

Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management
Annual Report 2004 – 2005



Coastal CRC



Established and supported under the Australian Government's
Cooperative Research Centres Programme

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The vision, mission and goals for the CRC for Coastal Zone, Estuary and Waterway Management are:

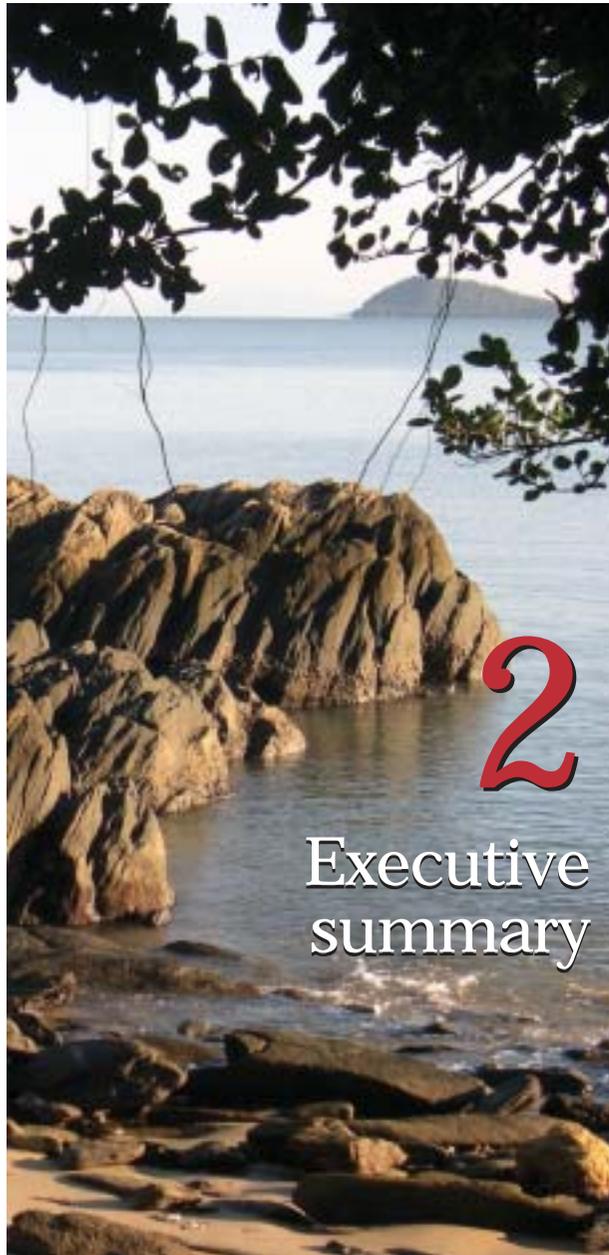
Vision: A high quality of life and coastal ecological health achieved through effective management.

Mission: To deliver decision-making tools, understanding and knowledge necessary for the effective planning, management and ecosystem health of coastal zones, estuaries and waterways.

The goal of the CRC is to bridge the gaps – between science, decision-making, policy and planning. We broker multidisciplinary research and build innovative partnerships to improve the ecosystem health of coastal areas, estuaries and catchments. We work cooperatively with clients and stakeholders to develop:

- decision-making tools to plan, manage and evaluate coastal resource uses in urban, industrial and agricultural catchments
- management and restoration strategies for ecosystem health and improved quality of life
- technologies to assess, monitor, map, understand and manage coastal ecosystems
- problem solving and research skills for consulting companies, government agencies, community groups and industry

- education and training opportunities for natural resource managers



Joint Chair and CEO report

It has been a highly successful year for the Coastal CRC. Our many and varied research projects have produced some remarkable outputs. Much of the current research is to be finalised in the early months of next year, but it is already beginning to reap outcomes. The benefits of CRC research are illustrated by a number of performance indicators. For example, this year alone, external research projects brought in additional funding of almost \$1 million for coastal research and management. Two commercial entities have been created as a result of the CRC's activities. More importantly, an independent review of the economic value of our research has estimated at least a 10-times multiplier on investment in four major CRC projects. This value may be conservative, yet it still outstrips multipliers in many other research fields. The key element to achieving these benefits is ensuring relevance of the research to stakeholders through participative research and development models. The Coastal CRC has always aimed at a participative and cooperative model of research that includes a range of stakeholders. This is an inherently complex task, sometimes with high transaction costs. However, an economic study has shown a significant return on this investment.

Over time, the Centre has developed a strong reputation for working collaboratively. This year alone the CRC has undertaken partnership-projects with three

commonwealth departments, state agencies in every state, nine regional catchment groups and ten private companies and industry associations. In addition, two local government authorities have joined the CRC as affiliate partners in the past six months and are already reporting benefits from our extension programs. A very positive relationship has been established with Parks Victoria, which became a partner to the CRC last year. Our collaboration with them has resulted in some of the most accurate and striking mapping of marine parks anywhere in the world.

This cooperative model is demonstrated effectively by the strong stakeholder demand for the skills, knowledge and intellectual property developed by the Centre. The CRC is increasingly being invited to undertake projects and provide advice on external research and many of the 'tools' developed in our projects are in high demand. Our website had almost 500 visits per day, many of these being international visitors. Monitoring demand for some of our recent reports and research papers shows that the top ten alone have been downloaded over 500 times during the past six months. The citizen science toolbox, planning compendium, coastal newsletters and Coastal Meta deserve special mention, being highly sought-after 'tools' created by the CRC that are now widely used around Australia and internationally.

The success of the Coastal CRC and the lasting legacy that it will leave owes in no small part to the original vision and leadership of Roger Shaw. The Board and

Senior Management have joined in thanking him for his tireless efforts in support of the Centre both before and after his retirement.

Following on from our extremely positive second year review, the 5th year independent review has been completed with an auspicious panel passing the CRC with flying colours. This positive review reflects the efforts over seven years of all CRC researchers, students and staff.

One of the greatest assets of any CRC and one of the most long lasting legacies for the Coastal CRC are our students. In comparison with other CRCs and with Universities in general, we have had an excellent retention rate with fewer than 1% of our students leaving their chosen degree. Around half of our students have been awarded their higher degrees to date. We have stayed in contact with our past students and it is pleasing to note that more than 80% are working in their field or another closely related research area.

Once again, this year our popular estuaries package was short-listed for a Eureka prize. A number of our researchers and students have also been recognised with prestigious awards for their contributions to research.

Although the CRC itself is winding down for a June 2006 close, many of the research and management impacts of the Centre will continue beyond this date.

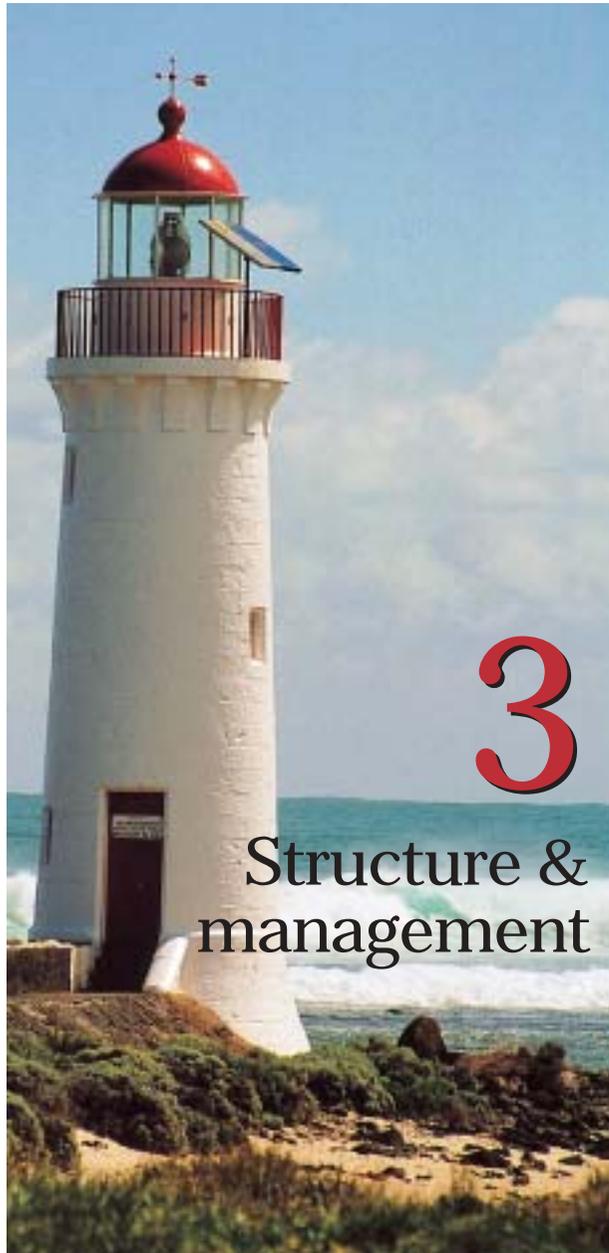
As well as creating two independent commercial entities, the Centre is investigating:

- a node of the international coastal body, LOICZ in Australia to continue some of the research tools of the Centre.
- transfer of specific ongoing research projects to existing CRCs and CERF hubs.
- transfer of 'public-good' IP for continued development by partners.
- client-focussed projects that aim to synthesise and package the CRC outputs in novel ways.

The final year of the CRC will be a busy time with final research outputs due in early 2006. A number of successful legacy projects will be packaged to continue beyond the CRC. We look forward to this period, which should see many of the benefits and potential inputs of 6 years of coastal research-for-management materialise.

Mr Will Bailey, AO
Chair

Dr Rob Fearon
CEO



The Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (Coastal CRC) is an unincorporated joint venture among the following parties:

- Brisbane City Council (BCC)
- Central Queensland University (CQU)
- Commonwealth Government
- CSIRO
- Curtin University of Technology (Curtin)
- Defence Science and Technology Organisation
- Geoscience Australia (GA)
- Griffith University (GU)
- James Cook University (JCU)
- Queensland Department of Natural Resource and Mines (QNRM)
- Queensland Department of Primary Industries and Fisheries (QDPI&F)
- Queensland Environmental Protection Agency (QEPA)
- The University of Queensland (UQ)
- The University of Western Australia (UWA)

with the support of several associate partners including:

- Fugro Survey Pty Ltd.
- Georeality Group Ltd.
- Hervey Bay City Council and Gosford City Council (affiliate partners)

- Parks Victoria
- Reson Inc.
- SGI (Silicon Graphics Inc.), and
- SonarData Pty Ltd.

The Coastal CRC operates a management company, Coastal Zone Australia Ltd., to hold the intellectual property in trust and manage contractual issues.

Current Board members

- Mr Will Bailey AO, Independent (Chair)
- Dr Elizabeth Truswell, Independent (Deputy Chair)
- Dr Roy Green AO, Independent
- Mr Barry Ball, Brisbane City Council
- Professor Errol Payne, Central Queensland University
- Professor Paul Greenfield, The University of Queensland
- Dr Colin Chartres, CSIRO
- Professor Helene Marsh, James Cook University
- Professor Lex Brown, Griffith University
- Mr Bob Speirs, Queensland Environmental Protection Agency
- Mr Don Begbie, Queensland Department of Natural Resources and Mines
- Mr Andrew Wyatt, SGI Inc.

- Dr Clinton Foster, Geoscience Australia (observer)
- Mr Tony Tate, Curtin University of Technology
- Professor Alistar Robertson, The University of Western Australia
- Mr Mike Potter, Queensland Department of Primary Industries and Fisheries
- Dr Alan Theabold, Defence Science and Technology Organisation

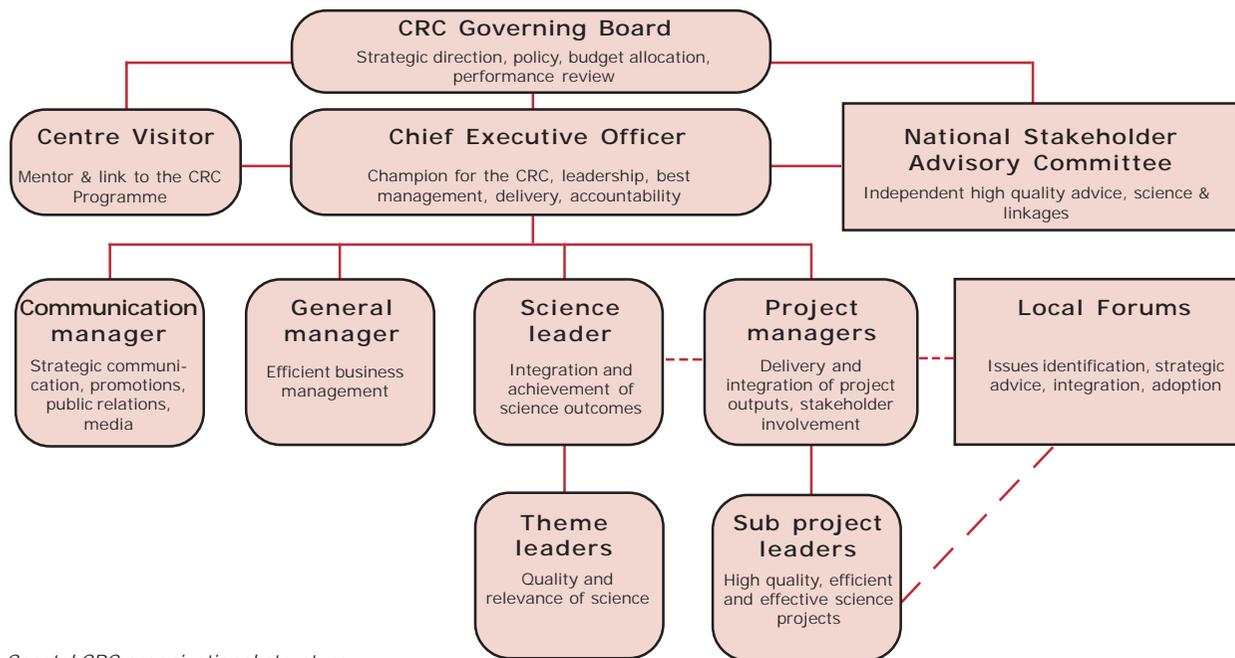
- Dr Barry Jones AO, Foundation Chair and Consultant to the Board
- Professor Henry Nix AO, is the CRC Visitor

The Board consists of independent and partner nominees and regulates all operations of the Centre including determining strategic development, reporting to the Commonwealth Government, approving projects, the annual budget and financial arrangements. It met three times during the year. The Chairman’s committee met once.

National Stakeholder Advisory Committee

The National Stakeholder Advisory Committee (NSAC) met twice during the year. The committee provided significant direction and national context for the development of projects for the second phase of the CRC. Committee members were integral to the identification of key research issues relating to coastal management. NSAC provided comment and advice on the research activities, project structure and the delivery of results. NSAC provided a forum for the members to update and exchange information on issues and initiatives of national significance relating to coastal management, providing the CRC with opportunities for linking to other national activities. NSAC consisted of the following members:

- Ms Diane James, Victorian Coastal Council (Chair)
- Cr Mike Berwick, Douglas Shire Council
- Dr Alastair Birtles, The Marine and Coastal Community Network
- Mr John Bishop, Queensland Farmers’ Federation
- Mr Mike Bugler, Bugler and Associates
- Ms Maria Comino, NSW Department of Infrastructure, Planning and Natural Resources
- Mr Colin Creighton, CSIRO Water for a Healthy Country Flagship
- Mr John Doohan, Sunfish



Coastal CRC organisational structure

- Ms Christina Dwyer, Queensland Department of Natural Resources and Mines
- Ms Rachel MacKenzie, Coastal CRC
- Dr Rick Morton, Association of Australian Ports and Marine Authorities
- Dr Darryl Low Choy, Griffith University
- Emeritus Prof Ian Lowe AO, Griffith University
- Ms Paula Tomkins, Great Barrier Reef Marine Park Authority
- Ms Claire Rodgers, Fitzroy Basin Association
- Mr Bill Sawynok, Infofish
- Dr Nick Schofield, Land and Water Australia
- Prof Bruce Thom, NSW State Department of Infrastructure, Planning and Natural Resources
- Dr David Williams, CRC Reef Research Centre
- Dr Blair Wood, National Land and Water Resources Audit

Executive management

Dr Rob Fearon is Chief Executive Officer. The CEO is responsible to the Board for the operational management of the Centre. The Centre Visitor, Professor Henry Nix AO, continued as a mentor and a link with the National CRC Program, and attended several staff and Board meetings.

The Centre's CEO and secretariat are based at Indooroopilly in Brisbane.

The Executive Management Group advises the CEO and manages the day-to-day activities of the Coastal CRC. These activities include staff management, ensuring quality of research, integration of activities, stakeholder participation, and allocation of resources. The group, which met monthly to coordinate the Coastal CRC and its activities comprised:

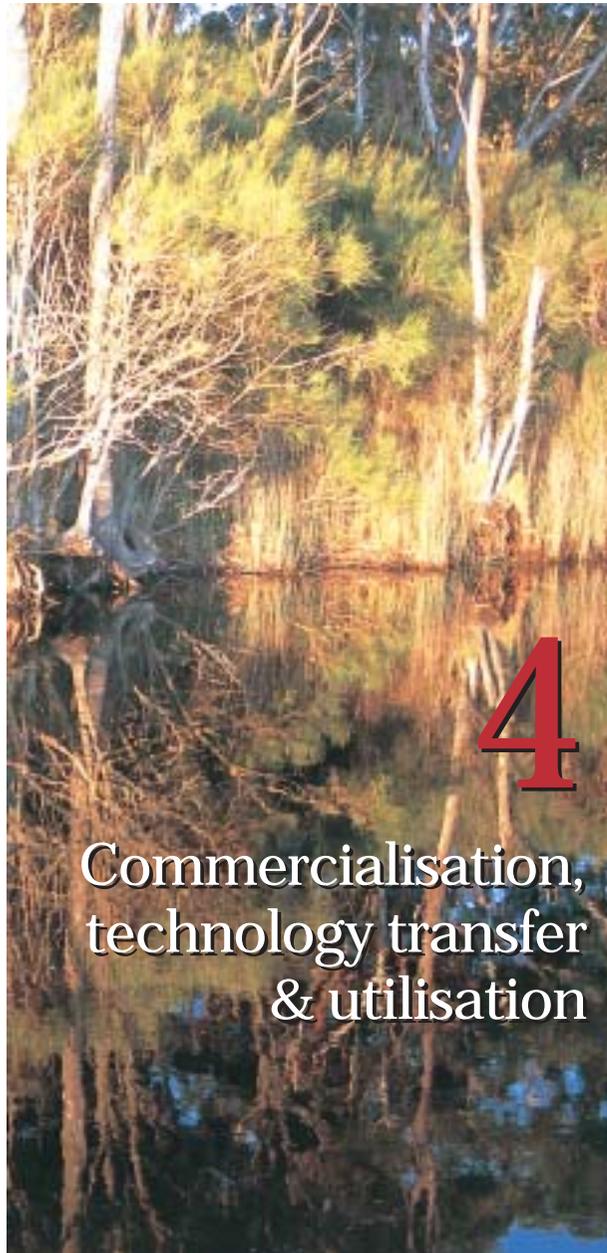
- Dr Rob Fearon, CEO, Coastal CRC (Chair)
- Dr Paul Lawrence, Theme Leader — Governance, Partnerships and Decision Frameworks (Queensland Department of Natural Resources and Mines)
- Dr James Whelan, Theme Leader — Governance, Partnerships and Decision Frameworks, (Griffith University)
- Professor Rodger Tomlinson, Theme Leader — Contaminants (Griffith University)
- Dr Peter Gehrke, Theme Leader — Wetlands (CSIRO)
- Dr Ron Johnstone, Theme Leader — Benthic Assessment (The University of Queensland)
- Mr Bob Noble, Agricultural (Fitzroy) Project Manager, (Queensland Department of Natural Resources and Mines)
- Ms Maria VanderGragt, Urban (South-East Queensland) and Industrial (Port Curtis) Project Manager, (Central Queensland University)
- Ms Rachel Mackenzie, Science to Enable Adaptive Management for Sustainability (SEAS) Project Manager, (Coastal CRC)

- Prof John Penrose, Coastal Water Habitat Mapping Project Manager, (Coastal CRC)
- Dr Regina Souter, Science Leader, (Coastal CRC)
- Dr David Scheltinga, Senior Project Officer, (Coastal CRC)
- Mr David Cameron, General Manager, (Coastal CRC)
- Mr Don Alcock, Communication Manager, (Coastal CRC)
- Ms Karen Snowden, Finance and Projects Officer, (Coastal CRC)

Participation arrangements

Organisations participate in the CRC in the following ways:

- CRC core partner — direct involvement in research, development and adoption, contribution of cash and in-kind resources, and a full range of benefits.
- CRC associate — direct involvement and financial contribution to selected projects, study areas, plus other benefits.
- CRC affiliate — selected involvement in projects and selected benefits.
- CRC stakeholder — participation in collaborative research, particularly by community and non-government organisations that are influenced, or affected by planning and policy decisions about the coastal zone.



Agricultural (Fitzroy region) project

Manager: Bob Noble

Scientific information and research from the CRC continued to be integrated into natural resource planning and management in the Fitzroy region through collaboration with other partners and associates with a 'source-to-sea' focus. The Natural Resource Management Plan developed by the Fitzroy Basin Association (regional management group for the area) was the first to be formally endorsed in Queensland. Support to the FBA continued with advice, data, and research and development provided for the Fitzroy coastal and Boyne/Calliope catchments.

Collaboration with GBRMPA in the re-zoning of marine bioregions continued through staff involvement in the Capricorn Local Marine Advisory Committee. Strong linkages were also made with Livingstone Shire Council in their planning for urban water supplies through the Community Reference Group and the independent Technical Panel.

Research teams were active in the estuary and coastal areas of the Fitzroy River; both in the field and working with stakeholders. Collaboration with natural resource managers and communication with stakeholders included a number of seminars and question-and-answer sessions.

Sediment, nutrient and contaminant dynamics studies in the Fitzroy estuary provided primary water quality data and knowledge that will be fundamental for the protection of the estuary and Great Barrier Reef.

Stakeholder analysis of the Fitzroy catchment identified all stakeholder groups involved in catchment management activities and mapped their values, aspirations and attitudes to the coastal zone. This information also allowed the design of the Central Queensland Healthy Waterways publicity campaign to be targeted and cost efficient.

Modelling of the Fitzroy produced computer models of the hydrodynamics (water currents and mixing), fine sediment dynamics and biogeochemistry for the Fitzroy estuary. The models will be used as a tool to predict how changes in the delivery of freshwater, sediments and nutrients from the catchment will impact on the ecological function of the estuarine system.

Highlights

- Accreditation of the regional Natural Resource Management Plan through FBA with the support of the Coastal CRC.
- Wrap-up of phase one research with a summary brochure and several comprehensive technical reports well received by stakeholders in the region.

- Implementation with stakeholder 'buddies' of phase two multidisciplinary research into water quality and contaminant dynamics, wetland resources and function, fisheries productivity and environmental flows, governance and partnership arrangements, beach stability and restoration, coastal water habitat mapping and socio-environmental history.
- Uptake of current research findings into marine, water supply and coastal natural resource planning processes by the Capricorn Local Marine Advisory Committee, the Great Barrier Reef Representative Area Program; Livingstone Shire Community Reference Group and Technical Panel for the Capricorn Coast Water Supply; 'Source-to-sea' collaborations with state agencies; and several conference and scientific publications.
- Continued sponsorship of the Central Queensland Healthy Waterways public awareness campaign, and development of a series of new television information segments, in conjunction with the Fitzroy Basin Association and other regional supporters.

Industrial (Port Curtis region) project

Manager: Maria VanderGragt

Highlights

Coastal CRC research made a significant contribution to regional natural resource planning and management, integrated port monitoring, and community participation in Port Curtis near Gladstone, through the adoption of scientific information.

- A coastal planning project with the Fitzroy Basin Association was completed. Results included a draft integrated natural resource management plan for the Boyne and Calliope River catchments (which used substantial CRC information from phase one research). The project recommended coastal and marine amendments to the draft Lower Fitzroy and Coastal Catchments Plan and the *Central Queensland Strategy for Sustainability 2004 and Beyond*. A series of presentations, and participation at 11 regional coastal and marine NRM information and target setting workshops, attended by over 220 coastal stakeholders, disseminated knowledge about Coastal CRC, and was used in the Boyne/Calliope regional planning project.

- Negotiations with industry in Port Curtis resulted in several industry and government organisations committing \$35,700 to field work for an evaluation of the Port Curtis hydrodynamic model developed by CSIRO Land and Water. Comalco, Queensland Energy Resources (formerly SPP), Boyne Smelters, Queensland Alumina Ltd, Central Queensland Port Authority and the Queensland Environmental Protection Agency contributed to the project. CSIRO committed to make the model commercially available.
- Subject to evaluation, local industry plans to use the hydrodynamic model for Environmental Impact Assessment and modelling of scenarios related to potential impacts associated with industrial site development, and to any shale oil stage two developments. Queensland EPA may also require the model to be applied for proposed coastal developments. This has the potential to substantially influence development approvals.
- The Port Curtis Integrated Monitoring strategy was completed by Sinclair Knight Merz and was based substantially on research from the Coastal CRC's phase one and phase two projects. Participation in the Port Curtis Integrated Monitoring Program is now a licence condition for a number of industries. Coastal CRC research continued to make a

contribution to integrated port monitoring design and researchers are providing an ongoing benefit to partner organisations through consultancy projects.

- Contaminant-sensitive oysters were used to monitor water quality in Port Curtis in a collaborative project involving Coastal CRC scientists from Central Queensland University and Griffith University. Results on assessing contaminant pathways in marine organisms have generated a high level of local interest and a national profile. Researchers collaborated with City University in Hong Kong to assess biochemical indices on contaminant exposure in oysters. Investigations indicate the project may have implications to manage the Fitzroy River estuary in addition to the Port Curtis estuary. The work is the first step to new tools to assess contaminant impacts.
- The Port Curtis intertidal wetlands project progressed and presented regional stakeholders with the results of several activities:
 - a review of the ecological literature about Port Curtis as a basis for conservation and management of human uses of the coastal system
 - preliminary results of a major survey of demersal (bottom-dwelling) fish

- sediment characteristics
- historical trends in recreational fish catches
- detailed mapping of wetlands systems
- conceptual modelling of processes influencing intertidal wetlands

Resource maps, linked in a Geographic Information System (GIS), were produced for natural resource planners, industry and local stakeholders to use for future coastal developments and environmental monitoring. Queensland DPI&F used data from various Landsat images and aerial photographs as baseline information on the extent and condition of coastal wetlands in the region. The project described what types of marine plants are growing, their importance to fisheries, and assisted resource managers to make recommendations on what conservation measures, such as Fish Habitat Areas, are needed to protect them for the future. Community organisations and industry stakeholders were highly supportive of the work and interested in the ideas about approaches to wetlands management and the mapping. The wetland mapping data is being considered by state government for EIS and development proposals.

- The governance and partnerships sub-project produced a biophysical indicator framework, and a social indicator framework and discussion paper. There is considerable interest in social indicators research with requests for copies of reports from interested organisations across Australia.

The industry and community partnership component of this sub-project produced a literature review on the theoretical underpinnings of organisational and institutional change, and links to community engaged in large-scale developments. The model will be tested in the coming year. Local government may adopt the model for planning grey water re-use programs and the team was invited to prepare the community consultation component for Ipswich Council.

- A Central Queensland Healthy Waterways television campaign, initiated by the Coastal CRC, was continued in Port Curtis. Twelve segments about science and catchment management aired weekly on WIN TV in 2004. Topics included GBR water quality monitoring and the importance of riparian vegetation and water flows for fish productivity.
- Coastal managers and scientists requested a number of technical reports and scientific papers about CRC research in Port Curtis. Over 70 re-

quests for the publications on historical fishing trends, industry community partnerships literature review and social indicators reports were made in a three-week period.

Urban (south-east Queensland) project

Manager: Maria VanderGragt

Highlights

- Sewerage overflows are an intermittent source of pollution downstream from urban centres. A study of the impacts of sewage in urban creeks found that wet- and dry-weather overflows do create a significant hazard to swimmers, pending a complete tidal change. It also found that, in relation to wet-weather overflows, the overwhelming bulk of the stress on ecological health is attributable to stormwater. A synthesis report on the impact of sewage overflows to Lota Creek in Brisbane was produced for Brisbane City Council and Brisbane Water. An economic evaluation of the project by ACIL Tasman found that Brisbane City Council indicated a 'value of options' from the study – relative to options it would face without such knowledge – to be worth more than \$100

million. The report was summarised in the Australian Water Association's journal *Water*, presented to several international conferences and circulated widely to local governments around Australia.

- Advice was provided to a number of government, community and scientific organisations. Coastal CRC staff and scientists participated in South-East Queensland Science Network and South East Queensland Natural Resource Management investment planning committees to provide expert advice on coastal science, planning and management issues. Staff helped to develop a Geographic Information System to prioritise regional investments in natural resource management.
- Integrated coastal zone planning and collaborative research was promoted to professional organisations throughout Australia and overseas. An international coastal conference was held in Brisbane in September 2004. The Coastal CRC and CSIRO Sustainable Ecosystem planned, sponsored and hosted the Coastal Zone Asia Pacific conference, which attracted 300 delegates. Queensland Environmental Protection Agency, the National Oceans Office and AusAid provided considerable support and sponsorship. A number of CRC students, researchers, staff and stakeholders attended the conference, presented papers, facilitated sessions and led field trips. Selected papers will be published in a future edition of Coastal Management, an international journal of Marine Environment, Resources and Law.
- The governance and partnerships sub-project excelled in consultation and communication with regional natural resource management groups and other decision-making audiences. A report 'Barriers and Bridges to Natural Resource Management' generated considerable interest from local stakeholders in south-east Queensland and other regions throughout Australia.
- A joint Coastal and Catchment Hydrology CRC study in south-east Queensland demonstrated that riparian zones play an important role in reducing the amount of nitrate flowing into waterways, thereby protecting downstream aquatic ecosystems. These zones can remove over 90% of the nitrate from the groundwater that flows through them. Nitrate typically comes from fertilizers, sewage or the breakdown of organic matter. Excess nitrate can contribute to undesirable algal blooms. Specialised soil bacteria remove nitrate permanently from the riparian zone (a process called 'denitrification') and convert it to harmless

nitrogen gas. To increase the potential for denitrification, levels of organic carbon in the soil need to be increased. Riparian vegetation plays a key part in adding carbon to soil reserves.

- The Urban Wetlands (Coomabah Lake) project established a local stakeholder reference group with representatives from Gold Coast City Council, Queensland DPI&F and Queensland NR&M. The project received publicity in *Sci-info Bulletin* that was circulated throughout Queensland. The group submitted a literature review on the impacts of urbanisation on wetlands for publication in a special edition of *Austral Ecology*. The project attracted additional funding for postgraduate students through the Queensland Smart State scheme, and additional funds are being negotiated with the Department of Primary Industries and Fisheries.

Science to Enable Adaptive Management for Sustainability (SEAS)

Manager: Rachel Mackenzie

Research conducted by the Coastal CRC has national application. The SEAS projects were developed to effectively integrate the outcomes of the place-based research and foster nationally focussed coastal re-

search projects. At a national scale, links between scientists, estuary managers and the community continued through the National Estuaries Network and the National Stakeholder Advisory Committee.

Highlights

- The knowledge integration and exchange project is building a decentralised store for information about Australia's coastal region. This capacity builds on the existing tools such as the OzEstuaries database and website (www.ozestuaries.org). The project team worked closely with stakeholders to develop a database for the Estuarine, Coastal and Marine Indicators for Regional Monitoring data, and other water quality information. The team also obtained input from state estuary managers throughout Australia through the National Estuaries Network.
- The characteristics of many estuaries in Australia are poorly documented, particularly for those estuaries in a near-pristine condition. The Pristine Estuaries project is mapping the habitats of a selection of estuaries, facilitating a comparative analysis geomorphology of relatively minor catchment disturbance. The project team collaborated with Conservation Volunteers Australia and the National Estuaries Network in delivering the

outputs of the project to date. The project team developed an innovative new mapping technique which they described at the recent Australian Marine Sciences Association Conference.

- The use of modelling to simulate coastal waterways has huge potential but requires careful selection of model platforms and associated monitoring regimes. The modelling, monitoring and management project fostered greater linkages between management needs and modelling and monitoring, and began developing a decision-support tool. An Australia-wide decision-support system user group was set up for the team to obtain feedback about the project.
- A series of National Water Quality Management Strategy workshops, in partnership with the Federal Department of Agriculture, Fisheries and Forestry and funded under the Australian Government's National Landcare Program, were conducted in several states to improve the capacity of regional planners and catchment groups to manage water quality in their regions. The workshops covered training in water monitoring, policy, planning, indicators and guidelines.
- The Remote Sensing for Coastal Water Quality project addressed stakeholder requirements for

regularly updated maps of coastal environments, in particular, maps showing water quality (sediment load and other bio-optical variables such as chlorophyll *a*) and aquatic vegetation (seagrass, algal blooms). The project team is conducting the most extensive field and image-based surveys of aquatic vegetation and water quality. A toolkit will instruct scientists and managers on how to implement remote sensing approaches.

- The Enabling Adaptive Management project team is working with the Mackay-Whitsunday Regional NRM group to improve partnership arrangements for natural resource management using the adaptive management framework. The EAM team seeks to add value to and support partnerships between regional NRM groups responsible for developing and implementing the Mackay-Whitsunday regional NRM plan. EAM support includes mapping the existing institutional and operational arrangements and the development of a linked database. These tools help identify complementary activities that contribute to protecting the natural resource assets.
- The Environmental Planning for natural resource management project is focussed on examining the cooperative and collaborative planning and management arrangements associated with the

recently formed natural resource management (NRM) regional bodies. It has a particular focus on the implementation phase of the NRM regional planning process while examining the role of local government in the process. Furthermore, this project will explore opportunities for enhanced capacity building that facilitates improved local government involvement in NRM. The project also seeks to understand how science-based outcomes, expected to be derived from these new cooperative planning arrangements, can supplement and enhance the existing statutory and non-statutory planning processes and practices of local government at the regional scale.

Coastal Water Habitat Mapping project

Manager: John Penrose

Aim: The Coastal Water Habitat Mapping project aims to develop and apply technologies for the rapid and cost-effective assessment of shallow marine habitats.

Highlights

- The Shallow Waters Assessment Technologies sub-project successfully completed scheduled field-work at four sites on the eastern Australian

seaboard. A combination of multi-beam, single-beam and side-scan sonars were deployed, together with towed video, sub-bottom profiling, grab and core sampling and aerial photography/spectrometry (CASI). Eight stakeholder organisations took part in the extensive field program, which was carried out within budget and on schedule. These field activities have facilitated access to a variety of seabed habitats and morphologies, including the first opportunity to date to work over coral substrates.

- The Benthic Biology and Assessment Classification sub-project analysed field and remotely sensed data from the two major field surveys made in the first half of 2004. This work included seagrass mapping of Success and Parmelia Banks in Cockburn Sound; an industry-funded project to compare 2004 mapped seagrass distributions with earlier mappings made in 1999 and further work was carried out on the Eastern Shelf of Cockburn Sound. Using technology developed in the project, it is possible to build reconstructed digital surfaces of seabed features for three-dimensional viewing and fly-throughs as well as volume calculations. The sub-project was awarded the Chair's Innovation Award at the CRC Annual Workshop.

- The Coastal Geomorphology sub-project continued to contribute to the program in terms of both geological/geophysical field-work and interpretation and as the project's primary data host. A coastal survey in central Queensland profiled the sources, sinks and pathways of sediment in the Fitzroy River estuary and Keppel Bay. Using a combination of sediment cores and acoustic data, researchers from [Geoscience Australia](#) and [James Cook University](#) built an historical picture of the seabed's geology, shape and composition.
- Work at Keppel Bay in the central Queensland coast show various morphologies and deep sediment built up during the Holocene age (the last 10,000 years), including the Fitzroy River's ancient river channel, submerged sandbars and sedimentary deposits built up over the ages.
- A revision of the Toolkit of Techniques and Interpretation sub-project was undertaken by Prof. John Penrose and Dr. Des Lord and a new sub-project leader, Mr Bill Russell-Cargill was appointed. A new form of the Toolkit is now emerging. Management of data, software, mapping images, technical training and interpretation material will also be informed by the extensive experience being gained from commercial and partnership work being undertaken.
- A major coastal mapping project started with Parks Victoria and several other organisations. Victoria's Minister for Environment John Thwaites launched the joint project with the Coastal CRC involving technology and expertise with the Perth-based marine survey company, Fugro Survey Pty Ltd. The \$1 million partnership mapped several of Victoria's deepest marine parks for the first time. Other members of the joint project include the University of Western Australia, University of Tasmania, Geoscience Australia and Curtin University of Technology. The first stage surveyed marine parks at Point Addis and sections of Wilsons Promontory. By June 2006, Cape Howe, Point Hicks, Twelve Apostles and Discovery Bay will also have been mapped.
- A key activity was conducting a unique series of comparative surveys, using acoustic and video techniques, in an area off the Perth metropolitan coast, in the Hillarys region. Results from the exercise will enable Western Australia's marine park managers to see the benefits of various systems and assess their suitability for the range of applications such as monitoring sediment movement, mapping underwater habitats, measuring biological changes over time, and planning marine protected areas.
- Backscatter interpretation associated with swath system analysis was developed, and significant progress was made in specialized video and image processing. These developments are reflected in a series of scientific publications now emerging.



Contaminant dynamics

Leader: Professor Rodger Tomlinson

Aims: to explore the inputs, processing and fate of a range of contaminants in near-shore coastal environments. The research is undertaken through a range of process studies and numerical modelling approaches combined with remote sensing. This package integrates a range of biophysical data and knowledge on ecosystem processes, particularly through predictive models that allow decision-makers to consider scenarios and potential ecosystem impacts.

Highlights

The contaminants package contributed significant understanding to the impacts, dynamics and movement of particular contaminants such as copper, excess nutrients such as nitrogen and phosphorous, and sediment to estuaries in central Queensland. In Port Curtis, research indicated that contamination is uncommon and only a few trace metals occur in concentrations higher than national guidelines. Surveys of Port Curtis included a contaminant assessment of water, sediments and marine organisms, and an examination of the effects of the contaminants on marine life. Although concentrations of some dissolved metals were elevated in harbour water, they were not above levels of regulatory concern and returned to natural background levels in coastal waters.

A new hydrodynamic model tested in the harbour determined that water flushing times are longer than previously thought – around 19 to 24 days. Metal concentrations were high in a range of plants and animals living within the port compared to those from a coastal reference area. This may be due to the high retention time of water (and therefore available contaminants) in the harbour.

New methods were used to assess the health of organisms exposed to contaminants in the harbour. They include the use of biochemical markers such as stress enzymes in oysters, and imposex (growth of male genitalia in females) in snails. In addition, laboratory studies explored different responses of organisms to periodic or continuous exposure to discharged contaminants.

Sediments were found to contain much lower levels of naphthalene (a potentially harmful Polycyclic Aromatic Hydrocarbon, PAH) than previously thought. PAHs are derived from a number of sources including oil shale and coal, but levels across the harbour were well below guidelines. Sediment cores also indicated that there have been no major contaminant inputs in recent history.

In the Fitzroy River Basin, research described processes and interactions of water quality parameters such as sediments, nutrients and pesticides, with ecosystem health in the estuary, Keppel Bay and the Great Barrier Reef lagoon. This understanding was extended

through incorporating data into numeric water, sediment and biogeochemical models for the region.

A study of cores taken on the Fitzroy estuary floodplain and Keppel Bay revealed a fascinating geological history of sediment deposition and movement in this coastal zone. It shows how this had changed after European settlement and the implications of these changes. A number of PAH's are present in parts of the cores deposited well before European settlement so these compounds are not the result of urban or industrial activities, and concentrations are well below guidelines. Concentrations of nickel and antimony, which exceed recommended levels, are present down the core and are therefore of natural geological origin.

As agricultural land uses dominate in the Fitzroy River Basin, considerable concentrations and loads of sediments, nutrients and pesticides carried into the estuary, and potentially out to the Reef lagoon during summer floods, were measured. Models were designed to predict how these materials move in the estuary and inshore coastal areas. Likely negative impacts, and improvements in ecosystem health from management of land, vegetation and water resources in the basin, can now be more accurately assessed.

State government agencies and the Fitzroy Basin Association, which financially supported the project, are using the results in regional natural resource planning and management in the region. Incorporating this new information from current research will greatly

assist the move towards improved water quality and other goals of the Reef Water Quality Protection Plan.

Governance, Partnerships and Decision Frameworks

Leaders: James Whelan and Paul Lawrence

Aim: The Governance, Partnerships and Decision Frameworks package aims to develop understanding and promote effective institutional arrangements for sustainable natural resource management.

There are three research projects that focus on collaborative management, industry-community partnerships, integrated environmental indicators and decision frameworks as elements of regional natural resource management arrangements. These elements relate closely to adaptive management and the CRC's mission to bridge the gaps between science, the community and decision-makers by fostering collaborative coastal zone science and processes of social learning and negotiation. Outcomes from this package demonstrate an improved business of doing partnership-based NRM science.

Dr James Whelan of Griffith University and Dr Paul Lawrence of the Queensland Department of Natural Resources and Mines shared leadership for this package. Between May and December 2004, Peter Oliver

of QNRM acted as co-leader. This package includes the following sub-projects: Adaptive Management, Environmental Planning, Software for Knowledge Integration and Exchange (SKIE), Governance and Partnerships, and Dialogue and Knowledge Exchange projects

Highlights

- Collaboration between large developers and local community groups can save money, environmental damage and investment risk – providing there is genuine communication and an equal sharing of power. A project on Industry-Community Partnerships found strategic partnerships between companies and local communities could be set-up to guide and direct development, and provide an ongoing basis for communication and negotiation of differences. Research demonstrated that, to achieve environmental, economic and social goals, these types of relationships are necessary. It found that industry leaders are increasingly recognising the importance of strategic relationships with local people. Queensland EPA and Department of NR&M actively participated in the Industry-Community Partnerships project, along with Calliope Shire Council and Cement Australia.
- Researchers James Whelan and Peter Oliver were engaged to provide advice and assistance to NRM SEQ Inc. This regional NRM body seeks to map

social capital, as measured according to a set of provisional indicators. Researchers also assisted the Queensland Consortium for Integrated Regional Management with a series of seminars related to social and economic research.

- Mackay-Whitsunday NRM (MWNRM) group and agencies in the region advanced adaptive management through a database developed in collaboration with the Coastal CRC. The database is a decision-making tool for progressing agreements on in-kind contributions and complementary regional deliverables amongst agency and regional body stakeholders for achievement of targets in the Mackay-Whitsunday NRM Regional Plan. Mapping institutional arrangements in the region in collaboration with regional stakeholders provided visual decision-making tools to support adaptive management in the region. MWNRM regional body installed the interactive maps on its website for open access.
- Researchers developed an extensive social and economic profile of Western Australia's Recherche Archipelago to underpin the region's future planning and management. A community initiated socio-economic study detailed the Archipelago's use by local residents, private operators and community organisations. The study produced a 'social map' that described the multiple uses, pressures and conservation priorities for the region's coastal waters. The study involved the

Recherche Advisory Group, Goldfields Esperance Development Commission, Esperance Council, The University of Western Australia, and WA Department of Conservation and Land Management.

- The Citizen Science Toolbox continued to be used by natural resource managers and community groups in Australia. Rangelands Australia has applied stakeholder engagement tools for a 'Building Effective Stakeholder Engagements' training course. It has been used to guide staff in a training manual by Victoria's Department of Sustainability and Environment, and has been referenced for government officers involved in community participation in Queensland's Department Natural Resources and Mines, and Environmental Protection Agency.
- Innovative science was disseminated widely. Researchers published several technical reports, which have been widely disseminated and well received. These include (1) Bridges and barriers to collaborative natural resource management in South East Queensland; (2) Decision frameworks: Assessment of the social aspects of decision frameworks and development of a conceptual model; (3) Toward a collaborative model of industry / community relationships in environmental management; (4) A conceptual framework for selecting and testing potential social and community health indicators linked to changes in coastal resource management or condition; and (5)

Coastal CRC – Enabling Adaptive Management Brochure in Mackay-Whitsunday region.

- James Whelan and Paul Laurence convened two workshops to revise and extend communication strategies associated with projects, and to identify and take advantage of opportunities for integration. Outcomes included an integrated set of conference papers for the 2006 International *Riversymposium* and a summary of the six research projects that comprise this package, which was disseminated to regional groups and other stakeholders and audiences.
- The 'Human Dimensions of Natural Resource Management ('Humdimmers') network increased to 90 members. The network hosted monthly lunch-time research seminars, maintained an email discussion group, encouraged collaboration among social researchers in Australia and overseas, and generated peer review of scientific papers.

Wetlands

Aim: To improve the management of coastal wetlands through better understanding of the processes that drive environmental, social and economic values of wetlands. Integrated wetlands projects across regional and national project areas focus on identifying:

- What do wetlands contribute to coastal ecosystems?
- What are the values associated with coastal wetlands?
- How does catchment use threaten wetland values?
- How can these threats be mitigated?

By establishing a package of projects focussing around wetland issues the CRC fosters an atmosphere that promotes professional exchanges and networking among wetland scientists, diverse stakeholders and natural resource managers responsible for coastal wetlands.

Activities

Research effort focussed on modelling the role of riparian vegetation on groundwater nutrient influx to wetlands; investigating changes in the biogeochemistry of urbanised wetlands and resultant ecological changes; identifying the role of floodplain wetlands to fisheries production; establishing the trophic pathways in intertidal wetlands and how they respond to disturbance;

assessing effects of freshwater inflows to estuaries on commercial fishery production; and valuing environmental goods and services provided by wetlands.

A series of scientific workshops was convened to build an integrated overview of wetland function through these projects, also drawing on knowledge obtained through the earlier research projects. The workshops identified where wetlands research made significant scientific advances leading to new scientific understanding of wetland function, as well as implications for wetland management by stakeholders arising from new information. The workshops focussed on synthesising the science undertaken in each project, through to refining conceptual models of wetland function. The approach identified significant new knowledge, as well as inconsistencies among existing models, to derive new overarching conceptual models of wetland function and the effects of change on wetland values.

A client-focussed project has been established to value-add to the wetlands package by synthesising outputs and outcomes from individual projects at a higher level, to identify and highlight implications for management, and to communicate these outcomes to stakeholders in coastal wetlands in a manner that addresses their information needs.

Highlights

The project on modelling and managing nitrogen in riparian zones to improve water quality produced a

quantitative, user-friendly model of groundwater denitrification. The model has been included in a Catchment Modelling Toolbox to enable widespread use by land managers to improve nitrogen management in wetlands.

The project, focussing on identifying the contribution of wetland habitats to fish production, developed a new conceptual model of the role of floodplain wetlands in aquatic life-cycles, based on physical and biological connectivity, habitat suitability, trophic relationships, and the diversity of wetlands in the floodplain mosaic. Detritivorous fish dominate these wetland communities, and provide a rich food source for larger predatory fish and birds that move between wetlands. Because each type of wetland pool harbours a characteristic fish assemblage, maintaining the diversity of habitat types is critical to sustaining the entire fish assemblage of the combined floodplain and estuarine system.

Studies in intertidal wetlands identified seagrass beds, including epiphytic algae, as the primary source of carbon for estuarine food webs. Whilst fish species like mullet feed actively in the upper intertidal zone, other species like whiting do not feed in these habitats, and may move with the tidal fringe to avoid predators. These findings led to the development of new conceptual models of the contribution of intertidal wetlands to coastal ecosystems, including tidal and freshwater hydrology, food web processes, the role

of climate and natural disturbances, and human activities.

Linking studies of wetland processes and estuarine biogeochemistry has produced a new conceptual model for the role of freshwater inflow to estuaries for production of commercial species such as prawns and fish. Three phases of response to flow were identified, based on physical and chemical changes; changes in primary production; and resultant changes in trophodynamics, species movements and population dynamics. The nature of response in each phase depends on the timing and magnitude of flow events, and the degree of over-bank connectivity. This model represents a significant advancement in knowledge of the dependency of estuaries on freshwater inputs, and will allow estuarine flow needs to be included in environmental flow decisions.

Benthic assessment

Leader: Ron Johnstone

Aim: to develop shallow water mapping and assessment methodologies and create tools that make these techniques more accessible to coastal managers.

Research products include seabed maps, remotely sensed images, and a web-based resource that describes mapping technologies, their costs, advantages and disadvantages, and how best to access them. This resource tool will be used for information dissemina-

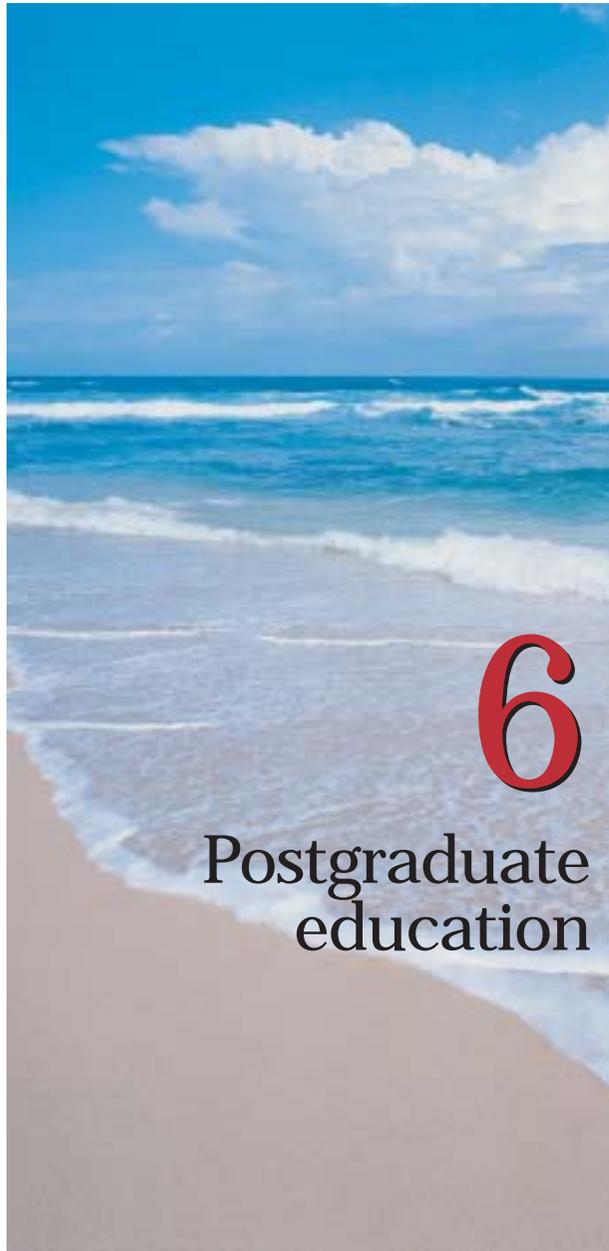
tion and for commercial promotion in conjunction with SME partners and affiliates. It will describe the science behind the techniques and show how different methodologies can best be used for different types of seabed habitat mapping and monitoring.

The benthic assessment package focussed on the collection, collection, and integration of a range of information across different spatial and temporal scales. This includes data from aerial and satellite platforms, acoustic and visual mapping, and biogeochemical processes in different benthic communities. Within the framework of these efforts, some of key technical advances made included:

- new algorithms to translate and correct satellite imagery data to more accurately account for different atmospheric conditions and water quality.
- improved techniques for automated analysis of satellite image data.
- effective systems and techniques to integrate sonar and video-based benthic mapping techniques.
- analytical techniques to assess issues of confidence and errors associated with the use of ecological data across different spatial scales.

These technical advances have been accompanied by the development of a number of synthesis products that include interactive dynamic systems models, a

remote sensing toolkit, a benthic mapping toolkit and direct application of these in coastal management initiatives. Two good examples of this are the roll-out of the benthic mapping system in support of Parks Victoria's efforts to characterize marine protected areas, and the inclusion of the dynamic modelling approach in the development of approaches for managing algal blooms in Moreton Bay.



The postgraduate education program seeks to build a culture that links formal education at doctoral, masters and other levels with industry skills and applied action research projects. It provides support for students' own research projects, participation in related CRC projects, and involvement in a professional development and training program that complements the traditional research provided by a postgraduate degree.

Highlights

- The Coastal CRC supported 23 research higher degree students through one of the CRC's partner universities. The studies included MPhil and PhD candidates with research topics relevant to the CRC's objectives.
- An Education Committee met bi-monthly and provided planning and advice for education and training activities. The committee was responsible for the development and evaluation of a range of seminars and training workshops, and assisted with the needs of individual students.
- The postgraduate education program continued to offer students the opportunity to participate in various forms of professional development activities. These activities included short courses, workshops and practical training activities in media skills, multi-variate and Matlab statistics, time management and integrating science and communities.
- The Young Water Scientist of the Year Award is designed to highlight the valuable role played by the Water Forum CRCs in training the scientists of the future. The five CRCs in the Water Forum group are the CRCs for Coastal Zone, Estuary and Waterway Management, Catchment Hydrology, Freshwater Ecology, Environmental Biotechnology, and Water Quality and Treatment. These CRCs are developing a new generation of scientists with a special blend of skills that include quality science, good communication skills and an understanding of industry. Cara Beal is a finalist in the 2005 Award. She will present her research on sustainable on-site wastewater treatment during *Riversymposium 2005* in Brisbane.
- Russell Richards presented his research to the CRC Association Conference held in Melbourne during May 2005. He argued that as a health indicator, Sydney Rock oysters are one of the best bio-indicators as they process litres of water every day from the environment, accumulating contaminants such as copper inside their flesh. His research provides a predictive computer model as a tool to monitor ecosystem health for marine managers.
- PhD students, Brenton Chatfield and Linda Cobiac attended a CRC Business Leadership and Ca-

reer Development Course in Melbourne, September 2004. The course, run by the University of Melbourne's Business School, covered knowledge and skills in leadership, motivation, communication, and team processes. Linda was awarded a scholarship to attend.

- PhD student Linda Cobiac was highly commended in Queensland's Smart Women – Smart State Awards. Linda is working on new method to help urban planners better assess the sustainability of stormwater systems. Current methods assess water quality and flow but Linda's model adds economic, social and environmental issues. Her research will help reduce waterway pollution, encourage re-use and recycling of stormwater resources and develop community education programs.
- Students presented successfully at various conferences. Ann Penny won the best student poster award at the Estuarine and Coastal Sciences Association and Estuarine Research Federation's international conference in Ballina for her project on fish fauna of intermittently connected wetlands. Jane Wilson and Ron Baker won the best student poster award at the Australian Society for Fish Biology's national symposium in Adelaide for their research into tropical estuarine fish communities.
- A seminar series complemented the education program throughout the year. Four student semi-

nars were presented. The audience varied from between 20 to 45 participants with representatives from various stakeholder groups, research participants, Executive Management Group members, CRC staff and other students.

- Andy Bickers and Julie Anorov, July 2004.
- Ann Penny, November 2004.
- Philip Haines, April 2005.
- Thirteen new and existing students participated in a workshop with staff and guest presenters to learn about the importance of understanding stakeholder needs before synthesising research results. Students also became aware of how to write grant applications and how to manage data.
- Seven associate and affiliate students were supported to conduct their research within a collaborative environment with senior scientists, attend conferences and access information relevant to their studies.

Completion of research

Four students submitted their research theses for examination. They were:

Michelle Greymore	PhD	GU
Michaela Guest	PhD	GU
Fiona Manson	PhD	UQ
Sean Ryan	MPhil	UQ

Five students were awarded their degrees within the reporting period: Julie Anorov, Michaela Guest, Fiona Manson, Peter Oliver and Sean Ryan.

Student attendance at conferences

The CRC supported students to develop their research competencies and financially assisted them to attend international and national conferences. The conferences included:

International

- American Limnology and Oceanography (ASLO) 2005 Aquatic Sciences Meeting, 20-25 February, 2005, Salt Lake City, USA.
- International Conference on Underwater Acoustic Measurements: Technologies and Results, 28 June – 1 July, 2005, Crete, Greece.
- International Council for the Exploration of the Seas (ICES) Annual Science Conference, 21-26 September, 2004, Vigo, Spain.
- IEEE/OES Oceans'05 Europe Conference and Exhibition, 20-23 June, 2005, Brest, France.
- The 7th INTECOL International Wetlands Conference, 25-30 July, 2004, Utrecht, The Netherlands.

National

- Australian Society for Fish Biology (ASFB) 2004 Annual Conference, 19-21 September, 2004, Adelaide, Australia.
- Coastal CRC Mini Conference 2004, 16 September, 2004, Coolangatta, Australia.
- Coastal Zone Asia Pacific (CZAP) Conference 2004, 5-9 September, 2004, Brisbane, Australia.
- Contaminated Site Remediation International Conference, 16-18 September, 2004, Adelaide, Australia.
- CRC Association Conference 2005: Showcasing CRC PhD Students, 18-20 May, 2005, Melbourne, Australia.
- Indian Ocean Marine Environmental Conference, 14-18 February, 2005, Perth, Australia.
- National Symposium on Ecosystem Research and Management of Fisheries, 22-24 September, 2004, Adelaide, Australia.
- OzWater 2005 Convention and Exhibition, the national convention of the Australian Water Association, 8-12 May, 2005, Brisbane, Australia.
- *Riversymposium* 2004, 31 August – 3 September, 2004, Brisbane, Australia.
- The 3rd International Workshop on Chemical Bio-availability in the Terrestrial Environment, 13-15 September, 2004, Adelaide, Australia.
- The 9th Arbovirus Research in Australia and 6th Mosquito Control Association of Australia Conference, 22-27 August, 2004, Noosa, Australia.

Postgraduate Students – Scholarships

Name	Degree	Sship	Univ	Start	Research Project Title	Principal Supervisor	Associate Supervisor/s
Baker, Ronald	PhD	Full	JCU	14.01.2002	Biological connectivity within and between estuarine and coastal nursery grounds in the Fitzroy/Port Curtis management areas	Marcus Sheaves (JCU)	
Baxter, Katrina	PhD	Top up	UWA	25.08.2003	Reconciliation, modelling and prediction of sea floor terrain and marine habitat characteristics within the Recherche Archipelago	Kimberly Van Niel (UWA)	Mark Shortis (RMIT) Gary Kendrick (UWA)
Beal, Cara	PhD	Full	UQ	04.03.2002	Tool kits to predict water quality in non-sewered subdivisions	Neal Menzies (UQ)	Ted Gardner (QNRM) Gunnar Kirchof (UQ)
Burton, Eddie	PhD	Op	GU	29.01.2002	Distribution, fate and toxicity of trace metals in coastal sediments	Ian Phillips (GU)	Darryl Hawker (GU)
Chatfield, Brenton	PhD	Top up	UWA	02.02.2004	Use of GIS for spatial modelling and prediction of marine benthos	Gary Kendrick (UWA)	Kimberly Van Niel (UWA)
Cobiac, Linda	PhD	Full	UQ	24.03.2001	Decision support for sustainable management of urban stormwater	Hugh Possingham (UQ)	Milani Chaloupka (UQ) Jackie Robinson (UQ)
Cox, Melanie	PhD	Full	UQ	17.10.2001	Integrative indicators for ecosystem health on human welfare	Ron Johnstone (UQ)	Jackie Robinson (UQ)
Cully, Tara	PhD	Full	UQ	27.01.2004	Examining the effects of economic development on the carbon sink and coastal protection functions of wetlands in the Gladstone region	Tor Hundloe (UQ)	Jackie Robinson (UQ)
Diatloff, Nicole	PhD	Full	UQ	01.05.2000	Wastewater management in low population density areas: An integrated framework for sustainability	Jurg Keller (UQ)	Roger Shaw (CRC) Thomas Loetscher (UQ)

Name	Degree	Sship	Univ	Start	Research Project Title	Principal Supervisor	Associate Supervisor/s
Graymore, Michelle	PhD	Full	GU	17.03.2001	The sustainable human carrying capacity of south east Queensland	Roy Rickson (GU)	Neil Sipe (GU) Roger Shaw (CRC)
Johnston, Ross	PhD	Top up	JCU	31.03.2000	Patterns of habitat/micro-habitat use by fishes in estuaries	Marcus Sheaves (JCU)	John Kirkwood (QDPI&F)
Knight, Jon	PhD	Top up	UQ	16.02.2000	Mapping mangrove ecosystems using remotely sensed data to determine structure and composition as ecosystem health indicators	Stuart Phinn (UQ)	Pat Dale (GU) Norm Duke (UQ) Alex Held (CSIRO)
Parnum, Iain	PhD	Full	Curtin	15.03.2004	Identifying coastal sea floor properties using single and multibeam sonar	Alexander Gavrilov (Curtin)	Tim Pauly (SonarData Pty Ltd.)
Penny, Ann	PhD	Top up	JCU	25.08.2003	Fish faunas in floodplain wetland habitats an agricultural area	Marcus Sheaves (JCU)	
Pillans, Richard	PhD	Top up	UQ	15.03.2000	Physiological ecology of the euryhaline bull-shark, <i>Charcharhinus leucas</i> , in the Brisbane River	Craig Franklin (UQ)	Gordon Grigg (UQ)
Pillans, Suzanne	PhD	Full	UQ	26.04.2000	Assessing the effectiveness of no-take marine reserves in subtropical Queensland	Ron Johnstone (UQ)	Hugh Possingham (UQ) Geoff Dews (ENRM)
Richards, Russell	PhD	Full	UQ	24.08.2000	Modelling the kinetics of toxicant bioaccumulation in bivalves for use as a water quality modelling and monitoring tool	Peter Bell (UQ)	Milani Chaloupka (UQ)
Schacht, Christie	PhD	Full	GU	01.02.2002	Flocculation and deflocculation in estuaries	Charles Lemckert (GU)	Phillip Ford (CSIRO) Ian Webster (CSIRO)
Sheaves, Janine	PhD	Full	JCU	11.03.2002	The effect of altered stream flow on benthic invertebrate communities along the freshwater-estuarine gradient of coastal streams	John Collins (JCU)	Richard Pearson (JCU) Satish Choy (QNRM)

Name	Degree	Sship	Univ	Start	Research Project Title	Principal Supervisor	Associate Supervisor/s
Stowar, Marcus	PhD	Top up	UQ	15.03.2000	Development of rapid biological assessment techniques based on benthic macrofauna for estuaries in south east Queensland	Greg Skilleter (UQ)	Alan Jones (Aust. Mus.) Andrew Moss (QEPA)
Tseng, Yao-Ting	PhD	Full	Curtin	25.08.2003	Techniques for the interpretation of acoustic backscatter from marine benthic communities	Alexander Gavrilov (Curtin)	Rob McCauley (Curtin) Alec Duncan (Curtin) Gary Kendrick (UWA)
Watson, Dianne	PhD	Top up	UWA	25.08.2003	Techniques for assessing the relative abundance, density and length frequency of coastal demersal fish assemblages	Gary Kendrick (UWA)	Euan Harvey (UWA)
Wilson, Jane	PhD	Top up	JCU	12.02.2001	The impact of modified flow on the trophic organisation and function of estuarine fish faunas	Marcus Sheaves (JCU)	Julie Robins (QDPIF)

Postgraduate Students – Associates and Affiliates

Name	Degree	Type	Univ	Research Project Title	Principal Supervisor	Associate Supervisor/s
Bickers, Andy	PhD	Affil	UWA	Broad scale assessment of marine habitat and benthic community structure using sonar and video techniques	Gary Kendrick (UWA)	John Penrose (Curtin)
Fox, Samantha	PhD	Assoc	CQU	A conceptual framework for the initiation, development and implementation of holistic and integrated coastal, estuarine and port ecosystem health monitoring programmes, and planning and management strategies	Alistair Melzer (CQU)	Stewart Lockie (CQU)
Haines, Philip	PhD	Assoc	GU	A theoretical basis for the assessment of sustainability of ICOLLS of south-east Australia	Rodger Tomlinson (GU)	Bruce Thom (UNSW)
Hudson, Kelly	MEnvSc	Assoc	GU	Evaluation of multi-tier governmental relations for integrated coastal management	Tim Smith (GU)	
Riedlinger, Michelle	PhD	Affil	UQ	Communication in collaborative research organisations	Sue McKay (UQ)	Cindy Gallois (UQ) Jeffery Puttam (UQ)
Smith, Craig	PhD	Assoc	UCanb	The role of nitrogen fixation in the nitrogen budget of subtropical and temperate Australian estuaries	Bill Maher (UCanberra)	Graham Skyring (Skyring Environment Enterprises)
*White, Clayton	PhD	Affil	GU	An operational theory of communicative action for citizen participation in catchment management	John Fien (GU)	Roy Rickson (GU)

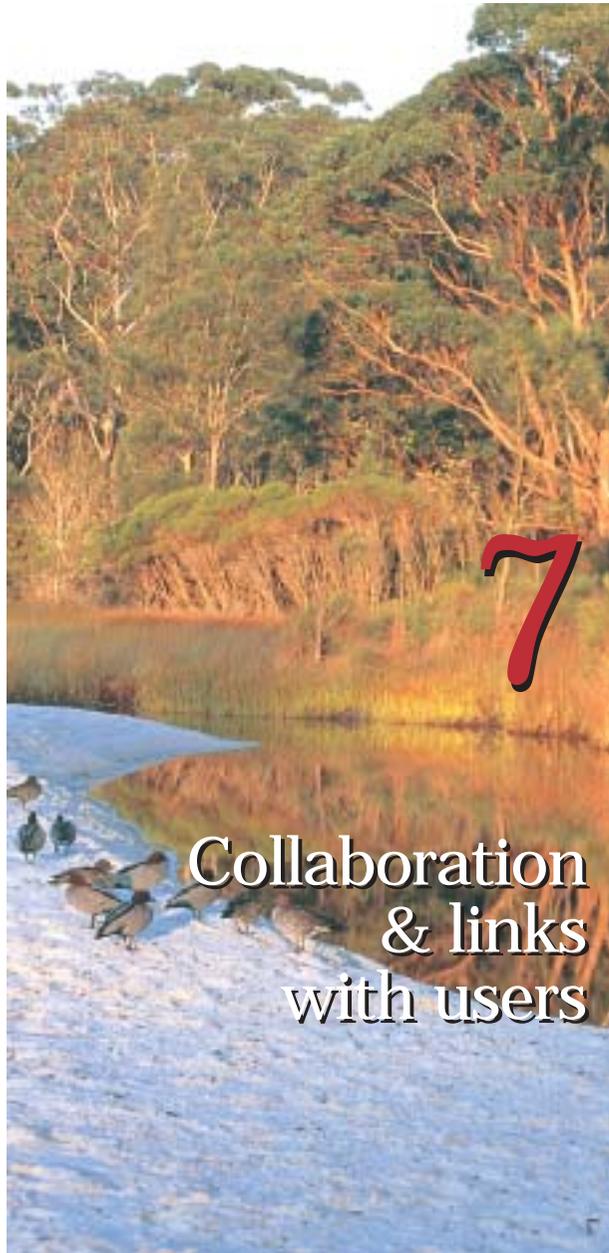
* CRC Catchment Hydrology students who are affiliate students with the Coastal CRC

Postgraduate Students – Awarded

Name	Degree	Mship Type	Univ	Awarded	Research Project Title	Principal Supervisor	Associate Supervisor/s
Anorov, Julie	PhD	Full	GU	12.10.2004	Integrative study of coastal wetland characteristics and geomorphic processes in a south east Queensland catchment	Pat Dale (GU)	Bernie Powell (QNRM) Margaret Greenway (GU) John Chappell (ANU)
Burrows, Damien	PhD	Partner	JCU	03.04.2004	The re-evaluation of the role of insect leaf herbivory in the ecology of mangrove ecosystems with reference to <i>Avicennia marina</i> and <i>Rhizophora stylosa</i>	Rhondda Jones (JCU)	Richard Pearson (JCU)
Clouston, Elizabeth	PhD	Partner	GU	21.02.2003	Linking the ecological and economic values of wetlands: A case study of the wetlands of Moreton Bay	John Tisdell (GU)	Rod Connolly (GU) Paul Lawrence (QNRM)
Cook, Perran	PhD	Assoc	UTAS	01.12.2003	Carbon and nitrogen cycling on intertidal mudflats in a temperate Australian estuary	Barry O'Grady (UTAS)	Ed Butler (CSIRO) Rhys Leeming (CSIRO) Bradley Eyre (SCU)
Costanzo, Simon	PhD	Partner	UQ	22.03.2002	Development of indicators for assessing and monitoring nutrient influences in coastal waters	Bill Dennison (UQ)	Neil Loneragan (CSIRO)
Dow, Ruth	MNatRes Econ	Assoc	UQ	27.11.2002	An expanded economic assessment methodology for the Queensland resource planning process	Robert Cramb (UQ)	Jackie Robinson (UQ)
Dunbar, Stephen	PhD	Partner	CQU	18.02.2002	Respiratory, osmoregulatory and behavioural determinants of distribution of tropical marine hermit crabs	Michael Coates (CQU)	Steve McKillup (CQU)
*Gooch, Margaret	PhD	Affil	GU	01.05.2004	Volunteering – linking social capital, learning, and environmental care	John Fien (GU)	Roy Rickson (GU) Jeni Warburton (UQ)

Guest, Michaela	PhD	Full	GU	06.12.2004	Movement of carbon among estuarine habitats and its assimilation by invertebrates	Rod Connolly (GU)	Neil Loneragan (CSIRO) Joe Lee (GU)
Jones, Mary-Anne	MAppSc	Partner	CQU	06.06.2003	Assessing the risk from chemical contaminants in the Port Curtis estuary, Australia	Leo Duivendoorn (CQU)	Bob Noble (QNRM)
Manson, Fiona	PhD	Partner	UQ	20.04.2005	Mangroves and fisheries: Are there links between coastal habitats and fisheries production?	Stuart Phinn (UQ)	Neil Loneragan (CSIRO) Greg Skilleter (UQ) Clive McAlpine (UQ)
Neumann, Luis	PhD	Partner	UQ	28.05.2004	Flocculation of cohesive sediments	Tony Howes (UQ)	Charles Lemckert (GU) Ian Webster (CSIRO)
Oliver, Peter	PhD	Full	GU	07.07.2004	Forming effective partnerships in natural resource management	John Fien (GU)	Roy Rickson (GU) Roger Shaw (CRC)
Powell, Bronwyn	MEnvSc	Assoc	GU	30.06.2004	Community participation and institutional change in the National Action Plan on water quality and salinity in the Fitzroy Basin, Queensland	Tim Smith (GU)	Roger Shaw (CRC)
Rapp, Josh	MPhil	Partner	UQ	24.11.2003	Spatial analysis of catchment characteristics in relation to water quality using remote sensing and Geographic Information Systems	Stuart Phinn (UQ)	Arnold Dekker (CSIRO)
Ryan, Sean	MPhil	Partner	UQ	21.02.2005	Transferable development rights for conservation in Queensland	Bill Crane (UQ)	Jackie Robinson (UQ)
Smith, Tim	PhD	Assoc	UNSW	02.12.2002	Australian estuary management: Drivers and perspectives	Jes Sammut (UNSW)	Morgan Sant (UNSW) Bruce Thom (UNSW)
Thomsen, Dana*	Affil	Affil	GU	26.03.2004	Community-based research: Perceptions and possibilities	John Fien (GU)	Margaret Greenway (GU)

* CRC Catchment Hydrology students who are affiliate students with the Coastal CRC



Cooperation between research teams, partner organisations, stakeholder groups and the community is vital to the success of the Coastal CRC. The complex arrangements for coastal management, whereby the Australian Government, state governments and local governments all bear legislative responsibility for managing the coast, and where industry and community are also active, mean there must be effective collaboration between research providers and research users. Strategies used to achieve effective linkages included:

- stakeholder advisory groups for project areas
- stakeholder 'buddies' for many sub-projects
- National Stakeholder Advisory Committee to review CRC research program
- National Estuaries Network to share data, models and science between states
- strong support by partner organisations for multi-agency research tasks
- an annual three-day Coastal CRC staff and stakeholder workshop
- maintenance of internal communication through team meetings, personal contacts newsletters, reports, meetings, workshops and emails

- provision of opportunities for CRC researchers, students and stakeholders to meet at workshops, conferences, project meetings, advisory committees and informally
- linkage of integrated research tasks and projects across themes
- regular reporting of progress to agencies and stakeholder groups
- dedicated project managers to link with local stakeholder groups in each management study area
- communication plans for all projects

Annual staff workshop

A staff workshop was held at Greenmount Resort, Coolangatta, in September 2004 and was attended by 100 CRC researchers, staff, students and stakeholders. The workshop provided an excellent opportunity to plan future multidisciplinary projects, recognise achievements, get together socially, and strengthen networks within and between teams. Sessions were also organised to promote research results, link with stakeholder groups and develop management and marketing skills.

Regional stakeholder advisory groups

Coastal researchers and central Queensland region stakeholders met in Rockhampton and Gladstone to discuss progress of several research projects and investigate ways to integrate research results with regional Natural Resource Management Plans. The meetings helped to exchange information and identify emerging issues. Representatives from various fishing, farming, local council, government and Indigenous organisations participated to review projects, identify new knowledge needs and discuss long-term planning strategies for the region. Stakeholder groups, especially the Fitzroy Basin Association, worked closely with scientists and assisted them to undertake water quality, sonar seabed surveys and fisheries fieldwork.

Regional Natural Resource Management Groups

The Coastal CRC maintained a strong link with Natural Resource Management South East Queensland Inc. and with the Fitzroy Basin Association. Both groups developed an integrated natural resource management plan for their region, and applied scientific tools, models and expertise for their respective environmental planning, investment, action and monitoring programs. Several 'stakeholder buddies' from gov-

ernment agencies and industry joined CRC project teams and participated in project reviews.

The Enabling Adaptive Management project team worked closely with the Mackay-Whitsunday Regional NRM group to improve partnership arrangements for natural resource management. A social profiling research project in WA's Esperance region involved community engagement training workshops and developed partnerships with local government and industry stakeholders. Strong community resource management links were developed in the Glenelg-Hopkins region of Victoria and in Queensland's far north to assist local government planners with environmental planning and regulations.

The Governance, Partnerships and Decision Frameworks package team worked closely with government, community and industry organisations in the Mackay region, particularly with regional NHT2 and NAP bodies, to assist review of internal and external partnership arrangements. They assisted the Mackay-Whitsunday NRM body to apply the principles of adaptive management using a decision-making tool to enhance agreements and in-kind contributions by government agencies and regional stakeholders to achieve natural resource targets in the region.

This Governance, Partnerships and Decision Frameworks team collaborated with Board members and staff of Natural Resource Management SEQ Inc. and grass roots groups in south-east Queensland. Social

researchers James Whelan and Peter Oliver have advised and assisted the regional body to map 'social capital', as measured according to a set of provisional indicators. The team assisted Queensland's Consortium for Integrated Regional Management to design a series of research seminars on social and economic research.

Jointly funded research projects

Twenty-one projects received external funding. These included hosting an international Coastal Zone Asia Pacific conference, sending researchers to a coastal habitat mapping training workshop in USA, developing a Coastal NRM plan for the Fitzroy Basin, developing an integrated monitoring program for Port Curtis, facilitating new farm management systems in Queensland, continuing an automated monitoring program in the Brisbane River, running a series of national water quality management workshops, providing training courses for natural resource managers, determining the relationship of freshwater flows to fisheries production in tropical estuaries, and finalising a study on the ecological impact of sewage overflows to an urban creek in Brisbane.

Other Australian agencies

The Coastal Water Habitat Mapping team developed a \$1 million marine mapping partnership with Parks Victoria and Perth-based marine survey company, Fugro Survey Pty Ltd. to map several of Victoria's deepest marine parks. Fugro Survey, one of the world's largest global surveying companies, brought to the partnership the latest sonar technology, which was used with advanced video imaging from the CRC's coastal water habitat mapping project. Other members of the joint project include Deakin University, University of Western Australia, University of Tasmania, Geoscience Australia and Curtin University of Technology.

The Coastal Water Habitat Mapping project team developed links and exchanged technical expertise with colleagues at the Australian Fisheries Management Authority, Western Australia Department of Fisheries, National Marine Fisheries, Australian Institute of Marine Science, CSIRO Marine, James Cook University, Verdant (Hobart), and U.S. National Marine Fisheries Service (Hawaii).

The Coastal CRC organised a series of National Water Quality Management Strategy workshops, in partnership with the Federal Department of Agriculture, Fisheries and Forestry and funded under the Australian Government's National Landcare Program. Workshops were held in several states to improve the capacity of regional planners and catchment groups

to manage water quality in their regions. The workshops covered training in water monitoring, policy, planning, indicators and guidelines.

International links

Linkages were made with a number of international organisations during the 2nd Coastal Zone Asia Pacific conference for September 2004 in Brisbane. The Coastal CRC and CSIRO Sustainable Ecosystems organised and hosted the event. An international planning team, with representatives from the Coastal Development Centre in Thailand, New Zealand Coastal Society, Hawaii University and South Pacific Environment Program assisted the conveners. More than 290 delegates attended the conference, many from developing countries in the region.

The Coastal CRC continued to support the International Geosphere-Biosphere Program: Land-Ocean Interactions in the Coastal Zone (LOICZ). Ron Johnstone, Don Alcock and John Parslow attended a LOICZ Open Science Meeting in The Netherlands in June 2005 and presented papers. Large-scale, adaptive management planning models for south-east Queensland, the Citizen Science Toolbox and SKIE project were promoted. The meeting provided a forum to bring together the scientific community to address the geographic and scientific scope of coastal zone research for the next decade. As a result, a LOICZ Oceania node will be established in Brisbane, supported by the Coastal CRC

and The University of Queensland, with a regional steering committee. Several regional workshops are planned for Brisbane in 2006.

University of Queensland scientist Chris Roelfsema visited the Centre for Marine Studies at the University of South Pacific, Suva, Fiji, to participate in an oceanography workshop for 35 students of the South Pacific Islands. He gave lectures and tutorials in marine remote sensing. The workshop was organised by the University of South Pacific, Pacific Island Global Ocean, Observing System (SOPAC), Institute of Applied Science at University of South Pacific, and World Wildlife Conservation Society. Chris Roelfsema also assisted local community groups with remote sensing field work for a Conserving the Marine Biodiversity project at Marovo Lagoon, Solomon Islands.

Geoscience Australia researchers Brendan Brooke and David Ryan participated in a capacity development workshop on acoustic techniques in seabed assessment in June, 2004, at the University of New Hampshire, USA. The workshop, run by Dr Larry Mayer, Director of the Centre for Coastal and Ocean Mapping, UNH, continued to build on-going collaborative links between ocean mapping scientists in Australia and the USA.

Central Queensland University researcher Leonie Andersen collaborated with City University, Hong Kong, on the assessment of biochemical indices for contaminant exposure in oysters that will potentially lead to

new tools for assessing contaminant impacts. The contaminants pathways project in Port Curtis generated a high level of international interest and a national profile.

Collaboration with other research groups

The Coastal CRC was involved with the following organisations for joint research, training and communication activities:

1. National

Commonwealth Government

- Australian Institute of Marine Science
- Bureau of Meteorology
- Department of Agriculture, Forestry and Fisheries
- Defence Science and Technology Organisation
- Environment Australia
- Geoscience Australia
- Great Barrier Reef Marine Park Authority
- Land and Water Australia
- National Oceans Office

Australian universities

- Australian National University

- Central Queensland University
- Curtin University of Technology
- Deakin University
- Griffith University
- James Cook University
- Southern Cross University
- Sunshine Coast University
- University of Newcastle
- University of New South Wales
- The University of Queensland
- The University of Tasmania
- The University of Western Australia

CRC and Australian research organisations

- Centre for Research on the Ecological Impacts of Coastal Cities
- CRC for Catchment Hydrology
- CRC for Freshwater Ecology
- CRC Reef Research Centre
- CRC for Sustainable Tourism
- CRC for Tropical Rainforest Ecology and Management
- CRC for Water Quality and Treatment
- CSIRO Atmospheric Research
- CSIRO Land and Water
- CSIRO Marine Research

- Fisheries Research and Development Corporation

State Government

Queensland

- Department of Innovation and Information Economy
- Department of Local Government and Planning
- Department of Natural Resources and Mines
- Department of Primary Industries and Fisheries
- Department of State Development
- Environmental Protection Agency
- Rockhampton Port Authority

New South Wales

- Department of Infrastructure, Planning and Natural Resources (DIPNR)
- Department of Land and Water Conservation
- Environmental Protection Agency
- Marine Parks Authority

Victoria

- Central Coastal Board, Port Phillip and Western Port Catchment Management Authority
- Environmental Protection Agency
- Melbourne Water
- Parks Victoria

Western Australia

- Department of Conservation and Land Management

- Water and Rivers Commission

Tasmania

- Department of Primary Industries, Water and Environment

Local Government

- Brisbane City Council
- Burdekin Shire Council
- Caboolture Shire Council
- Calliope Shire Council
- Douglas Shire Council
- Gladstone City Council
- Gold Coast City Council
- Hervey Bay City Council
- Ipswich City Council
- Livingstone Shire Council
- Noosa Shire Council
- Redland Shire Council
- Rockhampton City Council

Community organisations

- Australian Marine Conservation Society
- Australian Marine Sciences Association
- Barker Inlet Port Estuary Committee
- Bremer Catchment Association
- Coastcare Australia
- Cockburn Sound Management Council

- Darumbal-Noolar Murree Aboriginal Corporation
- Fitzroy Basin Association
- Fitzroy Basin Elders' Committee
- Glenelg Hopkins Catchment Management Authority
- Great Barrier Reef Marine Park Management Advisory Committee (Port Curtis)
- Lake Macquarie Project Management Committee
- Moreton Bay Waterways and Catchments Partnership
- NSW Coastal Council
- Queensland Conservation Council
- South East Queensland Natural Resource Management Inc.
- Sunfish Queensland
- Victorian Coastal Council
- Waterwatch Queensland
- Western Catchments Group Inc
- World Wide Fund for Nature
- Yarrhapinni Wetlands Reserve Trust

Private companies and industry associations

- ACIL Tasman
- Advanced Analytical Australia Pty Ltd
- AgForce
- Aldoga

- Association of Australian Ports and Marine Authorities
- Brisbane Airport Corporation Pty Limited
- Brisbane Water
- Canegrowers
- Cotton Australia
- DA Lord & Associates Pty Ltd.
- Fremantle Ports
- Fugro Survey Pty Ltd.
- Georeality Pty Ltd.
- Netstorm Pty Ltd.
- NRG Operating Services Pty Ltd.
- Oceanica Pty Ltd.
- ORICA Australia
- Port of Brisbane Corporation
- Port Curtis Integrated Monitoring Program (Boyne Smelters Ltd., Comalco, Gladstone Area Water Board, Central Queensland Port Authority, NRG Operating Services Pty Ltd., ORICA Australia, Queensland Alumina Ltd., Queensland Cement Ltd., Queensland Energy Resources Ltd.)
- Queensland Chamber of Commerce and Industry
- Queensland Energy Resource Management
- Queensland Farmers' Federation
- Queensland Fruit and Vegetable Growers (Grow-Com)

- Reson Inc.
- Silicon Graphics Inc.
- SonarData Ltd.
- South East Queensland Water Corporation
- Thiess Environmental Services, Pty Ltd.
- WBM Oceanics
- WIN Television

2. Overseas

Government agencies

- Environment Canada
- Ministry of Coasts and Small Islands, Indonesia
- US Army Corps of Engineers (Coastal Engineering Research Centre)
- US Department of Agriculture
- US EPA

International organisations and programs

- Coral Reef Management and Planning Program, Indonesia
- Eastern Europe Regional Environment Council
- Institute of Hydro Engineering, Polish Academy of Sciences
- International Geosphere-Biosphere Program: Land-Ocean Interactions in the Coastal Zone
- IUCN: The World Conservation Union

- South Pacific Regional Environment Programme, Samoa
- United Nations Environment Programme
- Western Indian Ocean Marine Science Association

Universities and research institutions

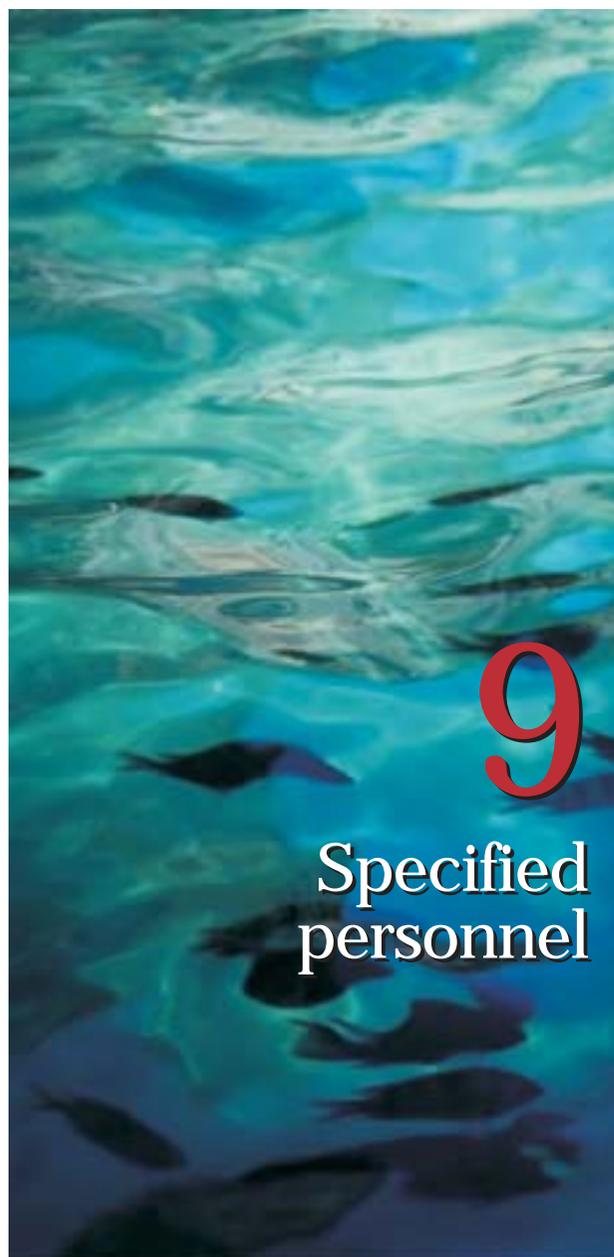
- Coastal Development Centre, Kasetsart University, Thailand
- City University, Hong Kong
- Delft Hydraulics Laboratory, The Netherlands
- National Space and Aeronautical Agency, USA
- National Institute of Water and Atmospheric Research, New Zealand
- San Francisco Estuary Institute, USA
- University of British Columbia, Canada
- University of Georgia, USA
- University of Maryland, USA
- University of New Hampshire, USA
- University of Newcastle, United Kingdom
- University of Stockholm, Sweden
- University of South Pacific, Fiji
- Virginia Institute of Marine Sciences, USA
- Woods Hole Oceanographic Institute, USA



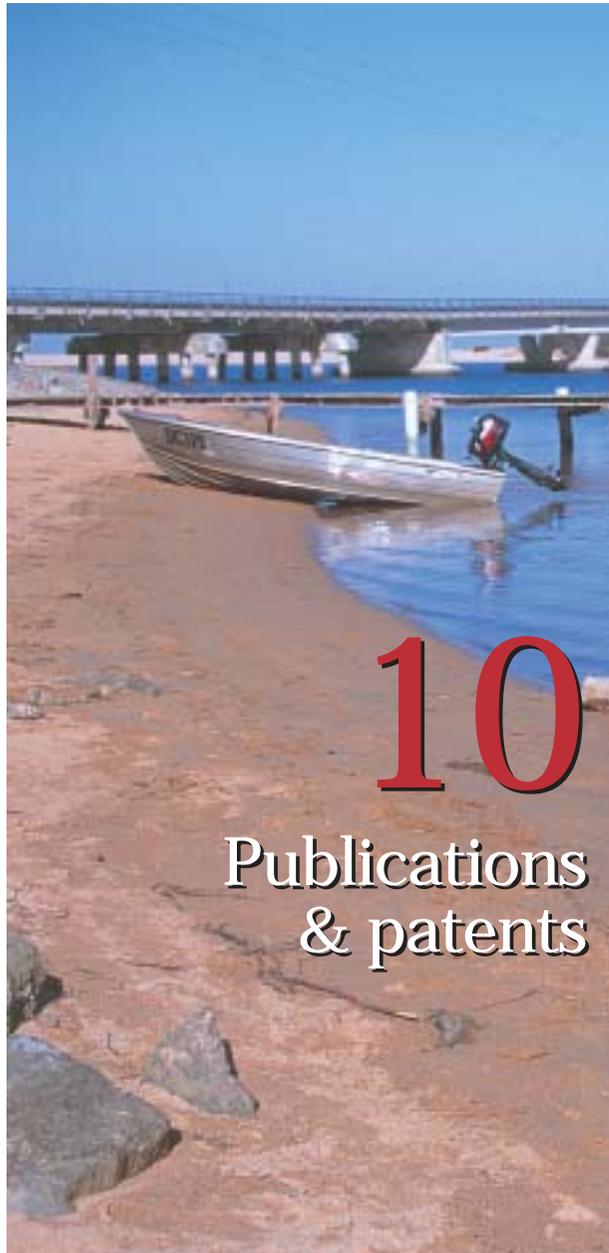
Approximately 259 people were involved in Centre activities, including 60 positions funded at least partially by the CRC, and 23 postgraduate students and associates.

In preparation for the wind-up of the Centre, 2004/2005 saw the reinstatement of regular partner meetings to consider the future of intellectual property and other CRC assets as well as refocussing of marketing and adoption efforts towards integrated, 'Client-Focussed' projects.

The 2005 independent review commended the Centre on its unique management structure, which facilitated collaboration and integrated results, as well as its 'soundly based evaluation processes'.



Title and Name	Employing Organisation	% of total working time in CRC (04/05)	Major role in Centre
Dr Rob Fearon	Coastal Zone Australia Ltd	100%	CEO of the Centre
Dr Regina Souter	Coastal Zone Australia Ltd	60%	Science Leader
Dr Paul Lawrence	Department of Natural Resources and Mines	35%	Theme Leader Decision Frameworks
Dr James Whelan	Griffith University	90%	Theme Leader Citizen Science and Education
Prof Rodger Tomlinson	Griffith University	20%	Theme Leader Management and Restoration
Dr Peter Gehrke	CSIRO Land and Water	25%	Theme Leader Ecosystem Processes
Dr Ron Johnstone	University of Queensland	50%	Theme Leader Assessment and Monitoring
Ms Rachel Mackenzie	Coastal Zone Australia Ltd	100%	Project Manager Science to Enable Adaptive management for Sustainability, National Management Study
Ms Maria VanderGragt	Central Queensland University	100%	Project Manager Industrial Catchment and Project manager Urban Catchment
Mr Bob Noble	Department of Natural Resources and Mines	70%	Project Manager Agricultural Catchment
Prof John Penrose	Coastal Zone Australia Ltd	50%	Project Manager Coastal Water Habitat Mapping



Conference papers – international

- Alcock, D. (2005) *The Seven Habits of Successful Science Communication Programs*. LOICZ II Inaugural Open Science Meeting – ‘Coasts and Coastal People: Scenarios of Change and Responses’, Egmond aan Zee, Netherlands. 27–29 June 2005
- Banin, L., Phinn, S., Roelfsema, C. & Aplin, P. (2005) *Field and Image Mapping of Seagrass Distribution on Eastern Banks, Moreton Bay Australia*. Remote Sensing and Photogrammetry Society Annual Conference: ‘Measuring, Mapping and Monitoring a Hazardous World’, Portsmouth, UK. 6–9 September 2005
- Beal, C.D., Gardner, E.A., Vieritz, A.M. & Menzies, N.W. (2004) *The role of the biomat in the sustainable performance of soil absorption systems in Australia*. ASAE 10th National Symposium on Individual and Small Community Sewage Systems, Sacramento, California, USA. 21–24 March 2004
- Cox, M., Johnstone, R., Jorgensen, B. & Robinson, J.J. (2004) *Impacts of environmental condition on human social well-being*. International Conference of the System Dynamics Society – 22nd – ‘Congeniality’, Oxford, UK. 25–29 July 2004
- Gavrilov, A.N., Duncan, A.J., McCauley, R.D., Parnum, I.M., Penrose, J.D., Siwabessy, P.J.W., Woods, A.J. & Tseng, Y-T (2005) *Characterisation of the sea-*

floor in Australia's coastal zone using acoustic techniques. International Conference Underwater Acoustic Measurements: Technologies and Results, Heraklion, Crete, Greece. 28 June – 1 July 2005

- Harris, C., Ramsay, I. & Howes, T. (2005) *Development of a decision support system for water quality managers: concepts and structure*. International Conference for simulation & Modelling, Bangkok, Thailand. 17–19 January 2005
- Harvey, E., Shortis, M., Seager, J. & Cappo, M. (2005) *Applications of stereo-video to the assessment of benthic fish assemblages*. American Fisheries Society – 135th Annual Meeting, Anchorage, Alaska, USA. 11–15 September 2005
- Harvey, E.S. & Cappo, M. (2004) *A review of the use of underwater video in Australia*. Report of the National Marine Fisheries Service Workshop on Underwater Video Analysis, Seattle, Washington, USA. 4–6 August 2004
- Harvey, E.S., Seager, J., Shortis, M., Robson, S. & Cappo, M. (2004) *Use of stereo-video photography in remote camera and diver transect assessments of fish populations*. Report of the National Marine Fisheries Service Workshop on Underwater Video Analysis, Seattle, Washington, USA. 4–6 August 2004
- Hoppe, P. & Rickson, R.E. (2004) *Community Alliances as Bases for Environmental Sustainability and*

- Local Peace*. International Conference on New directions in the Humanities – 2nd – ‘Future, Human’, Prato, Tuscany, Italy. 20–23 July 2004
- Jupiter, S.D., Phinn, S.R., Duke, N., Kamber, B., Potts, D.C. & Marion, G. (2004) *Downstream Consequences of Increased Run-off and Mangrove Die-back: a case study from the Pioneer estuary (Queensland, Australia)*. International Coral Reefs Symposium – 10th, Okinawa, Japan. 29 June – 2 July 2004
- Knight, J.M. (2004) *Using Remote Sensing to Monitor Hydrologic Processes in Mangrove Forests*. International Wetlands Conference (INTECOL 2004) – 7th, Utrecht, The Netherlands. 25–30 July 2004
- Oliver, P. & Whelan, J. (2005) *Forging partnerships between stakeholders in citizen participation programs*. Joint IXth International Congress on Ecology (INTECOL) and 90th Annual Meeting of the Ecological Society of America, Montreal, Canada. 8–12 August 2005
- Phinn, S.R., Dekker, A.G., Brando, V.E., Roelfsema, C.M. & Udy, J. (2005) *Integrating Remotely Sensed Data and Field Data for Monitoring Indicators of Coastal Ecosystem Health*. International Conference on Remote Sensing for Marine and Coastal Environments – 8th, Halifax, Nova Scotia, Canada. 17–19 May 2005
- Rassam, D. (2005) *Uncertainty associated with inverse numerical modelling: field and laboratory-based case studies*. ModelCARE’2005 – 5th International Conference on Calibration and Reliability in Groundwater Modelling – ‘From Uncertainty to Decision Making’, The Hague, The Netherlands. 6–9 June 2005
- Rickson, S.T., Rickson, R. & Burch, D. (2004) *Local Community Responses to Globalization*. RC-40 Meeting of The International Sociological Association, Austin, Texas, USA. 2004
- Roelfsema, C.M., Joyce, K.E. & Phinn, S.R. (2004) *Evaluation of benthic survey techniques for validating remotely sensed images of coral reefs*. International Coral Reefs Symposium – 10th, Okinawa, Japan. 29 June–2 July 2004
- Shortis, M.R., Seager, J.W., Harvey, E.S. & Robson, S. (2005) *The influence of Bayer filters on the quality of photogrammetric measurement*. Videometrics IX - IS&T/SPIE 17th Annual Symposium on Electronic Imaging, San Jose, California, USA. 16–20 January 2005
- Smith, C.S., Haese, R.R., Skyring, G.W. & Mayer, W. (2005) *Nutrient cycling in a tropical macro-tidal Australian estuary*. American Society of Limnology and Oceanography – Aquatic Sciences Meeting, Salt Lake City, Utah, USA. 20–25 February 2005
- Tseng, Y-T (2005) *Settings of genetic programming toward the improvement of acoustic classification performance for different seafloor conditions*. International Conference Underwater Acoustic Measurements: Technologies and Results, Heraklion, Crete, Greece. 28 June – 1 July 2005
- Tseng, Y-T., Gavrilov, A.N. & Duncan, A.J. (2005) *Classification of acoustic backscatter from marine macro benthos*. Boundary Influences in High Frequency Shallow Water Acoustics Conference, Bath, UK. 5–9 September 2005
- Tseng, Y-T., Gavrilov, A.N., Duncan, A.J., Harwerth, M. & Silva, S. (2005) *Implementation of genetic programming towards the improvement of acoustic classification performance for different seafloor habitats*. IEEE/OES Oceans’05 Europe Conference and Exhibition – ‘Today’s technology for a sustainable future’, Brest, France. 20–23 June 2005
- Andersen, L.E., Revill, A.T. & Storey, A.W. (2005) *Metal accumulation through food pathways in Port Curtis*. International Conference on the Biogeochemistry of Trace Elements – 8th, Adelaide, SA. 3–7 April 2005
- Andersen, L.E. (2004) *Imposex: A Biological Effect of TBT Contamination in Port Curtis, Queensland*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004

Conference papers – domestic

- Angel, B.M., Simpson, S., Stauber, J.L. & Jolley, D.F. (2005) *The effects of continuous and fluctuating copper exposures on the marine alga Phaeodactylum tricomutum*. International Conference on the Biogeochemistry of Trace Elements – 8th, Adelaide, SA. 3–7 April 2005
- Baker, R. & Sheaves, M. (2004) *Defining the piscivore assemblage of shallow tropical estuarine nurseries*. Australian Society for Fish Biology Conference, Adelaide, SA. 20–21 September 2004
- Balston, J. (2004) *Effects of seasonal climate variability on Barramundi (Lates calcarifer) fisheries productivity in the Great Barrier Reef World Heritage Area*. Australian Society for Fish Biology Conference, Adelaide, SA. 20–21 September 2004
- Beal, C.D., Gardner, E.A., Menzies, N.W., Rassam, D.W. & Vieritz, A.M. (2004) *Prediction of steady-state flux through variably saturated zones within a septic absorption trench*. International Soil Science Conference, Sydney, NSW. 5–9 December 2004
- Beal, C.D., Gardner, T., Menzies, N.W. & Rassam, D.W. (2004) *A Closer Look at the Biomat Zone: Prediction of flow rates and pathways in a septic absorption trench*. Queensland on-site wastewater treatment symposium, Brisbane, Qld. 28th October 2004
- Beal, C.D., Gardner, E.A., Menzies, N.W. & Kirchhof, G. (2005) *Influence of biomat zone on flow rate and pathways in septic systems*. On-site '05 Conference, Armidale, NSW. 27–29 September 2005
- Beal, C.D., Gardner, T. & Menzies, N.W. (2005) *Predicting the failure of septic tank – soil absorption systems: A step closer to managing water quality in non-sewered catchments*. Riversymposium – 8th International, Brisbane, Qld. 6–9 September 2005
- Bennett, J. (2005) *Implementing the National Water Quality Management Strategy – Insights from Capacity Building Workshops around Australia*. Riversymposium – 8th International, Brisbane, Qld. 6–9 September 2005
- Bickers, A. (2004) *Marine Habitat Classification and Mapping Using Sidescan Sonar: Examples of Mapping Shallow Water Marine Habitats in Australia*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Bostock, H., Ryan, D., Brooke, B., Skene, D., Radke, L. & Kuhnen, M. (2005) *Sediment dynamics and accumulation in the Fitzroy River/Keppel Bay system, Central Queensland*. Australian Marine Geoscience Conference – 7th, Orpheus Island, Qld. 25–29 June 2005
- Brando, V., Dekker, A., Phinn, S.R., & Roelfsema, C. (2004) *Mapping and Monitoring Coastal Environments Using Remote Sensing*. Catchment to Reef: Water Quality Issues in the Great Barrier Reef Region, Townsville, Qld. 9–11 March 2004
- Brooke, B., Ryan, D., Skene, D., Olley, J., Pietsch, T., Douglas, G., Radke, L. & Flood, P. (2005) *Coastal sedimentation during the last 1,500 yrs in Keppel Bay, Central Queensland coast*. Australian Marine Geoscience Conference – 7th. Orpheus Island, Qld. 25–29 June 2005
- Choy, S. (2004) *Assessing a gradient-of-impact design for ecological monitoring and assessment of the Fitzroy Basin Water Resource Operation Plan*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Connolly, R. (2004) *Scales of carbon movement and assimilation by invertebrates in estuaries*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Cox, M., Johnstone, R. & Robinson, J. (2004) *Assessing the social and economic impacts of changes in coastal systems*. Annual Environmental Research Conference – 'Environmental Sustainability through Multidisciplinary Integration' – 7th, Marysville, Vic. 1–4 December 2004
- Cox, M., Johnstone, R. & Robinson, J.J. (2004) *Effects of Coastal Recreation on Social Aspects of Human Well-being*. Coastal Zone Asia Pacific Conference 2004: Improving the Quality of Life in Coastal Areas, Brisbane, Qld. 5–9 September 2004
- Cox, M., Scheltinga, D., Rissik, D., Moss, A., Counihan, R. & Rose, D. (2004) *Assessing Condition*

- and Management Priorities for Estuaries in Australia*. Coastal Zone Asia Pacific Conference 2004: Improving the Quality of Life in Coastal Areas, Brisbane, Qld. 5–9 September 2004
- Dekker, A.G., Brando, V.E., Oubelkheir, K., Wettle, M., Clementson, L., Peters, S.W.M. & van der Woerd, H. (2004) *When Freshwater Meets Ocean Water: How Variable SIOPS Affect Remote Sensing Products of Estuaries, Bays and Coastal Seas*. Ocean Optics XVII, Freemantle, WA. 25–29 October 2004
- Dyall, A., Creasey, J., Murray, E., Brooke, B., Heap, A., Ryan, A. & Radke, L. (2005) *Mapping the geomorphic habitats of Australia's near-pristine estuaries*. Australian Marine Sciences Association Annual Conference, Darwin, NT. 11–13 July 2005
- Dyall, A., Murray, E., Creasey, J., Beard, D., Brooke, B., Heap, A., Radke, L. & Ryan, D. (2004) *Mapping the geomorphic habitats of Australia's near-pristine estuaries*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Filet, P.G. (2005) *Managing health threats to community activities in Brisbane waterways: A local government case study*. Australian Water Association Conference "Contaminants of Concern in Water", Canberra, ACT. 22–23 June 2005
- Gavrilov, A.N., Siwabessy, P.J.W., Parnum, I.M., Tseng, Y-T. & Duncan, A.J. (2005) *Acoustic techniques for rapid and efficient assessment of the coastal zone habitats*. IOMEC (Indian Ocean Marine Environment Conference), Perth, WA. 14–18 February 2005
- Gavrilov, A.N., Parnum, I.M., Siwabessy, P.J.W. & McCauley, R.D. (2005) *Using multibeam sonar to elaborate seafloor community structure*. Dynamic Planet Conference (IAPSO), Cairns, Qld. 22–26 August 2005
- Harvey, E.S., Wu, X. & Campbell, D.N. (2005) *Video imaging, mapping and interpretation of the seafloor*. Deep Blue Minerals Workshop, Sydney, NSW. 27 April 2005
- Hoppe, P. (2004) *Industry involvement in management*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Johnstone, R. (2004) *Distribution and tidal migration of fishes across intertidal zones*. Coastal CRC Mini Conference, Gold Coast, Qld 16 September 2004
- Leach, G., Lawrence, P. & Bennett, J. (2004) *Adaptive Management – Negotiating common ground for the delivery of property and regional planning outcomes*. Coast to Coast Conference, Hobart, Tas. 19–23 April 2004
- Mackenzie, J. (2004) *Catchment Management as Social Enterprise: The Challenge of Transition*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Martin, M., Mackenzie, R. & Bennett, J. (2005) *Water Resource Management And Assessment in Regional Australia – National Water Quality Management Strategy Regional Workshops*. Waterwatch Conference – 4th National – 'Navigating the Rapids', Melbourne, Vic. 7–10 February 2005
- McCauley, R.D. (2004) *Great Whale vocalisations along the Western Australian Coast – their use in biological studies*. Acoustics 2004 – 'Transportation Noise and Vibration – the New Millennium', Gold Coast, Qld. 3–5 November 2004
- Murray, E., Radke, L., Brooke, B., & Ryan, D. (2005) *Australia's near-pristine estuaries: current knowledge and management*. Australian Marine Sciences Association Annual Conference, Darwin, NT. 11–13 July 2005
- Oakes, J.M., Revill, A. & Connolly, R.M. (2004) *Compound specific isotope analysis of phytol to predict carbon isotopes of benthic microalgae*. Estuaries and Change ERF/ECSA Conference, Ballina, NSW. 21–24 June 2004
- Oliver, P. (2005) *Developing effective partnerships in natural resource management*. International Conference on Engaging Communities, Brisbane, Qld. 14–18 August 2005
- Oliver, P. & Mackenzie, J. (2004) *Giving the land whose hand? Collaboration in Regional Natural Resource Management*. Ecopolitics XV International Conference, Sydney, NSW. 12–14 November 2004

- Oubelkheir, K., Dekker, A.G., Clementson, L., Brando, V.E., Daniel, P., Webster, I., Ford, P., & Radke, L. (2004) *Bio-optical characterisation of Australian ocean, coastal and estuarine waters*. Ocean Optics XVII, Freemantle, WA. 25–29 October 2004
- Parnum, I.M., Siwabessy, P.J.W. & Duncan, A.J. (2005) *The effect of incident angle on statistical variation of backscatter measured using a high frequency multibeam sonar in shallow water*. Acoustics 2005 – 'Acoustics in a changing environment', Busselton, WA. 9–11 November 2005
- Parnum, I. (2004) *Using a Multibeam Echosounder for Investigation of Seafloor Characteristics in Coastal Shelf Waters*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
- Parnum, I.M., Siwabessy, P.J.W. & Gavrilov, A.N. (2004) *Identification of seafloor habitats in coastal shelf waters using a multibeam echosounder*. Acoustics 2004 – 'Transportation Noise and Vibration – the New Millenium', Gold Coast, Qld. 3–5 November 2004
- Penrose, J., Gavrilov, A.N., Siwabessy, P.J.W., McCauley, R.D., Parnum, I.M., Tseng, Y-T., Duncan, A.J. & Woods, A. (2005) *The use of single and multi-beam sonar systems in seafloor habitat mapping*. Dynamic Planet Conference (IAPSO). Cairns, Qld. 22–26 August 2005
- Phinn, S.R., Dekker, A.G., Joyce K., Roelfsema, C., Brando, V.E. & Wettle, M. (2004) *Current and Near Future Applications For Detection and Monitoring of Seagrasses, Macro-Algae and Corals*. Catchment to Reef: Water Quality Issues in the Great Barrier Reef Region, Townsville, Qld. 9–11 March 2004
- Radke, L.C., Webster, I.T., Ford, P., Oubelkheir, K., Brooke, B., Smith, C., Robson, B., Haese, R., Atkinson, I., Ryan, D., Bostock, H., & Verwey, P. (2005) *Biogeochemical Processes inferred from two dry season surveys in Keppel Bay and nearby coastal environments*. Australian Marine Sciences Association Annual Conference, Darwin, NT. 11–13 July 2005
- Radke, L., Prosser, I., Robb, M., Brooke, B., Fredericks, D., Douglas, G. & Skemstad, J. (2004) *Trends in sediment and water quality in relation to riverine sediment loads to estuaries in south Western Australia*. Estuaries and Change ERF/ECSA Conference, Ballina, NSW. 21–24 June 2004
- Radke, L.C. (2004) *Geochemical controls on the evaporative evolution of chemically diverse saline lakes in south eastern Australia*. LIMPACS Salinity, Climate and Salinisation Working Group – Setting research priorities 2005–2010, Mildura, Vic. 30 Sept–3 Oct 2004
- Rockloff, S. (2005) *Identifying and Using Social Indicators in Water Resource Management: Opportunities and Issues for Natural Resource Institutions*. Riversymposium – 8th International, Brisbane, Qld. 6–9 September 2005
- Rosenthal, K. (2004) *Knowledge Integration and Exchange in the Coastal Zone*. Coastal CRC Mini Conference, Gold Coast, Qld. 16 September 2004
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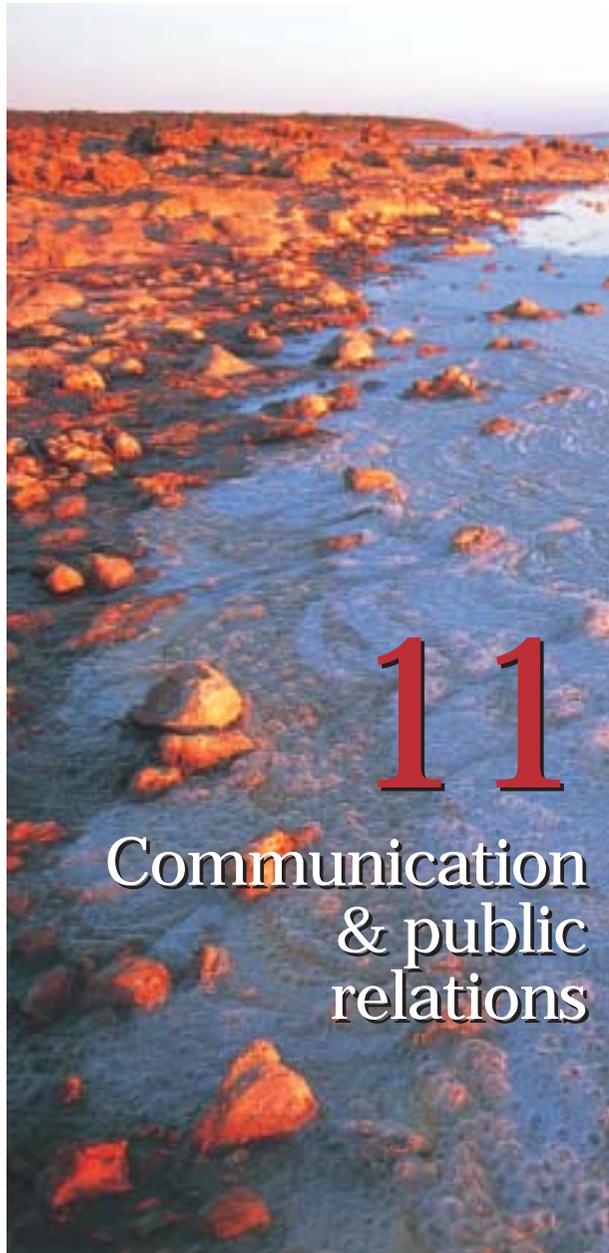
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The objectives of the Centre's communication strategy are as follows:

- Facilitate interactive communication with key CRC stakeholders and, in particular, ensure the research processes and results are used by stakeholder and interest groups.
- Ensure that staff, students and partner organisations in the CRC are aware of plans, activities, results and outcomes.
- Promote a distinctive and positive image for the Coastal CRC and national CRC Program through various products and services in conjunction with partner and associate organisations.
- Enhance organisational partnerships, use and application of our research, and links with information users.

Highlights

Stakeholder communication

The monthly e-newsletter, *Flotsam and Jetsam*, continued to inform CRC staff, students and other stakeholders about CRC research projects, coastal zone issues, research, events, conferences and training opportunities in Australia and overseas. More than 1200 people received the newsletter, which has an estimated total readership of over 2000.

A National Estuary Network continued to provide an opportunity for state and territory estuary managers to contribute and share data and information on Coastal CRC projects. The network met twice during the year to discuss national coastal issues and technical links. The National Stakeholder Advisory Committee met twice to review and discuss national coastal research issues.

The third phase of the Central Queensland Healthy Waterways television campaign was developed to show how science, management and community action are helping to keep catchments and waterways healthy. Twelve new 60-second information segments were broadcast throughout the region on WIN Television.

Internal communication

An annual Coastal CRC staff workshop was held at Greenmount Resort, Coolangatta, attended by more than 100 staff and students who presented progress reports, integrated projects and developed closer linkages with other researchers and stakeholder groups. Information posters were produced by task leaders and students.

A reference booklet was given out to staff and students at the annual workshop to provide information and administrative guidelines on postgraduate studies, project management, study areas, project milestones, publications, intellectual property and a contact list.

A large number of workshops, project team meetings, seminars, half-yearly milestone reports, annual project reviews and informal meetings were held or produced by staff, students and stakeholders throughout the year. The milestone reports were made available to project leaders, executive staff, stakeholder advisory committee members and Board members.

Executive management group meetings were held monthly for theme leaders and management study area coordinators to plan events, review progress, consider new projects and discuss issues of strategic importance.

Email news groups were used extensively to selected staff, project leaders, postgraduate students, executive members and stakeholders to keep in regular contact and advise of upcoming events, seminar invitations and data sharing.

External communication

The Coastal CRC website was revised to improve its design and content about coastal research information, links to related organisations and regular news updates. A monthly e-newsletter *Flotsam and Jetsam* continued to be distributed to staff, researchers and interested stakeholders. A reader survey indicated there are high levels of satisfaction with the newsletter's content, format and frequency.

An online bibliography of scientific publications and reports was developed at: www.coastal.crc.org.au/Publications/index.asp. The list includes 350 papers produced by researchers and postgraduate students since 2000. Many publication references have abstracts, online links and complete papers in PDF format. They are searchable by keyword or author surname.

An automatic system was introduced to measure the number of downloads made from the Coastal CRC website for its publications, papers and reports. New technical reports and the annual report were the most popular.

Summary reports on the 'Impact of Sewage Overflows on an Urban Creek', 'Coastal Science for Planners', 'Stream-studies Focus on Improving Waterway Health', and 'Governance and Partnerships in Natural Resource Management', were produced.

Two media skills workshop were conducted for 18 staff and students. The workshops led to the publication of a number of research stories by several media.

A large number of Coastal CRC presentations were made by CRC researchers at major conferences such as Coastal Zone Asia Pacific in Brisbane, and the Australian Marine Sciences Conference in Darwin, and the joint Estuarine and Coastal Sciences Association and Estuarine Research Federation in Ballina. Special

sessions on estuaries and coastal tools for planners were organised.

Five major displays promoting the Coastal CRC and its research were organised:

- Coastal CRC staff workshop in Coolangatta (September 04)
- Coastal Zone Asia Pacific Conference in Brisbane (September 04)
- CRC stakeholder workshop in Rockhampton (October 04)
- Launch of the Coastal Water Habitat Mapping project in Queenscliff (February 05)
- Cooperative Research Centres Association conference in Melbourne (May 05)

Media publicity

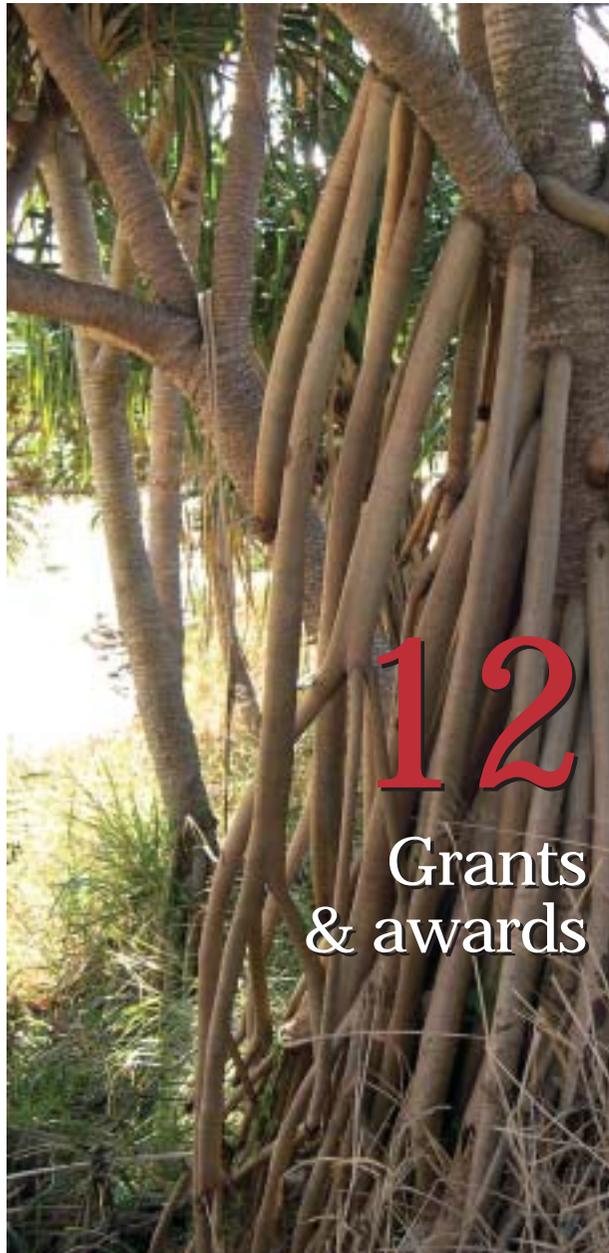
More than 18 media releases were distributed. Major news media stories included:

- Estuary fish populations assessed
- Sonar technology to map Victoria's marine parks
- New sea floor mapping in Western Australia
- Heavy metal contaminants in oysters

		Publicity in regional media	Publicity in state and national media
<ul style="list-style-type: none"> Cleaning up septic systems 			
<ul style="list-style-type: none"> Scientists showcase new coastal monitoring tools 	Print	14 (22) (28) (17) (15) (10)	2 (9) (12) (7) (14) (6)
<ul style="list-style-type: none"> Economic value of Australia's estuary services 	Radio	9 (18) (28) (14) (36) (9)	5 (6) (5) (4) (9) (8)
Media publicity generated during 2004/05 (listed opposite) shows an analysis of coverage in newspapers, radio stations, television stations and magazines compared to the past five years (in brackets).	Television	14 (14) (11) (17) (7) (4)	4 (11) (9) (8) (21) (11)
	Magazines	2 (2) (4) (4) (4) (5)	13 (14) (10) (9) (10) (6)

Future activities

- communicate outcome and application from client-focussed research packages to stakeholders and users
- continue sponsorship and produce new information segments for the Central Queensland Healthy Waterway media campaign
- ensure all technical reports and scientific papers are available for easy online access at the Coastal CRC website



Awards

Geoscience Australia Annual Award to a *Project for Achieving Results (Science)*, Coastal CRC Team (December 2004).

Stuart Phinn – Asia-Pacific Spatial Excellence Award for Education and Professional Development, 2004 (Spatial Sciences Institute & Australian Spatial Information Industry Business Association)

Stuart Phinn - Excellence Award for Education and Professional Development in Queensland, 2005 (Queensland Spatial Sciences Institute & Australian Spatial Information Industry Business Association)

Linda Cobiac - Business/Higher Education Round Table scholarship, CRC Leadership and Career Development, Melbourne. Highly commended, 2004 Queensland's Smart Women – Smart State Awards.

Dianne Watson – University of Western Australia 2005 Graduate Research Candidate Travel Award, to marine centres in Scotland.

Cara Beal – best poster (and paper), 2005 OzWater Watershed Convention & Exhibition, Brisbane

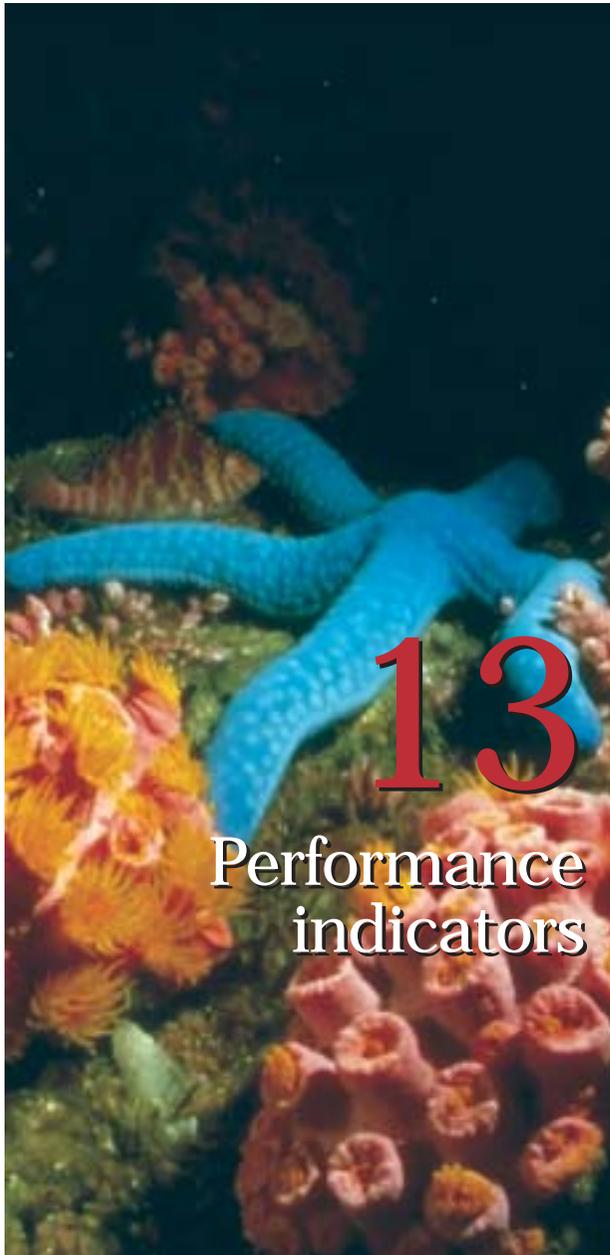
Grants

Grants made directly to Coastal CRC researchers through partner organisations.

(\$247,000) Euan Harvey, Dianne Watson and K. Nardi. Long-term monitoring of the effects of Marine Protected Areas on reef fish assemblages at the Houtman Abrolhos Islands. Northern Agricultural Catchments Council, 2005-2008.

(\$171,000) Euan Harvey, Mark Shortis James Seager, Norm Hall And James Findlay. Measuring the length frequency of Southern Bluefin Tuna transferred into cage culture using non-intrusive in situ stereo-video techniques: Monitoring, refinement of protocols and hardware. Australian Fisheries Management Authority, 2005.

(\$14,800) James Seager. (University of Western Australia). Modelling the effects of depth on three-dimensional underwater stereo image measurements using a laser projection system. University of Western Australia Research Grants Scheme, 2005.



For performance indicator table
[click here](#)

Appendix 1 Glossary of abbreviations

AMF	Adaptive Management Framework	GU	Griffith University	QNRM	Department of Natural Resources and Mines, Queensland
ANU	Australian National University	JCU	James Cook University	SKIE	Software for Knowledge Integration and Exchange
BCC	Brisbane City Council	LOICZ	Land-Ocean Interactions in the Coastal Zone	UNESCO	United Nations Educational, Scientific and Cultural Organisation
CQU	Central Queensland University	MBWCP	Moreton Bay Waterways and Catchments Partnership	UQ	The University of Queensland
CRC	Cooperative Research Centre	NAP	National Action Plan	UWA	University of Western Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation	NEN	National Estuaries Network		
CUT	Curtin University of Technology	NHT	Natural Heritage Trust		
EHMP	Ecosystem Health Monitoring Program	NIWA	National Institute of Water and Atmosphere Research (New Zealand)		
EIS	Environmental Impact Statement	NLWRA	National Land and Water Resources Audit		
EMG	Executive Management Group	NRM	Natural Resource Management		
FBA	Fitzroy Basin Association	NSAC	National Stakeholder Advisory Committee		
FRDC	Fisheries Research and Development Corporation	QDPI&F	Department of Primary Industries and Fisheries, Queensland		
GA	Geoscience Australia	QEPA	Environmental Protection Agency, Queensland		
GBR	Great Barrier Reef				
GBRMPA	Great Barrier Reef Marine Park Authority				

Performance indicators

The following indicators address the areas listed in Schedule 6 of the Commonwealth Agreement and align with the selection and evaluation criteria for Australian CRCs.

1. Contribution to Australia's sustainable economic, social and environmental development

Indicator

Assessment

Incidences of science being used for policy, development, planning, technology or management in Australia

Queensland property level management system framework adopted by Queensland Farmers' Federation and AgForce.

Condition assessment report for the Burdekin Dry Tropics NRM region incorporated into NRM planning for the region.

Citizen Science Toolbox used extensively by natural resource managers to improve community consultation programs undertaken by local and state government agencies.

Suite of ecosystem health indicators, developed for regional NRM bodies to measure coastal, estuarine and marine habitat integrity, incorporated into a national Coastal Resource Condition monitoring framework.

Objectives and targets for coastal zone resource use included into the Fitzroy and Port Curtis regional NRM plans.

NSW National Parks changed marine protected area zoning plans and maps at Byron Bay Marine Park as a result of high resolution habitat mapping data.

Parks Victoria agreed to base marine protected area planning on new coastal habitat mapping data provided by the CRC.

Estuary science, tools and models used by National Estuary Network and state government agencies.

Widespread exchange of scientific and technical information through national coastal conferences, workshops, networks, publications and websites.

CRC skills sought to support science, decision-making, development and conservation

Gold Coast and Hervey Bay councils use coastal process models in estuary entrance design and management.

Increased use made of online databases, decision-support software and models such as Coastal Meta, OzEstuaries, *Facilitator*, SERM and EHMP.

Seven National Water Quality Management Strategy workshops and training courses provided to regional NRM groups around Australia.

Online toolbox of community engagement strategies used extensively by Australian NRM groups to improve participatory research and decision-making. Toolbox promoted by Global Environment Program (LOICZ).

Socio-economic analysis of incentives for wetland management in the Great Barrier Reef catchment used by Department of Environment and Heritage in roll-out of Reef Plan.

Database examining alignment between regional Mackay-Whitsunday NRM body and Queensland state agencies activities used by state government in other regions.

New technology and algorithms for remote sensing of coastal habitat adopted by coastal management agencies in three states.

Two spin-off business entities developed for ongoing research and extension services.

Overseas coastal research and management organisations, especially in Asia Pacific, increase requests for scientific assistance following several study tours, conferences and workshops organised by the CRC.

New contracts secured for coastal water habitat mapping services in Victoria.

James Whelan was invited on the conference organising committee for the 2006 national Eco-politics Conference. He is convenor of the 'Civil Society, NGOs and Social Movements' sessions.

The Coastal CRC promoted Australian coastal research capacity extensively at the Coastal Zone Asia Pacific conference in Brisbane. Several international collaborative projects were generated.

Ecological and economic benefits for Australia's coastal zone

Independent evaluation of four CRC projects valued the overall benefits to partners, industry and stakeholders at "between tens to hundreds of millions of dollars."

Benefit to BCC of research into sewage overflows, public health and options for storm water management, valued at over \$100 million for future investment in water services by the council.

Contribution to NRM planning in Queensland's Fitzroy Basin region helped shape planning targets and investment in the order of \$40 million to achieve better Basin outcomes.

Work done on the relationship between environmental flows in the Fitzroy Basin and fish and prawn stocks has provided a basis for both more effective management in ensuring fisheries impacts are factored into setting flow regimes, and better planning of how to optimize fisheries effort. Future benefit estimated between \$10-20 million.

Work by the CRC on the Port Curtis Integrated Monitoring Program assessed as adding greatly to the value of information for managing environmental problems. Knowledge valued as insurance against high-cost, and cost-ineffective impediments to appropriate regional development, estimated to be worth tens of millions of dollars.

State and local government agencies increase use of national estuaries models, publications, websites and monitoring tools.

2. Quality and relevance of the research program

Indicator	Assessment
Extent to which theme objectives have been achieved (see Chapter 5)	<p>Research program developed into several 'Client-Focussed Packages' to better promote and deliver research products and services to coastal interest groups.</p> <p>Independent review panel found the research program to be effective and robust. The report said "there was good interaction between and amongst researchers and research managers. The multidisciplinary nature of coastal zone issues was handled effectively and results were reflected in the planning and content of research projects."</p> <p>Executive group and Board review six monthly project reports.</p> <p>Successful annual review of all projects by key national and regional stakeholder groups.</p> <p>Detailed milestones were used to monitor and assess the performance of each project.</p> <p>Project managers assigned to facilitate timely delivery of outputs and outcomes.</p>
Number of scientific papers, books, and chapters published, and conference presentations for clients and stakeholders (see Chapter 10)	<p>84 conference papers: 58 in 2004, 52 in 2003, 24 in 2002, 20 in 2001</p> <p>52 refereed papers (80) (29) (31) (36)</p> <p>14 books and chapters (4) (3) (10) (0)</p> <p>89 technical reports (38) (37) (16) (16)</p>
(figures in brackets are previous years)	<p>35 stakeholder newsletter features (31) (23) (17) (17)</p> <p>61 national conference presentations (48) (49) (16) (15)</p> <p>23 international conference presentations (12) (15) (15) (20)</p> <p>57 presentations to community groups (63) (30) (30) (44)</p> <p>34 presentations to government groups (52) (67) (25)</p>
Quality and relevance of research projects. (see Chapters 5 and 7)	<p>Independent review panel found that "close coordination between the research projects and the user community at which the results were aimed was maintained from initiation through to completion, and at a broad range of management levels."</p> <p>The panel stated Coastal CRC can "be proud of its own progress and achievement" in regard to quality and relevance of research projects.</p> <p>Research projects monitored and reviewed by Board and core partners.</p> <p>Invitations for CRC researchers to present at national and international conferences (LOICZ, AMSA, Remote Sensing, Contaminants, etc.).</p> <p>External peer review process used to maintain quality control for published scientific papers and final reports.</p> <p>Reviews of six-monthly reports carried out by theme leaders.</p>

NSAC, and stakeholders in Fitzroy, Port Curtis and south-east Qld regions reviewed projects to ensure relevance and reported positive feedback.

Several awards made to CRC researchers (see Ch. 11)

Awards and recognition by peers and prestigious organisations (see Chapter 12)

Geoscience Australia Annual Award to a *Project for Achieving Results (Science)*, Coastal CRC Team.

Eureka Sherman Environmental Research Award (finalist), 2004, Australian Estuaries Package.

Asia-Pacific Spatial Excellence Award for Education and Professional Development, 2004 (Stuart Phinn).

Excellence Award for Education and Professional Development in Queensland, 2005 (Stuart Phinn).

Business/Higher Education Round Table scholarship, CRC Leadership and Career Development, Melbourne (Linda Cobiac).

Highly commended, 2004 Queensland's Smart Women – Smart State Awards (Linda Cobiac).

University of Western Australia 2005 Graduate Research Candidate Travel Award (Dianne Watson).

Best student poster (and paper), 2005 OzWater Watershed Convention (Cara Beal).

BHERT scholarship (5th consecutive year by CRC) (Tara Cully).

CRC Association Student Award finalist (Russell Richards).

3. Utilisation and application of research

Indicator	Assessment
Management study area activities (see Chapter 5)	<p>Regional project and study area managers coordinated five major research projects, assisting stakeholders to review and adopt science in regional areas.</p> <p>Briefings and workshops organised for local industry, government and NGO stakeholder groups in Burdekin, Fitzroy Gold Coast, and Port Curtis regions of Queensland, Port Philip Bay region of Victoria, Cockburn region of Western Australia.</p> <p>Dissemination of estuaries scientific data through National Estuary Network meetings held at Warrnambool and Darwin.</p> <p>Social mapping workshops organised in Esperance region of WA for marine habitat assessment.</p> <p>Property Level Planning System workshops held for regional natural resource managers and farm managers.</p> <p>Port Curtis industry consortium used marine monitoring model for Gladstone harbour. Adoption of Port Curtis regional monitoring strategy based on CRC science.</p> <p><i>Healthy Waterways</i> public awareness campaign continued in central Qld.</p> <p>FBA extended Fitzroy River contaminant research project.</p> <p>Citizen science training workshops conducted for state resource managers in WA (30) and Vic. (30).</p> <p>Remote sensing techniques used to assess water quality indicators in Moreton Bay and to further develop advanced monitoring program with MBCWP.</p> <p>Seabed mapping surveys at Cockburn Sound, Byron Bay, Keppel Bay, Victorian coast and the Recherche Archipelago used by various government agencies.</p> <p>Catchment modelling techniques integrated into toolkit for environmental planners.</p> <p>Technical advice provided for Waterwatch's national community monitoring program.</p>
Stakeholder involvement in projects and activities (see Chapter 7)	<p>Stakeholder representatives on NSAC review project outcomes.</p> <p>Industry, government and community stakeholder 'buddies' attached to 22 sub-projects.</p> <p>Scientific advisory groups review phase 2 projects. Stakeholder communication plans for 20 research projects.</p> <p>Environmental planning project developed with NRM stakeholders from western Victoria, south-east Queensland and far-north Queensland.</p> <p>National Estuary Network meetings held to share and communicate data and outcomes between states and territories.</p> <p>Increased participation by Queensland's EPA and DNR&M in coastal research and regional NRM planning.</p> <p>All sub-projects involved two or more partners and one or more stakeholder representatives. Independent representatives involve in planning all new R&D projects.</p>

Acceptance and availability of outcomes	<p>Ecosystem Health Monitoring Program data for Moreton region published online for stakeholders.</p> <p>National estuary data published and maintained online in OzEstuaries public database.</p> <p>Online project milestone reporting and review system used extensively by CRC staff and researchers.</p> <p>Citizen science toolbox printed and used by NRM groups and state government agencies.</p> <p>Major technical reports, scientific papers and summaries published in print and online. Increased demand for report downloads from website.</p> <p>Approximately 169,000 visits made to website</p>																																																																																
Linkages to SMEs and industry (see Chapter 7)	<p>Significant association with 32 private companies and industry groups.</p> <p>Port Curtis monitoring program involves 6 industry groups.</p> <p>Governance project in Port Curtis involves 4 large companies.</p> <p>Four industries funded development of hydrodynamic model for Port Curtis.</p> <p>Property level planning project involved AgForce and Queensland Farmers' Federation.</p> <p>Coastal water habitat mapping project involves 6 SMEs. Major contribution by Fugro Survey of \$216k.</p>																																																																																
Use and publication of intellectual property	<p>Protocols and guidelines for IP in place. Student agreements for IP in place. Agreements for all funded projects. IP licensing agreements developed. Licensing agreement guidelines prepared for future projects. Commercialisation plans for several CRC tools commenced.</p>																																																																																
Recognition by the national media (see Chapter 11)	<table border="1"> <thead> <tr> <th></th> <th colspan="6">Regional media</th> <th colspan="6">State and national media</th> </tr> </thead> <tbody> <tr> <td>(Figures in brackets are for previous year)</td> <td>Print</td> <td>14</td> <td>(22)</td> <td>(28)</td> <td>(17)</td> <td>(15)</td> <td>(10)</td> <td>2</td> <td>(9)</td> <td>(12)</td> <td>(7)</td> <td>(14)</td> <td>(6)</td> </tr> <tr> <td></td> <td>Radio</td> <td>9</td> <td>(18)</td> <td>(28)</td> <td>(14)</td> <td>(36)</td> <td>(9)</td> <td>5</td> <td>(6)</td> <td>(5)</td> <td>(4)</td> <td>(9)</td> <td>(8)</td> </tr> <tr> <td></td> <td>TV</td> <td>14</td> <td>(14)</td> <td>(11)</td> <td>(17)</td> <td>(7)</td> <td>(4)</td> <td>4</td> <td>(11)</td> <td>(9)</td> <td>(8)</td> <td>(21)</td> <td>(11)</td> </tr> <tr> <td></td> <td>Mags</td> <td>2</td> <td>(2)</td> <td>(4)</td> <td>(4)</td> <td>(4)</td> <td>(5)</td> <td>13</td> <td>(14)</td> <td>(10)</td> <td>(9)</td> <td>(10)</td> <td>(6)</td> </tr> </tbody> </table>													Regional media						State and national media						(Figures in brackets are for previous year)	Print	14	(22)	(28)	(17)	(15)	(10)	2	(9)	(12)	(7)	(14)	(6)		Radio	9	(18)	(28)	(14)	(36)	(9)	5	(6)	(5)	(4)	(9)	(8)		TV	14	(14)	(11)	(17)	(7)	(4)	4	(11)	(9)	(8)	(21)	(11)		Mags	2	(2)	(4)	(4)	(4)	(5)	13	(14)	(10)	(9)	(10)	(6)
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Public displays and presentations	<p>Five major displays organised for coastal conferences and public events (8 in 2003-4, 6 in 2002-3, 12 in 2001-2).</p> <p>More than 100 presentations were made to regional, national and international stakeholder groups by researchers (85 in 2003-4, 100 in 2002-3).</p>																																																																																

4. Education and training to enhance the value to Australia of graduate researchers

Indicator	Assessment
Number of full time postgraduate students on full or top-up scholarships (see Chapter 6: Education)	23 full time students supported with scholarships
	21 in 2003-4
	25 in 2002-3
	22 in 2001-2
22 in 2000-1	
Number of affiliate and associate students supported by the CRC	7 affiliate and associate students
	7 in 2003-4
	10 in 2002-3
	7 in 2001-2
3 in 2000-1	
Number of higher degrees awarded	5 students awarded degrees
	5 in 2003-4
	6 in 2002-3
	4 in 2001-2
Number of short courses and workshop conducted for staff and stakeholders	Media skills (15 researchers).
	Citizen Science Toolbox workshop (15 LOICZ researchers).
	Annual CRC staff/student workshop (100 staff, students and stakeholders).
	Coastal Zone Asia Pacific workshops (300 participants).
	Melbourne University Leadership Course (2 researchers).
	National Water Quality Management Strategy workshops (90 participants).
	Wetlands workshop (20 researchers).
	Governance and Partnership workshop (14 researchers).
	Coastal Water Habitat Mapping workshops (30 researchers).
Contaminants workshops (30 participants).	
Social mapping workshop (30 participants).	

	Property Level Planning System workshops (50 participants). Regional NRM Partnership Workshops (150 participants).
Extent of professional development activities provided to postgraduates (see Chapter 6)	Education committee plans and oversee student support and training. \$5,000 p.a. allocated to each scholarship holder for professional development activities. 4 postgraduate seminars organised (6) (15) (13) (8). 13 students attended major conferences (19) (10) (6) (3). 1 student attended BHERT program (3) (1) (2) (1). 13 students attended CRC workshop (16) (8) (17) (17). All postgraduate student projects integrated into project teams
Number of CRC postgraduates co-supervised by two or more participants	15 were supervised by two or more participants 13 in 2003-4 18 in 2002-3 19 in 2001-2 17 in 2000-1
Percentage of CRC postgraduates with non-university co-supervisors	47% were supervised by non-university co-supervisors 67% in 2003-4 72% in 2002-3 67% in 2001-2 73% in 2000-1

5. Collaborative arrangements

Indicator

Assessment

Integration of science and sharing of results

More than 20% time commitment by theme leaders. Project managers, stakeholder advisory groups and partner organisation involvement ensures integration of results.

New collaborative partnerships formed 3 associate partners.

100 staff and students attended CRC workshop in 2004 to integrate tasks, projects and skills (120 in 2003, 110 in 2002 and 105 in 2001).

Secondment of 1 QEPA planner to CRC linking science with QEPA planning guidelines, values and objectives.

15 regional NRM groups from four States partnered in cooperative research activities (10 in 2003).

Monthly executive meetings ensured regional and theme activities are integrated.

Continuation of full-time Science Leader position.

Development of Client-Focussed Packages for target markets.

Level of effective communication networks among participants (see Chapter 11)

Monthly distribution of *Flotsam and Jetsam* email newsletter reaching 2,000 recipients.

Project advisory groups support research project packages.

Website redesigned and improved. Increased access to technical reports and publications. Open access by participants to milestone reports (1200 page visits per day, up from 850 in 2004 and 750 in 2003).

Average number of online publication downloads is six per day.

Regular project team meetings, and meetings with stakeholders in study areas.

Review of project progress by regional stakeholders.

'Buddy' system used to link project teams with key industry, government and community stakeholders.

Human Dimensions of Natural Resource Management research network linked over 90 members across Australia.

5 regional NRM partnership 'think tanks' held, with over 150 participants from community sector organisations, regional NRM bodies, state and local government and industry.

Commitment to long term strategic alliance

Board continued to provide governance and set research directions and priorities of the CRC.

Partner management group (met once).

Two meetings of NSAC held. Commitment to form national coastal body post 2006.

Joint venture mapping program established between Fugro Survey, UWA and Curtin Uni for post 2006.

Two review workshops with stakeholders held at Port Curtis and Fitzroy regions.

	<p>Staff from five partner organisations represented on the Executive Management Group.</p> <p>Two meetings of the National Estuaries Network held to coordinate estuaries research between states.</p>
<p>Links with other CRCs, other research institutions and coastal agencies (see Chapter 7)</p>	<p>Nationally, the CRC had significant interaction with 11 universities, 13 research organisations, 21 state government agencies, 18 local government agencies, 19 community organisations and 26 private companies (see Chapter 7).</p> <p>Membership of NRM SEQ Committee.</p> <p>Membership of Great Barrier Reef Science Panel.</p> <p>MoU signed with Deakin University for coastal mapping.</p> <p>Brisbane node for LOICZ planned with UQ.</p> <p>Coastal Zone Asia Pacific network established for post 2006.</p> <p>Regular involvement in CRC Assoc. communicator and business manager networks, especially in south-east Qld.</p> <p>Support for CRC Water Forum group with 4 other CRCs.</p> <p>Significant interaction with 5 overseas government agencies, 8 international organisations and programs, 17 overseas universities and 7 research institutions (see Chapter 7).</p> <p>Increased links with regional NRM groups, local councils and state government agencies in NSW, Vic, WA and SA.</p> <p>Joint project with CRC for Catchment Hydrology for catchment modelling.</p>
<p>Extent of commissioned collaborative or contract research undertaken (see Chapter 4)</p>	<p>21 projects received external funding</p>
<p>Commitment of Coastal CRC parties</p>	<p>Board meetings managed strategic directions, financial and governance issues.</p> <p>Brisbane City Council withdrew as partner as at June 2005.</p> <p>Additional funding and contract projects developed with partners (e.g. FBA agricultural contaminant project) and new associates (e.g. Hervey Bay and Gosford City councils).</p>

6. Management structure

Indicator	Assessment
Effectiveness of strategic planning process	<p>Strategic planning undertaken at annual workshop, special executive management meetings, Board meetings, NSAC meetings and stakeholder meetings.</p> <p>Independent external review undertaken in April 2005.</p> <p>Wind-down strategy for CRC developed by Board.</p> <p>Strategic planning workshop for executive and core CRC staff conducted in 2004.</p>
Effectiveness of human resource and project management	<p>Online milestone reporting system found useful and efficient by research teams. The system was adopted by the Australian Biosecurity CRC and considered by several other CRCs.</p> <p>Project progress payments made upon completion of set milestones.</p> <p>Roles and responsibilities statements, and postgraduate supervisor guidelines available. High core staff retention.</p> <p>Half-yearly project milestone reports produced.</p> <p>Annual review held for each project. New project agreements and milestone process implemented.</p> <p>Core staff performance reviews undertaken.</p>
Level of cash contributions by participants to the Centre	<p>\$1,131,529</p> <p>\$1,314,527 in 2003-4, \$1,018,371 in 2002-3, \$1,005,000 in 2001-02, \$1,136,409 in 2000-01.</p>
Level of in-kind contributions by core and supporting participants to the Centre	<p>\$8,294,239</p> <p>\$8,334,541 in 2003-4, \$6,677,117 in 2002-3, \$6,751,651 in 2001-02, \$6,384,790 in 2000-01.</p>
Extent of additional funding	<p>\$601,842 (excludes \$130k counted as BCC in-kind capital)</p> <p>\$571,604 in 2003-4, \$709,188 in 2002-3, \$1,225,882 in 2001-02, \$1,104,092 in 2000-01.</p>
Effectiveness of management structure	<p>3 Board meetings held to regulate operations, determine strategic development and approve projects, annual budget and finances. 1 partner/shareholder meeting, 2 chairman's committee meetings held.</p> <p>4 independent Board members.</p> <p>Executive Management Group met monthly to plan science issues, progress, budget, resource allocation, policy development and major activities.</p> <p>Project, stakeholder and National Stakeholder Advisory Committees advise Board and CEO.</p> <p>Coastal Zone Australia Ltd. streamlined HR and financial arrangements.</p>

7. Performance evaluation

Indicator

Assessment

Extent of internal protocols and effectiveness

Six-weekly notification system of forthcoming milestone/dates and reviewing system.
Staff, student and project data maintained on Coastal Meta.
Several Coastal CRC agreement templates accepted as exemplar by CRC Inc. project.
Monthly executive meeting review milestones.
Independent external review panel rated executive performance highly.
Protocols developed for two spin-off business entities.

Milestones achieved

83% of milestones accepted at first review.
All current phase 2 milestones reviewed by panel of internal and external reviewers.

Budget management

Cash expenditure to within 3% of projected annual budget.
Annual audit of finances undertaken.
