipping Company, and chartered from Jim Ure and his associates for two 60-day periods a year at £300 per day until she, too, fell victim to the financial vagaries of the tramp-steamer trade and was, in turn, sold off to overseas brokers.

At that stage, the Division received permission from a far-seeing Director-General, Dr Eddie Robertson, to seek a possible vessel for purchase. Under the directorship of Jim Brodie, Jack Irwin checked out local possibilities and settled on the Wellington Exporter, run by Columbus Lines as a refrigerated island freighter but personally owned by the German Managing Director of the line. The ship had been tied up at Auckland with a damaged freezer hold. Subsequent negotiations culminated in a telephone conversation with Mr Radford of the Sydney broking firm Banks Bros and Street, by Dan Doyle of Head Office, supported and encouraged by Head Office Accountant, Jack Havaican, Jack Irwin, and myself, which resulted in her purchase by the Department for the now unbelievable sum of \$158,000.

The 74-metre vessel, built in Germany in 1960 as the Harald Horn, was renamed Tangaroa. (The name was suggested by an unknown Maori Affairs officer to Paul Cotton of Foreign Affairs, who in turn offered the suggestion to me, appropriately enough in view of the Institute's long association with that suburb, on a Thorndon bus.)

Tangaroa was refurbished - never to the extent originally envisaged or required - at Whangarei Engineering Company in 1972. She was recommissioned and renamed at the Overseas Terminal by the Hon. Colin Moyle, Minister of Science, and made the first of her 155 scientific cruises under the DSIR flag in April, 1973.

Tangaroa averaged 225 days a year at sea. In her best year, she reached 260 days. She built up an impressive record of research in New Zealand waters and the South Pacific, carrying not only members of the Institute but also

Geophysics Division and Geological Survey and members of other Government Departments, universities, and overseas oceanographic research institutions. Her demise brought a spontaneous influx of sympathetic mail from overseas scientists who had sailed on her or knew of her work.

This record was in no small part due to the service given by her permanent masters (Tim Nicol, Neil Gillstrom, and Peter Scarrott), and the officers, engineers and crew, who came to feel just as strongly about her as the scientists and technicians.

The need for a full-time replacement is real and pressing and every effort will be made in that direction.

On the scientific front, this volume, with its record of projects and publications, stands as evidence. Amalgamation of effort with Taupo Research Laboratory was substantially effected, with Taupo staff transferring 5.5 person-years of effort from freshwater research to the marine field to which they have brought a significant amount of intellectual and technological input. The loss of Tangaroa will temporarily unsettle joint projects but not necessarily affect the marine content of the Taupo programme which also includes collaborative work with Fisheries Research Division of the Ministry of Agriculture and Fisheries.

The year also saw the retirement of Dr Joyce Richardson. Joyce came to us in 1976 in a second-spring career and made the most of her short career in government science, as the breadth of her list of publications indicates. We wish her well.

The details of the Science Programme are given later in this report but some of the highlights are worth mention here.

Computerisation has exploded in the past year and much historical baseline data, station data, and library information have been computerised. The student input during vacations has been particularly important. Charging has resulted in a growing source of revenue, reaching \$71,500 in the past year despite the cancellation of contracts with Taupo due to scaling down of geothermal research, especially in connection with the Ngawha field.

With the coastal bathymetric series nearing full coverage of the coastline, a new CONMAP series summarising offshore coastal geology (with its implications of identifying hazards for offshore engineering) has been initiated as a joint project with Geophysics Division and Geological Survey.

Remote sensing, in a profitable collaboration with Meteorological Office and the Remote Sensing Laboratory of PEL, is promising future dividends as well as present results and the current-meter servicing and reading facility is clearly meeting an increasing outside demand, particularly from the growing offshore engineering field. In association with Harding Signals, the diver's data logger, our first venture into developing a commercial product is making good progress towards market prototypes.

New Zealand's lakes are short of nutrient nitrogen relative to those of the Northern Hemisphere, which makes the findings of the OECD programme on eutrophication of dubious value to water managers in New Zealand. Studies on Lake Rotoiti give rise for concern about the deterioration of that lake. Finally, the book on Lake Taupo, written mostly by members of the Taupo Research Laboratory, has been very well received.

OBJECTIVES OF THE DIVISION OF MARINE AND FRESHWATER SCIENCE

In early 1983, after extensive discussion among the Directorate, section leaders, and senior staff (based on input from all staff members), the Division established a set of nine scientific objectives. Cited below in bold is a short title which is unlikely to be changed for the next 5-10 years, except in response to departmental or governmental policy changes. The remainder of each objective seeks to describe the locations in which it will be done, now and in the immediate future. Modifications to the latter part of each objective will be made as research is completed and new priorities identified.

Associated with the establishment of objectives has been the introduction of a more formal review of projects for the past year, and assessment by each scientist and technician of their research priorities for the next year. The review and assessment of research priorities will continue on an annual basis.

1. **To study the sedimentary regime of the New Zealand continental shelf and slope in areas considered to have potential for development**

It is intended that such investigations, in combination with the Division's ongoing sediment-mapping programme, will provide background information essential for the future siting of man-made structures such as submarine pipelines and cables, and for advising on anchorages for oil-drilling rigs, aspects of coastal stability, the dispersal of wastes dumped from harbour dredging, and sedimentary regimes in the fishing/shellfish grounds.

2. **To define the mineral resources within the New Zealand Exclusive Economic Zone**

Deposits to be prospected for and investigated include heavy mineral concentrations, submarine phosphorite, glauconite, and manganese nodules.

Emphasis is now being placed on completing studies of the phosphorite deposits on Chatham Rise.

3. **To evaluate the structure and stratigraphy of the New Zealand continental margin**

These studies will establish the basic geology of the New Zealand continental shelf and adjacent areas in relation to crustal plate movements. This will permit identification of resource potential, geological hazards, and rock types of importance to possible off-shore engineering projects.

4. **To study interaction between plants and those nutrients of importance in the control of eutrophication**

Excessive amounts of nitrogen and phosphorus added to fresh waters cause accelerated eutrophication, so the way in which these nutrients are used by bacteria, algae, and higher plants needs to be understood if this form of water pollution is to be controlled. Reduction of the nutrient load to lakes is the most practical way of controlling eutrophication at present; so research is also directed at establishing relationships between nutrient load and lake condition, the effectiveness of riparian

strips in removing nutrients from streams, and processes which can strip nutrients from sewage effluents.

5. To study nutrient supply and transfer through the marine food web to animals and plants of economic importance

An understanding of the biological, chemical, and physical processes which operate within productive marine systems will provide information of use to fisheries management. Attention is being given to the significance of upwelling processes off the west coast of South Island in relation to the deep-water, pelagic and squid fisheries of the area. The capacity of the Marlborough Sounds to support existing and projected mussel farming is also being studied.

6. To study the distribution, abundance, and identity of benthic species in the New Zealand Exclusive Economic Zone in relation to their environment and their role as an energy source in the marine food web

Benthic organisms are an important food source for bottom-feeding marine fish. Several benthic organisms are known to contain substances with antibacterial and antiviral activity while others are a potential or actual economic resource.

Initial emphasis is being placed on publishing distributional charts of dominant species within the New Zealand Exclusive Economic Zone, and analysing how benthic communities correlate with environmental factors.

7. To study the variability of water properties and movements on New Zealand's continental shelf and slope

The understanding of many aspects of the marine environment depends on knowledge of the physics of the oceans. This knowledge is essential to understanding the dispersion of fish larvae and plankton, the movement and deposition of sediment, and the impact of the oceans on climate.

Present physical oceanographic studies are aimed at understanding the variability with time of the physical environment. These include coastal climate studies using temperature and salinity observations, measurements of shelf and slope currents, and studies of near-surface ocean variability using satellite remote-sensing techniques.

8. To assess the impact of development in marine and freshwater environments

Estuarine studies will initially concentrate on sedimentation and benthic biological/sediment relationships in Rangaunu Harbour associated with proposed development. Freshwater studies will initially concentrate on the effects of geothermal waste discharges and on sedimentation in hydro lakes. As a baseline for pollution studies, geochemical cycling of elements in sediments from New Zealand lakes and harbours will be investigated.

Offshore studies will concentrate on the benthos and sedimentary regime of the Chatham Rise, associated with the potential development of the phosphorite resource in an important fishing area.

9. To engage, where deemed appropriate, in research related to international and bilateral co-operation programmes, New Zealand's aid programmes, and the New Zealand Antarctic Research Programme

This includes projects where there is a responsibility to participate in international programmes; where New Zealand science may benefit from access to new techniques, new data, and new instrumentation; where New Zealand aid obligations are involved (e.g., CCOP/SOPAC); and where two-ship or multi-ship operations are necessary.

It covers research in the Antarctic which has been a traditional, but minor, aspect of the Division's programme.

The discovery and evaluation of metalliferous sediments from back-arc basins in the Southwest Pacific is one focus of attention.

The research being carried out to achieve these objectives has been organised into several science programmes, each comprising a number of research projects which collectively encompass the programme.

Beginning on p.38 of this Annual Report, these programmes and projects are separately listed.

RESEARCH PROGRAMMES

N.Z. OCEANOGRAPHIC INSTITUTE

The Institute's interests are naturally centred within New Zealand's Exclusive Economic Zone, but range from the Equator to the Antarctic, and from the East Australian coast into the central South Pacific, far to the east of New Zealand. Studies extend over a comprehensive variety of marine and lacustrine environments that include lakes of fluvial, glacial, volcanic and man-made origin, coastal inlets, fiords, harbours and estuaries, and the seafloor down to abyssal depths, and environments ranging from tropical atolls and lagoons to the seafloor beneath the Ross Ice Shelf in Antarctica.

BIOLOGICAL OCEANOGRAPHY

The Biology Section comprises nine scientists (one an NRAC Fellow) and five technicians. A major improvement was made this year to the Section's facilities after a new gravel filter was constructed for the circulating seawater system. There is now an excellent supply of good quality water not greatly subject to salinity fluctuations.

Most of the Section's effort is now directed at the Division's programmes.

WEST COAST ECOSYSTEM PROGRAMME

Work progressed steadily on this programme. A number of papers were brought to completion this year. These included work on winter phytoplankton populations, their standing stocks and productivity, zooplankton distribution, benthic communities, and their sedimentary environment and role in the ecosystem. Effort went into processing the results of Cruise 1144 in western Cook Strait. In October 1983, a workshop was held at NZOI on the progress on this programme and included workers from a number of outside organisations. Options for future directions were identified.

BENTHIC FAUNAL PROGRAMME

Good progress was made this year in finalising the shelving and cataloguing of the benthic collections by entering data at the major group level on to a computer file. Progress was made towards publications on several groups: Subantarctic seaweeds, Tawera (Mollusca), reef fishes, Bryozoa, southwestern Pacific echinoderms, and lithodid crabs. Biological material collected by the Division was treated in publications by non-Divisional specialists on Bryozoa (British Museum (Natural History)).

AQUATIC ENVIRONMENTAL ASSESSMENT PROGRAMME

Progress in this programme is in three main areas: Rangaunu Harbour; the shallow rock-wall communities of northern New Zealand; and the Marlborough Sounds through a study of the biology of the horse mussel (Atrina). In addition, 27 environmental reports were dealt with.

Work was completed outside the Division's programmes on three types of noteworthy microalgae - on the fine structure of slime-producing Phaeocystis, the description of a new species of toxic Prymnesium, and factors affecting the growth of the Lake Grassmere hypersaline algae.

Specific projects are listed in the section entitled RESEARCH PROGRAMMES and PROJECTS (beginning on p. 38)

J.M. Bradford

MARINE GEOSCIENCE

The Geology Section of DMFS investigates and advises on most aspects of the underwater morphology, sedimentology, structure, and geochemistry of New Zealand's vast EEZ, and of many lakes, reservoirs, and estuaries. It plays a central role in offshore geosciences in New Zealand. Its broad mandate is covered by seven scientists, a senior technician, and two technicians.

During 1983-84, work proceeded rapidly on projects aimed at understanding the processes that control the shape, texture, and chemical composition of lake- and sea-floor. Joint projects with overseas organisations proved particularly profitable. The demise of R.V. Tangaroa necessitated the postponement of some projects but prompted a major programme to collate all available offshore data and interpretations into a monograph and map series of submarine geology for the whole EEZ.

LAKE AND ESTUARINE SEDIMENTATION

Dick Pickrill and Jack Irwin found Northern Hemisphere models of siltation and erosion in enclosed waters to be inapplicable in lakes and harbours dominated by oceanic climates and rapid changes in the natural regime. Concepts of circulation and sedimentation were developed for Lakes Wakatipu and Tekapo and for Rangaunu Harbour and used to develop locally applicable models for the management of new hydro lakes and rapidly modified harbours. Work began on the patterns in volcanic lakes and fiords.

John Mitchell and Ed Arron assisted the Hauraki Catchment Commission and Tauranga Harbour Board to define sediment distributional patterns in the harbours and inshore waters of the Bay of Plenty.

OFFSHORE MINERALS

Dave Cullen continued projects to assess the economic potential and geological history of Chatham Rise phosphorite. He collected additional data in order to understand the genesis of phosphorite in nearshore areas of northern New Zealand and on seamounts.

Geochemical studies were used by Geoff Glasby to trace pollutants in harbours and lakes and to develop concepts on mineralisation along seafloor rifts north of New Zealand.

CHARTING

Routine charting of seafloor and lake morphology and sediment cover continued as appropriate data were collected or became available from other sources. However, production was severely constrained by a lack of technical and cartographic staff.

COOK STRAIT

Lionel Carter has co-ordinated a multidisciplinary study of the complex physical environment and geological evolution of Cook Strait, with particular reference to the tidal-current-scoured, storm-modified and actively faulted area in the vicinity of the inter-island cables.

CONMAP

In 1985 it is proposed to begin production of a series of monographs and maps that summarise our knowledge of seafloor geology around New Zealand. Before any summary can commence it has been necessary to define the geology of some virtually unexplained and some particularly complex areas of New Zealand's continental margin. Work has proceeded in close liaison with petroleum geologists at N.Z. Geological Survey and with marine geophysicists at Geophysics Division.

Jim Eade has been able to relate the offshore geology of Northland to a complex series of seafloor riftings, rotations, and collisions in the basins and ridges between New Zealand and New Caledonia. Keith Lewis has related how seafloor rifting west of the Kermadec Arc is transmitted into the New Zealand continental crust at the Bay of Plenty. He has also interpreted seismic data, including some collected by the U.S. Geological Survey and some by the Deep Sea Drilling Project, to show how the ocean floor and Chatham Rise are deformed as they are thrust beneath the East Coast and Kaikoura Ranges. Lionel Carter has shown that the evolution of the Canterbury-Otago continental margin is related to the migration of sealevel-controlled sedimentary wedges. He has also inferred that outer parts of the eastern margins are sculptured by a deep ocean current from Antarctica.

With these projects nearing completion, work can begin on the regional synthesis required for the CONMAP Offshore Geological Map Series.

K.B. Lewis

PHYSICAL OCEANOGRAPHY

The end of 1983 saw the welcome return of Basil Stanton, after a period of three years in the United Kingdom variously employed by the Institute of Oceanographic Sciences and DSIR. Basil is now developing new projects aimed at investigating the influence of river inflow on the west coast (as part of the West Coast Ecosystem Programme), extreme wind-wave statistics, and hydrological variability in Cook Strait. Basil, in association with Anthony Cole, Bruce Shakespeare, Peter Hill, Malcolm Greig, and Bruce Chapman, is preparing for the operation of the soon-to-be-purchased C.T.D. (conductivity/temperature/depth) recorder.

Current observations continue on the South Island west coast in the West Coast Ecosystem Programme (Alex Gilmour, Ron Heath) with current meters at present in place on the continental shelf to allow investigation of the spatial extent of the 2-4-weekly variability present on the areas of sharp relief - the west coast continental slope and Kahurangi Shoals. The latter area has been studied as part of a joint biological/physical study of the cold-water nutrient-rich plume with which the western Cook Strait squid fishery is associated.

One-to-four-weekly flow variability evident in recent Cook Strait current observations has been found to be associated with strong winds (through the Strait) and non-linear tidal effects (across the Strait).

Norm Ridgway has been honoured by election to Chairmanship of the International Co-ordination Group for the Tsunami Warning System in the Pacific - this will involve him in improving the Pacific tsunami warning system and providing educational programmes and advice to other Pacific nations. Alex Gilmour has extended his normal-mode oscillation calculation, previously applied to investigation of harbour responses, to seiches in Lakes Taupo and Wakatipu.

Norm Ridgway, Bruce Shakespeare, and Malcolm Greig are presently analysing the extensive coastal-climate observations (daily temperatures from 16 locations on the New Zealand coast over the past seven years). Preliminary

analyses show an interesting influence of the 1982 Southern Oscillation/El Niño event - data providing longer time-series at single locations are now being analysed prior to interpretation for publication. Ted Barnes's remote-sensing research, in association with the N.Z. Meteorological Service and Physics and Engineering Laboratory, continues to expand, with several specific projects now in progress. This research is giving a new insight into the ocean's physical and biological spatial and temporal complexity.

The above research could not proceed without the diligence of Anthony Cole and Malcolm Greig in the computing and data-retrieval-and-analysis aspects, in both the Physics Section and the Institute as a whole, and Bruce Shakespeare with his overall responsibility for current-measuring equipment. The current-meter maintenance facility developed by Bruce, the current-meter reader developed by Bill Whitley, and the specialist analysis and plotting programmes developed by Malcolm Greig are in increasing demand from the private sector, local authorities, universities, and other government departments.

ELECTRONICS; ENGINEERING SERVICES

The electronics personnel are responsible for detailed electronics servicing of most of the Division's specialist aquatic equipment with Ted Barnes, Peter Hill, and Bill Whitley at NZOI and Max Gibbs at Taupo. Likewise, the mechanical aspects are serviced by John Hunt and Bruce Johnstone. Where necessary, specialist equipment has been designed and constructed, recent examples of which are the new auto-analyser system (Max Gibbs), diver logger and PIRTS (Programme to Integrate Real-Time Systems) (Peter Hill), electronic meter wheel and current-meter reader (Bill Whitley), and a new SWISH (Sediment/Wave Interaction on the Shelf) (Ted Barnes), core splitter, grabs (Bruce Johnstone), and calcium carbonate analyser and suction dredge (John Hunt). Both the auto-analyser and diver logger have generated commercial interest.

R.A. Heath

TAUPO RESEARCH LABORATORY

Studies of eutrophication continued at reduced effort. For Lake Rotoiti, a comparison of historical information with recent studies revealed serious deterioration over the last thirty years. This is considered to be a consequence of deterioration in Lake Rotorua.

A comparison of New Zealand limnological information with a major study by other OECD countries was completed, concluding that there is much less nutrient-nitrogen in New Zealand lakes compared with Northern Hemisphere ones. This potentially complicates the problems faced by managers seeking to control eutrophication here.

Underwater optical properties are being studied in conjunction with work on phytoplankton productivity and macrophyte growth, attention being focused on light-scattering properties and the way these affect photosynthetic efficiency, together with spectral composition and its effect on macrophyte germination and growth.

Analytical methodology continued to be refined. This included a major review of the problems posed by chlorophyll analysis; an automated Kjeldahl nitrogen method for fresh waters was described; interference by dissolved organic nitrogen in ammonium analyses was identified; and a low-cost highly sensitive solid-state photometer was developed for low-concentration colorimetry.

Scientific findings were published on the limnology of Lakes Ohakuri, Rotongaio, Horowhenua, Waikaremoana, and Titicaca, together with a book about Lake Taupo which described its human and geological history and ecology, in terms of interest to the general public.

Staff participated in several marine cruises, to study aspects of primary productivity and nitrogen cycling off the west coast of South Island and in the Taranaki Bight, and to assist studies by Fisheries Research Division of the green-lipped mussel in the Marlborough Sounds.

E. White

RESEARCH SPECIAL REPORTS

OCEAN RESEARCH VESSEL

New Zealand is an island nation with the fourth largest 200ⁿ-nautical-mile Exclusive Economic Zone (EEZ) in the world, an area of ocean equivalent to 14 times the land it surrounds. This has a wide-ranging influence on our life-style and economy which extends from the influence of the surface waters upon the coastal environment and overall climate, through to its largely unknown potential for exploitation of renewable and non-renewable resources. New Zealand's unique position in the world's oceans also makes it a valuable place from which to study features and events of global significance.

Wise management will be needed to realise the maximum potential of this immense marine resource, and thus the role of a deep-sea research vessel in marine science is critical. There is an important contribution which remote sensing from satellite can make but nothing replaces the need for a vessel at sea to provide an instrumental platform from which information necessary for the development of marine resources, both living and mineral, can be obtained. This need is acutely felt at the present time.

R.V. Tangaroa recently completed eleven years of research during which she has averaged 225 days at sea a year, particularly on the New Zealand continental shelf and within the New Zealand EEZ, but also ranging up into the South Pacific amongst our island neighbours. In that time, work on Tangaroa has included :

- the definition of the Chatham Rise phosphorite deposits with a potential life of 20 years and a potential value of \$10 billion dollars;
- substantial work on offshore hydrocarbon-related research;
- definition of the continental shelf with detailed bathymetric and sedimentary studies of the shelf region;
- productivity of coastal waters in relation to fisheries;
- distribution of marine animals (including the discovery of the orange roughy in New Zealand waters);
- measurements of currents on the shelf with regard to offshore exploitation and on the Chatham Rise in relation to phosphorite deposits;
- discovery of manganese nodule and cobalt crust fields (including a nodule field within the EEZ);
- definition and investigation of oceanic eddies and their relationship to fisheries distribution;
- distribution of offshore minerals such as gravel, ironsand, glauconite, and gold;
- assistance with investigations in Cook Strait for power-cable replacement and north of New Zealand for the ANZCAN cable;
- Maui pipe-line route;
- the sedimentary structure underlying offshore drilling platforms in relation to foundations and spudding in.

Charts produced from Tangaroa work are in demand by fishermen to expedite their fishing, and seismic and gravimetric soundings have been used to indicate potential drilling structures.

Tangaroa has also played a vital role in university and museum research. Examples of university use include ocean-circulation studies and current measurements, ocean-water properties, and productivity studies as part of the Maui Development Environmental Studies by Auckland University, which

have also been important in adding to the overall marine data-base. Canterbury University's collections have produced biologically derived compounds of promising medical potential from deep-water marine animals. Waikato University geologists have used Tangaroa for studies of offshore geology of subsequent practical use to local Harbour Boards.

In addition to these practical results, making Tangaroa available to these institutions each year has provided essential opportunities for giving staff and students training and experience in practical marine research.

International co-operation is a two-way process. The availability of Tangaroa has allowed New Zealand to participate in joint research ventures using the ship as a bargaining point with other research institutions. For example, the Glomar Challenger Deep Sea Drilling Project used Tangaroa for site-survey work in New Zealand waters which enabled us to "buy in", at no extra cost, on the research on Glomar Challenger itself and produced data of inestimable value for the offshore oil search in New Zealand waters.

Tangaroa has also shown her value in joint operations with the Pacific nations in providing research back-up for the Joint Committee on Offshore Prospecting - a UN agency in the South Pacific.

D.E. Hurley

OCEAN CURRENTS

Paramount to many aspects of understanding the marine environment of New Zealand's EEZ is knowledge of the variation with time of oceanic water properties and movements. In the past decade the technology has, for the first time, become available to allow water movements to be observed with internally recording current meters making observations every hour for up to two years. Measurements for this period of time and longer are needed to allow for meaningful estimates of the quasi-periodic flows that dominate the water movements. These current meters are maintained vertically with sub-surface buoyancy packages connected together by synthetic mooring lines attached to a weight on the seafloor via a release which can be triggered acoustically from the sea surface.

This technology has been used recently by the Division of Marine and Freshwater Science to investigate the flow on the west coast of the South Island (associated with biological, fisheries, and climate studies), in Cook Strait (associated with power cable design and deployment), and southeast of New Zealand (in a joint NZ/USA experiment related to global climate). One of the more interesting and important preliminary results of this research is the finding of unexpectedly strong 2- and 4-weekly cycles in the water movements on the West Coast and in Cook Strait.

The expertise in deployment and retrieval of oceanic moorings, the associated maintenance of the instrumentation and the facility to read and analyse the records is unique within New Zealand and has been used extensively, not only in the above primary research role for which it was established, but also in a growing number of marine engineering developments both within government and by local bodies.

R.A. Heath

THE MAKING OF A CONTINENT:

NEW LAND FROM THE OCEAN ON THE EAST COAST

Slowly, in a human timescale, but surely, new land is emerging from the sea along the Hawkes Bay-Wairarapa coast, pushed up by the same crustal forces that produce earthquakes, volcanoes, and mountain ranges. It is now believed that seismic records collected on board the U.S. Research Vessel S.P. Lee in

January 1984 show deep-sea sands and muds, many kilometres thick, being scraped off the Pacific Ocean crust as it plunges beneath eastern North Island. It is by this process that continents are made.

The Earth's crust beneath the ocean floors is completely different from that beneath our feet. It is thin and dense. It is continually being created at the great ridges that bisect the major ocean basins, and destroyed millions of years later at the deep trenches that mark the edges of some oceans, most notably the Pacific. There the ocean floor is pulled back into the Earth's interior. The ocean floors are like a series of great conveyor belts that carry the thick continents like buoyant packages around the world.

Despite recent interest in the break-up of continents, or continental rift and drift, it is the process of adding to continents that now excites geologists in their search for knowledge and minerals. But the process goes on only beneath the sea. It happens at the ends of the ocean floor conveyor belts as they dive back into the Earth's interior. The position where the ocean floor dives down is marked generally by deep trenches, by great earthquakes, and by lines of volcanoes where water and other volatile material is driven off from the downgoing slab as it descends 100 km or so down into the Earth's interior.

Unfortunately for geologists trying to unravel the processes by which continents grow, most of the places where continents are growing at the present time are either politically or physically inhospitable places. The eastern side of New Zealand, from East Cape to Kaikoura, is one of the few exceptions, although it has only recently dawned on us that we are indeed witnessing a continent in the process of growing offshore from our rugged east coast.

The evidence was partly there in the onshore geology of Hawkes Bay and Wairarapa, the central part of this system. The evidence that the process was still occurring offshore was there in some early oil-company seismic profiles but this evidence was ambiguous and could be interpreted in several different ways. The answer to what processes controlled the evolution of the east coast geology was important not only academically but also in terms of the hydrocarbon potential of the offshore and onshore ridges and basins.

In 1981, R.V. Tangaroa collected additional data that showed the age and structure of the seafloor off the Hawkes Bay and Wairarapa coast. In 1982 the International Deep Sea Drilling Vessel Glomar Challenger collected more information at the southern end of the system near Kaikoura. However, none of this was conclusive. The equipment available was simply not good enough to provide a definitive answer.

An opportunity arose to study the area in more detail when the U.S. Geological Survey Research Vessel S.P. Lee was in New Zealand waters en route to the Ross Sea. American scientists suggested a joint venture to look at offshore geological hazards, notably the great submarine landslides that occur off Cape Kidnappers. The object was to compare our slumps with similar features that occur off Alaska and California. However, the sophisticated seismic equipment on board the S.P. Lee was ideal for answering questions on the underlying structure. The Americans agreed to run a seismic line across the widest part of the continental margin off southern Hawkes Bay. In return, NZOI agreed to complete the geological hazards work from R.V. Tangaroa.

What the seismic records revealed was thick layers of mud and sand beneath the 3-km-deep Hikurangi Trough. Most of this fill came from the rising Southern Alps. It was washed down rivers to the sea and then swept northwards by storms and currents until it fell into the heads of the troughs at Kaikoura and in Cook Strait. One can think of the conveyor belt of the Pacific Ocean floor trying to carry this mass of mud and sand down under North Island but, as it goes downwards, the thick deposits are scraped off in great wedges and pushed under the edge of the continental margin. Each new wedge forms a ridge with a basin to landwards but as the wedge is pushed in and

under it rotates all the older wedges and basins up the slope. It is perhaps easier to visualise if one thinks of the relative motion the other way, with the continent as a great bulldozer pushing up a mound of fill that becomes glued, or accreted, to the front of the dozer.

One of the important and almost unique features of our east coast is that, not only is the accretionary mound eloquently displayed offshore but older segments of it have been pushed up above the sea where a geologist can hit them with a hammer (or cut them with a spade). One of the most amazing parts of the record from the S.P. Lee was the startling similarity between segments of the seismic profile and diagrams that show old basins onshore near Havelock North. New ridges and basins now forming at the foot of the slope look just like the onshore basins were thought to have looked 20-25 million years ago. A basin half way up the slope matches almost line for line a section of what an onshore basin must have looked like in its middle age about 10 million years ago. Although the processing and analyses are not yet finished we are now convinced that we have, along our east coast, one of the most dramatic examples anywhere in the world of geological processes in action and a continent in the making.

For the future, several Divisions of DSIR, including DMFS, Geophysics Division, and the N.Z. Geological Survey's Petroleum and Basin Studies Group intend to co-operate to continue this work and to expand it to map the geological structure, hazards, and resources of our offshore continent.

K.B. Lewis

DETERIORATION OF LAKE ROTOITI

Lake Rotoiti is a deep lake in central North Island with a largely undeveloped catchment. It currently demonstrates a number of limnological features that are more typically found in shallow, enriched waterbodies. Water clarity is relatively poor, the bottom waters (hypolimnion) are anoxic through much of the stratification period and a blue-green algal bloom on the lake during late summer 1984 caused public concern.

The Taupo Research Laboratory (TRL) of DMFS undertook a detailed compilation of limnological data from the many government or university groups which have investigated Lake Rotoiti over the last thirty years, including TRL. This analysis demonstrated that the eutrophic features of Lake Rotoiti are recent rather than longstanding properties of the lake. Since 1955, there has been a consistent decline in water clarity, a large and possibly exponential increase in hypolimnetic oxygen demand, and a conspicuous shift in the summer phytoplankton community towards blue-green algal dominance.

Hydrodynamic investigations by TRL have identified a probable cause of the accelerated eutrophication of Lake Rotoiti. The lake receives almost 80% of its water budget from the Ohau Channel which discharges from Lake Rotorua. Earlier researchers of Rotoiti had suggested that the impact of this inflow was restricted to the far western basin, and that most of the Ohau Channel water passed directly to the nearby Lake Rotoiti outflow, the Kaituna River. From a series of bathythermograph and current-meter measurements this earlier view appears incorrect. For perhaps six months of the year, Ohau Channel water is cooler (and therefore denser) than the surface waters of Lake Rotoiti, thereby penetrating as an underflow or interflow into the main eastern basin. It is probable that the worsening condition of Lake Rotorua has had a direct effect on the water quality of Lake Rotoiti. Our future investigations aim to quantify the hydraulic relationship between Rotorua and Rotoiti with a view towards management options.

W.F. Vincent

RESEARCH ADJUNCTS

CHARTING THE SEA

Only three new charts were published in 1983-84. The completion of Mokau Sediments meant that most of the continental shelf and upper slope were now mapped for surficial sediment texture and carbonate. These charts are widely used, especially by shelf fisheries, and the NZOI data are now being incorporated into a trial "Fisheries" chart by the N.Z. Hydrographic Office in collaboration with DMFS. This chart, covering the Cook Strait region, is being developed in response to requests from local fishermen for better sea-floor information.

The bathymetry of Lakes McKerrow and Alabaster revealed for the first time the impact of the Alpine Fault on the outline and floor of Lake McKerrow. This discovery has been followed up by a more detailed survey of the fault trace by NZOI and N.Z. Geological Survey geologists.

The second edition of Pegasus coastal bathymetry updated the earlier, fathom-contoured chart. Better-navigated data, together with a closer-spaced contour interval, highlighted several major morphologic features which in turn yielded an insight into the geologic and sedimentary processes operating in this area, e.g., the bathymetry shows the Pegasus Canyon to be blocked, implying that it is no longer acting as a sediment conduit to the nearby Hikurangi Trough.

While few charts were published, the Division still maintained a steady input of material into the Department's cartographic unit. Unfortunately, dwindling staff numbers in this unit have impaired chart production. However, the unit has made exciting progress in the computer drawing of ready-for-publication charts. This research and development, currently being applied to the bathymetry of McMurdo Sound, should significantly bolster chart production and publication.

L. Carter

R.V. TANGAROA

During the 1983-84 financial year, Tangaroa spent 227 days at sea. Activities in physical oceanography, geophysics, chemistry, mineral exploration, and marine biology required the vessel to operate in areas as diverse as the Southwest Pacific and the Marlborough Sounds in support of both national and international research programmes.

Tangaroa was declared unseaworthy in February 1984 and was withdrawn from service.

Representatives of DMFS, Fisheries Research Division of MAF, the Hydrographer RNZN, and Defence Scientific Establishment met in December to formulate joint research vessel programmes for submission to the Cabinet Committee on Science and Technology.

Days at sea according to principal user -

DMFS	180
Geophysics Division, DSIR	17
Universities	30
	227

R.E. Williams

ACTIVITIES AND EVENTS

Subsequent to the annual survey and repairs to No.1 Hold carried out in Lyttelton in June 1983, measuring devices were installed and constantly monitored. No changes were detected until January 1984 when the strengthening girders, fitted in Lyttelton, were found to be distorted.

Tangaroa was dry-docked in Wellington in an attempt to establish the cause of the deformation of the girders. No specific reasons could be ascertained but the Ministry declared Tangaroa to be unseaworthy due to her general condition. This decision was announced to the ship's staff on the afternoon of Friday, 3 February. It came as a great shock to all, as everyone had been led to believe that Tangaroa was at least fit until the end of the year.

After crossing many miles of ocean and weathering all sorts of storms and conditions, it seemed that Tangaroa was to end her days without even a last fling. The demise of Tangaroa was a great loss to all who had manned her over the years. She was not just a ship, but a way of life. The following days were somewhat hazy and confused, as everyone fought with the realities of the situation.

Consequently, after a great deal of discussion, it was agreed to pay off the ship's Company on 15 February. Some officers and crew were retained to tidy up and provide an inventory of equipment. In the meantime, everyone else was sent on leave. On 12 March, the ship was handed over to the care of Brian Rees, Sandy Ewing, and Roi Williams.

Subsequently, as officers concluded their outstanding leave, they were placed in temporary positions, sent on study leave, or took up alternative employment elsewhere. As at the time of going to press, ship's staff were placed as follows :

		<u>Years of Service</u>	<u>P (Permanent)</u>	<u>T (Temporary)</u>
Neil Gillstrom	Master	11	Met Office, Wellington	(T)
Peter Scarrott	Master	10	Met Office, Wellington	(T)
Jim Wardle	Mate	8	Head Office, MOT, Wgton	(T)
Doug Teasdale	Mate	8	Deputy Harbourmaster, Gisborne	(P)
John Parsloe	2/Mate	11	Antarctic Divn, DSIR, Christchurch	(T)
Peter Allison	2/Mate	9	Met Office, Nelson	(T)
Kevin Finnigan	3/Mate	3	Study Leave, Met Office, Wellington	(T)
Stephen Banks	3/Mate	1	Study Leave, private leave	
Don Strong	Chief ^s Engr	8	Ministry of Works, Napier	(T)
Don McKelvey	Chief Engr	3	MOT Survey, Christchurch	(P)
Rob Bonner	2/Engr	11	Accounts, MOT, Christchurch	(T)
Jimmy McLean	2/Engr	1	LWOP, Other Shipping Co.	
Wally Tripp	3/Engr	3	Lighthouse Tender <u>Stella</u> , Auckland	(T)
Tom Smith	3/Engr	10	Vehicle Testing Station, MOT, Masterton	(T)
Peter Lapsley	4/Engr	7	Hospital Board, Wellington	(P)
Perry Slako	4/Engr	2	Vehicle Testing Station, MOT, Auckland	(T)
			<u>James Cook</u>	(T)

A total of 106 years service given by staff as of 1984.

As of 1 January 1985, all Tangaroa ship's officers will cease to be employed temporarily and are to be offered alternative jobs, such as Nautical Advisory Officers, Nautical and Engineer Surveyors, Customs Officers, Met. Technicians, and L.W.O.P. or redundancy. It will seem likely that many officers will be forced to seek employment elsewhere.

We all feel sad at the loss of Tangaroa and are sorry that the Oceanographic Institute are now in this situation. A sad loss for New Zealand also. We all hope that maybe a replacement will arise sometime in the future and that we may be in a position to reform our team.

I take this opportunity to bid farewell to all the staff of the Institute whom I have been associated with and thank them for the valuable experiences we have shared. Perhaps sometime in the future ... one never knows.

Peter Scarrott

TABLE : Details of cruises of R.V. Tangaroa in its 11th year of operation,
1 April 1983 to 30 January 1984.

Cruise No.	Name of Cruise	Activity	Days at Sea*
1144	West Coast V NZOI	Primary productivity studies, west coast South Island.	32
1145	Bay of Plenty Seafloor Magnetotellurics Recovery Victoria University of Wellington : Scripps Institution of Oceanography	Recovery of seafloor magneto- telluric sensors.	7
1146	Western Boundary Currents II NZOI	A study to locate the path of the deep-flowing Western Boundary Current and assess its past and present effects on the ocean floor.	18
1147	Oceanographic Instru- ment Test NZOI	Test and rectification of instru- mentation.	7
1148	Fiords Winter Seismics NZOI	A study of the sedimentology and structure of representative New Zealand estuaries.	21
1149	Norfolk Basin Geology NZOI : Auckland Uni- versity	A study to check the structural relationships of the Norfolk Basin-Three Kings Ridge and to establish the nature and age of the Norfolk Basin.	18
1150	Three Kings Otago University : U.S. scientists	Investigation of the geochemical cycles of microstructures, selected trace elements, and organic compounds in the Three Kings upwelling area and over the Lord Howe Rise.	22
1151	Bounty Three Geophysics Division, DSIR	A geophysical survey of the Bounty Trough.	17
1152	Pacific Phosphorite Profiling NZOI : U.S. Geological Survey	An ongoing study of the potential phosphorite deposits in the SW Pacific.	43
1153	<u>Atrina</u> Benthic NZOI : Canterbury University	Collection of sponges and other benthic fauna in support of anti- viral and antibacterial research. Ongoing study of kelp beds in the Marlborough Sounds.	23

* Includes departure date and arrival date

Cruise No.	Name of Cruise	Activity	Days at Sea*
1154	Oamaru Coastal Mapping NZOI	Coastal mapping and sediment study in the Oamaru offshore area.	8
1155	Farewell Fine Structure NZOI : Victoria Uni- versity of Wellington	A fine-structure study of the eddies and upwellings in the Cape Farewell and Kahurangi Shoals areas.	11

* Includes departure date and arrival date

FACILITIES AND SERVICES

LIBRARY

Library use has grown considerably over the past year. The additional workload created by the Taupo Research Laboratory staff has meant that staff are more than fully occupied with day-to-day activities. Backlogs in some areas still exist but it is difficult to overcome these without extra staffing assistance being provided.

Many established library routines have been changed as a result of the introduction of computer-based activities. Considerable benefits are resulting from knowing what other DSIR libraries hold or have on order (as a result of co-operative input into the DSIR Bibliographic Network).

Storage problems persist with yet another corridor filled with library shelving. The new library wing is urgently required.

M.G. Hardy

EDITORIAL AND PUBLICATIONS

The Division of Marine and Freshwater Science annually produces a number of publications. From the Oceanographic Institute come various series of charts as well as NZOI Records, Memoirs, Field Reports, Summaries, Miscellaneous Publications, and Hydrology Station Data. File Reports are produced by the Taupo Laboratory.

During the calendar year 1983, one book and 65 publications were produced by the Division, not including 3 charts and 7 File Reports. Since its inception in 1954, the Oceanographic Institute alone has produced, to the end of 1983, directly or indirectly (including non-Institute staff working on Institute material) 1095 published papers and reports, and 214 charts. All publications are available to the public, most being obtainable at cost. Charts, especially lake and coastal bathymetry charts, sell well and netted over \$4,600 during the 1983-84 year.

In particular, the SIPC-produced book, "Lake Taupo : Ecology of a New Zealand Lake", co-ordinated by D.J. Forsyth and C. Howard-Williams of the Taupo Laboratory, has proved popular with the public. Of the print run of 2500 copies, fewer than 700 remain to be sold. While DMFS has taken the credit for this book, it originated while the Taupo Laboratory was part of Ecology Division.

In particular, the SIPC-produced book, "Lake Taupo : Ecology of a New Zealand Lake", co-ordinated by D.J. Forsyth and C. Howard-Williams of the Taupo Laboratory, has proved popular with the public. Of the print run of 2500 copies, fewer than 700 remain to be sold.

Memoirs, Charts, and NZOI Records are sent to 499 institutions. From most of these we receive, in exchange, valuable publications in the field of marine sciences which assist in maintaining our library's standing as a centre of excellence in this field. Some of the above publications are sent on a gift basis to smaller institutions, especially in the Third World, while a list of publications is sent on an information basis to 832 addresses (in 86 countries and dependencies). These include individuals as well as institutions.

D.P. Gordon

PUBLIC RELATIONS

The Division's public relations activities cover a number of avenues : disseminating information material in response to enquiries from the public; newspaper and magazine articles; radio and television interviews or features (e.g., "Science Express"); lectures and talks; tours; and exhibits and displays.

Among the more noteworthy aspects of public relations during 1983-84 were the following.

- A new information series entitled "Research in Oceanography and Fresh Water". This illustrated series, to be produced annually, comprises popular summaries of the scientific papers and reports published during a calendar year. These are freely distributed to science teachers, media, fishermen, and DSIR information officers, among others.
- Newspaper articles appeared during 1983-84 which featured the first appearance of a key to the world's giant king-crabs; life onboard Tangaroa during a research cruise, and the value of a research vessel (also featured in "Better Business"); seafloor slumping off the Hawkes Bay coast; brachiopod research in Fiordland; and the unseaworthiness of Tangaroa. The work of Taupo scientists was given prominence when the new SIPC-produced book on Lake Taupo was published; stories also covered Taupo's studies of lakes and streams in Antarctica, and Mike Timperley's appointment to study nitrogen dynamics in Japanese lakes.
- Ken Grange appeared on 2ZB's Science Night, a radio talk-back show, discussing aspects of NZOI's biological research.
- Exhibits. A significant opportunity came in 1983 to promote the work of the Division as it relates to the fishing industry, when, at the request of the N.Z. Fishing Federation, we were invited to enter a display at the 1983 Conference and Exhibition of the Federation, held at the Overseas Passenger Terminal in Wellington from 13 May to 3 June. Six subjects were chosen as having the most relevance to the fishing industry. These were the use of side-scan sonar, SWISH, coastal sea temperatures, remote sensing of sea surface by satellite, Fiordland fishes, and oceanographic charts. Chart sales during the exhibition in fact paid for the floor space rental.

Finally, another significant display opportunity came in January 1984, when 1500 scouts at the Jamboree in Feilding saw exhibits, with a resource and conservation theme, on marine plankton, Fiordland black coral, and Fiordland fishes.

D.P. Gordon

WORKSHOPS

WORKSHOP ON SOUTH ISLAND WEST COAST PROGRAMME
OCTOBER 1983

A workshop on the South Island West Coast Programme, organised by Janet Bradford, was held in Wellington, 26-28 October, at NZOI. The main objective was to share the results of investigations carried out up to that time, and discuss their implications as they affect our understanding of ecosystem functioning. The conclusions from this workshop are being used by DMFS to guide future planning of its major strategic West Coast Ecosystem Programme.

Specialists from the Division of Marine and Freshwater Science, DSIR, Fisheries Research Division MAF, Cawthron Institute, Auckland and Canterbury Universities, and Victoria University were invited to attend. Participants produced papers or notes (see below) on their work and these were circulated to everyone before the workshop. The workshop split into two-tier discussion groups for particular areas of study. The first tier was those participants with a primary expertise in particular areas of study (e.g., physical oceanography, primary producers, bacteria, zooplankton, pelagic fish, vertebrates, benthos, sediments, demersal fish) led by a chairman who started proceedings by summarising the material relevant to the discussion group. The second tier was the remainder of the workshop participants who were invited to participate by the chairman of each session. The chairmen (Ron Heath, Tony Viner, Janet Bradford, Don Robertson, Keith Probert) were responsible for contributing to an informal report summarising our understanding at that time.

The full benefit of this workshop will not become evident for several years. Nevertheless, the workshop was very useful, in that it gave everyone a rapid overview of what is and is not known, an appreciation of the problems involved in obtaining information outside their own disciplines, and allowing a preliminary analysis to be made of how the west coast ecosystem operates.

NOTES AND PAPERS CONTRIBUTED TO THE WORKSHOP

- BRADFORD, J.M.; BATTAERD, W.; PATCHELL, G.J.; FOSTER, B. Zooplankton biomass, and composition, off the west coast South Island and western Cook Strait.
- BRADFORD, J.M.; CHANG, F.H. A consideration of factors controlling primary production off Westland.
- CAWTHORN, M.W. Cetaceans : A speculative assessment of biomass and feeding requirements on the west coast of the South Island.
- *CHANG, F.H. Winter phytoplankton and microzooplankton populations off the west coast of Westland, New Zealand, 1979.
- *CHANG, F.H.; BRADFORD, J.M. Standing stocks and productivity of phytoplankton off Westland, New Zealand, June 1979.
- FENAUGHTY, J.M.; BAGLEY, N.W.; HURST, R.J. Preliminary biomass estimates from west coast South Island bottom trawl.
- FORCH, E.C. Results of a squid research cruise to Farewell Spit, May 1981, and some ideas concerning squid nutrition.
- FRANCIS, C. West coast South Island biomass estimates.
- GILLESPIE, P.A.; MACKENZIE, A.L.; MAYS, E. Microbial distribution and activity of sediments off the northwest coast of South Island.
- GILMOUR, A.E. Spectral analysis of currents and other variables.
- *GORDON, D.P. Western South Island bryozoan distribution and diversity.
- *HEATH, R.A. Tidal observations on the west coast, South Island, New Zealand.
- *HEATH, R.A. Two and four-weekly currents on the west coast, South Island, New Zealand continental slope.

- *HEATH, R.A.; GILMOUR, A.E. Ocean current variability on the continental shelf west coast, South Island, New Zealand.
- *HEATH, R.A.; RIDGWAY, N.M. Variability of the oceanic temperature and salinity field on the west coast, South Island, New Zealand continental slope.
- KASPAR, H. et al. The nitrogen cycle in the coastal water off the west coast, South Island, New Zealand.
- KASPAR, H. et al. Nitrogen mineralisation, denitrification, and dissimilatory nitrate reduction to ammonium in New Zealand coastal and shelf sediments.
- *MACKENZIE, A.L.; GILLESPIE, P.A. Estimations of microbial metabolic activity and biomass off Westland, New Zealand, June 1979.
- MACKENZIE, A.L.; GILLESPIE, P.A. Physical, chemical, and biological oceanographic observations off the north-western South Island coast, January 1982.
- MATTLIN, R.H. Squid biomass estimates - West coast, South Island.
- MATTLIN, R.H. Population estimates for New Zealand fur seals, west coast, South Island.
- PATCHELL, G. The fish community off the west coast of the South Island.
- PATCHELL, G. Food web, west coast, South Island.
- PATCHELL, G.; BATTARDE, W. Hoki juvenile stomach analysis.
- *PRISCU, J.C.; DOWNES, M.T. Nitrogen uptake, ammonium oxidation and N_2O levels in the coastal waters of western Cook Strait, New Zealand.
- *PRISCU, J.C.; PRISCU, L.R. Photosynthate partitioning by phytoplankton in a New Zealand coastal upwelling system.
- *PROBERT, P.K. Benthic structure and function of the west coast ecosystem : a first assessment.
- *PROBERT, P.K.; SWANSON, K.M. Sedimentary environment of the continental shelf and upper slope off the west coast of the South Island, New Zealand.
- RIDGWAY, N.M. Sea surface temperature variations measured at coastal sites on the west coast, New Zealand.
- ROBERTSON, D.A.; GRIMES, P.J. Some introductory comments on mesopelagic fish of the west coast of the South Island.
- *STOFFERS, P.; PLUGER, W.; WALTER, P. Geochemistry and mineralogy of continental margin sediments from Westland, New Zealand.
- SWANSON, K.M. Podocypid Ostracoda : Towards a biostratigraphy for the South-west Pacific.
- VAN DER BROEK et al. Catch composition, Challenger Plateau, 1983.
- VINER, A. Summary of information on the primary processes in the west coast study region.
- WILKINSON, V.; JAMES, M. Biomass, carbon ingestion, and ammonia excretion characteristics of the zooplankton assemblage associated with the Cape Farewell - South Taranaki Bight upwelling plume.
- * These have been published or accepted for publication.

J.M. Bradford

ZOOLOGICAL RECORD SEMINAR

The Institute was host to a one-day seminar on Zoological Record held in September 1983. Ms Barbara Bird, the BIOSIS Field Representative for this area gave an interesting and informative seminar on using the Zoological Record database online to 23 librarians and scientists.

M.G. Hardy

IN-HOUSE SEMINARS

During the year, in-house seminars are held at both NZOI and Taupo. These are contributed by staff or visitors and focus on work in progress or recently completed.

NZOI

1983	8 April	Significance and importance of drift algae W.A. Nelson, NZOI
	22 April	Factors influencing primary productivity on the West Coast, Winter 1979 J.M. Bradford, NZOI
	3 June	Remote sensing of the circulation of the East Coast, New Zealand E.J. Barnes, R.A. Heath, NZOI
	14 June	Chemical compounds from marine organisms M. Munro, University of Canterbury
	17 June	Effects of temperature, salinity, and light on the growth of hypersaline algae F.H. Chang, NZOI
	1 July	Charting at NZOI : A discussion of philosophy, procedures, and future directions L. Carter, NZOI
	15 July	Current variability, South Island west coast R.A. Heath, NZOI
	29 July	Faunal modification of sediment P.K. Probert, NRAC Fellow, NZOI
	12 August	Shelf development on fetch-limited shores, plus a brief resumé of marine geoscience on Canada's west coast R.A. Pickrill, NZOI
1984	10 February	What diatoms reveal about the Eocene-Oligocene boundary in DSDP cores J. Fenner, Visiting Scientist, University of Kiel
	22 February	The Lagrangian approach to oceanic diffusion, plankton patchiness, and internal waves B. Sanderson, University of British Columbia
	9 March	Oligocene-Miocene tectonic history of the seafloor from Northland to East Cape J.V. Eade, NZOI
	23 March	The Library in 1984 M.G. Hardy, NZOI

TAUPO

1983	14 April	Allochthonous humic matter : Another (?) missing link in the carbon metabolism of lakes K. Salonen, Visiting Scientist, University of Helsinki
------	----------	---

- 21 April Recent developments in nitrogen technology
M.H. Timperley, Taupo
- 28 April Effects of catchment topography and diversity of
limnological processes in some British Columbian
lakes
T. Northcote, University of British Columbia
- 22 July Limnology of Lake Rotongaio
A.B. Viner, D.J. Forsyth, M.T. Downes, Taupo
- 26 August Aquatic ecosystems of South America
W.F. Vincent, Taupo
- 16 September Biological models for Pinus radiata stands
P. Beets, Forest Research Institute, Rotorua
- 17 October Microbial ecology of shallow estuarine systems
D. Moriarty, CSIRO, Brisbane
- 4 November Nitrogen cycling in Lake Titicaca
W.F. Vincent, Taupo
- 1984 22 February Soil absorption of nutrients in wastewater
R. Ward, University of Colorado
- 27 February Carbon isotope ratios in freshwaters of central
North Island
B. McCabe, University of Waikato
- 23 March Limnological studies in Japan
M.H. Timperley, Taupo

OVERSEAS TRAVEL

G.W. Coulter	February 1982- January 1984	Deputy Director, South Pacific Forum Fishing Agency, Honiara, Solomon Islands
D.J. Cullen	March 1984	Second International Seminar on Offshore Mineral Resources, Brest, France
J.V. Eade	June-July 1983	Attended the Tripartite Cruise planning meeting, Washington, D.C. Also visited Lamont-Doherty Geo- logical Observatory, New York; USGS, Menlo Park; Hawaii Institute of Geophysics, Honolulu.
	3-7 October 1983	Attended the CCOP/SOPAC-IOC-UNU Workshop on Basic Geo-scientific Marine Research required for Assessment of Mineral and Hydro- carbons of the South Pacific, Suva Fiji
	11-20 October 1983	Attended CCOP/SOPAC Twelfth Annual Session, Nuku'alofa, Tonga.
	December 1983	Visited Tarawa, Kiribati, as Minerals Adviser to Kiribati Government.
G.P. Glasby	3-7 October 1983	Attended the CCOP/SOPAC-IOC-UNU Workshop on Basic Geo-scientific Marine Research required for Assessment of Mineral and Hydro- carbons of the South Pacific, Suva Fiji
K.R. Grange	20 October- 13 November 1983	Visited Woods Hole Oceanographic Institute; University of Connect- icut; Yale University, in con- nection with future directions in benthic ecology at NZOI; Univer- sity of Hawaii re black coral research.
R.A. Heath	19-24 September 1983	Attended IOC Third Session of the Programme Group for the Western Pacific, Townsville, Queensland.
C. Howard-Williams	July-August 1983	"Wetlands in Perspective" Workshop and UN/SCOPE Working Group on African Wetlands, in South Africa
D.E. Hurley	19-24 September 1983	Attended IOC Third Session of the Programme Group for the Western Pacific, Townsville, Queensland.
K.B. Lewis	September 1983	IOC Workshop to prepare the Geo- science Programme for the WESTPAC Third Session of the Programme Group, Townsville, Queensland.
	March 1984	Pre-cruise meeting to assist plan- ning for Japanese Indo-Pacific Plate Boundary Project cruise to northern end of Tongan Arc, in Tonga.

N.M. Ridgway	13-17 April 1983	Attended Eighth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Suva, Fiji.
B.R. Stanton	November 1982- November 1983	Study leave at the Institute of Oceanographic Sciences, Wormley, Surrey, U.K.
R.M.C. Thompson	11-20 October 1983	Attended CCOP/SOPAC Twelfth Annual Session Nuku'alofa, Tonga.
M.H. Timperley	July 1983- January 1984	DSIR Study Award in Japan
W.F. Vincent	February 1982- August 1983	Director of NSF-funded research programme at Lake Titicaca (Peru/Bolivia) per the University of California, Davis.
A.B. Viner	April 1983	SCOPE Workshop on Wetlands and Shallow Water Bodies, Hatyai, Thailand.
E. White	August-October 1983	Attended 22nd Congress of International Association of Limnologists at Lyon, France, and worked at Freshwater Biological Association in U.K.

HONOURS AND AWARDS

Mike Timperley	DSIR Study Award for six months to investigate atmospheric nitrogen inputs into Lake Biwa, Japan.
----------------	---

VISITING WORKERS

NZOI

Dr Juliane Fenner	Visiting Deutscher Akademischer Austauschdienst (DAAD) Fellow, to study diatom taxonomy for the interpretation of Early and Middle Tertiary palaeoceanography, March 1983 to December 1983.
Dr P. Keith Probert	NRAC Fellow, to work on marine benthic productivity for three years, 26 November 1981 - November 1984.

TAUPO

Dr John C. Priscu	University of California, Davis, for 18 months working on phytoplankton ecology.
Dr Kalevi Salonen	Lammi Biological Station, University of Helsinki, Finland, for six months to study seasonal and spatial changes in carbon content of zooplankton, to April 1983.
Dr Robert H. Spiegel	Department of Civil Engineering, University of Canterbury, for one year working on lake hydrology.

Dr W.C. Burnett	Florida State University, Tallahassee
Dr Wayne V. Burt	Oregon State University, Corvallis
Dr Monty Hampton	U.S. Geological Survey, Menlo Park, California
Dr Keith Kvenvolden	
Dr K.W. Kieninger	The Hydrographic Society, Norfolk, Virginia
Dr Mark Ohman	University of Washington, Seattle
Dr R. Ward	University of Colorado, Denver

RESEARCH CONTRACTS

Two research contracts to universities were current during 1983-84. These were :

UV/5/21 to Dr K.A. Hunter, Chemistry Department, Otago University -

Trace Metals Essential to Phytoplankton

Aim: To determine the systematic relationships between the classical micro-nutrients (phosphate, nitrate, silica) and biologically important trace metals like Cu, Ni, Cd, with a view to understanding the micro-nutrient role of trace metals in productivity and their usefulness as oceanographic tracers.

D-39 to Mr A.J. Macpherson, Geology Department, Victoria University of Wellington -

Granite Harbour Sedimentation Study

Aim: To identify the main sources, transport processes, and sinks in the Mackay Glacier Granite Harbour system (Antarctica), and to determine rates as far as is possible in order to construct a sedimentary model for this system.

OBITUARY

FRED PARKER 1911-1983

James Frederick ("Fred") Parker (born 16 April 1911), who was a well-known NZOI identity in the Thorndon Quay days, died 9 June 1983. Fred, who was a World War II veteran, was captured in Crete and finished the War in a POW camp in Poland. Upon his return to New Zealand he was a founding member of the Kiwi Carrying Company and operated his own business until joining the Institute in February 1964 as storeman/driver. In addition to his normal duties, Fred participated in a number of field trips and ocean cruises, and took a prominent role in our social and sporting activities. He will be especially remembered for his cheerful nature and his amusing anecdotes, particularly about his war experiences and his fishing exploits. When Fred retired in January 1976 he was the first NZOI staff member to do so.

Norm Ridgway

OFFICES HELD

List of staff holding office in International Bodies, Scientific Societies, Committees, etc. 1983-84.

INTERNATIONAL BODIES

- L. Carter *International Union of Geological Sciences (IUGS)*
National Representative, Commission for Marine Geology
- D.J. Cullen *International Geological Correlation Programme (IGCP)*
Project 156 (Phosphorites)
National Representative/Correspondent for Working Group
on "Young Phosphogenic Systems" (UNESCO-IUGS)
- Society of Economic Paleontologists and Mineralogists*
Trace Fossil Research Group with special interest in
animal/sediment relationships
- Editorial Board of*
Palaeogeography, Palaeoclimatology, Palaeoecology
- E.W. Dawson *Pacific Science Association (PSA) Scientific Committee*
on Coral Reefs
Chairman of Special Working Group on South Pacific Reefs
- International Association of Biological Oceanography*
(IABO) Coral Reef Committee
Member
- J.V. Eade *Committee for the Co-ordination of Joint Prospecting*
for Mineral Resources in South Pacific Offshore Areas
(CCOP/SOPAC)
Alternative New Zealand Representative
- Inter-Union Commission on the Lithosphere (ICL) Co-*
ordinating Committee 3. Geosciences within Developing
Countries
Corresponding Member
- G.P. Glasby *Editorial Board of*
Marine Geology
- D.P. Gordon *International Association of Biological Oceanography*
(IABO-IUBS)
National Correspondent
- R.A. Heath *International Union of Geodesy and Geophysics (IUGG)*
Tsunami Committee

- R.A. Heath *Intergovernmental Oceanographic Commission (IOC)*
1. WESTPAC - Technical Correspondent for Physical Oceanography
 2. WESTPAC - Chairman of Task Team on Coastal Continental Shelf Oceanography
 3. Member - Scientific Committee on Oceanic Research Working Group "General Circulation of the Southern Ocean"
 4. Member - Climate Changes in the Ocean Working Group on "Critical Aspects of the T and S Distribution"
- C. Howard-Williams *Editorial Board of*
Revue d'Hydrobiologie Tropicale
- UN/SCOPE Committee on African Wetlands*
 Member
- D.E. Hurley *Intergovernmental Oceanographic Commission (IOC)*
 Joint National Contact
- IOC/WMO - IGOSS Bathy/TESAC Operational Programme*
 National Co-ordinator
- Scientific Committee on Oceanic Research (SCOR)*
 New Zealand Nominated Member
- Advisory Editor*
Crustaceana
- K.B. Lewis *Intergovernmental Oceanographic Commission (IOC)*
 New Zealand Correspondent on Geoscience for WESTPAC
- Japan-Australia-New Zealand Joint Indian-Pacific Plate Boundary Project*
 New Zealand Scientific Co-ordinator
- Inter-Union Commission on the Lithosphere (ICL)*
 Convener of National Committee for the Lithosphere
- N.M. Ridgway *Intergovernmental Oceanographic Commission (IOC)*
1. International Co-ordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) - Chairman and National Contact
 2. WESTPAC - Member of Programme Group
- B.R. Stanton *International Association of Physical Science of the Oceans (IAPSO)*
 National Correspondent

- B.R. Stanton *International Oceanographic Commission (IOC)*
 1. WESTPAC - Scientific Committee on Ocean Circulation
 Member
 2. Bathy/TESAC Operational Programme
 National Co-ordinator
- Responsible National Oceanographic Data Centre
 National Correspondent
- A.B. Viner *Editorial Board of*
Revue d'Hydrobiologie Tropicale
- NEW ZEALAND BODIES**
- J.M. Bradford *National Committee on Oceanic Research*
 Member
- L. Carter *N.Z. Marine Sciences Society Committee*
 Member
- F.H. Chang *Shellfish Sanitation Committee*
 Member
- E.W. Dawson *National Museum of New Zealand*
 Honorary Research Associate
- J.V. Eade *Royal Society of New Zealand*
 Expeditions Committee
- Scientific Ocean Drilling Subcommittee of the National
 Committee for Geological Sciences
 Chairman
- N.Z. National Committee for the Tripartite Joint Pro-
 gramme of Marine Geoscientific Research and Mineral
 Resource Studies of the South Pacific Region
 Member
- D.J. Forsyth *N.Z. Limnological Society*
 Secretary/Treasurer
- K.R. Grange *Wellington Shell Club Committee*
 Member
- C.H. Hay *National Museum of New Zealand*
 Honorary Research Associate

R.A. Heath

National Committee for Geodesy and Geophysics
Member

N.Z. Marine Sciences Society
Committee

D.E. Hurley

Royal Society of New Zealand
Honorary Librarian
Chairman of Library Committee

Ross Dependency Research Committee
Appointed Member
Convener, Biology Working Group

K.B. Lewis

*Scientific Ocean Drilling Subcommittee of the National
Committee for Geological Sciences*
Member

P.A. Luckens

N.Z. Ecological Society
Council

N.Z. Committee for Water Pollution Research
Member

INTERDEPARTMENTAL COMMITTEES

L. Carter

Hydrographic Policy Working Party
Member

DSIR Cartographic Management Committee
Member

E.W. Dawson

Outlying Islands Reserves Committee
Member

D.E. Hurley

Hydrographic Policy Working Party
Member

N.Z. Journal of Marine and Freshwater Research
Chairman of Advisory Board

N.M. Ridgway

*National Civil Defence Warning Systems Planning Com-
mittee*
Member

E. White

Freshwater Fisheries Advisory Council
Member

NWASCO - Research and Survey Committee
Member

RESEARCH PROGRAMMES AND PROJECTS

The research of the Division of Marine and Freshwater Science is centred on the New Zealand Exclusive Economic Zone. The long-term research of the Division is guided by nine scientific objectives. The extensive research needed to achieve these objectives is executed through a series of science programmes, each comprising research projects.

Arranged below, by programme, are the current research projects being undertaken by the Division's scientists and technicians.

PROGRAMME - WEST COAST ECOSYSTEM

The objective of this programme is to evaluate the overall ecosystem on the South Island west coast and western Cook Strait continental shelf and slope and thus identify the major interactions of the various living and non-living aspects of the environment. Particular attention is being given to biological productivity and the influence that environmental variation has on the transfer of nutrients through the food chain to animals of economic importance.

The West Coast region currently under study extends from Jackson Bay in the south to Cape Egmont in the north, and includes western Cook Strait. It has importance because of its special impact upon New Zealand's economic fish species. The southern part of the region off Westland is the focus of winter breeding of a number of commercial fish species. Hoki are of particular importance because they migrate from all around New Zealand to breed off Westland, which is the location of a winter fishery for this species. In summer, squid and albacore, among other species, are taken here. Western Cook Strait supports a major squid fishery and appears to be the nursery of large numbers of juvenile fish, (e.g., hoki, tarakihi, jack mackerel, barracouta).

78-32 Influence of Physical Environment on Primary Production

This is an investigation, via simple models, of the possible influence of the depth of the mixed layer in controlling primary production around New Zealand.

R.A. Heath

In association with : J.M. Bradford
NZOI

Duration of project : 1978-84

Progress 1983-84 : Paper redeveloped for final preparation,
("Relevance of models in New Zealand research")

The following projects were begun under the title "79-19 West Coast Project - Plankton", the first phase of which (retroactively numbered 79-19.1) has been completed and published [Bradford, J.M. 1983: Physical and chemical oceanographic observations off Westland, New Zealand, June 1979. N.Z. J. mar. Freshwat. Res. 17(1) : 71-81.]

79-19.2 Standing Stocks and Productivity of Phytoplankton off Westland, New Zealand, June 1979

The South Island west coast and western Cook Strait are the location of several developing fisheries. Although the offshore waters of the Tasman Sea are oligotrophic, coastal waters on which these fisheries depend are apparently much more productive. This project sought to describe the standing stocks and productivity of phytoplankton in winter and assess the factors governing primary

productivity, particularly the role of physical processes.

F.H. Chang

In association with : J.M. Bradford, R.P. Baldwin
NZOI

Duration of project : 1979-84

Progress 1983-84 : Final draft prepared and approved and MS sent to N.Z. Journal of Marine and Freshwater Research.

79-19.3 **Winter Phytoplankton and Microzooplankton Populations off Westland, New Zealand**

The aim of this study was to quantify the winter phytoplankton and microzooplankton, describe the relative abundance of each group, and analyse results in relation to the physical and chemical environment.

F.H. Chang

In association with : R.P. Baldwin
NZOI

Duration of project : 1979-83

Progress 1983-84 : Completed

Publications 1983-84 : Chang, F.H. 1983: Winter phytoplankton and microzooplankton populations off the coast of Westland, New Zealand, 1979. N.Z. J. mar. Freshwat. Res. 17(2) : 279-304.

79-19.4 **Quantitative Distribution of Zooplankton off Westland**

This project was aimed at describing the distribution, biomass, and composition of zooplankton in summer and winter and assessing the factors controlling distribution.

J.M. Bradford

Duration of project : 1979-84

Progress 1983-84 : Essentially completed. The analysis of the summer samples was completed and the winter MS expanded to include the summer data. A final draft was completed and approved and is awaiting the completion of figures.

79-19.5 **Summer Standing Stocks and Productivity of Phytoplankton off Westland, New Zealand**

This project aims to describe the standing stocks and productivity of phytoplankton in summer and to assess the factors governing primary production, particularly the role of physical processes.

J.M. Bradford

In association with : F.H. Chang, R.P. Baldwin, B.E. Chapman
NZOI

Duration of project : 1979-84

Progress 1983-84 : Most of the first draft of a paper was completed (introduction, methods, results, diagrams). It was put aside until the cell organic carbon, calculated from cell counts and volumes, was completed. Species

identities and counts, recently completed by FHC, and calculations are in progress.

79-19.6 **Summer Phytoplankton and Microzooplankton Populations off Westland 1982**

This project aims to quantify the summer phytoplankton and microzooplankton populations, describe the relative abundance of each group, and analyse results in relation to the physical and chemical environment.

F.H. Chang

Duration of project : 1979-85

Progress 1983-84 : Cell counts of phytoplankton and microzooplankton were completed. For accurate identification of some phytoplankton and microzooplankton species, further transmission and scanning electron microscope work has to be done at PEL.

79-19.7 **Distribution of Zooplankton and their Grazing Pressure on Phytoplankton**

This project aims to describe the distribution, biomass, and composition of the zooplankton in the upwelling plume system extending from the Kahurangi Shoals - Cape Farewell area; and the grazing impact of some of these organisms on the phytoplankton. An assessment will be made of the factors governing zooplankton distribution.

J.M. Bradford

In association with : B.E. Chapman
NZOI

W.R. Battaerd, M.R. James
Taupo

Duration of project : 1979-85

Progress 1983-84 : WRB and BEC completed identification and enumeration of net and pump samples. BEC completed data entry and verification and population analysis. JMB plotted distributions and began the first draft of MS. Background fluorescence was calculated for Paracalanus indicus by BEC.

79-19.8 **Plankton and Nutrient Relationships in a Nearshore Region**

This project aims to contribute to an understanding of the relationship of offshore phytoplankton, zooplankton, and inorganic nutrient distributions to the nearshore region.

J.M. Bradford

In association with : B.E. Chapman, R.A. Heath
NZOI

P.H. Woods
Taupo

Duration of project : 1979-85

Progress 1983-84 : Analysis was made of zooplankton biomass and chlorophyll a data in relation to existing data for the West Coast Workshop. PHW began the dissolved inorganic nutrient analysis.

79-19.9 **Assessment of Annual Variation in Summer Phytoplankton**

This projects aims to assess year-to-year variation in summer standing stocks and primary productivity.

F.H. Chang

In association with : R.P. Baldwin
NZOI

P.H. Woods
Taupo

Duration of project : 1979-86

Progress 1983-84 : Carbon-14-uptake and chlorophyll data have now been processed. Nutrient samples collected on a 1983 cruise have yet to be analysed at Taupo.

79-19.10 **Chemical Data from a West Coast Cruise**

This project involves the calculation and tabulation of chemical nutrient data from Cruise 1144.

M.T. Downes

In association with : V.H. Wilkinson, P.H. Woods
Taupo

Duration of project : 1979-85

Progress 1983-84 : Most of the data were extracted from the autoanalyser charts and the 'T' and 'S' station data stored on the VAX computer. Careful checking of the data and reliability assessments are still required.

80-1.1 **West Coast Currents and Hydrology**

This study of temporal variability of the physical oceanography of the west coast South Island is a component of a multi-disciplinary approach involving productivity studies.

R.A. Heath

In association with : A.E. Gilmour, N.M. Ridgway
NZOI

Duration of project : 1980-84 (in this form)

Progress 1983-84 : Three papers completed and submitted.

Heath, R.A.; Ridgway, N.M. (in press): Variability of the oceanic temperature and salinity field on the west coast continental shelf. N.Z. J. mar. Freshwat. Res.

Heath, R.A. Meteorologically and tidally driven one-to-four-weekly currents on the west coast, South Island, New Zealand continental shelf. Submitted to Cont. Shelf Res.

Heath, R.A.; Gilmour, A.E. Ocean variability on the continental slope and west coast, South Island, New Zealand continental shelf. Submitted to Cont. Shelf Res.

80-9

Cook Strait Productivity

Cook Strait is an area of several kinds of fishing activity and appears to be a nursery area for the larvae of many species. The relationship of processes bringing about surface nutrient renewal (including tidally-induced mixing) to phytoplankton standing crop and primary productivity in Cook Strait has been investigated.

M.J. Bowman
(State University of
New York,
Stony Brook)

In association with : P.L. Lapennas, R.A. Murtagh
State University of New York, Stony Brook
F.H. Chang, J.M. Bradford
NZOI
V.H. Wilkinson
Taupo

Duration of project : 1980-84

Progress 1983-84 : Little progress was made. A paper is being drafted for circulation among co-authors.

80-21T

Analysis of Seawater Nutrients by Carbon/nitrogen Analyser

This project involves the development of chemical methods for analysing plant micronutrients in seawater.

M.T. Downes

In association with : P.H. Woods, S.E. Pickmere
Taupo

Duration of project : 1980-84

Progress 1983-84 : Testing with pure compounds suggests the sensitivity of the carbon/nitrogen analyser is now adequate for approximately 70% of the samples collected on Cruise 1144.

81-17

West Coast Benthos

This project is an assessment of the role of the benthos in the South Island west coast shelf/upper slope ecosystem, particularly with regard to the transfer of energy from pelagic production, through the benthos to bottom-feeding predators, especially demersal fish.

P.K. Probert

In association with : P.W. Anderson, B.E. Chapman, R.J. Singleton
NZOI

Duration of project : 1981-84 (3-year NRAC Fellowship)

Progress 1983-84 : Sediment data were analysed and a paper completed (in conjunction with K.M. Swanson, University of Canterbury); analysis of macrobenthic communities is almost finished, the macrobenthic biomass data analysed and a MS in prep.; a comparison of macrofaunal biomass and population-density data, obtained by box corer and anchor-box dredge, was

carried out and a draft MS prepared; analysis of meiofaunal samples is underway; preliminary sorting of epibenthic samples was carried out; a summary paper on the role of the benthos in the west coast ecosystem is in preparation.

Papers in press or in preparation are :

Probert, P.K. (in press): Disturbance, sediment stability, and trophic structure of soft-bottom communities. J. mar. Res. (42(4)).

Probert, P.K.; Swanson, K.H. (in press): Sedimentary environment of the continental shelf and upper slope off the west coast of the South Island, New Zealand. N.Z. J. mar. Freshwat. Res.

83-7 Circulation as Implied by the Distribution of Mixed Layer Depth

An investigation of when and how the current velocity can be evaluated from the distribution of mixed layer depth.

R.A. Heath

Duration of project : 1983-84

Progress 1983-84 : Completed

Publications 1983-84 : Heath, R.A. 1984: The depth of the mixed layer as an indicator of the oceanic circulation around New Zealand. N.Z. J. mar. Freshwat. Res. 18(1) : 83-92.

PROGRAMME - THE MARINE BENTHOS OF THE NEW ZEALAND EXCLUSIVE ECONOMIC ZONE

The objective of this programme is to sample communities on the seafloor of the New Zealand region and relevant areas in the Southwest Pacific and the Southern Oceans :

1. to identify the component species;
2. to describe community composition and, ultimately,
3. to determine the significance of each component in the flow of energy in the ocean ecosystem.

Before the establishment of the N.Z. Oceanographic Institute, little was known of the benthic fauna and flora of the oceans surrounding New Zealand, the species present, their overall distribution, and their interactions with the marine environment. A programme of qualitative dredge sampling of the benthos was therefore initiated in the 1950s with the resulting biological collections available for examination by both NZOI and outside specialists. It was anticipated that these results besides being of interest in themselves would, together with the expertise developed, be required for more definitive studies. Amongst these studies are those of assessing the role of the benthos in the marine food web, assessing the likely effects of resource exploitation, and evaluating the role of inter-specific competition in stimulating benthic organisms to produce substances which have antibacterial and antiviral activity.

Specific Successes

The discovery and description of benthic animals has resulted in the publication of 200 papers and major monographs.

The enormous and nationally valuable biological collection represents approximately 135,000 taxonomic group collections. The collection information

is being computerised and, as a result of this procedure, an 'atlas' on the distribution of conspicuous macrobenthic species is being produced.

While the programme is biased towards the benthic animals, the seaweed flora has not been ignored. Some work has been done in conjunction with the National Museum.

A comprehensive photographic record of deep-water benthic organisms over much of the New Zealand region has been assembled.

69-4 **Distribution of New Zealand Benthic Bivalves**

This project is associated with the surveying and documentation of the New Zealand marine biota, and their distribution and abundance. As shells persist after the death of the organism, a record remains of the growth rate, size, and sometimes the cause of death. The size distribution of live animals and dead shell is related to the biology, including the rate of turnover.

P.A. Luckens

Duration of project : 1969-86

Progress 1983-84 : Texts for two NZOI Marine Faunal Records were completed in 1983 (Tawera mawsoni, T. bollonsi) but the benthic station input data are not completed to print the distributional base maps. The final MS of "Distribution, size frequency, and growth-ring analyses of living and dead Tawera mawsoni (Bivalvia : Veneridae) at Macquarie Island" is nearly completed. Figures are to be finalised and then drafted.

70-1 **Lithodid Crabs of New Zealand and the Pacific**

The family Lithodidae, typified by the king crabs of Alaska, is widespread in deep waters of the Pacific and Southern Oceans. A study of the systematics, ecology, and fisheries potential of the four New Zealand species is providing much of importance to the world-wide interest in the commercial exploitation of this group, as well as providing an informed basis for any future local industry.

E.W. Dawson

In association with : Dr J.C. Yaldwyn
National Museum of New Zealand

Duration of project : 1970-86

Progress 1983-84 : Two MSS are in press (below); others are in a stage of advanced preparation (including two to be presented at the First International Kingcrab Symposium, Alaska, January 1985 ("Taxonomic and biogeographic review of the Lithodidae of the World, and Bibliography of the Lithodidae and their fisheries"; "Reports on Lithodidae from New Caledonia and from the Indian Ocean"). Steady progress was made on a monograph of New Zealand species.

Publications 1983-84 : Dawson, E.W.; Yaldwyn, J.C. (in press): Lithodes nintoku Sakai; a deep-water stone crab (Crustacea, Anomura, Lithodidae) newly recorded from Hawaii. Pacif. Sci.

Yaldwyn, J.C.; Dawson, E.W. (in press): A world key to Lithodidae (Crustacea, Decapoda, Anomura). J. crustacean Biol.

74-1

The Chatham Rise Benthos and its Environmental Significance

The role of the benthos in this resource-significant area is being studied, initially through distributions, then by considering benthic processes of critical significance in possible environmental disturbance.

E.W. Dawson

Other Programme

Affiliation : Environmental Assessment

Duration of project : 1974-86

Progress 1983-84 : A preliminary account of the likely effects of phosphorite mining on the benthic fauna has been completed, indicating the need to concentrate on a critical path approach, in this case the trophic roles of the major benthic components. Future work will develop the role of individual species and groups such as the dominant Polychaeta and Gastropoda.

76-6

New Zealand Echinoderms

This is initially a taxonomic study of the New Zealand fauna. Sufficient samples should be available for analysis of distributional patterns within the various groups, and the possible correlation of these with major features of the environment.

D.G. McKnight

Duration of project : 1976-89

Progress 1983-84 : Some more material was examined and a paper brought to MS stage. Further papers await examination of additional samples.

Publications 1983-84 : McKnight, D.G. 1984: Prionocidaris australis (Ramsay) (Echinoidea : Echinodermata) from north-eastern New Zealand. NZOI Rec. 4(10) : 135-36.

McKnight, D.G. (in press): Book Review : Echinoid Palaeobiology by A. Smith. N.Z. Jl Geol. Geophys.

76-9

Natant Shrimps of the New Zealand EEZ

This project aims to identify and determine the distribution of benthic natant shrimps from the Exclusive Economic Zone.

W.deL. Main

In association with : Dr J.C. Yaldwyn
National Museum of New Zealand

Duration of project : 1976-88

Progress 1983-84 : One paper is about to be submitted. Identification and distribution of NZOI specimens is almost completed.

Main, W.deL.; Yaldwyn, J.C. (in prep.): A new stylodactylid crab from New Zealand and Kermadec Island waters, with notes on characters of the genus Stylodactylus (Decapoda, Natantia, Caridea).

78-23

The Bathyal Fauna of the EEZ

Faunal composition, zonation, diversity, and trophic relationships of the bathyal fauna of the EEZ. This project seeks to determine the role played by the larger bottom-living marine invertebrates in the ecosystems of which the fisheries and other exploitable resources of the EEZ form a major part and in the productivity and predictability of marine biological resources generally.

E.W. Dawson

Other Programme

Affiliation : Environmental Assessment

Duration of project : 1978-86

Progress 1983-84 : Several other hitherto discrete projects (69-2, 75-5 [in part], 77-19 [in part], 78-29, 79-28) have been incorporated into this "bag" project. Substantial progress has been made towards a method of publishing much of the large mass of accumulated museum data by way of individual species distribution and identification charts, as a serial atlas of the New Zealand benthic fauna, the first parts of which are nearly finished. Joint work on the brachiopod project with Dr Daphne Lee (University of Otago) continues.

78-24

Bathycrinids of Indian and Pacific Oceans

Samples from the Galathea expedition and the U.S. National Museum have been examined. This project relates to 81-4 (q.v.) in that bathycrinids may be useful if rather rare indicators of environmental types. Measurements suggest some useful taxonomic characters within the group.

D.G. McKnight

Duration of project : 1978-84

Progress 1983-84 : A draft MS has been completed.

78-25

Coral Reef Fish Distributions in North Tasman and Coral Seas

The North Tasman Sea has several fish in common with Australia, New Zealand, and the Kermadecs, but there are also many endemic species. Zoogeography of the area may indicate recruitment areas for the New Zealand fish fauna, especially newer arrivals. Collation of data and photographs from several cruises should result in a coloured publication capable of being sold. This has not been done before for this area.

K.R. Grange

R.J. Singleton

Duration of project : 1978-84

Progress 1983-84 : Completed

Publications 1983-84 : Grange, K.R.; Singleton, R.J. (in press): A guide to the reef fishes of Palmerston and Suvarrow Atolls, Cook Islands. N.Z. oceanogr.Fld Rep. 21.

78-26

Hermatypic Corals of the North Tasman Sea

This area includes the southern limit of reef-building or hermatypic corals and the systematics and ecology of the genera appear to differ from those found within the tropics. Each isolated atoll has a collection of endemic forms. This project aims :

1. To identify the major coral genera and their distribution throughout the Tasman Sea;
2. To describe the coral zonation with depth at Palmerston Atoll, Cook Islands

K.R. Grange

In association with : R.J. Singleton
NZOI

Duration of project : 1978-84

Progress 1983-84 : Part 1 completed. Part 2 pending.

Publications 1983-84 : Grange, K.R.; Singleton, R.J. 1983: Elizabeth and Middleton Reefs : Australia's lonely atolls. Aust. Nat. Hist. 21(2) : 76-79.

79-22

Echinoderm Fauna of the Southwest Pacific

This project is a study of the taxonomy and distribution of echinoderms from areas peripheral to New Zealand.

D.G. McKnight

Duration of project : 1979-84

Progress 1983-84 : Several papers were completed and submitted. Only one remains in MS form.

Publications 1983-84 : McKnight, D.G. 1984: Astrocladus tonganus Döderlein (Ophiuroidea : Echinodermata) at the Kermadec Islands. NZOI Rec. 4(11): 137-38.

McKnight, D.G. 1984: Echinoderms from Macquarie Island and the Macquarie Ridge. NZOI Rec. 4(12) : 139-47.

McKnight, D.G. (in press): Some Cook Island Echinoderm records. Rec. Natn. Mus.

McKnight, D.G. (in press): Echinoderms from the Minerva Reefs, South-west Pacific Ocean. Rec. Natn. Mus.

80-11

Pennatulacea (Sea-Pens) of New Zealand

Initial studies focus on taxonomy but the main thrust is on distribution. There is little previous New Zealand work, but the number of species appears limited. Pennatulaceans could be ideal indicator species, when the fauna is known.

D.G. McKnight

Duration of project : 1980-86

Progress 1983-84 : None (other work was attended to).

80-13

Free-living Axinellid Sponge from Chatham Rise - Morphology and Ichnology

Description of morphology, ichnology, and taxonomy of a very unusual free-living, large sponge discovered on Chatham Rise

(initially by underwater TV) in 1978, and actually sampled in 1981.

D.J. Cullen

In association with : Prof. P.R. Bergquist
Auckland University

Duration of project : 1980-85

Progress 1983-84 : None. Contact is to be renewed with PRB.

80-14 **Hawke Bay Invertebrate Communities**

The purpose of this project is to identify the major invertebrate communities in Hawke Bay from data collected on past cruises.

K.R. Grange

In association with : D.E. Hurley, P.W. Anderson
NZOI

Duration of project : 1980-85

Progress 1983-84 : Original field data have been collated, processed, and tabulated ready for data entry.

80-22 **Bryozoa of Western South Island**

This project is an assessment of the identity and diversity of the bryozoans from an area of New Zealand never before studied in this regard, partly in conjunction with the West Coast Project.

D.P. Gordon

Duration of project : 1980-85

Progress 1983-84 : All SEM work was completed and the first of two memoirs from this project completed and submitted.

Publications 1983-84 : Bradstock, M.; Gordon, D.P. 1983: Coral-like bryozoan growths in Tasman Bay and their protection to conserve commercial fish stocks. N.Z. Jl mar. Freshwat. Res. 17 : 159-63.

Gordon, D.P. (in press): The marine fauna of New Zealand : Bryozoa : Gymnolaemata (Ctenostomata and Cheilostomata Anasca) from western South Island continental shelf and slope. Mem. N.Z. oceanogr. Inst.

81-4 **Abyssal Fauna**

This project is aimed at evaluating the benthic faunas and environments within the New Zealand region, to assess the fauna, their distributional patterns, and possible correlations with environmental data. Hydrological data may indicate differences in environments and, therefore, where to sample.

D.G. McKnight

Duration of project : 1981-83

Progress 1983-84 : None. The project has been terminated in this form and aspects incorporated into other projects.

PROGRAMME - COOK STRAIT GEOLOGICAL AND PHYSICAL REGIME

To understand the water and earth movements of Cook Strait is of prime importance, for this sea-way is not only a major shipping channel, but is the site of the submarine power cables joining the power grids of North and South Islands. It is also mooted as the site for a submarine pipeline to transfer Maui Gas to the South Island. Furthermore, the Strait is pressured locally by urban development as well as supporting a significant commercial fishery and a wide range of recreational pursuits.

Finally, Cook Strait is of considerable local and international scientific interest in that :

1. it is one of the few areas of the globe where tidal erosion of the seabed occurs at depths exceeding 300 m;
2. it cuts across the New Zealand transform margin and thus we are in a rare position to examine the impact of faults and earthquakes on the seabed;
3. the active sediment transport system of the Strait incorporates a major submarine canyon system, allowing us to evaluate the transfer of sediment from the continental shelf down to ocean depths exceeding 2500 m;
4. the lowerings of sea level that accompanied the major glaciations resulted in marked changes in the hydraulic and sedimentary regimes due to blocking of the western approaches to the Strait.

73-2 Sedimentation Cook Strait

The purpose of this project is to investigate modern sedimentary and tectonic processes to understand the history of the Strait with the emphasis on providing background and site-specific information for power cables and possible pipelines.

L. Carter

In association with : K.B. Lewis
NZOI

Duration of project : 1973-85

Progress 1983-84 : 1. Lessening of interest from NZED and loss of Tangaroa have inhibited progress;
2. Study of effects of modern faulting;
3. Analysis of sediments and cores underway;
4. Attempting to involve USGS in joint study of boundary layer.

Publications 1983-84 : Carter, L. 1983: Sediments, shallow seismic stratigraphy, and structure in the vicinity of the submarine power cables, Cook Strait, New Zealand. NZOI oceanogr. Fld Rep. 19 : 14 p.

Carter, L. 1984: Cook strait - the sea bed in motion. Alpha 40 : 4 p.

78-19 **Wellington South Coast Substrates**

Data relevant to engineering projects in Wellington Harbour entrance and along the coast south of Wellington already exist. Some additional data collected in mid-1984 are required to synthesise the total pattern of sediment movement and rocky outcrops on a storm-dominated coast.

K.B. Lewis

In association with : E.S. Arron
NZOI

Ruth Bew
University College of Swansea

Data supplied by Wellington City Council Engineering Division, Wellington Harbour Board, and Ministry of Works and Development.

Duration of project : 1978-84

Progress 1983-84 : Data sorted and assessed by visiting scholar Miss Ruth Bew. Additional data are necessary to complete coverage of Wellington south coast substrates in conjunction with E.S. Arron.

81-12 **Continental Shelf and Slope Currents (Cook Strait)**

Undergoing analysis are current observations from New Zealand's continental shelf and slope. The main observational programme at present is in Cook Strait and on the West Coast.

R.A. Heath

Other Programme

Affiliation : West Coast Ecosystem

In association with : B. Shakespeare, M. Greig
NZOI

Duration of project : 1981-84

Progress 1983-84 : Paper submitted (below).

Publications 1983-84 : Heath, R.A. (in press): In which direction is the mean flow through Cook Strait, New Zealand? Evidence of one-to-four-weekly variability. N.Z. Jl mar. Freshwat. Res.

PROGRAMME - OCEAN CLIMATE

To understand the physical variability of the oceans surrounding New Zealand has required input of many aspects of the marine environment, including its influence on biological productivity, climate, man-made structures, dispersion of fish larvae, plankton, pollutants, and sediments.

Past research has evaluated the mean offshore circulation and the New Zealand tidal regime. Present specific emphasis within this programme is directed at obtaining long-term time/sea-surface-temperature series (SST) at various locations on the New Zealand coast to study their variability and relationship with such factors as meteorological conditions and coastal water movements.

The immediate goal is to determine any correlations between coastal SST and meteorological events.

78-3 Coastal Climate Survey

This is the first long-term time-series of physical measurements made in New Zealand. The importance of such measurements is now recognised internationally, because of the role played by the sea temperatures in controlling climate, ocean circulation, and the distribution of biological species.

N.M. Ridgway

In association with : B. Shakespeare, M. Greig
NZOI

Duration of project : Long-term

Progress 1983-84 : A paper was presented at the West Coast Workshop dealing with short-term sea-surface temperature variations which is being prepared for publication. Another paper on long-term sea-surface-temperature variations will form a basis for publication.

78-3.1 Bay of Plenty Hydrology

The current regime on the east coast, North Island, consists of the East Auckland Current north of East Cape and the East Cape Current, south of East Cape. The continuity and relationship between these currents is not clear. It was hoped that the Bay of Plenty observations would assist in clarifying the problem but it appears that the flow in the Bay of Plenty is dominated by the East Auckland Current.

N.M. Ridgway

In association with : M.J.N. Greig
NZOI

Duration of project : 1978-84

Progress 1983-84 : A paper was readied for submission.

78-4 Tasman Sea Hydrology

This work involves looking at circulation in the South Tasman Sea in the vicinity of the Subtropical Convergence using temperature/salinity standard-bottle stations.

N.M. Ridgway

In association with : B.R. Stanton
NZOI

Duration of project : 1978-84

Progress 1983-84 : Data were worked up and the interpretation needs finalising.

78-6 Dynamics of the Flow South-east of New Zealand

This is an investigation of the role of eddies in the transfer of momentum, heat, and salt away from the Circumpolar Current.

H. Bryden, WHOI

In association with : R.A. Heath
NZOI

Duration of project : 1978-83

Progress 1983-84 : Completed

Publications 1983-84 : Bryden, H.L.; Heath, R.A. 1984: Energetic eddies at the northern edge of the Antarctic Circumpolar Current in the Southwest Pacific. Progress in Oceanography.

81-21 Eddies in New Zealand Waters

This work is a comparison of South Pacific western boundary currents and the resulting eddy structures.

R.A. Heath

Duration of project : 1981-84

Progress 1983-84 : The original paper was an input to the joint Eddy Workshop. The resulting paper has developed subsequently into a discussion of western boundary currents.

Publications 1983-84 : Heath, R.A. (in press): Large-scale influence of New Zealand seafloor topography on South Pacific Ocean western boundary currents. Aust. J. mar. Freshwat. Res.

PROGRAMME - Continental Margin Geological Mapping (CONMAP)

This programme has two objectives :

1. To define the principal geological structures, stratigraphy, and seabed sediments by collating and interpreting available data and, where necessary, collecting additional data to complete the regional overview.
2. To publish the results in a series of monographs with accompanying charts on a scale of 1:1,000,000 as a basic reference for future exploration, exploitation, environmental assessment and scientific interpretation of the continental margin around New Zealand.

CONMAP will identify the basic offshore geology of the New Zealand continental margin which, in return, will provide a range of new research opportunities. For example, evaluation of mineral deposits; investigation of geotechnical properties of geologic hazards such as slumps and other mass failure deposits; assessment of sedimentary basins with potential hydrocarbon sources and reservoirs; and investigation of areas where potentially hazardous recent crustal deformation and volcanic activity are found to be significant.

76-5 Northland Plateau Geology

The geology of the Northland continental margin is not understood. Interpretation of the geological history from on-land geology has not solved the problem. The answer to many problems in the region, and therefore assessment of regional resources, lies in understanding the offshore geology.

J.V. Eade

Duration of project : 1976-85

Progress 1983-84 : Regional synthesis is nearing completion as a result of Cruise 1149 and presentation of preliminary ideas at the N.Z. Geological Society Conference, a VUW Geology Seminar, a Sydney University Geology Seminar, and a

NZOI staff talk. The development of the Northland continental margin is intimately involved with Paleogene and early Neogene plate tectonics. Individual new projects arising from the regional synthesis will be put forward as part of the CONMAP programme.

Publications 1983-84 : Eade, J.V. 1983: Morphology and structure of the seafloor off northern New Zealand - and a suggested tectonic evolution (Abstr). Misc. Publ. geol. Soc. N.Z. 30A : 38.

77-11

Sedimentation on the South Island Margin

The purpose of this project is to investigate sedimentary and tectonic processes (modern and late Quaternary) operating on the continental margin including the Bounty Trough. This is of international interest because of the location of the margin relative to transform faults, applied interest because of alluvial gold on the Otago shelf, a wide range of geologic hazards on the shelf, slope, and basins, and because of detailed information on sea level changes.

L. Carter

In association with : R.M. Carter
James Cook University, Townsville

Duration of project : 1977-85

Progress 1983-84 : 1. MS on sea-level changes completed.
2. MS on Clutha-Taieri modern sediment wedge completed.
3. Bounty Trough MS draft by RMC awaits NZOI input.
4. Pegasus sediment chart in press.

Publications 1983-84 : Carter, L.; Carter, R.M. (in press): Current modification of a mass failure deposit on the continental shelf, north Canterbury, New Zealand. Mar. Geol. 65.

Carter, R.M.; Carter, L.; Williams, J.J.; Landis, C.A. (in press): Modern and relict sedimentation on the south Otago continental shelf, New Zealand. Mem. N.Z. oceanogr. Inst. 93.

Griggs, G.B.; Carter, L.; Kennett, J.P.; Carter, R.M. 1983: Late Quaternary marine stratigraphy southeast of New Zealand. Bull. geol. Soc. Am. 94 : 791-97.

Herzer, R.H.; Carter, L. 1983: Pegasus bathymetry, 2nd edition. N.Z. oceanogr. Inst. Chart, Coastal Ser. 1:200,000.

78-16

Structural and Sedimentological Effects of Oblique Subduction at the Hikurangi Margin

The Hikurangi Margin has several major changes of structural and sedimentological character associated with changes in the mode of interaction between the Indian and Pacific crustal plates. Definition of structures and sediments along the margin is important for the understanding of geological processes and resource potential, both onshore and offshore along the east coast, and for the understanding of active margin processes in general.

K.B. Lewis

In association with : M.A. Hampton
USGS, Menlo Park
J.B. Pettinga
University of Canterbury, Christchurch
D.J. Bennett
N.Z. Oil and Gas
C. van der Borch
Flinders University, South Australia
R.H. Herzer
NZGS, Lower Hutt

Duration of project : 1978-86

Progress 1983-84 : The following data were obtained - an excellent multichannel seismic record of the Hikurangi Margin accretionary prism; unsatisfactory records of low-angled slope failure. We also interpreted seismic data obtained on DSDP Leg 90 and co-ordinated it with New Zealand data from northwest Chatham Rise.

Publications 1983-84 : Lewis, K.B.; van der Borch, C.; Herzer, R.H. Bennett, D.J. (in press): Seismic stratigraphy and structure adjacent to a changing plate boundary, western Chatham Rise, New Zealand. Init. Rep. DSDP 90.

Lewis, K.B. (Ed.) (in press): New seismic profiles, cores, and dated rocks from the Hikurangi Margin. NZOI oceanogr. Fld Rep. 22.

79-12

The Structure and Sediments of the Bay of Plenty

The Bay of Plenty is a structurally unusual and scientifically interesting area where intra-oceanic back-arc spreading interacts with an ensialic marginal basin. The understanding of the tectonic and sedimentological evolution of this area is of prime importance in the interpretation of the geological history of northern New Zealand and of "fossil" marginal basins in several parts of the world.

K.B. Lewis

In association with : H.M. Pantin
British Geological Survey

Duration of project : 1979-84

Progress 1983-84 : Completed

Publications 1983-84 : Lewis, K.B.; Pantin, H.M. (in press): Intersection of a marginal basin with a continent : Structure and sediments of the Bay of Plenty, New Zealand. Spec. Publ. geol. Soc. Lond. 11.

PROGRAMME - MARINE MINERALS

New Zealand's dearth of land-based mineral resources and remote location mean that accessible seafloor minerals, particularly of types that can be used or processed locally, could be of significant national importance.

The objectives of this programme are, therefore :

1. To find and define the distribution, thickness, mineralogy, geochemistry, and genesis of seafloor minerals with a potential for exploitation. Such minerals include phosphorite, glauconite, constructional sand and gravel, glass sand, gold, ironsand, other heavy minerals, manganese nodules, cobalt crusts, polymetallic sulphides, and metalliferous sediments.
2. To liaise with other divisions and commercial interests to assess the viability of potentially exploitable minerals.

77-9 **Fission-track Dating of Volcanic Glass Shards in Chatham Rise Sediments**

This project involves the dating and trace-element comparison of volcanic shards with known terrestrial volcanics of comparable composition. Dating provides a maximum age for glauconite developed in vesicles in the shards.

D.J. Cullen

In association with : D. Seward, N. Whitehead
Institute of Nuclear Sciences

Duration of project : 1977-85

Progress 1983-84 : In abeyance. Fission-track dating has been completed, but is still awaiting trace-element data from N. Whitehead (recently seconded to IAEA in Monaco for two years).

78-11 **Phosphorite Deposits of Chatham Rise**

This project is an investigation of all aspects of the geology of Chatham Rise phosphorites.

D.J. Cullen

In association with : T. Wall
Australian Atomic Energy Commission
M. Bowden,
Chemistry Division, DSIR
Ms C. Gilchrist
ex-NZOI

Duration of project : 1978-85

Progress 1983-84 : The main objectives - distribution, major-element composition, etc. were completed. Several ancillary studies, raised during the main research (e.g., trace-element studies, structural analysis of Cr based on airgun data) await completion.

Publications 1983-84 : Cullen, D.J. (in press): Submarine sediments of the Southwest Pacific. In Cronan, D.S. (ed.) "Marine Geology and Mineral Resources of the Southwest Pacific". Academic Press, New York.

Cullen, D.J. (in press): Chatham Rise phosphorites of New Zealand. In Notholt, A.; Sheldon, R. (eds) "World Phosphate Resources". Cambridge University Press, Cambridge.

Cullen, D.J. (in press): Comments on the economic-agronomic potential and mining feasibility of the Chatham Rise phosphorite deposits. Proceedings of 2nd International Seminar on Offshore Mineral Resources.

Mitchell, J.S.; Cullen, D.J. 1984: Central Chatham Rise bathymetry, 1:50,000 (2 sheets). N.Z. oceanogr. Inst. Chart, Misc. Ser. 60.

78-15 Sediments Associated with Chatham Rise Phosphorite

This project was specifically designed to answer questions relating to future mining of the deposit - e.g., the nature and extent of the sediment "plume" created during mining operation.

D.J. Cullen

In association with : J.S. Mitchell
NZOI

Duration of project : Dependent on laboratory technician assistance and survival of frozen cores.

Progress 1983-84 : Little progress made.

79-6 Chatham Rise Glauconite

This work comprises determination of the distribution, mineralogy, geochemistry, and genesis of glauconite on the Chatham Rise. Concentration is on granular glauconite, but investigation of the other glauconite varieties of the Rise (thus interfacing with 77-9 and 78-11), is appropriate.

D.J. Cullen

In association with : R. Richards
Industrial Processing Division, DSIR

I. Brown, M. Bowden
Chemistry Division, DSIR

Duration of project : 1979-86

Progress 1983-84 : Contacts were made with Chemistry Division for mineralogical determination of the glauconites.

80-5 Southwest Pacific Seamount Phosphorites

This project aims to determine the distribution, nature, and genesis of phosphatic deposits on seamounts and other morphological "highs" in the tropical/subtropical southwestern Pacific.

D.J. Cullen

In association with : Prof. W.C. Burnett
Florida State University

Dr D.Z. Piper
USGS, Palo Alto

CCOP/SOPAC interest

Duration of project : 1980-86

Progress 1983-84 : A third cruise (late 1983) confirmed the presence of two distinct phosphorite assemblages on the seamounts (a new breakthrough). Progress in early 1984 was not as fast as hoped, due to the assignment of WCB as NRAC Senior Research Fellow to INS instead of NZOI.

80-18 **Deep-flowing Western Boundary Current**

The modern and ancient impacts of deep-flowing western boundary currents on the slope/rise, are being evaluated with the aim of finding out how the deep ocean functions, and the role of currents in Mn-nodule formation.

L. Carter

In association with : Dr R. Stewart
Soil Sciences, Massey University

Dr J. Fenner
Kiel University

Duration of project : 1980-85

Progress 1983-84 : 1. Detailed analysis of cores from Hikurangi Trough was completed at NZOI; mineralogical work (XRD, XRF ash analysis) is currently being worked on at Massey.
2. Diatom stratigraphy with Julianne Fenner nears completion.

81-2 **Metalliferous Sediments in the Lau Basin**

Geochemical prospecting for metalliferous sediments in back-arc basins is being carried out.

G.P. Glasby

In association with : Dr D.S. Cronan
Imperial College, London

Duration of project : 1983-84

Progress 1983-84 : Papers were submitted to Geochimica and Cosmochimica Acta and to the Keele Symposium volume.

83-5 **New Zealand Nearshore and Estuarine Phosphorites**

The distribution, mineralogy, geochemistry, stratigraphy, age and genesis of phosphorites in nearshore environments and coastal inlets around New Zealand are being investigated.

D.J. Cullen

In association with : Prof. W.C. Burnett
Florida State University

Duration of project : 1984-87

Progress 1983-84 : The project began with sampling in Raglan Harbour. Preliminary U-series dating was achieved, but more are to follow. Samples are in preparation for SEM, microprobe, etc. analyses.

PROGRAMME - LAKE AND HARBOUR SEDIMENTATION PROCESSES

Efficient management of lakes, estuaries, and harbours depends on understanding processes of sediment siltation and erosion. Models developed in the Northern Hemisphere on large continents are not applicable in lakes and harbours dominated by oceanic climates, very different catchments, and rapid changes in the natural regime. Volcanic lakes, glacial lakes, artificial hydro lakes, fiords, estuaries, and harbours each present a different subset of processes, the understanding of which is essential to management of existing hydro lakes and harbours and the planning of new lakes.

The objective of this programme, therefore, is to study the processes of sedimentation, the resulting sediment distributions and bedforms, and their post-depositional modification in New Zealand lakes, reservoirs, sounds, fiords, estuaries, and harbours. This understanding allows assessment of rates of siltation, influence of shoreline development, and changing catchment yields to provide for efficient management and design in enclosed waters.

77-17 **Auckland Harbour Sedimentation**

In 1937, A.W.B. Powell published an account of a 1926-27 survey of the sediments of the Waitemata Harbour. He used sediment grade as an important index but used non-standard sieves and methods; thus his sediment correlations are not directly comparable with those of subsequent workers. This study will analyse samples from his localities and compare present-day sediments with those of over half a century ago.

J.C. McDougall

Duration of project : 1977-84

Progress 1983-84 : A MS is ready for internal refereeing.

77-18 **Shoreline Development on Fetch-limited Shores**

A model for shoreline evolution on fetch-limited shores has been developed to predict shoreline response to changing water levels and shoreline development on newly formed lakes. The model is being tested on recently formed Lakes Moawhango and Otomangakau.

R.A. Pickrill

In association with : J. Mitchell
NZOI

Duration of project : 1977-86

Progress 1983-84 : Field work was completed. A MS on beach morphology on low-energy lake shores has been written and is awaiting in-house refereeing and diagrams. A bathymetric chart of Lake Moawhango was compiled and awaits an outline from SID. Survey data from Lakes Moawhango and Otomangakau have been 50% analysed.

Publications 1983-84 : Pickrill, R.A. 1983: Wave-built shelves on low-energy coasts. Mar. Geol. 51 : 193-216.

78-2 **Rangaunu Harbour Physical Oceanography**

This project is an investigation of the dynamics of Rangaunu Harbour in association with a sedimentological study.

R.A. Heath

In association with : B. Shakespeare, M. Greig
NZOI

Duration of project : 1977-83

Progress 1983-84 : Completed

Publications 1983-84 : Heath, R.A.; Shakespeare, B.S.; Greig, M.J. 1983: Physical oceanography of Rangaunu Harbour, Northland, New Zealand. N.Z. J. mar. Freshwat. Res. 17 : 481-93.

79-10 **Rangaunu Harbour Sedimentology**

This is part of an ongoing programme to study the sedimentology of 'typical' New Zealand estuaries in order to identify the role of estuaries in the sedimentary regime of the coast and shelf.

R.A. Pickrill

Duration of project : 1979-84

Progress 1983-84 : Two MSS have been submitted for publication, a third awaits revision based on data in Project 81-8.

Publications 1983-84 : Pickrill, R.A. (in press): Rangaunu Harbour and Bay Sediments, 1:40,000. N.Z. oceanogr. Inst. Chart, Misc. Ser.

Pickrill, R.A.; Mitchell, J.S. (in press): Suspended particulate matter in Rangaunu Harbour, Northland, New Zealand. N.Z. J1 Geol. Geophys.

79-17 **Sedimentation in Lakes**

Studies of the mechanics of sedimentation and the resulting sedimentary structures in natural lakes provide an insight into possible siltation problems in hydro-electric storage lakes.

J. Irwin
R.A. Pickrill

Duration of project : 1979-86

Progress 1983-84 : Studies of sedimentation processes in Lake Benmore were completed. A paper is in preparation covering this work. Studies of diurnal inflow patterns and sedimentary structures for Lake Wakatipu were concluded. Two papers are in preparation covering this work. Studies began in a multi-basin hydro lake, Lake Manapouri. A survey of sediment accumulation in Lake Arapuni under contract to Power Division, MWD for the Ministry of Energy was also carried out.

Publications 1983-84 : Irwin, J.; Pickrill, R.A. 1983: Sedimentation in glacial-fed natural lakes: Implications for hydro-electric storage lakes. Trans. Instn Prof. Engrs N.Z. 10(3-CE) : 84-92.

79-18 **Survey of North Island Lakes**

Subsurface morphology and recent sedimentary history will allow calculations of sediment budgets for selected North Island lakes in the Rotorua district.

J. Irwin
R.A. Pickrill

Duration of project : 1979-86

Progress 1983-84 : In abeyance while other work proceeded.

80-24 **Southern Fiords Sedimentology**

This is part of an ongoing project to study the sedimentology of 'typical' New Zealand estuaries, in order to identify their role in the sedimentary regime of the coast and shelf.

R.A. Pickrill

Duration of project : 1980-86

Progress 1983-84 : Laboratory analysis of sediment samples is now 90% completed. A seismic survey of Milford Sound was carried out in March 1984 to complete the field work. No time was available for data interpretation and writing.

81-8 **Rangaunu Harbour Entrance Dynamics**

An extension of Project 79-10 is being carried out in co-operation with the Northland Harbour Board to assess port options for barging.

R.A. Pickrill

Duration of project : 1981-84

Progress 1983-84 : Analysis of data was completed and a paper submitted for publication. A second paper on sediment transport has been reviewed internally and will be submitted to complete the project.

Publications 1983-84 : Pickrill, R.A. (in press): Sedimentology of an ebb-tidal delta, Rangaunu Harbour, Northland, N.Z. N.Z. Jl Geol. Geophys.

81-23 **Lake Sediment Geochemistry**

This project seeks to measure sediment geochemistry of lakes from different parts of the country, to provide base-line data from a relatively unpolluted part of the world.

G.P. Glasby

In association with : Drs P. Stoffers, P. Walter
Institut für Sedimentforschung, Heidelberg
Dr W.L. Plüger
Abterlung für Angewandte Lagerstättenlehre,
Aachen

Duration of project : 1981-83

Progress 1983-84 : Project completed in present form.

Publications 1983-84 : Stoffers, P.; Glasby, G.P.; Plüger, W.L.; Walter, P. 1983: Reconnaissance survey of the mineralogy and geochemistry of some New Zealand lake and nearshore sediments. N.Z. Jl mar. Freshwat. Res. 17 : 461-80.

83-6 **Assessment of Sediment Settling Rates in Lakes Arapuni, Waikaremoana and Taupo**

A project set up by MWD to drain Lake Arapuni has resulted in NZOI involvement, principally in the sounding and collection of data. Surveys of Lakes Waikaremoana and Taupo in conjunction with Dr Koyama from the Institute of Nuclear Sciences, Japan, are also being carried out.

J. Irwin,
R.A. Pickrill and
W.deL. Main

In association with : Dr Koyama
Institute of Nuclear Sciences, Japan

Duration of project : 1983-85

Progress 1983-84 : 1. Surveys were successfully completed and data processed. A field report was written and submitted to MWD as a base-line study for drainage of Lake Arapuni. Because of the report it was found necessary to extend work on the lake to substantiate sediment deposition rates.
2. A bathymetric and coring survey was successfully completed of Lakes Waikaremoana and Taupo and details of the survey supplied to Dr Koyama together with a distribution map.

Publications 1983-84 : Pickrill, R.A.; Main, W.deL.; Barnes, E.J.
1984: Sediment accumulation in Lake Arapuni. NZOI oceanogr. Fld Rep. 20 : 7 p.

PROGRAMME - UNDERWATER TOPOGRAPHY AND SEDIMENT COVER

Knowledge of the shape, depth, and sediment distribution of our oceanic and enclosed waters is fundamental to their management. This is manifest by the wide variety of users of bathymetric and sediment information, including other Government Departments (Agriculture and Fisheries, Transport, Defence, Works and Development), commercial interests (fisheries, petroleum and mineral explorers, engineers), universities, and the general public.

The purpose of this programme, therefore, is to chart the underwater shape, depth, and sediment cover of the seafloor surrounding New Zealand, and New Zealand's lakes, fiords, and harbours. The programme attempts to fulfill a continuing demand from a wide range of organisations, groups, and individuals with interests in the aquatic environment by the production and periodic updating of standard chart series.

79-37.1 Coastal Bathymetry Charts - Northern New Zealand

This aspect of the project aims to complete the coastal series for North Island.

J.V. Eade

Duration of project : 1979-86

Progress 1983-84 : Little progress was made. Meanwhile two charts were produced by the printer.

Publications 1983-84 : Irwin, J.; Eade, J.V. 1984: Hokianga bathymetry. N.Z. oceanogr. Inst. Chart, Coastal Ser. 1:200,000.

Irwin, J.; Eade, J.V. 1984: Kaipara bathymetry. N.Z. oceanogr. Inst. Chart, Coastal Ser. 1:200,000.

79-37.2 Coastal Bathymetry Charts - Tasman

This aspect of the project aims to update the Tasman charting area, originally produced in 1965.

J.S. Mitchell

In association with : L. Carter
NZOI

Duration of project : 1984-85

81-20 **Bathymetric Charting of Additional Lakes and Sounds**

The programme of bathymetric charting has been in response to requests from outside agencies and to give coverage of lakes, estuaries, and fiords.

J. Irwin

In association with : W.deL. Main
NZOI

Duration of project : 1981-87

Progress 1983-84 : Charts of Milford and Bligh Sounds and Lake Heron were brought to completion. A chart of Lake Arapuni (with the Waikato Valley Authority) is in press, as is southern Pelorus Sound. Work progresses on northern Pelorus Sound and other Waikato hydro lakes.

82-7 **Charting of Coastal Sediments**

Some sediment charts of coastal areas have already been produced. The aim is to produce a complete set of such charts for the New Zealand coastal region.

E.S. Arron
L. Carter
J.S. Mitchell

Duration of project : 1982-85

Progress 1984-85 : Some progress was made on the Oamaru, Otago (ESA/LC), and Tasman (JSM/LC) charting areas.

82-8 **Sediments of the New Zealand Region**

In the New Zealand region there is a vast amount of sedimentary information which could be published at a scale of 1:6,000,000. At the moment no more 1:1,000,000 charts are envisaged but a new chart will be a compilation of all existing data.

J.C. McDougall

Duration of project : 1982-85

Progress 1982-83 : Preliminary drafting underway.

PROGRAMME - AQUATIC ENVIRONMENTAL ASSESSMENT

It is necessary to understand the functioning of various aquatic ecosystems through careful quantitative descriptions of the interrelationships between organisms and the physical, geological, and chemical environment so that natural resources can be managed wisely and with minimal environmental disturbance. The programme has a strong multidisciplinary input with emphasis on evaluating and acquiring expertise of the complete ecosystem.

This programme essentially began in 1976 with the research into the possible environmental consequences of building a large thermal power station in Auckland and the effects of heated effluent on marine organisms generally. This research has continued by studying natural variability in shallow-water (mainly estuarine and fiordal) communities and correlating the trophic structure of those communities with the sediments in which they live.

75-3 **Manukau Harbour Littoral Monitoring**

The aim of this project was to investigate seasonal, short-term, and long-term variation in littoral macrobenthic communities and

their relationships with sediments and to develop a method to discriminate between natural fluctuations and man-induced changes.

K.R. Grange

In association with : P.W. Anderson
NZOI

Duration of project : 1975-84

Progress 1983-84 : A MS including a summary was published in 1983. There is still a large amount of data to be published which will augment the published summary. A MS is almost completed, and seminars were given in the US in October 1983 on the methods and results.

Publications 1983-84 : Grange, K.R. 1983: Environmental effects of cooling-water discharge into the ocean. N.Z. Energy Res. Dev. Com. Rep. No. 96 : 12 p.

75-4

Marsden "B" Power Station Baseline Study

Marsden "A" was completed before EIRs were instituted. When Marsden "B" was proposed a baseline 'before-and-after' study was requested by NZED to see what impact the seawater cooling system would have on the local ecosystem. Three surveys at 6-monthly intervals were carried out before the completion of Marsden "B". Three further surveys at 6-monthly intervals were to have been done after the station was commissioned. It has now been mothballed. The Report on the initial three surveys has been prepared for publication in view of the uncertainty of the final surveys being carried out.

P.A. Luckens

In association with : MAF, Whangarei

Duration of project : 1975-85

Progress 1983-84 : A report was drafted.

77-16

Wellington Beaches

Seasonal changes in beach levels have been evaluated with the aim of providing a management plan for these valuable recreational resources.

L. Carter

In association with : J.S. Mitchell
NZOI

Duration of project : 1977-84

Progress 1983-84 : Completed

Publications 1983-84 : Carter, L.; Mitchell, J.S. (in press): Stability of an artificially nourished beach, Balaena Bay, Wellington Harbour, New Zealand. N.Z. J1 mar. Freshwat. Res.

79-29

Rangaunu Harbour Ecology

The purpose of this project is to provide a quantitative appraisal of the existing ecology of the harbour to assess the impact of proposed development on the estuarine ecosystem.

K.R. Grange

In association with : P. Anderson, G. Read, R. Singleton
NZOI

Duration of project : 1979-85

Progress 1983-84 : Approximately 1/3 of the samples have been identified and counted. Polychaetes are being identified separately by G. Read. Progress should improve as remaining samples are likely to contain species already identified from sorted samples.

81-6 Shallow Rock-wall Communities

The aim of this project is to develop and present a reliable, quick, repeatable method to study quantitative aspects of community structure with depth using quadrat photography and scuba.

K.R. Grange

Duration of project : 1981-85

Progress 1983-84 : A paper is in press. While working up the data, further analysis showed that traditional "soft-bottom" types of species associations have parallels on hard bottoms. The computer analysis of this has been completed and should be written up, although this project has been completed as originally designed.

Publications 1983-84 : Grange, K.R. (in press): Species diversity of shallow rock-wall marine communities in northern New Zealand. Proceedings Off-shore Islands of Northern New Zealand Symposium, May 1983.

81-11 Information Required for Environmental Assessment in Coastal Inlets

Evaluation of ways of possibly short-circuiting environmental assessment by investigating how estuarine systems work.

R.A. Heath
K.R. Grange

Duration of project : 1981-84

Progress 1983-84 : A submitted paper has been refereed. It requires some modification on the mode of presentation and some further biological analysis.

83-3 Wellington Harbour Metal Pollution

A survey has been conducted in conjunction with the Hutt County Council to determine the amounts of metal pollution resident in the harbour sediments as compared with overseas industrialised harbours, in particular some German locations.

G.P. Glasby

In association with : E.S. Arron
NZOI

Dr P. Stoffers
Institut für Sedimentforschung, Heidelberg

Duration of project : 1983-85

Progress 1983-84 : The survey and a chart of sediment distribution were completed. Chemical analysis and geochemistry of the harbour are in progress.

83-4

Assessment of a New Zealand Black Coral Resource

The purpose of this project is to assess the potential economic resource of black coral in the southern fiords, by determining the standing crop, population structure, growth rates, and identity of species.

K.R. Grange

In association with : Dr R.W. Grigg
University of Hawaii

R. Singleton, B. Chapman,
P. Anderson, W.deL. Main
NZOI

Duration of project : 1983-86

Progress 1983-84 : The project began in 1983 with a preliminary feasibility study. In 1984 standing crop estimates were calculated from 3825 colonies measured on 235 underwater transects. X-rays for growth rings have begun, and branch diameter/length correlations are almost completed.

84-1

Biology of Atrina zelandica (Horse Mussel)

A detailed study is being undertaken of the distribution, biomass, size structure, and reproductive biology of the horse mussel in the Marlborough Sounds, to establish the extent of this potentially commercial resource as well as its ecological importance as a substratum for numerous other organisms.

C.H. Hay

In association with : R. Singleton, P. Anderson, W.deL. Main
NZOI

Duration of project : 1984-86

Progress 1983-84 : During six field trips, distribution of Atrina was established for Queen Charlotte and Pelorus Sounds, Croisilles Harbour, and D'Urville Island. Size-structural data were obtained as well as spatial distribution on a small scale. Two populations were tagged for growth-rate data and monthly samples for one year were obtained to establish reproductive periodicity and 'condition'.

PROGRAMME - EUTROPHICATION OF FRESH WATERS

This programme has two aims :

1. To identify the causes and effects of nutrient enrichment of fresh waters.
2. To define corrective and preventative management options.

In the mid-1960s deterioration of Lake Rotorua was linked to the massive and rapid deterioration of lake systems in Europe and North America. In response to public pressure, DSIR started a research programme on eutrophication in 1969.

Since then, knowledge has accumulated showing that eutrophication in New Zealand is less of an immediate and widespread threat to our fresh waters than initially thought. Public fears have been allayed. However, eutrophication will increase as a problem and it is anticipated that extensive management will be required by the early part of the 21st century.

71-6T Macrobenthos of Lake Ngapouri

The relationships between invertebrate distribution and the chemistry of sediments is being studied.

D.J. Forsyth

Duration of project : 1971-84

Progress 1983-84 : Data were computerised and the first half of a paper drafted.

74-11T Groundwater Quality Along the Foreshore of Lake Taupo

This study is tracing decline in nutrient concentrations associated with reticulation of sewage through the town.

M.M. Gibbs

Duration of project : 1974-84

Progress 1983-84 : No sampling was practical because of abnormally low lake levels.

74-12T The Relationship Between Nutrient Load and Trophic Status of Lakes

Information is being accumulated about nutrient loads and the condition of New Zealand lakes in order to allow an appraisal of the applicability of modelling techniques being developed overseas. The purpose is to provide an objective assessment of the usefulness of nutrient loading control in the management of eutrophication.

E. White

Duration of project : 1974-83

Progress 1983-84 : Completed

Publications 1983-84 : White, E. 1983: Lake eutrophication in New Zealand - a comparison with other countries of the Organisation for Economic Co-operation and Development. N.Z. Jl mar. Freshwat. Res. 17 : 437-44.

74-15T Limnology of Lake Rotongaio

Seasonal, chemical, floral, and faunal changes in Lake Rotongaio are being followed.

D.J. Forsyth

In association with : M.T. Downes, M.M. Gibbs, L.J. Kemp
G.W. Payne, I.D. McCallum, B. Don
Taupo

Duration of project : 1974-84

Progress 1983-84 : Completed

Publications 1983-84 : Forsyth, D.J.; Downes, M.T.; Gibbs, M.M.; Kemp, L.; McCallum, I.; McKenzie, L.; Payne, G. 1983: Aspects of the limnology of Lake Rotongaio. N.Z. Jl mar. Freshwat. Res. 17 : 423-35.

- 75-20T **Macrobenthos and Zooplankton of Lake Rotoaira**
 Population changes over 12 months are being traced and compared with information obtained before the start of the Tongariro Power Development Scheme.
 D.J. Forsyth
 In association with : I.D. McCallum
 Taupo
 Duration of project : 1975-85
 Progress 1983-84 : No progress.
- 76-12T **Westland Forest Lakes**
 Nutrient limitation is being studied in Westland lakes.
 G.W. Payne
 Duration of project : 1976-85
 Progress 1983-84 : More data were prepared for writing up.
- 76-13T **Chemical Characteristics of Short Sediment Cores from Lakes**
 Profiles of interstitial NH_4^+ and $\text{PO}_4^{=}$ indicate the depth of sediment-water interaction, and can be related to lake morphometry and to hydrodynamic studies. The depth of interaction of the nutrient-producing sediment with the water above is being assessed. This is important in building a model of nutrient recycling, especially for lake restoration plans.
 A.B. Viner
 Duration of project : 1976-85
 Progress 1983-84 : No progress.
- 77-13T **Groundwater Quality of the Upper Waikato River Catchment**
 The quality of groundwater entering the Waikato River from selected catchments of various land uses is being investigated.
 M.M. Gibbs
 Duration of project : 1977-84
 Progress 1983-84 : Data from 1982-83 were processed. Further sampling and flow gauging was done on the head of the Waiotapu Stream with MWD and Chemistry Division, Wairakei.
- 77-17T **Variations in C, N, P Ratios in Phytoplankton**
 This is a monthly survey of particulate C, N, and P in several lakes on the central plateau. Changes in C, N, and P ratios in particulate material during bioassays are being studied.
 S.E. Pickmere
 In association with : G.W. Payne
 Duration of project : 1977-85
 Progress 1983-84 : No progress - C and N are not yet able to be handled simultaneously.

77-18T **Transfer of $^{32}\text{PO}_4$ Between Solution and Particulate Material in Lakewater**

Transfer rates of radioactive phosphate, when related to the concentration of normal phosphate in solution and phosphorus in particulate material, may be used to indicate 'intensity of biological activity' in lakewater. The purpose is to identify periods of intense biological activity and to see if this approach can be used as a bioassay procedure to identify limiting nutrients.

E. White

In association with : S.E. Pickmere
G.W. Payne
Taupo

Duration of project : 1977-84

Progress 1983-84 : One file report was produced following research in English Lake District. Project completed.

Publications 1983-84 : White, E. 1984: Factors influencing ortho-phosphate turnover times in waters of the English Lake District. Taupo Res. Lab. File Rep. 66 : 7 + [4] p.

77-19T **Fractionating of Soluble Phosphorus Compounds**

Techniques are being developed by which the various phosphorus compounds which occur in natural water may be separated and their chemical and biological properties studied.

E. White

In association with : G.W. Payne
S.E. Pickmere
Taupo

Duration of project : 1977-85

Progress 1983-84 : No experimental work was carried out. Several MSS are in partially completed form. One file report was produced on research in the English Lake District, utilising techniques developed in this project.

77-20T **Sorption of Phosphate by Lake Sediments**

The potential significance of sorption in the sequestering of this nutrient, and under what environmental circumstances, is being assessed in relation to the amount of man-made nutrient-input permissible. [This links with Project 77-21T.]

A.B. Viner

Duration of project : 1977-85

Progress 1983-84 : No progress.

77-21T **Fractionation of Sediment Phosphate of Lakes**

This project is investigating the biological availability of phosphate for plant nutrition by algal bioassay, which is thought to be of more value than chemical analyses (see 77-20T).

A.B. Viner

Duration of project : 1977-85

Progress 1983-84 : No progress.

77-22T **Drift Fauna of the Mangawhero Stream**

Seasonal sampling of fauna is being carried out.

D.J. Forsyth

In association with : I.D. McCallum
Taupo

Duration of project : 1977-85

Progress 1983-84 : The first draft of a MS was prepared.

77-23T **Ecological Consequences of Proposed Geothermal Energy Developments in the Natural Freshwaters Near Sites of Development (Lake Rotoiti)**

The purpose of this project is to estimate the sublacustrine geothermal influence on lake hydrodynamics, nutrient loading, and trophic status, and to deduce the consequences for Lake Rotoiti of any change in the geothermal input.

M.M. Gibbs

In association with : G.W. Coulter, R.H. Spiegel
R.J. Vigor-Brown, M.H. Timperley, J. Davies
Taupo

Duration of project : 1977-84

Progress 1983-84 : Some further sampling was done on aspects of Ohau Channel underflow plus some biological sampling (ref. WPV). Most data are now on computer file and some extensive data manipulation has been conducted. Two further reports have been issued (below) and two more are currently in preparation.

Publications 1983-84 : Gibbs, M.M.; Spiegel, R.H.; Vincent, W.F. 1983: Penetration of Ohau Channel water into Lake Rotoiti. A brief summary of Lake Rotoiti studies 1981-1983, prepared for a meeting of the Bay of Plenty Catchment Commission in Rotorua, 19 October 1983. Taupo Res. Lab. File Rep. 63 : 5 + [4] p.

Vincent, W.F.; Gibbs, M.M. 1984: Trophic status of Lake Rotoiti. Algal production and standing crop; evidence of deteriorating water quality; and speculations on the impact of the Ohau Channel inflow. Taupo Res. Lab. File Rep. 65 : 13 + [9] p.

78-14T **Surface-water Chemistry in a Small Catchment**

The importance of vegetation in the weathering of geological material and the quantification of the major ion discharge from a pumice/greywacke catchment are being investigated.

M.H. Timperley

Duration of project : 1978-85

Progress 1983-84 : No progress while on overseas leave.

78-15T **Particle Sizes of River Suspended Load and Nutrient Phosphate**

Quantification of the amount of nutrients transported by rivers' suspended loads has been analysed. A pattern of phosphate-particle association has been established.

A.B. Viner

Duration of project : 1978-86

Progress 1983-84 : One methods paper was submitted for publication and another paper was redrafted.

78-16T **Lake Taupo Major Ion Balance**

The mechanisms controlling the major ion composition of Lake Taupo water, the magnitude of geothermal inflow (and hence likely ammonia contribution) to the lake are being studied.

M.H. Timperley

In association with : R.J. Vigor-Brown
Taupo

Duration of project : 1978-84

Progress 1983-84 : A MS describing the results of the project is in press. A second MS describing the water chemistry of lakes on the volcanic plateau is at draft stage.

78-17T **Phytoplankton Dynamics of Lakes Taupo and Waikaremoana**

Seasonal succession of algal species is being studied in relation to productivity and changes in chemical and physical conditions in these two deep oligotrophic lakes.

W.F. Vincent

In association with : J. Davies
C. Howard-Williams
Taupo

Duration of project : 1978-85

Progress 1983-84 : Primary productivity work was published. Two limnological papers await final writing up.

Publications 1983-84 : Vincent, W.F. 1983: Phytoplankton production and winter mixing: Contrasting effects in two oligotrophic lakes. J. Ecol. 71 : 1-20.

78-22T **C, N, P Metabolism of Anabaena**

This project relates to Project 79-27. The characteristics of this economically important alga, as interpreted from field data, were to be refined under controlled laboratory conditions.

A.B. Viner

In association with : L.J. Kemp

Duration of project : 1978-85

Progress 1983-84 : No progress.

78-23T **Natural ¹⁵N Abundance in Sediments**

The natural abundance of ¹⁵N relative to ¹⁴N is considered to be a reflection of microbial denitrification. A comparison of lakes should show their various degrees of potentiality for denitrification.

A.B. Viner

Duration of project : 1978-83

Progress 1983-84 : No progress.

78-25T **Mercury in Aquatic Systems**

The distribution of mercury through freshwater food chains in systems with different mercury exposures and different food-chain lengths is being determined.

M.H. Timperley

In association with : R.J. Vigor-Brown
Taupo

Duration of project : 1978-83

Progress 1983-84 : No progress while on overseas leave. Work by RV-B however, eliminated a large backlog of samples.

79-24T **The Role of Stream-bank Vegetation in the Long-term Removal of Nutrients from Stream Water**

This work examines the uptake of nitrogen and phosphorus compounds from stream waters by aquatic vegetation and vegetated habits. The study includes aspects of stream hydrology, growth, nutrient uptake and decomposition of vegetation, and nutrient loads in streams.

C. Howard-Williams

In association with : J. Davies, S.E. Pickmere
R.J. Vigor-Brown, M.T. Downes
Taupo

Duration of project : 1979-84

Progress 1983-84 : Routine monitoring was continued on vegetation changes and water chemistry. One paper was prepared for a recent national seminar on land disposal of wastes. This will be published shortly.

79-25T **The Growth of Lagarosiphon major in Lake Taupo**

Lagarosiphon major is the only aquatic plant in Lake Taupo which causes problems. It is a major problem species in many other New Zealand lakes. A number of excellent physiological studies on this plant have been completed at Auckland University, but very little is known of the in situ growth rates of dense (5 m high, + 600 shoots m⁻²) weed beds in lakes.

This project will examine in situ growth and decomposition rates and the distribution of the plant in Lake Taupo, and will attempt to identify factors controlling distribution, possible future spread, and growth in the lake.

C. Howard-Williams

In association with : J. Davies
Taupo

Duration of project : 1979-84

Progress 1983-84 : Work slowed down somewhat due to methodological problems in measuring wave energy on the weed beds. A design now exists for an apparatus to do this and hopefully will be able to construct it and begin testing.

79-27T **Nutrient Dynamics of Lake Rotongaio**

The purpose of this study is to assess the relative importance of the major coefficients of release and uptake of nitrogen and phos-

phate nutrients into and out of the important N and P pools. The final outcome is designed to enable a predictive model to be constructed of the dynamics of these nutrients.

A.B. Viner

Duration of project : 1979-85

Progress 1983-84 : Two papers were published and some more are in preparation.

Publications 1983-84 : Viner, A.B.; Kemp, L. 1983: The effect of vertical mixing on the phytoplankton of Lake Rotongaio (July 1979 - January 1981). N.Z. J1 mar. Freshwat. Res. 17 : 407-22.

Viner, A.B. 1984: Resistance to mixing in New Zealand lakes. N.Z. J1 mar. Freshwat. Res. 18 : 73-81.

79-29T **The Limnology of Antarctic Lakes**

This project involves studies of the inland waters of the New Zealand sector of Antarctica.

W.F. Vincent

In association with : C. Howard-Williams
M.T. Downes
Taupo

Duration of project : 1982-87

Progress 1983-84 : The 1983-84 expedition was completed.

79-30T **Algal Succession in Lake Okaro**

Using a high-intensity programme, the time scale of floristic and physiological changes of algae are being examined in a eutrophic lake.

W.F. Vincent

In association with : S.J. Dryden
D.J. Forsyth
Taupo

Duration of project : 1979-85

Progress 1983-84 : The data set has now been organised on computer file and is available for final analysis.

79-32T **Denitrification in Sediments and Lake Waters**

The significance of denitrification as a nitrogen sink in the lakes of the central plateau is being assessed.

M.T. Downes

In association with : J.C. Priscu
J. Davies
Taupo

Duration of project : 1979-85

Progress 1983-84 : No progress was made on the Lake Rotoma sediment study, but a MS was submitted.

Publications 1983-84 : Priscu, J.C.; Downes, M.T. (in press): Microbial activity in surficial lake sediments with particular reference to dissimilatory nitrate reduction. Appl. environ. Microbiol.

79-33T **Zooplankton of Lake Okaro**

The roles of calanoid and cladoceran crustacea in the grazing of phyto- and bacterioplankton are being investigated. The population dynamics and production of the zooplankton are under study.

D.J. Forsyth

In association with : M.R. James
Taupo

Duration of project : 1979-85

Progress 1983-84 : A paper on grazing was submitted for publication and a File Report published.

Publications.1983-84 : Forsyth, D.J.; Salonen, K. 1983: Carbon content of crustacean zooplankton in Lakes Okaro, Rotongaio and Taupo. Taupo Res. Lab. File Rep. 64 : 4 + [6] p.

Forsyth, D.J.; James, M.R. (in press): Zooplankton grazing on lake bacterioplankton. J. plankton Res.

79-35T **Investigation of Nitrification Rates in Sediments and Lake Waters**

The significance of bacterial ammonia oxidation in the nitrogen cycle of central plateau lakes is being assessed.

M.J. Downes

In association with : J. Davies
Taupo

Duration of project : 1979-85

Progress 1983-84 : Lake Okaro work is still being written up. The hydroxylamine assay (nitrifier "fingerprint") has been tested in the lab, but with limited field testing.

80-17T **Factors Influencing the Distribution of Aquatic Macrophytes in Lake Waikaremoana**

This is a study of the distributional pattern of macrophytes and factors influencing their growth. Particular attention is being paid to the effects of varying lake levels and optical properties on the extent of the important littoral zone in this lake.

C. Howard-Williams

In association with : W.F. Vincent
J. Davies
Taupo

Duration of project : 1980-84

Progress 1983-84 : Further field trips continued, with analysis of our long-term transects. Two File Reports were completed, one MS was written up and two more are planned in conjunction with Project 78-17 (WFV).

Publications 1983-84 : Howard-Williams, C.; Downes, M.T.; Davies, J. 1983: Limnological characteristics of the Tiniroto and Putere lakes. Taupo Res. Lab. File Rep. 59 : 9 + [11] p.

Howard-Williams, C.; Spigel, R.H. 1983:
Stratification of Lake Waihou (Tiniroto,
North Island) and calculations on small
lake heat budgets. Taupo Res. Lab. File
Rep. 60 : 7 + [13] p.

81-25T Particulate Matter in Lake Waters

This project seeks to understand the role of abiotic particulate matter in the cycle of phosphorus in lake waters.

M.H. Timperley

In association with : R.J. Vigor-Brown
Taupo

Duration of project : 1981-86

Progress 1983-84 : No progress while on overseas leave.

**81-26T Factors Controlling Algal Production in Lakes of the Central Vol-
canic Plateau**

The relative influence of light, temperature, nutrient supply, and grazing on patterns of phytoplankton production is being investigated in lakes of central North Island.

W.F. Vincent

In association with : S.J. Dryden
J. Davies
Taupo

Duration of project : 1981-86

Progress 1983-84 : Writing up began of certain portions of the work.

81-30T Chemical Methods Manual

A detailed description of routine chemical analytical methods currently in use by the section is being compiled in a form suitable for use as a bench manual.

M.T. Downes

In association with : M.H. Timperley, S.E. Pickmere
R.J. Vigor-Brown, M.M. Gibbs
Taupo

Duration of project : 1981-84

Progress 1983-84 : The initial draft of the manual was circulated to staff for comments.

81-32T Nitrogen Balance for an Exotic Forest Catchment

This project seeks to quantify and identify the origin of nitrogenous compounds entering Lake Taupo from a pumice catchment under exotic forestry.

S.E. Pickmere

In association with : M.H. Timperley
R.J. Vigor-Brown
Taupo

Duration of project : 1981-85

Progress 1983-84 : Outlines of N contributions from various compartments to the system are complete, and the final N mass balance calculated. Work on atmospheric N input is proceeding (MHT, RVB).

81-33T **Optical Properties of New Zealand Lake Waters**

The aim is to understand factors affecting the quality and quantity of both available radiation (as it affects biological processes underwater) and perceived colour from above.

C. Howard-Williams

In association with : W.F. Vincent
J. Davies
Taupo

Duration of project : 1981-84

Progress 1983-84 : Final papers were submitted.

Publications 1983-84 : Howard-Williams, C.; Vincent, W.F. 1984: Optical properties of New Zealand lakes. 1. Attenuation, scattering and a comparison between downwelling and scalar irradiances. Arch. Hydrobiol. 99 : 318-30.

82-9T **Ecology and Life History of the Freshwater Mussel Hyridella menziesi in Tapuaeharuru Bay, Lake Taupo**

This project seeks to determine :

- (a) Factors affecting the distribution and standing crop of Hyridella in Tapuaeharuru Bay;
- (b) The potential for the stripping of particulate nitrogen and phosphorus in the littoral zone;
- (c) The life history of Hyridella in Tapuaeharuru Bay.

M.R. James

In association with : J. Davies
Taupo

Duration of project : 1982-85

Progress 1983-84 : A draft of one paper has been completed. Some analyses are still to be completed for a second paper on particulate removal.

82-10T **Nutrient Limitation in Central Volcanic Plateau Lakes**

The nutrients limiting phytoplankton growth at four limnologically critical times of year in 12 central volcanic plateau lakes, are being determined using short-term bioassays.

E. White

In association with : S.E. Pickmere, G.W. Payne
K.D. Law, J.C. Prisco
Taupo

Duration of project : 1982-85

Progress 1983-84 : A draft MS was prepared.

83-8 **Use of Fluorescence Profiles and Primary Production in Contrasting Locations of Physical Disturbance**

A.B. Viner

Duration of project : 1983-86

Progress 1983-84 : Data were collected and sorted prior to analysis.

ADDITIONAL PROJECTS

There are a number of projects which do not fit directly into any of the above programmes but nevertheless provide important background or information to the programmes or divisional objectives. There are also projects that involve supportive services or instrumentation necessary to accomplish programme objectives.

77-5 **STEVE Microstructure**

STEVE (Salinity, Temperature, Velocity, Equipment) is able to detect small-scale variations in vertical profiles. These variations are of importance to large-scale circulations.

T.G.L. Shirtcliffe
Victoria University

Other Programme

Affiliation : West Coast Ecosystems

In association with : A.G. Cole
NZOI

M. Moore
Victoria University of Wellington

Duration of project : 1977-84

Progress 1983-84 : Active participation has now effectively passed to VUW personnel, and NZOI involvement has ceased.

78-22 **The Causes of Productivity Enhancement off East Cape**

Using physical, chemical, and primary production data, the importance of warm-core eddies to the productivity in New Zealand seas, was assessed (see Deep Sea Research 29 (1982)). The importance of warm-core eddies to the distribution and abundance of zooplankton is also being investigated.

J.M. Bradford

In association with : B.E. Chapman
NZOI

Duration of project : 1978-85

Progress 1983-84 : No progress while work focused on project 79-19.

80-1.2 **Remote Sensing of East Coast Circulation**

This study involved investigating the remote-sensing technique in a region with the strongest thermal signal (east of Cook Strait).

E.J. Barnes

Duration of project : 1980-84

Progress 1983-84 : A paper was drafted and submitted.

Publications 1983-84 : Barnes, E.; Ellis, P.; Taylor, B. 1984:
Satellite remote sensing of our oceans.
Bull. N.Z. Fishg Ind. Bd 77 : 4-8.

Barnes, E.J. (in press): Eastern Cook Strait
region circulation inferred from satellite
derived sea-surface temperature data.
N.Z. J. mar. Freshwat. Res.

81-10 **Reactive Silicate in New Zealand Waters**

In subantarctic waters and coastal waters around New Zealand, silica necessary for diatom growth is often not in good supply, and some rivers introduce silica into the sea. The sources of reactive silica and its significance for phytoplankton production and population composition were investigated.

J.M. Bradford

In association with : W.A. Nelson

Duration of project : 1981-84

Progress 1983-84 : This project was terminated with the production of an unpublished report "Silicon in coastal waters - the contribution of river discharge".

81-13 **Combined Effects of Light, Temperature, and Salinity on Growth of Two Hypersaline Dunaliella Species from Lake Grassmere**

The two phytoflagellate species Dunaliella salina and D. euchlora (Volvocales) have outstanding tolerance and adaptability to a very wide range of salinities. These hypersaline algae are the principal food of the brine shrimp Artemia. This study has a commercial potential relating to the exploitation of both the algae Dunaliella and the brine shrimp growing in the lake.

F.H. Chang

In association with : Dr R.G. Wear
Victoria University of Wellington
J. Reynolds
Applied Mathematics Division, DSIR
R.P. Baldwin
NZOI

Duration of project : 1983-84

Progress 1983-84 : Project completed and a paper submitted.

Publications 1983-84 : Chang, F.H.; Wear, R.G.; Reynolds, J. (in press): The combined effects of salinity, temperature, and light intensity on growth rates of two halophilic flagellates Dunaliella euchlora Lerche and D. salina Teodoresco (Volvocales : Polyblepharidaceae) from the salinas of Lake Grassmere, New Zealand. J. exp. mar. Biol. Ecol.

81-14 **Fine-structure of Mucilage-producing Phaeocystis pouchetii, Cultured from the 1981 "Tasman Bay Slime"**

Massive occurrences of a mucilage-producing organism severely affected fish catches and the livelihood of fishermen in Tasman Bay. Overseas reports of slime outbreaks have repeatedly implicated the non-motile form of Phaeocystis pouchetii. The 1981 Tasman Bay slime

outbreak has also involved this colonial form of the organism. This project aims to study the fine-structure of the colonial non-motile form in order to understand the mucilage-producing mechanism.

F.H. Chang

Duration of project : 1981-85

Progress 1983-84 : Project completed and a second paper published.

Publications 1983-84 : Chang, F.H. 1984: The ultrastructure of Phaeocystis pouchetii (Prymnesiophyceae) vegetative colonies with special reference to the production of new mucilaginous envelope. N.Z. J. mar. Freshwat. Res. 18: 303-08.

82-2

Littoral and Infralittoral Ecology of New Zealand's Southern Islands

There is a dearth of information on the identity, ecology, and biogeography of the marine fauna and flora of New Zealand's subantarctic islands, which makes it difficult to assess any environmental impact in this area. Many samples have been taken by NZOI from this region, which need only to be worked up, however work will be concentrated on the algal flora.

C.H. Hay

In association with : Miss N.M. Adams
National Museum, Wellington

Dr M.J. Parsons
Botany Division, DSIR, Christchurch

Duration of project : 1982-84

Progress 1983-84 : This project concentrated initially on the seaweed flora of these islands. A paper has been prepared that lists the seaweeds, citing representative herbarium specimens and containing notes on taxonomy and distribution. This will be published as a Miscellaneous Publication of the National Museum. Work continues on an ecological paper concerning the seaweed floras of the Antipodes and Bounty Islands.

82-3

Marine Ecology of South Atlantic and South Indian Ocean Subantarctic Islands

Most papers concerning the marine biogeography of the so-called Southern Ocean are fairly superficial, and a number contain factual errors. This is mainly because most marine biologists are unable to make personal observations and studies on a wide variety of the oceanic islands that are dotted around the Southern Hemisphere between the convergence zones. The inaccessibility of these islands and the southern coast of Chile effectively prevents biogeographers from making detailed comparative studies based on their own observations.

It is hardly surprising therefore, that some circumpolar species are recognised as different species, or even genera, in different sectors of the Southern Ocean. It is also the reason why there are very few comparative ecological papers on the near-shore marine life of the region.

This project is focusing on (1) the seaweed flora of Marion Island, (2) a comparative account of the seaweed floras of Tristan

da Cunha and Gough Islands, and (3) a general account of the marine fauna and flora of Gough Island.

C.H. Hay

In association with : R. Anderson, N. Jarman,
K. Loep, T. Gosslingen
University of Cape Town

Duration of project : 1982-86

Progress 1983-84 : The work described above was approved in 1984 and at least one aspect will reach MS stage by late 1985.

82-6 North Fiji Basin - Geology and Geophysics

The South Pandora Ridge provides an excellent example of a rapid-spreading ridge in a back-arc basin. The geology and geophysics are being studied with the emphasis on establishing information on the occurrence and formation of polymetallic sulphide deposits.

J.V. Eade

In association with : CCOP/SOPAC
Hawaii Institute of Geophysics

Duration of project : 1982-85

Progress 1983-84 : Little progress owing to lack of opportunities to get together with co-workers and in getting samples analysed.

Publications 1983-84 : Eade, J.V.; Kroenke, L.W. 1983: Geology of North Fiji Basin (Abstr.) In "Workshop on Basic Geo-scientific Marine Research required for Assessment of Minerals and Hydrocarbons of the South Pacific", Suva, Fiji, October 1983.

82-10 Tsunami Risk to the New Zealand Coastline

Some coastal areas are more likely to be the site of tsunami damage than others. Prior analysis of conditions will be of assistance for tsunami warning purposes.

A.E. Gilmour

In association with : N.M. Ridgway, M.J.N. Greig
NZOI

Duration of project : 1982-86

Progress 1983-84 : A numerical model programme for shallow water oscillations was applied to the Hauraki Gulf, Wellington Harbour, Lyttelton Harbour and several other water bodies. Two papers were written (with C. Butcher) [Free oscillations in Wellington and Lyttelton Harbours - C.N. Butcher and A.E. Gilmour (in preparation); Free oscillations in a narrow deep lake, Wakatipu, and a triangular lake, Taupo - A.E. Gilmour and C.N. Butcher (in preparation)].

83-1 Prymnesium from the 1983 Northland Phytoplankton Bloom

An undescribed golden-brown Prymnesium species (Prymnesiophyceae) had been isolated from an early summer 1983 phytoplankton bloom off Northland. This new species is closely related to Prymnesium par-

vum Carter, long known to produce biotoxin which causes fish and shellfish kills. This project aims to describe this new species of Prymnesium and to confirm its toxicity.

F.H. Chang

In association with : K.G. Ryan
PEL
R.P. Baldwin
NZOI

Duration of project : 1983-84

Progress 1983-84 : One paper (below) had already been sent to Phycologia. A second paper ["The occurrence of Prymnesium calathiferum Chang & Ryan during the summer 1983 phytoplankton bloom in Northland, New Zealand"] is in preparation.

Publications 1983-84 : Chang, F.H.; Ryan, K.G. (in press): Prymnesium calathiferum sp. nov. (Prymnesio-phyceae), a new species isolated from Northland, New Zealand. Phycologia.

83-2

Isolation of Dinophysis fortii/acuminata from Marlborough Sounds

Toxicity tests of New Zealand mussels conducted overseas show reasonably high levels of diarrhetic shellfish poison (DSP). In Japan and Northern Europe, two species of thecate dinoflagellate, Dinophysis fortii and D. acuminata are related to diarrhetic shellfish poisoning. Both these species are found in Marlborough Sounds. This project aims to establish culture of either species for obtaining a toxin standard and confirming the toxicity.

F.H. Chang

In association with : Mr Desmond Till
National Health Institute
R.P. Baldwin
NZOI

Duration of project : 1984-85

Progress 1983-84 : Two attempts were made to isolate D. acuminata for unialgal culture without success. During a recent Toxic and Anoxic Workshop in Sydney, I found out from several experts that no-one has yet managed to culture Dinophysis. Dr F.J.R. Taylor from the University of British Columbia, Canada, suspects that this organism is heterotrophic. Most of the Dinophysis species observed from samples collected off the Westland coast in summer 1982 appear to be low-light adapted.

SERVICES AND INSTRUMENTATION

78-10

Quartz Sensor Bathythermograph

Quartz temperature and pressure sensors are to be combined in an internally recording instrument for work in lakes, estuaries, fiords, and the sea.

A.E. Gilmour

Duration of project : 1978-85

Progress 1983-84 : The project has been in abeyance.

79-36

Storage and Retrieval of NZOI Station and Underway Data

To collate more easily station, bathymetric, and geophysical data, NZOI basic data records are being progressively transferred to computer storage.

K.B. Lewis

In association with : A.G. Cole
NZOI

Duration of project : 1979-85

Progress 1983-84 : Station data entry is now complete. Underway data entry is about two-thirds complete. This is now regarded as a non-research topic.

81-7

Microprocessor Controller for Remote Camera

A system was being developed to allow a remote underwater camera to be positioned just above the seafloor and photographs taken automatically when the bottom is in focus.

R.J. Singleton

Duration of project : 1981-83

Progress 1983-84 : This project has been terminated.

81-9

Catalogue and Retrieval System for Underwater Photographs

A system was being developed to enable the information contained in the collection of underwater photographs to be sorted, catalogued, and retrieved.

R.J. Singleton

In association with : A.G. Cole
NZOI

Duration of project : 1981-8?

Progress 1983-84 : Some, but not all, of the backlog has been entered. Two week's work should bring the entries up to date.

81-22

PIRTS - Programme to Integrate Real-Time System

PIRTS is an instrument to allow the acquisition, display, and recording of real-time data from depth and temperature sensors and a variety of primary instruments, e.g., transmissiometer, quantum meter, fluorometer.

P.J. Hill

Other Programme

Affiliation : Hydro Lake Sedimentation

Duration of project : 1981-83

Progress 1983-84 : Project completed.

81-24

Diver's Data Recorder

A device has been designed to make diving operations more effective by automatically recording the dive profile, together with manually entered event marks. Dive depth, time, and surface interval are continuously displayed, thus allowing one's decompressional status to be determined.

P.J. Hill

Other Programme

Affiliation : Benthic Fauna

Duration of project : 1981-84

Progress 1983-84 : After several setbacks, Harding Signals have now nearly completed eight pre-production prototypes. Involvement through 1984 will be for evaluation and any modifications to these units.

81-31T Computer Facilities Development

It is intended to install, maintain, and develop computer facilities at the Taupo Research Laboratory for general computing and data-logging from laboratory instruments.

M.H. Timperley

In association with : G.W. Payne

Duration of project : 1981-83

Progress 1983-84 : Substantial progress was made by GWP with major advances in the ability to satisfy rapidly increasing demand. A link to the DSIR Network was established.

ENVIRONMENTAL ASSESSMENT AND ANALYSIS

Environmental Impact Reports / Management Plans

Documents forwarded from other scientific organisations/institutions or government departments, require information and comments on proposed reclamations, etc.

P.A. Luckens

Those dealt with during 1983-84 include :

Coastal Reserves Southland County
 Snares Draft Management Plan
 Marsden Refinery Pipeline Fouling Problem
 Seaview LPG Bulk Depot and Pipeline
 Whangarei Harbour Study
 NAWASCO Water Quality Research
 Horowhenua District Scheme
 Northland Regional Planning Scheme
 National Reserves
 Inland Waterways Proposal Auckland Region
 Tauranga Harbour Plan
 Otago Harbour Plan
 Taranaki Regional Planning Scheme
 Abel Tasman National Park Management Plan
 Havelock Harbour
 Marlborough Sounds Maritime Park Board
 Potential Natural Hazards
Chlamys delicatula Benthic Photograph Requests
 Martha Hill Mine
 Urupukapuka and Waewaetorea Management Plan
 Coastal Reserve Management Plans
 Marine Farming Planning Study Hauraki Gulf
 Export of Water from Deep Cove (EIR)
 Kermadec Islands Marine Reserve Proposal
 Mavora Lakes Pastoral Park Management Plan
 National Wetland Inventory
 Scientific Research in New Zealand's Subantarctic Nature Reserves

PROJECT INDEX

Project No.	Title	Project Leader	Page No.
69-4	Distribution of New Zealand Benthic Bivalves	P.A. Luckens	44
70-1	Lithodid Crabs of New Zealand and the Pacific	E.W. Dawson	44
71-6T	Macrobenthos of Lake Ngapouri	D.J. Forsyth	66
73-2	Sedimentation Cook Strait	L. Carter	49
74-1	Chatham Rise Benthos and its Environmental Significance	E.W. Dawson	45
74-11T	Groundwater Quality Along the Fore-shore of Lake Taupo	M.M. Gibbs	66
75-3	Manukau Harbour Littoral Monitoring	K.R. Grange	63
75-4	Marsden "B" Power Station Baseline Study	P.A. Luckens	63
75-20T	Macrobenthos and Zooplankton of Lake Rotoaira	D.J. Forsyth	67
76-5	Northland Plateau Geology	J.V. Eade	52
76-6	New Zealand Echinoderms	D.G. McKnight	45
76-9	Natant Shrimps of the New Zealand EEZ	W.deL. Main	45
76-12T	Westland Forest Lakes	G.W. Payne	67
76-13T	Chemical Characteristics of Short Sediment Cores from Lakes	A.B. Viner	67
77-9	Fission-track Dating of Volcanic Glass Shards in Chatham Rise Sediments	D.J. Cullen	55
77-11	Sedimentation on the South Island Margin	L. Carter	53
77-13T	Groundwater Quality of the Upper Waikato River Catchment	M.M. Gibbs	67
77-17	Auckland Harbour Sedimentation	J.C. McDougall	58
77-17T	Variations in C, N, P Ratios in Phytoplankton	S.E. Pickmere	67
77-18	Shoreline Development on Fetch-limited Shore	R.A. Pickrill	68
77-19T	Fractionating of Soluble Phosphorus Compounds	E. White	68

Project No.	Title	Project Leader	Page No.
77-20T	Sorption of Phosphate by Lake Sediments	A.B. Viner	68
77-21T	Fractionation of Sediment Phosphate of Lakes	A.B. Viner	68
77-22T	Drift Fauna of the Mangawhero Stream	D.J. Forsyth	69
77-23T	Ecological Consequences of Proposed Geothermal Energy Developments in the Natural Freshwaters near Sites of Development (Lake Rotoiti)	M.M. Gibbs	69
78-3	Coastal Climate Survey	N.M. Ridgway	51
78-3.1	Bay of Plenty Hydrology	N.M. Ridgway	51
78-4	Tasman Sea Hydrology	N.M. Ridgway	51
78-6	Dynamics of the Flow Southeast of New Zealand	H. Bryden	51
78-10	Quartz Sensor Bathythermograph	A.E. Gilmour	80
78-11	Phosphorite Deposits of Chatham Rise	D.J. Cullen	55
78-14T	Surface-water Chemistry in a Small Catchment	M.H. Timperley	69
78-15	Sediments Associated with Chatham Rise Phosphorite	D.J. Cullen	56
78-15T	Particle Sizes of River Suspended Load and Nutrient Phosphate	A.B. Viner	69
78-16	Structural and Sedimentological Effects of Oblique Subduction at the Hikurangi Margin	K.B. Lewis	53
78-16T	Lake Taupo Major Ion Balance	M.H. Timperley	70
78-17T	Phytoplankton Dynamics of Lakes Taupo and Waikaremoana	W.F. Vincent	70
78-19	Wellington South Coast Substrates	K.B. Lewis	49
78-22	Causes of Productivity Enhancement off East Cape	J.M. Bradford	76
78-22T	C, N, P Metabolism of <u>Anabaena</u>	A.B. Viner	70
78-23	Bathyal Fauna of the EEZ	E.W. Dawson	46
78-23T	Natural ¹⁵ N Abundance in Sediments	A.B. Viner	70
78-24	Bathycrinids of Indian and Pacific Oceans	D.G. McKnight	46
78-25	Coral Reef Fish Distributions in North Tasman and Coral Seas	K.R. Grange	46

Project No.	Title	Project Leader	Page No.
78-25T	Mercury in Aquatic Systems	M.H. Timperley ^g	71
78-26	Hermatypic Corals of the North Tasman Sea	K.R. Grange	47
79-6	Chatham Rise Glauconite	D.J. Cullen	56
79-10	Rangaunu Harbour Sedimentology	R.A. Pickrill	59
79-12	Structure and Sediments of the Bay of Plenty	K.B. Lewis	54
79-17	Sedimentation in Lakes	J. Irwin R.A. Pickrill	59
79-18	Survey of North Island Lakes	J. Irwin R.A. Pickrill	59
79-19.5	Summer Standing Stocks and Productivity of Phytoplankton off Westland, N.Z.	J.M. Bradford	39
79-19.6	Summer Phytoplankton and Micro-zooplankton Populations off Westland 1979	F.H. Chang	40
79-19.7	Distribution of Zooplankton and their Grazing Pressure on Phytoplankton	J.M. Bradford	40
79-19.8	Plankton and Nutrient Relationships in a Nearshore Region	J.M. Bradford	40
79-19.9	Assessment of Annual Variation in Summer Phytoplankton	F.H. Chang	41
79-19.10	Chemical Data from a West Coast Cruise	M.T. Downs	41
79-22	Echinoderm Fauna of the Southwest Pacific	D.G. McKnight	47
79-24T	Role of Stream-bank Vegetation in the Long-term Removal of Nutrients from Stream Water	C. Howard-Williams	71
79-25T	Growth of <u>Lagarosiphon major</u> in Lake Taupo	C. Howard-Williams	71
79-27T	Nutrient Dynamics of Lake Rotongaio	A.B. Viner	71
79-29	Rangaunu Harbour Ecology	K.R. Grange	63
79-29T	Limnology of Antarctic Lakes	W.F. Vincent	72
79-30T	Algal Succession in Lake Okaro	W.F. Vincent	72
79-32T	Denitrification in Sediments and Lake Waters	M.T. Downes	72
79-33T	Zooplankton of Lake Okaro	D.J. Forsyth	73
79-35T	Investigation of Nitrification Rates in Sediments and Lake Waters	M.T. Downes	73

Project No.	Title	Project Leader	Page No.
79-36	Storage and Retrieval of NZOI Station and Underway Data	K.B. Lewis	81
79-37.1	Coastal Bathymetry Charts - Northern New Zealand	J.V. Eade	61
79-37.2	Coastal Bathymetry Charts - Tasman	J.S. Mitchell	61
80-1.2	Remote Sensing of East Coast Circulation	E.J. Barnes	76
80-5	Southwest Pacific Seamount Phosphorites	D.J. Cullen	56
80-9	Cook Strait Productivity	M.J. Bowman	42
80-11	Pennatulacea (Sea-pens) of New Zealand	D.G. McKnight	47
80-13	Free-living Axinellid Sponge from Chatham Rise - Morphology and Ichnology	D.J. Cullen	47
80-14	Hawke Bay Invertebrate Communities	K.R. Grange	48
80-17T	Factors Influencing the Distribution of Aquatic Macrophytes in lake Waikaremoana	C. Howard-Williams	73
80-18	Deep-flowing Western Boundary Current	L. Carter	57
80-22	Bryozoa of Western South Island	D.P. Gordon	48
80-24	Southern Fiords Sedimentology	R.A. Pickrill	60
81-2	Metalliferous Sediments in the Lau Basin	G.P. Glasby	57
81-4	Abyssal Fauna	D.G. McKnight	48
81-6	Shallow Rock-wall Communities	K.R. Grange	64
81-6	Rangaunu Harbour Entrance Dynamics	R.A. Pickrill	60
81-9	Catalogue and Retrieval System for Underwater Photographs	R.J. Singleton	81
81-10	Reactive Silicate in New Zealand Waters	J.M. Bradford	77
81-11	Information Required for Environmental Assessment in Coastal Inlets	R.A. Heath K.R. Grange	64
81-12	Continental Shelf and Slope Currents (Cook Strait)	R.A. Heath	50
81-17	West Coast Benthos	P.K. Probert	42
81-20	Bathymetric Charting of Additional Lakes and Sounds	J. Irwin	62
81-21	Eddies in New Zealand Waters	R.A. Heath	52
81-24	Diver's Data Recorder	P.J. Hill	81

Project No.	Title	Project Leader	Page No.
81-25T	Particulate Matter in Lake Waters	M.H. Timperley ^β	74
81-26T	Factors Controlling Algal Production in Lakes of the Central Volcanic Plateau	W.F. Vincent	74
81-30T	Chemical Methods Manual	M.T. Downes	74
81-31T	Computer Facilities Development	M.H. Timperley	82
81-32T	Nitrogen Balance for an Exotic Forest Catchment	S.E. Pickmere	74
81-33T	Optical Properties of New Zealand Lake Waters	C. Howard-Williams	75
82-2	Littoral and Infralittoral Ecology of New Zealand's Southern Islands	C.H. Hay	78
82-3	Marine Ecology of South Atlantic and South Indian Ocean Subantarctic Islands	C.H. Hay	78
82-6	North Fiji Basin - Geology and Geophysics	J.V. Eade	79
82-7	Charting of Coastal Sediments	E.S. Arron L. Carter J.S. Mitchell	62
82-8	Sediments of the New Zealand Region	J.C. McDougall	62
82-9T	Ecology and Life History of the Fresh-water Mussel <u>Hyridella menziesi</u> in Tapuaeharuru Bay, Lake Taupo	M.R. James	75
82-10	Tsunami Risk to the New Zealand Coastline	A.E. Gilmour	79
82-10T	Nutrient Limitation in Central Volcanic Plateau Lakes	E. White	75
83-1	<u>Prymnesium</u> from the 1983 Northland Phytoplankton Blooms	F.H. Chang	79
83-2	Isolation of <u>Dinophysis fortii/acuminata</u> from Marlborough Sounds	F.H. Chang	80
83-3	Wellington Harbour Metal Pollution	G.P. Glasby	64
83-4	Assessment of a New Zealand Black Coral Resource	K.R. Grange	65
83-5	New Zealand Nearshore and Estuarine Phosphorites	D.J. Cullen	57
83-6	Assessment of Sediment Settling Rates in Lakes Arapuni, Waikaremoana and Taupo	J. Irwin R.A. Pickrill W.deL. Main	60

Project No.	Title	Project Leader	Page No.
83-8	Use of Fluorescence Profiles and Primary Production in Contrasting Locations of Physical Disturbance	A.B. Viner	76
84-1	Biology of <u>Atrina zelandica</u> (Horse Mussel)	C.H. Hay	65

COMPLETED PROJECTS 1983-84

74-12T	Relationship Between Nutrient Load and Trophic Status of Lakes
74-15T	Limnology of Lake Rotongaio
77-16	Wellington Beaches
77-18T	Transfer of $^{32}\text{PO}_4$ Between Solution and Particulate Material in Lakewater
78-2	Rangaunu Harbour Physical Oceanography
78-6	Dynamics of the Flow Southeast of New Zealand
78-20T	Mechanisms of Rapid Photosynthetic Adaptation in Natural Plankton Populations and Associated Change in <u>in vivo</u> Fluorescence
78-25	Coral Reef Fish Distributions in North Tasman and Coral Seas
79-12	Structure and Sediments of the Bay of Plenty
79-19.1	West Coast Project - Plankton
79-19.2	Standing Stocks and Productivity of Phytoplankton off Westland, New Zealand, June 1979
79-19.3	Winter Phytoplankton and Microzooplankton Populations off Westland, New Zealand
79-19.4	Quantitative Distribution of Zooplankton off Westland
80-1.1	West Coast Currents and Hydrology
81-13	Combined Effects of Light, Temperature, and Salinity on Growth of Two Hypersaline <u>Dunaliella</u> Species from Lake Grassmere
81-14	Fine-structure of Mucilage-producing <u>Phaeocystis pouchetii</u> Cultured from the 1981 "Tasman Bay Slime"
81-22	PIRTS - Programme to Integrate Real-Time Systems
81-23	Lake Sediment Geochemistry
83-7	Circulation as Implied by the Distribution of Mixed Layer Depth

TERMINATED PROJECTS 1983-84

These are projects which were terminated wholly or in their original form. The latter were modified to become new project proposals.

69-1	Distribution of Planktonic Foraminifera in the Southwestern Pacific
69-2	Deep-sea Brachiopods
69-3	Coral Reef Ecosystems in the Southwest Pacific
73-1	Distribution of Felsic and Mafic Sands in Wanganui Bight
75-5	Cold Water Coral Banks in the New Zealand Region - Their Occurrence and Significance
75-17T	Effect of Changed Hydraulic and Nutrient Loads on Lake Rotoaira
76-2	Gravels in Northern Hawke Bay
76-3	Recent Sedimentary History of Pauatahanui Inlet
76-8	Water Motion-Sediment Transport Interaction
76-14T	Automated Kjeldahl-N and Total Phosphorus Analytical System
77-5	STEVE (Salinity Temperature Velocity Equipment)
77-8	Lau Ridge Phosphate and Associated Mineral Deposits
77-19	Canyon Faunas
78-15	Electronic Meter Block
78-17	Sedimentary Environment of Foveaux Strait Oyster Beds
78-29	Scaphopoda of New Zealand - a Review
78-32	Influence of the Physical Environment on Primary Productivity
79-5	East Australian Phosphorite
79-24	New Zealand and Southwest Pacific Dinoflagellates
79-26	Deep-sea Asellota (Crustacea : Isopoda) from New Zealand
79-28	Non-reef-building Scleractinian Corals of New Zealand - Distribution, Biogeography and Taxonomy
79-32	Ecology and Distribution of New Zealand Coastal Diatoms
79-34	Hard-shelled Plankton Survey Around New Zealand and the Southwestern Pacific
80-16	Modification of Camera System
80-19	Antarctic Studies on Phytoplankton
80-20	Information Retrieval of Biological Collection Data
80-20T	Total Phosphorus Analysis
80-21T	Nutrient Analysis in Seawater
80-25	Remote Sensing

80-25T	Selective Withdrawal in Lakes
80-26T	Modelling of Stratification in Upper Huia Reservoir
81-3	Wellington Harbour Seasonal Plankton
81-4	Abyssal Fauna and Environment
81-5	Antipatharian and Gorgonian Coelenterates of New Zealand
81-7	Microprocessor Controller for Remote Camera
81-10	Reactive Silicate in New Zealand Waters
81-28T	Boron Sensitivity of Waikato River Phytoplankton
82-4	Warm-core Eddy Zooplankton
82-5	Regional and Seasonal Variation in Water Quality and Benthos of the Marlborough Sounds
82-11T	An Evaluation of Chlorophyll <u>a</u> Estimation Methodologies
82-13T	Topographic Shading of Solar Radiation

PUBLICATIONS

FOR THE CALENDAR YEAR 1983⁺

- ANSCOMBE, K.*; THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Tonga. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 188-205.
- BOWMAN, M.J.*; CHISWELL, S.M.*; LAPENNAS, P.L.*; MURTAGH, R.A.*; FOSTER, B.A.* WILKINSON, V.; BATTARDE, W. 1983: Coastal upwelling, cyclogenesis and squid fishing near Cape Farewell, New Zealand. Pp 279-310 in Gade, H.G.; Edwards, A.; Svendsen, H. (eds) "Coastal Oceanography". Plenum Press, New York. ix + 582 p.
- BOXSHALL, G.A.*; LINCOLN, R.J.* 1983: Some new parasitic copepods (Siphonostomatoida : Nicotoidae), from deep-sea ascellate isopods. *Journal of Natural History* 17 : 891-900.
- BRADFORD, J.M. 1983: Physical and chemical oceanographic observations off Westland, New Zealand, 1979. *N.Z. Journal of Marine and Freshwater Research* 17 : 71-81.
- BRADFORD, J.M. 1983: Plankton and primary productivity in the vicinity of the Chatham Rise. *NZOI Oceanographic Summary* 21 : 14 p.
- BRADFORD, J.M.; HAAKONSSON, L.; JILLET, J.B.* 1983: The Marine Fauna of New Zealand : Pelagic calanoid copepods : Families Euchaetidae, Phaennidae, Scolecithricidae, Diaixidae, and Tharybidae. *N.Z. Oceanographic Institute Memoir* 90 : 150 p.
- BRADFORD, J.M.; WELLS, J.B.J.* 1983: New calanoid and harpacticoid copepods from beneath the Ross Ice Shelf, Antarctica. *Polar Biology* 2 : 1-15.
- BRADSTOCK, M.*; GORDON, D.P. 1983: Coral-like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. *N.Z. Journal of Marine and Freshwater Research* 17 : 159-63.
- BURNS, D.A. 1983: The distribution and morphology of tintinnids (ciliate protozoans) from the coastal waters around New Zealand. *N.Z. Journal of Marine and Freshwater Research* 17 : 387-406.
- BURNS, D.A.; MITCHELL, J.S. 1983: New Zealand coastal dinoflagellates with *Gonyaulax* affinities. *N.Z. Journal of Marine and Freshwater Research* 17 : 51-58.
- CARTER, L. 1983: Sediments, shallow seismic stratigraphy, and structure in the vicinity of the submarine power cables, Cook Strait, New Zealand. *NZOI Oceanographic Field Report* 19 : 14 p.
- CARTER, L.; SCHAFER, C.T.* 1983: Interaction of the Western Boundary Undercurrent with the continental margin off Newfoundland. *Sedimentology* 30 : 751-68.
- CHANG, F.H. 1983: The mucilage-producing *Phaeocystis pouchetii* (Prymnesiophyceae), cultured from the 1981 "Tasman Bay slime". *N.Z. Journal of Marine and Freshwater Research* 17 : 165-68.

⁺ And late entries for 1982

* Authors not on Divisional staff

- CHANG, F.H. 1983: Winter phytoplankton and microzooplankton populations off the coast of Westland, New Zealand, 1979. *N.Z. Journal of Marine and Freshwater Research* 17 : 279-304.
- COULTER, G.W.; DAVIES, J.; PICKMERE, S. 1983: Seasonal limnological changes and phytoplankton production in Ohakuri, a hydro-electric lake on the Waikato River. *N.Z. Journal of Marine and Freshwater Research* 17 : 169-83.
- DAWSON, E.W. 1982: [The bathyal marine fauna of the New Zealand Exclusive Economic Zone.] Pp 43-60 in Kussakin, O.G.; Kafanov, A.I. (eds) ["Fauna and Hydrobiology of the Shelf Zones of the Pacific Ocean".] Far East Science Center, Academy of Sciences of the USSR. Vladivostok. 148 p. [Proceedings of the XIV Pacific Science Congress, Issue 4.] [In Russian, with English summary]
- DOMINIK, J.*; STOFFERS, P.*; GLASBY, G.P. 1983: Clay mineralogy and occurrence of palygorskite in deep-sea sediments from the eastern Indian Ocean collected during D.S.D.P. Legs 22, 26, and 27. *Chemie der Erde* 42 : 1-14.
- DUPONT, J.*; THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Wallis and Futuna. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 230-31.
- FORSYTH, D.J.; DOWNES, M.T.; GIBBS, M.M.; KEMP, L.; MCCALLUM, I.; MCKENZIE, L.; PAYNE, G. 1983: Aspects of limnology of Lake Rotongaio. *N.Z. Journal of Marine and Freshwater Research* 17 : 423-35.
- FORSYTH, D.J. 1983: Introduction. Pp 1-3 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". *N.Z. DSIR Inf. Ser.* 158 : xii + 163 p.
- FORSYTH, D.J. 1983: Animals of the lake bed. Pp 97-110 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". *N.Z. DSIR Inf. Ser.* 158 : xii + 163 p.
- FRIEDRICH, G.*; GLASBY, G.P.; THIJSSSEN, T.*; PLUGER, W.L.* 1983: Morphological and geochemical characteristics of manganese nodules collected from three areas on an equatorial Pacific transect by R.V. Sonne. *Marine Mining* 4 : 167-253.
- GAUSS, G.A.*; EADE, J.; LEWIS, K. 1983: Geophysical and sea bed sampling surveys for constructional sand in Nuku'alofa Lagoon, Tongatapu, Kingdom of Tonga. *South Pacific Marine Geological Notes* 2(10) : 155-84.
- GILMOUR, A.E. 1983: Glitch filtering. *Automation & Control* 4 : 36.
- GLASBY, G.P. 1983: The three-million-tons-per-year manganese nodule "mine site". An optimistic assumption? *Marine Mining* 4 : 73-77.
- GLASBY, G.P. 1983: The Southwestern Pacific and Samoan Basins. *N.Z. Geographer* 39(1) : 3-11.
- GLASBY, G.P. 1983: Pacific is favored for sub-seabed radio-active waste disposal. *Pacific Islands Monthly*, April 1983 : 15, 17.
- GLASBY, G.P. 1983: The sub-seabed disposal of high level nuclear waste : An alternative viewpoint. *N.Z. International Review* 8(3) : 21-23.
- GLASBY, G.P.; FRIEDRICH, G.*; PLUGER, W.L.*; THIJSSSEN, T.*; KUNZENDORF, H.* 1983: Manganese nodule studies in the Equatorial and Southwest Pacific : The I.C.I.M.E. Project. *NZOI Oceanographic Summary* 22 : 10 p.
- GLASBY, G.P.; THIJSSSEN, T.*; PLUGER, W.L.*; FRIEDRICH, G.*; MANGINI, A.*; STOFFERS, P.*; DOMINIK, J.*; FRENZEL, G.*; ANDREWS, J.E.*; ROONWAL, G.S.* 1983: Manganese nodule distribution, mineralogy and geochemistry and

- relation to sediment type in the Aitutaki Passage, South-west Pacific. *Report of the Hawaii Institute of Geophysics, HIG-83-1* : 112 p.
- GORDON, D.P.; McKNIGHT, D.G. 1983: Entoprocta, Phoronida, Bryozoa, Echinodermata, Hemichordata, Tunicata and Cephalopoda. In Brownsey, P.J.; Baker, A.N. (eds) "The New Zealand Biota - What do we know after 200 years?" *National Museum of N.Z. Miscellaneous Series 7* : 74-86.
- GRANGE, K.R. 1983: Environmental effects of cooling water discharge into the ocean. *N.Z. Energy Research and Development Committee Report No. 96* : 12 p.
- GRANGE, K.R.; SINGLETON, R.J. 1983: Australia's lonely atolls. *Australian Natural History 21(2)* : 76-79.
- GREIG, M.J.N. (Comp.) 1983: New Zealand Oceanographic Institute hydrology station data 1979-80. *N.Z. Oceanographic Institute Hydrology Station Data [3]* : 63 p.
- GRIGGS, G.B.*; CARTER, L.; KENNETT, J.P.*; CARTER, R.M.* 1983: Late Quaternary marine stratigraphy southwest of New Zealand. *Bulletin of the Geological Society of America 94* : 791-97.
- HAY, C.H. 1983: Book Review. "The Shore Environment, Vol. 1 Methods. Vol. 2 Ecosystems". Price, J.H.; Irvine, D.E.G.; Farnham, W.F. (eds). Published for the Systematics Association by Academic Press, London, 1980. *Phycologia 22* : 213-21.
- HAY, C.H.; HODGSON, V.*; SCOTT, G.*; MILLER, J.* 1983: Colorimetric determination of the algin content of three South African kelp seaweeds (*Ecklonia maxima*, *Laminaria pallida* and *Macrocystis angustifolia*). *Transactions of the Royal Society of South Africa 45* : 73-89.
- HEATH, R.A. 1983: Observations on Chatham Rise currents. *N.Z. Journal of Marine and Freshwater Research 17* : 321-30.
- HEATH, R.A. 1983: Tidal currents in the southwestern Pacific Basin and Campbell Plateau, southeast of New Zealand. *Deep-Sea Research 30* : 393-409.
- HEATH, R.A.; SHAKESPEARE, B.S.; GREIG, M.J.N. 1983: Physical oceanography of Rangaunu Harbour, Northland, New Zealand. *N.Z. Journal of Marine and Freshwater Research 17* : 481-93.
- HOWARD-WILLIAMS, C.; PICKMERE, S.; DAVIES, J. 1983: Decay rates and nitrogen dynamics of decomposing watercress (*Nasturtium officinale* R. Br.). *Hydrobiologia 99* : 207-14.
- HOWARD-WILLIAMS, C.; VINCENT, W.F. 1983: Plants of the littoral zone. Pp 73-83 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". *N.Z. DSIR Inf. Ser. 158* : xii + 163 p.
- IRWIN, J.; PICKRILL, R.A. 1983: Sedimentation in glacial-fed natural lakes : Implications for hydro-electric storage lakes. *Transactions of the Institution of Professional Engineers of N.Z. 10(3/CE)* : 84-92.
- IRWIN, J.; PICKRILL, R.A.; MAIN, W.deL. 1983: An outrigger for sampling from small boats. *Journal of Sedimentary Petrology 53* : 675-76.
- JOUANNIC, C.*; THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Kiribati. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". *U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5* : 52-64.
- JOUANNIC, C.*; THOMPSON, R.M. 1983: Bibliography of the geology and geophysics of the Southwestern Pacific : Regional. In Jouannic, C.; Thomp-

- son, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". *U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5* : 232-56.
- KNEDLER, K.E.*; GLASBY, G.P.; FREEMAN, A.G.* 1983: Mineralogy and geochemistry of iron in some Recent continental shelf sediments off Goa. *Indian Journal of Marine Science* 12 : 133-37.
- LINCOLN, R.J.*; BOXSHALL, G.A.* 1983: A new species of *Deoterthron* (Crustacea: Tantulocarida) ectoparasitic on a deep-sea asellote from New Zealand. *Journal of Natural History* 17 : 881-89.
- LYON, G.L.*; RICHARDSON, J.R. 1983: Non-terrestrial food source for Fiordland brachiopods : Carbon isotope evidence. *Report of the Institute of Nuclear Sciences (N.Z.) INS-R 317* : 15 p.
- NELSON, W.A.; ADAMS, N.M.* 1983: A taxonomic revision of the families Chordariaceae and Chordariopsidaceae (Phaeophyta) in New Zealand. *N.Z. Journal of Botany* 21 : 77-92.
- PICKRILL, R.A. 1983: Wave-built shelves on some low-energy coasts. *Marine Geology* 51 : 193-216.
- PICKRILL, R.A.; IRWIN, J. 1983: Sedimentation in a deep glacier-fed lake - Lake Tekapo, New Zealand. *Sedimentology* 30 : 63-75.
- PICKRILL, R.A.; CURRIE, R.G.* 1983: Computer programs to estimate wave generated orbital velocities and threshold erosion velocities. *Current Research, Part A. Geological Survey of Canada Paper 83-1A* : 253-61.
- RICHARDSON, J.R. 1983: Brachiopoda. In Brownsey, P.J.; Baker, A.N. (eds) "The New Zealand Biota - What do we know after 200 years?" *National Museum of N.Z. Miscellaneous Series 7* : 72-73.
- SCHAFER, C.T.*; COLE, F.E.*; CARTER, L. 1983: Paraecology of some arenaceous foraminifera genera and species associations off northeast Newfoundland. In Verdenius, J.G. et al. (eds) "Proceedings of the First Workshop on Arenaceous Foraminifera, 7-9 September 1981, Trondheim, Norway". *Institutt for kontinentalsokkelundersokelser Publication 108* : 133-45.
- STANTON, B.R. 1983: Low frequency variability in the Mediterranean Outflow west of Gibraltar. *Deep-Sea Research* 30(7A) : 743-61.
- STOFFERS, P.*; GLASBY, G.P.; PLUGER, W.L.*; WALTER, P.* 1983: Reconnaissance survey of the mineralogy and geochemistry of some New Zealand lake and nearshore sediments. *N.Z. Journal of Marine and Freshwater Research* 17 : 461-80.
- STOFFERS, P.*; SCHMITZ, W.*; GLASBY, G.P. 1983: Geochemistry of deep-sea sediments from the Indian Ocean collected during D.S.D.P. Legs 22, 24, 26 and 27. *Chemie der Erde* 42 : 15-30.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics of the Cook Islands. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". *U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5* : 17-27.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Nauru. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". *U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5* : 65-67.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics of offshore New Zealand (north of 40°S). In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". *U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5* : 97-118.

- THOMPSON, R.M. 1983: Bibliography of the geology and geophysics of Niue. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 119-22.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Samoa. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 150-55.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics for Tokelau. In Jouannic, C. Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 186-87.
- THOMPSON, R.M. 1983: Bibliography of geology and geophysics of Tuvalu. In Jouannic, C.; Thompson, R.M. (eds) "Bibliography of Geology and Geophysics of the Southwestern Pacific". U.N. ESCAP, CCOP/SOPAC Tech. Bull. 5 : 206-07.
- TIMPERLEY, M.H. 1983: Phosphorus in spring waters of the Taupo Volcanic Zone, North Island, New Zealand. *Chemical Geology* 38 : 287-306.
- TIMPERLEY, M.H. 1983: Geological history. Pp 5-15 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.
- TIMPERLEY, M.H. 1983: Climate and hydrology. Pp 45-54 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.
- VINCENT, W.F. 1983: Fluorescence properties of the freshwater phytoplankton: Three algal classes compared. *British Phycological Journal* 18 : 5-21.
- VINCENT, W.F. 1983: Phytoplankton production and winter mixing : Contrasting effects in two oligotrophic lakes. *Journal of Ecology* 71 : 1-20.
- VINCENT, W.F. 1983: Physics of the lake - waves, mixing, current, and clarity. Pp 55-62 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.
- VINCENT, W.F.; FORSYTH, D.J. 1983: Plankton of the open water. Pp 85-95 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.
- VINER, A.B.; KEMP, L. 1983: The effect of vertical mixing on the phytoplankton of Lake Rotongaio (July 1979 - January 1981). *N.Z. Journal of Marine and Freshwater Research* 17 : 407-22.
- WHITE, E. 1983: Lake eutrophication in New Zealand - a comparison with other countries of the Organisation for Economic Co-operation and Development. *N.Z. Journal of Marine and Freshwater Research* 17 : 437-44.
- WHITE, E. 1983: Chemicals and their importance to the lake. Pp 63-72 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.
- WHITE, E.; FORSYTH, D.J.; HOWARD-WILLIAMS, C. 1983: Concluding perspective : The lake and man. Pp 151-54 in Forsyth, D.J.; Howard-Williams, C. (comps) "Lake Taupo : Ecology of a New Zealand Lake". N.Z. DSIR Inf. Ser. 158 : xii + 163 p.

CHARTS

- ARRON, E.S.; DOYLE, A.C. 1983: Mokau sediments. *N.Z. Oceanographic Institute chart, Coastal Series 1:200,000.*
- HERZER, R.H.*; CARTER, L. 1983: Pegasus bathymetry, 2nd edition. *N.Z. Oceanographic Institute Chart, Coastal Series 1:200,000.*
- IRWIN, J.; HUTCHINSON, R.T.* 1983: Lake McKerrow : Lake Alabaster bathymetry 1:18,000. *N.Z. Oceanographic Institute Chart, Lake Series.*

UNPUBLISHED REPORTS

- FORSYTH, D.J. 1983: The effect of geothermal waters on stream invertebrates. *Taupo Research Laboratory File Report 27/T/57 : 12 + [10] p.*
- FORSYTH, D.J.; SALONEN, K.* 1983: Carbon content of crustacean zooplankton in Lakes Okaro, Rotongaio and Taupo. *Taupo Research Laboratory File Report 27/T/64 : 4 + [6] p.*
- GIBBS, M.M.; SPIGEL, R.H.; VINCENT, W.F. 1983: Penetration of Ohau Channel water into Lake Rotoiti. A brief summary of Lake Rotoiti studies 1981-1983, prepared for a meeting of the Bay of Plenty Catchment Commission in Rotorua, 19 October 1983. *Taupo Research Laboratory File Report 27/T/63 : 5 + [4] p.*
- HOWARD-WILLIAMS, C.; DOWNES, M.T.; DAVIES, J. 1983: Limnological characteristics of the Tiniroto and Putere lakes. *Taupo Research Laboratory File Report 27/T/59 : 9 + [11] p.*
- HOWARD-WILLIAMS, C.; SPIGEL, R.H. 1983: Stratification of Lake Waihou (Tiniroto, North Island) and calculations on small lake heat budgets. *Taupo Research Laboratory File Report 27/T/60 : 7 + [13] p.*
- SPIGEL, R.H.; TIMPERLEY, M.H. 1983: Geothermal influences on the limnology of Lake Rotoiti. Preliminary conclusions from the 1982 field data. *Taupo Research Laboratory File Report 27/T/58 : 14 p.*
- WILKINSON, G. 1983: Chlorophyll Manual. Chlorophyll a analysis - guidelines and procedures for extraction, measurement and calculation of chlorophyll a concentration. *Taupo Research Laboratory File Report 27/T/62 : 31 + [28] p.*
- WILKINSON, V.H.; GOLDSTONE, A.* 1983: An oxygen budget estimate applied to an anomalous diatom bloom off the Coromandel Peninsula of the North Island, New Zealand, in summer, 1983. *Taupo Research Laboratory File Report 27/T/61 : 14 + [13] p.*

PUBLICATIONS BY OUTSIDE AUTHORS

These non-Divisional publications arise, in whole or in part, from work, material, or data collected by NZOI or Taupo or result from association with the Division.

- BOWMAN, M.J.; KIBBLEWHITE, A.C.; CHISWELL, S.M.; MURTAGH, R.A. 1983: Shelf fronts and tidal stirring in greater Cook Strait, New Zealand. *Oceanol. Acta 6(2) : 119-29.*
- BOWMAN, M.J.; KIBBLEWHITE, A.C.; MURTAGH, R.A.; CHISWELL, S.M.; SANDERSON, E.G. 1983: Circulation and mixing in greater Cook Strait, New Zealand. *Oceanol. Acta 6(4) : 383-91.*

- COOK, P.L.; CHIMONIDES, P.J. 1983: A short history of the lunulite Bryozoa. *Bull. mar. Sci.* 33(3) : 566-81.
- COOK, P.L.; CHIMONIDES, P.J. 1984: Recent and fossil Lunulitidae (Bryozoa: Cheilostomata) 1. The genus *Otionella* from New Zealand. *Journal of Natural History* 18 : 227-54.

DIVISION OF MARINE AND FRESHWATER SCIENCE

STAFF DIRECTORY 1983-84

D.E. HURLEY, Director

N.Z. OCEANOGRAPHIC INSTITUTE

LOCATION	Greta Point, Evans Bay, Wellington
POSTAL ADDRESS	P.O. Box 12-346, Wellington North
TELEGRAMS	OCEANGRAPH Wellington
TELEPHONE	861-189 Wellington

DIRECTOR'S OFFICE & ADMINISTRATION

Director

Dr D.E. Hurley

Administration

K.P. Fitzgerald¹
 J.G. Heffernan
 C.B. Kerr¹
 P.A. Malpas¹
 R.E. Tolmie¹
 L.M. van Hout¹
 M.H. Wilkinson¹

Reception

P.H.L. Jones

Typing

K.P. Jackson
 G.A. Marsden

Tea Room

M.S. McCabe

Library

M.G. Hardy
 M. Kelly
 A.D. Milne

Information & Editorial

D.P. Gordon
 G. Stephenson
 R.M.C. Thompson

WORKSHOP & MAINTENANCE

B.J. Hunt
 B.R. Johnstone
 P. Wahren
 P.D. Wilson

SHIP LIAISON

R.E. Williams

BIOLOGICAL OCEANOGRAPHY

P.W. Anderson
 R.P. Baldwin
 *J.M. Bradford
 F.H. Chang
 B.E. Chapman
 E.W. Dawson
 K.R. Grange
 C.H. Hay
 P.A. Luckens
 D.G. McKnight
 W.deL. Main
 P.K. Probert (NRAC Fellow)
 J.R. Richardson¹ (Retired)
 R.J. Singleton
 W.A. Nelson¹ (Temp. App't)

MARINE GEOSCIENCE

E.S. Arron
 D.A. Burns (Seconded to Treasury)
 L. Carter
 D.J. Cullen
 J.V. Eade
 G.P. Glasby
 J. Irwin
 *K.B. Lewis
 J.C. McDougall
 J.S. Mitchell
 R.A. Pickrill

PHYSICAL OCEANOGRAPHY

A.G. Cole
 A.E. Gilmour
 M.J.N. Greig
 *R.A. Heath
 N.M. Ridgway
 B.S. Shakespeare
 B.R. Stanton (O'seas Leave)

ELECTRONICS

E.J. Barnes
 P.J. Hill
 W.E. Whitley

TAUPO RESEARCH LABORATORY

LOCATION Tuwharetoa Street, Taupo
 POSTAL ADDRESS P.O. Box 415, Taupo
 TELEPHONE Taupo 86-660

OFFICER-IN-CHARGE & ADMINISTRATION

Officer-in-Charge

Dr E. White

Administration

R.J. Jones

Reception, Typing, Library

J.M. Simmiss

RESEARCH

W.R. Battaerd ¹	(Temp. App't)	G.W. Payne	
G.W. Coulter ¹	(O'seas Leave)	S.E. Pickmere	
M.T. Downes		M.H. Timperley	
S.J. Dryden ¹		R.J. Vigor-Brown	
D.J. Forsyth		W.F. Vincent	(O'seas Leave)
M.M. Gibbs		A.B. Viner	
C. Howard-Williams		V.H. Wilkinson ¹	
M.R. James		J.C. Priscu ¹	(Temp. App't)
K.D. Law ¹		R.H. Spigel ¹	(Temp. App't)

TANGAROA STAFFMasters

D.N. Gillstrom
 P. Scarrott

Mates

First - I. Park
 D. Teasdale
 B.J. Wardle

Second - P. Allison
 J.C. Parsloe
 D. Teasdale

Third - P. Allison
 S. Banks
 K. Finnigan

Engineers

Chief - D. McKelvey
 D.J. Strong

Second - R. Bonner
 G. Guthrie
 J. McLean

Third - T. Smith
 W. Tripp

Fourth - P. Lapsley
 P. Slako

* Section Head

¹ Part of year