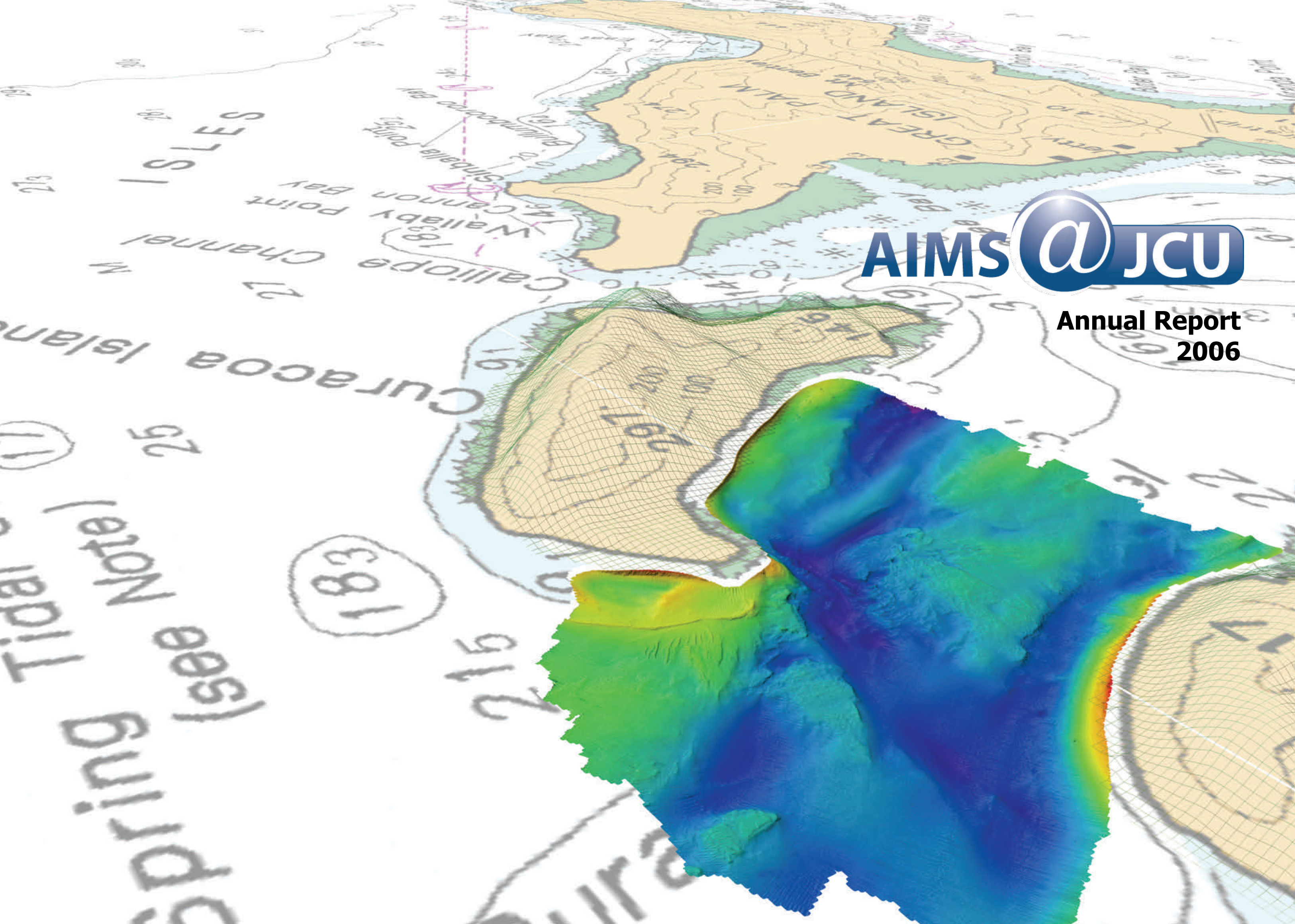
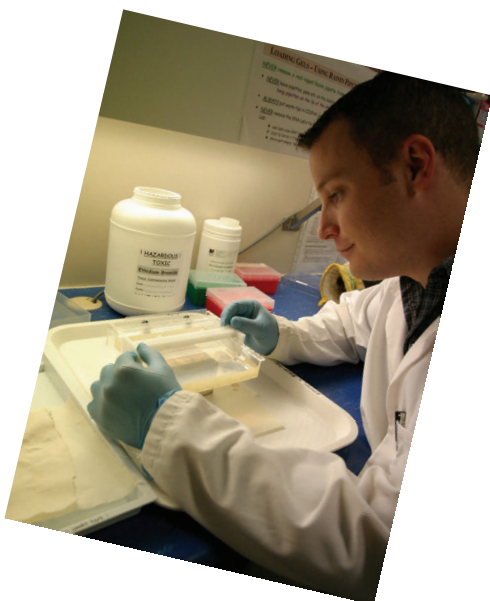




**Annual Report
2006**





This report covers the period from the signing of the *AIMS@JCU Joint Venture Agreement* on 17th June 2004, up until 30th June 2006.

Aim

The aim of the Joint Venture is to enhance the levels of collaboration between the Australian Institute of Marine Science and James Cook University and increase Townsville's, and consequently Australia's, profile as a world leader in tropical marine research and education.

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Photo credit - cover

Curacoa Channel (Palm Islands) 3D Overview
Dr Thomas Stieglitz
AIMS@JCU Postdoctoral Fellow

Photos credits - this page

Top: Neal Cantin
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Australian Government



AUSTRALIAN INSTITUTE
OF MARINE SCIENCE

AIMS@JCU is a joint venture between the Australian Institute of Marine Science and James Cook University with funding from the Australian Government.

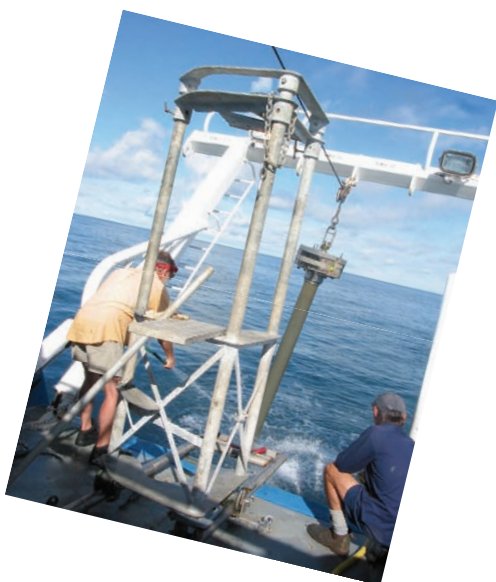


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AIMS@JCU Overview

Background

In 2003, an agreement was made between the Australian Institute of Marine Science and James Cook University to form an unincorporated Joint Venture, to be called AIMS@JCU.

The aim of the Joint Venture was to enhance the levels of collaboration between the Australian Institute of Marine Science and James Cook University and increase Townsville's, and consequently Australia's, profile as a world leader in tropical marine research and education.

Funds of \$3.9 million were allocated by the Federal Government for the set up of the Joint Venture.

On the 17th June 2004 a formal *AIMS@JCU Joint Venture Agreement* was signed by authorised representatives from each institution, Mr Peter Willers of AIMS and Professor Harry Hyland of JCU.

Objectives

The objectives of AIMS@JCU as set down in the *AIMS@JCU Joint Venture Agreement* are to:

- increase research activities by the Participants in the Program Fields;
- improve the Participants' individual research capabilities and the research outputs and outcomes of all Participants;
- improve research training opportunities for students;
- enhance the reputations of the Participants;
- maximise the Participants' capacity for collaboration on projects through, among other things, the sharing of research facilities, equipment and scientific personnel;
- enable the Participants to undertake activities collectively which they could not have undertaken individually;
- improve the operating position of the Participants in terms of research infrastructure and research income;
- create new areas of research expertise for the Participants, both individually and together;
- provide the Participants, their staff and students with reciprocal benefits regarding improved research training, intellectual stimuli, research diversification and access to new research income streams;
- contribute to the realisation of the Commonwealth Government's National Research Priorities, as established under its "Backing Australia's Ability" program and as amended from time to time;
- facilitate technology transfer of research outputs, including commercialisation and dissemination of national benefit research outputs to the wider community.

About the Joint Venture Partners

Both the Australian Institute of Marine Science and James Cook University are considered to be world leaders in marine science and the Joint Venture brings together the largest concentration of tropical marine scientists in the world.

Australian Institute of Marine Science

The Australian Institute of Marine Science (AIMS) is one of the most innovative and progressive research laboratories in the world with unparalleled capability in the field of cutting-edge tropical marine science and technology.

AIMS was established by the Australian Government in 1972 under the *Australian Institute of Marine Science Act 1972* in recognition of the importance of marine assets, especially the Great Barrier Reef, to Australia.

AIMS headquarters is located on a 170 hectare coastal site 50km from Townsville, in a scientific zone surrounded by National Park and Marine Reserve. Additional offices are located in Fremantle, Western Australia and Darwin, Northern Territory.

James Cook University

James Cook University is Australia's leading tropical research university. The University was proclaimed in Townsville on 20 April 1970 and is a multi-campus university with the main sites located in the vibrant tropical Queensland cities of Townsville and Cairns. Smaller sites are located in Mount Isa, Mackay and Thursday Island. JCU courses are also delivered in partnership with education providers in Sydney, and Melbourne. Offshore facilities and partnerships continue to grow. JCU offers courses in a broad range of study areas and has a strong research focus, particularly in matters relating to life in the tropics.

Chairperson's Report



The AIMS@JCU Joint Venture was an initiative of the then Federal Minister for Education and Science, Dr Brendan Nelson, with the full agreement of the two participating institutions, AIMS and JCU, and with Federal seed funding to support its initial establishment. The terms of the agreement were negotiated by a steering committee chaired by Mr Donald McDonald, and including Ms Elizabeth Nosworthy, Professor Bernard Moulden (the Vice-Chancellor of JCU), and Dr Steve Hall (the Director of AIMS at that time). They did a good job – the agreement they reached has so far served us well!

The Joint Venture agreement was signed in mid 2004. The Board appointed its chair and had its initial meeting later that year, and appointed its executive officer early in 2005, so AIMS@JCU has now been operational for almost two years. This is a good time to reflect on progress toward its goals, and what we might need to do differently in the future.

The Joint Venture agreement spelt out a range of objectives, summarised earlier in the “Overview” section of this report. The overall theme of these objectives might be characterised as “Better Science through collaboration”. North Queensland in general, and Townsville in particular, contain a large proportion of Australia’s tropical marine research effort – a research area of critical strategic value and importance. It is of obvious national benefit for the two key marine research institutions in the region to maximise the joint use of their human and material resources to achieve critical mass.

The joint venture set up three main program areas (‘Tropical Aquaculture’, ‘Coastal Processes and Modelling’, and ‘Stress in Tropical Marine Systems’) where clear collaborative potential could be identified. These are discussed in more detail in the body of this report, but in general, we wanted to see three general kinds of collaborative development in these programs:

- jointly developed infrastructure to support marine research,

- jointly supervised research students and post-doctoral appointments, using the facilities of both institutions,
- an increase in collaborative projects involving staff of both institutions.

This report demonstrates that those kinds of collaborative activity have indeed developed over the last two years. There are now more than 80 members of AIMS@JCU participating in one or more of its programs, including over 30 student members, and two collaboratively funded post-doctoral appointments. As a result, the number of students jointly supervised by staff of both institutions has substantially increased, allowing the expertise of AIMS staff to be used more extensively in training the next generation of marine researchers.

The AIMS@JCU seed funding allowed some critical infrastructure improvements, particularly in electronic communications, in aquaculture facilities, and in the ability to maintain and rear marine organisms in controlled environments. Those developments have certainly enhanced joint use of marine research facilities.

Increase in staff collaborative projects was initially slower to develop, but is now increasing, particularly in the coastal processes program and in aquaculture. Of particular note are the strong developments in sponge aquaculture and in the development of sensor networks. Both those project areas include extensive participation by student researchers as well as strong research leadership from both AIMS and JCU staff.

In coming years, we will focus more strongly on the outputs and outcomes of programs and projects, as well as continuing to encourage their initiation. But it is evident that the joint venture is indeed producing the kinds of improvement in collaborative use of research resources, research, and research training that its initiators hoped and expected.

The AIMS@JCU Board retained its original membership until late this year, when two of its members left the partner organisations: Mr Peter Willers (AIMS) retired, and Professor Ned Pankhurst (JCU) moved to Griffith University. As Chair, I would like to note my gratitude for the valuable contributions made by both members during the development of the joint venture.

Rhondda Jones
AIMS@JCU Chair

Executive Officer's Report



The AIMS@JCU Joint Venture was established to enhance capability in research in tropical marine science and brings together two world renowned research and educational institutions. The appointment of an Executive Officer and a Communications Officer in June 2005 has provided the management structure to deal with the day to day activity and enabled the Board to focus on the strategic direction of the Joint Venture.

The Board have approved three Research Programs to date, these include:

- Tropical Aquaculture
- Coastal Processes and Modelling
- Stress in Tropical Marine Systems

Each Program has been developed in consultation with the partners and enhances the capacity at both institutions through post-graduate projects and recently the collaborative investment in two post-doctoral positions.

There were seven PhD scholarships awarded in 2006, building on the five scholarships provided the previous year. The two post-doctoral positions were approved by the Board in May 2006 and represent a new level of collaboration by the partners. Each position is jointly funded, with one being based at JCU and the other at AIMS.

Operational funds were provided to four honours students who demonstrated the collaborative nature of their projects and these students have had access to infrastructure and supervision from both partner organisations.

The Joint Venture also provided support for students to travel to present a paper at a conference. Student members receiving travel grants included three students who attended a conference on sponges in Brazil, one student to Hawaii and one student to Adelaide.

Capital projects completed include:

A fibre-optic communication link between the AIMS and JCU facilities enabled access to the AARNET and provides video linkage for researchers at each site to connect through a virtual laboratory. The connection also enables the transfer of data from each of the partners to take advantage of the diverse skills at each organisation in data manipulation and the utilisation of statistical packages.

The Controlled Environment Facility at the Cape Cleveland site is a state of the art building, providing users access to environment controlled rooms with air conditioning, filtered ambient sea water, filtered heated or cooled sea water and fresh water reticulation. Both air and water temperatures can be regulated through automated controls and monitored remotely to ensure the required conditions are maintained. The facility provides a wide range of research capability and projects across each of the Research Programs are already scheduled to utilise the new building. Special mention must be made of the AIMS team who managed the project. Led by Alan Caldwell and Andrew Blair the team produced a world class facility on a limited budget and were quite ingenious in providing engineering and operational solutions.

The MARFU Aquashed was completed in February 2006 and provides researchers with 350 square metres of covered floor space in a safe working environment that is cooler and drier than the previous facility. The project has doubled the previously available space and upgrades to the power, water and waste water collection systems provide exceptional working conditions for the students. This process was managed by the JCU MARFU team and the result is a testament to their experience in providing solutions to meet a wide range of research projects by staff and students.

Brett Dinsdale
AIMS@JCU Executive Officer

Governance

AIMS@JCU is governed by a Board comprising five core members, including two members from each of the Joint Venture partners, JCU and AIMS, plus an independent Chair. Alternate Board members, one from each institution, substitute for absent Board members.

Board Member	Position	Joint Venture Partner Institution
Professor Rhondda Jones	Independent Chair	
Mr Peter Willers	General Manager	Australian Institute of Marine Science
Dr M. Julian Caley	Principal Research Scientist	Australian Institute of Marine Science
Professor Helene Marsh	Dean of Postgraduate Studies Professor of Environmental Science	James Cook University
Professor Ned Pankhurst	Executive Dean Faculty of Science, Engineering and Information Technology	James Cook University
Alternate Board Member		
Dr Chris Battershill	Research Group Leader Marine Biotechnology	Australian Institute of Marine Science
Professor Michael Kingsford	Head of School Marine Biology and Aquaculture	James Cook University

Role of the Board

The Board is responsible for the overall strategic management of AIMS@JCU and decisions concerning AIMS@JCU.

The functions of the Board include:

- determining the institutional equity of each Joint Venture partner with respect to the activities of AIMS@JCU
- appointing and managing the activities of the Executive Officer
- determining the Members of AIMS@JCU
- approving Research Programs (and Research Projects forming part of Programs)
- overseeing and authorising the expenditure of AIMS@JCU funds
- determining the location, management and ownership of assets and infrastructure
- setting the policy and strategic focus of AIMS@JCU
- approving business, operational and other plans for AIMS@JCU including budgets, policies and procedures

Board Accountability

The AIMS@JCU Board is bound by the terms and conditions set down in the "*AIMS@JCU Joint Venture Agreement*", dated 17th June 2004.

Board Meetings

Initially the AIMS@JCU Board met frequently in order to facilitate the start-up of the Joint Venture. The first Board meeting was held on the 14th July 2004, where an independent Chairperson was appointed. A further three meetings followed in 2004 and eight Board meetings were held in 2005. The Board resolved to meet quarterly from 2006 and generally, meeting locations alternate between JCU and AIMS.

Interaction with Management

The Chairperson has weekly briefings with the Executive Officer on all relevant aspects of the Joint Venture's activities and performance. Detailed verbal and written briefings on various issues are provided as necessary. Research Program Leaders provide written quarterly reports to the Executive Officer prior to a Board meeting which are then presented to the Board at its meeting.

Record of Board Meetings

The dates and locations of AIMS@JCU Board meetings held up to 30 June 2006:

Meeting No.	Date	Time	Location	Meeting Chaired by:
2/2006	23-May-06	1.30pm	JCU	Rhondda Jones
1/2006	28-Feb-06	2.00pm	AIMS	Rhondda Jones
8/2005	06-Dec-05	2.00pm	JCU	Rhondda Jones
7/2005	18-Oct-05	8.45am	AIMS	Rhondda Jones
6/2005	13-Sep-05	9.30am	JCU	Rhondda Jones
5/2005	28-Jul-05	10.30am	JCU	Rhondda Jones
4/2005	24-Jun-05	8.30am	JCU	Rhondda Jones
3/2005	24-May-05	3.30pm	JCU	Rhondda Jones
2/2005	05-Apr-05	11.30am	AIMS	Rhondda Jones
1/2005	15-Feb-05	8.45am	JCU	Rhondda Jones
5/2004	09-Dec-04	3.30pm	JCU	Rhondda Jones
4/2004	03-Nov-04	9.00am	JCU	Rhondda Jones
3/2004	22-Sep-04	1.00pm	AIMS	Rhondda Jones
2/2004	24-Aug-04	1.00pm	JCU	Rhondda Jones
1/2004	14-Jul-04	12.30pm	AIMS	Peter Willers



AIMS@JCU Board
Front Row (L-R): Prof. Ned Pankhurst, Prof. Rhondda Jones, Dr Julian Caley.
Back Row (L-R): Mr Brett Dinsdale, Prof. Helene Marsh, Mr Peter Willers.
Photo: T. Fielding.

AIMS@JCU Board Members

Professor Rhondda Jones



Rhondda Jones has extensive experience in research funding and research management issues as a result of serving on federal and state panels and boards, including as Director of the Sugar Research and Development Corporation, on Australian Research Council funding panels, and as a member of the Genetic Manipulation Advisory Committee. Born and educated in Western Australia, Professor Jones has worked at CSIRO (Entomology Division), University of Western Australia, University of British Columbia, University of California at Davis, James Cook University, and the University of Central Queensland, the latter two as Deputy Vice-Chancellor. She has a strong awareness of tropical marine issues and the value of marine research and was a member of the Great Barrier Reef Marine Park Authority between 1989 and 1998. She also has research experience and publications primarily in ecology and ecological modelling and is fellow of the Australian Academy of Technological Sciences and Engineering.

Email: rhondda.jones@bigpond.com

Professor Ned Pankhurst



Ned Pankhurst has worked in the tertiary education and research sector for 25 years, covering positions with the University of Alberta, New Zealand Fisheries Research, the University of Auckland, the University of Tasmania, and most recently James Cook University where he is currently Pro-Vice Chancellor Science, Engineering and IT. His research experience covers various areas of aquaculture, natural biology and physiology of fishes, and includes both temperate, and tropical reef species with research activity spanning the range from pure basic to highly applied industry-sponsored research. Management and leadership roles in addition to direction of the Faculty of SEIT and membership of the Senior Management Group at JCU, include past membership of CRC for Aquaculture and Aquafin CRC Management Advisory Committees, establishment Board of the Tasmanian Aquaculture and Fisheries Institute, JCU-CSIRO Tropical Landscapes Joint Venture Board, Board of ATFI (Australian Tropical Forest Institute) Pty. Inc., Australian Tropical Herbarium Board, QDPI&F-JCU Research MoU Management Steering Committee, and the AIMS Council.

Email: Ned.Pankhurst@jcu.edu.au

Mr Peter Willers



Peter Willers has been the General Manager at AIMS since 1993 and a member of the AIMS @ JCU Board since its inception. The General Manager is directly responsible for day to day running of the Institute and all technical, operational and corporate support within the Institute. It is an extremely broad role, covering Field and Ship Operations, Human Resources, Workshops, Building and Property, Library, and Information Technology. Support staff numbers are approximately 50, with additional 30 contractor staff to cover ships crews, catering, cleaning, security and building maintenance. The position has nine (9) direct reports and responsibility for an operating budget of \$13m. The General Manager is currently also responsible for the review of the Risk Management Profile and implementation of the Risk Policy; Development of the Business Continuity Plan, Staff Performance Management System and leading the development, specification and design of the Institute's latest 35m new research vessel.

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Dr M. Julian Caley



Julian Caley is a Principal Research Scientist with AIMS and currently leads the Biodiversity: Assessment and Trends research team. His marine research has ranged through population and community ecology, macroecology and evolutionary biology. This research has used many different model organisms depending on the question of interest, but most of his recent work has concentrated on the evolution and evolutionary ecology of reef fishes with an emerging interest in the evolution of coral symbiosis. In particular, his current research explores ecological and contemporary evolutionary processes that generate and maintain biodiversity. Julian received his Ph.D. from the University of Sydney in 1992 and has since held four prestigious research fellowships at the University of British Columbia and James Cook University. He has supervised many research students and has published numerous scientific papers. In addition to his responsibilities as a research leader at AIMS, he has been involved from the beginning in the establishment of the AIMS@JCU joint venture as a member of the Institutional Steering Committee and now as a Member of its Board. Julian is also a graduate of the Australian Institute of Company Directors.

Email: j.caley@aims.gov.au

Professor Helene Marsh



Helene Marsh is Dean of Graduate Research Studies and Professor of Environmental Science at JCU. The focus of her research has been dugong population ecology with an emphasis on life history, reproductive ecology, population dynamics, diet, distribution, abundance and movements. Helene has collaborated widely with colleagues in other disciplines including Anatomy, Anthropology, Botany, Biochemistry, Genetics, Geography, GIS, Law, Psychology, Sociology and Statistics. The policy outcomes of her research include significant contributions to the science base for the Dugong Sanctuary established in Torres Strait; dugong management in the Great Barrier Reef Marine Park, especially the Dugong Protected Areas and no-take areas to protect dugongs in various zoning plans; and the establishment of a Commonwealth Ministerial Taskforce to Investigate the Sustainability of Indigenous Hunting of Dugongs and Turtles. Her research has also provided the conceptual basis for the 'Back on Track' Program currently being conducted by the Queensland EPA. In 1998, Helene was awarded a Pew Charitable Trust Fellowship in Marine Conservation for dugong research. She has authored more than 200 scientific publications.

Email: Helene.Marsh@jcu.edu.au

AIMS@JCU Alternate Board Members

Professor Michael J. Kingsford



Michael Kingsford is currently Head of the School of Marine Biology and Aquaculture at James Cook University. The School is a recognised world leader in tropical marine studies. He is also coordinator of the Area of Research Strength, Marine Science at JCU, member of the International Advisory Committee of the Great Barrier Reef Research Foundation, Immediate Past President of the Australian Coral Reef Society and the former Director of One Tree Island Research Station in the southern Great Barrier Reef. He has published extensively on the ecology of reef fishes, jellyfishes and biological oceanography. His projects have encompassed a range of latitudes and include a well respected book on temperate marine environments. A major focus of his research has been on connectivity of reef fish populations and how the findings can assist managers of marine parks. In addition to research and leadership, he teaches undergraduate and postgraduate students and supervises many postgraduate students.

Email: Michael.Kingsford@jcu.edu.au

Dr Chris Battershill

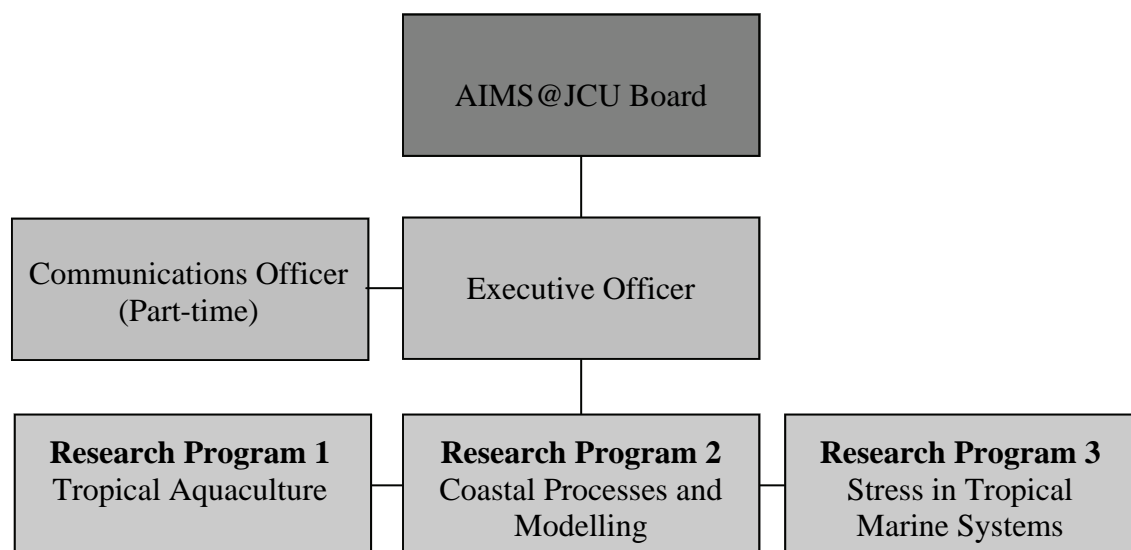


Chris Battershill has led the Marine Biotechnology Group at the Australian Institute of Marine Science for the past six years, having established a similar project in New Zealand over the previous nine years. The Group focuses on Tropical Aquaculture as well as Discovery and Development of new drug and industrial biocide leads from marine organisms. Chris has research experience throughout the South Pacific and in Antarctica. He specialises in marine chemical ecology, environmental toxicology and sponge taxonomy and has developed methods to enhance discovery and production of novel marine chemicals. Recent successes include development of aquaculture enterprise to produce anti-tumour active compounds and initiation of research to enhance chemotherapeutic specificity of biologically active natural compounds. Chris has contributed directly to the advance of almost one quarter of the marine natural products listed in late phase preclinical or clinical trial with the National Cancer Institute.

Email: c.battershill@aims.gov.au



Management Structure



Administrative Staff

AIMS@JCU is staffed by an Executive Officer and a part-time Communications Officer. The positions are employed through Joint Venture partner James Cook University with salaries and oncosts reimbursed to JCU from Joint Venture funds.

- The Executive Officer is Mr Brett Dinsdale, email: Brett.Dinsdale@jcu.edu.au
- The Communications Officer is Mrs Trisha Fielding, email: Trisha.Fielding@jcu.edu.au

Research Program Leaders

Co-leaders were appointed by the Board (one from each partner institution) to oversee the three Research Programs of AIMS@JCU. Program Leaders as at 30 June 2006 are listed below:

Research Program	Co-Leader
Tropical Aquaculture	Dr Chris Battershill, AIMS Associate Professor Paul Southgate, JCU
Coastal Processes and Modelling	Mr Craig Steinberg, AIMS Associate Professor Michael Ridd, JCU
Stress in Tropical Marine Systems	Dr Madeleine van Oppen, AIMS Dr Mark McCormick, JCU



Research Programs

Overview

AIMS@JCU has three core research programs, which were developed in consultation with the joint venture partners. The programs enhance the research capacity at both institutions through increased collaboration among research staff, and also through post-graduate projects.

Program 1: Tropical Aquaculture

Aquaculture is the fastest growing primary industry in Australia for the production of seafood and bio-products. The AIMS@JCU Tropical Aquaculture team has expertise in the established industry sectors (penaeid prawns, pearl oyster, finfish) and in emerging, developing aquaculture sectors (tropical rock lobsters, sponges, crabs, freshwater prawns and marine ornamentals). It also has strong research capabilities in the mitigation of environmental effects of high density culture systems (ponds, fish cage and recirculating systems) and in developing aquaculture for remote communities.

The AIMS@JCU Tropical Aquaculture program is built on a synergistic partnership between Tropical Aquaculture at AIMS, and two Schools at James Cook University (the School of Marine Biology & Aquaculture, and the School of Veterinary & Biomedical Sciences). The program now has excellent resources and both staff and students working on aquaculture projects have direct access to pristine coastal seawater, state-of-the art land and sea-based aquaculture facilities, and biotechnology and veterinary science laboratories, including molecular microbiology.

The major themes within the program are: Hatchery Technology; Environmental Impacts; and Emerging Species.

Program 2: Coastal Processes and Modelling

The Coastal Processes and Modelling research program within AIMS@JCU brings together the two organisations' staff and complementary capabilities to focus on coastal processes of special interest in tropical environments.

The major themes within the program are: Hydrodynamic modelling and hydrological processes, including sediment dynamics; Water quality, catchment /coastal interactions, and near-shore processes; Biogeosciences and environmental change; Biological and chemical oceanography; and New observing technologies. Improving our understanding of biological, physical and chemical processes in the coastal zone is essential to the effective management of this culturally and economically important region.

Program 3: Stress in Tropical Marine Systems

Global warming, fishing, pollution, habitat loss or degradation, competition and social aggression are all examples of different types of stress which are common in marine systems. Although the action of stress is on the individual, stress influences the dynamics of populations through to ecosystems.

Understanding how stress acts is important to predict the response of an individual, population, community or ecosystem to change in its environment. Furthermore, as a variety of stressors can cause similar stress responses, understanding the physiological and molecular basis of stress responses may enable us to identify the particular stressors responsible for degradation of marine organisms in the field and in aquaculture. The Research Themes within this program are: Cellular processes involved in stress responses; Ecological and population responses to stress; and Evolution of stress tolerance.



Research Program Leaders

Dr Chris Battershill is the AIMS Program Leader for the **Tropical Aquaculture Program** and one of the alternate AIMS@JCU Board members.



Chris has led the Marine Biotechnology Group at the Australian Institute of Marine Science for the past six years, having established a similar project in New Zealand over the previous nine years. The Group focuses on Tropical Aquaculture as well as Discovery and Development of new drug and industrial biocide leads from marine organisms. Chris has research experience throughout the South Pacific and in Antarctica. He specialises in marine chemical ecology, environmental toxicology and sponge taxonomy and has developed methods to enhance discovery and production of novel marine chemicals. Recent successes include development of aquaculture enterprise to produce anti-tumour active compounds and initiation of research to enhance chemotherapeutic specificity of biologically active natural compounds. Chris has contributed directly to the advance of almost one quarter of the marine natural products listed in late phase preclinical or clinical trial with the National Cancer Institute.

Email: c.battershill@aims.gov.au

Associate Professor Paul Southgate is the JCU Program Leader for the **Tropical Aquaculture Program**.



Paul has two major research interests: culture of tropical molluscs and hatchery foods for aquaculture. His research with molluscs focuses primarily on pearl oysters and he leads the Pearl Oyster Research Group at JCU. Research focuses primarily on pearl oyster resources and industry development in Pacific island countries, factors influencing pearl quality and pearl oyster genetics. Paul's research with hatchery foods focuses on development of novel live-foods and micro-particulate diets for bivalve, finfish and crab larvae, and the use of micro-particulate diets to investigate nutritional requirements of larval stages.

Email: Paul.Southgate@jcu.edu.au

Mr Craig Steinberg is the AIMS Program Leader for the **Coastal Processes and Modelling Program**.



Craig has over 20 years' experience as a physical oceanographer undertaking research in multi-disciplinary studies at AIMS in the Coastal Processes and the Conservation and Biodiversity Research Groups. This involves observation, analysis and numerical modelling on scales that range from individual reefs to the Coral Sea, of phenomena ranging from waves to ocean circulation. He is currently investigating impacts of tidal mixing on productivity hot spots, coral bleaching and turbidity mapping. Craig also currently manages the Remote Sensing unit that provides extensive Sea Surface Temperature and Ocean Colour products for the public and the research community.

Email: c.steinberg@aims.gov.au

Associate Professor Michael Ridd is the JCU Program Leader for the **Coastal Processes and Modelling Program**.



Michael is Associate Professor (Analytical Chemistry) and Head of Discipline in the School of Pharmacy and Molecular Sciences at James Cook University. Previous positions include Senior Environmental Geochemist for Ok Tedi Mining Limited; Lecturer in Analytical Chemistry/Director Advanced Analytical Centre, JCU; and Resources and Energy Advisor, Parliamentary Research Service. Michael's research interests include: Biogeochemistry of intertidal sediments; Development of passive sampling devices for metals and nutrients; and Metal cycling through sediment, waters and biota.

Email: Michael.Ridd@jcu.edu.au

Dr Madeleine van Oppen is the AIMS Program Leader for the **Stress in Tropical Marine Systems Program**.



Madeleine is a senior research scientist at AIMS where she has worked since 2001. She obtained her PhD in the Netherlands in 1995 on the molecular biogeography and evolution of benthic cold-water seaweeds. Following her PhD, she took up a postdoctoral position at the University of East Anglia in the UK to work on sexual selection and speciation in Lake Malawi cichlid fishes. In 1997 she moved to JCU, first as a JCU postdoctoral fellow and later as an ARC fellow (ARF) to work on the evolutionary genetics of reef corals and their algal endosymbionts. At AIMS she leads the Environmental Change & Impacts research team. Her research focuses on acclimatisation and adaptation of corals to increased sea water temperatures (e.g., the role of zooxanthellae in coral physiology, population genetics and biogeography of zooxanthellae, the molecular basis of the coral bleaching response), molecular systematics and evolutionary genetics of marine organisms, and genetic connectivity of coral reefs.

Email: m.vanoppen@aims.gov.au

Dr Mark McCormick is the JCU Program Leader for the **Stress in Tropical Marine Systems Program**.



Mark is a distinguished field researcher in marine ecology and the population dynamics of marine fishes. Much of his work has examined complexities of settlement in fishes, with over 50 publications in this field. Mark is a Reader at James Cook University and supervises the research of a dozen postgraduate students. His research explores connectivity among life history stages of coral reef fishes, and how events in earlier phases influence subsequent population dynamics. This includes work on maternal effects, larval development and growth, and how attributes of larvae and juveniles interact with their social and physical environment to influence their chances of survival. He has shown that maternal stress has effects that last into the next generation. Mark also works on reproduction in coral reef fishes, including the location and timing of spawning aggregations, growth in protogynous reef fishes, and the endocrine control of sex change. He is one of three Biology Editors for the journal Coral Reefs.

Email: Mark.Mccormick@jcu.edu.au



Tropical Aquaculture Program

Program Leaders:

Dr Chris Battershill, AIMS

Associate Professor Paul Southgate, JCU

Number of members: 26

Number of student members: 13

Global demand for marine protein is increasing at a rapid rate, while stocks of wild fisheries dramatically fall. Aquaculture is an alternative. Australia is a minor producer of aquaculture product, despite having one of the largest marine economic exclusion zones (EEZ) in the world and mega-biodiverse marine environments. There are, however, several marine species candidates that could transform Australia as an important producer and exporter. Australia can also contribute to production of non-food aquaculture products such as fine chemicals and biomaterials. The species of most potential are tropical.

The AIMS@JCU Tropical Aquaculture Program has identified a number of candidates for new industry and the aquaculture potential of these is being addressed; tropical rock lobster *Panulirus ornatus* – a potential high value export species; mudcrabs and sponges – the latter potentially low-infrastructure alternative livelihood species for indigenous and remote coastal communities in tropical Australia. Other research elements essential to sustainable aquaculture endeavour such as hatchery technology, bioremediation of waste, solving biofouling issues and examining niche high value 'boutique' classes of tropical aquaculture, are also examined.

AIMS@JCU seeks to improve synergies between the research portfolios of the Australian Institute of Marine Science (AIMS) and James Cook University (JCU) across several scientific disciplines. Both organisations are ideally located and resourced to constitute central research providers for developing sustainable aquaculture in tropical Australia and the Pacific. As wild fisheries become increasingly managed for sustainability, the gap between supply and demand for seafood (aquatic protein) and other marine derived products progressively increases. Aquaculture production systems range from ranching, to captive aquaculture to true closed life-cycle production (farming). The emphasis in Australia is on native species and closed life-cycle production, but there are several bottlenecks in developing emerging and candidate aquaculture species into commercial reality.

Although over 50% of the Australian EEZ is within the subtropical and tropical area, tropical aquaculture lags behind production and value in temperate Australia and far behind that of Asia. A major constraint in the development of tropical aquaculture candidates is inconsistency or failure in the larval or hatchery culture phase of mollusc, crustacean and finfish species.

Tropical rock lobster is a species with high market value (over \$30 per kg) that is currently obtained only from wild fisheries. The fishery, limited to the tropical NE coast and Torres Strait, are fully exploited and increased yield will not be forthcoming despite massive overseas demand for the product. As rock lobsters are Australia's most valuable single species fisheries there is a national effort to develop aquaculture technologies for both temperate and tropical species to increase supply.

The most significant challenge to be met, in the first instance, is the successful commercial production of fry (post-larvae) through the hatchery phase. Rock lobsters have a planktonic larval phase spanning months and considerable advancements by research in the production of high health post-larvae are required. AIMS@JCU is focusing on this aspect of domestication with backup programs utilising the same crustacean physiology skill set to examine other species such as mud crabs.

The second major area of initial focus for the AIMS@JCU Tropical Aquaculture program has been on commercial bath sponge aquaculture, specifically designed for remote and indigenous communities. The concept for this was derived from success in generating anti-tumour active compounds from sponges to supply initial phases of drug lead screening. The suite of research conducted by AIMS@JCU staff and students is comprehensive, ranging from an integrated program including research on population genetics, feeding biology, taxonomy, reproduction, farming technology, business planning, cloning and seeding technology, sustainability, and development of rigorous techniques for assessing quality and industrial attributes of fibres based on engineering parameters. The program is now at the stage of full handover to a new industry and has been enormously successful. All of the students are near completion of PhDs with two other degrees completed. Over 10 scientific papers have been submitted or published from this work, initiated less than two years ago, with more in preparation.

Coastal Processes and Modelling Program

Program Leaders:

Mr Craig Steinberg, AIMS

Associate Professor Michael Ridd, JCU

Number of members: 23

Number of student members: 8

The development of a more detailed understanding of the physical, chemical and biological processes that operate within the Great Barrier Reef lagoon is important not only for reasons of scientific curiosity but also to underpin the environmental management of this natural asset. Major issues in which the Coastal Processes and Modelling research program seeks to undertake research include (i) the possible effects of climate change on oceanic chemistry and biological processes; (ii) the development of networked instrumentation to obtain high quality physical and chemical oceanographic data through sensor networks and (iii) improved understanding of the effects on biological process of anthropogenically enhanced discharges of chemicals and sediments into the Great Barrier Reef lagoon.

The program themes are: Hydrodynamic modelling and hydrological processes, including sediment dynamics; Water quality, catchment/coastal interactions and near-shore processes; Biogeosciences and environmental change; Biological and chemical oceanography; and New observing technologies. Within those themes, two specific projects are well underway.

The *Acoustic mapping of benthic habitats around the Palm Islands group* project has revealed significant uncharted bottom features at high resolution that delineate benthic habitats. The investigation into the seascapes and the biological communities that live there has developed into a short-term research fellowship that was awarded to Dr Thomas Stieglitz in May 2006. This study will focus on the spatial and ecological impacts of ship wrecks on the surrounding seabed.

The *Sensor networking for environmental and physical monitoring* project is progressing well with significant progress testing the microwave communications between AIMS and Davies Reef and a test sensor network around AIMS. The project aims to deploy a permanent high-bandwidth connection between Davies Reef weather station and AIMS with an interactive sensor network around the reef.

Individual projects have attracted high calibre students and whilst in their initial stages of study, have made good progress with well regarded confirmation seminars and presentations at various national and international conferences. Two projects focussing on observing bleaching and flows around coral reefs have attracted significant funding and attracted two PhD candidates. A large observational array was deployed over the 2005/2006 summer and captured an actual bleaching event. Preparations for an ocean surface radar to provide long term monitoring are well advanced and is waiting only for final licensing approval. Interest has been shown by the Great Barrier Reef Marine Park Authority in techniques developed by one of our PhD research projects to help develop ecosystem protection guidelines for the Great Barrier Reef.

A high degree of collaboration is developing across the different projects which is serving to strengthen the overall program. While the primary focus in 2007 will be to bed down the existing projects and collaborations, the long-term objectives of the program include:

- Developing new - and enhancing existing - capabilities to observe and predict climate-change induced effects within the Great Barrier Reef lagoon;
- Exploiting capabilities likely to become available through NCRIS (National Collaborative Research Infrastructure Scheme) funded infrastructure in (i) High Frequency Radar for remote sensing of waves and currents and (ii) long term oceanographic moorings monitoring the coastal and shelf environment
- Using the results from sensor networks to inform the development of instrumentation and models required to model sediment and nutrient dynamics within the Great Barrier Reef lagoon.



Stress in Tropical Marine Systems Program

Program Leaders:

Dr Madeleine van Oppen, AIMS

Dr Mark McCormick, JCU

Number of members: 32

Number of student members: 10

Coral reefs are in severe decline due to over-harvesting, pollution, disease and global climate change. In an increasing number of places in the world, the synergistic effects of multiple simultaneously occurring stresses to coral reefs have exceeded their capacity to fully recover and this has led to a marked shift in the species composition¹.

Given the reliance of many human communities on coral reefs through fishing and tourism, these dramatic shifts in the nature of coral reefs can have severe economic repercussions. Recent reviews¹⁻⁴ have highlighted the importance of identifying the causes of stress in coral reef ecosystems and how populations within the ecosystems cope with stress, with the view to determine which factors predominately influence the resilience of coral reef ecosystems – their ability to bounce back after a disturbance.

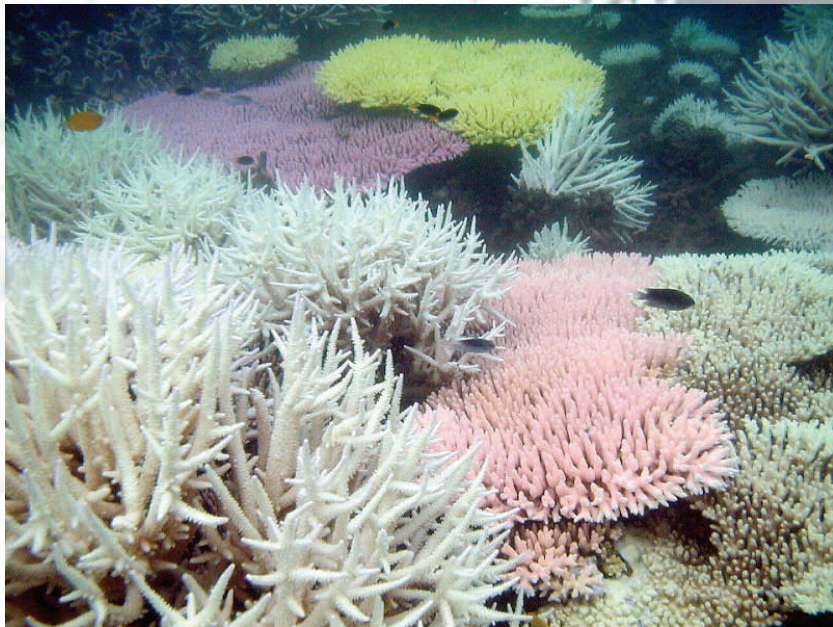
Stresses on coral reefs are many and varied. Although the action of stress is on the individual, stress influences the dynamics of populations through to ecosystems. Understanding the exact impact of a stressor is important in order to predict the response of an individual, population, and community. Furthermore, as a variety of stressors can cause similar stress responses, understanding the physiological and molecular basis of stress responses may enable us to identify the particular stressors responsible for degradation of marine organisms in the field and in aquaculture.

Because of the varied nature of stress our program is broad-based and consists of three themes: Cellular processes involved in stress responses, Ecological and population responses to stress, and Evolution of stress tolerance. Currently, there are ten students covering all three programs.

Focus in the first year has been on understanding stress responses in reef corals, including: the study of genes involved in the coral bleaching response, the role of coral-inhabiting algal endosymbionts in bleaching resistance, the identification of pathogens responsible for coral disease in the field and enclosed systems, the population structure of algal endosymbionts in space and time, the vulnerability to extinction of rare coral species, and the study of the potential ecological advantage of coral chimeras through increased genetic diversity (especially at immunity loci).

In addition, we have started to explore the anthropogenic impact on bioactivity and natural products from marine intertidal sources and thermal stress responses in reef fish. In the following year we aim to expand our vision to the influence of environmental and biological stress on fish communities.

- 1, Bellwood, D. R., T. P. Hughes, C. Folke, and M. Nystro. 2004. Confronting the coral reef crisis. *Nature* **429**:827-833.
- 2, Bellwood, D. R., and T. P. Hughes. 2001. Regional-scale assembly rules and biodiversity of coral reefs. *Science* **292**:1532-1534.
- 3, Hughes, T. P., D. R. Bellwood, C. Folke, R. S. Steneck, and J. Wilson. 2005. New paradigms for supporting the resilience of marine ecosystems. *TREE* **20**:380-386.
- 4, Berkes, F., T. P. Hughes, R. S. Steneck, J. A. Wilson, D. R. Bellwood, B. Crona, C. Folke, L. H. Gunderson, H. M. Leslie, J. Norberg, M. Nyström, P. Olsson, H. Österblom, M. Scheffer, and B. Worm. 2006. Globalization, roving bandits, and marine resources. *Science* **311**:1557-1558.



AIMS@JCU Investment in Infrastructure

Overview

The strategic vision of the Board included investment in capital infrastructure to enhance facilities available to collaborating researchers. The three capital investments approved by the Board included: a Fibre Optic cable between AIMS and JCU, a Controlled Environment Facility on the AIMS site and the refurbishment of facilities at the JCU Marine and Aquaculture Facility. The partner institutions contributed significant additional funds to the projects to further enhance the functionality of the facilities. These projects have been completed and are operational, providing outstanding resources for researchers across all programs.

At meeting no. 7/2005, held 18th October 2005, the AIMS@JCU Board allocated ownership of the assets funded by AIMS@JCU in the following way:

- Fibre Optic Cable - AIMS
- Controlled Environment Facility - AIMS
- Aquashed (within MARFU complex) - JCU

Fibre-optic cable link between JCU and AIMS

A 47 kilometre fibre-optic communication link between AIMS and JCU has been completed and is operational. The new link means that researchers in the two institutions can now exchange greater amounts of information much faster than was provided by an ordinary internet connection.

A conference hosted by AIMS from the 28th to the 30th March 2006 made use of the new link in a way that was a first for regional Australia. The CREON (Coral Reef Observatory Network) conference saw international coral reef scientists working on ways to automatically or remotely monitor coral reef systems. As part of this conference AIMS used the new fibre-optic cable link to beam a high-definition video stream (30MB/s) from San Diego in the USA.



Scott Bainbridge, of AIMS, tests equipment in preparation for the CREON Conference in March 2006.
Photo: B. Dinsdale

AIMS@JCU 'Aquashed'

The AIMS@JCU funding was used to transform an existing greenhouse within the Marine and Aquaculture Research Facilities Unit (MARFU) at JCU into a new 'Aquashed'. Completed in February 2006, the Aquashed now provides 375m² of usable space for researchers to conduct their freshwater projects under cover.

The Aquashed has new power, water and waste-water collection included and provides a cooler and drier work area. The new facility was fitted-out with equipment in time for first semester students to set up experiments.

Since its initial completion, the Aquashed has had removable winter side-covers installed and new roller doors fitted. Future improvements may include security cameras and computer monitoring.



(Above) The Aquashed with removable winter side-covers
(Top and centre) Experiments are now underway in the Aquashed.
Photos: J. Morrison

AIMS@JCU Controlled Environment Facility

The AIMS@JCU Controlled Environment Facility (CEF) was completed in February 2006 and is an excellent example of the collaborative scope of AIMS@JCU.

The million-dollar state-of-the-art facility, located at AIMS, Cape Ferguson, gives users access to environment-controlled rooms with air-conditioning, filtered ambient seawater, filtered heated or cooled seawater, and freshwater reticulation.

The facility makes efficient use of energy through clever design. Air-conditioning and seawater cooling is made possible by re-circulating water from a nearby chiller plant. Seawater will be circulated through solar strip-heaters on the roof of the building to provide heated water.

Within the facility, air and seawater temperatures will be regulated through automated controls and monitored remotely to ensure the desired conditions are maintained. The facility is managed by Matt Kenway, of AIMS and has two large broodstock rooms and three smaller rearing rooms.

Since completion of the facility AIMS have contributed capital funds for an ozone system; an ultrafiltration system; funds towards purchasing a dam cover to improve water quality supplied to the facility; and for a covered slab adjoining the eastern-most rearing room and plant room to house the ozone system.

In addition, AIMS have supplied two 5,000 litre tanks and the plumbing to commission the system; along with funds to fit out two broodstock rooms (now operational) and one of the rearing rooms (in progress).

Initial use of facilities involves AIMS@JCU PhD student research into larval rearing of marine ornamentals and the nutritional requirements of target species larvae, for example rock lobster.



*Photos (top to bottom): Preparing the slab; Board Members inspect the progress; Buildings after completion; Plant Room; Racking in one of the Rearing Rooms.
Photo (left): Landscaping taking place outside the CEF.*

AIMS@JCU Membership

As at 30 June 2006, AIMS@JCU membership totalled 82. The total number of student members was 31. Membership by Research Program was as follows: Tropical Aquaculture - 26 members in total, including 13 students; Coastal Processes and Modelling - 23 members in total, including 8 students; Stress in Tropical Marine Systems - 32 members in total, including 10 students.

Research Staff Members

Name	Partner Institution	Program Code	Email Contact
Associate Professor Ian Atkinson	James Cook University	CP & M	ian.atkinson@jcu.edu.au
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Associate Professor Lance Bode	James Cook University	CP & M	lance.bode@jcu.edu.au
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Mr Richard Brinkman	Australian Institute of Marine Science	CP & M	r.brinkman@aims.gov.au
Dr Gregg Brunskill	Australian Institute of Marine Science	CP & M	g.brunskill@aims.gov.au
Dr Kathy Burns	Australian Institute of Marine Science	CP & M	k.burns@aims.gov.au
Dr Julian Caley	Australian Institute of Marine Science	STMS	j.caley@aims.gov.au
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Professor Ross Crozier	James Cook University	STMS	ross.crozier@jcu.edu.au
Professor Rocky de Nys	James Cook University	TA & STMS	rocky.denys@jcu.edu.au
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Mr Mark Meekan	Australian Institute of Marine Science	STMS	m.meekan@aims.gov.au
Professor David Miller	James Cook University	STMS	david.miller@jcu.edu.au
Dr Philip Munday	James Cook University	STMS	philip.munday@jcu.edu.au
Dr Andrew Negri	Australian Institute of Marine Science	STMS	a.negri@aims.gov.au
Associate Professor Leigh Owens	James Cook University	TA	leigh.owens@jcu.edu.au

AIMS@JCU Membership

Research Staff Members cont'd.

Name	Partner Institution	Program Code	Email Contact
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Mr Hugh Sweatman	Australian Institute of Marine Science	STMS	h.sweatman@aims.gov.au
Dr Sven Uthicke	Australian Institute of Marine Science	STMS	s.uthicke@aims.gov.au
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Dr Madeleine van Oppen	Australian Institute of Marine Science	STMS	m.vanoppen@aims.gov.au
Dr Jody Webster	James Cook University	CP & M	jody.webster@jcu.edu.au
Mr Peter Willers	Australian Institute of Marine Science	Board	p.willers@aims.gov.au
Associate Professor Bette Willis	James Cook University	STMS	bette.willis@jcu.edu.au
Dr Graham Woods	James Cook University	CP & M	graham.woods@jcu.edu.au
Dr Chaoshu Zeng	James Cook University	TA	chaoshu.zeng@jcu.edu.au

Administrative Staff Members

Mr Brett Dinsdale	James Cook University	Admin.	brett.dinsdale@jcu.edu.au
Mrs Trisha Fielding	James Cook University	Admin.	trisha.fielding@jcu.edu.au

Student Members

Name	Program Code	Name	Program Code
Mr David Abrego	STMS	Mr Michael Horne	TA
Ms Shelley Anthony	STMS	Ms Emily Howells	STMS
Mr Raymond Bannister	TA	Ms Jasmine Jaffrés	CP & M
Mr Neal Cantin	CP & M	Ms Karin Kassahn	STMS
Ms Sarah Castine	TA	Mr Daniel Loudon	TA
Ms Severine Choukroun	CP & M	Ms Marie Magnusson	CP & M
Ms Vivian Cumbo	STMS	Mr Luiz Felipe Mendes de Gusmão	TA
Ms Kathryn Danaher	TA	Mr Eneour Puill-Stephan	STMS
Mr Martin Durkan	CP & M	Ms Zoe Richards	STMS
Ms Carol Erwin	CP & M	Mr Francois Seneca	STMS
Mr Piers Ettinger-Epstein	TA	Ms Megan Stride	TA
Ms Marnie Freckelton	STMS	Mr Meir Sussman	STMS
Mr Gilles Gigan	CP & M	Ms Vasiliki Tziouveli	TA
Ms Jana Guenther	TA	Mr Stephen Whalan	TA
Mr Ronald Hoeke	CP & M	Mr Xugan Wu	TA
Ms May-Helen Holme	TA		

Students

Overview

AIMS@JCU has 31 student members jointly supervised by 35 scientists and academic staff from both the Australian Institute of Marine Science and James Cook University. Membership is conferred by nomination from Research Program Leaders and approval by the AIMS@JCU Board. Student members must be engaged in projects that are both relevant, and significant to, the three AIMS@JCU Research Programs.

AIMS@JCU offers competitive PhD scholarships along with Travel Support and Honours Support scholarships to both domestic and international students, to ensure substantial growth of the knowledge-base within identified research areas.

AIMS@JCU student members enjoy access to world-class facilities, and have the advantage of infrastructure support at both the Australian Institute of Marine Science and James Cook University. This includes the new Controlled Environment Facility at AIMS; the 'Aquashed' at JCU; and sophisticated communication capabilities provided by the AIMS@JCU fibre-optic cable link between JCU and AIMS.

In addition, a commuter vehicle is currently under trial giving all members (and especially students) assistance with transport from JCU to AIMS and back. The service is free to members and was initiated to relieve some of the operational costs borne by both AIMS and JCU research teams who support students. Bookings are made through the AIMS@JCU website.

Students members are actively promoted in AIMS@JCU newsletters, with particular emphasis on

achievements, awards and publications.

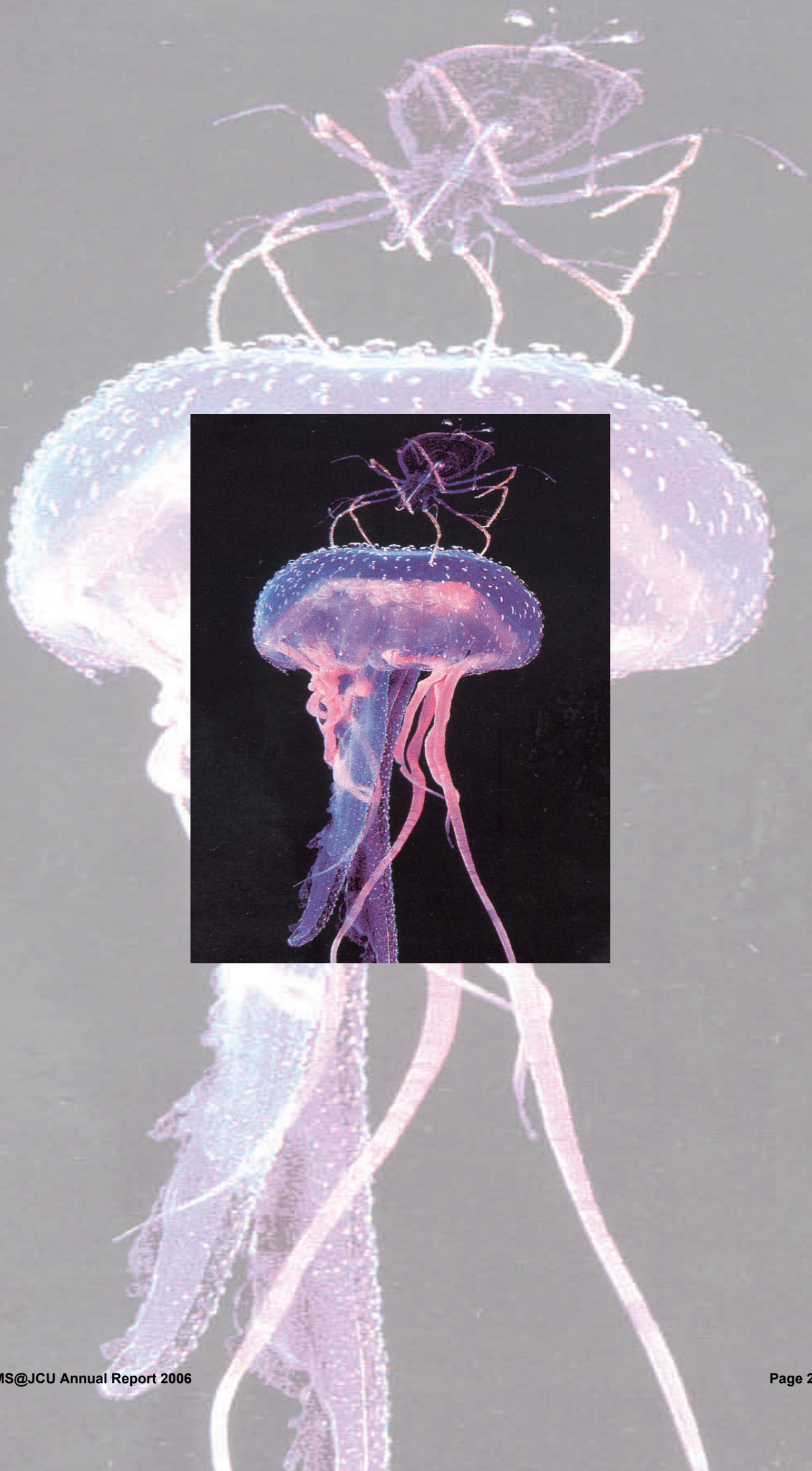
AIMS@JCU students are encouraged to publish widely to present research findings and have attended twelve conferences, both nationally and internationally in the last year alone. Conferences attended included:

- 7th International Sponge Symposium, Brazil, 2006
- Workshop ACI MOOREA 2005 EPHE - CNRS - Universite de Perpignan - Centre de Biologie Tropicale et Mediterranee de Perpignan.
- Australian Coral Reef Society Conference, Heron Island Research Station, 2005.
- Dynamic Planet, Joint Assembly of IAG, IAPSO, IABO August 2005 Cairns.
- Greenhouse 2005: Action on Climate Change, Melbourne, November 2005.
- Rainforest meets Reef Joint Rainforest CRC and CRC Reef Conference, Southbank Hotel & Convention Centre, Townsville, November 2005.
- Ocean Sciences Meeting 2006
- CRC Reef and Torres Straits Workshop, 2006
- Australian Society for Microbiology (ASM) Annual Conference held in Canberra, September 2005
- OCEANS '06 Asia Pacific IEEE - Singapore conference/exhibition, May 2006

The AIMS@JCU Board agreed to invest in Postdoctoral positions to further enhance the capacity within the research programs. As this report went to print, two Postdoctoral positions had been filled, one in Coastal Processes and Modelling and one in Tropical Aquaculture.



Some of the new students who were welcomed into the AIMS@JCU family at a Certificate Presentation in May. Photo: T. Fielding



Education and Postgraduate Student Funding

A significant objective of AIMS@JCU is to improve research training opportunities for students. The first round of scholarship funding was offered to five students in 2005. In 2006, seven students were offered full or supplementary scholarships.

Applicants were competitively assessed by a selection panel made up of Research Program Leaders and Board Member representatives. Applications were received from a diverse range of students, with particular interest shown from international students.

In 2006, AIMS@JCU's investment in student funding totals more than \$168,000.

2006 Scholarship Round		
Student	Research Program	Project Title
Vivian Cumbo (PhD)	Stress in Tropical Marine Systems	Evolutionary and environmental controls on coral symbiosis
Ronald Hoeke (PhD)	Coastal Processes and Modelling	Investigation of bed shear, water mixing and circulation in oceanic coral reefs
Jasmine Jaffrés (PhD)	Coastal Processes and Modelling	The oceanographic and geochemical effects of increasing anthropogenic CO ₂ on planktonic and benthic calcification in the Coral Sea and outer Great Barrier Reef of NQ
Eneour Puill-Stephan (PhD)	Stress in Tropical Marine Systems	Self non-self recognition and chimerism in <i>Acropora millepora</i> and the acquisition of immunity
Fancois Seneca (PhD)	Stress in Tropical Marine Systems	The molecular stress response in a model Scleractinian coral: <i>Acropora millepora</i>
Vasiliki Tziouveli (PhD)	Tropical Aquaculture	Culture of ornamental marine shrimp
Xugan Wu (PhD) *	Tropical Aquaculture	A comparative study of lipid nutrition of two tropical commercial crustaceans (<i>Portunis pelagicus</i> and <i>Panulirus ornatus</i>)
* Yet to take up scholarship		

2005 Scholarship Round		
Student	Research Program	Project Title
Neal Cantin (PhD)	Coastal Processes and Modelling	Effects of herbicide photoinhibition on photosynthesis and reproduction of adult reef-building corals
Severine Choukroun (PhD)	Coastal Processes and Modelling	Patchiness of Coral Bleaching at Heron Island and the Capricorn Bunker Group
May-Helen Holme (PhD)	Tropical Aquaculture	Lipid nutrition of mudcrab (<i>Scylla serrata</i>) larvae
Marie Magnusson (PhD)	Coastal Processes and Modelling	Environmental assessment of selected pesticides and their breakdown products - impacts on shallow benthic microalgal and meiofaunal communities in the Great Barrier Reef lagoon
Andrew Rumsby (MSc) **	Coastal Processes and Modelling	Development of a eulerian sediment transport model
** Withdrew in late 2005.		

In 2006, AIMS@JCU offered the first round of Travel and Honours Support Scholarships. Travel scholarships were offered for students to attend conferences or seminars where they were delivering a presentation or presenting a poster.

Honours Support scholarships of \$1000 each were offered to Honours students enrolled at James Cook University. Applicants were required to demonstrate the relevance of their project to existing AIMS@JCU Programs or identify potential new collaborations that might be generated by the project.

2006 Travel Scholarships		
Student	Research Program	Details
Raymond Bannister (PhD)	Tropical Aquaculture	7th International Sponge Symposium, 7-13 May 2006, Brazil
Piers Ettinger-Epstein (PhD)	Tropical Aquaculture	7th International Sponge Symposium, 7-13 May 2006, Brazil
May-Helen Holme (PhD)	Tropical Aquaculture	Australasian Aquaculture, 27-30 August 2006, Adelaide
Meir Sussman (PhD)	Stress in Tropical Marine Systems	2006 Ocean Science Meeting, 20-24 February 2006, Hawaii
Stephen Whalan (PhD)	Tropical Aquaculture	7th International Sponge Symposium, 7-13 May 2006, Brazil

2006 Honours Student Support		
Student	Research Program	Project Title
Emily Howells (Hons.)	Stress in Tropical Marine Systems	Spatial and temporal genetic diversity of zooxanthella (<i>Symbiodinium</i>) populations hosted by a soft coral (<i>Sinularia flexibilis</i>)
Marnie Freckelton (Hons.)	Stress in Tropical Marine Systems	Anthropogenic impact on bioactivity and natural products from marine intertidal sources
Sarah Castine (Hons.)	Tropical Aquaculture	Ontogeny of the digestive system and aspects of protein nutrition in sand crab larvae (<i>Portunis pelagicus</i>)
Megan Stride (Hons.)	Tropical Aquaculture	Biochemical composition of 'new' species of tropical microalgae for potential use in tropical aquaculture



Steve Whalan (L) and Piers Ettinger-Epstein (R) at the 7th International Sponge Symposium, in Brazil.

Student Member Projects as at 30 June 2006

Name	School	Project Title	AIMS Supervisor	JCU Supervisor
David Abrego (PhD)	Marine Biology & Aquaculture	Flexibility in coral-dinoflagellate symbioses: symbiont succession and physiology of the holobiont	Dr M. van Oppen	A/Prof. B. Willis
Shelley Anthony (PhD)	Marine Biology & Aquaculture	Coral disease in closed systems	Dr D. Bourne	A/Prof. B. Willis
Raymond Bannister (PhD)	Marine Biology & Aquaculture	Feeding biology and ecology of the tropical sponge, <i>Rhopaloeides odorabile</i> : a cross shelf comparison	Dr C. Battershill	Prof. R. de Nys
Neal Cantin (PhD)	Marine Biology & Aquaculture	Effects of herbicide photoinhibition on photosynthesis and reproduction of adult reef-building corals	Dr A. Negri	A/Prof. B. Willis
Sarah Castine (Hons.)	Marine Biology & Aquaculture	Ontogeny of the digestive system and aspects of protein nutrition in sand crab larvae (<i>Portunis pelagicus</i>)	Dr M. Hall	Dr C. Zeng A/Prof. P. Southgate
Severine Choukroun (PhD)	Mathematics & Physical Sciences	Patchiness of Coral Bleaching at Heron Island and the Capricorn Bunker Group	Dr J. Lough	Dr P. Ridd Dr L. Bode Prof. M. Heron
Vivian Cumbo (PhD)	Marine Biology & Aquaculture	Evolutionary and environmental controls on coral symbiosis	Dr M. van Oppen	Dr Andrew Baird Prof. Terry Hughes
Kathryn Danaher (PhD)	Marine Biology & Aquaculture	Natural diets and aquaculture of ornate rock lobster larvae, <i>Panulirus ornatus</i>	Dr M. Hall Dr D. McKinnon	Prof. M. Kingsford
Martin Durkan (Hons.)	Tropical Environment Studies & Geog.	Acoustic mapping in the Palm Island Group using a multibeam echosounding sonar	Dr P. Doherty	Dr. T. Stieglitz Dr. S. Smithers
Carol Erwin (MSc.)	Tropical Biology	Climate perturbations and the responses of pelagic foraging terns across the Great Barrier Reef	Dr J. Caley	Dr B. Congdon
Piers Ettinger-Epstein (PhD)	Marine Biology & Aquaculture	Marine natural products: developing sources of supply	Dr D. Tapiolas Dr C. Battershill	Prof. R. de Nys
Marnie Freckelton (Hons.)	Pharmacy & Molecular Sciences	Anthropogenic impact on bioactivity and natural products from marine intertidal sources	Dr T. Wright Dr D. Bourne	A/Prof. B. Bowden
Gilles Gigan (Hons.)	Information Technology	Environmental monitoring: seamless integration of sensing technologies and efficient data transport in sensor networks	Dr P. Doherty	Dr. S. Smithers
Jana Guenther (PhD)	Marine Biology & Aquaculture	Behaviour, physical and chemical antifouling defences of sea stars of the Great Barrier Reef	Dr T. Wright	Prof. R. de Nys
Ronald Hoeke (PhD)	Mathematics & Physical Sciences	Investigation of bed shear, water mixing and circulation in oceanic coral reefs	Dr R. Brinkman	Prof. M. Heron
May-Helen Holme (PhD)	Marine Biology & Aquaculture	Lipid nutrition of mudcrab (<i>Scylla serrata</i>) larvae	Dr M. Hall	A/Prof. P. Southgate
Michael Horne (MSc.)	Marine Biology & Aquaculture	Investigation into development and preparation of 'artificial' food particles for tropical rock lobster, <i>Panulirus ornatus</i> , phyllosoma	Dr M. Hall	A/Prof. P. Southgate

Student Member Projects as at 30 June 2006

Name	School	Project Title	AIMS Supervisor	JCU Supervisor
Emily Howells (Hons.)	Marine Biology & Aquaculture	Spatial and temporal genetic diversity of zooxanthella (<i>Symbiodinium</i>) populations hosted by a soft coral (<i>Sinularia flexibilis</i>)	Dr M. van Oppen	A/Prof. B. Willis
Jasmine Jaffrés (PhD)	Earth Sciences	The oceanographic and geochemical effects of increasing anthropogenic CO ₂ on planktonic and benthic calcification in the Coral Sea and outer Great Barrier Reef of NQ	Dr G. Brunskill Dr R. Brinkman	Prof. N. Oliver A/Prof. M. Ridd
Karin Kassahn (PhD)	Tropical Biology	Transcriptional responses to thermal stress in the coral reef fish <i>Pomacentrus moluccensis</i> and studies of molecular adaptation	Dr J. Caley	Prof. R. Crozier
Daniel Loudon (PhD)	Marine Biology & Aquaculture	Bath sponge aquaculture: Aspects of culture and quality	Dr C. Battershill	Prof. R. de Nys
Marie Magnusson (PhD)	Marine Biology & Aquaculture	Environmental assessment of selected pesticides and their breakdown products - impacts on shallow benthic microalgal and meiofaunal communities in the Great Barrier Reef lagoon	Dr A. Negri	Dr K. Heimann A/Prof. M. Ridd
Luiz Felipe Mendes de Gusmão (PhD)	Marine Biology & Aquaculture	The use of biochemical methods for the evaluation of zooplankton secondary production	Dr D. McKinnon	Prof. M. Kingsford
Eneour Puill-Stephan (PhD)	Marine Biology & Aquaculture	Self non-self recognition and chimerism in <i>Acropora millepora</i> and the acquisition of immunity	Dr M. van Oppen	A/Prof. B. Willis Dr L. van Herwerden
Zoe Richards (PhD)	Tropical Biology	Genotypic diversity, phylogeny and fitness of rare <i>Acropora</i> corals: Implications for conservation	Dr M. van Oppen	A/Prof. B. Willis Prof. D. Miller
Francois Seneca (PhD)	Pharmacy & Molecular Sciences	The molecular stress response in a model Scleractinian coral: <i>Acropora millepora</i>	Dr M. van Oppen	Prof. D. Miller
Megan Stride (Hons.)	Marine Biology & Aquaculture	Biochemical composition of 'new' species of tropical microalgae for potential use in tropical aquaculture	Dr M. Hall	A/Prof. P. Southgate
Meir Sussman (PhD)	Marine Biology & Aquaculture	Pathogens for coral disease on the Great Barrier Reef and in the Indo Pacific, a molecular and microbiological approach	Dr D. Bourne	A/Prof. B. Willis
Vasiliki Tziouveli (PhD)	Marine Biology & Aquaculture	Culture of ornamental marine shrimp	Dr M. Hall	Dr C. Zeng A/Prof. P. Southgate
Stephen Whalan (PhD)	Marine Biology & Aquaculture	Reproduction, larval ecology and population genetic structure of <i>Rhopaloeides odorabile</i>	Dr C. Battershill	Prof. R. de Nys
Xugan Wu (PhD)	Marine Biology & Aquaculture	A comparative study of lipid nutrition of two tropical commercial crustaceans (<i>Portunus pelagicus</i> and <i>Panulirus ornatus</i>)	Dr M. Hall	Dr C. Zeng A/Prof. P. Southgate

Media and Communications

Through its media and communications activities AIMS@JCU seeks to build awareness of its operations and activities; highlight the strength of its researchers and students; and establish a significant profile in order to further the interests of its Joint Venture partners.

Newsletters

The first issue of *AIMS@JCU news* was released in July 2005 and distributed via email to all staff at both JCU and AIMS. The aim of the newsletter is to inform staff and students of the partner institutions of current developments at AIMS@JCU and to assist in building a recognisable profile for the Joint Venture.

The first newsletter consisted of three pages and outlined the structure of AIMS@JCU, listed scholarship students, and research programs and provided staff contact information.

A second newsletter was quickly issued in August 2005 in order to disseminate further relevant information about the Joint Venture. A final newsletter for 2005 was issued in December.

In 2006 *AIMS@JCU news* moved to quarterly issues and in addition to distribution via email, a small colour print run is now distributed to key stakeholders including government offices and key management from each partner institution.

AIMS@JCU news has grown to a six page newsletter with a heavy emphasis on the achievements of AIMS@JCU scholarship students and other student members along with research program news. Newsletters were issued in March and June.

Website

A dedicated website for AIMS@JCU was available from the end of August, 2005. The website was a collaborative effort between Rhondda Jones, Robin Gilliver and Trisha Fielding. The website has two areas, a public site and a member's only site, accessible via a valid username and password login.

The comprehensive public site gives users access to information on research programs and projects, program leaders, student projects and news, scholarships, facilities and infrastructure as well as online access to AIMS@JCU newsletters.

In addition, a media page is located on the public site containing media releases, fact sheets, photos and bios.

The member's only section of the site was made available in June 2006 and is a comprehensive database designed by Robin Gilliver. Members now have easy access to contact details for other AIMS@JCU

members, including a facility to email groups of members; program information; documents and publications as well as a personal web page. Through the member's site, Board members have special access to minutes and agenda documents for all AIMS@JCU Board meetings.

The member's site also hosts the AIMS@JCU Commuter Vehicle booking system, designed by the AIMS Data Centre team. Members can log on to the site, and book a seat in the vehicle which commutes twice a day from JCU to AIMS.

The website continues to evolve and grow into an indispensable communication tool for AIMS@JCU.

Promotional / branding efforts

A dedicated logo was designed for AIMS@JCU by Tim Simmonds, of AIMS.



The logo (above) was approved by the Board at meeting number 8/2005, held on the 6th December 2005 and has now been incorporated into all Board documents, Letterhead and With Compliments stationery in order to give AIMS@JCU a professional image.

Polo shirts with an embroidered AIMS@JCU logo were sourced through local company Cueldee and distributed to scholarship students, program leaders, board members and staff. The shirts will help to present a consistent image for AIMS@JCU, particularly when worn by scholarship students presenting papers at conferences.

A brochure (pictured below) designed to attract potential postgraduate students to AIMS@JCU was developed and printed in time for distribution at JCU's Discovery Day in May 2006.



Media coverage

Since the announcement that government funds would be made available to set up the Joint Venture, AIMS@JCU has regularly appeared in media press articles. A selection have been included here:

Media Release, James Cook University, *JCU tops in research grants*, 22 June 2006

Townsville Bulletin, *VC's last hurrah, Moulden to finish science precinct*, 17 June 2006

Australian Maritime Digest, *Seven scholarships awarded*, April 2006

Townsville Sun, *Funds for marine science students*, 29 March 2006

Media Release, Australian Institute of Marine Science, *Turning on the marine sensor network*, 29 March 2006

4TTT Radio News, *The study of tropical marine science*, 24 March 2006

Townsville Bulletin, *Cable link-up boosts uni, AIMS project*, 30 December 2005

Media Release, Australian Institute of Marine Science, *'Digital skins' for the environment set to revolutionise marine science*, 20 May 2005

Media Release, Australian Institute of Marine Science, *Chair announced for AIMS@JCU joint venture*, 3 September 2004

Townsville Bulletin, *AIMS boss keen on enterprise*, 21 July 2004

Media Release, James Cook University, *Agreement affirms global claim on marine science*, 17 June 2004

Townsville Bulletin, *Joint AIMS-JCU project rolling*, 11 December 2003

Australian Biotechnology News, *Budget pushes AIMS, JCU collaboration*, 14 May 2003

Other public / member awareness efforts

Research Program Workshops were held at JCU in September 2005 for two programs. The **Coastal Processes and Modelling** workshop was held on 2nd September 2005. A total of 23 people attended the workshop, with 13 from JCU, 8 from AIMS, and 2 from AIMS@JCU.

The **Stress in Tropical Marine Systems** workshop was held on 15 September 2005. A total of 17 people attended the workshop with 10 from JCU, 4 from AIMS

and 3 from AIMS@JCU. The workshops provided a forum for operational issues to be raised and for potential projects with the programs to be identified.

An **Information Presentation** for AIMS staff was held on 25th November 2005 in the AIMS theatre. Rhondda Jones conducted the seminar, which helped to raise awareness of AIMS@JCU.

AIMS@JCU's May-Helen Holme was involved with JCU's **Discovery Day**, held on Sunday 21st May, as part of the School of Marine Biology and Aquaculture display. Displays attracted both young and old alike and potential graduate students took the opportunity to ask questions of the lecturers and researchers present. AIMS@JCU brochures were available on the day.



May-Helen Holme (right) chats to an enthusiastic youngster on Discovery Day, Photo: T. Fielding

Certificates were presented to scholarship students at a ceremony during Board meeting no. 2/2006, held 23rd May. The presentation was followed by a short afternoon tea where board members, program leaders and students took the opportunity to meet and talk informally.



Megan Stride (left) is presented with a scholarship certificate and congratulated by Rhondda Jones and Brett Dinsdale. Photo: T. Fielding

Selected Research Publications

According to ISI Essential Science Indicators, the Joint Venture partners James Cook University and the Australian Institute of Marine Science were ranked the first and second most cited institutions respectively, in the world; on the topic of 'coral reef ecology'.^{1*}

The data, collected over a ten year period from 1994 to 2004 showed the number of total cites for the two institutions as 5,948.¹ This figure represents a total of 443 papers cited, at well over ten citations per paper.

Dr Geoff Jones (JCU) was ranked as the fourth most cited author on the topic of 'coral reef ecology' in the ten year period 1994 to 2004, with almost 600 citations.² Dr Julian Caley (AIMS) was ranked tenth in this same list with over 400 citations² and Dr Peter Doherty (AIMS) ranked seventeenth in the list with over 300 citations.²

The publications listed below by AIMS@JCU members provide an indication of the broad range of research activity being conducted, whilst not being confined to AIMS@JCU projects. It should be noted that a number of these publications have authors from both AIMS and JCU, illustrating the true collaborative nature of the Joint Venture. Member author names are printed in capital letters.

BOOKS

Lovatelli A, Conand C, Purcell S, UTHICKE S, Hamel JF and Mercier A (eds) (2004) *Advances in sea cucumber aquaculture and management*. FAO Fisheries Technical Paper 463. FAO. 425 p.

Robertson C and KENWAY MJ (eds) (2006) *Australian prawn farming manual: health management for profit*. Queensland Department of Primary Industries and Fisheries. 157 p.

Wilson KJ, HALL MR, Davey ML, KENWAY MJ and Coren D Pandian TJ, Strussmann CA and Marian MP (eds) (2005) *Fish Genetics and Aquaculture Biotechnology*. Oxford and IBH Publishing Co Pty Ltd. 162 p.

BOOK CHAPTERS

BOURNE DG, EVANS-ILLIDGE EA & LLEWELLYN LE (2004) Marine microbes for biodiscovery: just the tip of an iceberg. pp. 185-205. In: Kurtboke I and Swings J (eds) *Microbial Genetic Resources and Biodiscovery*. World Federation of Culture Collections. 400 p.

BRINKMAN R, Wolanski EJ and Spagnol S (2004) Field and model studies of the nepheloid layer in coastal waters of the Great Barrier Reef, Australia. pp. 225-229. In: Jirka G and Uijttewaai W (eds) *Shallow Flows*. A.A. Balkema Publishers. 684 p

Byrne M, Cisternas P, Hoggett A, O'Hara T and UTHICKE S (2004) Diversity of echinoderms at Raine Island, Great Barrier Reef. pp. 159-163. In: Heinzeller T and Nebelsick JH (eds) *Echinoderms: Munchen. Proceedings of the 11th International Conference*, 6-10 October 2003, Munich Germany. A.A. Balkema Publishers. 360 p.

Byrne M, Smoothey A, Hoggett A and UTHICKE S (2004) Population biology of shallow water holothuroids and ophiuroids from Raine Island and Moulter Cay, northern Great Barrier Reef. pp. 165-169. In: Heinzeller T and Nebelsick JH (eds) *Echinoderms: Munchen. Proceedings of the 11th International Conference*, 6-10 October 2003, Munich Germany. A.A. Balkema Publishers. 360 p.

DE NYS R., Givskov M., Kumar N., Kjelleberg S., Steinberg P.D. Furanones. *Progress in Molecular and Subcellular Biology – Subseries Marine Molecular Biotechnology*. N. Fusetani, A.S. Clare (Eds). Antifouling Compounds. Springer-Verlag Press. pp 55-86, 2006

MCKINNON AD, Smit N, Townsend S and Duggan S (2006) Darwin Harbour: Water quality and ecosystem structure in a tropical harbour in the early stages of development. pp. 433-459. In: Wolanski EJ (ed) *The environment in Asia Pacific Harbours*. . 497 p.

Mendola D, Naranjo Lozano SA, DUCKWORTH AR and Osinga R (2006) The promise of aquaculture for delivering sustainable supplies of new drugs from the sea: Examples from in-sea, and tank-based invertebrate culture projects from around the world. pp. 21-72. In: Proksch P and Muller WEG (eds) *Frontiers in Marine Biotechnology*. Horizon Bioscience.

Miller IR and SWEATMAN H (2004) Status of coral reefs in Australia and Papua New Guinea in 2004 (Chapter 11). 2: 303-335. In: Wilkinson CR (ed) *Status of Coral Reefs of the World: 2004*. Australian Institute of Marine Science. 572 p

UTHICKE S (2004) Over fishing of holothurians: lessons from the Great Barrier Reef. pp. 163-171. In: Lovatelli A, Conand C, Purcell S, Uthicke S, Hamel JF and Mercier A (eds) *Advances in sea cucumber aquaculture and management*. FAO Fisheries Technical Paper 463. FAO. 425p.

WILLIS BL, Page CA & Dinsdale EA (2004) Coral Disease on the Great Barrier Reef. In: *Coral Health and Disease* (eds E Rosenberg & Y Loya), Springer-Verlag, Germany

1. Source: ISI Essential Science Indicators, accessed on 13/07/06 at <http://www.esi-topics.com/coralreef/inst/c1a.html>

2. Source: ISI Essential Science Indicators, accessed on 13/07/06 at <http://www.esi-topics.com/coralreef/authors/b1a.html>

* JCU total cites, 4,031; AIMS total cites, 1,917.

Wilson KJ, HALL MR, Davey ML, KENWAY MJ and Coren D (2005) Biotechnology to improve reproductive performance and larval rearing in prawns and rock lobsters. Chapter 7. pp. 103-117. In: Pandian TJ, Strussmann CA and Marian MP (eds) *Fish Genetics and Aquaculture Biotechnology*. Oxford and IBH Publishing Co Pty Ltd. 162 p

Wolanski EJ, MCKINNON AD, Alongi DM, Spagnol S and Williams D (2006) An ecohydrology model of Darwin Harbour. pp. 477-488. In: Wolanski EJ (ed) *The environment in Asia Pacific Harbours*. . 497 p.

Zahir H, Allison W, Dews G, Gunn J, SWEATMAN H, Rajasuriya A, Solandt JL, Thompson AA, Tamelander J and Wakeford M (2006) Post-tsunami status of the coral reefs of the islands and atolls of the Maldives. pp. 111-123. In: Wilkinson CR, Souter D and Goldberg J (eds) *Status of Coral Reefs in Tsunami Affected Countries: 2005*. Australian Institute of Marine Science and AusAID. 154 p.

JOURNAL ARTICLES – 2004

Acosta-Salmon H, Martinez Fernandez E & SOUTHGATE PC (2004) A new approach to pearl oyster broodstock selection: can saibo donors be used as future broodstock? *Aquaculture*, 231, 205 - 214

Acosta-Salmon H & SOUTHGATE PC (2004) Use of a Biopsy Technique to Obtain Gonad Tissue from the Blacklip Pearl Oyster *Pinctada margaritifera* (L.). *Aquaculture Research*, 93 - 96

Alongi, D. M., A. Sasekumar, V. C. Chong, J. Pfitzner, L. A. Trott, F. Tirendi, P. Dixon and G. J. BRUNSKILL (2004) Sediment accumulation and organic material flux in a managed mangrove ecosystem: estimates of land-ocean-atmosphere exchange in peninsular Malaysia. *Marine Geology* 208(2-4):383-402.

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Ball EB, Hayward DC, Saint R & MILLER DJ (2004) A simple plan-cnidarians and the origins of developmental mechanisms. *Nature Reviews Genetics*, 5, 567 - 577

Bastidas C, FABRICIUS K & WILLIS BL (2004) Demographic aspects of the soft coral *Sinularia flexibilis* leading to local dominance on coral reefs. *Hydrobiologia*, 530, 433 - 441

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BOURNE DG, Young N, Webster NS, Payne M, Salmon M, Demel S and HALL MR (2004) Microbial community dynamics in a larval aquaculture system of the tropical rock lobster, *Panulirus ornatus*. *Aquaculture* 242: 31-51.

Bromage ES, Ye JM, OWENS L, Kaattari IM & Kaattari SL (2004) Use of staphylococcal protein A in the analysis of teleost immunoglobulin structural diversity. *Developmental and Comparative Immunology*, 28 (7-8), 803 - 814

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Financial Reports

AIMS@JCU

STATEMENT OF CASH FLOWS

for the year ended 30 June 2006

	TO 30/06/2006 \$'000	TO 30/06/2005 \$'000
OPERATING ACTIVITIES		
Cash received		
Interest	103	-
Total cash received	<u>103</u>	<u>-</u>
Cash used		
Scholarships	131	90
Employees	163	41
Suppliers	18	142
Total cash used	<u>312</u>	<u>273</u>
Net cash from operating activities	<u>(209)</u>	<u>(273)</u>
INVESTING ACTIVITIES		
Cash used		
Purchases property, plant and equipment	955	720
Net cash used by investing activities	<u>(955)</u>	<u>(720)</u>
Net increase in cash held	<u>(1,164)</u>	<u>(993)</u>
Cash at beginning of the reporting period	2,907	3,900
Cash at end of the reporting period	<u>1,743</u>	<u>2,907</u>

AIMS@JCU**STATEMENT OF FINANCIAL PERFORMANCE**

for the year ended 30 June 2006

	TO 30/06/2006 \$'000	TO 30/06/2005 \$'000
REVENUE		
Revenue from ordinary activities		
Interest	51	52
Revenue from ordinary activities	51	52
EXPENSE		
Expenses from ordinary activities		
Employee expenses	163	36
Scholarships	131	90
Advertising	1	2
Consultancy	-	-
Consumables	5	3
Computer Equipment	5	-
Legal	-	15
Training	3	-
Travel	4	27
Expenses from ordinary activities	312	173
Operating deficit from ordinary activities	261	121
Net deficit	261	121
CAPITAL EXPENDITURE	955	720



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