NEW ZEALAND MARINE SCIENCES SOCIETY

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THE NEW ZEALAND MARINE SCIENCES SOCIETY

REVIEW 42

Edited by:
Justine Saunders

New Zealand Marine Sciences Society
New Zealand

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September 2000

Cover Acknowledgements:

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The New Zealand Marine Sciences Society

ABOUT THE SOCIETY

The Society is a non-profit organisation formed in 1960 to foster an understanding and appreciation of our marine environment, to provide a means of communication within our marine science community, to encourage and assist marine science students and young scientists and to provide advice to government on marine policy issues

The NZMSS currently consists of about 400 individual members. As at July 1999 the society had a total of 310 individual members comprising 166 full members, 132 student members and 12 life members who are nominated for their contribution to the Marine Sciences in New Zealand. Life members are:

Dame Professor Patricia Bergquist
Mr Jim Brodie
Dr Vivienne Cassie-Cooper
Professor J.Howard Choat
Paul Ensor
Mr R. I. C. Chris Francis
Roger Grace
Dr Janet Grieve
Dr Ron Heath
John Jillett
Professor George A. Knox
Professor John Morton

Subscription rates for 1998 were:

Full member	$45.00
Student member	$20.00
Retired member	$20.00
Institution membership	$45.00

The NZMSS holds an annual conference, usually in July-August, in conjunction with the Annual General Meeting. Student participation is strongly encouraged, and the Society awards student prizes each year. Students who present their research at the conference are also eligible for assistance with their travel costs. Members receive the annual Marine Sciences Review, which details abstracts from the preceding conference, activities of the society, summaries of research activities, and a list of recent publications.

Inquiries and correspondence should be addressed to:

The Secretary, Dr Karen Tricklebank
New Zealand Marine Sciences Society
School of Environmental and Marine Sciences
University of Auckland
Private Bag 92019
Auckland
New Zealand

THE SOCIETY COUNCIL

1999-2000

President:	Russ Babcock	***Secretary:***	Karen Tricklebank
Vice president:	Dan McClary	***Treasurer:***	Bob Hickman
Past President:	Rob Murdoch		
Council members:	Karin Bryan, Russell Cole, Sam Du Fresne, Mark Gibbs, Conrad Pilditch, Clive Roberts, Carol Stewart, Kathy Walls.		

NZMSS Alphabetical List of Council Members 1999/00

Dr Russ Babcock (President): r.babcock@auckland.ac.nz
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Ph. +64 (09) 849 4180, Fax 815 4326

Dr Rob Murdoch (Immediate Past President): r.murdoch@niwa.cri.nz
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Dr Clive Roberts (Council): cliver@tepapa.govt.nz
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Dr Carol Stewart (Council): c.stewart@auckland.ac.nz
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NEW ZEALAND MARINE SCIENCES SOCIETY RULES

(as at 4 May 1995)

1. NAME

The name of the Society shall be the New Zealand Marine Sciences Society, hereinafter called the Society.

2. OBJECTS

The objects of the Society shall be:

a) To encourage and assist marine research in New Zealand.

b) To provide means of communication among persons interested in research in the marine sciences and to provide opportunity for them to foregather by the holding of an annual conference.

c) To act as spokesman when required, on behalf of the interests of marine research in New Zealand.

d) To co-operate with other scientific bodies and to seek such affiliations as may be appropriate.

3. MEMBERS

(a) Members shall be classified as follows:

i) Overseas Members and Institutions

ii) Student Members of NZ educational institutions

iii) Full NZ Members and NZ Institutions

iv) Retired Members

v) Honorary Life Members

vi) Corporate Members

(b) The Council may elect any person as an ordinary member of the Society on the recommendation of two members of the Society.

(c) Any member who has given outstanding service to marine science in New Zealand may, on the recommendation of the Council, be elected as an Honorary member at any Annual or Special General Meeting.

(d) Any member of the Society may resign by giving notice in writing to the Secretary and paying all subscriptions due; provided that any member giving such notice before 30th April shall not be liable to pay the subscription for that year.

(e) Any member whose annual subscription is more than two years in arrears shall be removed from membership of the Society and may be re-admitted by resolution of the Council on payment of all arrears.

4. SUBSCRIPTION

(a) The annual subscription shall be one dollar ($1.00), or such other sum as any Annual or Special General Meeting shall, from time to time, decide.

(b) The first subscription for membership shall be forwarded to the Secretary or Secretary/Treasurer with the completed application form.

(c) All subscriptions after the first shall become due and payable on the first day of each financial year.

(d) Each person elected as a member shall be given notice thereof in writing by the Secretary.

(e) Any member requiring a copy of the rules of the Society may do so by requesting a copy from the Secretary.

(f) In exceptional circumstances the Council may by resolution remit the payment of an annual subscription or part thereof.

5. OFFICERS

The Officers of the Society shall consist of a President, a Vice-President, a Secretary, a Treasurer (or a Secretary-Treasurer), and an Auditor, all of whom except the Auditor, shall be members of the Society.

6.COUNCIL

(a) The Council shall consist of the following:

(i) The officers except the Auditor

(ii) The Immediate Past President

(iii) Five members elected by the Annual General Meeting.

(b) The President, Vice-President, Secretary (or Secretary-Treasurer), and Treasurer shall be elected by successive ballots in that order at the Annual General Meeting.

(c) The members of the Council shall be elected by ballot at the Annual General Meeting after the officers have been elected.

(d) Candidates for positions as officers or members of the Council shall be nominated by members of the Society at the Annual General Meeting, or in writing signed by any two members, received by the Secretary before the time of such meeting. Every candidate shall before election signify personally or in writing his or her acceptance of nomination.

(e) All officers and members of Council shall be eligible for immediate re-election PROVIDED ALWAYS that no person having held the same office either of President or Vice-President, for two successive years shall be eligible for immediate re-election to that office.

(f) The Council shall have powers to appoint members of the Society to fill any casual vacancies.

(g) The officers and Council shall take office immediately after the close of the Annual General Meeting at which they are elected and shall have full control of the management of the Society except where otherwise provided in these rules.

(h) At any meeting of the Council four shall form a quorum.

(i) The Council may delegate any of its powers and duties to sub-committees consisting of such member or members of the Society as it may resolve, provided that at least one member of each sub-committee shall be a member of the Council, and may grant to such sub-committees the power to co-opt other persons whether members of the Society or not.

(j) Meetings of the Council shall be called by the Secretary (or Secretary-Treasurer) on the instructions of the President or on the receipt of a requisition signed by not less than four members of the Council.

7. FINANCES

(a) The control and investment of the funds of the Society shall be wholly within the power of the Council, which may open and operate accounts at any bank or banks as it deems fit, including the Post Office Savings Bank. The Trustees of any such accounts shall be the Treasurer (or Secretary-Treasurer) and any two officers or members of the Council appointed by the Council for that purpose, cheques and withdrawal warrants shall be signed by any two of the Trustees.

(b) The Treasurer shall keep a correct account of all funds received and expended by the Society, and shall prepare at the end of each financial year a Balance Sheet and Statement of Accounts for that year.

(c) The accounts of the Society shall be audited at the end of each financial year by an Auditor, who shall hold professional qualifications in accountancy. The Auditor shall be appointed each year at the Annual General Meeting.

(d) The financial year of the Society shall end on the 31st March in each year.

(e) The Society shall not have the power to borrow money.

8. MEETINGS

(a) The Society shall hold at least one General Meeting in each financial year. At one such meeting there shall be a business session, which shall constitute the Annual General Meeting of the Society. At this meeting the Society shall:

  (i) Receive from the Council a Report, Balance Sheet, and Statement of Accounts for the preceding financial year.

  (ii) Elect the officers and Council and appoint an Auditor for the ensuing year.

  (iii) Decide on any motion which may be duly submitted to the meeting.

(b) A Special General Meeting shall be held at any time by resolution of the Council or within six weeks of receipt by the Secretary of a requisition signed by at least ten members specifying the purpose for which the meeting is to be called.

(c) Notice and agenda of each Annual and Special General Meeting shall be posted to each member at least fourteen days before that meeting. At any Special General Meeting no motion not included in the notice calling the meeting may be proposed, discussed, or put to vote except by consent of two thirds of the members present.

(d) The Annual Report, Balance Sheet and Statement of Accounts for each financial year shall be posted to all members at least fourteen days before the next Annual General Meeting.

(e) At any Annual or Special General Meeting fifteen members shall constitute a quorum.

(f) At any Annual or Special General Meeting, or Council Meeting, the chair shall be taken by the President, or if the President is absent the Vice-President, or failing him a member elected by the meeting.

(g) At any meeting voting shall be on the voices or by show of hands or by ballot at the discretion of the chairman, PROVIDED THAT if any member so demand, voting shall be by ballot. The chairman shall have a deliberate and casting vote.

9. ALTERATION OF RULES

(a) Any alteration, addition, or recession in these rules shall be made only at an Annual or Special General Meeting.

(b) Notice of the proposed alteration, addition, or recession shall be posted to every member at least fourteen days prior to the meeting.

(c) The meeting may amend any such proposals.

(d) No resolution shall effect any alteration of these rules unless assented to by two-thirds of the members present at the meeting.

10. INTERPRETATION OF THE RULES

The decision of the Council as to the interpretation of these rules shall be final and binding on all parties except at any Annual or Special General Meeting when the decision of the chairman of such meeting will be final and binding on all parties.

11. COMMON SEAL

The common seal of the Society shall be in the custody of the Secretary (or Secretary-Treasurer), who shall in pursuance of a resolution of the Council to that effect, affix the same to all instruments requiring the same.

12. WINDING UP

In the event of the dissolution of the Society any remaining assets of the Society after payment of all liabilities shall be disposed of in such manner as the last Annual or Special General Meeting shall decide, or failing any such decision, shall, ipso facto, become the property of the Royal Society of New Zealand.

13. AWARDS

Periodically the Council of the Society may present an award to any person who they feel has made an outstanding contribution to marine science.

NZMSS ONLINE

Members are encouraged to take advantage of the following online options:

The NZMSS Website

By visiting the homepage at: http://www.rsnz.govt.nz/clan/nzmss/
you can:

- obtain a listing of your current council, elected officers and their contact details
- get access to the guidelines for the First Overseas Conference Travel Fund for students
- see the latest version of the Society rules
- download abstracts from previous Marine Sciences conferences
- download excerpts from previous Reviews and more.

The Marine Sciences listserver

This communication tool is somewhat under-utilised at present, and you are encouraged to make use of it. The list server is moderated by:

Owen Watson: owen@rsnz.govt.nz
The Royal Society of New Zealand, P O Box 399, Wellington
Ph. +64 (04) 472 7421, Fax 473 1841

To join the list server, send a message to:	majordomo@rsnz.govt.nz
Request the following two lines:	subscribe nzmss-list end
To unsubscribe, send a message to:	majordomo@rsnz.govt.nz
Type the following two lines:	unsubscribe nzmss-list end

To distribute your message to everyone on the NZMSS list send your message to :
nzmss-list@rsnz.govt.nz

ANNUAL REPORT

FOR THE YEAR ENDED 31 MARCH 2000

Management Statement

The Council has been responsible for the preparation of these financial statements, which were approved at the Society's Annual General Meeting on 31 August 2000 They fairly reflect the Society's financial position and activities for the year ended 31 March 2000.

The financial report was audited by Peter H Scholtens CA, of Wellington, in whose opinion it "fairly reflects the financial position of the New Zealand Marine Sciences Society as at 31 March 2000".

The audit report, dated 6th August 2000, is lodged in the Society's records.

Annual Financial Report

Income and Expenditure Account for the year ended 31 March 2000

	1999	**2000**
Income		
Subscriptions Received - Arrears	2840	2345
Subscriptions Received - Current year	11,158	4835
Conference Net Income	3,793	6316
Donations	300	0
Interest Received	616	962
	18,707	$14,458
Expenditure		
NZ Marine Sciences Review & Newsletter	3598	2185
Council Expenses	0	1070
Royal Society of NZ - affiliation fees	563	562
First Overseas Conference Travel Awards	3500	3920
Postage	186	0
DOC Prize	300	0
Student Travel Grants	2835	3880
Stationary and General Expenses	379	0
Bank Fees	124	154
Auditor's Fees	135	135
Total Expenditure	11,620	$11,906
Surplus of Income over Expenditure	7,086	$2,552

Balance Sheet as at 31 March 1999

	1999	2000
Members Funds:		
Balance 1 April	15,435	22,522
Surplus of Income over Expenditure for Year	7,087	2,552
Balance 31 March	22,521	**$25,074**
Represented by:		
Westpac Trust Bank - Cheque Account	7,438	9,179
Westpac Trust Bank - Term Investment	14,632	15,473
Accounts Receivable	593	422
	$22,663	$25,074
Less Accounts Payable	140	0
	22,521	**$25,074**

Notes to the Financial Statements

Statement of General Accounting Policies

These financial statements have been prepared using the historical cost method. Accrual accounting has been used except as noted below, and reliance has been placed on the Society being a going concern.

Statement of Particular Accounting Policies

All subscription receipts have been accounted for on a cash basis. Subscriptions received in advance ($200) have not been disclosed separately.

The net surplus from the conference has been recorded on a cash basis. A statement of income and expenditure for the conference was included in the audit, however no source documents were sighted.

These financial statements were prepared on a Goods and Services Tax (GST) inclusive basis.

Changes in Accounting Policies

There have been no changes in accounting policies. All policies have been applied on bases consistent with the previous year.

First Overseas Conference Travel Awards	**1998/99**	**1999/2000**
Peter Stratford		500
Manel Wanigasekera		420
Nicole Goebel		1000
Julia Phillips		800
Paul Brewin		1200
	3,500	$3,920

There was no income specifically designated for the First Overseas Conference Travel Fund.

Income

The Society maintained a healthy financial position.

Subscription income was only half that of the previous year, because no invoicing was done during the year whilst the new membership/subscription database was being developed.

Income from the conference was more than predicted because venue costs came in below budget.

Most of the interest earned is from investment of the 1997 conference profit as a term deposit.

Expenditure

Expenditure was again held in check during 1999/2000, with email and telephone used for council business. Council expenditure comprised an airfare for the President to attend a meeting, and a payment for work involved in preparing the membership/subscription database.

The usual three major items (the Review/Newsletter, FOCTF Awards, and student travel grants) continue to make up over 80% of the Society's expenditure.

The Society gave 39 student travel grants for the 1999 conference, varying from $80-130 each.

The Royal Society of NZ fee is $500 + GST per annum (calendar year).

The accounts receivable item is nine months (April-December 2000) Royal Society affiliation fees paid in advance.

1999 ANNUAL GENERAL MEETING OF THE NEW ZEALAND MARINE SCIENCES SOCIETY

Room 206, Hugh Mackenzie Lecture Theatres,
Victoria University, Wellington
Thursday 2 September, 5:45 pm

MINUTES

1. The **minutes** of the 1998 AGM were accepted by all present.
2. Russ Babcock gave the **President's report** on current activities of NZMSS.

   The topics covered were:

   a) the Society's lobbying on the Fisheries Amendment Bill

   b) the future publication of the NZMSS Review on our homepage, with hard copies to be made available to members without Internet access

   c) the future involvement of NZMSS in the protection of seamounts. It was suggested that a small group pursue the issue of seamount protection on behalf on the Society.

   Action: Russ to coordinate efforts, and to consult with fishing industry rep Jonathon Peacey.

3. **Financial report**

   Bob Hickman presented the (unaudited) accounts of the Society, and they were accepted by all present.

4. **The 2000 NZMSS conference** was discussed. The next venue is to be Hamilton, with the organisation to be a joint effort between NIWA and Waikato University. Contact people are Julie Hall, Terry Hume and Conrad Pilditch.
5. **Elections** for the 1999/2000 NZMSS council were held.

Office	**Elected**
President	Russ Babcock
Vice-president	Dan McClary
Secretary	Karen Tricklebank
Treasurer	Bob Hickman
Immediate past president	Rob Murdoch
Student representative (new position from 1999):	Sam du Fresne

Council

Carol Stewart

Clive Roberts

Russell Cole

Kathy Walls

Mark Gibbs

Conrad Pilditch (2000 conference organiser)

Karin Bryan (2000 conference organiser)

All were elected unopposed. Members of the 1998/99 council not seeking re-election were Liz Slooten, Julie Hall and Janet Grieve.

6. Carol Stewart. proposed that a **student representative** become a permanent feature of the council. This suggestion was seconded by Alistair McDiarmid. CS suggested that Sam du Fresne, of Otago University, would be a good candidate.

   Action: Sam to be approached.

7. **General business**: Alistair McDiarmid suggested that it would be appropriate for the Society to endorse a Code of Conduct for animal experimentation. According to the general discussion, there are several versions of these already existing in NZ, at Leigh Marine Lab and Otago. A version is to be posted on our Homepage for comments.

The meeting was declared closed at 6:30pm.

Annual Conference

1 – 3 September, 1999

Wellington

PRESIDENT'S ADDRESS

Welcome to Wellington, and thank you to the organising committee for putting together what looks to be an extremely interesting three days of talks and posters. I know I am looking forward to having a chance to talk with colleagues, many of whom I see much too infrequently.

I'll try to briefly mention some of the highlights. One of these is the work that NZMSS is doing to promote the protection of marine ecosystems in Fiordland via their inclusion in the Fiordland World Heritage Area. This effort has been driven largely by Chris Paulin and Clive Roberts. The Society can be proud of its efforts in this area, it is an excellent cause and the Society's promotion of it will do a lot to raise the profile of marine science nationally.

Other programs such as the NIWA Sea Views tour which takes children to school on the Kahuroa is another example of bringing the positive side of marine science to the public. Something we need to continue to strive to do.

On a less positive note, the Society has been very concerned, over the past year, about the amendments to fisheries legislation that would see purchasing of fisheries research devolved to the industry. NZMSS concerns surrounding this Bill were that it has the potential to create a serious threat to:

- The marine resources of our EEZ,
- The objectivity of the science which determines safe annual harvesting levels
- The integrity of the Quota Management System itself
- The seafood harvesting industry which depends on it (worth $1.3 billion each year in exports).

The bill is of such serious concern to many of the marine science community and some of the more responsible members of the fishing industry because it would make "provision for the devolution of the purchasing and provision of fisheries services by Quota Owners". The Government's response to our criticisms was to say "don't worry, a process of consultation will be set up", and that the standards and specifications put in place by MoF would safeguard the quality of fisheries research data. NZMSS remain unconvinced by such arguments. Even before the Bills' introduction, senior Government fisheries scientists were unwilling to comment publicly because of fear of industry backlash. This fact is either ignored or not appreciated by government. There are some positive changes in the Bill relating to quota trading that seem quite sensible. The rest of the changes we will just have to live with and do our best to work around. Probably the most important task for NZMSS is to ensure that our members are represented in any consultation process that develops around new the fisheries research processes. It will be very difficult to be effective without the same level of resources as the representatives of industry, and I see this as an area where we should be lobbying the Government strongly to provide support.

Clearly I have started this lobbying process already, since Dr. Morgan Williams, who will give the opening address, is the Parliamentary Commissioner for the Environment. Dr Williams's role is to review and assess the effectiveness of Government agencies in managing and protecting natural and physical resources. As an ecologist with a background with agricultural, environmental and ecological research in terrestrial ecosystems, and extensive experience in policy and management, I'm sure that he will have some interesting thoughts to share with us and I invite him to officially open the 1999 NZMSS Conference.

Dr Russ Babcock

FIRST OVERSEAS CONFERENCE TRAVEL FUND

Reports to the New Zealand Marine Sciences Society, 1999

I had the privilege of attending the 3rd International Lobster Congress in Adelaide, Australia during 19th to 23rd September, 1999. The Congress brought together scientists, researchers, the commercial sector and policy makers involved in the management and production of lobster resources. The Congress was preceded by an International Lobster Health Management Symposium. Topics such as health management in lobster aquaculture and long term holding, immunity and health assessment, and progress made in health monitoring studies and stress management issues provided valuable information for the commercial and scientific sector alike. Norway, USA, Australia, New Zealand and Canada were represented at this symposium. I made an oral presentation on the effects of L-carnitine on the survival of *Jasus edwardsii* under conditions of stress experienced during aquaculture. The symposium and congress were timely as the launching of the South Australian Rock Lobster fishing season took place during this period.

A wide spectrum of topics covering quality and marketing, re-seeding and stock enhancement, holding systems, puerulus and sub legal growout were discussed under the theme "Lobster Culture". Lively discussions and heated debates took place under resource sharing and industry management issues, where the role of scientists and investor confidence were kept open as workshop topics.

Under the theme "Conserving Industry and the Oceans", the role of ITQ-related management strategies and their effect on conservation, marine stewardship by industry and debatable issues related to marine parks focused on many management issues which needed cooperation and resolution.

I found the symposium and congress invaluable for establishing and strengthening contacts within the lobster aquaculture and research sector. I wish to thank the New Zealand Marine Sciences Society for contributing part of the funds in the form of a First Overseas Travel Grant which enabled me to avail myself of this opportunity.

Manel Dias-Wanigasekera

Dept of Marine Science,

University of Otago, Dunedin.

The international meeting titled 'Primary Productivity of Planet Earth: Biological determinants and Physical constraints in Terrestrial and Aquatic habitats' was held in Plymouth, England during the second week in September 1999. There were 100 participants including leaders in my field of marine primary productivity, such as Paul Falkowski, Trevor Platt, John Raven, Shubba Sathyendranath and Victor Smetacek. I was thrilled to be able to present and interact at this one-time conference with such distinguished international scientists.

The main topic addressed at the conference was ecological and physical constraints on primary productivity, the topic of my current PhD research in the unique Fiordland environment of New Zealand. Aside from the overall theme, the meeting differed from previously attended conferences in several ways. Firstly, the scope of the conference not only covered freshwater and marine primary productivity, but also terrestrial production. Information conveyed by the terrestrial papers revealed the major advances in this field compared to that of aquatic studies - likely to be due to the easier access of habitat! these talks also revealed the parallels between aquatic and terrestrial primary productivity, and most importantly their interdependence on one another. This interdependence was demonstrated in Tim lenton's talk on the historical change sin terrestrial and marine primary productivity

which drive the feedback mechanisms that account for stability of our atmospheric oxygen levels. Secondly, there were no concurrent sessions, and the talks were no shorter than 30 minutes, and more often hour-long letures. This allowed detailed and in-depth discussion on topics that would otherwise be quickly brushed over (particularly for aquatic scientists attending terrestrial talks and vice-versa!). Not only did I get an excellent review of familiar topics, but I was also exposed to an extraordinary amount of new information, experiments and techniques. One talk that stood out in my mind was that given by Jef Huisman, A researcher from Stanford and the University of Amsterdam, who demonstrated a novel experiment used to test the competition for light between marine phytoplankton species.

My poster displayed a summary of my PhD work to date. Although my study site drew a lot of attention, the information and data displayed spurned interesting discussions, feedback and ideas that are likely to contribute to my thesis. Because I have recently just completed my fieldwork and the analysis of data is in its infancy, interpretation of certain trends left some researchers boggled (much to my relief!). On the other hand, some researchers were able to make suggestions that may help answer some of those uninterpretable trends in my data (much to my relief!). Since the conference, I have ben able to start unravelling the factors that influence the trends of phytoplankton blooms occurring in Fiordland.

Although the conference enabled invaluable discussions and lessons with like-minded scientists on various studies of primary productivity, an even more valuable outcome of the conference was the recognition of these scientists as colleagues, future contacts and friends.

Nicole L. Goebel

Departments of Marine Science and Chemistry

University of Otago, Dunedin.

In July 2000 I was fortunate to be able to attend the 54th annual meeting of the Phycological Society of America held in San Diego, USA. This meeting brought together over 200 delegates from all corners of the world, including a small contingent from New Zealand as well as some Australian colleagues.

The conference opened with a day devoted to student talks in the Bold Award session. All talks were of a high standard and a large proportion of the research presented was in the field of systematics, reflecting a current trend in phycology. Student research that was of particular interest to me included sperm limitation in the fertilization ecology of *Fucus vesiculosus* (Lynn Berndt), photosynthetic capabilities of coralline rhodoliths (Diane Stellar), and stress survival adaptations in *Macrocystis pyrifera* (Lydia Ladah). The eventual winner of the Bold Award for best student presentation was Terence Evens, for his talk entitled "Photosynthesis in the deep blue sea: photophysiological responses of *Phaeodactylum tricornutum* to dynamic and static irradiances".

My own talk on the seasonal and zonal variation in nitrogen source for four intertidal seaweeds from New Zealand generated interest as it presented evidence for urea uptake by macroalgae, an area of research that to date has been limited to the microalgae. I presented data illustrating that urea was an important nitrogen source in summer for the algae examined, and highlighted directions for future research into the nutrient ecophysiology of intertidal seaweeds.

With up to four concurrent sessions on the remaining three days it was often difficult to see all presentations of interest. Sessions were categorised into ecology, physiology, biochemistry, cytology, applied phycology and systematics, with additional mini-symposia. Key note speakers Beth Gantt and John Raven gave plenary lectures on light-harvesting antennae systems, and energy, information and materials in symbiosis, respectively, both of which generated much discussion. I was particularly inspired by Paul Dayton's plenary lecture on kelp ecology and the Point Loma kelp forest, as it highlighted the evolution of ecological research in kelp ecology as it moved from a descriptive to a mechanistic focus.

Dayton pointed out the need for adaptive research, where new questions are continually generated from long-term observations at multiple spatial scales, particularly where humans continue to impact the environment.

While in North America I took the opportunity to visit Paul J. Harrison at the University of British Columbia in Vancouver, Canada. Paul Harrison has worked on the physiology of algae for many years, with a particular focus on nutrient physiology. He provided me with excellent advice and feedback on my PhD research, which will be extremely useful to me as I write my thesis. I was also fortunate enough to spend five days at Bamfield Marine Station on Vancouver Island, participating in intertidal macroalgal fieldwork being conducted by Robert de Wreede's research group. Again, this was also of great benefit to me.

I would like to thank the New Zealand Marine Sciences Society for contributing to the funding of my overseas conference trip.

Julia Phillips

University of Otago, Dunedin.

Research News

CAWTHRON INSTITUTE

MARINE SCIENCE AND AQUACULTURE:

The Cawthron organisational structure has been altered to provide greater focus for research and analytical activities. We now operate five divisions based on our various market sectors, designed to make us more responsive to end users. The five groups are: Aquaculture, Biosecurity, Coastal, Freshwater and Laboratory Services.

Aquaculture

Based at the Glenhaven Aquaculture Centre**,** 15 minutes north of Nelson, this group specialises in shellfish and seaweed aquaculture, especially shellfish breeding and husbandry. The group is led by Henry Kaspar, with Achim Janke and Rodney Roberts, supported by Wendy Gibbs, Simon Tannock, Shirley Plant, Bevan Fraser and Sam Foster.

Biosecurity

The group comprises Mike Taylor, Group Leader, Lesley Rhodes, responsible for Cawthron's Science Liaison, Lincoln MacKenzie, Doug Mountfort, Allison Haywood, with technical support from Janet Adamson, Tim Dodgshun and Krystyna Ponikla. The group provides front line research as well as scientific advice and services on marine bioinvasions, and shellfish biotoxin and harmful algal bloom research. Toxic and noxious microalgae research underpins our phytoplankton monitoring section (led by Kirsten Todd assisted by Cushla Zeewoldt, Wendy Gibbs, and Judy McKenzie.

Coastal and estuarine ecology

Led by Barry Robertson, Cawthron's Coastal group carries out scientific research to expand our understanding of coastal and estuarine systems. Cawthron's activities include work on baseline resource surveys, environmental monitoring and effect assessments, oil spill planning and response, and water and sediment quality. Paul Gillespie, Barrie Forrest, Leigh Stevens, Paul Barter, Stephen Brown and Sinnet Jensen form the group, with technical and field expertise provided by Rod Asher. Our Freshwater team: Rowan Strickland, John Stark, John Hayes, Jon Harding, Karen Shearer, Roger Young, Yvonne Stark, and Aaron Quarterman provide valuable support to the marine team.

MAJOR RESEARCH PROGRAMMES

Benthic and planktonic microalgae in Tasman Bay: Describe benthic microbial processes that effect fertility, productivity and food web transfer pathways of coastal ecosystems, with particular reference to soft sediment habitats in Tasman Bay (Paul Gillespie, PGSF).

Toxic and noxious microalgae: Further the knowledge of toxic and noxious microalgae in order to contribute to the safety and quality of NZ seafood. Examine the taxonomy and phylogeny of the marine dinoflagellate genus *Gymnodinium*, and describe and characterise New Zealand *Alexandrium* species and determine the causes of PSP toxicity (Lincoln Mackenzie, PGSF). Trial of DNA probes and describe subtropical benthic and epiplytic dinoflagellates (Lesley Rhodes, PGSF).

Shellfish aquaculture:

Cryopreservation of shellfish gametes, embryos and larvae: Establish cryopreservation methods for shellfish gametes, embryos and larvae so as to contribute to higher productivity, lower production costs, and improved products in NZ shellfish aquaculture (Rodney Roberts, PGSF).

Mussels: Develop hatchery mussel spat production technology and improve mussel lines (Henry Kaspar, PGSF).

Pacific oyster: Selective breeding of NZ Pacific oyster for specific production traits (Achim Janke, PGSF).

Paua settlement: Establish effective methods for settlement induction in *Haliotis* larvae and develop practical methods for bulk production of food diatoms (Rodney Roberts, PGSF).

Aquaculture of Undaria: Investigate the feasibility of establishing the edible brown seaweed *Undaria pinnatifida* as a new commercial aquaculture crop (completed, Barrie Forrest, PGSF).

Ballast water treatment: Develop technically feasible, cost effective and environmentally acceptable treatment / separation options that can be widely adopted by shipping companies (Doug Mountfort, PGSF).

Oil spill mitigation: Adopt and modify existing overseas methods on dispersant application for use in NZ, and identify information gaps in the dispersant application methods. Produce and publish draft guidelines for dispersant application in NZ (Leigh Stevens, PGSF).

Adventives marine invaders: Identify ballast water origins and measuring uptake, survival, and delivery of high-risk species in ballast tanks, and continue sampling of seachests and epibiota of targeted vessels (Mike Taylor, PGSF).

Marine biotoxins:

Improve the monitoring and management of marine biotoxins in New Zealand shellfish by developing bioassay procedures for: the presence of diarrhetic shellfish poisoning (DSP) in shellfish utilizing the ability of these toxins to inhibit phosphoseryl/phosphothreonyl protein phosphatases (Doug Mountfort, PGSF - sub contract with ESR).

National Protocol for Estuarine Monitoring: "Classifying New Zealand Estuaries: Habitat Structure and Quality". The project aims to identify a set of core criteria that will allow a broad classification that is indicative of estuarine quality, and with additions to cover site specific characteristics, such a classification system will be comparable on a national level. The initial characterisation will establish a baseline that can also be compared with historical information, where available, and used for monitoring change over time (Paul Gillespie, SMF).

Microbial ecology of herbivore fish gut: Examine how seaweed-eating fish carry out digestion by characterising the short-chain fatty acid (SCFA) in marblefish **(**Doug Mountfort, Marsden Fund).

Students: Allison Haywood (University of Auckland) and Rodney Roberts and Othman Bojo (both University of Otago) continued their PhD studies.

Visiting scientists: Dr Toshi Suzuki from the Tohoku National Fisheries Research Institute in Japan was at Cawthron from September 1998 to August 1999. Dan Dietrich, Professor of Environmental Toxicology, University of Konstanz, worked at Cawthron for 4 months from November 1999.

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DEPARTMENT OF CONSERVATION

Te Papa Atawhai

The Department of Conservation comprises 13 conservancies (12 have coastal marine areas), three regional offices (Northern, Central and Southern) and a Wellington-based Head Office.

ADDITIONAL FUNDING

As a result of the New Zealand Government's commitment to implement the NZ Biodiversity Strategy (NZBS), several key environment and conservation projects received a funding boost. The NZBS recognises that a wide range of issues in the marine environment have yet to be adequately addressed, including protecting a full range of marine habitats and ecosystems to effectively conserve marine biodiversity. Marine reserves is one of the projects to receive funding and the Department of Conservation is the lead agency. Funding for the marine reserves project will; support the establishment of new marine reserves, support the management of all existing and newly established marine reserves; and, aim to improve public and iwi support for marine reserves. There will be a strong focus on development of a network of marine reserves around the country.

HEAD OFFICE

Conservation Policy Division

Jim Nicolson and **Susan-Jane Owen** are the contacts for marine protection strategic policy. During 1999 and the first part of this year, key work focused on development of a draft marine reserves strategy, a review of the marine reserves legislation and an inter-agency approach to developing an Oceans Policy for New Zealand.

Tracie Yeboah left the department this year to live overseas. She worked on strategic coastal policy development including; monitoring the implementation of the New Zealand Coastal Policy Statement, reviewing the department's foreshore and seabed responsibilities and an analysis of the Minister of Conservation's role in Restricted Coastal Activities and Regional Coastal plans. Her position was advertised recently and is expected to be filled within the next couple of months.

External Relations Division

Katie Mathieson is the contact for managing relationships with external agencies concerning marine protection. During 1999 and this year she co-ordinated development of a protocol between the Ministry of Fisheries and the Department of Conservation to streamline communication between the two agencies on marine reserves.

Mike Donaghue continued to manage international relationships concerning marine mammal protection.

Science and Research Unit

Ian West is the Science Manager (Marine and Freshwater Group). Ian is responsible for running Science and Research Unit's (SRU) research in marine and freshwater including overseeing contract work in this work area and the research done under cost-recovery from the commercial fishing industry (the CSL programme).

Alan Baker is carrying out a survey of Bryde's whales (*Balaenoptera edeni)* in the Hauraki Gulf and northern coastal waters. This work is related to management requirements for whale-watching permits in the region. Alan has also continued to accumulate data on rare cetaceans from strandings, and has completed a study of Andrews' beaked whale, and in collaboration with Anton van Helden at Te Papa, and Pádraig Duignan and Richard de B. Norman at Massey University, has prepared a paper on Hector's beaked whale.

Hugh Best is studying the demography of New Zealand fur seals on three rookeries on the West Coast (South Island) in relation to fisheries interactions. In late-January 1999 and 2000, estimated pup numbers on the three

rookeries were the lowest Hugh had recorded annually since January 1990. The reason for the low pup estimates is not known. A likely cause is a decline in the ability of cows on each rookery to produce and raise young. Average pup weights in late-January 1999 and 2000 were significantly lower than in the late-January 1991-1998 period, indicating that foraging conditions were difficult for lactating cows. The December 1998/ January 1999 and December 1999/ January 2000 breeding seasons coincided with strong La Nina (LN) climatic conditions, which gave warmer than normal sea surface temperatures (SST's) off the West Coast. Similar periodic episodes of higher than normal SST's (during El Nino events) in the eastern Pacific have coincided with low pupping rates, low pup weights, and low survival rates of pups and yearlings in fur seals and sea lions breeding in Peru, the Galapagos and southern California.

Eduardo Villouta completed work on the impacts of kina in Fiordland and intends to publish this work this year. Work on marine reserve design included investigating the spillover of fish from Long Island – Kokomohua Marine Reserve through assessment of the recruitment and diet of juvenile blue cod and working with others on the effects of marine reserve boundaries on the lobster population at Tonga Island Marine Reserve.

Clinton Duffy joined SRU's Marine & Freshwater Group in July 1999 and is located in the Northern Regional Office, Hamilton. He is working with EduardoVillouta, Nick Shears and Russ Babcock from the University of Auckland on the effect of marine reserves on benthic community structure and productivity. Other work includes the development of a visitor impact research strategy for marine protected areas, and co-ordination of the department's input to the Ministry for the Environment's marine environment classification project. He is also collaborating with Andrew Martin, University of Colorado, on global population genetics of white sharks, and Malcolm Francis, NIWA, on the distribution and biology of white and basking sharks within the EEZ.

Jacqui Burgess was the Conservation Services Levy (CSL) Programme Manager but left the department in June this year to take up a position in science policy with the Ministry of Fisheries. The CSL Programme covers the research necessitated by the impact of commercial fishing on protected species, principally sea birds and marine mammals. The department intends to meet the high work demand required by the programme by advertising for a Programme Manager and a Science Manager later on this year.

Reg Blezard continued as briefing officer for the CSL observer programme and is currently preparing a manuscript which captures the qualitative information arising from the programme.

Ian Wilkinson and **Simon Childerhouse** continued their work on New Zealand sea lion. Their work included checking the quality of brand healing resulting from the hot-branding programme and participating in development of a stochastic population model for sea lions. Simon also lead the New Zealand delegation to the science meeting of the IWC, held in Adelaide during May/June this year.

Peter Moore worked on predation of Chatham Island oyster catchers while **Mike Imber** continued his research on petrels.

C**hristopher Robertson** retired from the department in April this year but continues contract work for the department on autopsies of seabirds which are caught as bycatch species.

REGIONAL OFFICES & CONSERVANCIES

Regional Offices

The function of the three regional offices is to provide advice and support to conservancies and to improve on or develop procedures. Each specialist area has a key contact who works from their particular regional office with nominated contacts in the two other regional offices to ensure that projects are completed to required standards.

Kathy Walls (Northern Regional Office, Hamilton) is the national contact for marine

reserves. A key project during the last year was to set up and co-ordinate a Marine Survey and Monitoring Advisory Group to oversee all biological monitoring in marine reserves. Monitoring programmes were carried out at ten marine reserves last year and it is hoped that the programmes will be continued to enable sufficient information on the trend and condition of the reserves to be obtained. The Advisory Group includes staff from SRU and conservancies and draws from expertise outside of the department from time to time. Kathy also collaborated with Australian counterparts on continuing the development of marine protected area networks for both countries.

Rob Suisted (Central Regional Office, Wellington) is the national contact for marine mammal issues, in particular, commercial marine mammal viewing and whale strandings.

Paul Hardy (Northern Regional Office), **Guy Kerrison** (Central Regional Office) and **Herb Familton** (Southern Regional Office, Christchurch) provided advice to staff within their respective regions on coastal management issues related to the Resource Management Act and processed Restricted Coastal Activity permits.

Stephanie Turner, left the department earlier this year to take up a position as coastal ecologist with Environment Waikato. While with the department, she was one of three Principal Regional Scientists, and was responsible for maintaining an overview of marine, estuarine and freshwater ecosystems and marine species research and providing advice to improve conservation management. The position will be advertised this year.

Northland Conservancy

In October 1998 the Poor Knights Islands Marine Reserve became a completely protected marine reserve. The Department commissioned the University of Auckland to carry out a biological monitoring programme, commencing at the time of complete protection. Compliance of the reserve was an important activity for the conservancy during the last year to ensure the "no-take" status of the reserve is well recognised by visitors to the reserve. A management plan is being developed in collaboration with the Marine Issues Advisory Committee (established by the Northland Conservation Board). Development by tangata whenua of proposals for a marine reserve and a taiapure at Deep Water Cove in the Bay of Islands, and three marine reserve proposals in the Whangarei Harbour by Kamo High School continued. Work continued on the management of the commercial marine mammal viewing and swimming operations in Northland, most of which are in the Bay of Islands. Last year, the department worked with other statutory agencies and iwi to clean up a large oil spill which was the result of illegally discharged ballast water and spread to the Poor Knights Marine Reserve and affected Rikoriko Cave and Jan's Tunnel, in particular. Over the last two years the Conservancy assisted the Maritime Safety Authority (MSA) with preparation of a Draft Oil Spill Response Plan for the Three Kings Islands which are a nature reserve and not covered by the Northland Regional Council's Tier 2 Response Plan. Following last year's oil spill which affected marine life at the Poor Knights Islands Marine Reserve, the department, Northland Regional Council and Northland Conservation Board have expressed concerns to the MSA about commercial shipping operating between the Poor Knights and the mainland. The key marine protection and coastal management staff are **Alan Fleming**, **Keith Hawkins, Jenny Edwards** and **Ray Pierce.**

Auckland Conservancy

There continues to be strong research interest in the three marine reserves in the Auckland region and several University of Auckland and Unitech investigations are underway. The department funded the University of Auckland to carry out a research project on the movement of snapper in the Cape Rodney – Okakari Pt Marine Reserve using radio acoustic positioning. The department also funded the University to carry out monitoring programmes for benthic community assemblages and fish assemblages beginning in 1999 and these were continued during 2000. Coastal and Aquatic Systems was contracted by the department to begin a monitoring programme

on rocklobster populations in 2000. The University was also funded by the department to establish a baseline monitoring programme of key intertidal habitats in the Long Bay-Okura Marine Reserve. The conservancy continued to respond to distressed and stranded marine mammals. **Chris Roberts** is the conservancy's marine reserve/marine mammal contact.

Waikato Conservancy

Work continued on managing the Te Whanganui a Hei Marine Reserve with a strong focus on enforcement and monitoring marine life in the marine reserve. Coastal and Aquatic Systems and the University of Auckland continued monitoring programmes on rock lobster, reef fish populations and benthic communities in the marine reserve through department contracts. The Te Whanganui a Hei Marine Reserve Committee was actively involved in the marine reserve and, among other projects, developed plans for a snorkel trail at Gemstone Bay. Conservancy contacts are **Dave West**, **Peter Carter, Gillie Adam, Jason Roxburgh** and **Garry Hickman**. Garry has an ongoing project on Hector's Dolphin. He continues to distribute survey forms to west coast boat operators to record sightings of Hector's dolphins. The conservancy continued to respond to distressed and stranded marine mammals.

Bay of Plenty Conservancy

Alan Jones continued to co-ordinate a monitoring programme with the Bay of Plenty Polytechnic Marine Studies students at Tuhua Marine Reserve. Species monitored include fish, rock lobster and paua. The programme is an ongoing one which aims to quantify some of the changes which may result from establishing the marine reserve. The conservancy continued investigations into a proposal for a marine reserve in the White Island/Volkner Rocks area, focusing on consultations with tangata whenua, stakeholders and the public. Submissions from the public and stakeholders shows support for a reserve around the Volkner Rocks (Te Paepae Aotea). This area will be progressed as a proposal this year. **Matt Cook** is the contact for the marine reserve proposal.

East Coast /Hawkes Bay Conservancy

The annual survey of reef fish and rock lobster in Te Angiangi Marine Reserve was undertaken in January 1999. The three years of protection of this area has resulted in few significant changes to the fish fauna, although at least one species was added to the species list for the reserve. Preliminary results indicate that rock lobster, in particular males, may be larger within the marine reserve than in the control areas. Unfortunately, adverse sea conditions have precluded a repeat survey in 2000. A survey of the intertidal populations of paua (*Haliotis iris*) and kina (*Evechinus chloroticus*) within and outside Te Angiangi Marine Reserve was undertaken in September 1999. Te Tapuwae o Rongokako Marine Reserve was established in November 1999, following nearly 10 years of consultation and discussion by the applicants – Ngati Konohi and the Department of Conservation. Located just north of Gisborne, the marine reserve protects an area of 2452 hectares which is representative of the marine environment between East Cape and Mahia Peninsula. The baseline survey of this marine reserve was carried out earlier this year and included reef fish, rock lobster and intertidal reef surveys.

The usual incidence of pygmy sperm whale strandings was reported on Mahia Peninsula, with a number of beaked whales being recorded from the Opotiki coastline. Several deceased sperm whales were beach cast during 1999. A large male elephant seal took up residence in and around Gisborne for 6 weeks in April / May 1999. Named 'Rolly' by the local media, the seal was the topic of much public interest and the department was kept busy monitoring the behaviour and movements of the visitor. Another elephant seal, named 'Homer', settled in Gisborne Harbour early in 2000 and proved to be much more of a troublemaker than his predecessor, causing damage to boats, trailers, vehicles, rubbish bins and electricity transformers.

A northern giant petrel (*Macronectes halli*), banded as a chick on Possession Island, Crozet Islands, was caught by a fisherman on Ariel Reef, several kilometres off the Gisborne coast. The fisherman subsequently released the entangled bird. The conservancy contact is **Debbie Freeman**.

Wanganui Conservancy

Consultation between the Minister of Conservation and Minister of Fisheries regarding concurrence for the Parininihi Marine Reserve Application, North Taranaki continued. The size and boundaries of the proposed reserve have been altered to reduce possible interference with customary and recreational fishing. The focus of the proposed reserve is Pariokariwa Reef, which supports a diverse encrusting fauna dominated by sponges and bryozoa. A pilot biological monitoring programme has been undertaken over the summer in the Nga Motu/Sugar Loaf Islands Marine Protected Area. This has focused on looking at rock lobster, invertebrates and reef fish within and outside of the protected area. The Sugar Loaf Islands MPA contact is **Bryan Williams,** New Plymouth Area Office. A local community group, Nga Motu Marine Reserve Society has been actively promoting the values of marine protection in Taranaki and in particular in the Nga Motu/Sugar Loaf Islands Marine Protected Area. **Norm Marsh**, Wanganui Area Office, continues to be at the forefront of marine mammal euthanasia nationally. **Rosemary Miller** replaced Clinton Duffy as (Freshwater/Marine) Technical Support Officer in October 1999 reflecting a slight change in emphasis in the job focus.

Wellington Conservancy

The department contracted NIWA to re-survey the Kapiti Marine Reserve. This survey was also part of a wider study by NIWA to compare three coastal management regimes – full protection (Kapiti Marine Reserve), partial protection (Palliser Bay taiapure) and less protection (Wellington South Coast). The marine reserve and Wellington South Coast are also study sites for research into biological monitoring being carried out by Victoria University and part-funded by the Department of Conservation. The South Coast Marine Reserve Coalition continues to advance their proposal for a marine reserve on the Wellington South Coast taking the time to ensure widespread consultation with the community and stakeholders.

The department has also supported research on marine mammals, including collaborating with Te Papa, Massey University and the University of Auckland by collecting sightings and strandings data and biological samples for these institutions. A permit has been issued to the University of Auckland to survey Hector's dolphins in the southern and eastern Wairarapa area. The conservancy contact is **Bruce Dix**.

Nelson/Marlborough

Three marine reserves currently exist within Nelson/Marlborough Conservancy: Long Island-Kokomohua Marine Reserve (Queen Charlotte Sound), Tonga Island Marine Reserve (Abel Tasman National Park), and Westhaven (Te Tai Tapu) Marine Reserve. The Minister of Conservation also approved a new marine reserve about 10km north of Nelson, but this reserve still requires concurrence from the Minister of Fisheries before it can be implemented. Biological monitoring of blue cod and other key species has continued at Long Island - Kokomohua Marine Reserve. A report on baseline biological monitoring for Tonga Island Marine Reserve has been completed and a long-term monitoring proposal trialed in early 2000. Research into the movements, size and distribution of rocklobsters at Tonga Island Marine Reserve continued over the last year. Research commissioned on the impacts of tourism on Sperm whales and fur seals has continued. There was an ongoing response to marine mammal strandings and provision of tissue samples and specimens to Massey University and Te Papa. There was ongoing input into Resource Management Act processes related to the coastal marine area. Marine farming and fast ferry issues have continued to dominate Nelson/Marlborough Conservancy's time. Conservancy contact is **Andrew Baxter**.

Canterbury Conservancy

The Pohatu Marine Reserve, located at Flea Bay, Banks Peninsula was gazetted in June 1999. A baseline monitoring programme planned soon after gazettal was delayed until this year through poor weather conditions. Research was carried out on Hector's Dolphins and the impact of commercial tourism by Greg Stone, New England Aquarium in collaboration with Alistair Hutt of the Department of Conservation. The focus of the research is on the behaviour of the dolphins. Other research includes a baseline survey of white flippered penguins on Banks Peninsula, funded by the New England Aquarium. Conservancy contact is **Martin Rutledge**.

West Coast Conservancy

The department collaborated with Te Papa scientists in a coastal fish survey in the vicinity of Jackson Bay where some 70 new species were recorded. NZ fur seal monitoring on West Coast Rookeries was reported previously by SRU as recording substantial drops in fur seal pups. Three Otago University PhD students continued research on Hector's Dolphins continued in the West Coast area. Eight beach cast Hector's Dolphins were recovered during the year and at least five were probably accidentally caught in gillnets. Progress was made with the papatipu runanga with development of a marine mammal bone allocation protocol. Fiordland crested penguin monitoring continued at South Westland breeding sites. Work continued on Resource Management Act consents and the proposed Regional Coastal Plan. Conservancy contact is **Don Neale.**

Otago Conservancy

Jim Fyfe continued to work on a wide range of coastal marine issues for the conservancy, including advancing the Nuggets/Tokata Marine Reserve application and assisting Otago University with monitoring sea lion population numbers and numbers of births on the Otago coast. Other work includes input into Resource Management Act processes.

Southland Conservancy

The conservancy marine reserve monitoring programmes were co-ordinated by **Lindsay Chadderton**, who has recently taken up a position as Freshwater/Estuarine Ecologist with the Science and Research Unit, based in the department's Northern Regional Office, Hamilton. **Alan Munn** is the key contact for marine issues in Fiordland and **Wayne Costello** manages the MV Renown. **Greg Lind** manages the southern islands including Stewart Island. **Ken Murray** is the key contact for coastal planning issues.

The fifth annual monitoring of fish (fish counts, size frequency) was completed for the Paterson Inlet marine reserve application. It has been decided that no further monitoring will occur in this area until the marine reserve is formally gazetted (it is currently awaiting ministerial approvals). Monitoring of red coral populations by Karen Miller and Craig Mundy within Te Awaatu Channel Marine Reserve has been completed and crayfish populations were surveyed at both Te Awaatu and Piopiotahi Marine Reserves by Shane Kelly (Coastal and Aquatic Systems) and the department, respectively. **Mike Stuart** continued to co-ordinate the *Undaria* eradication programme, which was extended to include Bluff Harbour and hull monitoring of vessels in southern ports. A commercial marine mammal research strategy which focuses on research into the effects of commercial marine mammal operations was developed by **Karen Schroeder** and Lindsay Chadderton.

MARINE RESERVE SCIENCE PRIZE

The NZMSS Department of Conservation Marine Reserves Science prize was awarded to Karen Miller for her paper on populations of fragile red coral in the Te Awaatu (the Gut) Marine Reserve in Fiordland, which she delivered to the 1999 annual Marine Sciences Society conference. The prize is awarded each

year for the best paper given at the conference on marine science conducted in relation to marine reserves in New Zealand. Karen received $300.00 for her paper.

INSTITUTE OF GEOLOGICAL & NUCLEAR SCIENCES

Currently we know more about the surface of the moon than we do about the bottom of the ocean. GNS' marine activities are aimed at reducing that knowledge gap. Offshore studies have already led to significant improvement in the understanding of the structure and evolution of the New Zealand region. This contributes to more informed evaluation, development, and management of marine resources.

Stuart Henry is part way through a two-year study aimed at better understanding the distribution and physical properties of gas hydrates, the origin of methane, and ways that individual components of gas hydrates change over time. Gas hydrates are an ice-like material made of methane and water found in ocean sediments. It is estimated that worldwide, gas hydrates could hold twice the energy of all known reserves of oil, coal and natural gas. This study ties in with other Institute projects on eveluating oil and gas reservoirs, mapping geological structures on New Zealand's continental margin and assessing the mineral potential of the seafloor.

Marine geology and geophysics

Institute scientists have worked on marine investigations, mostly seismic surveys, of the Ross Sea for the past three decades. These studies have given scientists information on the break up of the Gondwana supercontinent and the formation of New Zealand about 85 million years ago. Seismic data have also provided targets for offshore geological drilling.

Mapping of geological structures on New Zealand's continental margin, particularly on the seafloor off Fiordland and the Hikurangi Plateau has added significantly to the body of geological and geophysical knowledge. This will ultimately be useful for hazard assessment, education, fisheries management, defence and evaluating offshore resources. These projects has been achieved in collaboration with French and United States organisations, and with New Zealand's National Institute of Water and Atmospheric Research.

Offshore minerals and petroleum

Another study involving the Institute and collaboration with the Seattle-based Pacific Marine Environmental Laboratory and NIWA found evidence of hydrothermal activity at five submarine volcanoes northeast of the Bay of Plenty. The associated plumes were found to contain high concentrations of iron, manganese, plus localised pockets of hydrogen sulphide. Initial results show that the chemistry varies strongly between the volcanoes. But the uniting factor is that they appear to play an important role in supplying key minerals into the ocean and marine food chains.

The Institute continues to produce monographs on New Zealand's sedimentary basins under the Cretaceous-Cenozoic Project. Monograph topics include surface geology, subsurface structures, neotectonics, basement rocks and tectonic evolution.

Fisheries Research

The Institute recently formed a partnership with a North American company that has developed a broadband sonar system for finding and identifying fish. This technology is aimed at sustainable, cost-effective harvesting with minimum by-catch. Recent trials have a success rate of 75 percent in identifying the species of shallow-water fish,

with similar results for estimating the size of fish.

GNS researchers have also refined a technique to assess the life histories of fish. The technique is based on determining the distribution of strontium in the otolith. The rate at which naturally occurring strontium is deposited in the otolith depends on ambient water temperature and on the alkalinity, of the fluid of the inner ear in which the otolith grows. Therefore, the pattern of strontium distribution provides a code which, in essence, tells scientists about the water masses through which fish have passed and indicates rates of metabolic activity at various stages during their life. This has a number of consequences for fisheries managers.

Ocean drilling programme

The institute is a participant in an international study under the Ocean Drilling Programme (ODP). The drill cores provide historical information including detailed histories of change in the Earth's magnetic field over the past 20 million years, records of the North Island's big volcanic eruptions over the past 12 million years and changes in the composition, temperature and speed of local currents.

KINGETT MITCHELL & ASSOCIATES

ENVIRONMENTAL CONSULTANTS

The marine and coastal resources group at Kingett Mitchell is led by **Paul Kennedy**, a Director of Kingett Mitchell, and **Rick Boyd** (in the Wanaka Office) heads up the fisheries and aquaculture group. Team members include **Mike Fitzpatrick** (water chemistry/quality), **Sarah Flynn** (botany), **Dan McClary** (benthic ecology) and **Scott Speed** (marine aquaculture, fisheries and ecology). **Jenny Gadd**, an environmental chemist, joined Kingett Mitchell in June and recently defended her MSc thesis at the School of Environmental and Marine Sciences. **Gene Browne** joined Kingett Mitchell in July from private consulting, and will supplement our fisheries team as well as develop our business in the biosecurity field. Gene will also be adding some statistical firepower to the team (much to the relief of Dan and Scott!). **Joh Taylor** (our resident expert on seabirds) left Kingett Mitchell earlier this year to work at Environment BOP.

The ports and marinas sector has been relatively quiet for Kingett Mitchell over the past year, with only a few small jobs for Ports of Auckland and Milford Marina, and submission of the benthic monitoring report for Port Marlborough. In the coastal sector, we have been recently involved in resource consent applications for North Shore City (Project Rosedale-Marine Ecology; Takapuna Stormwater Upgrade Programme), Telecom (Cook Strait Cable Crossing) and in benthic monitoring programmes for Contact Energy's combined cycle co-generation plant at Otahuhu. Separate projects led by **Paul** (Comprehensive Urban Stormwater Programme) and **Sarah** (Henderson Creek Ecological Investigations) saw several muddy excursions tramping through the mangroves of Waitakere City. We have also taken the step into whole effluent toxicity testing, performing testing services for Contact's Otahuhu co-gen plant.

The fisheries group has seen quite a busy year, with the National Recreational Fishing Survey for the Ministry of Fisheries, led by **Rick,** kicking off in mid 1999. This project has involved combined telephone, diary and boat ramp surveys with the goal of estimating the level of recreational catch across the country. The boat ramp survey saw a team of approximately 50 personnel across the country (from Northland to Stewart Island) intercept recreational fishers as they returned to shore from a days fishing. Nearly 2000 datasheets have been returned since December 1999, representing over 3000 interviewer-hours.

Data collection for this project will be completed by December this year.

The fisheries group's first major field expedition took place in two parts during this year. In May an Otago University sampling team led by **Dan** spent several weeks in Doubtful Sound in the pursuit of the elusive blue cod (*Parapercis colias*) for the Ministry of Fisheries. Despite savage attacks by Scarlet Wrasse ('like underwater sandflies' said one of the crew), the team went back to the area in July, this time concentrating on Thompson Sound to the north. Our thanks to the fine efforts of the sampling crew, and also to Mr John Swaley of the fishing vessel Voska for persevering through horrendous weather conditions to carry out our potting trials.

MINISTRY OF FISHERIES

NORTH REGION

The Ministry's North region Policy group is based in Auckland. The group has been involved in a number of initiatives relating to its role of providing advice on the sustainable utilisation of fisheries and fisheries resources within the upper North Island and nationally throughout the 1999 calendar year. Many of these activities regularly draw on research knowledge, whether this is catch statistics supplied by fishers, the Ministry's contracted research projects, or information from other sources (eg, academic institutions, Crown Research Institutes, local authorities, private individuals, or companies). The activities of the staff in the group are outlined as follows.

Dave Allen provides advice on both strategic and operational issues relating to fisheries management, and consequently advice relating to legislative and regulatory development or implementation. This includes continuing work on implementation of the Fisheries Act 1996, and involvement in an advisory capacity on a wide range of statutory and biological issues. Dave peer reviewed many of the Ministry proposals put forward in the annual review of sustainability measures and other management controls. On a regional level, he continues to facilitate the activities of interested parties in eel fishery management. This included the facilitation and production of the draft Tainui Tuna Working Group management plan.

Megan Anderson has been involved in the review of permitting decisions affecting access to various non-quota fishstocks, as sought by various fishing industry participants. Megan also evaluated options for the on-going management of popular recreational shellfish species, and participated in the production of revised recreational fishing pamphlets. Other roles include undertaking the statutory role of assessing special permit applications where permission is required to take aquatic life for purposes other than that specified by law.

Les Curtin continues to administer the processing of various types of authorisations in relation to leases and licences granted under the Marine Farming Act. Similarly, he fulfills the statutory requirements required to complete forfeiture proceedings for failure to meet lease/licence conditions. Other work includes the provision of responses to Regional Councils on coastal permit applications for marine farming, and the processing of applications to the Ministry for marine farming permits and spat catching permits. Les brings his practical expertise to the fore in providing advice on legislation development for aquaculture. Throughout the year Les provides advice in response to numerous public queries regarding aquaculture ventures.

Bob Drey is involved with customary fisheries issues affecting Maori. These include the implementation of management measures such as taiapure and customary fishing regulations. Taiapure-local fishery areas that have been further advanced by Maori in the upper North Island include those at Maketu, Waikare Inlet, Te Puna Inlet, and Kawhia / Aotea harbours. More general responsibilities include appraisal of resource consent applications, proposed coastal management/reserve plans, and submissions relating to effects of various

activities on fisheries values (eg, marina developments). A portion of his time has been dedicated to ensuring that recreational user groups are consulted on proposed management strategies, as well as providing advice to local communities, on how specific issues of concern could be addressed. Bob also undertakes resolution of disputes between sector groups through liaison and mediation.

Richard Fanselow is involved in the resolution of disputes between sector groups. Following on from the application of the nationally developed dispute resolution process to the debate about commercial drag net fishing in Tauranga Harbour, a number of resolutions were implemented for this issue. Richard continues his involvement with conflict issues in the Bay of Plenty, notably claims about trawl fishing activity close inshore. In addition to consultative responsibilities with sector groups, he contributes to statutory planning matters of significance to the region's fisheries. He is also involved in discussions relating to the Hauraki Gulf forum, as well as environmental issues under the Resource Management Act 1991.

Arthur Hore is the manager of the group and coordinates the activities and resource requirements of staff across the various work outputs. He has facilitated the medium term management options for the scampi fishery, drawing on contracted research information. He also contributed to the review of sustainability measures and other management controls during the year. Arthur is a member of the Ministry's Research Coordinating Committee. He additionally represents the Ministry in various stakeholder liaison committees, and is the Minister of Fisheries' nominee on the Hauraki Gulf Forum.

Doug Macredie was employed specifically to facilitate the implementation of customary fishing management tools in the region. During the latter half of 1999 Doug has attended many hui to discuss the customary regulations and what they mean to tangata whenua in terms of being able to better provide for the management of customary fishing activities. Doug has a particular interest in the Bay of Plenty and Waikato areas, and spends much of his time working from the Tauranga office with an interest in integrating customary fisheries management tools with other options for other fisheries sectors.

Graeme McGregor continues his involvement in the management of scallop fisheries. Graeme has participated in discussions with stakeholders on the impact of dredging and trawling operations on the unique benthic community of Spirits Bay, and has provided analysis and policy advice in reviewing contracted research findings. In addition, he has been resolved the Coromandel scallop fishery dispute between commercial and recreational users through regulatory separation of fishing activities, as well as providing advice on sustainable harvest levels for the commercial fishery. He continues to provide advice on fisheries interactions, particularly the use of the by-catch trade-off scheme. This involves an analysis of catch mixes taken by commercial operators in proportion to the available quota of respective stocks.

Tania McPherson was employed specifically to facilitate the implementation of the customary fishery management tools in the region. During the latter half of 1999 Tania has attended many hui to discuss the customary regulations and other legislative options for customary fisheries management and what they mean to tangata whenua. Tania has a particular interest in the Northland area and the management of shellfish resources.

Steve Pullan concentrates on aquaculture activities within the region and, in particular, onshore farming ventures involving marine and freshwater species. This involves the processing of fish farm licences and the provision of advice to potential and existing ventures. He is also required to assess the policy implications arising from aquaculture ventures, as they may relate to wider government responsibilities. Steve also has an interest in freshwater fisheries management. A considerable amount of his time has been involved with the farming and use of grass carp as a biological control agent. Steve has also assisted compliance staff where technical evidence or biological expertise is required.

Todd Sylvester helps to resolve and advise on resource conflicts between the commercial and non-commercial fishing sectors. He also contributes to the snapper Working Group deliberations as part of the annual stock assessment working group process. Issues of particular interest have included the provision of Ministry data to stakeholders involved in disputes (eg. Tauranga Harbour), and facilitation of parties to discuss issues of common concern (eg. improving Raglan Harbour fisheries resources). Todd also attends Ministry liaison group meetings and contributes to such processes.

John Taunton-Clark has a particular interest in the identification of regional research priorities. John also undertakes the statutory role of assessing special permit applications where permission is required to take aquatic life for purposes other than that specified by law. He has contributed to management initiatives in the scampi and seaweed fisheries and has participated in the review of sustainability and other management controls process. Further, contributions to reviews of sustainable harvest levels were made for gemfish fisheries.

MUSEUM OF NEW ZEALAND

Te Papa Tongarewa

MUSEUM RESOURCES

Much of last year has seen most Natural Environment marine staff involved with planning a move of the National Collections, laboratories, libraries and offices to new premises at 169 Tory Street, Wellington. A new General Manager and two new managers were appointed.

Bruce Marshall continued work collection building and research on systematics and biogeography of marine Mollusca from the New Zealand EEZ. Bruce continued work on an analysis of the molluscan fauna of Fiordland, and is currently putting finishing touches to papers on Anomalodesmata, Scissurellidae and Calyptraeidae. Papers on giant bivalves of the genus *Acesta*, the muricid genus *Muricopsis*, and the trochid genus *Infundibulum* were accepted for publication.

The fish team **Clive Roberts, Chris Paulin, Andrew Stewart** and **Robin McPhee** continued with development of the National Fish Collection through networks and active field work off Westland (with DOC Hokitika). Contributions to two symposia where prepared: the Fiords Symposium (Clive convenor) during the NZMSS 1999 meeting in Wellington, and preparing presentations for the "Species 2000" symposium. Several scientists from New Zealand (NIWA, MOF, VUW) visited the fish collection to carry out taxonomic research; 148 lots of fishes in 23 loans were sent overseas. The Museum/PGSF project Biosystematics of New Zealand EEZ Fishes continues with over 40 collaborating authors preparing collection-based descriptions and keys for a monographic guide to all New Zealand fishes (seven papers published in 1999). Our scientific illustrator, **Erica Mackay**, produced 62 world class fish drawings. We welcome **Peter Smith** and his team at NIWA genetics laboratory who joined the Programme under subcontract, to investigate the molecular taxonomy of problematic NZ fishes.

Wendy Nelson, **Tracy Farr,** and **Gina Williams** are carrying out various aspects of field and culture work as part of the algal life histories and systematics programme at Te Papa.. **Judy Broom** and **Wyn Jones** are working on molecular aspects of this programme at Otago University. Collaborative work continues with **Ruth Falshaw, Jackie Hemmingson** and colleagues at Industrial Research Ltd, including field trials of *Gigartina* farming (with NIWA), and *Porphyra* harvesting and farming (with Ngati Koata and NIWA).

Jean-Claude Stahl continued work towards modelling the effects of fisheries mortality on seabirds, a PGSF-funded research programme in collaboration with **Paul Sagar** (NIWA

Christchurch) and **Niall Broekhuisen** (NIWA Hamilton). Using Southern Buller's Albatross as a "pilot" species to develop the model, the current year's effort focussed on satellite telemetry and colony attendance patterns of non-breeders from the Snares.

For **Rick Webber** the last year has been considerably disrupted by a move to new premises of collections, including large numbers of particularly fragile dry invertebrates. But work continued on the presentation and writing of papers on the Decapoda, the Euphausiacea and the Stomatopoda of New Zealand for the Species 2000 Conference held in February. He, Dr John Yaldwyn and Elliot Dawson are also compiling an annotated list of the Decapoda of New Zealand. Rick is revising the New Zealand lithodid crabs with Elliot, and describing a new species of the hydrothermal vent shrimp *Alvinocaris* sp. with John.

Honorary Research Associates

Peter McMillan continues collection-based systematic research on rattails. **John Yaldwyn** and **Elliot Dawson** continue with crustacean taxonomy (see above). It is with deep regret that we report the death of Te Papa Research Associate Prof. **Peter Castle** on 21 December 1999, he is greatly missed.

NATURAL HISTORY NEW ZEALAND LTD

Based in Dunedin, Natural History New Zealand Ltd is researching and filming television documentaries around the world. We are always looking for new ideas for documentaries in the fields of natural history, science, and as of recently health. The following programs with marine or underwater subject matter have been completed in 1999.

The Crystal Ocean

1 x 1hour. This is Mike Single's film about Antarctic sea ice and icebergs and follows the yearly cycle of sea ice and the lifecycle of icebergs. Filmed in the Ross Sea and around the Antarctic Peninsula this is a compelling and visually stunning portrait of the cycle of freeze and thaw, life and death in the most extreme environment on earth.

First Hand

1 x 1 hour. This film by Rachel Wilson takes us behind the scenes of a natural history film shoot — the Antarctic peninsula trip to film *The Crystal Ocean*. Five weeks aboard a 65 foot yacht in amongst the ice of Antarctica and what's involved in bringing home the pictures!

Riddle of the Rays

1 x 1 hour. This film follows black rays on their annual cycle from Parengarenga harbour to their secret offshore destination, the Poor Knights, where they meet each year to mate. The rays' unique adaptations to their underwater world are revealed with clever graphics and analogies.

Serpents of the Sea

1 x 1 hour. From their obscure origins on land several million years ago, sea snakes have become one of the most deadly predators in tropical oceans. This film by John Hyde follows the evolutionary path of these highly venomous snakes, and journeys with pioneering sea snake biologist Mick Guinea to Ashmore Reef, Australia.

Pantanal – 'Land of Water' & 'Sea of Grass'

2 x 1 hours. These two films explore the interior wetlands of Brazil which respond to the wet and dry seasons of the tropics by swelling and shrinking each year. Every year within a few short months, a sea of waving grass is amazingly transformed into a sea of water, and an explosion of life occurs.

Red Crabs Crazy Ants

1 x 1 hour. On Christmas Island every year red crabs migrate across the islands in an extraordinary spawning event, but now tiny yellow crazy ants are attacking them with formic acid. Scientists examining the problem must find a way to prevent these attacks and in doing so save the ecology of the Christmas Island rainforest.

Wild Asia: Creatures of the Thaw

1 x 1 hr. Northern Asia is blessed with huge quantities of freshwater. In winter this precious resource is locked in snow and ice, but come spring the annual thaw brings life and abundance to the lakes, rivers and marshes of this part of the continent. From the freshwater seals of Lake Baikal to the elegant Japanese cranes, the wildlife of the thaw is explored in high definition.

White Shark: The Nature of the Beast

1 x 1 hour. Filmed in the Chatham Islands and off south Australia this film follows the efforts of scientists, researchers and divers as they battle weather, fear and an elusive subject in order to gain a greater understanding of the secret world of the great white shark.

Videos of Natural History New Zealand documentaries can be ordered via our web page at: www.naturalhistory.co.nz
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NEW ZEALAND SEAFOOD INDUSTRY COUNCIL

The New Zealand Seafood Industry Council (SeaFIC) operates under an agency agreement with the New Zealand Fishing Industry Board. SeaFIC's overarching role is consultation and advocacy. It is incorporated to provide stakeholders in the seafood industry in New Zealand with generic services relating to the promotion of their interests and with technical services relating to the industry.

SEAFIC SCIENCE UNIT

The SeaFIC Science Unit represents and gives advice to the fishing industry on all aspects of fisheries stock assessment and fisheries management issues. Staff include: **Jonathan Peacey/Michael Harte**, Science Unit Manager; **Paul Starr,** Chief Scientist Stock Assessment; **Adam Langley**, Stock Assessment Scientist; **Nokome Bentley**, Stock Assessment Scientist; **Michael Manning**, Stock Assessment Technician. Additional technical work in SeaFIC is done by **Rachel Harvie**: Food technology and biotoxins. Work in the unit is supported by a Business Manager.

The board also employs consultants from other organisations including **Ray Hilborn and Vivian Haist** from the University of Washington to assist in specific stock assessment and research projects.

SeaFIC staff are involved in industry initiated and funded research and data collection for rock lobster, orange roughy, hoki, hake, southern blue whiting, marine mammals, seabirds, blue nose, ling, setnet shark species and blue cod. SeaFIC staff have also been contracted by the Rock Lobster Industry Council (the rock lobster "stakeholder" group which holds the stock assessment research contract to the Ministry of Fisheries) to supply the rock lobster stock assessment in

conjunction with the National Institute of Water and Atmospheric Research.

Jonathan Peacey was the manager of the SeaFIC Science Unit during the first part of 1999. He left to take up a position with the Marine Stewardship Council in London.
Michael Harte took over management of both the Policy and Science units during 1999. He was previously the Senior Policy Analyst at SeaFIC. Michael specialises in research that integrates science with policy and has a particular interest in exploring the social construction of science.

Paul Starr is the senior stock assessment consultant. Since starting at the NZFIB in late 1991, Paul has worked on a variety of stock assessments with an emphasis on the more valuable species such as orange roughy, snapper and rock lobster, and is a regular participant in the entire stock assessment process run by Ministry of Fisheries. Paul has also investigated real-time catch reporting in several key fisheries to assist in the management of these fisheries (West Coast South Island hake/hoki fishery, orange roughy fishery, sub-Antarctic southern blue whiting and squid fisheries). He has also initiated logbook programmes in the rock lobster potting fishery, the longline fishery for bluenose and ling, and the setnet fishery for sharks. These programmes are designed to obtain detailed catch and effort data from these fisheries, along with associated biological information. Paul is presently a senior member among the rock lobster stock assessment scientists who provide advice on these stocks to the Ministry of Fisheries.

Adam Langley, stock assessment scientist, has been working with Paul Starr and the SeaFIC Science Unit since mid-1998. Prior to that time, Adam worked in a scientific capacity with Sanford Ltd. and with the National Institute of Water and Atmospheric Research. With SeaFIC, Adam is responsible for the design and execution of the ever increasing number of fishing industry initiated data collection programmes which are intended to increase the reliability of the data collected at sea on fishing vessels while keeping costs to a minimum. Adam also specialises in the analysis of fishery-related data and providing the scientific advice which underpins fisheries management.

Nokome Bentley, stock assessment scientist, works independently for Trophia Ltd, a fisheries research and consulting firm. However, the majority of his work in 1999 was under contract to the SeaFIC Science Unit in support of the rock lobster stock assessment contract where he provides an invaluable contribution from assessment model development to final report preparation.

Michael Manning has been employed as a technician whose primary responsibility is to ensure that all the fishing industry data collection programmes are running smoothly and that the data quality is maintained. He has been especially involved in the development and implementation of fisher logbooks in the shark setnet fishery and in the bluenose line fishery which collect industry generated data in support of the adaptive management programme. He also has a primary responsibility for ageing adaptive management species and of validating the ageing methods.

CONSULTANCY WORK

Consultants from the University of Washington work on a number of stock assessments including orange roughy, rock lobster and hoki. The hoki work is now contracted by the Hoki Management Company Ltd., the relevant stakeholder group for this species, with the orange roughy work contracted by the Orange Roughy Management Company. In conjunction with the SeaFIC Science Unit, the UW consultants provide an independent stock assessment for these two species within the Ministry of Fisheries stock assessment process.

OTHER SEAFIC TECHNICAL INITIATIVES

Rachel Harvie, as consultant Seafood Technologist for SeaFIC, is involved mainly in the area of quality assurance, food safety, and the regulatory aspects of exporting New Zealand seafoods. This means keeping up to date with international developments which, most recently, have been in the field of

HACCP (Hazard Analysis Critical Control Point) and risk management and their application to seafood products. Rachel is currently involved in a project to review the strategic direction and prioritisation of research for the post harvest and processing sector of the industry.

INFORMATION RESOURCE CENTRE

While the main strength of this library collection is in the area of seafood marketing, holdings in other subjects are also significant — gear technology and fishing methods, food technology and quality issues, fisheries management and economics, aquaculture, resource management, and the marine environment. The types of information held are: reports of the old NZFIB, the present SeaFIC and other New Zealand organisations; monographs and informal reports on overseas work applicable to New Zealand; serial collection which includes popular technical journals; NZFIB and SeaFIC commissioned product development and seafood handling and quality studies; seafood industry codes of practice; conference proceedings; New Zealand reports and papers documenting the development of the quota management system.

Holdings are accessible through New Zealand Library Interloan, or may be consulted at SeaFIC by appointment.

SEAFOOD NEW ZEALAND

Seafood New Zealand is the monthly magazine to the seafood industry edited by **Peter Stevens**. It contains numerous research articles and reviews by industry, Government and other organisations.

NIWA

(National Institute of Water and Atmospheric Research Ltd)

AUCKLAND REGIONAL OFFICE

FISHERIES & MARINE ECOLOGY

Martin Cryer leads the group, several shellfish stock assessment projects (mostly scallops and scampi), and some marine ecological research related to the effects of marine shell-fisheries. He also maintains a broad oversight of inshore finfish research in the north and recreational fisheries research and contributes to research on the environmental effects of fishing. He is an active, if ageing member of the NIWA dive team, and a member of the diving board of control.

Bruce Hartill has an expansive interest in estuarine fish ecology, billfish, gamefish, and acoustic tagging, recreational fisheries, scampi assessments, shellfish harvesting, and anything else where he can make himself useful. He has a good grasp of GIS systems, a skill which has been extremely useful in many of the group's projects. In addition to an increasing analytical role, however, Bruce maintains a healthy level of field activity. He is an active member of the NIWA dive team and our regional dive co-ordinator.

Cameron Walsh is the driving force ensuring that commercial catches of snapper and trevally are adequately sampled and described. He is also involved in a wide variety of other projects such as scallop fishery assessments, habitat mapping, and estuarine fish sampling and tagging. He is an active member of the NIWA dive team.

Derrick Parkinson is one of those people who turns fancy ideas into pragmatic reality. He is primarily involved in leading the field components of a wide range of research programmes but is also heavily involved in the technical aspects of testing and commissioning new sampling equipment. His latest "baby" is a novel outrigger trawl for sampling estuarine fish in very shallow water. His work during the last two years has included leading successful inshore demersal trawl surveys, intertidal shellfish surveys, fish

tagging trials, and extensive sampling of estuarine fish for FRST programmes. He was also a team member during the deployment of a mini submarine off Kaikoura.

Helena Cadenhead is a recent addition to the team. She has been involved with the field component of a FRST programme on estuarine fish for the last year. She has also done time on the snapper market sampling team and will return again this season for more otolith reading. Whilst working mainly in hydrology and air quality this year, she has also contributed to other fisheries projects, such as John dory otolithing and marine biological sample sorting. Helena is a new site safety adviser and looks after the day to day running of the labs.

Jeremy McKenzie is deeply involved in many aspects of the assessments of snapper, trevally, and grey mullet. His penchant is the coordination of large, complex programmes of fisheries research, the most recent of which has been the design of a large scale tagging programme to estimate the biomass of snapper off the North Island west coast. He has "diversified" a little this year by tackling a project on population modelling of marine mammals. He is an active member of the NIWA dive team.

Jim Drury has a lead role in the development of practical systems for the mapping of marine habitats using high precision GPS, underwater video, and acoustic seabed classification methods. This work has been conducted in sheltered estuaries, in the exposed environments off Cape Reinga, and on the continental slope in the Bay of Plenty. Jim is also our site safety adviser and co-ordinates our use of small boats through the Safe Ship Management system.

Mark Morrison leads a large and successful FRST programme on the use of estuarine and coastal habitats by fish. This programme involves a huge commitment of "low tech" fish sampling, but is underpinned by highly sophisticated GIS, remote sensing, and acoustic tagging framework. Mark also leads a variety of fisheries research projects (notably trawl inshore trawl surveys, intertidal shellfish surveys, and cockle assessments) designs and leads coastal mapping projects using remote sensing, and contributes to research on the environmental effects of fishing

Matt Smith has just completed his first year as a permanent team member, dividing his time between fisheries and aquaculture projects. He supervised the snapper market sampling field team during the summer and has been involved with most aspects of Mark Morrison's estuarine project, including juvenile fish sea cages. Aquaculture work has predominantly been for kingfish with Carolyn Poortenar. Matt has also been appointed responsibility for Auckland's new multi purpose vessel '*Haku*' (otherwise known as *Red Dwarf*!).

Nick Davies has worked in fisheries for the past 13 years focussing primarily on stock assessment. His main projects include the sampling of commercial landings of snapper for catch-at-age since 1988, developing new length- and age-structured population models, analysis of snapper tagging studies, and administrating a co-operative gamefish tagging programme. However, Nick has "diversified" quite a bit this year by tackling population modelling projects related to marine mammals and marine reserves.

AQUACULTURE

Michael Bruce arrived from the UK in September of 1999 and has provided expertise in the area of aquaculture nutrition and aquaculture development. Michael works mainly with rock lobster and now leads the rock lobster propagation project for NIWA.

Simon Hooker is based in Auckland and leads NIWA's commercial aquaculture research and development New Zealand wide and works closely with the industry to make NIWA's aquaculture research and development expertise more readily available. He is currently working on various aquaculture projects including mussels, lobsters, snapper, kingfish, oysters, brine shrimp, salmon, paua, seahorses, environmental monitoring, shellfish

sustainability and aquaculture economics as well as new seawater recirculation technology.

Andrew Jeffs leads the aquaculture group at NIWA Auckland. He has been working on lobster post larval ecology and aquaculture, including developing new sea cage culture methods for lobsters.

Michelle Kelly is a world expert on the taxonomy of indo-pacific sponges. In the past year she has been working on a number of bath sponge aquaculture projects across the Pacific region. She has also been researching New Zealand's deep-water lithistid sponge biodiversity and will continue to work on this as part of her Marsden Grant. Michelle is the programme coordinator for marine natural products research within NIWA.

Carolyn Poortenaar is largely involved in finfish aquaculture research and leads the kingfish aquaculture project. Carolyn has particular expertise as a reproductive physiologist and has recently applied her skills to improve gamete collection techniques in commercially important finfish species.

Michelle Wilkinson provides technical support on a wide range of aquaculture and marine ecology projects, including sponge taxonomy, kingfish biology, and benthic ecology.

HAMILTON OFFICE

Research by the team led by **Rob Bell, Derek Goring, Roy Walters** and **Basil Stanton** continued into understanding tides, currents and low-frequency fluctuations in sea level on the shelf and New Zealand's EEZ. The work is now part of a wider coastal physical FRST programme called "Natural Physical Hazards Affecting Coastal Margins and the Continental Shelf", that covers coastal erosion, surf-zone dynamics, damaging wave and winds, tsunami, storm surge, extreme tides and prediction of currents. The barotropic or depth-averaged tidal model of New Zealand's entire EEZ is being further refined around shallow coastal areas, Cook Strait and harbours. The NIWA sea-level network, now comprising 11 open-coast gauges, continues to deliver high-quality data, under the direction of **John Fenwick**. It was used to determine the nation-wide effect on storm surge for the 17-April storm that caused flooding in Dargaville. **Derek Goring** has developed a service of providing extreme tide warnings to local authorities and emergency managers a year in advance, on the basis that on such days, if a storm does occur, it will usually cause coastal flooding. **Rob Bell** and **Derek Goring** continue their work on describing and understanding low-frequency (periods ≥1 year) fluctuations in sea level and "flow-on" effect they have on regional sea-level rise. Published papers demonstrate that the unprecedented period of persistent El Niño events since the climate regime shift in 1976 has caused a "temporary" halt in sea-level rise around NZ. However the recent La Niña has seen regional sea levels rise again to one of the highest recorded in any year (Moturiki). **Basil Stanton** analysed tides in nearly 400 current-meter records around NZ since recording began in 1970, of which nearly 200 were of sufficient quality. A good match was obtained between field current data for the dominant tides and those predicted by the tidal current model of New Zealand's EEZ. Further details on research findings, coastal flooding prognostications and tidal model animations can be found on NIWA's web site at http://www.niwa.cri.nz/pgsf/CASHCANZ/.

Kerry Black, Rob Bell and **John Oldman** completed modelling and describing 3-dimensional flow structure in the Hauraki Gulf. Complex interactions occur in the Gulf between tidal flows, wind-induced upwelling/downwelling and the bathymetry. Work has continued on describing surface and sub-surface wind-generated currents in the Gulf, to estimate the long-term residual circulation over several years.

Karin Bryan and **Richard Gorman** are using video imagery of the mean location of wave breaking on Tairua Beach (Coromandel) and 2-D orthogonal eigenfunction techniques to map changes in sand bank patterns for major storm events in 1999. **Kerry Black** (University of Waikato) is reproducing some of these patterns using a numerical wave

shoaling model coupled with a radiation stress and sediment transport model. These patterns will be correlated with changing wave parameters, also extracted from video images using techniques being developed by **Iain MacDonald** and **Karin Bryan**. This work is coupled with the group's micro-scale work looking at changes in eddy viscosity across the surf zone and the associated effects on sediment fluxes and morphodynamic response.

In a program to study the occurrence of damaging winds and waves, led by **Andrew Laing** (NIWA Wellington), **Richard Gorman** has established a wave generation model for the New Zealand region, and validated it against buoy data. The model has been used to produce a 15-year hindcast of wave conditions for the entire coast, providing a synthetic wave climate. Among other applications, this is being used in work led by **Terry Hume** to characterise large-scale longshore sediment transport on the West Coast. In other work based on wave modelling studies, this time in Manukau Harbour, **Richard Gorman** has investigated the variation the tidal cycle of the physical processes influencing wave development. As a result of this work errors have been identified in the way existing models calculate the exchange of energy between interacting waves, resulting in slow and unstable computation of wave behaviour in shallow water.

Max Gibbs has been working on nutrient cycling in the water column and across the sediment interface, and the sedimentation and resuspension of particulate matter in estuarine and coastal ecosystems associated with aquaculture. Most of this work has been in Pelorus Sound and Tasman Bay. He has also been investigating the use of stable isotope techniques at natural abundance levels for determining pathways and recovery processes following clay deposition on estuarine sand flats near Auckland and around the Coromandel Peninsula.

In a study of large-scale sand transport process on open coasts, **Terry Hume, Andrew Swales** and **Rick Liefting** have being investigating broad scale morphology and sand transport pathways using field mapping, photogrammetry and digital terrain modelling techniques. A parallel study has looked at sediment processes within and between disconnected embayments, analysing field data to quantify sediment-suspension dynamics at the Cape Rodney headland, and in the nearshore zone at Mangawhai-Pakiri.

Vladimir Nikora (NIWA Christchurch), **Mal Green**, **Terry Hume** and **Simon Thrush** completed writing up results from an experiment in which fine-scale turbulence structure was measured over patches of horse mussels. It was found that the internal boundary layer that grows downstream of the leading edge of a patch is a zone of lower mean longitudinal velocities but more energetic turbulence relative to the ambient boundary layer. The former translates into shelter, which some organisms might take advantage of, and the latter translates into increased vertical exchange across the top of the IBL, which might enhance inwards flux of nutrients and outwards flux of wastes.

Mal Green and **Iain McDonald** wrote up a dataset from the mouth of Okura estuary (Auckland). The aim of the experiment was to measure the processes that drive estuary infilling by marine sands. Sediment transport was found to be governed by subtle interactions between waves and currents that vary over the tidal cycle. Some interactions, such as those that drive bedload transport, are bound to promote estuarine infilling, and others, such as those associated with wave groupiness, do the opposite.

Mal Green and **Don Morrisey** infiltrated the limnology community to promote the idea of thinking of estuaries and coasts as "downstream receiving waters" for material (sediment, contaminants, nutrients) leaving the land and being carried in fluvial systems. The aim here is to establish the marine scientist's right to participate in the catchment management process.

Tian Yong and **Mal Green** scoped out an approach for using NIWA's supercomputer to run Monte Carlo simulations with a linked catchment–estuary model to estimate

sedimentation probabilities in different estuarine habitats. The work is supporting the ecological research in the Effects of Sediments on Estuarine Ecosystems programme.

Mal Green, Terry Hume and **Karin Bryan** wrote a proposal for joint work with the Virginia Institute of Marine Science that was funded by the National Science Foundation's International Programs Division. The 3- year project, which begins in September 2000, is looking at the effects of complex seabed roughness on the nearshore sediment transport system at Tairua (Coromandel Peninsula).

Niall Broekhuizen, John Zeldis, Richard Gorman and John Oldman have continued the development of a 3-dimensional Lagrangian model to simulate the coupled dynamics of nutrients, algae and organic detritus in oceanic waters, and has applied the model to study sporadic intrusions of oceanic water into the Hauraki Gulf. These are believed to have a major influence upon nutrient and phytoplankton dynamics in the Gulf. **Niall** and **Julie Hall** are developing a model of the planktonic foodweb for the Sub-Tropical convergence zone to the east of New Zealand in order to allow us to better understand what regulates planktonic production and community structure in that region. **Niall** is also studying the impact of long-line by-catch upon the population dynamics of Southern Bullers albatross. This work is in collaboration with **Paul Sagar** and **Jean-Claude Stahl**.

The benthic ecology team (**Simon Thrush, Judi Hewitt, Vonda Cummings, Greig Funnell, Alf Norkko, Joanne Ellis** and **Diane Schultz**) have this year conducted a major research programme into the ecological effects of sediment in estuaries. This includes both the catastrophic effects of sediment dumps, such as from a large storm runoff event, and the long-term effects of elevated turbidity associated with changing land-use practises. Work is focussed on the effect of burial on intertidal habitats, the effect of suspended sediment on estuarine species, and the behaviour of ecosystems in estuarine fringing habitats. The group is continuing work on the impacts of fishing on marine soft sediment habitats, and is concentrating on defining ecological linkages between seafloor habitats and the sustainable production of exploited species and the maintenance of coastal biodiversity.

WELLINGTON CAMPUS

AQUACULTURE RESEARCH CENTRE, MAHANGA BAY

Len Tong retired from NIWA in May and although he has apparently rapidly adapted to the joys of his post-employment situation, he is a not infrequent visitor to Mahanga Bay as he completes the write-up and publication of his lobster research.

Bob Hickman, **Mike Tait** and **Peter Redfearn** have completed a variety of flatfish rearing experiments using the first significant batch of juvenile turbot, reared from eggs, collected from wild fish off the west coast of South Island in August I998. Survival and growth of the juveniles up to 20 months of age have been investigated in relation to factors including weaning, water temperature, salinity, and water depth and tank configuration. The results are now being compiled as a series of papers, emphasising the aquaculture potential of turbot and brill in New Zealand.

Bob Hickman presented the keynote address on molluscan biotechnology at the World Aquaculture Society conference in Sydney in May and at an Aquaculture Development conference in October in Chile, where Bob was examining their approach to flatfish R & D and Chilean aquaculture in general. Bob has continued as Editor of NIWA's Aquaculture Update, which is heading towards its 25th issue.

DEEPWATER FISHERIES GROUP

The group primarily carries out research for stock assessment of orange roughy, smooth oreo, black oreo, black cardinalfish, and ribaldo. Work on these species involves

assessing stock size using acoustic and trawl techniques, carrying out catch effort analyses, and continuing to research their biology. The group is also involved in projects on middle depth and inshore species e.g., acoustics and market sampling, and as well carry out research on the ecology of seamounts and fish communities.

Malcolm Clark leads the Deepwater Group, and has continued work on stock assessment of orange roughy in northern areas of New Zealand, and outside the EEZ. He carried out exploratory survey work with the Fishing Industry for orange roughy in the Bay of Plenty and off Northland in June, with **Shelton Harley**, **Peter McMillan**, and **Chris Thomas**. The Industry also commissioned a report from NIWA on the northern fisheries during the last two years. Stock assessment of orange roughy outside the EEZ has focused on the Lord Howe Rise, Challenger Plateau, and Louisville Ridge fisheries. A new fishery on the South Tasman Rise south of Tasmania has involved Malcolm and **Owen Anderson** in cooperative research with Australian scientists.

Malcolm and Owen also lead the team on a commercial fishing vessel supporting the acoustic survey of the Northwest Chatham Rise by NIWA scientists on *Tangaroa* in June-July.

PGSF-funded research on the ecology of seamounts in the New Zealand region has taken a lot of Malcolm's time, and has also been linked in with separate contract work on seamount issues for the Department of Conservation, and The Orange Roughy Management Company. The programme has compiled a lot of information on seamount distribution, physical characteristics, and the composition of benthic invertebrate and fish fauna. This has been carried out by a number of scientists at NIWA, primarily **Ian Wright**, **Steve O'Shea**, **Don McKnight, Andy Hill, Brent Wood, Dave Cook,** and **Di Tracey**. A short survey of the "Ritchie Hill" on *Kaharoa* in June used photographic and trawl techniques to examine faunal composition and the effects of bottom trawling. Other work completed by Malcolm examined whether physical features of seamounts could guide appropriate catch levels for deepwater fisheries on seamounts. Some aspects of this work were presented at the NZMSS conference in Wellington. The busy schedule in New Zealand has meant a reduced presence at international meetings, although Malcolm presented an address on deepwater fisheries at the Fisheries Week of the Azores in March.

Di Tracey has continued her MFish work on stock assessment of deepwater species. She worked with several members of the acoustic and deepwater teams on the orange roughy stock assessments on the Chatham Rise. With **Ian Doonan, Alan Hart, Peter McMillan**, and **Roger Coombs** she has helped complete the analysis of data from the Spawning Box survey in 1998 and this year helped Ian, **Brian Bull**, Roger, and Malcolm design the 1999 Northwest Hill survey. Di led part one of the *Tangaroa* voyage. She has analysed several orange roughy ovary sections as part of the spawning dynamics turnover experiment carried out on the Northwest Hills in June 1999. Currently she is writing up these results with Ian.

Di has just completed a project with **Kimon George** and **David Gilbert** on the age and growth of black cardinalfish for stock assessment. She continues to carry out ageing work on orange roughy. PGSF-funded research has involved Di in research on the composition of fish fauna of seamounts in the New Zealand region.

Paul Grimes participated on the Northwest Hills Chatham Rise winter acoustic survey of orange roughy and was involved with the sampling and analysis of the ovary sections. Paul has continued his involvement in the southern blue whiting stock assessment, participating on the acoustic survey of the Bounty Platform stock and carrying out the analysis of the acoustic results. Paul and **Gavin MaCauley** have continued to develop swimbladder modelling techniques to estimate acoustic target strength and apply them to hoki and hake.

Owen Anderson has continued to work on orange roughy biological data collected by

observers of the Ministry of Fisheries. He has also been working on a stock assessment of orange roughy in the East Cape hills fishery based on standardisation of catch per unit effort data. He has continued to work with **Malcolm Clark** and **Dave Gilbert** on analyses of discards and bycatch in New Zealand fisheries, most recently the trawl fisheries for jack mackerel and arrow squid, and the ling longline fishery.

Owen has continued his involvement with a FoRST funded project studying fish community structure, helping to produce three atlases of fish distributions based on catch records from trawl surveys, observers on trawlers and longliners, and from aerial sightings. Owen remains involved in shellfish projects such as paua and seaweed stock assessments.

Karen Field has been involved in the assessment of deepwater fish stocks for many years and specialises in the mathematical modelling of catch per unit effort (CPUE) in marine commercial fisheries. This year while continuing her work on orange roughy she carried out new CPUE analyses for black cardinalfish and tarakihi.

Peter McMillan, **Alan Hart**, **Ian Doonan** and **Ralph Coburn** have continued with stock assessment of smooth oreo and black oreo. Work has focused on the large fisheries for smooth and black oreo on the Chatham Rise and included carrying out and analysing acoustic abundance surveys. Estimates of smooth and black oreo abundance were also made from standardised catch per unit of effort analyses.

Peter has also worked on other MFish projects including one sampling commercial catch of alfonsino, bluenose, gemfish and rubyfish from east coast North Island and another examining stock relationships of smooth oreo and black oreo around NZ. He led another acoustic survey of Cook Strait hoki on *Kaharoa*. He also continued part-time work on the systematics of NZ grenadier fishes (Macrouridae).

Alan Hart has been involved in acoustic biomass estimation of oreos on the southeast Chatham Rise and of orange roughy in the Northwest Hills (Graveyard) area, Chatham Rise. Alan led the 2nd leg of the Graveyard acoustic survey. During this survey this region of undersea seamounts was extensively mapped. Alan has also worked on black and smooth oreo swimbladder modelling with **Richard Barr** to estimate target strength.

HOKI AND MIDDLE DEPTH FISHERIES

The Ministry of Fisheries funded all the projects detailed below.

Hoki

Most of the hoki team are involved to some extent in the hoki stock assessment project led by **Patrick Cordue**. This project has many objectives including the compilation of commercial catch and effort data, length frequencies, and age frequencies (**Sira Ballara, Peter Horn, Mary Livingston**); the analysis of catch-effort data to produce relative abundance indices (**Sira Ballara, Alistair Dunn**); and the stock assessment (**Patrick Cordue**), which uses these data and other abundance information, from trawl and acoustic surveys, to estimate virgin and current stock sizes and yields for the hoki stocks. Other objectives in the current project include the shed-sampling of the spawning hoki catch from Cook Strait (overseen by **Dave Fisher** in Wellington and **Ron Blackwell** in Nelson); an investigation into observed sex ratios in commercial catches and during trawl surveys (**Mary Livingston**); a review of natural mortality estimates for hoki (**Sira Ballara, Rosie Hurst**); a descriptive analysis of west coast South Island catch and effort data (**Terese Kendrick**); and estimation of the proportion of mature females on the southern plateau during a recent trawl survey (**Mary Livingston**).

Acoustic surveys of spawning hoki in Cook Strait have been done annually for several years using NIWA's research vessel *Kaharoa*. In recent years **Peter McMillan** has led them with **Keith Michael, Guy Porritt,** and **Malcolm Hopkins** (amongst others). The

surveys are analysed by **Sira Ballara** and **Shelton Harley** to produce biomass estimates for the stock assessment. **Paul Grimes** and **Gavin Macaulay** are involved in refining target strength estimates for hoki (so that the acoustic backscatter can be appropriately scaled to biomass).

Trawl surveys of hoki during their dispersed phase have been carried out annually in January on the Chatham Rise since 1992. This research project, led by **Mary Livingston**, aims to obtain a relative estimate of abundance of juvenile hoki (pre-recruits) and of the adult population which remain on the Chatham Rise to form the eastern stock of hoki. In 1999, **Neil Bagley** successfully led the eighth survey in the series. Other objectives included estimation of abundance for other commercially important species, particularly hake and ling. The potential for using acoustic techniques to refine estimates of catchability is also being investigated by **Patrick Cordue** and **Brian Bull** as part of this project.

Middle Depths

Ongoing research on other middle depth species in 1999 included gemfish, hake, ling, and southern blue whiting. A one-year project on barracouta was completed. **Shelton Harley** joined the team for 10 months prior to heading to Canada to study for a Ph.D. in August 1999. At Greta Point, **Rosie Hurst** and **Ralph Coburn** updated the cpue analyses and stock assessment for northern gemfish; **Rosie** and **Brian Bull** also looked for relationships between trends in year class strength to ocean climate variables; **Shelton Harley**, **Rosie**, and **Neil Bagley** analysed the catch and effort data for southern barracouta; **Alistair Dunn** and **Terese Kendrick** updated the stock assessment and cpue analyses for hake; and **Shelton Harley** carried out a cpue analysis of ling.

At Nelson, **Stuart Hanchet** continued his work on the stock assessment of southern blue whiting. In 1999 this included: research on age and growth (with **Kim George)**; conducting a further acoustic survey (with **Paul Grimes**); reviewing diel differences in acoustic surveys, estimating recruitment from environmental variables (with **Jim Renwick**); and completing the annual stock assessment for this species. **Peter Horn** worked mainly on stock assessment of ling, but has also been involved in stock assessments or ageing studies of hake, gemfish, alfonsino, rubyfish, white warehou, Patagonian toothfish, and Antarctic toothfish. Members of this team (**Mary**, **Rosie** and **Neil** have also become involved in two environmental projects, one assessing trends in abundance of species associated with hoki on the Chatham Rise and the other determining areas of importance for spawning and juvenile coastal fishes.

INSHORE AND PELAGIC GROUP

Talbot Murray, Ken Richardson, Lynda Griggs and **Hudson Dean** continued developing new generalised linear and additive models of catch rates for southern bluefin and bigeye tunas, and assessing the status of their stocks and the longline fisheries targeting them. Research to monitor the stocks of albacore, skipjack, and yellowfin tuna, and swordfish has also been undertaken.

Malcolm Francis, Suze Baird, and Lynda Griggs updated assessments of bycatch (fish and seabirds) from observer data collected on Japanese and New Zealand fishing vessels, particularly in the tuna longline fishery where the main bycatch is oceanic sharks (blue, porbeagle and mako sharks) and Ray's bream. **Suze** also updated estimates of the bycatch of New Zealand sea lions, fur seals, and seabirds in trawl fisheries and seabirds in the ling longline fishery. **Elizabeth Bradford** and **Suze** completed some exploratory work on the factors that influence bycatch of some species. **Malcolm** was also heavily involved in FRST studies on fish community composition in the EEZ, and the use of estuaries by fishes.

Larry Paul completed some teamwork on ageing grey mullet collected from the Auckland region. He worked on ageing Cook Strait butterfish, and on developing an ageing technique for rubyfish. He returned to studies

on the commercial school shark fishery, essentially to describe its complex nature, while **Elizabeth Bradford** developed CPUE indices from some regional target setnet and longline fisheries. He also began describing the commercial fishery for gropers (hapuku and bass).

Paul Taylor continued his work on stock assessments of jack mackerels with further investigation of inputs to an age-structured model for JMA 7. He completed a desktop study designed to investigate the stock structure of the Chilean jack mackerel, *Trachurus symmetricus murphyi*, in the South Pacific, and determine whether it has established a self sustaining population in New Zealand waters. Paul's work also included producing time series of relative abundance indices from aerial sightings data for a number of schooling pelagic species.

Malcolm Francis, **Caoimhghin Ó Maolagáin,** and **Darren Stevens** completed studies on age and growth of the endemic rough and smooth skates, and began another on ageing ghost sharks (*Hydrolagus* species) using fin spines. **Caoimhghin** was also involved in ageing a variety of other species including butterfish, rubyfish, snapper, trevally, grey mullet and giant squid (using statoliths for the latter).

SHELLFISH GROUP

The Shellfish Group in Wellington focuses on stock assessment and associated research into rock lobsters, paua, oysters, and clams. **Martin Cryer** in Auckland leads work on scampi and scallops. There has also been some contract research into lobsters, oysters, clams, and scallops.

Rock lobsters

Major projects determine annual larval settlement indices as a means of monitoring the state of the resource and predicting trends in catches, investigate settlement surfaces and settlement dynamics, look at enhancement opportunities and issues, collect data (including size distributions) relevant to understanding population dynamics, conduct analyses for stock assessment, and study population reproduction issues.

John Booth and **Jeff Forman**, with help from **Dean Stotter**, continued to follow rates of puerulus settlement along the major rock lobster fishing coasts of New Zealand. The previous settlement pattern continued: higher levels along the east coast of the North Island (Gisborne, Napier, and Castlepoint) than along the east coast of the South Island (Kaikoura, Moeraki, and Halfmoon Bay). The relation between puerulus settlement and subsequent juvenile abundance and recruitment to the fishery is important to management and also reflects ecological processes that affect juvenile rock lobsters. Juvenile abundance study sites coincide with key puerulus monitoring sites at Wellington, Otago, and Stewart Island and there continued to be good correlation between levels of settlement and subsequent abundance of young juveniles. Collector design and settlement dynamics were investigated at Port Gisborne as part of a FRST programme and for private clients. **John Booth** also leads a MFish-funded project to estimate the recreational and customary rock lobster take, along with other species, from the Maketu Taiapure in the Bay of Plenty.

Paua

Neil Andrew, Reyn Naylor, **Peter Gerring, Peter Notman** and **Steve Mercer** have recently completed stock assessment surveys of paua (*Haliotis iris* and *H. australis*) in the Marlborough Sounds, and in the next fishing year will conduct stock assessment surveys of paua on the Wairarapa coast and at the Catlins in Southland. The group is continuing growth and fecundity studies of paua at Taranaki and Banks Peninsula and has begun a FRST funded investigation of customary enhancement of paua on the Wairarapa coast, and an assessment of paua/kina interaction at D'Urville Island.

Paul Breen, Neil Andrew and Terese Kendrick have recently completed a new length-based model for PAU 5B which

indicated that the current paua catch in that area was not sustainable.

FISH COMMUNITIES OF NEW ZEALAND

This FRST funded project aims to provide a comprehensive analysis of fish community structure and species affinities in the New Zealand EEZ. The work is carried out by a team comprising **Rosie Hurst, Malcolm Francis, Neil Bagley, Owen Anderson, Brain Bull, Malcolm Clark, Paul Taylor, Larry Paul** and **Mike Beentjes (Dunedin)**, with statistical advice from **Brian McArdle** (Auckland University). In the year to December 1999 the programme has focused on four main aspects: completing the EEZ-wide presence/absence analysis (**Malcolm Francis**); **e**xpanding the datasets of fish distributions throughout the New Zealand EEZ by incorporating new data from the Ministry of Fisheries scientific observer databases (trawl and tuna longline) and research midwater and prawn trawl records, and the range of environmental variables associated with fish distribution; determining spatial and temporal changes in community structure and relationships with environmental factors; summarising data on feeding patterns of commonly caught fishes. Two new atlases were produced: (i) distribution of fishes and squids caught by midwater and tuna longlines and recorded by aerial sightings; (ii) distribution of juvenile fishes and squid from bottom and midwater trawls and tuna longlines.

OCEANOGRAPHIC AND ATMOSPHERE

Edward Abraham is interested in the impact of physical processes on the plankton. He has continued work on simulating the generation of plankton patchiness by physical mechanisms, and has also been modelling the vertical trajectories of phytoplankton in the surface water. This work has the aim of seeing how the changing light induced by vertical mixing affects phytoplankton photosynthesis. He has recently become involved with the physical side of an oceanographic programme on the northeast coast.

Phil Barnes undertakes studies of active tectonics, structural styles, and sedimentation of the continental margin off New Zealand. Seismic reflection profiles, swath data, and samples are being used to study active faults and unravel the major fluctuations of sea level on the continental shelf during the last one million years. The research has implications for plate tectonic models, structural evolution, seismic hazard assessment in coastal regions, and offshore engineering development.

Sarah Bury's main interests are phytoplankton ecology, primary production, carbon, nitrogen, and sulphur fluxes in the ocean, and the application of stable isotope techniques to environmental studies. She has been involved in a programme monitoring inter-annual and seasonal changes in nutrient fluxes and primary production in relation to water movements in the Hauraki Gulf. She is also involved with an atmospheric programme investigating the sulphur cycle in the upper ocean and the role of marine biological processes in sulphur fluxes. Sarah runs and manages the continuous flow stable isotope mass spectrometer facility at Greta Point. The mass spectrometer analyses carbon, nitrogen and sulphur content and stable isotope ratios in solid, liquid and gaseous samples and is central to environmental process work within NIWA.

Lionel Carter works on the abyssal circulation along the eastern New Zealand continental margin using data obtained from the recent Leg 181 of the Ocean Drilling Program. 3.6 km of cores from a total of seven drill sites is revealing the inception of the deep flow since the break-up of the super continent Gondwana. Thus, we are in a position to examine the evolution of the New Zealand sector of the Ocean Conveyor System that is responsible for the transport of heat around the planet. Cores also contain numerous layers of volcanic ash which not only help date the oceanic events but also provide an insight into the development of the North Island volcanic zones since their inception over 12 Ma.

Hoe Chang continues research on the toxicity of a newly described dinoflagellate, *Gymnodinium brevisulcatum* which caused havoc during the 1998 toxic episodes in Wellington Harbour; the spread of this species along with human respiratory syndromes off the central east coast of New Zealand; the downstream effects of cross-shelf transfer of nitrogen nutrients on phytoplankton off the North Island northeast coast; the life cycle study of a palytoxin-analog-producing dinoflagellate, *Ostreopsis siamensis*. He is also involved in the Ocean Front and Southern Ocean Iron Fertilisation Programmes studying phytoplankton population dynamics in both the Subtropical Convergence over Chatham Rise and Southern Ocean.

Steve Chiswell has been studying currents around New Zealand, with a view to determining mechanisms that retain rock lobster larvae near the coast. He has also been working on currents in the Subtropical Convergence over the Chatham Rise.

Kim Currie is interested in the air-sea exchange of carbon dioxide, and marine carbonate chemistry. She investigates spatial and temporal changes in oceanic carbon dioxide uptake on a time-series transect including the subtropical front and subantarctic surface water.

Mike Elliot is a palynologist working with Barbara Manighetti and Lionel Carter. This research is part of the Ocean Variability programme and investigates oceanic and terrestrial climate linkages offshore East Coast, New Zealand. Mike is reconstructing vegetation histories for the Hawkes Bay and Poverty Bay regions by analysing the pollen spectra from two marine sediment cores collected by the R.V. *Marion Dufresne* during the IMAGES cruise in May 1997. High-resolution sampling is producing detailed results from which the effects of climate change, major volcanic eruptions, and human impact can be inferred.

Richard Garlick utilises skills in GIS and database query to produce maps and figures for publication and scientific analysis. He also conducts field surveys from both small and large vessels. Studies are under way into the offshore geology in the Fiordland, Hawke Bay, Wairarapa, and Marlborough regions.

Belinda Glasby's main area of research is the systematics of marine sponges using traditional morphological characters and molecular data. She is currently working on the Marine Natural Products programme, studying population genetics of a complex sponge species with interest for the pharmacological industry; and for the Seamounts programme inventorying sponge fauna associated with seamounts of the New Zealand region.

Chris Glasby pursues studies on the taxonomy, phylogeny and biogeography of New Zealand's polychaetes, in particular, the terebellomorphs and nereidoids Results will be published both in the NIWA Biodiversity Memoir series and on CD ROM in the form of an interactive identification key. Concurrently, phylogenetic studies using cladistic methods will be used to assess current classifications of selected groups and to generate hypotheses for subsequent biogeographic studies. Together these studies will contribute toward a better understanding of diversity, distributions, and relationships of New Zealand's rich polychaete fauna.

Dennis Gordon is Programme Leader of Marine Biodiversity and Systematics and edits the *NIWA Biodiversity Memoirs* (formerly *N.Z. Oceanographic Institute Memoirs*). He continues to work on the systematics of Cretaceous to Recent New Zealand Bryozoa and is author-coordinator of the volume, Order Cheilostomatida (Treatise on Invertebrate Palaeontology). He is active nationally and internationally in biodiversity issues, serving as a member of the Systematics Steering Committee of DIVERSITAS and Species 2000 Asia-Oceania Working Group. He is coordinator of the Species 2000: New Zealand Inventory Project, and also a Council Member of the N.Z. Association of Scientists.

Malcolm Greig conducts New Zealand coastal and sea-surface temperature studies; tidal studies; and is involved with work on the physical oceanography of the East Auckland /

Hauraki Gulf. He supervised the construction of NIWA's Metocean buoy and continues to be involved with programs using the buoy. Malcolm co-ordinates the oceanographic mooring programme.

Janet Grieve continues to transfer data on the Southwest Pacific pelagic copepod fauna onto the ETI database "Linnaeus II". She is describing new benthopelagic calanoid copepod species (currently of *Tharybis* and *Neoscolecithrix*). She is leading a research objective on life-supporting capacity of New Zealand marine ecosystems within the Ocean Ecosystems programme and is personally focusing initially on the Bounty-Campbell Plateau area.

Mark Hadfield has a background in air pollution meteorology and upper ocean processes, but in the last few years he has been moving into oceanographic and coastal hydrodynamic modelling. He has been modelling flow in Pelorus Sound, in order to quantify exchange between Beatrix Bay and the remainder of the sound. The results are fed into an ecosystem model, which estimates limits on sustainable mussel production in Beatrix Bay. Mark has also been modelling instabilities and horizontal mixing in the Subtropical Front over the Chatham Rise, and he has been involved in developing plans for other ocean modelling projects in the New Zealand region. Mark contributed to the Southern Ocean Iron Release Experiment (SOIREE) that was conducted in February 1999 by carrying out a desktop survey for the proposed release sites.

Mike Harvey works on the marine atmosphere with a research interest in production and air-sea exchange of dimethylsulfide, the atmospheric fate of dimethylsulfide, and the role and importance of sulfur aerosols to climate. He has expertise in field measurements using micrometeorological techniques, atmospheric and dissolved trace gas and atmospheric aerosol measurements. Mike has experienced the Southern Ocean on research voyages to obtain his data.

Peter Hill works on oceanographic electronic equipment specification and system design, commissioning, maintenance, and field operations.

Chris Jones has joined the group that maintains and commissions electronic equipment.

Andrew Laing specialises in marine winds, ocean waves, marine winds, and satellite oceanography. He has used satellite scatterometer data to look at marine wind patterns in the coastal waters around New Zealand, and has been determining the role of coastal winds in high wave events at the coast. He has also been investigating the origin of high wave and swell events affecting New Zealand and has collated a climatology of waves from satellite data. Using radar altimeter data from the satellite missions, he has been exploring dynamic variations in ocean currents and their correlation with sea-surface temperature observations from satellites.

Geoffroy Lamarche is a marine geophysicist studying the active tectonics, structural styles and sedimentary processes in the Wanganui Basin and Bay of Plenty. He is also involved in the study of the New Zealand margin instabilities, and the structural style of the offshore Alpine Fault offshore Fiordland. His work have implications in seismic hazard assessment, landslide generated tsunamis modelling, plate tectonics, and sea level change within the last million years. He is responsible for the seismic processing capabilities at Greta Point, and supervises and undertakes acquisition, processing and interpretation of seismic data collected at NIWA. Within the framework of his FRST funded project, Geoffroy has strong links with the University of Rennes (France) and the Southampton Oceanography Centre (UK). Both centres have PhD students using NIWA data for their research, and are co-supervised by Geoffroy.

Keith Lewis is has completed work on the Ruatoria Giant Avalanche, which was interpreted as a secondary effect of oblique seamount subduction and is searching for

effects of seamount subduction on the continental margin to landward of the Ruatoria Indentation. He is now working on seismic data from the Hikurangi Fan-drift, 600km east of Ruatoria, where newly processed seismic data shows, in detail, the interaction between far distal turbidity currents and the Pacific's Deep Western Boundary Current.

Alison MacDiarmid coordinates a new research programme on sustainability and enhancement of coastal reef fisheries of economic and cultural importance. As well as studying fundamental aspects of reef species biology and ecology this programme is developing close ties to Maori and community groups interested in local management of coastal reefs. Alison's own research on rock lobster reproduction and enhancement ecology continues within the context of the larger programme and there are strong links with spiny lobster research programmes in Australia and the US.

Don McKnight continues with the systematics and biogeography of New Zealand region echinoderms, with joint work by Helen Rotman, towards a series of memoirs on asteroids, and another on ophiuroids.

Bill Main is involved in the development, recovery and maintenance of physical oceanography survey equipment; small-boat hydrographic surveys, and in curation of NIWA biology collections.

Barbara Manighetti is examining marine sediment core data from offshore NE New Zealand, to identify fluctuations in environmental parameters such as oceanographic regime, biological productivity, the history of volcanism, and terrestrial sediment input via fluvial and aeolian transport. The project, "Environmental Stability of NE New Zealand", is focused upon two giant piston cores collected during the IMAGES campaign in 1997, and links with terrestrial studies of lake sediments, in association with Landcare Research. She continues work on rapid characterisation of seafloor habitats in Foveaux Strait, aimed at understanding, monitoring and enhancing the elements important for oyster growth on biogenic reefs in the area.

John Mitchell spends time in the operation, maintenance, analysis and interpretation of data from marine survey instrumentation; oversees navigation and data acquisition from commercial surveys and production of track plots and charts.

Michele Morris is investigating the variability of currents and water masses in the subantarctic ocean around New Zealand. She is currently analysing data collected from a comprehensive subantarctic field programme that involved seasonal hydrographic surveys over the Campbell Plateau and long-term measurements of temperature and velocity using moored instrumentation. She is particularly interested in variability of the Subantarctic Front and Subantarctic Mode Water formation over the Campbell Plateau.

Helen Neil is currently undertaking studies into the impact of past climate on the southern water masses of New Zealand. In particular, characterising present and past formation and flow paths of climatically important intermediate water masses and determining the history of water column stability over the Campbell Plateau. The character of present day planktonic assemblages is compared with past assemblages in order to derive an analogue for environmental change in a globally warmed ocean.

Scott Nodder is involved in research investigating oceanic sediment and elemental (C, N, P, Si) fluxes using floating and moored sediment traps. This work is in conjunction with benthic biological studies that are designed to understand the relationships between benthic and pelagic processes. Study areas include the Southern Ocean, west coast South Island, Subtropical Front (Chatham Rise), Hauraki Gulf, and northeast coast of New Zealand. Other research interests are Taranaki-Wanganui shelf sedimentology and structure, marine particulate matter processes, continental shelf sediment transport, and the oceanic carbon cycle.

Lisa Northcote has been involved in detailed analysis of sediment cores taken from Hawke

Bay, Chatham Rise, and the Campbell Plateau region. The analyses include % grain size, % $CaCO_3$, total organic matter, dry bulk density, formaniferal extraction for isotope analysis, and examination of terrigenous input. She also works on sediment trap and MOCNESS samples. Lisa has previously been involved in marine sponge taxonomy and cell culture.

Megan Oliver is involved in studying breeding and growth of the New Zealand spiny rock lobster; the growth of the New Zealand deep-sea lobster or scampi; the collection of ocean-going data for the Ocean Colour programme.

Steve O'Shea. In addition to studying the systematics of the Cephalopoda, Steve has broad interests in systematics of the majority of marine invertebrate phyla, marine impact assessment, reporting and conservation. His Ph.D from the University of Auckland dealt with a revision of the systematics of the New Zealand octopodous Mollusca. He is also involved with the mapping of benthic invertebrate faunas of soft-sediments and seamounts around New Zealand, and is curator of the NZOI/NIWA biology collection, where he is actively involved in their maintenance, upgrading and expansion.

Mike Page. Since his return from Samoa, Mike Page has been working for the Marine Natural Products/ Marine Biotechnology group based at NIWA Greta Point. Mike's research is primarily focused on the discovery of novel secondary metabolites from sponges, tunicates, bryozoans and algae. He is currently involved in projects to evaluate the aquaculture potential of sponges and native seaweed for sustainable production of marine natural products. He is also studying the chemical ecology of a bioactive sponge species in collaboration with chemists from Victoria University.

Matt Pinkerton uses satellite images of ocean colour to estimate phytoplankton distributions around New Zealand. He is interested in making the remote measurements more accurate by tuning the method to the New Zealand region. The satellite images help to identify patterns of production and are used in climate change and fisheries research.

Geoff Read completed an overview and checklist of all New Zealand Polychaeta for Species 2000 in conjunction with Chris Glasby. An offshoot of this project is a database of all taxonomic information on NZ polychaetes. A review of Pectinariidae was completed, and work continued on several spionid reviews, as did identification services for several benthic ecology studies. Planned future projects include a review of polychaetes associated with commercial molluscs and the preparation of a guide to beach polychaetes. Geoff also moderates the international Annelida list and maintains a web-site for annelid research information.

Helen Rotman (née Clark) is working on a monograph, with Don McKnight, of the asteroids of New Zealand and its outlying islands. The work is based on NZOI and MoNZ collections; she also examined the asteroids held by the Auckland Museum, with interesting results. She is also interested in the anatomy, parasites, and stomach contents of seastars wherever it is possible to examine them; this has been of interest and it has also shown how voracious their appetites are.

Hamish Saunders has joined the Marine Geology group and reports to a number of senior scientists. His primary responsibilities include the undertaking of coastal mapping surveys, processing and presentation of marine GIS data, and assistance with the production of scientific papers and posters.

Dick Singleton carries out biological field work and data entry and analysis. He maintains the biology collection database.

Murray Smith studies air-sea interaction, ocean waves, and radar remote sensing of the sea surface. He is investigating how the turbulent processes near the sea surface affect the exchange of climatically important gases with the atmosphere. Wave breaking is of particular interest, being an important source of near-surface mixing and also a key component of ocean wave models. He also works with microwave radar which has been

developed at NIWA to obtain information on waves, wave-breaking and currents.

Basil Stanton studies ocean variability and its effects on New Zealand, in the sub-tropical and subantarctic regions. These studies utilise research voyage data, notably CTD and current meter data, along with satellite remote sensing data. The aim is to understand ocean climate changes on time scales of months through to interannual. He is also involved in tidal current studies, aimed at ultimately providing operational predictive models for the New Zealand region.

Craig Stevens has a range of interests including a Royal Society Marsden Fund project exploring physical interaction between large macrophytes (*Durvillaea*) and surrounding flow especially the effects of waves. This is a collaborative effort with Catriona Hurd (Otago) and follows on from their successful collaborations studying the biomechanics of *Macrocystis*. The *Durvillaea* work has involved three field campaigns that have yielded fundamental data on how these large macrophytes cope with the extreme forces exerted by large breaking waves on rocky coastlines. The observations include the first known usage of accelerometers and load cells in this type of application.

In addition to this he has been involved in measuring internal mixing processes in a variety of situations using temperature microstructure. This technique uses a very fragile package that rises or falls through the water column measuring temperatures every millimeter. From these tiny variations in temperature it is possible to determine a range of physical properties describing how mass and energy are transported. This is fundamental to under-standing how nutrients move within coastal embayments (i.e., related to mussel farming) and also to understanding how breaking surface waves impart energy to the ocean surface waters (i.e., related to global warming issues).

Rob Stewart continues to work on the rock lobster breeding and enhancement programmes. He is also the field team leader for the Taiapure programme investigating shellfish, fish, and lobster populations at the Palliser Bay Taiapure, Wellington south coast, and Kapiti Island.

Philip Sutton is working on the main flow and variability of the East Auckland Current and is investigating large stationary eddies off the northeast coast. Other interests include a study of the frontal dynamics in the Subtropical Convergence over Chatham Rise.

Michael Uddstrom has developed a high-resolution (1 km) dataset of cloud cleared, validated, sea surface temperature (SST) data - the NIWA SST Archive (NSA). Extending from 1993 to the present, these data are being used to determine aspects of ocean (surface feature) variability, and to place *in situ* physical, biological, and fisheries observations in context. A paper on the spatial and temporal variability of sea surface temperatures in the New Zealand region has been published in JGR. Relationships between SST, Ocean colour and SSH are also being investigated.

Matt Walkington specialises in software and instrumentation development; particularly as applied to acquisition, processing, and analysis of high-accuracy conductivity, temperature, depth (CTD) and related measurements. He programs in Matlab and C, and is expert at supporting modern software and (inter-) networked Windows 95 PCs. He has extensive experience of oceanographic field work as well as a variety of physical and chemical laboratory work.

Vicky Webb's specialty area is in animal tissue culture, microbiology, and molecular biology. As part of the Marine Biotechnology programme she is determining whether it is the sponge cell or its accompanying symbionts that is responsible for the production and/or storage of specific bioactive molecules. She is also evaluating the use of tissue culture of sponges as a means of supplying bioactive molecules for pharmaceutical and agrochemical applications. As an adjunct to this she is determining the feasibility of producing sponge cell "hybridomas". She hopes the "hybridomas" will overcome the problem of growing delicate bioactive producing cells by fusing them with sponge

cells from rigorous, fast growing species. Vicky is also initiating the development of new bioassays with an aim to increase the breadth of applications to which the extracts may be applied, especially in the area of agrochemical and anti-fouling agents.

Steve Wilcox continues to maintain and commission electronic equipment.

Phil Wiles is involved in the operation, processing and analysis of upper ocean velocity data collected by the acoustic current profiler mounted on RV *Tangaroa*. He is also responsible for archiving and maintaining databases for the Ocean Physics group and developing techniques to assist in the interpretation of remotely sensed data products.

Ian Wright continues his studies on active tectonic and volcanic processes within the southern Havre Trough and Kermadec volcanoes. Specific work includes understanding processes of submarine arc volcanism by analysing side-scan imagery, swath bathymetry, photogeological investigations, and radiometric age data of the active southern Kermadec Ridge submarine-arc volcanoes.

UNIVERSITY OF AUCKLAND

DEPARTMENT OF CHEMISTRY

Marine natural products chemistry has continued under the leadership of **Brent Copp**, and a number of promising new compounds are now under examination. Surprisingly some of these have come from organisms that have previously been assayed by a variety of groups. It is interesting to speculate whether this is a result of varying taxonomy, natural variation, improvements in technology or all of the above. The growing relationship with the Leigh Marine laboratory looks set to be a productive one and Brent has also initiated collaborations with pharmacology groups in Berlin and Zurich.

The natural products group has been boosted by the enrolment of **David Appleton** for PhD studies supported by a University of Auckland Doctoral Scholarship. David joins **An Pearce** also studying for a PhD, and both are examining a wide range of organisms, mainly ascidians.

Other students with an interest in things marine come from the Food Science MSc program:

F. Blaha: Development of a new fish product, (supervised by L.D. Melton)

K. Chen: Analysis of lipids in fried fish, (supervised by C.J. O'Connor)

DEPARTMENT OF GEOGRAPHY

Kevin Parnell and **Scott Nichol** received further support from the Kaipara Harbour Study Working Party to collaborate with NIWA in the study of environmental changes. Kevin was on study leave for part of 1999, studying the effects of wave wash generated by spectator vessels during the Americas Cup! **Willie Smith** and Kevin Parnell continue their major involvement in science policy and coastal policy formulation in New Zealand's central and local government sectors, and overseas. **Jay Gao** and **Paul Augustinus** have continued to be active in their studies of sheltered coastal landforms. The department regrets the departure of **Craig Millar** and **Paul Osborne** to their native Canada.

PhD

Paul Villard: Complex wave behaviour and nearshore sediment flux.

MSc

Anthony Modrich: Long term beach profile variations: Parengarenga Ocean Beach, **Robert Stewart**: Interest lobby in the re-establishment of Poor Knight's Marine Reserve,

Carolyn Wratt: Sedimentary evolution of the Puhoi River Estuary, Northland.

DEPARTMENT OF GEOLOGY

The year was marked by the retirement of **Murray Gregory**, whose contributions to marine geology at Auckland will be greatly missed. **Paul Augustinus** continued his studies of coastal geomorphology whil on leave in semester 2. Members of the department pursued a huge range of topics related to marine enviornments from global warming (**Liz Sikes**) to deep sea vents (**Kathy Campbell**) and from plastics as sediments (Murray Gregory) to the ecology of foramenifera (**Bruce Hayward**). Students continue to be active in marine-related areas.

PhD

G. Abrahim: Holocene Sedimentation in the Inner Hauraki Gulf, Auckland.

MSc

M. Collins: Ancient Hydrocarbon Seep Faunas, Hawkes Bay.

M. Eagle: Crinoid Faunas.

J. Robertson: Petrology and Geochemistry of a Shallow Submarine Geothermal System, Bay of Plenty, New Zealand

LEIGH MARINE LABORATORY

The laboratory was fully utilised during 1999, with full occupancy of MSc students as well as a growing number of PhD students (40 in total). These numbers indicate the strength of interest in marine science at Auckland and in the marine laboratory in particular. One third of all graduate students come from outside the University of Auckland and 12% from overseas. The potential for this interest to grow is apparent to us at the Laboratory, but if this is to happen we must plan for expanded facilities and accommodation, not only for students but also for the staff that would need to supervise their activities. Funds obtained from consulting work, another area for potential growth, now support one full time (**Jarrod Walker**) and one part-time (**Justine Saunders**) research assistant at the laboratory. Again, if this is to be supported there is a need for expanded facilities. The laboratory is poised for further growth that will capitalise on its geography, proximity to Auckland, and its staff expertise.

19 University of Auckland field courses and 9 external workshops or courses were held at the Laboratory in 1999. In addition, over 350 primary and secondary school students visited the laboratory.

R.V. Proteus was at sea for 141 days, supporting a range of research and teaching from the University of Auckland. Outside users were mainly Cawthron Institute and BBC Film Unit. The number of dives made from the Laboratory was 1550 with an additional 401 from *Proteus*. The skill and dedication of skippers **Brady Doak**, and **Murray Birch** are acknowledged as vital for the continued safe and effective operations of *Proteus* and all other boat and diving activities from the Laboratory.

The subtidal ecology group, led by **Russ Babcock** has had an active year with members conducting research at sites located from Cape Reinga to Stewart Island. A close relationship with the Department of Conservation has helped to support this work which is aimed at understanding the processes that structure kelp forest communities on New Zealand's rocky reefs. Marine reserves are an integral part of much of this research since they can be used as large scale ecological manipulations for assessing the role of predators. A spin off of this has been the demonstration of widespread indirect fishing effects on coastal reef community structure.

Estuarine and soft shores have been the focus of recent work by **Bob Creese** who has been studying the potential for ecological effects of sand dredging proposed for subtidal areas in the outer Hauraki Gulf. This work however only scratches the surface of Bob's involvement in environmental issues which have extended to studies of the impacts of

urbanization on beaches and estuaries adjacent to the City of Auckland. Bob has also maintained an active interest in rocky shore ecology and the biology of molluscs with potential as new aquaculture species.

Marine Reserves and marine conservation continue to be the focus of **Bill Ballantine's** activities. Bill has been active in this regard both within New Zealand and internationally.

Progress into the understanding of nitrogen metabolism in green algae has led **Alwyn Rees** and his students to develop bioassays for the nutrient status of marine plants that is likely to become a useful tool in monitoring and environmental assessment for eutrophication.

University of Auckland Post Doctoral Fellow **Nick Tolimieri** (with John Montgomery) has made important progress concerning the orientation of larval fishes prior to settlement. Nick has also been involved in student projects related to fish ecology.

Karen Tricklebank (with Bob Creese and Gillian Lewis) has been based part-time at Leigh (and at SEMS Tamaki) working as a postdoctoral fellow to identify subtle indicators of environmental change, funded by Auckland Regional Council.

Chris Clarke PhD candidate, presented a poster (with Bob Creese) entitled "Abalone (paua) aquaculture in northern New Zealand: diet and temperature effects on growth and survival" at the World Aquaculture Conference in Sydney.

Graduate students based at the Laboratory in 1999:

PhD

Chris Clarke: Aquaculture of northern paua.

Sharon DeLuca: Impact of leachate on bivalves.

Chris Denny: Effects of Marine Reserves on reef fish populations.

Eddy Fong: Nitrogen metabolism in marine microalgae.

Elke Franke: Fertilization ecology in *Evechinus chloroticus* and *Coscinasterias calamaria.*

Tim Haggitt: Physiology and ecology of *Ecklonia radiata.*

Andrew Morgan: Ecology and culture of sea cucumbers.

Aletha Samuela: Biochemical indicators of nutrient enrichment in temperate and tropical seaweeds.

Nick. Shears: Effects of marine reserves on subtidal communities.

Kala Sivaguru: Feeding ecology of crabs.

Megan Stewart: Recruitment ecology of cockles and population responses to habitat changes.

Trevor Willis: Effects of marine reserve protection on fish.

MSc

Neil Barr: Ammonium metabolism in *Enteromorpha* sp.

Darshani DeSilva: Ecology of Pulmonate Limpets.

Bruce Dudley: Swimming abilities and orientation behaviour of late stage larval reef fish.

Brendon Dunphy: Shell epibionts of paua.

David Feary: Diet and habitat of triplefins.

Shaun Henderson: Ecology of *Jason mirabilis* and its hydroid prey.

Rebecca Hunter: Osmoregulation and nitrogen assimilation in *Enteromorpha.*

Rochelle Johnston: Ecology of *Ophiopsammus maculata*.

Mick Kearney: Ecology and management of cockles.

Scott Kington: Enhancement of red rock lobster.

Steve Lyon: Effects of sedimentation on corals at Rarotonga.

Natalie Managh: Feeding ecology of octopus.

Adrian Moore: Utilization of estuaries by juvenile fish.

Greg Nesbit: Fertilization, growth and mortality of *Pecten novaezelandae.*

Pip Nichols: Environmental impact of *Spartina*.

Mei Tsin Oh: Sandmining impacts on benthos.

Kogoro Osumi: Ecology of juvenile paua *Haliotis iris.*

Justine Saunders: Estuarine fish communities of Pollen Island.

Carina Sim: Population ecology of the asian date mussel.

Schannelle van Dikjen: Reproductive ecology of the New Zealand seahorse.

Jarrod Walker: Ecology of rocky coastal communities.

Andrew Wright: Current surveying of the Hauraki Gulf.

PhDs awarded

Sam Buchanan: Greenshell mussel culture.

Shane Kelly: Crayfish movement and marine reserves.

Mark Morrison: Population dynamics of the scallop *Pecten novaezelandiae* in the Hauraki Gulf.

MScs awarded

Shaun Henderson: Ecology of *Jason mirabilis* and its hydroid prey.

Rebecca Hunter: Osmoregulation and nitrogen assimilation in *Enteromorpha*

Rochelle Johnston: Ecology of *Ophiopsammus*.

Mick Kearney: Ecology and management of cockles.

Scott Kington: Enhancement of red rock lobster.

Natalie Managh: Feeding ecology of octopus.

Greg Nesbit: Fertilization, growth and mortality of *Pecten novaezelandae.*

Pip Nichols: Environmental impact of *Spartina*

Kogoro Osumi: Ecology of juvenile paua *Haliotis iris.*

Justine Saunders: Estuarine fish communities of Pollen Island.

Carina Sim: Population ecology of the asian date mussel.

Megan Stewart: Ecology and restoration of cockles.

Jarrod Walker: Ecology of rocky coastal communities.

Staff from other University of Auckland departments who worked at the Laboratory were:

Dr G. Allen (SEMS); Prof. M.J. Bowman (SEMS, Chair of Marine Science); Dr K.D. Clements (SBS); Dr G. Lewis (SEMS); Dr R.D. Lewis (SBS); Dr N. Mitchell (SEMS); Prof. J.C. Montgomery (SBS); Dr P. Osborne (Geography).

A total of 11 scientists (including 6 from abroad) from other universities and institutions who worked at the Laboratory were:

Dr C. Battershill (NIWA, Wellington); Dr D Bodznick (Wesleyan University, USA); Dr J. Caley (James Cook University, Australia); Dr R. Cole (NIWA, Nelson); Prof. D. Dietrich (The Stennis Space Centre, Mississippi, USA); Dr B. Diggles, (NIWA, Wellington); Drs A. & H. Freudenthal (Long Island, USA); Dr M. Page, (NIWA, Wellington); Dr A MacDiarmid (NIWA, Wellington); Dr W. Prud'homme van Reine (Leiden University, The Netherlands); Dr L. Schwarzkopf (James Cook University, Australia); M. Stiles (Thomas J. Watson Fellowship Grant, USA).

DEPARTMENT OF PHYSICS

Chris Tindle has continued Work on Coupled Perturbed Modes. The combination of conventional coupled modes with perturbation theory is a natural one and greatly improves calculations in range dependent cases. Work on ray theory at caustics and complex rays that had proved intractable about four years ago was picked up again in September. The two outstanding problems were quickly solved and the technique now gives detailed agreement with test data. **G Bold** has continued the university's involvement with the Acoustic Thermometry of Ocean Climate (ATOC) through his work on signal processing of ATOC experiment results.

PhD students:

C. Higham,: Theoretical Underwater Acoustics.

SCHOOL OF BIOLOGICAL SCIENCES

During the year the School has also been fortunate to be able to appoint **Mary Sewell** to a lectureship in Marine Biology. **Brian McArdle** transferred at the beginning of the year to the Department of Statistics after a period of 21 years' service to pursue his expanding interests in numerical analysis and statistics. Excellence in marine botaonical research was recognised by the award of the 1998 Marian Cranwell Prize to **Michael Taylor** (MSc student), and a Technology New Zealand Scholarship was won by **Andrew Bell** (PhD candidate)

Dave Todd spent a month in Antarctica at the end of the year to provide technical support for Dr **John Macdonald** and graduate students who were undertaking field work. This involved drilling holes in the sea ice to collect fish and preparing and running remote field camps for up to a week at a time. On this visit, Dave re-discovered an historic camp-site from the Scott 'Terra Nova' Expedition.

Professor Dame Patricia Bergquist and **Associate Professor Michael Miller** both retired on 31 January, and the school acknowledges their role in making SBS the force in New Zealand marine science that it is today.

Visitors to the School of Biolgoical Sciences included:

Professor David Bodznick (Wesleyan University), Professor Howard Choat (James Cook University, Queensland), Dr Doug Mountfort (Cawthron Institute), Dr Rick Pridmore (NIWA), Dr Nevilele Sweijd (University of Cape Town).

Ecology and evolution research group

The Molecular Ecology laboratory, under the direction of Dr **Scott Baker** continued work on genetic variation and systematic relationships among endangered and commercially exploited species, including whales, dolphins, sea lions, fur seals and marine fish. Dr Baker, Research Fellow Dr **Gina Lento** and School technician **Justine Murrell**, continue their study of conservation genetics of cetaceans and pinnipeds, including evolution global phylogeny of humpback whales and southern hemisphere fur seals, with grant support from the Marsden Fund.

In collaboration with international conservation agencies, they and Research Fellow Dr **Brad Congdon** also conducted molecular genetic identification of whale and dolphin meat on commercial markets of Japan and Korea. Research Fellow Dr **Luis Medrano** and honorary research associate, **Rosalba Robles-Saavedra** conducted studies of the molecular evolution and population genetics of whales, dolphins and manatees.

PhD students in the laboratory researched the genetic variation and population structure of Hector's dolphins and sperm whales (**Franz Pichler**), the molecular systematics of beaked whales (**Merel Dalebout**), the behaviour and ecology of bottlenose dolphins in the Bay of Islands (Rochelle Constantine), the genetic and demographics structure of southern right whale populations (**Nathalie Patenaude**) and, in collaboration with Dr **K Clements**

(Experimental and Marine Biology), the evolution and population structure of New Zealand triplefin fishes (**Tony Hicky**). MSc students completed studies of the population genetics of New Zealand sea lions (**Rachael Ashton**) and the molecular systematics of New Zealand fish (**Sarah Eyton**).

The Behavioural Ecology laboratory, under the supervision of Dr **Dianne Brunton**, has worked on a diverse range of topics including the following: Population numbers and habitat selection by burrowing seabirds on Tiri; factors influencing the breeding success of fairy terns and white-fronted terns in Northland; Dusky dolphin habitat use, group size and dispersion in Kaikoura; acoustic behaviour of bottlenose dolphins in response to dolphin tourism in the Bay of Islands; near shore habitat use by southern right whale cow/calf pairs in the Auckland Islands.

PhD students

Gene Browne: Techniques for the detection of biological impacts,.

Rochelle Constantine: Behavioural ecology of bottlenose dolphins.

Merel Dalebout: Molecular systematics of the rare southern ocean beaked whales (*Ziphiidae*).

Franz Pichler: Molecular genetic variation and population systematics of Hector's Dolphin (*Cephalorhynchus hectori*).

PhDs Awarded

Michael Taylor: The Influence of Environmental Factors on Reproduction and Recruitment of *Macomona liliana* (Class: Bivalvia) in Manukau Harbour, New Zealand).

MSc. students

Brent Barrett: The ecology of southern right white cow/calf pairs in the Auckland Islands.

Nichollette Brown: The habitat use and behavioural ecology of Dusky dolphins in Kaikoura, New Zealand.

Neville Phillips: Evaluation of techniques used in fisheries stock assessment.

David Snell: Acoustic behaviour of dolphins in response to dolphin tourism in the Bay of Islands.

Experimental and marine biology research group

Within Experimental and Marine Biology, research highlights for 1999 include excellent progress on existing Marsden grants and further success with Marsden funding. Drs **Michael Walker** and **Carol Diebel** have taken the search for the vertebrate magnetic sensor a step closer with the Atomic Force/Magnetic Force visualisation of trout magnetite particles, and have welcomed a new Marsden funded Post-doctoral Fellow Dr **Todd Dennis**.

Dr **Kendall Clements** has published an update on progress in his joint Marsden with Dr **Doug Mountfort** of Cawthron Institute in the Marsden Fund Newsletter (Dec 1999). Kendall and Doug have shown that symbiotic gut microbes may be as important for some herbivorous fishes as they are for terrestrial vertebrate herbivores.

The University of Auckland Post-doctoral Fellowship to Dr **Nick Tolimieri** was successfully converted to a Marsden Fellowship. Nick has already discovered that replayed reef sounds are attractive to settling reef fish larvae.

The Antarctic fish work continues to prosper with two graduate students participating in the 1999 Antarctic season under the direct supervision of Dr **John Macdonald**. With the expansion of Experimental Biology to Experimental and Marine Biology we welcomed new staff member Dr **Mary Sewell** to the group and look forward to more Marine Biology highlights in the future.

PhD Students

Cindy Baker: Native freshwater fish research - Larval recruitment process.

Andrew Bell: Metabolism and growth in the Pacific oyster.

Stephen Cook: The Dictyoceratida of New Zealand and a review of the general taxonomic arrangement of the order.

David Crossman: Dietary composition of reef fishes.

Vonda Cummings: Processes influencing the survival and growth of post-settlement *Austrovenus stutchburyi*.

Allison Haywood: *Gymnodinium* from New Zealand waters: taxonomy and detection.

Neill Herbert: Physiological ecology of fish.

Anthony Hickey: New Zealand's triplefin diversity.

Laith Al Hassan Jawad: Morphological systematics of New Zealand triplefin fishes (Family Tripterygiidae).

Safaa Majed: Biochemical correlates of growth in New Zealand snapper, *Pagrus auratus.*

Scott Speed: Physiology and genetics of the Pacific Oyster.

Kim Walshe: The Fisheries Individual Transferable Quota System.

Lindsey Zemke-White: Algae as food for fishes.

PhDs Awarded

Stephen O'Shea: New Zealand Octopoda (Mollusca: Cephalopoda) Systematics

John Tyrrell: Molecular Probes for the Fish-Killing Raphidophytes and the Phylogeny of the Group.

MSc students

Angus Benham: Elasmobranch orientation in and out of a New Zealand estuary.

Jane Campbell: Fermentative digestion in the marblefish *Aplodactylus arctidens.*

Serena Cox: Evidence for temperature copmpensation of fish synaptic currents.

Bruce Dudley: Presettlement larval fish.

David Feary: Diet analysis and habitat distribution in New Zealand *Tripterygiidae.*

Rhys Hodson: Magnetoreception in the stingray, *Dasyatis brevicaudata.*

Damian Moran: The feeding and digestive biology of a temperate water herbivorou fish, Silver Drummer (*Kyphosus sydneyanus*).

Isabel Pasch: Dominant microbial ecotypes in the guts of marine herbivorous fish.

Benson Taylor: Short-tailed stingray behaviour.

Molecular genetics & microbiology research group

MSc Thesis

Timo Birkenstock: Ecological and genetic assessment of the symbiont Symbiodinium of the sea-anemone *Anthopleura aureoradiata.*

SCHOOL OF ENVIRONMENTAL AND MARINE SCIENCES

The School of Environmental and Marine Sciences (SEMS) had a varied year. There were considerable changes in staff while student numbers increased slightly. Professor **Malcolm Bowman** left, Dr **Carol Stewart** took maternity leave and Dr **Gillian Lewis** took two years leave of absence.

The Mangemangeroa Environmental Effects program continues in conjunction with ARC and has been expanded to include the Long Bay catchment. Dr **Karen Tricklebank** continues to coordinate this.

Newer staff members such as **Liz Sikes** and **Graham Allen** received research grants to establish ocean research programmes. Liz attended the meeting of the NZ Geological Society where she presented a paper titled 'Past Ocean-Atmosphere radiocarbon age differences from the New Zealand region of the southwest Pacific'. Visitors to the School

included Dr **William R. Howard**, University of Tasmania, who collaborated on Southern Ocean sea surface temperature studies with Liz.

Studies of currents and larval retention around the Poor Knights Islands and hydrodynamics of the Western Hauraki Gulf have been initiated by **Graham Allen**.

DEPARTMENT OF STATISTICS

A notable feature in the Department of Statistics is the emergence of the large group with interests in statistical marine ecology and fisheries. This group, comprising four permanent members of the department, and one PhD students, forms one of the largest such groups in any Statistics department anywhere. It has strong links with SBS and SEMS within the University, and with NIWA and the Ministry of Agriculture and Fisheries. Core members of the group are **George Seber**, **Brian McArdle**, **Renate Meyer** and **Russell Millar**. **David Scott** also contributes and the group is soon to be boosted by the arrival of **Marti Anderson**.

PhD student:

Carl Donovan: Statistical ecology.

UNIVERSITY OF CANTERBURY

ZOOLOGY DEPARTMENT

Teaching programmes

The Department is currently reviewing all its courses and in 1999 introduced several new first year courses. Next year there will be a new second year level course on principles of physiology. We are retaining Stage II courses in Marine Invertebrate Zoology (with an emphasis on structure and function, life histories, behaviour and ecology) and Vertebrate Biology and Evolution (comparative anatomy, general biology and evolutionary history of vertebrates). The Stage III course in Ecology is an aquatic ecology course with the marine component in the first half and freshwater component in the second half of the course. Graduate-level courses are offered in Aquaculture and Fisheries, Marine Biology, Experimental Marine Ecology and Applied Ecology.

Staff Research

Dr Bill Davison, in addition to being HOD of the Zoology Department is continuing with research on Antarctic fish. Current topics include CO_2 excretion, oxygen uptake, blood flow through the gills and X-cell disease.

Dr Malcolm Forster and his students and are continuing with research on the cardiovascular system of hagfish and marine teleosts and the effects of stress on marine organisms.

Dr Neil Gemmell has research interests on the population biology and social structure of marine mammals, particularly the pinnepeds. One of his main objectives is to provide fine scale analyses of population structure and social organisation necessary to develop effective management programs for the long-term conservation of these animals. Current projects include behavioural and genetic investigations of fur seal populations and breeding systems.

Steven Giesig has research interests in fish macrophage biochemistry and is assessing the effects of excessive exercise and environmental effects such as temperature on fish antioxidant systems. He is also attempting to biochemically characterise X-cell disease in the gills of Antarctic fish.

Dr Islay Marsden is continuing with research on the physiological ecology of crustacea and bivalve molluscs. This research includes a comparison of the effects of temperature, salinity and aerial exposure on the growth and energetics of cockles and tuatuas. . She is also

working on ecotoxicology of marine and supralittoral amphipods.

Dr Colin McLay has returned from study leave and continuing work on systematics of dromiid, dynomenid and other podotreme crabs. He also has interests in crab mating strategies and the mechanisms of sperm transfer from males to females.

Prof. Bob Pilgrim is working on taxonomy of ectoparasitic Arthropoda including ticks, fleas and their larvae from sea birds, Anoplura from seals and copepoda from fishes.

Dr Harry Taylor is continuing research into the comparative physiology of molluscs and crutaceans. A study of the physiology of the New Zealand paua has attracted support from the Marsden Fund (3years). This wide-ranging investigation involves morphological as well as physiological studies of circulatory, respiratory and excretory systems. Work also continues on the stress responses of lobsters to live transport and on the ontogeny of osmoregulation in the eggs of intertidal crabs.

Dr David Schiel has continued his work on establishment of commercial paua farms and in nearshore intertidal ecology. The emphasis of the intertidal program has been on human impacts to habitats and the processes responsible for recovery. Much recent work has been on the early life stages of habitat-forming species, especially dispersal distances, settlement and early survival. This research has expanded into a wider collaboration with NIWA and with researchers at Oregon State University and the University of California at Santa Barbara through funding from the Andrew Mellon Foundation of New York. The programme involves many students.

Dr Frank Sin is continuing with research on the molecular biology, growth and development in abalone and lobsters and genetic improvement of growth in salmon. This research with Dr Jenny Khoo has received funding for 6 years from FoRST. Research involves isolation and characterisation of paua growth hormone and insulin-like growth factors and functional analysis of a novel neuropeptide in the rock lobster.

Prof George Knox is updating The Natural History of Canterbury and writing a new book on the ecology of seashores that will be published by CRC Press in 2000. He is also preparing manuscripts of past research carried out in McMurdo Sound, New Zealand estuaries, sewage disposal in the coastal zone and the intertidal ecology of the Snares Islands. His extensive collection of polychaete worms, reprints and monographs have been donated to NIWA and he has collaborated with Dr Glasby to complete some of his previous research.

Dr John Warham is continuing with his research work on petrels and a provisional bibliography of the Procellariiformes is now available (>14000 citations) on the Internet at: http://www.zool.canterbury.ac.nz/jwibpl.htm

Student research

(C) = Centre of Excellence (Aquaculture and Marine Ecology) students.

PhD Students

Julie Anstiss: Venous control in "primitive Fish"

Suzie Black: Factors affecting the survival of excised muscle in phylogenetically diverse marine species.

Annette Brockerhoff: Mating strategies of NZ grapsid crabs

Maxine Bryant: Growth regulating genes in abalone.

Jo Davis: (C) Zooplankton grazing interactions around mussel farms.

Steve Fox: (C) Collaborative project on mussel stocks (with Sealord Shellfish Ltd).

Howard Lees: A demographic study of *Ecklonia radiata* in southern New Zealand kelp forests and interactions with associated species.

Shaun Ogilvie: Hydrodynamics around mussel farms.

John Pirker: Demography, production of biomass, and effects of harvesting giant kelp

(*Macrocystis pyrifera* Linn) in southern New Zealand.

Ragg Norman: Circulatory physiology of the black-foot abalone *Haliotis iris*

Jeffrey Ren: (C) Dynamic Energy Budgets of Oysters (*Crassostrea gigas*).

Deepani Seneviratna: Ontogeny of osmoregulation in the eggs of intertidal crabs.

Dave Taylor: (C) Biodiversity and species interactions on rocky intertidal shores.

MSc/BSc Students

Vicki Allan: Feeding dynamics and the use of tactile stimulants in the culture of *Haliotis iris*

Laura Boren: Impacts of land and sea based tourism on New Zealand fur seals at Kaikoura and Tonga Island.

Courtney Day: Ecology of the shrimp *Palaemon affinis*.

Liz Dowling: Supralittoral amphipods as biological indicators of sediment contamination

Heather Flint: Isolation of an insulin-growth factor from paua.

Eden Hannam: The growth and age structure of *Petrolisthes elongatus*

Salim Ismail: Invertebrates as biological indicators for *Campylobacter spp*. in recreational water supplies.

Kate Lefever: Patterns of oxygen uptake by juvenile rock lobsters.

David Just: Exercise and lactate dynamics in fish.

Tanya Mans: X-cell disease in Antarctic fish.

Megan Oliver: (C) Growth studies on NZ lobsters.

Bren Patrick: Influence of exposure levels on predation rates in the intertidal

Georgia- Rose Travis: Effects of algal mats on estuarine benthos.

Successful completion of PhD degrees

Alan Duckworth: (C) Sponge aquaculture for bioactive compounds.

Michael Hickford: Larval fish distributions with respect to hydrographic features along the central eastern South Island coast.

Successful completion of B.Sc./M.Sc. degrees

Simon Coubrough: (C) Feeding biology of juvenile NZ turbot, *Collostium nudipinnus* – a potential aquaculture species.

Sharon Kingsbury: The population dynamics, activity and feeding ecology of a cirolanid isopod *Natatolana rossi*

Michelle Pritchard: The effect of temperature on the respiratory function of the rock lobster *Jasus edwarsi,* in air and water.

Madeline Ware: Post-prandial nitrogen excretion and respiration in Antarctic fish.

Carol Wong: Ecotoxicology of estuarine amphipod *Paracorophium excavatum.*

UNIVERSITY OF OTAGO

DEPARTMENT OF BOTANY

The research interests of **Dr Catriona L. Hurd,** lecturer in Marine Botany include: Seaweed nutrient ecophysiology, hydrodynamics and bio-mechanics, limitation and disruptive stress in intertidal seaweeds, seaweed-animal nutritional interactions. Ongoing, Marsden-funded research on 'Interactions between large kelps and waves' is in collaboration with Dr. Craig Stevens, NIWA.

Research Students

PhD Students

Norhadi Ismail: Norhadi has completed his PhD research on the ecology of the seagrass

Zostera novazelandica at Harwood, Otago Harbour. The aims of this study were to (1) map the aerial extent and dynamics of the eelgrass beds using image processing techniques from remotely sensed data, (2) understand biological and ecological aspects of eelgrass as a baseline reference for its future management strategies and (3) to experimentally determine the important environmental factors such as light, temperature and nutrients that affect the seasonality of the eelgrass vegetation.

Julia Phillips has completed her laboratory and field investigation into the nutritional ecophysiology of intertidal seaweeds. She has shown that seaweeds growing at different vertical positions on the seashore have different strategies for obtaining nutrients (nitrate, ammonium and urea), and these strategies vary seasonally. Julia is currently writing up her PhD thesis.

Sheryl Miller: Factors controlling seasonal primary production of the kelp *Ecklonia radiata* Doubtful Sound, Fjordland.

Svenja Heesch's thesis focuses on endophytic phaeophyceae, microscopic brown algae, which live inside the tissue of other algae and can cause diseases in their hosts. Of particular interest is the ecology, ultrastructure and molecular systematics of endophytes of New Zealand kelps, such as *Macrocystis pyrifera* and *Durvillaea antarctica*. *D. antarctica* is host to the only known parasitic brown alga worldwide, *Herpodiscus durvillaeae*.

Lisa Russell is studying for her PhD on the phylogeny of the red seaweed *Pachymenia* in New Zealand. Lisa is using a combination of ecological, biochemical and molecular techniques to determine the phylogenetic relations of this little-studied NZ alga. The project is in collaboration with Drs. Wendy Nelson, Judy Broom and Ruth Falshaw.

Abi Loughnan is 2-years into her PhD study of how the nutrient status of the intertidal red alga *Stictosiphonia arbuscula* influences it's ability to prevent and/or repair damage to the cell membranes following desiccation stress.

Christopher Hepburn is studying the effects of bryozoan colonisation on seasonal growth rates and the nitrogen status of *Macrocystis pyrifera* in Otago Harbour.

Deane Harder is 1-year into his PhD study of on the physiological bases for biomechanical adaptations of the kelp *Durvillaea antarctica*.

MSc Students

Kate Neill. Kate is collaborating with Drs. Wendy Nelson and Ruth Falshaw to examine the seasonal population ecology of the commercially valuable red seaweed *Gigartina circumcincta*.

ENVIRONMENTAL SCIENCE

Dr Liz Slooten is the Director of Environmental Science. With her students, she is involved in several projects working on the effects of fishing and tourism on whales and dolphins, population viability analyses for marine mammals, and development of policies and education programs for managing human impacts on the marine environment.

Dr Slooten continues her research on the environmental effects of fishing, in particular marine mammal bycatch, using population models and risk analyses to assess the risk of population decline. She collaborates with staff and students from the Departments of Zoology and Marine Science on fieldwork to gather the biological data needed to build these models. This involves estimating survival and reproductive rates from photographically identified individuals and carrying out population surveys. For the last three years she has participated in boat surveys for Hector's dolphins, using a line-transect survey design.

Since 1992, Dr Slooten has represented New Zealand on the Scientific Committee of the International Whaling Commission. Her own research includes work on the distribution, abundance and population structure of sperm whales off Kaikoura, in collaboration with staff and students from the Departments of Marine Science and Zoology.

MSc students:

S. Childerhouse: Effects of fisheries bycatch on the viability of New Zealand sea lion populations

F. Koon: Changes to the growth and distribution of blue cod caused by dredging its habitat

L. Lariviere: Relationship between environmental conditions and sperm whale distribution and abundance off Kaikoura

E. Martinez: Effects of tourism on Hector's dolphins

PhD students:

D. Clement: Relationship between environmental conditions and Hector's dolphin distribution and abundance

D. Lusseau: Effects of tourism on bottlenose dolphins in Fiordland

C. Richter: Effects of whale watching on sperm whales at Kaikoura

A. Samaranayaka: Population modelling of Hooker's sea lions

E. Secchi: Population biology of Hector's dolphin in Buller Bay (West Coast, South Island)

DEPARTMENT OF MARINE SCIENCE

Dr Mike Barker's research interests concern the general biology of echinoderms, reproductive ecology of marine invertebrates and the relationship between nutrition and growth in abalone and sea urchins. Current research projects are centred on the sea urchin *Evechinus chloroticus*:

1. the utilisation of nutrients and the relationship between diet and gonad quality
2. the role of carotenoid pigments in enhancing larval survival of UVB radiation
3. mass larval rearing and reseeding of urchin populations;
4. understanding the process of biomineralisation in the formation of the endoskeleton.

Dr **Steve Dawson's** research focuses on the ecology, conservation biology and bioacoustics of marine mammals:

1. Ecology and conservation biology of Hector's Dolphin (with Dr Liz Slooten, Sam DuFresne).
2. Survey designs and abundance estimation of inshore dolphins and porpoises (with Dr Liz Slooten, Sam DuFresne, Dr David Fletcher, Deanna Clement).
3. Population structure, distribution and abundance, and acoustic behaviour of sperm whales at Kaikoura (with Dr Liz Slooten, Dr Nathalie Jaquet, Christoph Richter, Quin Rhinelander, Lesley Douglas).
4. Ecology, behaviour and bioacoustics of bottlenose dolphins in Fiordland (with Patti Haase, David Lusseau, Dr Karsten Schneider, Dave Rundgren).
5. Reproductive biology, population biology and diet of New Zealand sealions and fur seals (with Helen McConnell, Gail Dickie, James Holborow, Nathan McNally and Dr Chris Lalas).

Dr **Mark Gibbs** joined the department in 1998. His general research interests are focused on biologically important coastal oceanographic processes. In particular, modelling physical and biological coastal oceanographic processes in order to determine ecosystem functioning and the impacts of anthropgenic changes to coastal marine environments. Other interests include determining relationships between the physical structure of the marine environment and demographics of marine mammal populations.

Dr Nathalie Jacquet is a postdoctoral fellow and has been working with Dr Steve Dawson and Dr Liz Slooten's group studying sperm whales at Kaikoura. The principal research focus is on quantifying the impact of whale-watch tourism, while maintaining the group's long-term interest in patterns of occurrence

and residence, population structure and acoustic behaviour. Nathalie has also been working in the Gulf of California, helping start a research programme of sperm whales there.

Dr **Jake Keogh** continues as a part time research fellow in marine science. In the past year he has been primarily involved with various stock enhancement initiatives undertaken by the Bluff Oyster Management Company Limited. Jake also carried out various other consultancies during the year and assists with the supervision of several research students.

Professor **Philip Mladenov** and his postgraduate students are working on various aspects of paua aquaculture including cryopreservation of gametes (with PhD student Serean Adams and collaborators from the Wellcome Institute, Cawthron, AgResearch and Abalone South); neurohormonal regulation of reproduction and spawning (with PhD student Jahangir Kabir, who is supported by GRIF and Abalone South Limited); factors causing heterogeneous growth in captive populations (with MSc student Callum Lilley, Dr Steve Wing from Marine Science, and Abalone South Limited); and the role of photoperiod on abalone reproduction. He is also involved in research on the neurohormonal control of reproduction in Greenshelled mussels (with PhD student Sultan Mahmud and collaborators from Cawthron). A PhD student (David Tung) and a MSc student (Stephanie Thompson) are working with Philip on various topics dealing with the ecology, reproduction and culture of seahorses. Philip continues to work on a variety of projects in echinoderm biology.

Dr **Keith Probert** has continued research in benthic ecology, including collaborative studies with Scott Nodder, Chris Glasby and Don McKnight (NIWA) into benthic community structure and function across the Chatham Rise and the response of bathyal benthos to differences in quality and quantity of organic flux; studies with Malcolm Clark (NIWA) into seamount benthos of the New Zealand region and impact of trawling on seamount benthos; and work with Janet Grieve (NIWA) on ecosystem functioning of the Campbell Plateau. Studies in collaboration with research students have mainly concerned the biology and ecology of coastal species and habitats, effects of human disturbances and management of coastal resources. He spent most of 1999 on study leave at the University of Plymouth in the UK concentrating on writing.

Dr **Abigail Smith** continues her research into shelf carbonate sediments and bryozoan geochemistry, while teaching and supervising students in various aspects of marine sedimentology. She has just completed a project on bryozoan growth rates in Doubtful Sound. Current projects include geochemistry of Otago bryozoans, carbonate sediment production on the Otago shelf, and molluscan mineralogical patterns. Students working with Dr Smith are working on mineralogy of molluscs, production rate of *Halimeda* in Fiji, sediment facies of Bluff Harbour, and bryozoan thickets of the Otago mid-shelf.

Dr **Brian Stewart** has interests in echinoderm reproduction, behaviour and physiology, and fiord benthic ecosystems. He continues his interest in Antarctic marine biology and assists in the co-ordination of a course in Antarctic studies. Current research includes the anatomy of *Astrobrachion constrictum*, correlating ecosystem health with public health, physiology and life history of black and red corals in Fiordland and monitoring of long-term changes in the shallow rock wall assemblages of New Zealand fiords.

Dr **Ross Vennell** has been investigating estuarine circulation after his 1997 visit to the University of Wales at Bangor. He is also working on the vorticity dynamics in tidal jets as well as assisting Team New Zealand with the defense of the Americas Cup.

Dr. **Stephen Wing's** research focuses on the population biology of marine invertebrates and fishes. In particular the physical oceanographic processes that control larval dispersal and benthic productivity resulting in spatial structure of marine populations. Current research in New Zealand includes:

1. A metapopulation model of *Evechinus chloroticus* in Doubtful Sound.

2. Population genetics of invertebrates and hydrographics of Fiordland.
3. Population biology of *Haliotis iris* and kelp forest ecology on Stewart Island.
4. Conservation and management of coastal resources in Fiordland and Stewart Island.

Deirdre Kennedy continues in her administrative role with **Leslie McAuley** providing secretarial support. **Daryl Coup** continues to provide computer and technical support to the Department, both on the main campus and at the Portobello Marine Laboratory.

Portobello Marine Laboratory

Bev Dickson, Laboratory Manager, supervises the day to day running of the marine laboratory. **Libby Friel** provides full time secretarial/administrative support and an after-hours presence. **Bill Dickson** co-ordinates local field activities and carries out grounds maintenance. **Clive Heseltine**, Workshop Technician, undertakes seawater system maintenance and construction of equipment. **Evan Hunt**, Laboratory Technician, assists in the operation of the communal laboratories.

Visitors to the Portobello Marine Laboratory in 1999 were: **Mattias Skold** (starfish and sea urchin genetics), University Goteborg, 5-413 90 Gotegorg, Sweden. **George Jackson** (Fisheries Biologist), James Cook University, Queensland, Australia. **Glen Hyndes** (Fish ecologist), Murdoch University, Perth, Western Australia. **Kim Mouritsen** (benthic animals (amphipods, gastropods, bivalves from intertidal flats), Department of Marine Ecology, University of Aarhus, Denmark

RV Munida

Chris Spiers, the vessel Master and **Keith Murphy**, crewperson, continue to operate the *R V Munida*. Over the past few years, *R.V Munida's* hours at sea have nearly doubled. More oceanographic equipment has been installed making for a very sophisticated vessel. The area of most voyages continues to be in local waters undertaking regular student research programmes. There are, however, increasing requests for work outside Otago waters and sometimes the *R.V Munida* is stretched to accommodate these needs. The future demand for its services needs careful consideration including the possibility of a new research vessel.

Public Education Programme

The University of Otago's New Zealand Marine Studies Centre under the leadership of **Sally Carson** rolls back the tide to introduce the secrets of the Southern Ocean to the general public, schools and special interest groups. Peek inside a shark egg, shake hands with an octopus or try a little seaweed with your morning tea.

The Centre offers a variety of services:

1. Programmes for schools, universities, professionals and special interest groups
2. Public Aquarium and holiday programmes
3. Teacher training programmes, and
4. The development of activity guides and resource material for schools and the general public.

This marine education facility has a seminar room (60 people), a multipurpose room with full kitchen and outdoor terrace, interpretive displays and a large circular display tank featuring marine life of southern New Zealand. The Westpac Trust Aquarium is also part of the Centre. The Centre is an idea venue for short courses, workshops and small conferences.

PhD Students

Serean Adams: Cryopreservation of New Zealand abalone, *Haliotis iris* and *Haliotis australis*, gametes, embryos and larvae.

Othman Bojo: Studies on New Zealand nanoplankton.

Paul Brewin: Ecology of benthic communities in the deep basins of New Zealand fiords.

Glen Carbines: The population ecology and reproductive biology of blue cod *Parapercis colias*.

Simon Childerhouse: Population biology of New Zealand sealion *Phocarctos hookeri*.

Vanessa Craig: Life history characteristics of five tropical gobiids (*Teleostei: Gobiidae*).

Manel Dias-Wanigasekera: Growth, survival and protein turnover in *Jasus edwardsii* in response to nutritional regimes.

Darrin Drumm: Impact of subsistence harvesting of reef flat organisms on marine community structure of Rarotonga, Cook Islands.

Blair Gray: Characterisation of the ultrastructure and optical properties of *Haliotis iris* shell and pearls and the development of a suitable classification and grading system for marketing pearls.

Nicole Goebel: Factors controlling primary production in Doubtful Sound.

Oliver Gussmann: Oceanography and sedimentology of a tropical lagoon, southeast Viti Levu, Fiji.

Craig Irwin: Effects of commercial harvesting on a population of *Chione stutchburyi*.

Norhardi Ismail: Ecology of seagrass, *Zostera novaezelandica* in Otago Harbour.

Weimin Jiang: Blue cod fisheries biology.

N. M. Jahangir Kabir: Improved paua breeding for aquaculture.

Georgina Knapp: Roe enhancement and the role of carotenoids in the sea urchin *Evechinus chloroticus.*

Sultan Mahmud: Factors regulating reproduction in green-shelled mussel, *Perna canaliculus*.

Jean McKinnon: Aspects of the population biology of the southern Arrow Squid, *Nototodarus sloanii*..

Sheryl Miller: Ecophysiology of *Ecklonia radiata* in Doubtful Sound.

Dejereanne Ostrow: Genetic variation of the brachiopods in the New Zealand fiords.

Cecile Perrin: Genetic differentiation of the sea urchin *Evechinus chloroticus* to test a hydrographic model of New Zealand's fiords that predict their identity to act as barriers to the dispersal of marine organisms.

Christop Richter: Impact of whale watching on sperm whales off Kaikoura.

Rodney Roberts: Factors controlling larval settlement and post-larval survival/growth of New Zealand abalone.

Dwi Eny Djoko Setyono: Reproductive biology and seed production techniques for the tropical abalone (*Haliotis asinina*) in Maluku waters, Indonesia.

Renate Spooner: Molecular evolution of the cosmopolitan brittle star, *Amphipholis squamata*.

Peter Stratford: Reproduction and growth of red coral *Errina novaezelandiae* from Fiordland, New Zealand.

David Tung: The aquaculture of New Zealand seahorse.

MSc Students

Peter Batson: Bryozoan communities on the Otago mid-shelf - patterns of distributions.

Michael (Hamish) Bowman: The physical oceanography of the Doubtful Sound sill: Fiord - Open ocean mixing dynamics.

Paul Buisson: Enhancement of gonad quality in the New Zealand sea urchin *Evechinus chloroticus* fed combinations of artificial and natural feeds.

Michael Bunckenburg: Reproductive biology of the sand dollar, *Fellaster.*

Blair Davoren: Development of nutrition requirements of juvenile blackfoot abalone (*Haliotis iris*).

Gail Dickie: (completed) Population dynamics of New Zealand fur seals and sea lions, and assessment of the impacts of incidental catch in fisheries.

Sarah Donald: Taphony of Otago shelf molluscs.

Lesley Douglas: Acoustic cencusing and behaviour of sperm whales, *Physeter macrocephalus*, at Kaikoura.

Samuel Dufresne: (completed) Abundance estimation of Hectors dolphin.

Samuel Eccles: Cadmium removal in dredge oysters.

Jason Fell: Field experiments on enhancing gonads of the sea urchin *Evechinus chloroticus*, in the Marlborough Sounds, New Zealand, using artificial and macroalgae species.

Hamish Forrester: Quality assessment for paua: Improvement in storage techniques.

Thomas Franklin: Use of underwater visual census for the qualitative observation of reef associated fishes in Otago.

James Fyfe: Population biology and dynamics of *Macrocystis pyrifera* kelp beds on wave exposed offshore reefs in Otago.

Bruce Gabites: Sediments and hydrodynamics of Bluff Harbour.

Wiebke Finkler: The impact of whale watching on tourists.

Patricia Haase: Social behaviour of bottlenose dolphins in Doubtful Sound, Fiordland.

Tarius Haggood: Methodology for Marine Science education in indiginious cultures.

Victoria (Kate) Hamilton: Stable isotope paleothermometry in New Zealand paua *Haliotis iris*.

Rachel Haydon: Diver impacts on benthic species composition, Doubtful Sound, Fiordland, New Zealand.

Alexandra (Jessica) Hjerpe: Interactions between paua and kina around Stewart Island.

James Holborow: The diet of NZ fur seals in Southern New Zealand.

Grant Hopkins: Interactions between large kelps and waves: a study of the reproductive cycle and growth rates of the horse mussel, *Atrina zelandica* in Doubtful Sound, Fiordland, New Zealand.

Takanori Kai: Reproductive and larval biology of black coral, *Antipathes fiordensis*.

Ralf Kellmann: Bacteria as the source of paralytic shellfish toxins in New Zealand surf clams.

Jolene Key: Growth and condition of Greenshell Mussels (*Perna canaliculis*) in Big Glory Bay, Stewart Island: Relationships to environmental parameters.

Laszlo Kiss: Feeding ecology of black coral, *Antipathus fiordensis* and description of a new species copepod (*Poecilostomatorida: Thamnomolgidal*) pararitic on the black coral.

Benjamin Knight: Coupled physical/ biological model at Thompson Sound.

Louise Kregting: The bathymetric distribution of black coral in Doubtful Sound.

Callum Lilley: Growth heterogeneity in *Haliotis iris*: The effect of size grading, stocking, density and food availability on abalone growth rates.

Helen McConnell: Population dynamics of New Zealand sea lions at the Catlins and Stewart Island.

Nathan McNally: Population dynamics of the New Zealand sea lion of South Otago, the Snares and Campbell Island.

Craig McVie: The ecophysiology of *Enteromorpha intestinalis* and *Bachelotia antillarum* in Waikouaiti Estuary, New Zealand.

Sonja Miller: (completed) An investigation into the viability of a tuatua, *Paphies donacina* fishery off the Otago coast.

Simon Muncaster: Formulation of an artificial diet for greenbone.

Nicholas Naysmith: (completed) Role of photoperiod in conditioning of the New

Zealand abalone *Haliotis Iris* and *Haliotis australis*.

Kathryn Neill: Reproductive phenology of the red seaweed *Gigartina lanceat*a: Population density, growth and chemistry in Otago, New Zealand.

Claire Nesus: Water quality for abalone growth and survival

Lisa Pagano: Macrobenthic community patterns and taxonomic resolution in Waikouaiti River Estuary.

Helen Palmer: Monitoring changing Pacific Oyster conditon: correlations with environmental variables.

Marcus (Quin) Rhinelander: Inter-pulse intervals: Acoustic measurement of sperm whale length.

Oliver Rudd: Intertidal rocky shore community organisations in the South Island, New Zealand.

Armagan Sabetian: Population dynamics of groupers in the Solomon Islands.

Nigel Sidwell: (completed) Seasonal aspects to the diet of Toheroa, *Paphies ventricosa*.

Debbie Steel: (completed) Population genetics of *Astrobrachion constrictum* in Fiordland, New Zealand.

Russell Stock: (completed) Brooding and larval biology of the Bluff oyster, *Tiostrea chilensis*.

Stephanie Thompson: Optimal diet for seahorse fly.

Keryn Webb: The diving behaviour of pre-weaned New Zealand fur seal pups, *Arctocephalus forsteri,* Otago Peninsula, New Zealand.

THE POLAR MARINE PHYSICS AND MODELLING GROUP

The Polar Marine Physics and Modelling Group at Otago University continues to work in three major areas of activity: the first two, supported by the Marsden Fund, involve the development of theory; while the third, which includes experiments in the Southern Ocean and from shore fast sea ice in McMurdo Sound, Antarctica, is funded through the PGSF.

Theoretical work has led to the development of a second-generation model for ocean wave energy transport in marginal ice zones using the coherent potential approximation. This powerful method allows a random distribution of ice floes to be incorporated; a significant advance on current models. A paper reporting a two-dimensional version of the model is currently being finalized for submission to the **Journal of Geophysical Research**; a three-dimensional model is the next goal. Another study applies ideas from granular flow theory to modelling how ice floes interact in fields of pack ice, while including waves, currents and winds as the driving factors.

Last year's experimental ship work aboard the Nathaniel B Palmer icebreaker produced two papers. There we tracked ice floes using GPS, while simultaneously measuring vertical and horizontal accelerations and rotation. A paper has also been prepared on the optical properties of sea ice, supported by data collected at the same time. The experiment planned for year 2000 with Australian collaboration was postponed.

The oceanographic conditions present during the formation of platelet ice are being measured at various times throughout the growth cycle of the sea ice cover in McMurdo Sound, Antarctica. In addition a number of investigations of the physical and mechanical properties of sea ice are being undertaken.

Staff involved are:

Department of Mathematics and Statistics

- Professor Vernon A Squire
- Dr Tony Dixon, Postdoctoral fellow
- Mr Josh Downer, PhD student

Department of Physics

- Dr Patricia Langhorne
- Ms Inga Smith, PhD student

- Mr Paul Bond, PhD student
- Mr Martin Gribble, PhD student

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UNIVERSITY OF WAIKATO

DEPARTMENT OF CHEMISTRY

Current Projects:

Projects all involve investigation of marine invertebrates (predominantly bryozoans) for biologically active and/or novel compounds. This involves isolation of the active compounds by various forms of chromatgraphy and structural elucidation, which predominantly employs nuclear magnetic resonance (NMR) spectroscopy. All projects are supervised by Dr Michèle Prinsep, Senior Lecturer in Chemistry.

Students:

Biao Yao (M.Sc.)

Jamie Hollands (M.Sc.)

Rita Patel (M.Sc.)

Mukesh Deo (undergraduate)

VICTORIA UNIVERSITY OF WELLINGTON

SCHOOL OF BIOLOGICAL SCIENCES

A Tragic Loss to Marine Science

We are profoundly sorry to report that **Dr Peter Castle**, D.Sc., for whom retirement tributes were published in the last newsletter, passed away close to Christmas 1999. Few of us need reminding of his great contribution to Marine Science in New Zealand and worldwide on the subject of eels and eel biology. His "detective"investigations into the trans-oceanic migrations of eel leptocephali are legendary. He will be sadly missed.

Staff Research

Jonathan Gardner continues his research on shellfish genetics and ecophysiology, as well as on the proposed Marine Reserve for Wellington's south coast. Jonathan and Bob Wear have recently published the first paper from their research in Wellington Harbour which set out to determine the extent of faunal mortality following the naturally occurring toxic algal bloom of early 1998. Completed research includes the molecular identification of the smooth shelled blue mussel Mytilus galloprovincialis as an invader into Pearl Harbour, Hawaii (in conjunction with Smita Apte, VUW, and colleagues at the Bishop Museum and the University of Hawaii).

Margaret Gordon has completed her collaborative research project with Karen Tutt, Dr Valerie Vreeland (UC Berkeley) and Dr Anya Waite (UWA), and with Karen Tutt on the nature of compounds and reactions involved in diatom aggregation and adhesion to substrates. She is currently finishing some similar research on zygotes of brown algae with Dr Vreeland. Dr Gordon and M.Sc student Catherine Seamer attended the 9th International Conference on Harmful Algal Blooms (HAB 2000) in Hobart, 7-11 February 2000. They presented a poster entitled "The production of yessotoxin by Protoceratium reticulatum". With Ph.D. student Susan Fraser, Margaret attended the Macroalgal Workshop at IRL, Lower Hutt on 24 February, at which Susan presented a paper entitled "Sporulation of Gigartina circumcincta".

Bob Wear continues to be involved with ecological aspects of various Wellington Harbour dredging and sediment disposal programmes, beach refurbishment, pipeline laying proposals and the like. In particular, his research effort has been concentrated on quantifying the first year of recovery of the Wellington Harbour basin benthos following mass mortalities resulting from the major Gymnodinium sp bloom of February-March, 1998 in conjunction with Jonathan Gardner.

Another major task has been that of quantifying the biological effects of surplus river shingle disposal over a silty substrate in the Wellington Harbour basin, including changes in biodiversity indices from baseline levels resulting from increased substrate heterogeneity. Bob and Jonathan have completed their their 3 year programme of monitoring the slow but steady advance of Undaria pinnatifida along the Wellington south coast.

John Wells continues to work on the large collection of undescribed species of harpacticoid copepods from New Zealand intertidal sediments built up together with Geoff Hicks over many years, and on the production of a new set of identification keys to the world fauna of these animals.

Marine Laboratory

Research activity at the Island Bay marine laboratory continues to be focused around various aspects of the ecology of Wellington's south coast and Wellington Harbour.

Research vessel

The Raukawa Challenger is now maintained at the marine laboratory. The skipper, Robert Williamson, is kept very busy by constant use of the vessel in a number of different research projects including benthic studies of Wellington Harbour, water column sampling of the harbour and the south coast, sampling to determine the effects of storm drain effluent upon the biota of the harbour, and marine reserve monitoring on the south coast and at Kapiti Island.

Ph.D. Students

Smita Apte's Ph.D. thesis is due for submission. Smita has carried out an extensive allozyme survey of population genetic variation in the endemic New Zealand greenshell mussel (Perna canaliculus) which has been complemented by an examination of mitochondrial DNA polymorphisms. These data will be used to address questions of genetic structuring in this species.

Lesley Bolton-Ritchie continues her Ph.D. research, which looks at the ecological impact of storm drain run off upon the biota of Wellington Harbour. A multi disciplinary approach is being used in this study, incorporating ecology, geochemistry and sedimentology in an attempt to determine the degree of impact storm water has upon the local biota and to identify key indicator species for further studies.

Susan Fraser continues her research on the phenology, life history, growth and development of selected New Zealand species of the red seaweed genus Gigartina circumcincta.

Jeremy Helson continues his Ph.D. research which looks at a number of different factors including spat supply, larval settlement success, water column dynamics, and food availability as possible explanations for why mussels are largely absent from Wellington's south coast.

Kerstin Kröger continues her Ph.D. research focusing on the benthic recolonisation and successions in Wellington Harbour following the toxic algal bloom event of March/April 1998.

Anjali Pande continues her Ph.D. research that looks at the established Kapiti Island marine reserve and at the proposed Taputeranga Marine Reserve on Wellington's south coast. This work focuses on key algal, invertebrate and fish species to determine if reservation status is having a detectable effect upon sizes and numbers of these key organisms.

Susie Wood has started her Ph.D. research work on ecotoxicological aspects of Cyanobacteria from Australia and New Zealand.

M.Sc. Students

Kirsty Dickson continues her study on the distribution, abundance and species composition of bivalves living in a wide range of sediment types in Wellington Harbour.

Crispin Keith has submitted his thesis on larval fishes on the Wellington south coast.

Hayley Lynch's M.Sc. research focuses on genetic variation in seven New Zealand mytilid mussels using analyses of allozymes and mitochondrial DNA sequences. This research will be completed during 2000.

Martin Rea has completed his histological studies on changes in the nature and cell structure of the hepatopancreas in phyllosoma larvae of the rock lobsters Jasus edwardsii and J verreauxi.

Catherine Seamer is continuing her research on the effect of environmental variables on the production of yessotoxin by the dinoflagellate Protoceratium reticulatum.

Jonty Tetley continues to analyse NIWA records of benthic biota collected over the years within the New Zealand EEZ. He is identifying areas of differing species richness and mapping these in relation to location, latitude, depth and sediment type.

M. Con. Sci.

Sheree Christian continues her thesis comparing growth and colonisation of Undaria pinnatifida along the Wellington south coast with two rather more sheltered localities within Wellington Harbour.

B. Sc. Hons.

Kathryn Botherway has conducted a short-term study of the ecological effects of storm water on soft substrate infauna in Porirua Inlet.

Recent Publications

Refereed Journals, Papers, Conference Proceedings, Books and Monographs

CAWTHRON INSTITUTE

CHANG, F.H., GARTHWAITE, I., ANDERSON, D.M., TOWERS, N., STEWART, R. & MACKENZIE, L. (1999). Immunofluoresent detection of a PSP-producing dinoflagellate, *Alexandrium minutum* from the Bay of Plenty, New Zealand. *New Zealand Journal of Marine and Freshwater Research* **33**:533-543.

CHO, E.S., RHODES, L.L. AND KIM, H.G. (1999). The comparison of two strains of *Fibrocapsa japonica* (Raphidophyceae) in New Zealand and Japan. *Journal of Fisheries Science and Technology* **2(1)**:58-65.

CHO, E.S.; RHODES, L.L.; KIM, H.G. (1999). The morphological and growth characteristics of two strains of *Fibrocapsa japonica* isolated from New Zealand and Japan. *Journal of Fisheries Science and Technology* **2(1)**:17-24.

CHO, E.S., PARK, J.G., KIM, H.G., KIM, C.H., RHODES, L.L. AND CHUNG, C.S. (1999). The rapid differentiation of toxic *Alexandrium* and *Pseudo-nitzschia* species using fluorescent lectin probes. *Journal of the Korean Society of Oceanography* **34(3)**: 167-171.

HARDING, J.S., YOUNG, R.G., HAYES, J.W., SHEARER, K.A. AND STARK, J.D. (1999). Changes in agricultural intensity and river health along a river continuum. *Freshwater Biology* **42**:345-357.

HAY, C. AND TAYLOR, M. (1999). Biosecurity in ports: pros and cons of an "insurance assessment" approach. *In* Hillman, S.P (ed). The Ballast Water Problem – Where to from here? Proceedings of a workshop held 5-6 May 1999, Brisbane Australia. *EcoPorts Monograph Series* **19**. 207p.

JEFFS, A.G. (1999). The potential for developing controlled breeding in the Chilean oyster. *Aquaculture International* **7**:189-199.

MACKENZIE, L., SUZUKI, T. AND ADAMSON, J. (1999). DSP-toxin profiles in *Dinophysis acuta* and mussels from Wedge Point, Queen Charlotte Sound. *In* Proceedings of the Marine Biotoxin Science Workshop No 10. 21 May 1999. *MAF Food Assurance Authority publication*: 76-83.

MACKENZIE, L., SUZUKI, T. AND ADAMSON, J. (1999). Elimination and differential transformation of yessotoxin by the Greenshell mussels *Perna canaliculus* and the Blue mussel *Mytilus galloprovincialis.* *In* Proceedings of the Marine Biotoxin Science Workshop No 12. 19 November 1999. *MAF Food Assurance Authority publication*: 47-56.

MILES, C., WILKINS, A., STIRLING, D. AND MACKENZIE, L. (1999). A new analogue of gymnodimine. *In* Proceedings of the Marine Biotoxin Science Workshop No 10. 21 May 1999. *MAF Food Assurance Authority publication*: 104-106.

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