Annual Report 2008/2009

Reef & Rainforest
RESEARCH CENTRE

PARTNERS


Sunfish
CSIRO
Queensland Health
Queensland Seafood Industry Association
FNQ ROC
Biotropica
Australian Centre for Tropical Freshwater Research
Fish Collectors
World Wildlife Fund
University of New South Wales
Commercial Fishers
Australian Fisheries Management Authority
University of Melbourne
Southern Cross University
Charter Fishers
Ports Corporation of Queensland
Alliance for Sustainable Tourism
University of Queensland
James Cook University
Australian Defence Force Academy
Tourism Tropical North Queensland
Traditional Owners
Terrain NRM Ltd
Queensland Department of Natural Resources and Water
Great Barrier Reef Marine Park Authority
Australian Institute of Marine Science
North Queensland Climate Alliance
Reef Water Quality Partnerships
Australian Maritime College
Reef and Rainforest Research Centre
Environmental Protection Agency
Queensland Department of Primary Industries and Fisheries
Girringun Aboriginal Corporation
Surf Lifesaving Australia
Torres Strait Regional Authority
Central Queensland University
Australian Museum
Queensland Canegrowers Association
Private Researchers
University of Alberta
Wet Tropics Management Authority
Association of Marine Park Tourism Operators
Griffith University
Great Barrier Reef Foundation
Island Councils
Department of Agriculture Forestry and Fishing
Reef Check
Queensland Department of Main Roads
Powerlink
Australian National University

INTRODUCING THE REEF AND RAINFOREST RESEARCH CENTRE (RRRC)

We manage and deliver one of the world's most comprehensive tropical environmental research portfolios.

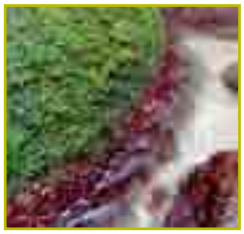
Through a consortium of 15 research agencies involving the work of more than 300 leading tropical scientists, our aim is to deliver useful and timely solution-based science addressing the needs of north Queensland's key environmental assets:

- The Great Barrier Reef and its catchments,
- The tropical rainforests including the Wet Tropics World Heritage Area, and
- The Torres Strait.

Among other projects, we implement the Australian Government's Marine and Tropical Sciences Research Facility (MTSRF) in north Queensland, managing a $A100 million research portfolio comprising $A40 million in Commonwealth funds with additional external funding and in-kind contributions from supporting and partner organisations.

Our unique engagement framework involves researchers and end users working together to define and supervise research projects addressing environmental management issues.

The results of RRRC-facilitated research are already being used by more than 38 organisations – government agencies, industries including tourism and fisheries, primary producers, community groups and Indigenous bodies.




FROM THE CHAIR

Richard Ireland, Chairman of the RRRC Board

We live in uncertain and challenging times. In the media and among gatherings of family and friends the 'barbecue stoppers' in our conversations increasingly relate to the likely range of impacts from climate change as well as our uncertainties about energy and food production.

In north Queensland these discussions have the added edge of our shared concerns for our environmental assets, particularly the Great Barrier Reef and the tropical rainforests of the Wet Tropics. Not only are we the local custodians of these special places, but these places also define our communities and all of us, in some way, draw from their lifestyle and economic benefits.

One thing we can be certain of is that science - or more importantly good science – will guide our responses to what lies ahead. It is in this capacity that the Reef and Rainforest Research Centre will increasingly come into its own in informing our discussions and responses.

As you read this annual report it is apparent that the RRRC is involved with a broad range of timely research that addresses some of the key challenges going forward – the resilience of our reefs and rainforests to climate change, the survival of critical species such as the cassowary and dugong, the importance of water quality to the health of our reefs, and the sustainability of our fisheries. And much, much more.

While much of this research is extraordinarily complex and long term in its nature, the early findings are providing significant clues for a sustainable future. And that, in essence, is our role – promoting good science, timely reporting, and ongoing discussion with the end users and communities we serve.

On behalf of the Board I would like to thank the RRRC staff, our research collaborators and supporting organisations for their leadership, dedication and collaboration over the last 12 months. Working together we are achieving great things.

I commend this annual report to you.

EXECUTIVE SUMMARY

Sheriden Morris, RRRC Managing Director

Welcome to the 2008/09 Annual Report for the Reef and Rainforest Research Centre (RRRC). The RRRC has had another successful and productive year managing and delivering a number of projects, including the Marine and Tropical Sciences Research Facility (MTSRF) – arguably the world's most comprehensive research consortium dedicated to tropical environments.

Our emphasis is on research with its end use in mind. To achieve this the RRRC supports a functional engagement framework between our research providers and our end users. This engagement is fundamental to framing research questions that are relevant to management needs, important in keeping research projects on track, and critical to the successful delivery of research results to end users. Much thought and effort have gone into the development of our engagement framework, and it is now one of our major strengths, enabling us to support governments, communities and industries as they endeavour to manage north Queensland's key assets – reefs, rainforests and the Torres Strait – sustainably and for the public good.

There has never been a better time for this research. With the challenge of climate change the stakes for this mega-diverse region are particularly high, not only for our environment but also the human populations that rely on it. There is an urgent need to make decisions based on sound science that will guide north Queensland to a sustainable future. And we hope that the lessons learned here will have wider application across the globe's tropical regions.

Our efforts are already seeing results. I encourage you to read the section of this Annual Report entitled "Our impact: Improving the region's sustainability" (p 13) for examples of some of the ways in which our consortium's solution science is already helping end users change management, policy and practice for the better. This rate of uptake is remarkable given that 2008/09 has only been the third year of our operation, but this is only the beginning. Using our engagement framework as a solid foundation, and by developing a dedicated program to enhance delivery of research to end users, we at the RRRC intend to ensure that the projects we manage deliver an unprecedented return on investment in terms of benefits for north Queensland's environment, economy and communities.

More than 300 scientists and more than 38 end user organisations are involved in the research and delivery of the MTSRF program. We thank all our scientists and partner organisations for their efforts over the last two years. As we continue our efforts to deliver science solutions for the tropics, we look forward to further developing these very productive partnerships.

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THE REEF AND RAINFOREST RESEARCH CENTRE: DELIVERING SCIENCE SOLUTIONS FOR THE TROPICS

Created in 2006 to implement the Australian Government's Marine and Tropical Sciences Research Facility (MTSRF), the RRRC has evolved an innovative approach to addressing the problems facing north Queensland's key environmental assets:

- the Great Barrier Reef and its catchments,
- tropical rainforests including the Wet Tropics World Heritage Area, and
- the Torres Strait.

The RRRC is a not-for-profit consortium of research providers, industry and community organisations that cooperate via a strong and effective engagement framework. What sets the RRRC apart is a unique focus on engagement with key sectors to provide solutions based on good science that address key tropical environmental management issues.

Another important feature is the RRRC's emerging role as a knowledge broker, ensuring the effective delivery of research results and tools to end users. The aim is for end users to be aware of new research, understand it, and then apply it towards sustainable outcomes. This results in the maximum possible return on investment in research, and the best possible benefit for north Queensland.

About the Marine and Tropical Sciences Research Facility (MTSRF)

The $A40 million MTSRF is part of the Australian Government's Commonwealth Environment Research Facilities program. MTSRF is the largest research portfolio currently managed by the RRRC. This year over 300 scientists from 15 research organisations have been working on projects designed to solve specific management and policy problems faced by end users across at least 38 government, industry and community organisations.

Goals and research strategy

The vision of the MTSRF is to plan, fund and coordinate the highest quality, cross-disciplinary research for public good, to:

- ensure the protection, conservation, sustainable use and management of the environmental assets of the Great Barrier Reef and its catchments, tropical rainforests including the Wet Tropics World Heritage Area and the Torres Strait;
- foster an understanding of the interactions of north Queensland's natural environment with the social and economic aspects of north Queensland's communities;
- support the adoption of science-based knowledge in policies and practices for ecologically sustainable management; and
- facilitate capacity-building for sustainable environmental management and environmental management research, in partnership with the community, environmental managers, research institutions, industry and policy-makers.

The MTSRF's Research Investment Strategy[1] guides investment across five major themes:

- Status of the Ecosystems,
- Risks and Threats to the Ecosystems,
- Halting and Reversing the Decline of Water Quality,
- Sustainable Use and Management, and
- Enhancing Delivery.

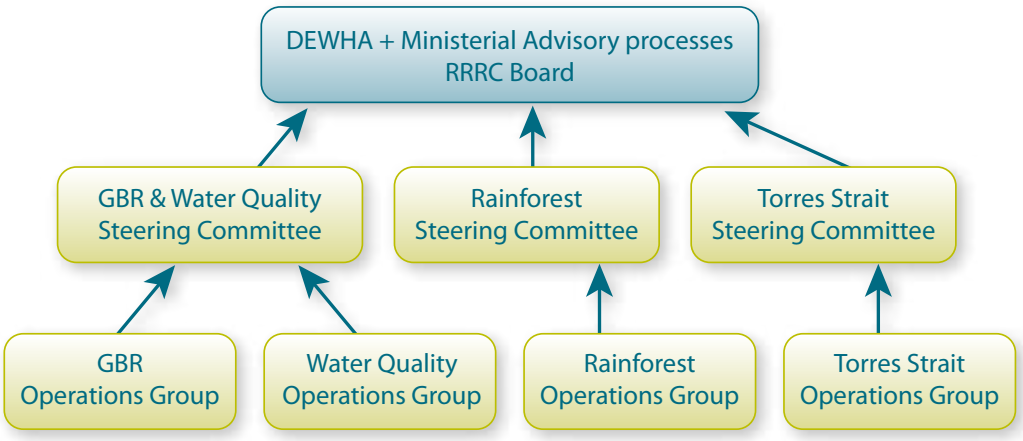
The MTSRF 's third Annual Research Plan, covering financial year 2008/2009, was contracted in September 2008. The Plan covers all five themes in the Research Investment Strategy, supported by more than $7.8 million in MTSRF funds combined with cash and in-kind contributions from partners of a further $2.3 million and $13.3 million respectively. This represents over $23 million of investment in the third year of the MTSRF 's operation. Please see the financial summary on page 42 for more details.

1 The MTSRF's Research Investment Strategy is available at http://www.environment.gov.au/programs/cerf/publications/mtsrf-ris.html.

Cooperation for better outcomes

Effective delivery and adoption of research results relies on a close link between research providers and the end users of the research. Engagement between providers and end users is essential through all stages of development of the MTSRF's research programs, from commencement when research problems are specified, during research activity in order to keep projects on track, and finally to facilitate end user uptake of research results such that management, policy, or practice is changed for the better. Without engagement, there would be a high risk that this considerable public investment in research would not lead to a more sustainable future for north Queensland. The RRRC has ensured that engagement between researchers and end users has been built into the very structure of the MTSRF, through active membership by key research and end user groups in the MTSRF's internal Operations and Steering committees.

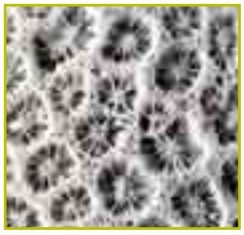
Figure 1. The MTSRF governance model including the relationship between Operations and Steering committees. Fundamental to the success of the model is the involvement of end users, research providers and RRRC staff at all levels.



THE CONSORTIUM

The Reef and Rainforest Research Centre's innovative and responsive approach to research management and delivery relies on the diverse talents and expertise of the consortium the Centre represents.

Leading members of the consortium include Mr Richard Ireland (Chair of the RRRC Board), Dr Russell Reichelt (Chair of the Great Barrier Reef Marine Park Authority), Mr David Hutcheon (the Association of Marine Park Tourism Operators), Mr Max Shepherd (Skyrail Pty Ltd), Mr Daniel Gschwind (Queensland Tourism Industry Council), Prof Chris Cocklin (Deputy Vice Chancellor, James Cook University), Mr Andrew Maclean (Executive Director of the Wet Tropics Management Authority), Dr Andrew Johnson (CSIRO), Dr Ian Poiner (Chief Executive Officer, the Australian Institute of Marine Science), and Dr Eva Abal (Great Barrier Reef Foundation).




The consortium is supported through the enthusiastic activities of nine full-time staff in two offices in Cairns and Townsville. Development and management of the research program is led by Sheriden Morris, the Managing Director of the RRRC. With her degree in Agricultural Science followed by considerable experience in the tropical agriculture industry, natural resource management, environmental management and policy development, Sheriden was formerly Director of Water Quality and Coastal Development, Great Barrier Reef Marine Park Authority and Manager of the Great Barrier Reef program of CSIRO's Water for a Healthy Country Flagship.

Research program coordination, including development of the e-Atlas, is the responsibility of RRRC's Research Director, Dr David Souter, who is also the Senior Research Manager for Great Barrier Reef projects. David is a coral reef scientist with broad international experience conducting and managing coral reef research and tropical coastal ecosystem management projects in Australia, East Africa, the Indian Ocean Islands, South and Southeast Asia through World Bank, UNEP, Sida, and AusAID funded programs.

As Senior Research Manager for Rainforests and Catchments, Mellissa Jess manages and coordinates researchers and end users, reviewing milestone reports and resolving any disputes to ensure that projects remain on track towards the desired outcome. Mellissa's experience includes expertise in wildlife research and management, monitoring and evaluation of mulga and rangeland communities, rehabilitation projects for threatened species/communities, ecological consultancy and collaboration in international quarantine research. From December 2008, Mellissa has also been responsible for Torres Strait projects.

Dr Joelle Prange fulfilled a similar role as Senior Research Manager for research projects related to Water Quality. Joelle left RRRC to take up a position with WorldFish in April 2009.

The task of synthesising and enhancing delivery of research to end users is undertaken by Dr Suzanne Long, RRRC's Senior Scientist. Drawing upon her broad international experience as a research scientist working in the fields of evolutionary biology, marine ecology and conservation biology, Suzanne leads Theme 5 of the MTSRF, helping end users to uptake research results, and is motivated to ensure that publicly-funded, public-good research actually benefits the public. Suzanne calls on other RRRC

staff as appropriate to help respond to information requests and needs from end users, including government agencies.

Hayley Gorsuch is a Research Manager, providing support to the Senior Research Managers in their task of keeping track of all research projects managed by the RRRC, and reporting on progress to DEWHA. Hayley is a marine science graduate with experience in tropical marine tourism and marine education in Australia and Southeast Asia. She has particular interests in sustainable use of coral reefs and shark conservation.

Financial management and accountability is the responsibility of RRRC's Finance Manager, Karrah Krauss. Karrah somehow manages to maintain perfect order despite balancing the financial and auditing demands of three levels of government, fifteen research provider organisations and over 300 scientists. She worked in tax consultancy before deciding to put her skills and Bachelor of Commerce to work for good in a not for profit company.

Dealing with the considerable logistics and coordination involved in RRRC's daily acitivities is Toni Fulton, our Cairns Office Manager. Toni maintains a grasp on the technical details of RRRC's daily operations and events, and contributes a strong administrative and north Queensland cultural background to the RRRC team.

The essential role of managing and continuously updating our website falls to Shannon Hogan, RRRC's Publications Manager. She is also the Office Manager for Townsville. Shannon coordinates the publication of technical and research reports along with other communications devices. Shannon draws on her experience in the publishing and graphic design fields to ensure the quality of RRRC and MTSRF deliverables. Shannon returned to the RRRC following eighteen months' absence to replace Isobelle Lavers, who relocated to Perth in December 2008.

OUR IMPACT: IMPROVING THE REGION'S SUSTAINABILITY

Helping to improve prospects for some of north Queensland's vulnerable species, such as dugongs and cassowaries, is a major focus of MTSRF research

In just the third year of the MTSRF's operation, this RRRC-managed and delivered research portfolio is already helping to improve the sustainability of management and use of north Queensland's environmental assets.

Scientific support for management of important dugong habitats

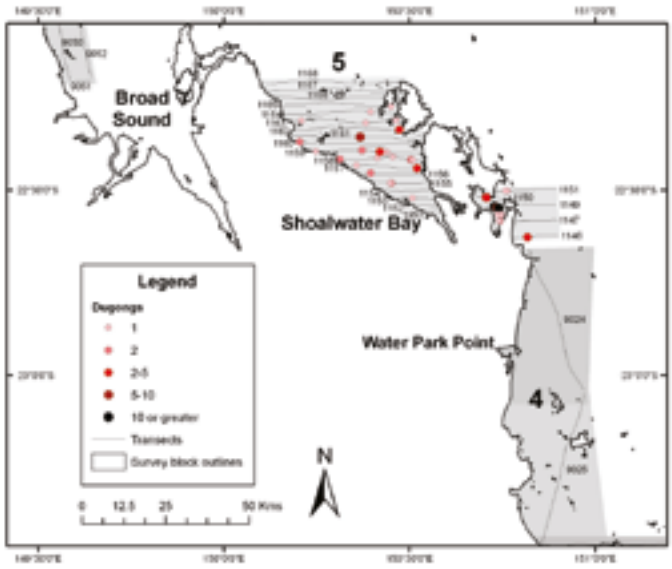
THE GREAT BARRIER REEF MARINE PARK (GBRMP) still contains globally important numbers of dugongs, but evidence suggests that dugong numbers have declined substantially in the region since the 1960s.

Dugong habitats were considered a priority in the Australian Government's Representative Areas Program, which aimed to protect 'representative' examples of all the different habitats and communities in the GBRMP.

Specific guidelines for dugong habitats could be set with a high degree of confidence because of the significant amount of research and monitoring of this species and its habitats that had occurred in the area over the past 25 years.

The MTSRF report *Dugong distribution and abundance on the urban coast of Queensland: a basis for management* was written with the specific aim of informing management of this species. It provides substantial support for the locations that were selected as important dugong habitats in the Regional Area Program.

This report has also been used in negotiations about future management arrangements for the East Coast Inshore Finfish Fishery.



Results of an aerial survey of part of the southern section of the Great Barrier Reef Marine Park showing the positions and sizes of the dugong groups sighted (November 2005).

The e-Atlas: A knowledge management system for Australia's Tropical Lands and Seas

MANAGING OUR TROPICAL LANDS and seas to enhance their resilience, particularly in the face of growing threats posed by climate change, declining water quality and unsustainable use, is a significant scientific, policy and management challenge. One of the keys to successfully meeting this challenge will be the effective collation, synthesis, analysis and dissemination of credible climate change-related bio-physical and socio-economic information to policy makers, natural resource managers, scientists and the general public.

In order to provide a framework to facilitate effective use and sharing of information, the MTSRF (with additional contributions from the Great Barrier Reef Marine Park Authority and the Great Barrier Reef Foundation) is funding a substantial collaborative effort involving many research providers and end users to develop the e-Atlas, which is a new web-accessible integrated knowledge management system designed to enhance evidence-based decision making for effective management and long-term sustainable use of the Great Barrier Reef and its catchments, the Wet Tropics rainforest and Torres Strait. The e-Atlas is a portal providing access to the data and information handling, spatial mapping and analytical tools to collate, integrate, share and analyse the vast array of bio-physical and socio-economic required to manage these environmentally, economically and culturally valuable systems effectively. The e-Atlas facilitates identification and enhances understanding of the major risk and resilience factors influencing the MTSRF region, and their ecological, social and economic impacts, and enhances capacity to evaluate and implement effective policy and management responses to ensure the long-term sustainability of North Queensland's natural assets.

Sheriden Morris and Dr David Souter from the Reef and Rainforest Research Centre (left) demonstrate the features of the Reef Atlas for Prime Minister The Hon. Kevin Rudd and Climate Change Minister Senator Penny Wong (obscured), with Member for Leichhardt Mr Jim Turnour MP and Principal Research Scientist Dr Katharina Fabricius (AIMS) looking on.

The e-Atlas is already the major knowledge capture and delivery tool for the MTSRF program and planning is underway to incorporate the e-Atlas into the Australian Government's Caring for Our Country - Reef Rescue initiative as the major reporting tool for monitoring programs, enabling the evaluation of progress towards improvements in reef condition.

e-Atlas.org.au
Australia's Tropical Land And Seas

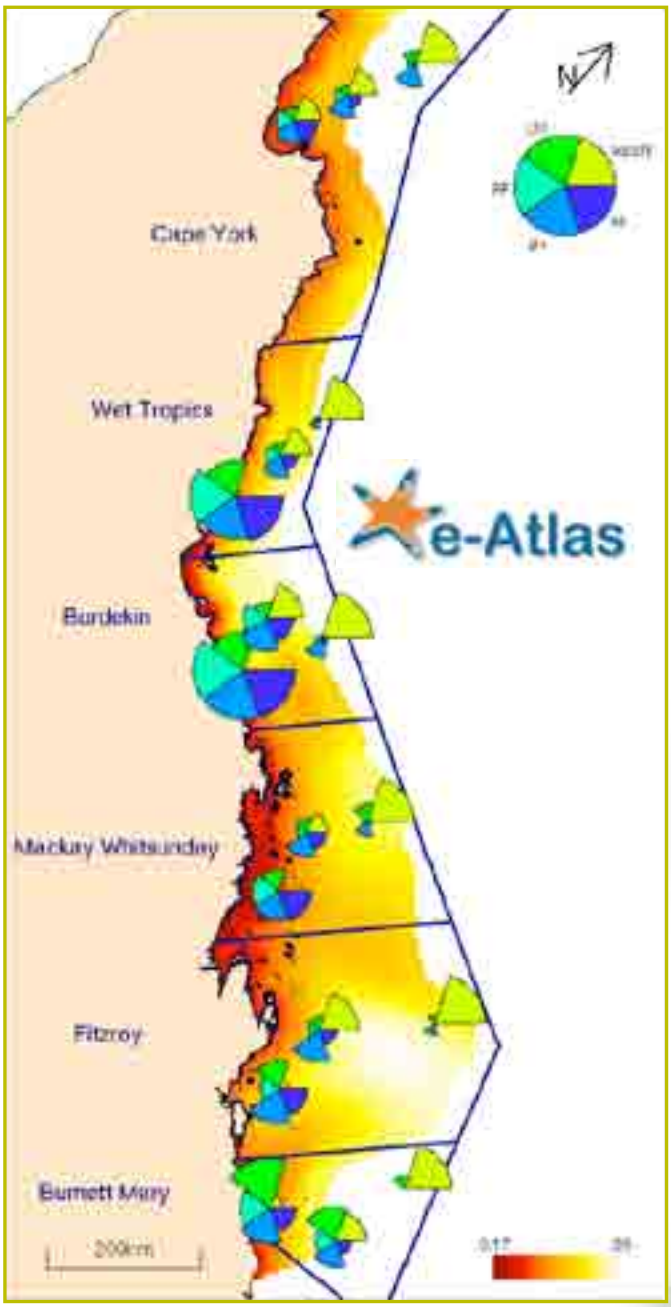
Informing water quality guidelines for the Great Barrier Reef

POOR WATER QUALITY has already contributed to declines in the health of many inner shelf areas of the Great Barrier Reef. Considerable research effort – including major MTSRF projects examining the role of sediments, nutrients and pesticides – has been invested in improving our understanding of the important components of water quality and their impacts on reef ecosystems.

A recent report commissioned by the Great Barrier Reef Marine Park Authority (GBRMPA) synthesised this information and recommended specific, science-based water quality trigger values for key pollutants to provide a tool for effective reef management. Following these recommendations, GBRMPA has produced guidelines for Great Barrier Reef water quality which will guide all future attempts to improve reef health and resilience through water quality management.

The MTSRF's solution science approach has thus directly informed management of the Great Barrier Reef, and is likely to be instrumental in achieving future improvements in the health and resilience of the reef through improvements in water quality.

Ove Hoegh-Guldberg, Centre for Marine Studies, The University of Queensland



The e-Atlas is a new tool that enables managers to integrate datasets from many sources, investigating the relationships between (eg) water quality (pie graphs) and benthic biodiversity (red-yellow shading). *For more information please see page 13.*

Innovating to help avert cassowary extinction at Mission Beach

SOUTHERN CASSOWARIES are large, flightless birds that play important roles in rainforest ecosystems - notably in the successful dispersal and germination of many native rainforest plants, as well as in fostering recovery of rainforest communities from cyclones. These charismatic animals are also considered an integral part of the ecotourism appeal of areas such as Mission Beach.

However, the future of cassowaries in the Cassowary Coast Regional Shire, particularly Mission Beach, is far from secure. Despite considerable conservation-focused planning effort over decades, persistent implementation failure has meant that cassowary numbers have continued to plummet in the Mission Beach area, with some experts predicting imminent local extinction. A group of MTSRF-funded researchers have responded to this clear management need by developing an innovative approach to averting extinction and achieving sustainability for cassowaries at Mission Beach.

Spatial patterns and trends in human population and land use in the Mission Beach were used to develop a 'business-as-usual' scenario for Mission Beach in 2025. This was presented at a community workshop in December 2007, and was instrumental in helping achieve consensus about future planning objectives for the area. Encouragingly, local area planning targets developed at this workshop showed a surprising degree of community cohesion in relation to the cassowary conservation issue.

The adaptive, collaborative planning framework developed through the MTSRF research includes a strong focus on brokering across multiple state and federal cassowary conservation organisations. Recent state and federal government decisions to restrict Mission Beach's urban footprint, and to reject an application to clear essential local cassowary habitat, provide encouraging evidence these innovative approaches developed through MTSRF-supported planning systems research may prove successful in generating lasting cassowary conservation solutions for Mission Beach.

Photo WTMA

Adult Southern cassowary

Complex spatial analyses integrating information from many different sources about habitat condition, future vegetation in climate scenarios, level of protection, threat, and opportunity – such as will be possible with the e-Atlas - lead to improved understanding of the relative conservation value of Mission Beach's diverse habitats (red = high biodiversity and integrity).

Photo WTMA

Cassowary eggs

Improving rainforest revegetation outcomes

RESEARCHERS FROM GRIFFITH UNIVERSITY funded by the MTSRF and Terrain NRM have produced a toolkit – Monitoring Revegetation Projects For Biodiversity In Rainforest Landscapes – which is already being used extensively by local councils, landholders and rehabilitation specialists, for example Conservation Volunteers Australia and Rainforest Rescue.

The toolkits are user-friendly but ecologically meaningful for monitoring progress of vegetation condition and biodiversity at sites whose vegetation is changing either because of impacts (including land clearing and cyclones) or recovery processes (including regrowth, ecological restoration and reforestation). Use of the toolkit should substantially improve the return on investment in rainforest revegetation efforts in the Wet Tropics, with multiple downstream benefits for the region in terms of biodiversity conservation, water quality improvement and carbon biosequestration.

Senator for Queensland and President of the Senate, The Hon. John Hogg (centre), inspects a site that is being revegetated using tools developed through the MTSRF, escorted by staff from RRRC, Rainforest Rescue and QPWS. Cow Bay, Daintree region, 7 May 2009.

MTSRF-funded research contributes to improving Great Barrier Reef water quality

THE EFFECTIVENESS OF THE AUSTRALIAN Government's Reef Rescue Marine Monitoring Program has been considerably enhanced by the use of the robust, useful marine water quality indicators (including biological indicators such as biofilms) that have been developed by MTSRF-funded researchers at AIMS. In addition, MTSRF-funded statistical analyses of water quality indicators and thresholds of concern have informed GBRMPA's development of draft water quality guidelines for the Reef and the Queensland State Government's new regulations introduced in January 2009.

The Queensland Premier, Anna Bligh, is briefed on the relationship between water quality and reef health by Sheriden Morris, the Managing Director of the Reef and Rainforest Research Centre, 27 January 2009.
Image courtesy Suzanne Long/RRRC.

Science supporting the development of a new industry for the Torres Strait

SCIENTIFIC RESEARCH INTO NATURAL SPONGE populations by many organisations (including the MTSRF) has paved the way for approval for a proposed commercial sponge aquaculture farm. A Yorke Island community-owned company, Kailag Enterprises, is currently in the process of operationalising the research results into a functioning farm, which is already beginning to provide the local Islander community on Yorke Island with employment and income.

MTSRF-funded research will continue to ensure that EPBC assessment processes are informed and that sponge farming is environmentally sustainable.

The Hon. Desley Boyle, then Minister for Tourism, Regional Development and Industry (right, holding some Yorke Island sponges) announces that Kailag Enterprises will receive state government funding through the Indigenous Businesses Development Scheme to develop a commercial sponge farm in the Torres Strait (Cairns, late 2008). Also present are (L-R) Darren Cleland from DTRDI in Cairns, Dr Libby Evans-Illidge from AIMS, Philippa Bauer from Kailag Enterprises, and Prof David Yellowlees from JCU.

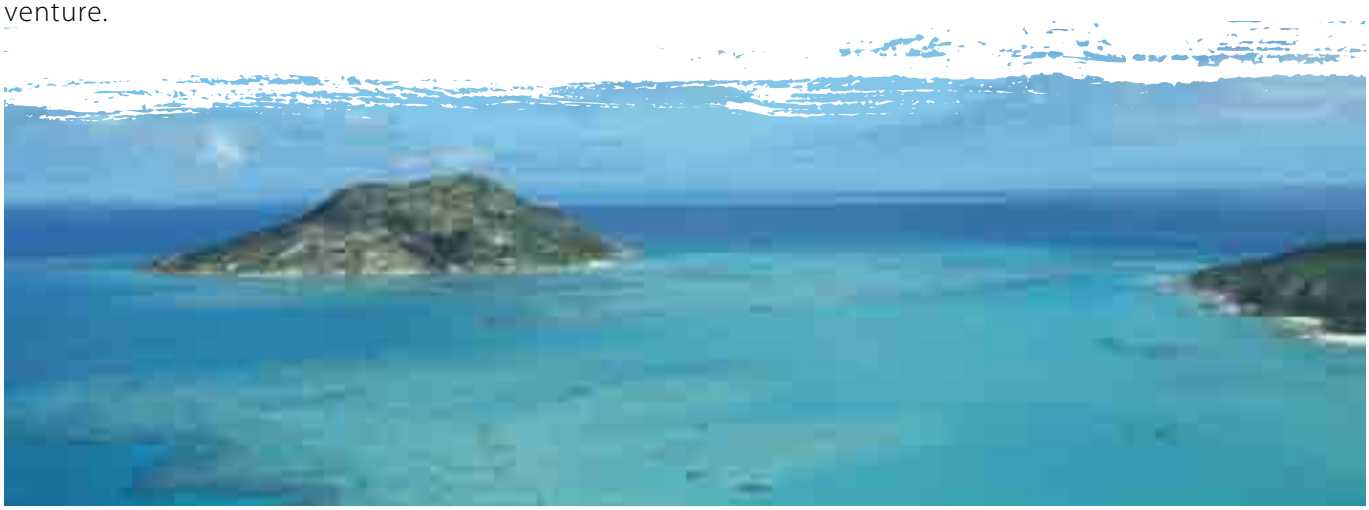
Decades of research by many agencies and providers, including the MTSRF, has resulted in Yorke Island locals being trained in all the skills necessary to run their community's sponge farm as a commercial business.

Constructive contribution to controversial swim-with-whales ecotourism debate

THE PRIZE FOR THE BEST STUDENT POSTER or talk at the 2009 annual MTSRF conference was won by Arnold Mangott of JCU for his thoughtful presentation describing his PhD research into the impacts of tourism on dwarf minke whales. Following his presentation, a senior end user from the tourism industry publicly thanked Arnold for opening the industry's eyes and making such a constructive contribution to the controversial debate about expansion of this particular ecotourism venture.

Dwarf minke whales (left) congregate in the waters of the northern Great Barrier Reef from May – August each year. They are very inquisitive, closely approaching vessels and swimmers (right). Images courtesy of Arnold Mangott of James Cook University, winner of the prize for the best student presentation at the 2009 MTSRF Conference, for his talk entitled "Attraction of dwarf minke whales to vessels and their swimmers in the GBRWHA - management challenges for an inquisitive whale".

Images courtesy of Arnold Mangott



Development of the latest and most up-to-date climate change projections for terrestrial north Queensland

UNDERSTANDING HOW CLIMATIC VARIABLES, such as rainfall and temperature, will change in future is critical to managing the impacts of climate change on the environments, industries and communities of north Queensland. MTSRF-funded researchers from CSIRO have developed models that show annual temperature for the Wet Tropics rainforests is projected to increase between 0.5 and 1.4°C by 2030, dry seasons will be drier and wet seasons will be slightly wetter.

The projected increase in severity of cyclones and the increase in sea level means that storm surges similar to the one that inundated many coastal areas of north Queensland on 12 Jan 09 will become more regular events.

This information has been provided by RRRC in a submission to the Parliamentary Standing Committee on Climate Change, it has been used by the Queensland Climate Change Centre for Excellence in preparing its regional north Queensland assessments, was included in a recent film made by the UN University about the impacts of climate change on Indigenous communities, and has been included in numerous RRRC delivery documents and presentations.

Don Whap poses on Victoria Parade on low-lying Thursday Island, Torres Strait, during the tidal inundation on 12 January 2009. Rising sea levels will have enormous consequences for the viability of many Torres Strait communities.

Image courtesy of Michael Koppman.

Early warning system for crown-of-thorns starfish outbreaks

CROWN-OF-THORNS STARFISH (COTS) outbreaks can devastate the corals of the Great Barrier Reef (GBR). MTSRF-funded researchers at AIMS have developed and implemented an early warning system which is used by the marine tourism industry to alert operators of an imminent COTS outbreak and to prepare eradication programs for the reefs most frequented by tourists.

In late February 2009 a survey team from the MTSRF-funded Reef Check program responded to tourism industry concerns of COTS at Moore Reef, and found that starfish numbers remained low. The MTSRF also funds AIMS to carry out COTS surveys across the entire GBR. The Australian and Queensland Governments support the COTS eradication program through supplementary funding.

Predicting and tracking dispersal of invasive weeds

MTSRF-FUNDED RESEARCHERS FROM CSIRO have developed a simple, but very effective, way to predict the dispersion of weeds or invasive species in tropical landscapes. We now have a way of mapping the potential geographical spread following an accidental introduction of an invasive weed.

The researchers are currently engaging closely with local councils and government departments to adapt the method to the specific needs of each, enabling them to rapidly and cost-effectively target their control efforts. [QDNRW, local councils and NRM bodies]

Understanding and managing the impacts of climate change on rainforest animals

THE WET TROPICS IS PREDICTED TO BECOME hotter, drier and more seasonal as the climate changes, which will have profound consequences for rainforest ecosystems and the species that comprise them. MTSRF-funded computer modelling in the lab of Prof Stephen Williams at JCU predicts that climate change will cause significant shrinking of distribution, and potentially extinction, for more than seventy Wet Tropics animal species, including lemuroid possums, which are considered amongst the most susceptible.

Complementary field surveys by the same researchers have confirmed striking changes in abundance and distribution of the white lemuroid possum, which until very recently had not been seen for three years in an area in which it was previously quite common. The most recent survey in March 2009 discovered just three individuals. This story has drawn significant regional, national and international media attention to the current and future impacts of climate change on rainforests. Ongoing MTSRF-funded research by this team is aiming to identify potential climate refugia within the region, thereby enabling more effective management of Wet Tropics fauna despite climate change.

The white lemuroid possum, a Wet Tropics endemic which has been identified as being highly vulnerable to extinction due to climate change.

Image courtesy of Michael Trenerry / EPA

The impacts of climate change on the world's largest green turtle population

The northern part of the Great Barrier Reef is the world's most significant breeding area for green turtles. MTSRF-funded researchers at JCU have measured a rapid decline in breeding success for green turtles in the region, and are working to assess whether climate change is responsible. Knowledge gained is being delivered to local Torres Strait communities via training programs for Indigenous rangers, simultaneously building the capacity for field monitoring of turtles, which are an important food and cultural resource for Islanders. The Queensland Minister for Climate Change and Sustainability, Kate Jones, recently publicly acknowledged the value of this study, indicating that such research led to increased capacity for management.

MTSRF-funded researchers are working with local communities in the Torres Strait to build capacity to manage and monitor sea turtle populations

Understanding and predicting outbreaks of coral disease

There has been increasing concern worldwide about the potential for outbreaks of coral disease to reduce reef resilience. MTSRF-funded research by JCU and AIMS has investigated the links between the prevalence of the coral disease 'white syndrome' and thermal anomalies. Results indicate that the incidence of disease is greater:

- during high summer temperature anomalies that follow warmer than average winters;
- during summers that follow winters characterised by the absence of a cold snap; and
- when the density of acroporid coral hosts is high, facilitating the spread of the disease.

This information is contributing to the development of GBRMPA's guidelines for managing coral disease, and is also being used to develop a model of coral disease incidence and a web-based tool for predicting disease outbreaks, which should be publicly available online by July 2009.

The development of this web-based predictive tool involves collaboration with another CERF hub (AEDA) and co-funding from GBRMPA's Climate Change Group. Latest trials indicate that this tool can also reliably predict outbreaks on reefs in other regions and hence could be a very useful mechanism for monitoring and reporting on disease incidence in remote, tropical Commonwealth-managed marine protected areas such Ashmore and Cartier Reefs.

Detail of plate Acropora coral showing symptoms of coral disease: healthy tissue on the left, a moving "front" of dead white coral skeleton in the middle, and dead coral becoming colonized by algae on the right.

Image courtesy of Suzanne Long / WA DEC

MTSRF is delivering for the north Queensland tourism industry

NORTH QUEENSLAND'S PEAK TOURISM industry body, Tourism Tropical North Queensland (TTNQ), is using MTSRF-generated information to educate their members (regional tourism businesses) and prospective tourists to the region about environmental sustainability issues. Their specially designed website relies heavily on links to regularly updated technical and interpreted information available via the RRRC website.

The Australian Government's Department of Resources, Energy and Tourism has co-invested with TTNQ in this product. The characteristics of north Queensland's tourism industry itself are the focus of another MTSRF-funded team of researchers from JCU. Their regularly updated results are publicly available online via the RRRC website and include Tourism Barometers, media releases and reports. Feedback received from local business people in the industry indicates that information is being successfully delivered to these important end users, that they consider the research results credible, and that they are considering how to use the information to increase the sustainability of their industry.

MTSRF RESEARCH HIGHLIGHTS FOR 2008/2009

Here are some selected research highlights from this year. Please see Appendix 1 for the full list of projects active this year.

Theme 1: Status of the ecosystems

This Theme contains research projects that aim to increase our understanding of the condition of the environmental assets of north Queensland, and their interdependencies. These projects seek to assist management by developing methods for effective long-term monitoring and reporting on trends in the condition of these assets.

Snapshot

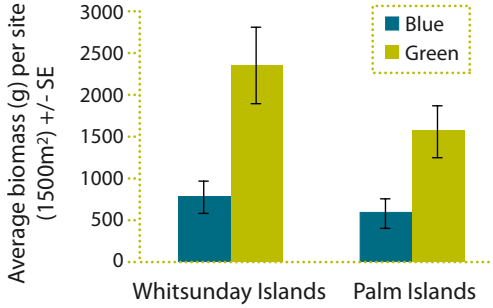
Addressing the relatively poor health of some areas of the Great Barrier Reef (Project 1.1.1)

There have been consistent, significant declines in the relative health of the inner shelf regions of the GBR over the last decade. However, until recently it has been difficult to measure reef health robustly and at the temporal and spatial scales necessary for adaptive management.

In response to this clear management need, MTSRF researchers from the AIMS and JCU have developed a robust method of quantifying reef health.

Analyses show that reefs in the central inner-shelf regions of the GBR are in relatively poor health, and that poor reef health often corresponds with poor water quality (low water clarity and high chlorophyll concentration). Reef health monitoring programs using these indicators will be used to evaluate the effectiveness of different reef management strategies over time.

The past century has seen substantial declines in the health of some areas of the Great Barrier Reef. These images show the same reef off Bowen in a very healthy state around 1900 (left) and with little if any live coral cover in 2000 (bottom). MTSRF research projects are helping to come up with ways for management agencies to measure and prevent further reef decline (images courtesy GBRMPA).



Graph shows the effectiveness of green (no-take) zones in conserving coral trout.

Snapshot

Spectacular recovery of coral trout populations inside green (no-take) zones on the Great Barrier Reef (Project 1.1.2)

The decision by the Great Barrier Reef Marine Park Authority to close around 33% of the Marine Park to fishing in 2004 was controversial, even though it was based on good science. Now MTSRF researchers from AIMS and JCU have found dramatic evidence that this closure has already benefited populations of coral trout, a species highly prized by both recreational and commercial fishers.

Numbers of these fish have increased by 31-75% on the majority of reefs that have been closed to fishing for as little as 1.5-2 years.

Most surprisingly, these increases were observed consistently in green zone (no-take) reefs across more than 1000 km of the GBR. Green zone reefs in the Palm and Whitsunday islands showed increases in coral trout population densities of 65% and 75% respectively, compared with nearby reefs left open to fishing (blue zones). Populations on green zone reefs offshore from the cities of Townsville (64%), Cairns (53%) and Mackay (57%) also showed marked increases relative to nearby open reefs.

This unequivocal demonstration of the effectiveness of green (no-take) zones as management tools for targeted fish species has been of great interest to fishers, scientists and managers in Queensland, nationally and internationally.

Snapshot

Use of acoustic alarms on gill-nets is unlikely to decrease the risk of dolphin bycatch (Project 1.4.2)

Queensland waters support internationally significant populations of two little-known coastal dolphin species: the Indo-Pacific humpback dolphin *(Sousa chinensis)* and the Australian snubfin dolphin *(Orcaella heinsohni)*. Little is known of these populations, although it is known that a commercial fishing method called gill-netting is a significant threat to coastal dolphins throughout their range.

Two mechanisms for ameliorating this threat are proposed in Queensland: (1) employing acoustic alarms (pingers) to reduce bycatch in gill-nets; and (2) equipping gill-net fishers with devices to detect dolphin sounds so that the fishers can change their behaviour in the presence of dolphins.

A MTSRF research project at JCU is studying the behaviour of the dolphins in areas with and without pingers to evaluate the likely success of these approaches. Preliminary results using innovative video and acoustic technology indicate that the use of pingers is unlikely to consistently deter humpback dolphins from approaching gill-nets.

The second proposed mechanism - equipping fishers with devices to detect dolphin sounds to warn them when to change their netting behaviour – may not always work either, as it has been found that humpback dolphins are silent for about 25% of the time during the day.

Theme 2: Risks and threats to the ecosystems

Ove Hoegh-Guldberg, Centre for Marine Studies, The University of Queensland

Research projects within Theme 2 are increasing our understanding of the processes threatening the ecosystems comprising north Queensland's key environmental assets. These research projects aim to improve the long-term sustainability of these assets by using science to develop options for mitigating and managing risks and threats.

Snapshot — Investigating the potential for corals to adapt to increased temperatures (Projects 2.5i.2 and 2.5i.3)

While coral reefs are demonstrably suffering a growing frequency and intensity of coral bleaching as the climate changes, their potential to adapt to increasing temperatures has been a controversial topic. Based on the premise that the potential of corals to adapt depends on the extent to which there is an underlying variable genetic component for thermal tolerance, a MTSRF project has looked into the heritable genetic variation in thermal tolerance in a common coral species by partitioning the variance among coral clones (= environmental differences) versus that among genetically distinct coral colonies (= environmental and genetic differences).

Heritable genetic variation related to thermal tolerance has been found and several gene variants associated with the bleaching response and thermal tolerance have been identified, and could potentially be used as markers for bleaching susceptibility. Development of survey methods for these markers is underway, and will complement other MTSRF research endeavours aiming to produce tools to assess and manage climate change-related risks to the Great Barrier Reef.

Snapshot — The Great Barrier Reef will bleach more frequently in future (Project 2.5i.4)

Encouraging scientific evidence generated within the MTSRF by AIMS researchers strongly suggests that there has been an increase in thermal tolerance of many reefs after (and possibly due to) the 2002 mass bleaching event on the GBR. Nonetheless, predictive modelling indicates that the GBR will bleach more frequently in future as the climate changes. The central-southern part of the GBR appears to be at greatest risk of future coral bleaching events, and by 2050, the predicted frequency of catastrophic damage (>50% coral mortality) is roughly once every five years. Reefs in this area are likely to suffer earliest and be the most degraded by climate change-related bleaching.

In addition, MTSRF researchers from AIMS have demonstrated that reefs commonly exposed to terrestrial runoff (i.e. coastal and inshore reefs) are two to four times more sensitive to bleaching due to temperature stress than those that are not subjected to runoff. The management implications are clear: changes in land management strategies leading to improvements in runoff water quality would directly benefit the resilience of these reefs to bleaching.

Snapshot

Detailed climate change forecast for north Queensland (Project 2.5ii.1)

In collaboration with Commonwealth Scientific and Industrial Research Organisation (CSIRO), the MTSRF has developed climate change projections specifically for north Queensland, using the most up-to-date probabilistic modelling techniques available. By 2030, the regional annual average temperature increase will be 0.8°C (with an uncertainty range of 0.6 to 1.1°C). The rate of temperature increase after that will depend on the global carbon emissions scenario – high emissions will mean that the temperature increases faster.

Dry seasons will generally become significantly drier, while wet seasons may become slightly wetter, especially by 2070. Cyclones may become more intense, and the geographic range of cyclonic activity will shift over time, reaching ~300 km south of its present location by 2070. Sea levels will rise 13-20 cm (above 1990 levels) by 2030, potentially increasing to 49-89 cm by 2070, even under a low emissions scenario.

The combination of higher sea levels, greater storm surges, and a likely increase in the variability and intensity of rainfall means that the potential for flooding and cyclone-related damage in coastal areas of north Queensland will be markedly increased.

	2030	*2070 (low emissions scenario)*	*2070 (high emissions scenario)*
Average annual warming	0.9°C (0.6 to 1.2°C)	1.5°C (1.1 to 2.0°C)	3.0°C (2.0 to 4.0°C)
Average number of days over 35°C per year (currently 3.8)	6.6 (5.4 to 9.1)	12 (8 to 22)	44 (19 to 96)
Average annual rainfall change	0% (-8 to +8%)	-1% (-14 to +13%)	-1% (-25 to +25%)
Sea surface temperatures	0.7°C (0.4 to 1.0°C)	1.3°C (0.6 to 2.0°C)	2.3°C (1.0 to 3.0°C)
Sea level rise relative to 1990	13-20 cm	49-89 cm*	
Ocean acidity	increase#	?#	

** There is considerable uncertainty regarding the rate at which polar ice will melt. This melting rate will be an important determinant of sea level rise.*

 # The acidity of the oceans is predicted to increase, but the rate of increase is currently unclear.

Climate change projections for the MTSRF region derived from modelling conducted by CSIRO using both low and high emissions scenarios. Temperature and rainfall projections are given relative to the 20-year period to 1999. Forecasts represent the best estimate (50th percentile), with figures in brackets indicating the range of uncertainty in the model's prediction (10th – 90th percentile of spread of model results).

Snapshot

Sinks becoming sources: significant shifts in Wet Tropics rainforest productivity expected due to climate change (Projects 2.5ii.3 and 2.5ii.4)

While rainforests are traditionally viewed as major carbon sinks, few quantitative estimates of their primary productivity (≈rates of carbon fixation) have been made. In addition, there has been controversy about the ability of rainforests to continue to act as carbon sinks as the climate changes.

In response to these information needs, MTSRF researchers from CSIRO and JCU have recently made important contributions to our understanding of primary productivity (≈rates of carbon fixation) for Wet Tropics rainforests. Preliminary results suggest that significant changes in productivity are to be expected with climate change, across both altitudinal and latitudinal ranges.

One change is directly related to the amount of rainfall and cloud cover, causing mountaintop forests to increase their productivity in the short term due to improved light interception and reduced water saturation; the latter is related to seasonality, with southern areas experiencing lower rainfall and a longer dry season, thereby reducing overall productivity in those areas.

Persuasive evidence from long-term monitoring of fixed rainforest plots suggests that while tree turnover rates and growth rates will increase with increasing temperature, the capacity for long-term storage of carbon as biomass will be reduced. This indicates that climate change may cause even rainforests that are protected from other disturbances to become net sources of carbon to the atmosphere, rather than sinks.

The relationships between Wet Tropics primary productivity and biodiversity, and how these might be affected by climate change, are currently under investigation.

Snapshot

Identification of climate refuges for species with high extinction risk (Project 2.5ii.4)

Biodiverse ecosystems are resilient ecosystems. Maintaining biodiversity – reducing extinction risk – is therefore an essential component of managing ecosystems for resilience to disturbances, such as climate change. This MTSRF project, based at JCU, is investigating how climate change will increase the risk of extinction for north Queensland rainforest animals.

Preliminary results strongly suggest that these species will retreat to higher altitudes as temperatures increase. As a consequence, there is considerable cause for concern for species that currently occupy the highest elevations – such as the Atherton Scrub Wren and the Beautiful Nursery Frog – because there is no opportunity for them to escape to cooler altitudes as temperatures increase. This research has demonstrated that endemic species such as these are at much greater risk of extinction than more wide-ranging, non-endemic species.

A multidisciplinary research program is now working to identify vulnerable species and the location of potential climate refuges for these species. Understanding of the extinction risk factors for each species will enable prioritisation of management responses as the climate changes. Once identified, active protection of climate refuges will enable them to act as islands of rainforest biodiversity, help to reduce the rate of species extinctions and foster ecosystem resilience to climate change in the Wet Tropics.

Snapshot

Human health consequences of climate change impacts on dinoflagellate–macroalgal associations (Project 2.6.1)

Increasing numbers of cases of ciguatera, also known as tropical reef-fish poisoning, are probably occurring in subtropical regions. Ciguatera is associated with bioaccumulation of dinoflagellate-derived toxins in predatory reef fish. However, surprisingly little is known of the ecological/trophic pathways resulting in human poisoning and how climate change might alter these relationships.

Members of the relevant dinoflagellate species complex have broad ecological tolerance and are often associated with macroalgae, which tend to dominate unhealthy reefs. MTSRF researchers from JCU have theorised that these characteristics, in combination with climate change, could lead to an increase in the geographic range within which humans could suffer ciguatera poisoning.

This research team is now working to develop novel molecular identification tools to improve understanding of current patterns of dinoflagellate distributions throughout the Great Barrier Reef area, which will be a major step towards future preventative management strategies for the region.

Snapshot

Promoting rainforest resilience by controlling invasive pests (Project 2.6.2)

Many rainforests in the Wet Tropics have been fragmented by human activities, and this substantially increases their vulnerability to degradation. Maintenance of native plant biodiversity within fragments is an important component of managing these ecosystems for resilience.

This MTSRF research project, based at CSIRO, has found that the presence of invasive pests is often associated with a decline in the abundance of rare native species or rare native functional groups in tropical forest remnants, which, in turn, significantly impairs ecosystem resilience over long time frames.

Control of invasive pests in remnant rainforest areas must therefore be a priority if these remaining fragments are to be resilient to disturbances such as climate change.

Theme 3: Halting and reversing the decline of water quality

In recognition of the fundamental importance of water quality to the health of north Queensland's aquatic, estuarine and marine ecosystems, including the Great Barrier Reef, projects in this Theme aim to build a comprehensive understanding of the causes and effects of changing water quality and water resource use patterns. Results from these projects are already helping to develop management options for improving practices, reducing risks and mitigating impacts, as well as methods for measuring the effectiveness of management efforts.

Snapshot

Detection of herbicide residues in the lagoon of the Great Barrier Reef (Projects 3.7.1 and 3.7.2)

The herbicide residues atrazine and diuron have been identified in water samples taken from flood plumes in the GBR lagoon, at concentrations that are known to have negative effects on seagrass and corals. These herbicide residues persist in the lagoon at low concentrations even in non-flooding seasons.

The possible effects of some of the commonly found herbicides on reef organisms are being investigated through MTSRF Project 3.7.1. An additional project will be initiated in 2008-09, co-funded through the Great Barrier Reef Marine Park Authority, to investigate the combined effects of thermal and herbicide stress on symbionts of corals and foraminifera.

Snapshot

Increased understanding of hydrological processes fundamental to wetlands health and flood plume water quality (Projects 3.7.3 and 3.7.4)

The loss of functional wetlands throughout north Queensland due to urban and agricultural expansion may have contributed to significantly greater quantities of sediment, nutrients and pollutants being delivered to the Great Barrier Reef lagoon than previously estimated during floods.

Collaborative MTSRF research between JCU and CSIRO in the Tully-Murray catchment is investigating the hydrological connectivity between wetlands and their ecological condition.

Of particular note are concentrations of dissolved organic nitrogen (DON), which occur in floodwaters at nearly twice the concentrations found in normal riverine water. Riverine waters tend to contain more dissolved inorganic nitrogen (DIN) than DON, but pulses of either may affect marine water quality.

The management responses to try to limit transfer of DIN and DON downstream will therefore differ: minimisation of DIN requires changes to agriculture practices, while minimisation of DON requires off-farm actions to slow flow and reduce the rate of runoff.

Snapshot

Environmental economics models reveal costs and benefits of changes in land use practices (Projects 3.7.5 and 3.7.6)

North Queensland's economy is highly dependent on the ability of the region's interconnected ecosystems to continue to supply goods and services to the farming, fishing and tourism industries.

For example, improvements in the quality of water running off the land are expected to lead directly to improvements in the resilience of the inner and middle shelf areas of the Great Barrier Reef to climate change. Socio-economic constraints to, and incentives for, the adoption of land use and management options for water quality improvement are being investigated by MTSRF researchers from CSIRO using environmental economics models.

Effectively, this enables modelling of the effects of different management scenarios on profitability, costs and environmental outcomes. Early modelling results indicate that tillage management and fallow management practices would not increase the cost of production of sugarcane, but would be significantly better for the environment than current practices.

Modelling of the likely social, economic and environmental outcomes of potential shifts in management strategies is likely to improve understanding of the potential costs and benefits, as well as their eventual on-ground effectiveness.

Theme 4: Sustainable use and management

Projects within this Theme aim to increase our understanding of the current and future ways in which north Queensland's key environmental assets are being used by industries and communities. Results from these projects are helping managers optimise the use of resources for sustainability, and minimise adverse impacts where they occur.

Snapshot — Investigating shark fisheries in the waters of the Great Barrier Reef (Project 4.8.4)

There is increasing worldwide concern about the vulnerability of shark populations to fishing pressure, with marked declines in reef shark numbers recently reported from the waters of the GBR.

Now a MTSRF research project based at JCU has found that inshore fisheries of the GBR are catching a wide range of shark species, with blacktip, spot-tail, scalloped hammerhead, milk and whitecheek sharks dominating commercial fisherman's catches. Recreational fishers also catch significant numbers of sharks, but the vast majority of these are released alive.

While most of these sharks captured by commercial and recreational fishers are considered less vulnerable to fishing pressures than reef sharks, research is continuing into these species' demography and life history characteristics to determine the level of risk faced by each of the species. The outcomes of this research have already been utilised in the development of new shark fishery management arrangements proposed for Queensland's east coast.

Snapshot — Recreational fishers support the 2004 rezoning of the Great Barrier Reef Marine Park (Project 4.8.5)

The rezoning of the Great Barrier Reef Marine Park in 2004 was controversial amongst some sectors of the community. The attitudes and perceptions of recreational fishers to the 2004 rezoning plan were investigated by MTSRF researchers from JCU, with the aim of obtaining an objective assessment of the success of the rezoning and consultation processes.

Encouragingly, most recreational fishers said they thought that the rezoning had been a good idea, with almost 60% supporting the actual zoning plan that was implemented in 2004. However, the majority felt that recreational fishers were not fairly treated compared to other groups during the rezoning process, and a third of those surveyed felt that the concerns of recreational fishers had not been taken seriously.

While the majority of recreational fishers agreed that the 2004 rezoning plan would help ensure the future sustainability of fisheries and marine biodiversity for the marine park, this research highlights the importance of maintaining a strong and productive relationship between resource managers and the recreational fishing community.

Theme 5: Enhancing Delivery

RRRC seeks to maximise the impact of the MTSRF through an appropriately resourced and dedicated program - Theme 5: Enhancing delivery. The RRRC leads this Theme, and has had a busy and productive year managing the MTSRF's engagement framework and delivering results to end users.

RRRC's capacity to deliver timely, comprehensive, relevant information directly to the people who need to know is highly appreciated by all members of the MTSRF consortium. We have been particularly successful this year in delivering information at the highest levels of government, personally briefing the Prime Minister, the Minister for Climate Change and Water, the Minister for the Environment, Heritage and the Arts, and the Queensland Premier, on one or more occasions during the past twelve months. Some of the most noteworthy activities are highlighted below.

- The Prime Minister, the Hon. Kevin Rudd, the Minister for Climate Change and Water, the Hon. Sen. Penny Wong and the Member for Leichhardt, Jim Turnour, were escorted by RRRC Managing Director Sheriden Morris on a visit to Low Isles off Port Douglas on the 25th July 2008. Sheriden Morris briefed the both the Prime Minister and the Minister for Climate Change for 3 hours on issues affecting the long-term sustainability of the Great Barrier Reef, particularly climate change and water quality. On their return, the Prime Minister and the Minister for Climate Change were shown a trial version of the e- Atlas by RRRC's Research Director, Dr David Souter, and then addressed the press, speaking at length about climate change and its impacts on north Queensland, particularly coral reefs. The Prime Minister and Minister for Climate Change were keen to understand the science, asking many questions. The Prime Minister and Minister for Climate Change were grateful for the opportunity to examine the GBR first-hand, the breadth and depth of the briefing and appreciative of RRRC's effort in hosting the tour.
- The Minister for Environment, Water, Heritage and the Arts, the Hon. Peter Garrett and his Chief Advisor Peter Wright visited the RRRC offices in Cairns, on 14 September 2008. The Minister and his advisor were briefed by RRRC staff for 2 hours on a wide range of issues that are affecting the marine and terrestrial environments of North Queensland and Torres Strait, highlighting some of the key research outcomes of the MTSRF Program. The Minister provided his own impressive summary of the briefing, relating the outcomes to his own priorities and those of the Australian Government. The Minister was impressed by the breadth and value of the research program and by the way it was being managed and delivered.

- RRRC staff and MTSRF researchers attended the 2008 CERF Conference in Canberra on 15-16 September 2008. Presentations were made in the categories of Water Scarcity (Dr Angela Arthington, GU); Biodiversity (Dr Stephen Williams and Dr Helene Marsh, JCU); EPBC Act (Dr Rosemary Hill); Marine Policy (Dr Peter Doherty, AIMS and Dr Steve Sutton, JCU); Caring for our Country (Mr Jon Brodie); Environmental Information (Dr Suzanne Long, RRRC) and a discovery session (Dr. David Souter, RRRC) with interesting feedback and discussions at each session.
- RRRC staff and MTSRF-funded scientists met with the Board of the Torres Strait Regional Authority, plus community leaders and representatives of various Australian Government agencies at a special meeting on 26 September 2008, on Thursday Island. Researchers' presentations of the most important of their results so far relevant to Australia's most northern region were well-received by the Board.

- Two industry nights aiming to inform the tourism industry of relevant MTSRF-funded research results and products were hosted by RRRC on 1 October (marine) and 12 November (rainforest) 2008.
- RRRC held a Cocktail Evening at Parliament House in Canberra on 24 November 2008. This successful event was attended by Australia's Chief Scientist, Prof Penny Sackett, as well as numerous Ministers and Senators, with particularly strong representation from the Queensland MPs. Key representatives from relevant government departments were also in attendance. Sheriden Morris spoke about the RRRC, MTSRF and the role of solution science in advancing policy. Outcomes from the reception included meetings arranged with key people interested in particular aspects of MTSRF research.

- On 27 January 2009, the RRRC office in Cairns was visited by the Australian Government's Climate Change and Water Minister, Senator The Hon. Penny Wong. The discussion ranged widely during the two-hour briefing covering all aspects of relevant research managed by RRRC.
- The Queensland Premier, The Hon. Anna Bligh, visited the Great Barrier Reef guided by RRRC staff on 29 January 2009 to see first-hand the negative effects of poor water quality on Queensland's corals. RRRC took the opportunity to brief the Premier and her advisors extensively on the latest MTSRF research results relevant to water quality and reef health.
- The RRRC convened a series of workshops involving research providers and end users to identify key research needs for the region over the next five years. The Research Directions workshops were held on 5 March and 7 April in Townsville (Water Quality and Great Barrier Reef respectively) and 20 March and 14 May in Cairns (Rainforest and Torres Strait respectively). Key outputs of the workshops are being synthesised into a document that identifies current understanding, maturity of issues, information gaps and thematic areas of future focus.
- The 2009 MTSRF Annual Conference was held at Rydges Southbank Hotel in Townsville, 28-30 April[1]. Around three hundred registered delegates attended over the three days to hear ~70 speakers and view 30 posters presenting the outcomes of MTSRF funded research. Feedback received to date indicates that this was the most successful MTSRF conference to date, with an excellent program, very high quality of presentations and strong attendance by researchers and diverse end users. The 2009 MTSRF student prize for the best student poster or talk at the annual conference was won by Arnold Mangott of James Cook University for his description of his PhD research into the impacts of tourism on dwarf minke whales. Arnold was publicly thanked by a senior end user from the tourism industry for opening the industry's eyes and making such a constructive contribution to the controversial debate about expansion of this particular ecotourism venture. A conference proceedings volume is in production.
- RRRC convened a "Thinking Offsets in FNQ" workshop in Townsville on 29 April 2009 to bring together thirty Queensland-based offset practitioners and researchers to share practical knowledge on best practice environmental offset design and implementation. The workshop also facilitated discussion on the knowledge needs to support successful offset policy in Queensland into the future. A summary report on workshop outcomes is available for download from the MTSRF website[2].

1 The conference program is available for download at http://www.rrrc.org.au/news/downloads/2009_conf_program.pdf

2 http://www.rrrc.org.au/publications/downloads/Program-9-CSIRO-Coggan-A-2009-Thinking-Offsets-in-FNQ-Workshop-Report.pdf.

- On 7 May, Sheriden Morris, Toni Fulton and Suzanne Long accompanied Senator The Hon. John Hogg to visit MTSRF-funded researchers at the Australian Canopy Crane Research Facility. The group also visited a field team from Rainforest Rescue, a local community group that is using the MTSRF Rainforest Revegetation Toolkit to improve the success of their revegetation efforts in the Daintree. Senator Hogg took the opportunity to discuss the latest climate change research with several MTSRF-funded researchers and had the great fortune to spot an endangered tree kangaroo from the canopy crane gondola.
- In a major new Enhancing Delivery initiative, RRRC began a series of Essential Science sessions based on peer-to-peer communication of research results. Initial trials in May 2009 involving Mr John Courtenay delivering to the tourism industry, and Mr Tony Mooney delivering to the FNQ Regional Organisation of Councils, were very successful and we look forward to employing this method more frequently in future.
- Other briefings provided by RRRC included delegations from the US Embassy (July 2008), Department of Foreign Affairs and Trade (October 2008), and regular meetings with state Ministers and Members of Parliament and the Mayor of Cairns Regional Council.
- Other meetings and conferences of note convened, hosted or attended by RRRC included CSIRO's Innovation, Services and Smart Information Use symposium (Melbourne, July 2008), co-chairing a symposium at the Coast to Coast meeting (Darwin, 18-22 August 2008) with TRaCK, international Biodiversity and Climate Change Workshop (Daintree, 17-21 November 2008).

OTHER RESEARCH PORTFOLIOS MANAGED AND DELIVERED BY RRRC

The MTSRF is the largest but not the only research portfolio managed and delivered by RRRC. This year we were also responsible for implementing part of the Australian Government's Reef Rescue initiative – the Marine Monitoring Program for the Great Barrier Reef Marine Park.

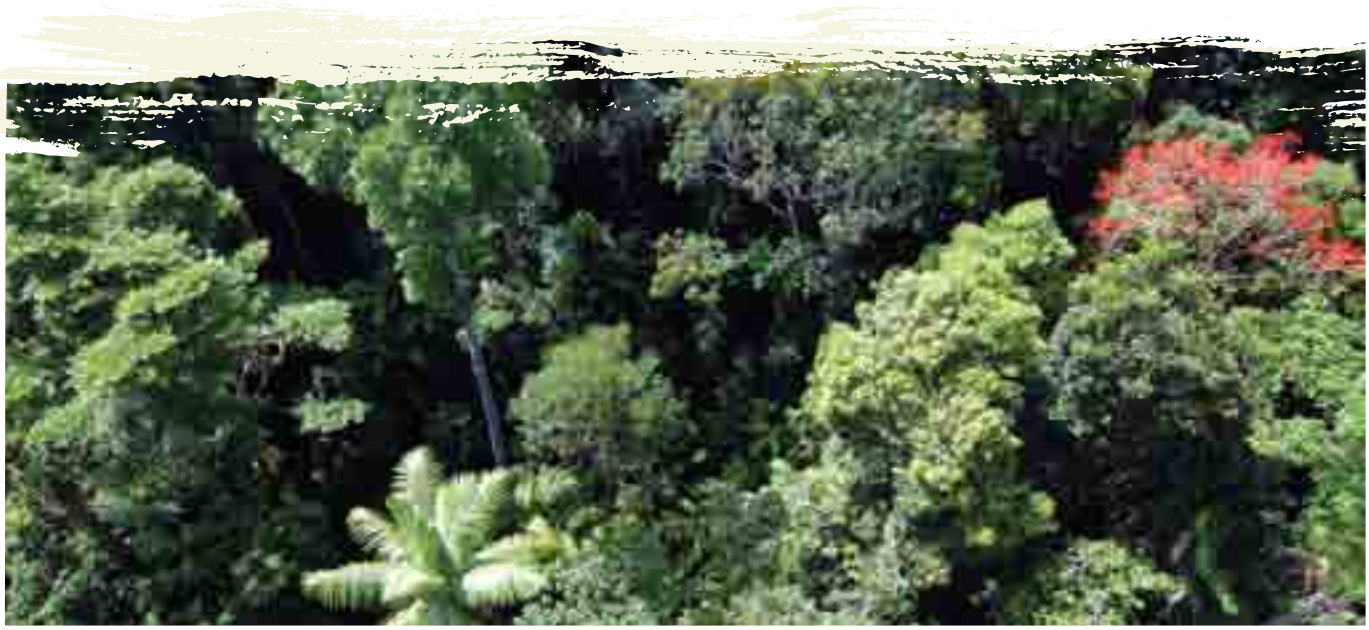
Through the Reef Rescue Plan, $22 million has been allocated for a Water Quality Monitoring and Reporting Program to expand existing efforts and to continue the already established RWQPP Marine Monitoring Program. In 2008/2009 the Marine Monitoring Program is supported through Reef Rescue and is now known as the Reef Rescue Marine Monitoring Program. The Program is a critical component of the assessment of any long-term improvement in regional water quality that will occur as best practice land management is widely adopted across the catchments feeding into the Great Barrier Reef.

The Reef Rescue Marine Monitoring Program assesses the health of key marine ecosystems - inshore coral reefs and intertidal seagrasses - and the condition of water quality in the inshore Great Barrier Reef lagoon. The monitoring program has been developed using the best available science and is continuously improved with the advancement of scientific understanding.

Management of this program through RRRC allows many of the indicators and technologies being developed through Theme 3 of the MTSRF to be put to work. The Reef Rescue Marine Monitoring Program is now a highly coordinated ambient and event response program monitoring water quality throughout the Great Barrier Reef region, augmented by remote sensing. The first draft annual report for the program has been compiled by RRRC and submitted to the Great Barrier Reef Marine Park Authority for review.

In 2008/09, the Marine Monitoring Program involved two core programs and seven sub-programs:

- Inshore biological modelling: (a) Inshore coral reef monitoring; (b) Intertidal seagrass monitoring; (c) Assessing light as a driver of change in seagrasses of the Great Barrier Reef; and
- Water quality monitoring: (d) Inshore marine water quality monitoring; (e) Floodplume water quality monitoring; (f) Inshore and river pesticide monitoring; (g) Remote sensing of water quality in the Great Barrier Reef.



BUILDING CAPACITY FOR NORTH QUEENSLAND

As the largest single source of public funding for research in north Queensland, the MTSRF has considerable responsibility for capacity-building in the region. The RRRC builds regional capacity on behalf of the MTSRF by breaking down old institutional silos (facilitating cooperation between traditionally competitive institutions via collaborative research programs and workshops), providing training opportunities for north Queenslanders (through the MTSRF Student Scholarships program, see below), and by contracting with local north Queensland businesses wherever possible (for example, this Annual Report was designed and printed by professionals based in the region).

Education and training are important aspects of RRRC's capacity-building activities on behalf of the MTSRF. Nine MTSRF student scholarships have been awarded during 2008/09 on the basis of scholarly merit, relevance to the MTSRF Research Investment Strategy, end-user support and availability of co-investment. Some of the students and their projects are highlighted below.

Arnold Mangott

Arnold studies the behaviour of dwarf minke whales as part of his PhD candidature at James Cook University. Working in close collaboration with tour operators, he aims to provide information directly relevant to the future sustainable management of the fledgling swim-with-dwarf minke whale industry. "These little whales are very inquisitive and actually approach boats and swimmers. This provides both researchers and the tourism industry with unique opportunities," said Arnold. Now embarking on the final year of his studies, Arnold won the prize for the best student presentation at the 2009 MTSRF conference.

Amanda O'Malley

As part of her PhD research at James Cook University, and in association with MTSRF Project 1.4.1, Amanda is investigating the ecology and trophic relationships of Wet Tropics freshwater turtle communities. Winner of the inaugural Smart State – Smart Women Green Award in 2008, Amanda's work has already shown that habitat alteration is likely to be having negative effects on populations of the recently-described pink nose turtle. "Most of Queensland's freshwater ecosystems are under pressure, yet their proper functioning is vital for the health of the environment as a whole," she said. "This kind of basic research is important because it will help us manage these ecosystems better."

Amanda O'Malley releasing a pink nose turtle (Elseya stirlingi) back into the Johnstone River.
Photo courtesy of Scott Waugh.

Monica Gratani

In a fine example of the MTSRF's end-user driven approach to research, this project has arisen in response to a suggestion from the Mullanbarra Yidinji people of the lower Mulgrave River. Monica will be investigating the potential usefulness of traditional indigenous methods of catching fish – using the milky sap of rainforest vines as an anaesthetic – for control of noxious fish species, such as tilapia, in the rivers and streams of the Wet Tropics. "It would be fantastic if it turns out that, by working in partnership with local indigenous groups, we can use traditional ecological knowledge to help solve a modern ecological problem," she said. This project is associated with MTSRF Projects 4.9.1 and 2.6.2, and is also supported by CSIRO and JCU (the Centre for Sustainable Indigenous Communities).

CHALLENGES AND OPPORTUNITIES FOR THE RRRC IN 2009/2010

The next few years will be challenging for Australia's Great Barrier Reef, Wet Tropics Rainforest and Torres Strait. The health of these key national assets will be increasingly threatened by climate change and the demands of a rapidly increasing human population.

The RRRC consortium is well-placed to help management rise to these challenges. Through 2009/2010 and beyond, the consortium intends to continue using our strong engagement framework to help deliver solutions for management and provide information that allows for continuous improvement and adaptation.

A key consideration is our growing awareness that communities which actively engage climate change issues at an early stage are the ones that will cope best as its effects unfold. The breadth of our research portfolio and the timeliness of our reporting frameworks mean communities have access to the best possible information to plan a sustainable future. Coping with unprecedented change is never easy but it is heartening to see the willingness of those who live and work in north Queensland to better understand these changes and plan accordingly - Cairns Regional Council and Queensland Government have recently utilized the information to inform their planning processes .

Management agencies such as The Great Barrier Reef Marine Park Authority, Wet Tropics Management Authority and the Torres Strait regional Authority are partnering with industry and community to meet the challenge of building ecosystem resilience. Strengthening resilience through reducing threats such as water quality, habitat fragmentation and over use of the resource is the regions best adaptation to climate change. The RRRC consortium is positioned to deliver timely and relevant information to assist in achieving this outcome.

As the body of knowledge generated by the MTSRF 's solution science grows, the RRRC consortium will significantly increase its emphasis on successful delivery of that knowledge to end users. The consortium can maintain a strategic overview of all MTSRF activities while remaining fully engaged with researchers and end users, ensuring delivery success for the entire Facility via a coherent range of credible, strategic communications. Delivery success will be evaluated using a range of multidisciplinary metrics, enabling adjustment of delivery practices where necessary.

The evaluative and adaptive nature of the Consortium's strategic plan to enhance delivery will help ensure that the maximum public-good return is realised on the public's considerable investment in the MTSRF. Taking a positive attitude to the challenges ahead will enhance the resilience, capacity and sustainability of our key industries, particularly tourism, farming and fishing, as well as tropical lifestyles generally. Opportunities to transfer our new knowledge to other tropical regions of the world continue to emerge.

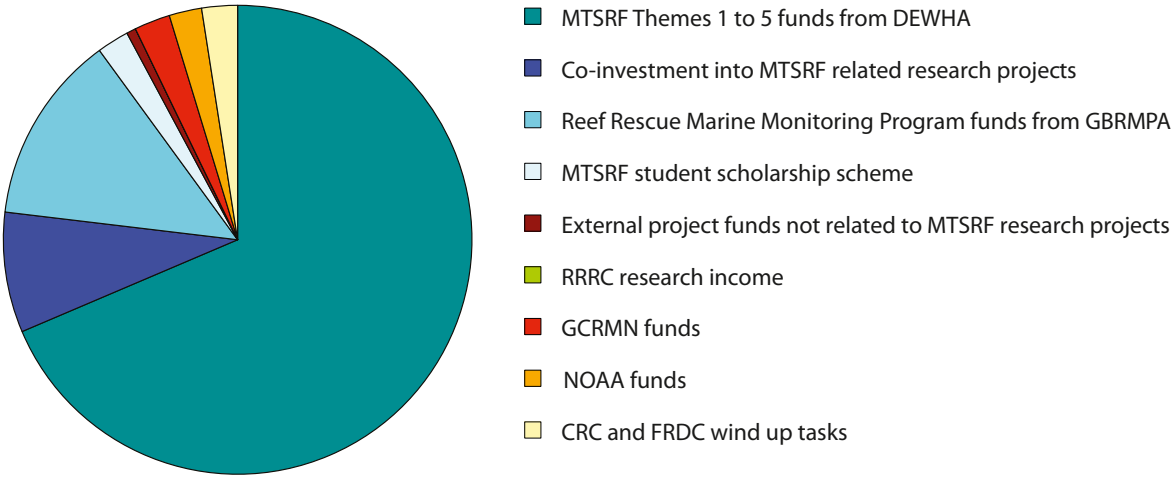
Our key challenge for the next year is to maintain our leading edge and capture the benefits that flow from it.




FINANCIAL SUMMARY FOR 2008/2009

The Reef and Rainforest Research Centre Ltd (RRRC) is a not for profit public company which in the 2008/09 financial year received research income for the Marine and Tropical Sciences Research Facility (MTSRF) program managed for the Department of Environment, Water, Heritage and the Arts (DEWHA), the Marine Monitoring Program managed for the Great Barrier Reef Marine Park Authority (GBRMPA), and several other research projects.

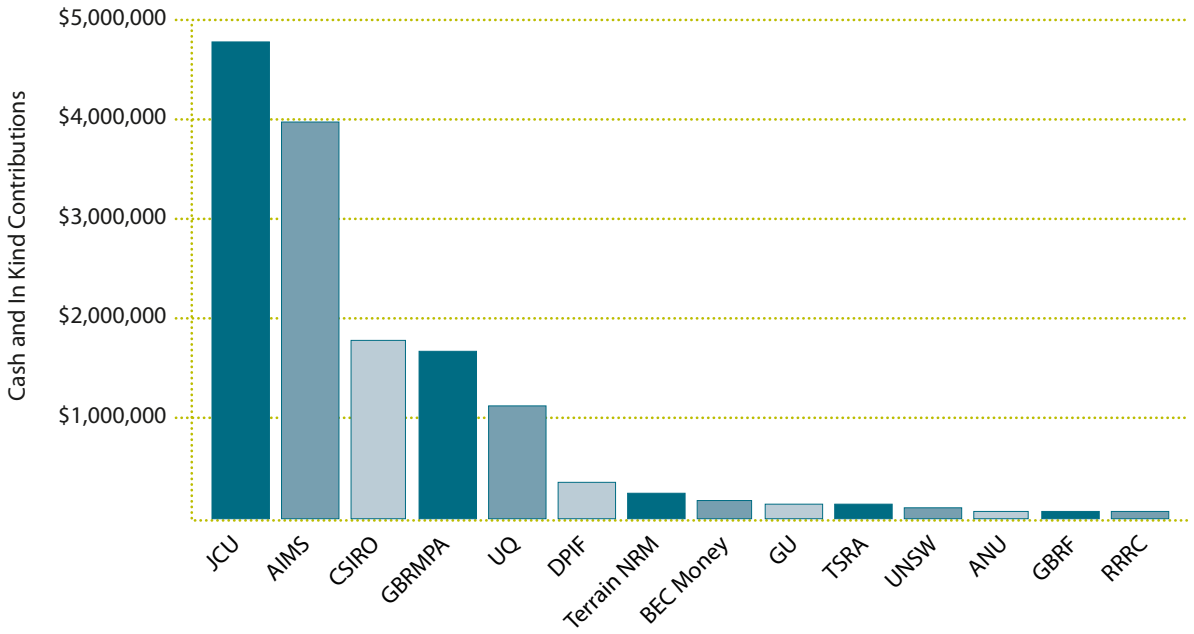
RRRC research income 2008/2009



The MTSRF is the main research program managed by the RRRC. The total funding into the MTSRF including co-investment, in-kind contributions and Smart State in-kind contributions for completed themes 1 to 5 projects within 2008/09 was $23.5 million.

The institutions which contributed via cash and/or in kind contributions into the MTSRF program for the 2008/09 financial year to a value greater than $50,000 are highlighted in the chart below.

2008/2009 Major contributions into the MTSRF



PUBLICATIONS

In 2008/2009, around 160 MTSRF milestone reports, technical and scientific reports, tourism barometers, newsletters and other communications devices were reviewed, edited and made available to the general public via the RRRC/MTSRF website.

Six Communiqués were distributed to key stakeholder groups, with files also uploaded to the MTSRF website for public access.

Also available from the MTSRF website:

- Thirteen CRC➔MTSRF Transition Reports are available for download.
- Around 120 Rainforest CRC research reports, 'Issues in Tropical Forest Landscapes' and 'Using Rainforest Research' information sheets, annual reports and magazines are available for download from the MTSRF website – for the purpose of maintaining an archive of Rainforest CRC research. The MTSRF website also contains links to the vast amount of similar publications and communications products produced by CRC Reef Research Centre and CRC Torres Strait.
- Several products stemming from the joint Rainforest CRC and CRC Reef 'Catchment to Reef' program are also available for download from the MTSRF website.

MTSRF-funded Peer-Reviewed Journal Articles

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APPENDIX 1: MTSRF THEMES, PROGRAMS AND PROJECTS AND PROJECT LEADERS DURING 2008/2009

Theme 1: Status of the Ecosystems

Program 1: Status and Trends of Species and Ecosystems of the Great Barrier Reef (GBR)		**Dr Peter Doherty, AIMS**
Project 1.1.1	Identification of indicators and thresholds of concern for ecosystem health on a bioregional scale for the GBR	A/Prof Michelle Waycott, JCU & Dr Madeleine van Oppen, AIMS
Project 1.1.2	Condition and trend of the GBR ecosystem: Indicators, thresholds of potential concern and ecological influence of the GBR Zoning Plan on mid and outer reefs	Dr Hugh Sweatman, AIMS
Project 1.1.3	Condition, trend and risk in coastal habitats: Seagrass indicators, distribution and thresholds of potential concern	A/Prof Michelle Waycott, JCU & Mr Len McKenzie, QDPI&F
Project 1.1.3a*	Intertidal seagrass monitoring: RWQPP Marine Monitoring Program	Mr Len McKenzie, QDPI&F
Project 1.1.3b*	Assessing light as a driver of change in seagrasses of the GBR	A/Prof Michelle Waycott, JCU
Project 1.1.4	Dating and mapping historical changes in GBR coral communities	Dr Jian-Xin Zhao, UQ
Project 1.1.5	Reef Atlas: Risk, Resilience and Response	Dr Katharina Fabricius, AIMS
Project 1.1.5a*	Framework and Data Integration to Support Risk, Resilience and Response Atlas for the GBR	Dr Katharina Fabricius, AIMS
Project 1.1.5b*	Enhancing delivery of the Risk, Resilience and Response Atlas	Dr David Souter, RRRC
Program 2: Status and Trends of Species and Ecosystems in the Wet Tropics Rainforests		**Dr James Butler, CSIRO**
Project 1.2.1	Status and trends of biodiversity and ecosystem services	Dr James Butler, CSIRO
Program 3: Torres Strait – Status, Use and Trends		**Mr Vic McGrath, TSRA**
Project 1.3.1	Climate change impacts in the Torres Strait: building resilience and planning adaptation strategies	Dr Donna Green, UNSW
Project 1.3.2	Ecological role and potential economic value of sponges to the Torres Strait	Mr Carsten Wolff, AIMS
Project 1.3.2s	Impact and causes of sponge disease in Torres Strait and the GBR	Dr Rocky De Nys, JCU
Project 1.3.3	Livelihood benefits of co-management of hand collectable fisheries in the Torres Strait	Dr James Butler, CSIRO
Project 1.3.4	Communication, community engagement and enhanced delivery	Mr Vic McGrath, TSRA
Project 1.3.5	Data integration and synthesis for development of reports on ecosystem health in the Torres Strait region	Dr James Butler, CSIRO
Program 4: Species and Communities of Conservation Concern		**Prof Helene Marsh, JCU**
Project 1.4.1	Condition trends and projected futures of marine species of conservation concern	Dr Mark Hamann, JCU
Project 1.4.1s	Ecological and trophic relationships within Wet Tropics freshwater turtle communities and their sensitivity to climate change and habitat alteration	Dr Mark Hamann, JCU
Project 1.4.2	Sustainable use of marine species of conservation concern	Prof Helene Marsh, JCU
Project 1.4.3	Rainforest threatened species and communities and ecosystem processes	Dr Dan Metcalfe, CSIRO

Theme 2: Risks and threats to the ecosystems

Program 5: Climate Change: Understanding the Threat, Ecosystem Impacts and Mitigation **Program 5i: Climate Change: Great Barrier Reef**		**Dr Julian Caley, AIMS**
Project 2.5i.1	Regional climate scenarios	Dr Andreas Schiller, CSIRO
Project 2.5i.2	Early warning and assessment system for thermal stress on the GBR	Prof Ove Hoegh-Guldberg, UQ
Project 2.5i.2a*	Zooxanthellae tolerance to climate change (vulnerability to bleaching): Early warning and assessment system for thermal stress on the GBR	Prof Ove Hoegh-Guldberg, UQ
Project 2.5i.2b*	The Implementation of Kd[par], the attentuation of photosynthetically available radiation, to the GBR ecosystem	Dr Scarla Weeks, UQ
Project 2.5i.2c*	A genetic method to assess bleaching tolerance in corals	Dr Madeleine Van Oppen, AIMS & Dr Petra Souter, AIMS
Project 2.5i.2s	Climate change and satellite oceanography of the GBR	Dr Scarla Weeks, UQ
Project 2.5i.3	Resilience to climate change	Prof Terry Hughes, JCU & Dr Julian Caley, AIMS
Project 2.5i.3a*	Linkages between thermal anomalies and coral disease dynamics: Resilience to climate change	Dr Julian Caley, AIMS & Prof Bette Willis, JCU
Project 2.5i.4	Tools to support resilience-based management in the face of climate change	Dr Scott Wooldridge, AIMS
Program 5ii: Climate Change: Rainforests and Catchments		**Prof Steve Turton, JCU**
Project 2.5ii.1	Regional climate projections for tropical rainforests	Dr Penny Whetton, CSIRO
Project 2.5ii.2	Climate change: scaling from trees to ecosystems	Dr Michael Liddell, JCU
Project 2.5ii.3	Understanding climate change threat to ecosystems and ecological processes	Dr David Hilbert, CSIRO
Project 2.5ii.4	Impacts of climate change on biodiversity	A/Prof Steve Williams, JCU
Project 2.5ii.4s	Conservation of the northern bettong, a rare and threatened endemic macropod species of the Wet Tropics: limits to current distribution and a mechanistic model for predicting effects of climate change	A/Prof Steve Williams, JCU
Project 2.5ii.4s2	Biodiversity of dung beetles in the Wet Tropics biogeographic region: assessing the impacts of climate change on an important functional group	A/Prof Steve Williams, JCU
Program 6: Understanding Threats and Impacts of Invasive Pests on Ecosystems		**Prof David Blair, JCU & Dr David Westcott, CSIRO**
Project 2.6.1	Understanding threats and impacts of invasive pests in the Great Barrier Reef	Prof David Blair, JCU
Project 2.6.2	Identification and impact of invasive pests in the Wet Tropics rainforests	Dr David Westcott, CSIRO
Project 2.6.2s	Applying indigenous ecological knowledge to the control of invasive fish: a feasibility study for the Wet Tropics	Mr Damien Burrows, JCU

Theme 3: Halting and reversing the decline of water quality

Program 7: Halting and Reversing the Decline of Water Quality		Dr K. Fabricius, AIMS; Prof R. Pearson, JCU; Prof I. Gordon, CSIRO
Project 3.7.1	Marine and estuarine indicators and thresholds of concern	Dr Katharina Fabricius, AIMS
Project 3.7.1s	Understanding interactive effects between pesticides and climate change on symbiont bearing and calcifying marine species	Prof Jochen Mueller, UQ
Project 3.7.2	Connectivity and risk: tracing materials from the upper catchment to the reef	Mr Jon Brodie, JCU
Project 3.7.2b*	Marine flood plume monitoring: RWQPP Marine Monitoring Program	Mr Jon Brodie, JCU
Project 3.7.3	Freshwater indicators and thresholds of concern	Prof Richard Pearson, JCU & Prof Angela Arthington, GU
Project 3.7.3s	Dynamics of flow and ecosystem health in Dry Tropics rivers	Prof Richard Pearson, JCU
Project 3.7.3s2	Validating freshwater fish indicators and thresholds of concern in the Wet Tropics streams	Prof Richard Pearson, JCU
Project 3.7.4	Wetlands and floodplains: connectivity and hydro-ecological function	Prof Jim Wallace, CSIRO
Project 3.7.5 & 3.7.6	Socio-economic constraints to and incentives for the adoption of land use and management options for water quality improvement	Dr Martijn van Grieken, CSIRO
Project 3.7.7	Analysis and synthesis of information for reporting credible estimates of loads for compliance against targets and tracking trends in loads	Dr Petra Kuhnert, CSIRO
Project 3.7.8*	Monitoring of organic chemicals in the GBR and selected tributaries using time integrated monitoring tools: RWQPP Marine Monitoring Program	Prof Jochen Mueller, UQ
Project 3.7.9*	Remote sensing of GBR wide water quality: RWQPP Marine monitoring Program	Dr Arnold Dekker, CSIRO

Theme 4: Sustainable use and management

Program 8: Sustainable Use and Management of Marine Resources of the Great Barrier Reef		Dr Colin Simpfendorfer, JCU
Project 4.8.1	Resilience and connectivity	Prof Terry Hughes, JCU
Project 4.8.2	Influence of the GBR Zoning Plan on inshore habitats and biodiversity, of which fish and corals are indicators	Dr Peter Doherty, AIMS & A/Prof Garry Russ, JCU
Project 4.8.3	Evaluation of the resiliency of key inter-reefal fish species	Dr Colin Simpfendorfer, JCU
Project 4.8.4	Evaluation of the impacts from industry and community uses on inshore biodiversity	Dr Andrew Tobin, JCU
Project 4.8.5	Incorporating stakeholders and their values, knowledge and aspirations in the care and development of the GBRMP	Dr Stephen Sutton, JCU
Project 4.8.5s	Valuation of ecosystem services provided by coastal wetlands for fisheries	Dr Stephen Sutton, JCU
Project 4.8.6	Analysis of recreational and tourism use and impact on the GBR for managing sustainable tourism	Prof Bruce Prideaux, JCU
Project 4.8.7	Forecasting risk of exposure to irukandji	Prof Michael Kingsford, JCU
Project 4.8.8	Communication, community engagement and enhanced delivery for GBR projects	Dr Suzanne Long, RRRC
Program 9: Sustainable Use, Planning and Management of Tropical Rainforest Landscapes		**Prof Steve Turton, JCU**
Project 4.9.1	Indigenous landscapes of the Wet Tropics World Heritage Area	Dr Michael Wood, JCU
Project 4.9.2	Sustainable nature based tourism: planning and management	Prof Bruce Prideaux, JCU
Project 4.9.3	Impacts of urbanisation on north Queensland environments: management and remediation	Prof Steve Turton, JCU
Project 4.9.4	Integrating ecology, economics and people in forest and landscapes	Dr Nick Emtage, UQ & A/Prof John Herbohn, UQ
Project 4.9.5	Restoring tropical forest landscapes	A/Prof Carla Catterall, GU
Project 4.9.6	Strategic natural resource management and land use planning	Dr Cathy Robinson, CSIRO
Project 4.9.7	Understanding social resilience and identification of social resilience indicators for management	Prof. H. Ross, UQ; Dr T. Lynam, CSIRO; Dr M. Gooch, JCU

Theme 5: Enhancing delivery

Program 10: Enhancing Delivery		Dr Suzanne Long, RRRC
Project 5.10.1	Visual Documentation of MTSRF Projects	Dr Suzanne Long, RRRC
Project 5.10.2	Communication, engagement and enhanced delivery for tourism operators in the Wet Tropics rainforests	Ms Annie Riddet, TTNQ
Project 5.10.3	Indigenous engagement (to be brokered)	

FIND OUT MORE?

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