

NEWSLETTER NO.40  
FEBRUARY 2011

# Australian Coral Reef Society

**A society promoting the scientific  
study of Australian coral reefs**



Australian  
Coral Reef Society



# Editorial

Dear Members,

Welcome to the 40th edition of the Australian Coral Reef Society's annual newsletter! 2010 saw a new president take the reins and an exciting annual conference hosted at a fresh venue. With membership numbers up again and an upgraded website on the way, the Society has been having a great year!

New and old faces were seen at our research stations, which continue to accommodate our many needs with new facilities and innovations to reduce carbon footprints. Reefs spent time in the media limelight this year, with graphic images of bulk carrier Shen Neng 1 gouging a three-kilometre-long channel into the reef off Rockhampton. Society members were quick to respond.

Thermal acclimation in some fish species and the fate of calcifying macroalgae in future climate change scenarios are a couple of the findings presented by student award winners at the end of the newsletter.

Confronting climate change is the single most important issue for coral reef management and conservation. This newsletter is now offered primarily as an electronic resource to help reduce consumption of resources and resulting greenhouse gas emissions. Make sure you power your computer using Greenpower when enjoying this edition.

We are keen to hear your ideas, opinions and stories so don't hesitate to contact the Society if you would like to contribute to future ACRS newsletters or submissions. We hope you enjoy this newsletter prepared by your editorial team Dave Logan and Fergus Molloy.

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Photo: Chris Roelfsema

Cover Photo: Maxi Eckes

# President's Message

What an action-packed year for our Society and our nation's coral reefs! The Australian Coral Reef Society continues to play an active role in preserving Australia's coral reefs, raising awareness, providing advice and helping to train and educate the next generation of Australian research scientists and stakeholders.

In 2010, an important book was published with the help of the ACRS, the Indo-Pacific Coral Finder by Russell Kelley who describes the book as "...a proven, practical, underwater coral identification tool that allows anyone to identify hard corals to genus, regardless of growth form, anywhere in the Indian and Pacific Oceans." Development of the Indo Pacific Coral Finder was supported by the Australian Coral Reef Society and Dr. Charlie Veron (author of Corals of the World). The Coral Finder is supported by a website of free learning resources including video training movies from beginner to advanced levels. Congratulations to long-term ACRS supporter Russell Kelley for this incredibly useful achievement.

The ACRS has engaged with both federal and state politicians this year on a number of reef related issues and we are grateful once again to Pat Hutchings for keeping us up to speed through our membership with FASTS (Federation of Australian Scientific and Technological Societies). Pat hands this duty on to Frances Michaelis and AMSA this year and we look forward to working with Frances as our conduit to and from the Australian government. Emily Howells and I represented the ACRS at Science Meets Parliament, a FASTS-run event. This event is a wonderful opportunity for the Society to express its views directly to politicians about the conservation and management of Australia's coral reefs.

Speaking of AMSA, I am happy to report that 2010 saw the development of a special relationship between ACRS and AMSA with a commitment to co-host an upcoming annual conference. Initial efforts were spent to co-host the 2011 event in Fremantle, but the 2010 ACRS meeting (see below) was too late in the year and our involvement in the proposed 2011 joint meeting was not early enough to make that happen. So, we will now shoot for a 2013 joint meeting. We'll keep you posted on that. In the meantime, I encourage you to attend the AMSA meeting in Fremantle in July 2011. And don't forget that in 2012 The ARC Centre of Excellence for Coral Reef Studies will coordinate the International Coral Reef Symposium (ICRS) in Cairns and ACRS will as ever have a strong presence. Although still a ways away, this is a huge undertaking and is an event that ACRS has a strong responsibility to help facilitate.

Coral reefs and coastal systems continue to come under increasing stress, both local and from climate change. ACRS is now taking a very active role in making our voice heard at the state and federal levels, urging greater care and more effective management. One recent letter featured on the ACRS website was a submission to the Solitary Islands Marine Park (SIMP) Draft Zoning Plan. The ACRS Council is committed to continuing to provide the basis for coral reef conservation and advocacy in Australia. As such we continue to recommend all ACRS members to write to federal and state as well as local government on a more regular basis. All ACRS councillors are happy to provide guidance with such approaches and our Vice-President, Pete Mumby, is heading a special sub-committee to help in this regard.

Speaking of web sites, our own ACRS website is having a makeover which should come live very soon. Many thanks to our website designer, Diana Kleine with input from Ross Hill and Anna Scott. With the new website we are now able to process memberships and handle financial and logistical arrangements for participants in the annual ACRS conference. We will also have a very noticeable place on the site to attract potential donors, since

we are now eligible to accept tax-free donations. Many thanks to Pat Hutchings and husband Peter who have been tireless in their efforts to guide the society through the necessary legal doorways to enable this to happen.

And speaking of the ACRS conference, we had another wonderfully organized event in Coffs Harbour this year, thanks to the hard efforts of a number of people, in particular ACRS Treasurer Anna Scott and past President Selina Ward, who continues to ensure the success of ACRS conferences on a yearly basis. Anna's team at the The National Marine Science Centre provided an incredible display of organizational skill – it was a wonderful forum for exchange of the latest research from the best and the brightest of the up and coming generation of Australian coral reef scientists. I would like to thank all of you who came to share new results and research. Many thanks to all of the insiders who also played pivotal roles in making sure the meeting was a success including Uli Siebeck, Ross Hill, Zena Dinesen, Naomi Gardiner, Emily Howells, Andy Hoey, Rebecca Lawton, and Brigitte Sommer. As well as the next generation of reef scientists, represented by our students, I would like to thank our keynote speakers in particular for coming to share their experience and knowledge: Maria Byrne, Maoz Fine, Alan Jordan, Mark Meekan, and Pete Mumby. The event was generously sponsored by The SCU Marine Ecology Research Centre (MERC), GBRMPA, SCU, and UQ. Thanks are also due to the The National Marine Science Centre for hosting the event, SCU Vice Chancellor Prof Peter Lee for opening the conference and Mark Flanders for his warm 'Welcome to Country'.

Congratulations to the 27 student recipients of awards to travel to the annual ACRS conference in Coffs Harbour. Several councillors (Zena Dinesen, Pat Hutchings and Ulrike Siebeck) assessed student submissions for the travel awards and another group of councillors (Zena Dinesen, Peter Mumby, David Wachenfeld, Ross Hill, and myself) helped judge student entries so many thanks to all for these time consuming tasks. I also take this

opportunity to congratulate the 4 students who received research awards from ACRS this year through our Danielle Simmons (Christopher Doropoulos, UQ), Terry Walker (Verena Schrameyer, UTS), and unnamed ACRS awards (Nicola Browne- JCU & Sutinee Sinutok, UTS).

The ACRS would not run without the efforts of its office bearers and the considerable time that they give to ensuring that this society, the oldest coral reef society in the world, continues. I would like to give a personal note of thanks to the treasurer Anna Scott, secretary Uli Siebeck, vice president Pete Mumby, immediate past president Justin Marshall, and the tireless efforts of Selina Ward, Pat Hutchings, Zena Dinesen, website master Ross Hill and to Publications manager Dave Logan. Without these dedicated workers our Society would not be able to accomplish so much. Thanks also to The ARC Centre of Excellence in Coral Reef Studies and The School of Biological Sciences at UQ for continuing to help us reduce our carbon footprint in providing video conferencing for council meetings.

I wish you all a successful and productive 2011 and I invite you to make your views on coral reefs known within and outside of the ACRS. We hope to provide you channels for your voices on a number of key issues in 2011, but also encourage you to speak out and be heard within your community and by your government at all levels. It is up to all of us to advocate for a reef that is still stunning for our children's children.

**John Pandolfi 2010**



**Photo: Chris Roelfsema**

# Society News

## Your ACRS council

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# Minutes of the Annual General Meeting, 2010

VENUE: Surf Club, Arcadia, Townsville

DATE: Friday, 14 May 2010

The Meeting opened 6:00pm

Present: Naomi Gardiner, Anna Scott, Justin Marshall, Zena Dinesen, Erin Graham, Andrew Hoey, Christopher Goatley, Vimoksalehi Lukoschek, Ashley Frisch, Rachel Pears, Mary Bonin, Rebecca Lawton, Johnston Davidson, Tom Bridge, John Pandolfi, David Williamson, Terry Done, Terry Hughes, Ben Kinsey, Clive Wilkinson, Pat Hutchings, Bette Willis, S. Schmidt Roach, Sven, Carden Wallace, Emma Gyuns, Andrew Chin, Laurence McCook, Hugo Harrison, Fergus Molloy, Colin Wen

## 1. Apologies

Ulrike Siebeck, Emily Howells, Ross Hill, Ian Poiner, Russell Kelley

## 2. Minutes from previous meeting

One amendment was made to the 2009 President's report: Name correction 'Mark O'Callaghan'. The minutes from last meeting were accepted by Laurence McCook, seconded by Anna Scott.



## 3. Business arising from minutes

Nil

## 4. Correspondence

Justin highlighted 5 specific matters and encouraged engagement.

- i. Oil spill - WA
- ii. NSW recreational fishing
- iii. Coral Watch book sent to all Federal and State MPs over 30 letters back
- iv. WAMS - world association of marine stations.
- v. Invitation to partner with ICRS

## 5. President's report

Please see below

## 6. Treasurer's Report

Anna Scott presented the annual treasury report and the report from the auditor. The motion to approve the report was put by Justin Marshall and seconded by Vimoksalehi Lukoschek and Pat Hutchings. Voted by all present.

Laurence McCook moved to accept Wybenga & Co as auditors for next year. Motion was seconded by Pat Hutchings. Majority voted in favour.

## 7. Election of new council

John Pandolfi was elected President of the Society. John thanked Justin Marshall and discussed future for ACRS and desire to provide policy advice. Uli Siebeck was re-elected secretary and Anna Scott re-elected treasurer. Justin Marshall steps down from his role and is the immediate Past President.

All nominations for council and office bearers were accepted by the membership.



## 8. Other business

### Upcoming conferences (ACRS and ICRS)

See page 17

### Address on ICRS 2012 - Eliza Glasson and Coral CoE.

Dom Kempsey raised the issue of how to help retirees to keep attending science conferences. Clive Wilkinson suggested a formal mentoring program could be an opportunity for this.

Members thanked Eliza and Coral CoE for the presentation.

### Invited talk: Dr. Laurence McCook

'Marine Reserve Networks: Outcomes of Zoning on the Great Barrier Reef'

The meeting was closed at 8.00pm

## **Presidents Report ACRS AGM 2010**

Thanks all for coming to AGM, many important things to decide and vote on here.

Support and meeting and consensus are essential in these challenging times for reefs worldwide. Especially given the rudderless or Rudd - Errr-Less government and general political apathy we are under.

At this AGM I hand over to John Pandolfi and it has been a pleasure to serve and help to secure Australian reefs for future generations. There is still a great deal to do and we need in particular the strong leadership and expertise of folks such as John and his perspective of reefs over time.

We also need the dynamism and energy of young reef scientists and conservationists and it is great to see the number of students that ACRS continues to attract. Thank you for being here!

Membership is up again this year.

**Thanks** for excellent work and support:

Anna Scott (Treasurer), Uli Siebeck (Secretary) *and congratulations on Emma to you and Guy!*, John Pandolfi (Vice president), Selina Ward (Conference organiser), Ross Hill (Web-master), Dave Logan and Fergus Malloy (Newsletter wranglers), all councillors, CMS and CoE for technical and logistical support as well as financial.

Student awards team:

Pat Hutchings

Zena Dinesen

Uli Siebeck

**Congratulations** to those who have won awards and prizes.

ACRS Student Research grant winners (see next article)

Darwin Conference Student Prizes for presentations:

1st - Vicki Harriott - Emily Howells - JCU

2nd - Quicksilver - Rebecca Fox - JCU

Research Station prizes:

1st - Connor Champ - UQ

2nd - Yui Sato - JCU/AIMS

3rd - Andrew Hoey - JCU

4th - Laura Wicks - Victoria U Wellington

GBR book - Colin Wen - JCU

Judges:

Zena Dinesen, Fergus Molloy, Ross Hill, Uli Siebeck, Phil Munday - Thanks!

20 or so student travel awards to go to Darwin - congratulations for all.

Thanks also to Quicksilver for 2nd prize sponsorship.

**Darwin conference** was a great success.

Thanks to students and student supervisors who got students there. It was great to spread it around Australia.

Thanks to Selina for a superb job of organising with team Ross, Uli, Naomi, Emily and others.

### **Letters and communications**

Public engagement and awareness has increased with letters sent regarding oil spills and fisheries issues. This is important for everyone to do!

FASTS report on Science meets Parliament? Many thanks to Pat who stands down as FASTS rep this year and hands to AMSA rep - Frances Michaelis.

### **Tax deductible status now running**

Thanks to Pat and Peter and Anna. Please encourage others to donate. You can choose to put funds into specific fund or general. Donate through Justin, John, Selina, Pat. In the near future you can donate online.

### **Coralfinder and Russell Kelley**

Funded by ACRS and now available. Russell is out there now.

### **CoralWatch book**

Book from co-authors Craig Reid, Diana Kleine and Dave Logan and me - Coral Reefs and Climate Change: the guide for education and awareness. Sample here. Thanks Paul Greenfield UQ VC for support.

Great team of writers and scientists and artists, many of them ACRS Members. Thanks to all, especially Charlie Veron for support and encouragement. Stay tuned for the video and the Bahasa translation.

### **Thanks for putting this event together:**

Erin, Emily, Chris, Bec, Shane, Naomi Gardiner, Fergus

Thanks to Laurence McCook for being our special guest speaker for tonight. Will talk to us after we hear about ICRS 2012 from Eliza Glasson

Do give us suggestions, do join if not a member and get your friends and relations to join.

Reefs need as much help as they can get.

“Unless people like you care a whole awful lot, nothing is going to get better, it’s not.”

The Lorax, Dr Suess



### **Justin Marshall 2010**



Photo: Craig Reid



## ACRS Student Awards

### Student Research Awards for 2011 & 2012

The ACRS supports the research of up to four students each year by the provision of Student Grants. The best proposals received are awarded the Terry Walker Prize of \$2500 or the Danielle Simmons Prize of \$2500. Research Grants for 2010 have already closed. The **closing date** for research grants applications **for 2012** will be **Friday 9<sup>th</sup> December, 2011**.

Given Terry Walker's commitment to field studies on Australian coral reefs and cays, this award is to be spent primarily on field studies on Australian coral reefs. Given Danielle Simmons commitment to field work at Heron Island, successful applicants for this award will need to spend some time at Heron Island working in the field.

The other research grants (up to two) of \$2000 are to be used for laboratory and/or field studies relevant to Australian coral reefs. Any student who is currently enrolled at an Australian university and working towards a PhD or MSc on a topic involving research on Australian coral reefs is eligible to apply. Awards may not be used to fund conference attendance, or travel not related to field studies.

**Applicants must be a financial member of the society for the year in which the grant is to be awarded before applying for these awards.**

Applications must be sent electronically and consist of one single document. The application itself must not exceed four pages in total including budget and short summary CV.

In addition, letters of support from the supervisor and institution and evidence of membership status must be provided and included within the single electronic document. Therefore applicants must arrange access to a scanner if required in advance of the closing date for applications.

Applications must include the following information:

1. Name, address, date of birth and tertiary qualifications.
2. Name of institution, department and supervisor with email contact details.
3. Project title and degree for which enrolled.
4. Brief description of the project, stating: aims and justification, methods, including project design, progress made to date, and expected year of completion and year in which enrolled.
5. An indication of how the award would be spent including a short but explicit budget.
6. Details of all other sources of funding for the project.
7. A signed statement by the supervisor and a representative of the university, verifying that the project has been represented accurately and that the Institution is prepared to administer the award.
8. Students should indicate whether they wish to be considered for the Terry Walker and/or the Danielle Simmons award, bearing in mind the requirements for these awards, extensive field work and working at Heron Island at least for part of the project respectively.
9. A copy of your ACRS membership receipt (or application for membership/renewal) for the membership year in which the grant is to be awarded.

Proposals will be judged on:

- Scientific merit of proposed research
- Relevance of topic to current Australian coral reef research
- Design of project and progress to date
- Project scope, given the degree to be awarded and applicable resources
- Proposal presentation
- Track and research record of the student (e.g. publications, talks, prizes).

Successful applicants are required to prepare a one-page report for publication in the Society's newsletter at the end of the one-year grant period, and provide a summary of how the research grant was spent.

To apply, please email your completed application to:

Dr Pat Hutchings  
[pat.hutchings@austmus.gov.au](mailto:pat.hutchings@austmus.gov.au)

### **Research Grants for 2011 have already closed.**

The **closing date** for research grants applications **for 2012** will be **Friday 9<sup>th</sup> December, 2011**. The successful applicant will be notified by late January/early February 2012.

Applications received after the closing will not be considered, and they must be complete (i.e. CV, letter of support of supervisor and willingness of University to administer the grant and evidence of current membership status attached) and be provided with a single electronic document.

### **ACRS Student Award Recipients for 2010**

The following students were awarded research grants for the year 2010. Stay tuned for next year's newsletter to find out the outcomes of this research.

#### **Terry Walker Award \$2500**

Verena Schrameyer - Plant Functional Biology and Climate Change Cluster, University of Technology Sydney.

For her research into "Climate change and Hexo.. and Octocorals."

#### **Danielle Simmons Award \$2500**

Christopher Doropoulos – Marine Spatial Ecology Lab, University of Queensland

For his investigation into "Climate change and Algal recruitment on GBR."

#### **Australian Coral Reef Society Fellowship \$2000**

Nicola Browne - School of Earth and Environmental Sciences, James Cook University

For her work on "Sedimentary influence on coral growth."

Sutinee Sinutok – Plant Functional Biology and Climate Change Cluster, University of Technology Sydney.

For investigations into "Ocean acidification impact on sediment dwellers."

### **Reports from ACRS Student Award Recipients for 2009**

As a condition of the ACRS student Awards, recipients submit a report of their work. Reports received for the awards granted in 2009 and 2010 have been included in full at the end of this Newsletter. These reports reflect the high quality of work to be found within the student membership of ACRS. They are an encouraging reminder of the importance of supporting student development through research and travel awards.

Please also check out Rebecca Fox's paper which found its way into the [ACRS Newsletter 2009](#) edition last year.

# Conference Reports

## Coffs Harbour 2010

The 85th Annual ACRS conference was held this year for the first time at Coffs Harbour. It once again brought together Australia's coral reef community to exchange ideas and the latest research findings and to encourage and reward postgraduate students in their endeavours.

Hosted by Southern Cross University's National Marine Science Centre, the conference involved more than 130 leading national and international coral reef researchers.



Friday evening saw the conference officially opened by Southern Cross University Vice Chancellor Professor Peter Lee as the National Marine Science Centre showcased their excellent research and educational facilities.



Coral bleaching, the impact of warming waters on coral reefs, marine debris and the management of marine parks were just some of the topics covered as the conference continued on Saturday and Sunday at the Novotel Pacific Bay Resort. The next generation of reef scientists, represented by our students provided some engaging presentations, alongside veteran researchers and keynote speakers.

Speakers at the conference included.

- Professor Peter Mumby, The University of Queensland
- Dr Mark Meekan, Australian Institute of Marine Science, WA
- Dr Alan Jordan, NSW Department of Environment, Climate Change and Water
- Dr Maoz Fine, Bar-Ilan University, Israel
- Professor Maria Byrne, University of Sydney
- Dr David Wachenfeld, Great Barrier Reef Marine Park Authority





## Workshops

Coral identification and sub-tropical reefs workshops were on offer to attendees in addition to the annual student mentoring day hosted by the ARC Centre of Excellence for Coral Reef Studies.



## Thanks to speakers, organisers and sponsors

Huge thanks goes to local conference organiser Anna Scott, and again to Selina Ward for another brilliantly organised event. Other special mentions here include Uli Siebeck, Zena Dinesen, Naomi Gardiner, Emily Howells, Andy Hoey, Ross Hill, Chris Goatley, Rebecca Lawton, and Brigitte Sommer. Thanks also to our speakers and all who came and contributed their expertise and enthusiasm to a most memorable event. Congratulations to all students who won prizes.

Thank you especially to event sponsors The SCU Marine Ecology Research Centre (MERC), GBRMPA, SCU, and UQ. Thanks also to the National Marine Science Centre for hosting the

event, SCU Vice Chancellor Professor Peter Lee for opening the conference and Mark Flanders for his warm 'Welcome to Country'.

## Wrap up

Sundowners, the live band and the awards presentation were highlights of the closing dinner at the Park Beach Surf Club which was a time to celebrate those few great days of collaboration and fun.



## Field excursion

The local residents of the Solitary Islands Marine Park put on a show for conference goers who enjoyed the excitement of shark encounters with scuba diving company *Dive Quest* and a perfect day of whale watching aboard the *Spirit of Coffs Harbour* guided by Dr. Daniel Burns.







## Student Travel Awards

For the 2010 Conference, ACRS awarded travel awards to assist students with their fares to the national conference. While many of these students were from James Cook University, travel awards were also given to students from UTS in Sydney and the University of Queensland. This time applications were also open to New Zealand students, and travel assistance was provided to two students from the Victoria University of Wellington. ACRS is really pleased to be able to support so many students to travel to the annual conference and present their research. The society awarded travel grants between \$250 and \$770 to the 27 students listed below:

Brian Beck - UQ

Mary Bonin - JCU

Rowan Broker - JCU

Nicole Browne - JCU

Chia-Miin Chua - JCU

Hong Tan Chun - JCU

Peter Cowman - JCU

Jennifer Donelson - JCU

Marnie Frekelton - JCU

Naomi Gardiner - JCU

Chris Goatley - JCU

Hugo Harrison - JCU

Andrew Hoey - JCU

Emily Howells - JCU

Jacob Johanson - JCU

Rebecca Lawton - JCU

Adrian Lutz - JCU

Matthew Mitchel - JCU

FJ Pollock - JCU

Sebastian Schmidt-Roach - AIMS/UniTas

Verena Schrameyer - UTS

Sutinee Sinutok - UTS

Dorota Starzak - Uni of Wellington NZ

Jessica Stellar - JCU

Amelia Wegner - JCU

Colin Wen - JCU

Anne Wietheger - Uni of Wellington NZ

## Student Prizes at the 2010 Annual Scientific Conference

The annual ACRS scientific conference always provides a great opportunity for postgraduate students to showcase their research, and this year in Coffs Harbour there were, again, many high quality student presentations.



A panel of judges assessed the presentations according to an agreed set of criteria, with at least two judges allocated per student paper. The panel consisted of Zena Dinesen, John Pandolfi, Peter Mumby, Ross Hill, and Dave



Wachenfeld. (Please note this year there were very few posters entered by student members, and no awards were given in this category.)

The most prestigious student award is the Vicki Harriott Memorial Student Prize, established by the ACRS Council in 2005 in memory of the late Vicki Harriott, in recognition of Vicki's great contributions to coral reef research and marine science education. The Vicki Harriott Prize for 2010 (a cheque for \$500.00) for the best student presentation was awarded to Sebastian Schmidt-Roach of AIMS/University of Tasmania, for his paper (Schmidt-Roach et al.) entitled 'Challenging morphological plasticity in a keystone coral species'. This was a very interesting paper on phenotypic plasticity and genetics of *Pocillopora damicornis* that challenges, inter alia, some of the established taxonomic ideas about the range of growth forms encompassed within this species. Congratulations to Sebastian!



The second major prize, a trip for two people on a Quicksilver outer barrier reef cruise, was awarded to Rebecca Lawton, of the ARC Centre of Excellence for Coral Reef Studies, at James Cook University, for her presentation of 'High population connectivity across large geographic scales in two widespread coral reef butterflyfishes'. Well done, Rebecca.

There were also four prizes involving 4-7 days' bench fees at the various Great Barrier Reef research stations. These were awarded to Jessica Stella of JCU (Lizard Island RS); Andrew Olds of Griffith University, Gold Coast (Orpheus Island RS); Hugo Harrison of JCU (One Tree Island RS); and Adrian Lutz of JCU (Heron Island RS).

A copy of the book 'The Great Barrier Reef – Biology, Environment and Management' edited by Pat Hutchings, Mike Kingsford and Ove Hoegh-Guldberg and published by the CSIRO, was presented to Deborah Cleland of the Australian National University for her presentation on SimReef and ReefGame, tools to support integrated reef research and management.



Our congratulations to these prize winners, and thanks to all the students for their excellent and interesting presentations. The ACRS Council is very grateful to Quicksilver, the Research Stations and CSIRO for generously donating these prizes. Thanks also to Pat Hutchings and Selina Ward for liaising with these institutions and helping to arrange for the donations of prizes.

**Zena Dinesen**

## Thank you for the support

*Dear ACRS committee*

*I would like to thank you for awarding me with the ACRS travel grant to attend the 2010 ACRS conference in Coffs Harbour. It was a really positive experience for me. I was able to present my PhD research to an audience of coral reef specialists and attend a wide range of very informative presentations. Most importantly, I was able to liaise with scientists in the coral research field which served as a wonderful opportunity for me to receive ideas and suggestions about my current and future work. The student day also provided invaluable career guidance relative to the scientific field and, given that I am in the process of preparing the first manuscript from my PhD research, it enabled me to structure my work into a publishable format.*

*Kind Regards*

*Dorota Starzak*

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*Thank you for the student travel fund for 2010 ACRS conference held in Coffs Harbour. I really enjoyed presenting my paper on the impact of ocean acidification on *Halimeda* sp. and foraminifera from Great Barrier Reef. It was a very good opportunity for me to get feedback on my data before submitting for publication and get new idea for my future researches. I had good experiences in Coffs Harbour enjoying interesting presentations of other students and researchers and great conference venue. Furthermore, it provided me a good network with other researchers and students and broadened my idea in Australian coral reef research.*

*Yours sincerely,*

*Sutinee Sinutok  
University of Technology, Sydney*



Photo: Craig Reid

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*I would like to thank the Australian Coral Reef Society for supporting me with travel funding for this year's ACRS Annual Scientific Conference in Coffs Harbour.*

*The lovely venue helped to create a productive and yet enjoyable time. It was a really good experience to meet peers from the same research field. I attended a whole range of interesting talks, which were informative, innovative and full of good science.*

*I am looking forward to next year's ACRS conference,*

*Kind regards,*

*Verena Schrameyer  
University of Technology, Sydney*

## Upcoming Conferences

Don't miss out on any of the exciting mix of ACRS conferences coming up over the next 3 years across Australia.

### 2011 ACRS on the Sunshine Coast

The 86th Annual ACRS conference will be held at Surf Air Resort on the Sunshine Coast, Qld from 19 – 21 August. The call for papers is now open and the themes are listed on our website at [www.australiancoralreefsociety.org](http://www.australiancoralreefsociety.org)

This promises to be a dynamic event and we look forward to receiving your abstracts soon.

#### Get involved

Are e-mails and phone calls alone not quite getting your message across? Do you believe that face-to-face discussions, debate and workshops are essential to share ideas and celebrate successes? Have you ever hosted a party and want to take it to the next level? Then please consider contributing your time and enthusiasm, joining a dynamic committee to help organise the ACRS conference.

Please contact Selina Ward via e-mail [selinaward@uq.edu.au](mailto:selinaward@uq.edu.au)



Photo: Chris Roelfsema

### 2012 ICRS in Cairns



Start preparing your abstract for the 12th International Coral Reef Symposium (ICRS) that will be held in Cairns from 9 – 13 July 2012. With the support of ACRS, James Cook University and the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies are coordinating an event not to be missed.

Over 2,000 talks and posters are planned on major themes including Climate Change, Reef Ecology, Conservation Planning, Fish and Fisheries, Genomics, Management Tools, The Coral Triangle Initiative, and the Human Dimension of Coral Reefs. Visit at [www.icrs2012.com](http://www.icrs2012.com) to register and for further information.

### 2013 AMSA / ACRS joint event

Huge networking opportunities, collaborative research and stimulating debates will be unavoidable at the joint ACRS and AMSA co-hosted annual conference planned for 2013.



## ACRS Membership

This Newsletter has a membership application/renewal form attached. Please note that the society now offers both Individual and Corporate memberships and fees are tax deductible.

An important incentive is a \$10 reduction for all applications/renewals made before February 28 – think of it as a gift from the ACRS to thank you for your support, and to complement your New Year resolution to get active about contributing to Society issues. So, if you haven't already renewed your membership, fill in the attached form send it to:

ACRS Memberships  
c/- School of Biological Sciences  
The University of Queensland  
St Lucia QLD 4072  
[acrs@cms.uq.edu.au](mailto:acrs@cms.uq.edu.au)

Don't forget to make a copy and give it to your friends and colleagues.



## ACRS comments on environmental management plans

The Society makes submissions from time to time on government plans relating to coral reef management. This is an important role for ACRS, which has some very knowledgeable and experienced members.

Take a look at some of the [comments and recommendations](#) submitted throughout 2010:

**Solitary Islands Marine Park Draft Zoning Plan**  
ACRS submission on the Solitary Islands Marine Park (SIMP) Draft Zoning Plan

### Recreational fishing in NSW

ACRS submission on the Parliamentary Enquiry into recreational fishing in NSW

All ACRS members are encouraged to write to federal and state as well as local government on a more regular basis. The voice of the voter is very powerful, even if it does not result in an instant and desired reaction.

All ACRS councillors are happy to provide guidance with such approaches and our President, John Pandolfi has convened a special sub-committee to help in this regard.

Email: [j.pandolfi@uq.edu.au](mailto:j.pandolfi@uq.edu.au)

How to get involved and add your expertise to the Society's pool of knowledge:

1. Keep a watch for submissions and opportunities to comment.
2. Send comments to coordinator by email and indicate clearly whether comments are for publication or to raise a query.

The more input we receive the more effective and scientifically sound will be our contribution.

## The ACRS website and email list

### Watch this SPACE!

### Upgraded website coming soon!

[www.australiancoralreefsociety.org](http://www.australiancoralreefsociety.org)

The ACRS website is the global doorway to your Society. The website contains the latest information on student grants, workshops and conferences, plus Councillor contact details. As submissions are lodged, they too are posted on the website.

The website also contains details on how to subscribe to the ACRS List (in case you are not already on it) and more importantly, a membership form so you can renew your membership and encourage your colleagues to join.

The website will also act as a repository for documents and conference material. There are also links to other reef-related sites.

The Email List provides a discussion forum for current issues in coral reef science, and is also the main method by which the ACRS distributes information to its membership. The email list is open to all members and new members will automatically be added to the list once their membership has been approved. Alternatively, the ACRS website contains a link that allows members to subscribe to the email list themselves.

## Tax-deductible donations to ACRS

The majority of funds raised by the ACRS go toward supporting the next generation of Australia's coral reef scientists. We support Australian student participation to the annual ACRS meetings and we provide several research grants to PhD students working on the biology and geology of coral reefs.

You can donate to the ACRS in several ways. Tax-deductible donations will be used to support student

travel to annual ACRS meetings and student research grants. Presently, 4 student research awards are competed for annually and the two best are represented as the Terry Walker Prize (\$2500) and the Danielle Simmons Prize (\$2500). If you would like for your donation to be use in some other manner consistent with the goals of the Society, we would welcome your input.

### Donate to the Vicky Harriott Memorial Student Prize

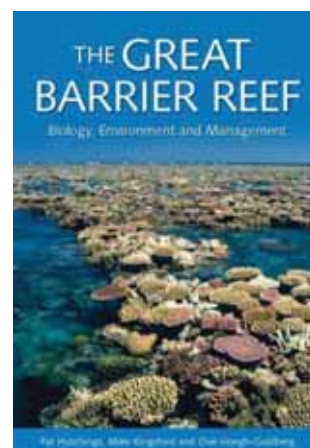
You can also make contributions to another individual ACRS award, such as the annual Vicki Harriott Memorial Student Prize given to the student with the best presentation at each annual ACRS meeting. Contributors should note, however, donations to this fund are NOT tax deductible.

### ACRS book profits

The ACRS publication the Great Barrier Reef: Biology, environment, and management, continues to make profits for the society.

The various chapters of the book have been written by leading Australian experts, edited by Pat Hutchings, Mike Kingsford and Ove Hoegh-Guldberg and published by CSIRO Publishing.

The book is a comprehensive introduction to the Great Barrier Reef, for students and interested public. While the book concentrates on the GBR, much will be relevant to other coral reefs in Australia and indeed throughout the world. For your copy, just fill out the form included in this Newsletter to place an order and send it to CSIRO Publishing (full details available on the form).





# Australian Coral Reef Society Inc.

A society promoting scientific study of Australian Coral Reefs

Address: ACRS Memberships  
c/- School of Biological Sciences  
The University of Queensland  
St Lucia QLD 4072

Tel: (07) 3365 3307  
Fax: (07) 3365 4755  
Email: [acrs@cms.uq.edu.au](mailto:acrs@cms.uq.edu.au)

## APPLICATION FOR MEMBERSHIP

I,.....(Title, first name and surname)

hereby apply for membership of the Australian Coral Reef Society Inc.

Mailing address:.....

.....Postcode:.....

Email:.....Phone:.....

Research/professional/other interests in coral reefs:.....

Institution/Organisation and Branch/Department (if any):.....

Signature of Applicant:.....Date:.....

### For New Members Only

\*Proposed by:..... \*Seconded by:.....

Signature:.....

\* both being members of ACRS Inc. who, to the best of their knowledge, verify that the applicant is eligible for membership under the ACRS Constitution. In the case of those applying for student membership, this would include their full-time status. NB: Applications are considered by the ACRS Council (minimum of three meetings/annum) and applicants are notified of its decision in writing.

I would like to pay \$...... to The Australian Coral Reef Society Inc for the following membership fees (please tick as appropriate): ☐ Full (\$50.00) ☐ Student (Full-time) (\$30.00)

**Note: There is a \$10.<sup>00</sup> discount on the above prices for applications received between 1<sup>st</sup> January and 28<sup>th</sup> February each year. Memberships are valid until the end of the calendar year.**

**5 year** full membership: ☐ Full (\$200) – save \$50 using this option. Early bird discount for renewal before February does not apply.

I would like to receive the annual newsletter in ☐ PDF format ☐ Hard copy

### Payment Options

☐ **Internet payment: Preferred Option**

Account name: Australian Coral Reef Society Inc. BSB: 034-212. Account number: 16-1127.

Please enclose transaction receipt with application and send to treasurer for processing

☐ **Cheque or money order option:** Please enclose a cheque/money order with application and send to treasurer for processing

☐ **Credit card authority:** Please charge \$...... to the following card: ☐ MasterCard ☐ Visa

Card Number: \_\_\_\_\_ Valid to: \_\_\_\_/\_\_\_\_/\_\_\_\_

Name on the card:.....

Signature:.....

President: Prof John Pandolfi; T: (07) 3365 3050; F: (07) 3365 4755; E: [j.pandolfi@uq.edu.au](mailto:j.pandolfi@uq.edu.au)  
Hon Secretary: Dr Ulrike Siebeck; T: (07) 3365 4070; F: (07) 3365 4522; E: [u.siebeck@uq.edu.au](mailto:u.siebeck@uq.edu.au)  
Hon Treasurer: Dr Anna Scott; T: 0421 181 484; F: (02) 6651 6580; E: [ascott@nmsc.edu.au](mailto:ascott@nmsc.edu.au)





# Australian Coral Reef Society Inc.

A society promoting scientific study of Australian Coral Reefs

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The University of Queensland  
St Lucia QLD 4072

Tel: (07) 3365 3307

Fax: (07) 3365 4755

Email: [acrs@cms.uq.edu.au](mailto:acrs@cms.uq.edu.au)

## CORPORATE MEMBERSHIP APPLICATION

The Organisation,.....

ABN:.....wishes to apply for corporate membership of the Australian Coral Reef Society Inc.

Postal address:.....

.....Postcode:.....

Email:.....Phone:.....

Web address:.....Fax:.....

Describe the major activity of your organisation:.....

.....Total number of employees (incl. Executives):.....

**Authorisation:** *On behalf of the above organisation, I authorise this corporate membership application for the Australian Coral Reef Society Inc.*

Name:.....Position:.....

Date:.....Signature:.....

*Please note: Applications are considered by the ACRS Council (minimum of three meetings/annum) and applicants are notified of its decision in writing.*

**Members Names:** Please identify three people to whom correspondence from the ACRS should be sent:

Name:.....Email:.....

Name:.....Email:.....

Name:.....Email:.....

**Yearly Membership Options:** ☐ Non-Profit Organisations (\$250) ☐ Other Organisations (\$500)

I would like to pay \$..... to The Australian Coral Reef Society Inc. for a 1 year calendar membership.

I would like to receive the annual newsletter in ☐ PDF format ☐ Hard copy

### Payment Options

☐ **Electronic Funds Transfer:** *Preferred Option*

Account name: Australian Coral Reef Society Inc. BSB: 034-212. Account number: 16-1127.

Please enclose transaction receipt with application and send to Treasurer for processing

☐ **Cheque or money order option:** Please enclose a cheque/money order with application and send to Treasurer for processing

☐ **Credit card authority:** Please charge \$..... to the following card: ☐ MasterCard ☐ Visa

Card Number: \_\_\_\_\_ Valid to: \_\_\_\_/\_\_\_\_/\_\_\_\_

Name on the card:.....

Signature:.....

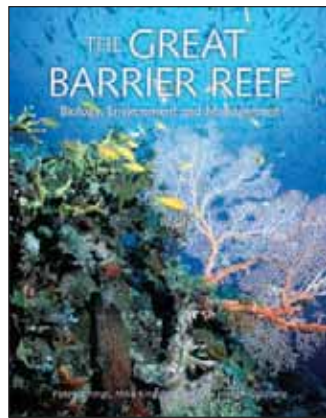
President: Prof John Pandolfi; T: (07) 3365 3050; F: (07) 3365 4755; E: [j.pandolfi@uq.edu.au](mailto:j.pandolfi@uq.edu.au)

Hon Secretary: Dr Ulrike Siebeck; T: (07) 3365 4070; F: (07) 3365 4522; E: [u.siebeck@uq.edu.au](mailto:u.siebeck@uq.edu.au)

Hon Treasurer: Dr Anna Scott; T: 0421 181 484; F: (02) 6651 6580; E: [ascott@nmsc.edu.au](mailto:ascott@nmsc.edu.au)

# The Great Barrier Reef

## Biology, Environment and Management



**NOVEMBER 2008**  
**CSIRO PUBLISHING**  
 392 pages, PB  
 Colour illustrations  
 ISBN: 9780643095571  
**\$89.95**

**Sales in Australia and New Zealand:**

CSIRO Publishing  
[www.publish.csiro.au](http://www.publish.csiro.au)

**Sales in the rest of the world:**

Springer Publishing Company  
[www.springerpub.com](http://www.springerpub.com)

**Pat Hutchings, Mike Kingsford and Ove Hoegh-Guldberg**

This book gives readers a broad overview of biological and physical attributes of the Great Barrier Reef and, where relevant, other reefs of the world. Contemporary pressing reef issues such as coral bleaching, coral disease and the challenges of coral reef fisheries are discussed by world research leaders.

*The Great Barrier Reef* also includes a 'field guide' that will help people to identify the common animals and plants on the reef, then to delve into the book to learn more about the roles the biota play on the reef. The introductory sections explain the numerous coral reef processes which are responsible for this ecosystem – one of the most diverse in the world. The major processes include primary productivity, calcification and energy flow through coral reef food webs, and these are explained using accessible language. The major threats that face coral reefs are also covered, as well as the management solutions that can be adopted to reduce these threats.

While its focus is on the Great Barrier Reef, this comprehensive volume can be used as a baseline text for most Indo-Pacific coral reefs.

### FEATURES

- Exciting and contemporary account of the issues that face the world's most complex marine ecosystem
- Examines the diversity, physiology, ecology and conservation of coral reefs in one volume
- Australian focus
- Written by leading authorities on the biodiversity of the GBR as well as its position as an icon for monitoring global warming
- Beautifully illustrated

### AUTHOR INFORMATION

**Dr Pat A Hutchings** is a Senior Principal Research Scientist at the Australian Museum.

**Professor Michael Kingsford** is currently the Head of School of Marine Biology and Aquaculture at James Cook University.

**Professor Ove Hoegh-Guldberg** is the Director of the Centre for Marine Studies at Queensland University.

Please send me:

☐ The Great Barrier Reef AU\$89.95

**Subtotal** \$

#### Postage and Handling

Please include \$9.00 postage and handling for orders within Australia. For all other orders please include \$35.00 for the first item and \$15.00 for each additional item to cover air freight delivery, insurance and handling.

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# Science, Conservation and Management News

The Australian Coral Reef Society is the oldest organisation in the world concerned with the study and protection of coral reefs. ACRS plays a key role by promoting scientific research on Australian coral reefs and provides a forum for discussion and information transfer among scientists, management agencies and reef-based industries that are committed to ecological sustainability.

## Coral Finder Toolkit launched

The Coral Identification Capacity Building Program (CICBP) is pleased to announce the launch of the Coral Finder Toolkit - a suite of resources for building capacity in coral identification and data sets that rely on same.

The Coral Finder Toolkit is based on the Indo Pacific Coral Finder, a unique underwater visual decision tool - [www.byoguides.com](http://www.byoguides.com) - and the Coral Hub website - [www.coralhub.info](http://www.coralhub.info) - which provides free coral identification resources. The Coral Finder Toolkit allows the motivated person to teach themselves how to identify Indo Pacific coral genera regardless of the myriad growth forms expressed by their species.

Stage 1 of the Coral Hub delivers the Learning Centre which has about two hours of free coral identification video training and self testing / revision resources based on real world application of the Coral Finder. Stage 1 of the Coral Hub also features the Termigator - a set of six interactive visual glossaries (see the tabs) - in 2011 these will be supported by an extensive library of support articles.

Also coming in 2011 will be Stage 2 of the Coral Hub - a comprehensive genus index. The genus index pages will serve as a bridge between the real world of coral identification as experienced underwater and the formal knowledge framework that leads to coral taxonomy.

You can see some examples of how the genus pages translate real world observations made using the Coral Finder to the formal knowledge here:

[www.coralhub.info/cf/a-z/acanthastrea/](http://www.coralhub.info/cf/a-z/acanthastrea/)

[www.coralhub.info/cf/a-z/leptoseris/](http://www.coralhub.info/cf/a-z/leptoseris/)

[www.coralhub.info/cf/a-z/acropora/](http://www.coralhub.info/cf/a-z/acropora/)

Anyone interested in incorporating coral identification into their teaching, resource management or conservation activities might also be interested in the coral identification capacity building workshops we run.

## Russell Kelley

Program Director

Coral Identification Capacity Building Program



To obtain a copy of the Coral Finder, please go to [www.byoguides.com](http://www.byoguides.com)





# The Coral Finder Toolkit

SUPPORT TOOLS FOR CORAL IDENTIFICATION

## Coral Finder



- visually driven coral identification tool
- can be used underwater or topside



## Coral Hub



- compare & confirm tools
- training movies (stream or download)
- self revision tools
- links to deeper knowledge



## Toolkit Disc



- DVD training movies (PAL / NTSC)
- offline version of the Coral Hub
- bandwidth independent



# Coral Finder Toolkit Disc

Support for remote and low bandwidth communities

## Toolkit Disc



The Coral Finder Toolkit disc contains coral identification training movies and an offline version of the Coral Hub which **does not require the internet**.

## DVD movies



The disc will autoplay the training movies on any **DVD player**. Ensure you have a disk suited to your television system **PAL or NTSC**.

## Offline Coral Hub



This offline version of the Coral Hub will run without the internet. It contains the same training movies, comparison and revision tools as the online version. Put the disc in a computer, cancel the DVD player if it auto-plays, and inspect the files on the disc.

Drag the folder called "**Coral Hub DVD-ROM contents**" to your computer's hard drive. Locate and double click the file called "**index** or **index.html**" - requires Chrome, Firefox, Safari, and Internet Explorer (**Version 7 or later**). Requires Flash (**Version 9 or later**).



# The learning pathway

BUILDING CAPACITY IN CORAL IDENTIFICATION

## Coral Finder Toolkit of teach yourself resources

### Coral Finder



Underwater genus level field identification anywhere in the Indo Pacific

### Coral Hub



Compare and confirm genus level field observations. Train yourself and others. Revise and test your skills.



Bandwidth limited users

## Capacity building through tailored partnerships

### Partnerships



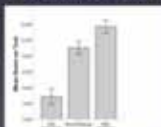
Customise to partner's needs: e.g. basic through advanced training, training the trainers, data integration etc.

### Local / regional workshops



Beginner through intermediate & advanced level training, mentorship & skills building

### Better data & decisions



More accurate & reliable data for conservation & resource management

## Link and integrate with advanced resources

### Examples...



Species level coral identification resources



Scientific and taxonomic applications



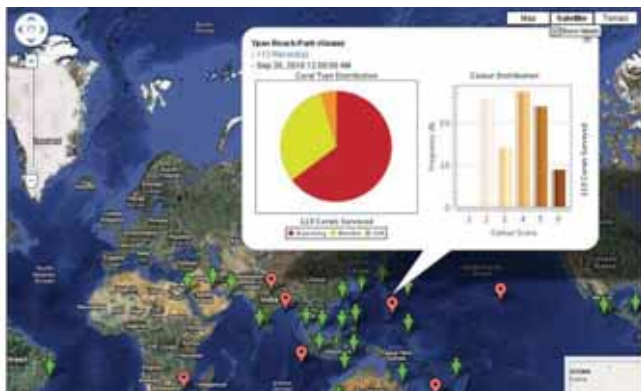
## CoralWatching on the rise

First and foremost, we would like to thank you all for your continued support for CoralWatch, and for your contributions to our global database of coral health status. Thanks to your surveys, we now have data for over 30,000 corals at 493 sites around the world, and the numbers are always increasing! Please continue to help us monitor our coral reef ecosystems by conducting surveys on as many corals as possible, and see how their health changes over time.

### New website



Hopefully, you have had a chance to visit our new website which was launched in May this year. This version is more user-friendly, and allows you to view all surveys from around the world using Google maps, and search through the database for results from specific countries or reefs. You can also download instructional and educational materials for using the Coral Health Charts, read reviews and event information, and order CoralWatch materials such as charts, “Do It Yourself Kits”, books and education packs.



## Coral Health Chart Distinctive Specialty

We have developed a PADI ‘CoralWatch Health Chart Distinctive Specialty’ specialty in conjunction with Project AWARE, so you can teach, dive and certify your students in coral monitoring and data collection. This course highlights the impact of coral bleaching and provides students with the knowledge and skills needed to identify coral health and record data. PADI Instructors who would like to apply for the instructor rating can contact us to apply for permission and should send this together with the PADI Specialty Instructor Application to their local PADI Training Department.

### CoralWatch Up-To-Date

Current members: 854  
Number of reefs surveyed: 493  
Number of corals surveyed: 30,674  
Number of surveys: 1,709  
Highest contributor:

Crystal Dive – Eco Koh Tao.

If you have any questions or suggestions we would love to hear about your monitoring adventures, about the reefs in your area, and any feedback you may have.

Best wishes, and keep up the good work!

### CoralWatch Team

[www.coralwatch.org](http://www.coralwatch.org)





## Coral Health News

### Mass Bleaching Event in Kuwait

Dive groups have reported a shocking 90% rate of coral bleaching between 1-13m depth around the islands of Qaruh and Umm Maradim in Kuwait in September, 2010. Causes of the mass bleaching event remain unconfirmed. However, it is believed rubbish and pollutants are primarily to blame. Mass deaths of reef fish, found floating amongst the dead and dying corals, were also reported. The dive team, in association with Kuwait Foundation for Advancement of Science (KFAS), have now removed at least eight tonnes of waste from around the reef sites over the past few weeks. The dive groups are attempting to reach out to their governing bodies for support and a call to action – unfortunately their pleas remain largely unanswered at this time. They have, however, called for cessation of activities based around the reef to help prevent further damage at this time.



Fortunately, just a few weeks after the first bleaching events were reported, there have been some signs of recovery in some individual corals, as well as the return of small fish shoals. To read and see more, please visit: [www.coralwatch.org/web/guest/news](http://www.coralwatch.org/web/guest/news)

Information and photos from Kuwait Dive Team. [www.freekuwait.org](http://www.freekuwait.org)

### Mass Bleaching Event in Thailand

Extensive, widespread coral bleaching occurred around the island of Koh Tao, Thailand, as well as other surrounding islands, at the end of summer in 2010. At this time, water temperatures peaked at up to 32 degrees (34 degrees at the surface) and were the highest on record! Bleaching was even observed at depths of 30m. Some corals show promising signs of survival during the event, indicating positive adaptation of the symbiotic zooxanthellae. In winter, reduced temperatures (down to 30 degrees) and increased cloud cover allowed some corals to recover. Unfortunately, many corals did die off completely – mainly the fast growing *Acropora* species which rely more heavily on their symbionts for survival. Other species recovered quite well, such as the slower growing *Porites* species, and were deemed the pioneers of future coral reef communities, given their greater ability to withstand the increasing environmental stressors.

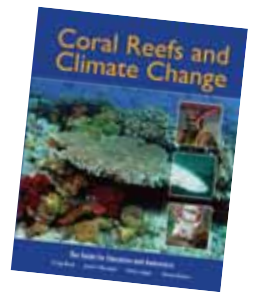


Thankfully, many scientists and concerned community groups have been actively monitoring and researching the status of the reef throughout the event, recording and tracking changes over time, and investigating the coping mechanisms of the coral species within the reef ecosystems. Given the valuable, intrinsic links between the coral reefs and the local economy, extra effort has been poured into this monitoring activities by groups such as Reef Check, Project AWARE and CoralWatch. For more information, please visit: <http://www.coralwatch.org/web/guest/news> or view footage of the bleaching event at: <http://www.youtube.com/watch?v=xggGyoasaoQ>.

Information and photos from Crystal Dive Resort [www.crystaldive.com](http://www.crystaldive.com) and [ecokohtao.com](http://ecokohtao.com)

## Education Materials

Don't forget to order your copy of our book "Coral Reefs and Climate Change" by Craig Reed, Justin Marshall, Dave Logan and Diana Kleine, for your collection. This book is a comprehensive look at the effects of climate change on our fragile marine environment, and is an especially good educational tool for students and dive enthusiasts. We are currently in the process of translating the book into Indonesian to assist our Indo-members in learning more about climate change and sustainability.



Our education packs are a great way to get your school class passionate and involved in environmental issues relating to climate change, and the threats posed to coral reefs. The pack contains a range of educational classroom materials that can be implemented for practical field studies anywhere you can access corals. It's an easy, non-invasive, and VITAL means of educating our younger generations about monitoring and conserving the marine environment. For a full list of the contents of the education pack, please visit the following link: <http://www.coralwatch.org/web/guest/education-packs>.

Check out our free 'download materials' section on the web: [www.coralwatch.org/web/guest/monitoring-materials](http://www.coralwatch.org/web/guest/monitoring-materials)

### Coral Health Charts

You can apply for a FREE Coral Health Chart form our website – available in English, Chinese, Japanese and Spanish.



### DIY Kit

Downloadable for free, available in English, French, Japanese, Korean and soon in Spanish and Chinese.

## For more info

Contact:  
Diana Kleine & Chris Talbot  
[www.coralwatch.org](http://www.coralwatch.org)  
Email: [info@coralwatch.org](mailto:info@coralwatch.org)  
Ph: +617 3365 3127  
Fax: +617 3365 4522

CoralWatch gets support from



## Podcast

Download from our website and hear more about CoralWatch raising awareness and getting people involved. Act now for the future of our reefs!



**CORALWATCH**



# Coral Reefs and Climate Change



The Guide for Education and Awareness

Craig Reid

Justin Marshall

Dave Logan

Diana Kleine

Order your copy now! [www.coralwatch.org](http://www.coralwatch.org)



## Reef Check Australia

### **Managing Director's report**

*2009-2010 has once again been a year of enormous change for Reef Check Australia, with both new opportunities and considerable challenges. Our projects have been growing from strength to strength with the permanent establishment of our South-East Queensland office, and the successful launch of our coral trout and educational programs. At the same time a number of our grant contracts came to an end leaving significant gaps in our funding and a necessity to find alternative income sources.*

*Our Great Barrier Reef survey season was finished in record time under the competent helm of our Science Operations Manager Dr Marie-Lise Schläppy and our Project Officer Paul Markey. 35 research sites were monitored on 18 dive sites including 2 inshore sites on Magnetic Island. During the course of the survey season, 2 major tropical storms, Cyclones Olga and Ului, caused noticeable damage to reefs surveyed by volunteers off Port Douglas and the Whitsundays, with our resulting data being of particular interest to academia and marine managers.*

*In South-East Queensland, our projects have been progressing in leaps and bounds under the leadership of Project Manager Jennifer Loder, with surveys carried out on 28 sites on 19 distinct coral habitats in 2009. Demand for community training has more than exceeded our expectations, and support from organizations in the area has been overwhelming. In particular our new office has been established in Brisbane CBD thanks to the generous support of SEQ Catchments. We now have over 12 dive operators involved in supporting our projects in the region, and new burgeoning relationships with Noosa Integrated Catchment Association and the University of Queensland's Coral Watch.*

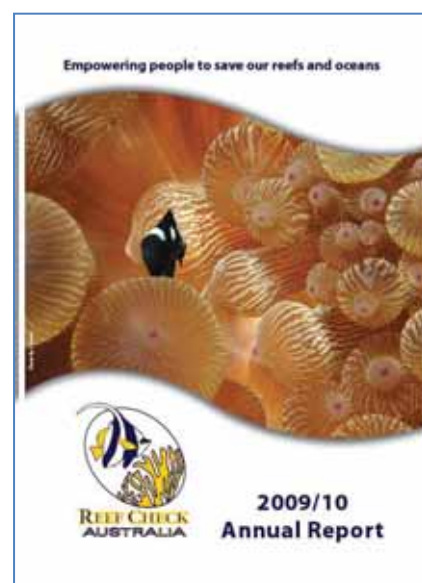
*The global financial crisis has continued to place a painful squeeze on funding. With crisis comes opportunity however and the need to find more funding has led to the development of new income streams and a much needed diversification of Reef Check Australia's income revenue, including a new program and drive to secure corporate sponsorship.*

*Upheaval amongst staff and board in the early part of the year created substantial challenges for Reef Check Australia. However, with the recruitment of a fantastic new Board of Directors, and the unstinting support of staff and volunteers, hurdles were overcome and we were soon back on track. The new Board immediately set to the crucial task of developing a new Strategic Plan further clarifying our objectives and creating a strong foundation for future growth.*

*Once again a big thank you goes to all our staff and office volunteers, including Dr Marie-Lise Schläppy and Gemma Routledge who gave so much to Reef Check Australia and who have now moved on to cooler climes. It also goes without saying that we are grateful to our community volunteers, dive operator supporters, corporate sponsors and funding bodies without whom we would not exist!*

**Jo Roberts, Managing Director**

**Excerpts from...**



# Project reports

## Great Barrier Reef project report – Paul Markey

The objectives of the 2009/10 season were to survey 18 of our high priority dive sites, or sites on which we have collected 3 or more years of data. This target was surpassed, completing 35 surveyed research sites, 67% of which were high priority. We were able to involve 15 new volunteers who had yet to join us for a survey since completion of their training which always makes for an exciting outing. In addition, two 2010 RCA Orpheus training sessions saw 9 eager new volunteers through completion of the Reef Check course.

The project was funded mainly through the Marine Tropical Science Research Facility (MTSRF) administered by the Reef and Rainforest Research Centre (RRRC), and also by a Community Action Grant from the Australian Government's Caring for our Country program.

As project officer for the 2009/10 season I had the privilege of working with Reef Check Australia's amazing volunteers and supporters; and again, many thanks to all who made it such a success.



**"It is very personally satisfying to do something to actively help coral reef conservation. I learned a tremendous amount about corals during my Reef Check training and now have an entirely new perspective when I dive recreationally."**

-Robbie Wisdom, RCA Volunteer Surveyor

## Inshore reef monitoring

This year's inshore reef monitoring completed a total of seven surveys on Magnetic, Orpheus, and Pelorus Islands utilising funds from our Community Action Grant.

Magnetic Island was also chosen for the location of our clean up dive for the 2010 Great Northern Cleanup. Volunteers participated in two dives and a beach clean to collect rubbish from Nelly Bay.



## Coral health database

2009/10 data has been uploaded, often the day after surveys were completed, and is now online and can be viewed by the public.

## The RCA Ute

The 2009/10 Survey season marked the arrival of the RCA ute which was kindly donated through a grant from the Gambling Community Benefit Fund. The ute has been essential to both GBR and SEQ survey seasons, transporting volunteers to and from surveys along the coast.





## SEQ monitoring project report – Jennifer Loder

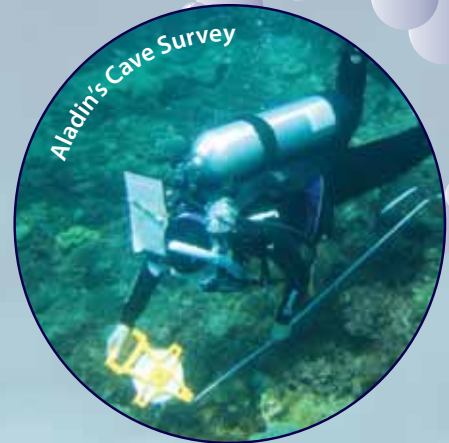
RCA South-East Queensland (SEQ) continues to grow in leaps and bounds. The SEQ 2009 survey season added 19 new sites, for a total of 28 research sites in the region, including a number of sites in new Marine National Park zones and Ramsar sites. Our local connections continue to grow and we appreciate the support of more than a dozen dive operators in the SEQ region, who have helped our monitoring teams reach survey sites. We have trained 17 new volunteers this year and RCA is now hoping to greatly contribute to the available data about coral habitat health in SEQ. The project was made possible through funding by the Australian Government's Caring for Our Country program, as well as funding through the SEQ Catchments Moreton Bay Oil Spill Environmental Restoration Program and a Sunshine Coast Regional Council Environmental Grant.

The RCA data in the ever-growing SEQ region is particularly important, with extensive coastal impacts from population growth and urban development. It has also proved important in monitoring the impacts of major events, such as the oil spill off Moreton Island in March 2009. RCA coral health data from 13 sites were utilized in the monitoring of sensitive marine areas potentially impacted by oil contamination. The baseline data from four sites established prior to the spill have been analysed for statistical differences to detect any changes in marine habitats after the spill.

We have also started implementing public education and community based social marketing programs in the area, based on an in-depth research study about knowledge, attitudes and environmental behaviours in SEQ. In the next year, we plan to involve many more people in actively working to protect coral habitats.

Our hard work in the region has paid off, with a nomination as a finalist for the 2010 Healthy Waterways Community Award for our community-based monitoring project. We will continue to build our framework in South East Queensland with a new office location in the SEQ Catchments building, and look forward to many more positive outcomes in our new branch.

In 2010-2011 we will continue to work towards collecting more valuable information about coral health in this region. As available data grows, we plan to work with local organizations, including Noosa Integrated Catchments Association, South East Queensland Healthy Waterways Partnership, the Department of Environmental Resource Management, SEQ Catchments, CoralWatch and Queensland Parks and Wildlife Services on numerous projects, ranging from marine-themed community events and underwater clean-ups, to mapping projects and youth education.



## Other Projects – Jo Roberts

### Reef IQ

The successful launch of Reef IQ at the end of 2008/2009 was followed by an equally successful uptake of the online materials by schools and teachers. By the end of 2009 the materials had been downloaded over a thousand times from educators as far away as Tanzania, UK, and Mauritius. Six months after the launch we carried out an extensive monitoring and evaluation program revealing that 49% of respondents viewed the program as 'very good' with 41% viewing it as 'excellent'. Feedback was almost unanimously positive with comments including:

- 'This is a fantastic initiative. I hope you are able to provide many more programs that are modern, dynamic, engaging and related to world issues/events'.
- 'I love the whole program and the students were really excited by it'

Our Reef Check game also received excellent feedback and increased our website traffic substantially. Our game developers, Precedence, entered the game into the QLD Multi-Media Awards where it won the "Best Use of Flash Animation" category. We also received more funding from the Myer Foundation to run our indigenous workshops at Bwcolman School on Palm Island, and look forward to spending more time there teaching coral reef conservation and snorkeling in the future.

### Coral Trout

After much hard work our new coral trout monitoring program was launched in 2010. Workshops and in-water training were carried out under the expert tutelage of Dr Marie-Lise Schläppy in the Keppel Islands, Townsville and off the coast of Port Douglas. Volunteers thoroughly enjoyed the training and in particular the simpler monitoring protocols that the trout search entails. Monitoring packs are now available free online to anyone who enjoys snorkeling and wishes to support marine conservation.



**'Thanks for making our jobs more enjoyable'**  
- Primary School Teacher, Queensland



# Research Station News

## Lizard Island Research Station

A facility of the Australian Museum

### Numbers

Scientists from 43 institutions in 16 countries conducted almost 100 research projects at LIRS during 2010. They comprised 70 senior researchers, 30 PhD students, 14 Masters students and 4 Honours students. Nine high school or undergraduate student groups also used the Station's facilities during the year. Overall, usage slightly exceeded the planned operating capacity of 7,000 visitor nights.

More than 90 publications based on work conducted at LIRS have been added to the collection this year, bringing the total to 1381. They comprise 71 papers in peer-reviewed journals, five book chapters, 13 PhD theses, one Masters thesis, three Honours theses, and one popular article.

### Facilities upgrades

Implementation of the 30th Anniversary Development Project has been underway since 2005, thanks to the Lizard Island Reef Research Foundation and its numerous donors. The \$4.75 million project will be complete in 2011.

The maintenance workshop was substantially rebuilt in May 2010 and its new storage systems have improved efficiency. The scuba filling system was upgraded at the same time as the workshop. The compressors were rebuilt and moved to a

location where the noise causes less impact. They are connected to an air bank, allowing scuba tanks to be filled at any time of the day. The compressors are now run when power draw is low which reduces fuel consumption.

A new dinghy, named "Primrose" for its donor Lady Potter, was ordered in June 2010, the eighth purchased in this program.

The final major development is a 30 kW solar power system that will replace up to 60% of the diesel that is used at the Station to generate electricity. This will be operational by mid 2011.

### Scientific diving

Queensland regulations covering the training of scientific divers have caused difficulty since a sunset clause expired in October 2008. Lobbying by LIRS and other stakeholders (including ACRS) has been successful in achieving an amendment that allows experienced overseas scientific divers to dive in Queensland without Australian certification. The amended regulation came into effect in September 2010.



**Dr Megan Porter, the 2009 Isobel Bennett Marine Biology Fellow, in the newly refurbished dive area.**





**View of the dive area from the beach.**

### **Lizard Island Fellowships**

Nine researchers conducted work at LIRS in 2010 through fellowships awarded in 2008 and 2009.

The program continued in 2010 with new awards to two PhD students and two early-career postdoctoral researchers, enabling them to conduct field-intensive coral reef research at LIRS. The fellowships are made possible through the generosity of sponsors as shown below. Information about the fellowships is at [www.australianmuseum.net.au/Lizard-Island-Fellowships](http://www.australianmuseum.net.au/Lizard-Island-Fellowships).

The 2010 Lizard Island Doctoral Fellowship was awarded to Chris Goatley of the ARC Centre of Excellence for Coral Reef Studies at James Cook University. Chris will receive \$7,700 in each of 2010 and 2011 for his project: "The ecological role of sediments on coral reefs." This Fellowship is funded by the Lizard Island Reef Research Foundation.

The 2010 Ian Potter Doctoral Fellowship at Lizard Island was awarded to Darren Coker, also from the ARC Centre of Excellence for Coral Reef Studies at James Cook University. Darren will receive \$7,700 in each of 2010 and 2011 for his project: "Effects of climate-induced coral loss on

coral reef fishes: the critical importance of live coral as habitat." This Fellowship is funded by The Ian Potter Foundation.

The 2010 John and Laurine Proud Fellowship was awarded to Dr Nichola Raihani of the Zoological Society of London. Nikki's award of \$8,000 enabled her to visit LIRS for two months to conduct her project: "The evolution of punishment and cooperation in nature." This Fellowship is funded by the John and Laurine Proud Family Estate Trust.

The 2009 Yulgilbar Fellowship was awarded to Dr Maud Ferrari of the University of California at Davis. Her award of \$7,100 enabled her to work at LIRS for almost two months to study "The effect of ocean acidification on predator/prey interactions in coral reef fishes." This Fellowship is funded by the Yulgilbar Foundation.

### **Dr Anne Hoggett & Dr Lyle Vail, Directors**

Lizard Island Research Station

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**Beautiful Lizard Island (Photo: Vanessa Messmer)**

## One Tree Island Research Station

The year at One Tree Island Research Station saw the comings and goings of a number of staff and friends of the station – old and new. Station staff Russell Graham and Jenny Reiffel took 4.5 months leave. They were replaced by Chloe Bailey and Jonathan Dowsett, who did a marvellous job. Chloe obtained her coxswain endorsement to skipper the station's 11 meter vessel "Linckia". In August, Dr Glen Shaw and Wendy Shaw manned the station.

The station still strives to offer the unique experience only a remote field station can within a Scientific Research Zone. (GBRMP MPZ17 – Gladstone). There are only two Scientific Research "Orange Zones", currently listed in the GBRMP. The other Scientific Research Zone being adjacent to AIMS near Townsville.

The station continues in its quest to have as neutral environmental footprint as possible. To this end we had a major upgrade of our water storage and delivery system and our solar power infrastructure. The water upgrade project, 7 new 5000Lt rain water tanks, was very ably managed and undertaken by Jono (a licensed plumber). This installation brings our total fresh water storage capacity to 64,000Lts, big thanks to Jono!



This year also saw the completion of the solar power upgrade bring our total possible KWhrs/day in November to 34.770. This project was co-funded by the Queensland EPA and the University of Sydney and we gratefully acknowledge this support. This means the station is now 99% self sufficient in producing its own 240 volt power. It will also mean a quieter time as we hope that the backup diesel generator will be seldom heard.



### Station Users

Prof Mike Kingsford from JCU continues research which involves genetics, olfaction, habitat, and fish counts. Accompanying Mike, were Prof Jelle Atema (Boston University), Prof Gabi Gerlach (University of Oldenburg), Mark O'Callaghan (RA), Emma Woodcock and Emily Gerard (JCU Students).

Allison Paely and Yui Sato (JCU) School of Marine and Tropical Biology, whose supervisor is Prof Bette Willis, were studying the Ecology and Biology of Coral Disease and Rapid Response to Coral Disease Outbreaks.

AIMS, Scott Bainbridge, Damien Eggeling, Geoff Page, and Shawn Smith, came to OTI to do some work for GBROOS (Great Barrier Reef Ocean Observing System). Their time at the Station was cut short as they were evacuated due to Cyclone Ului.

A/Prof Gavin Birch (USYD) School of Geosciences had a group of undergrad students. The course description: Coastal and Estuarine environment and processes.

USYD's Prof Maria Byrne (Director of OTI) brought her course work masters students to the station again. The projects this year focussed on goby behaviour under the helpful guide of Kelly Davis, from the fish behaviour at the University of Sydney.

At the same time a team lead by Dr Jody Webster and Ana Vila Conjejo, School of Geosciences USYD, started a major project involving sand cores and sediment dynamics of One Tree Reef. The cores are providing interesting insights into the recent geological history of the lagoon.

UTS, Prof David Booth and Prof Peter Ralph lead a group of students for a course on Coral Reef Ecosystems.

In August the UNSW ocean acidification team led by Emily Shaw collected water samples across the tide for water chemistry, following up on the research conducted earlier by the Silverman – Caldiera team.

At this time the Digital Dimensions filming crew came to the station to film waves on the reef crest.

Dr Ashley Ward and James Herbert-Read from the School of Biological Sciences, USYD, and Lyndon Jordan, UNSW, were studying the Social Behaviour of Humbug Damselfish.

USYD Students Benjamin Thorne & Amy Parry worked together on two different projects. Ben was working on the Population status of beech-de-mer, while Amy was looking at the sediment dynamics of OTI's sandsheet. The efforts to contain the Houdini sea cucumbers in cages provided a major challenge, but with Russell's

engineering, Ben managed to keep them in place for his research.

JCU, School of Marine and Tropical Biology student April Boaden along with RA Mark O'Callaghan, looked at the Ecology and growth of *O. doederleini* and Nemipterids.

Erika Woolsey, JCU PhD student, will be at OTI in November for the Coral Spawning, as well as Sebastian Schmidt-Roach from AIMS.

Dr Chris Fulton from ANU, School of Botany and Zoology, will have an undergrad group at OTI to look at the Ecology and evolution of fishes

### Special Visit

A special treat for the station this year was a visit from Katarina Moberg (nee Lundgren). Katarina came from Sweden and was a research assistant to Don Kinsey in the 1970's. Katarina (Kate) was introduced to OTI in May 1973. Then from June 1973 to March 1974, she stayed on to collect data, sharing the island with the caretakers at that time June and Ted, along with other visitors from time to time. She then went to Lizard Island in 1975 and stayed there for about 1 ½ years, again working for Don Kinsey.

Her stories were fantastic, giving us an insight to how the station infrastructure was back then, from using "The Gutter" for the toilet, and having only 3 huts. One for the caretakers, one for visitors combined with a small kitchen, and one laboratory-hut (to which they added 2 walls at the back that became Kate's open-air bedroom. Kate wrote a lovely paper for the station, on her experience while staying here back in the 70's. At the end of the paper she wrote the following quote from Charles Darwin.



*"The long swell, caused by the gentle but steady action of the trade-wind always blowing in one direction over a wide area, causes breakers, which even exceed in violence those of our temperate regions, and which never cease to rage.*

*It is impossible to behold these waves without feeling a conviction that an island, though built of the hardest rock, let it be porphyry, granite, or quartz, would ultimately yield and be demolished by such irresistible forces.*

*Yet these low, insignificant corals islets stand and are victorious, for here another power, as antagonist to the former, takes part in the contest. The organic forces separate the atoms of carbonate of lime one by one from the foaming breakers, and unite them into a symmetrical structure. Let the hurricane tear up its thousand huge fragments; yet what will this tell against the accumulated labour of myriads of architects at work night day, month after month. Thus do we see the soft and gelatinous body of a polypus, through the agency of the vital laws, conquering the great mechanical power of the waves of an ocean, which neither the art of man, nor the inanimate works of nature could successfully resist."*

*Charles Darwin, Voyage of the Beagle, 1836*

The following photos were taken by Katarina Moberg at One Tree Island.



Katarina Moberg



OTI 1973



Don Kinsey



Kees Hultsman "The early study of coral mineralisation of the Kinsey team which provided the crucial base line data for current ocean acidification studies at OTI."

## Integrated Marine Observing System (IMOS)

While Glen and Wendy manned the station, the next project for IMOS in the Capricorn Bunker region was started with deployment of the acoustic infrastructure around Heron and One Tree Reefs. This work was done by AIMS. The acoustic receiver locations we deployed for Australian Animal Tagging and Monitoring System (AATAMS), capability of IMOS.

Under IMOS the AATAMS receiver array in the southern GBR is research infrastructure for all. This means that all receivers will be serviced at regular intervals by AATAMS staff and that all tag receptions will be downloaded and posted on the web. This is a great investment to advance our common knowledge of fish movements. This real time data is freely available via the [IMOS Ocean Portal](#) and can be overlaid with data from the other IMOS facilities.

In August, 10 Coral Trout and four Grey Reef Sharks were captured by hand line or rod/reel, surgically implanted with acoustic transmitters and immediately released in shallow water adjacent to capture location, at OTI.

**Jennifer Reiffel**  
**Administration Officer**



Institute of Marine Science  
The University of Sydney,  
NSW 2006 Australia.



## Orpheus Island Research Station

A Facility of James Cook University



Orpheus Island Research Station was established in 1979 as a research facility by James Cook University set within a 2-hectare site surrounded by the Orpheus Island National Park. Orpheus Island is an inshore island in the Great Barrier Reef Marine Park in the Palm group of islands.

### Increasing popularity of station facilities

This year (2010) Orpheus Island Research Station has hosted twenty educational groups and more than 40 research groups with usage expected to exceed 6000 user nights. This is a 35% increase on previous year's usage.

### Educational Study Groups

OIRS had two international undergraduate visits this year, one from Appalachian State University, USA and the other organised by Australearn Australia. We had the usual ten field trip classes from JCU's Marine Biology and Earth and Environmental Science faculties, plus St Michael's Grammar School and Tully State High Schools marine biology camps. We also hosted the 11<sup>th</sup> annual visit for the Australian Institute of Professional Photography

On the local community front we saw two training courses for Reef Check who also conducted four field site surveys whilst out here and also a visit from the NQUEC and the JCU dive

club who participated in the annual underwater cleanup day at the beginning of the year.

### Research Groups

Major research themes during 2010 have been mainly focusing on specific effects of climate change with three longitudinal research projects being undertaken.

- Steve Whalan from JCU has continued his investigations into sponge ecology.
- Christine Schonberg from AIMS and Max Wisshak from Universitat Erlangen-Nurnberg, Germany began studies into the spatial and temporal effects of anthropogenic carbon on bioerosion.
- Dominique McCowan from JCU began a study into the ecological and evolutionary vulnerabilities of Scleractinian Corals to mass bleaching events.

Other research projects undertaken this year have included:

- Nitrogen fixing bacteria in corals
- Coral immunity and sea surface temperatures
- Coral disease monitoring
- Effects of ocean acidification on predator-prey interactions
- Home range analysis of parrotfish
- Hatchery techniques for winged pearl oyster, *Pteria*
- Ecological connectivity in corals
- Evolution and Ecology of Cryptobenthic reef fishes
- Energetics of coral larvae
- Synergistic effects of ocean acidification and elevated temperature on carbon-concentrating mechanisms and energy transfer in coral
- Ecosystem function of siganids
- Predator hotspot aggregations and interactions
- Population biology of *Acropora millepora*



- Recruitment hotspots of predatory fishes
- Shipworm identification
- Novel antifouling technologies
- Modelling effects of PH, temperature and flow on calcification of reef corals
- Colour polymorphism and thermal tolerance of corals
- Fishing activities in the Orpheus/Pelorus Channel
- Molecular control of coral development and impacts of climate change on the development
- Use of otoliths to monitor environmental change
- Coral spawning
- Limits to coral recruitment
- Connectivity in reef building corals
- Social associations of *Neopomacentrus* spp.
- Aerobic scope of cardinal fish
- Variation in population dynamics of reef building corals along the GBR latitudinal gradient
- Potential for thermal acclimation in coral reef fish

#### This year's developments:

Early this year saw the installation of several buoys in the area for the Great Barrier Reef Ocean Observing System (GBROOS). These Sensor Networks relay real-time information about conditions on the reef including atmospheric (meteorological) conditions and in-water parameters such as temperature, salinity and wave height.

Late August saw the installation of 20 acoustic receivers as part of the Acoustic Tracking and Monitoring System (ATAMS) run by IMOS. This system will allow researchers at OIRS and around the world to gather tracking data whilst offsite and this information will be freely available to all. The AATMS team will be visiting OIRS again early

next year to begin tagging and tracking sharks in the area, including our resident population of juvenile black tip reef sharks.

OIRS recently hosted a crew from the BBC who spent several days filming at OIRS and the Palm Island area for the BBC's Great Barrier Reef series which should be televised in March 2012.

Other improvements and developments to the station have included securing detailed bathometric charts for the Palm Island area, minor repairs to existing facilities such as replacing stumps and repairing roofs, procuring new bain-maries, ovens and dishwashers for accommodation facilities and improvements to the plumbing system in the temperature control rooms.

#### Upcoming developments in 2010/2011

Major developments that are currently underway or in planning stages include:

- Replacing the station's main transfer and charter vessel "Challenger III" with a bigger vessel capable of transferring up to 25 passengers between the mainland and the station.
- Development of a new online booking and station management operating system.
- Redevelopment of the OIRS website.



**Haley Burgess**

Orpheus Island Research Station

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## Low Isles Research Station

Located within a Marine National Park Zone of the Great Barrier Reef Marine Park, Low Isles Research Station (LIRS) is the perfect base for researchers to investigate the tropical northern regions of the Great Barrier Reef. The Low Isles consist of a large oval 200 hectare coral platform containing ecosystems rarely found in one convenient location.

We currently have three research projects running at LIRS – the pigeon research, sea grass monitoring and turtle monitoring.

### Pigeon Research

Andrew Peters from Charles Sturt University School of Animal and Veterinary Sciences in NSW, has undertaken a four-year study of infectious organisms of Pied Imperial-pigeons found in Australia and Papua New Guinea. The first season at Low Isles was very successful. Initial genetic studies have discovered the presence of at least two new species of parasites in these birds. These are currently being described and will be published next year. The organisms found have the potential to tell us a lot about where Pied Imperial-pigeons go and how their populations interact.



### Sea Grass Research

Dr Catherine Collier in collaboration with Assoc. Prof Michelle Waycott at James Cook University, are currently conducting a study that investigates

light and temperature as drivers of change in seagrass meadows on the Great Barrier Reef (GBR), one of our study sites being Low Isles. Regular sampling episodes take place approximately every 3 months, to compare the seagrasses state to the patterns in light and temperature shown by the loggers. The results revealed by this study will have important implications for present and future seagrass monitoring programs along the (GBR).

### Green Turtle Research

Dr Julia Hazel from James Cook University's School of Earth and Environmental Sciences is trialling a new ultrasonic system for tracking green turtles at Low Isles. Julia and her team have conducted two sessions based at LIRS plus many additional days of boat operations in the Low Isles locality.



### Other events at the Research Station

LIRS has been used for several other community projects and the UQ house has also been used as a venue for several high profile meetings.

If you would like any further information regarding Low Isles Research Station please contact the Faculty of Science office at the University of Queensland on **07 3346 9459**.

## National Marine Science Centre

Southern Cross University



Since its inception the National Marine Science Centre (NMSC) has been jointly run and owned by Southern Cross University (SCU) and the University of New England (UNE). In July 2009 the NMSC Board announced that SCU would become the sole owner of the NMSC, a move that suited the strategic directions of both universities. As a consequence, 2010 was a particularly challenging time for the NMSC and its staff as they moved to be fully incorporated within SCU's School of Environmental Science and Management. In addition, several staffing changes took place, including the appointment of a new Director.

In a strong show of commitment to the NMSC, SCU's Vice-Chancellor, Peter Lee, allocated \$1.85M towards the re-development of the research and teaching facilities at the NMSC. Among the initiatives that will be undertaken are the doubling of the current aquaculture tank facilities, improvements to the sea-water system, construction of new temperature-controlled laboratories, reconfiguration of the current open plan research space to produce six self-contained specialist laboratories, and upgrade of the media and video conferencing facilities of the theatre. These improvements will provide an excellent research environment for NMSC researchers, post-graduate students and visiting researchers, as well as enriching the learning experience for undergraduate students

undertaking the SCU Marine Science and Management Course. Work on the redevelopment is planned to start mid-2011 and be completed by early 2012.

Despite the significant changes during 2010, NMSC research staff were highly successful in securing major research grants including: ARC Discovery (jointly with University of Sydney), NSW Environmental Trust, Australian Centre for International Agricultural Research, Rural Industries Research and Development Corporation, Northern Rivers Catchment Management Authority, Hunter-Central Rivers Catchment Management Authority, and the NSW Recreational Fishing Saltwater Trust. These grants will fund research projects on the effects of ocean acidification on coral reefs and other marine ecosystems, sustainable aquaculture and fisheries, and effects of recreational diving on reef systems.

2010 saw the NMSC Aquarium go from strength to strength in terms of visitor numbers and school education programs. The Aquarium is fulfilling an important role in education the community on the diversity of marine life situated in the Solitary Islands Marine Park which lies at the nexus between the temperate and sub-tropical waters of eastern Australia.

A particular highlight for the NMSC in 2010 was hosting the Australian Coral Reef Society Conference in September. This was the first time that the conference was held in Coffs Harbour, and it was a great opportunity to showcase our research facilities and also the beautiful Solitary Islands Marine Park. More than 100 leading national and international coral researchers attended, and we hope that this event will foster future collaborative research and that some of may come back to conduct your own research projects.

**Dr Les Christidis, Director NMSC**



## Heron Island Research Station (HIRS)

A facility of the University of Queensland

Heron Island Research Station (HIRS) is a world class research and teaching facility. The Station has been established for over 50 years and is internationally renowned for coral reef research and student training in marine sciences. HIRS operates seven days a week all year round, except for Christmas.



Heron Island

The Station operates boating, diving and laboratory facilities, and scientific equipment available at HIRS is more sophisticated than that of most research facilities situated away from large population centres. Plants and animals can be collected, studied and returned to the ocean quickly, avoiding the cost and time incurred transporting specimens back to home laboratories.

Heron Island is also an important site for long-term collection of oceanographic data on the Southern Great Barrier Reef. It is an integral component of the Great Barrier Reef Ocean Observations System (GBROOS) and the nationwide Integrated Marine Observing System (IMOS).

2010 has been a year of change for the Station, including new management structure, new staff, new accommodation, and a redirection of the Station's focus back on researchers.

Management of HIRS has moved to the Faculty of Science at UQ and a new academic steering committee for the Station has been established. 2010 also saw the appointment of new scientific staff, new housekeeping staff, and a new boating and diving officer. The new staff complement the existing staff and bring new enthusiasm and energy to the team.

The new laboratory facilities and equipment that were re-opened in 2009 have been extensively utilized in 2010 by both national and international researchers alike. Researchers are clearly settling back at Heron after the disruptions the 2007 Station fire created. In addition, we had a number of researchers visit HIRS for the first time in 2010 who will be establishing their research further on the island this coming year. 2010 saw a diverse range of research projects conducted at the Station, including studies investigating the effects of climate change on the reef, coral disease, bird ecology, invertebrate larval development, turtle ecology, fish behaviour including herbivory and predation, coral spawning and GIS mapping to name a few. In addition, a number of exciting longer term projects have been established and we look forward to working with these researchers and seeing the results of these studies. HIRS was also used as a venue for several scientific retreats and hosted 4 retreats for the Great Barrier Reef Foundation and its patrons.



Research Lab Facility

In terms of infrastructure, 2010 was also a big year for the station. The new researcher accommodation block was opened and can comfortably house up to 36 researchers at a time. The new rooms all have internet access and the complex provides researchers with areas for both working and socialising. Heron Island as a whole is also undergoing a green facelift after receiving \$3.14 Million funding from the Green Precinct Project. As part of the project, 240 new solar panels have been added to the Station's roof tops, reducing the stations dependence on diesel generated power by one third.



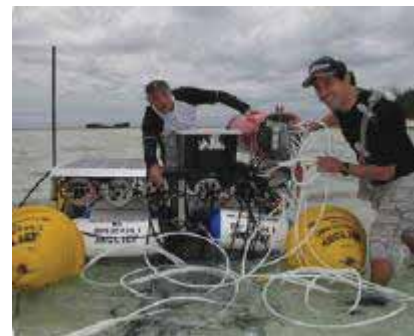
**Researchers Accommodation**

Applications for 2011 are looking good and the station is looking forward to helping researchers achieve their goals this coming year.

### **UQ Research - Ocean Acidification**

Researchers from the Hoegh-Guldberg/Dove Coral Reef Ecology lab, at the Global Change Institute, UQ have installed a new experimental system on the Heron Island reef flat to study the impacts of future predicted levels of CO<sub>2</sub> on coral reef communities. The Heron Island Climate Change Observatory was funded by an ARC LIEF grant to examine the impact of rising CO<sub>2</sub> levels in the coral reef environment for the first time. The Coral Proto Free Ocean Carbon Enrichment

(CP-FOCE) system was designed to add low pH water into experimental chambers on the reef to stimulate pH levels predicted to occur on coral reefs in the next 50-100 years. The experimental system has four chambers that will be used for well replicated, long term studies of climate change impacts on coral reefs. Additionally the system includes a network of over 20 high precision instruments that will allow the monitoring of the already changing water chemistry conditions on coral reefs. The development of this climate change observatory is being led by Dr. David Kline, Aaron Chai and Thomas Miard of the Hoegh-Guldberg/Dove lab and Malcolm Marker from UQ engineering.



**Prof Ove Hoegh-Guldberg and Dr David Kline**

Climate change and ocean acidification are widely recognized as key threats to Australia's natural ecosystems, yet we are currently ill equipped to respond due to poor knowledge of the scale/nature of the impacts. The Heron Island Climate Change Observatory will establish key infrastructure that will rapidly improve our understanding of the impacts of ocean acidification which is important to local communities and the nation given that coral reefs support over \$6 billion in revenue (and employ 60,000 people) each year. This critically important information is essential to the management and protection of Australia's coral reefs, including the Great Barrier Reef.

Contact: David Kline ([d.kline@uq.edu.au](mailto:d.kline@uq.edu.au))

## UQ Research – Sponge Sequencing

Professor Bernard Degnan from UQ's School of Biological Sciences and the Centre for Marine Science has led an international team of scientists to sequence the genome *Amphimedon queenslandica* - the first marine animal from the Great Barrier Reef and Australian waters to be sequenced.

The sequencing of the sea sponge genome offers unprecedented insights into the origin of the animal kingdom and how ancient genes contribute to human biology and health. The research illustrates how all contemporary animals, from sea sponges and corals to butterflies and humans, evolved from ancient and long-extinct ancestors – the very first multicellular animals. This incredibly old ancestor possessed the same core building blocks for multicellular form and function that still sits at the heart of all living animals, including humans. Professor Degnan has found that sponges and humans, and their common ancient ancestor, share an amazing number of genes. They underpin the key features of animal life: sex, development, cell growth and differentiation – including stem cells – and immunity. It now appears that the evolution of these genes not only allowed the first animals to colonise the ancient oceans but to transcend their microbial ancestry, to grow big and to move into the macroscopic world they inhabit today.

In a cruel twist, it was the dysfunction of these very same essential genes in modern animals that drive diseases such as cancer, in which controls on multicellularity failed, and autoimmune disorders in which distinctions between self and non-self were disrupted. Remarkably nearly all the genes associated with human disease can be found in all modern animals, including sponges, and traced back to these long-extinct ancestors.



In addition to have all these disease genes, sponges also possess stem cells. In fact, sponges have the ultimate stem cells with features of great interest to biomedical research. All adult sponge cells can become a stem cell that can convert back in to any cell type. By looking at sponge stem cells we can understand the absolute core requirements of their formation. This in turn could inform human stem cell biology and medicine.

If you would like any further information regarding Heron Island Research Station please contact the Research Station directly on Phone 07 4978 1642 or Email [hirs@uq.edu.au](mailto:hirs@uq.edu.au).

Alternatively please contact the Faculty of Science office at the University of Queensland on Phone 07 3365 1888 or Email [science.enquiries@uq.edu.au](mailto:science.enquiries@uq.edu.au).



# Advances in Coral Reef Science

In 2010, the major marine science institutions in Australia continue to produce numerous press releases that highlight significant research advancements. Check out the following websites to keep up with the latest coral reef research!



Photo Chris Roelfsema

## Centre of Excellence for Coral Reef Studies

### [Worst coral death strikes at SE Asia](#)

19 October 2010

### [Call to Heal the World's Reefs](#)

7 October 2010

### [Call to Curb Reef Runoff](#)

6 October 2010

### [Ending the Oceans' 'Tragedy of the Commons'](#)

14 September 2010

### [Corals dangerous childhoods](#)

24 August 2010

### [How corals fight back](#)

17 August 2010

### [Bikini atoll inscribed on World Heritage List](#)

3 August 2010

### [Super-rare "Elkhorn" coral found in Pacific](#)

28 July 2010

### [Scientists test Moreton Bay as coral "lifeboat"](#)

26 July 2010

### [Carbon emissions threaten fish populations](#)

7 July 2010

### [Fringe dwellers "hold secrets to survival"](#)

18 June 2010

### [Moving "house" tests corals](#)

18 June 2010

### [Fishers caught between degradation and development](#)

10 June 2010

### [Climate change sceptics 'lack scientific credibility'](#)

12 April 2010

### ["Evil twin" threatens world's oceans scientists warn](#)

29 March 2010

### [Ancient corals hold new hope for reefs](#)

1 March 2010

### [World class protection boosts Australia's Great Barrier Reef](#)

22 February 2010

[Participation "important for healthy marine parks"](#)

22 February 2010

[New theory could help save biodiversity](#)

3 February 2010

[Weeds Submerge Inshore Reefs](#)

4 January 2010

**Australian Institute of Marine Science**

[First Census Shows Life in Planet Ocean is Richer, More Connected, More Impacted than Expected](#)

5 October 2010

[Largest study of water quality effects on Great Barrier Reef](#)

27 July

[AIMS to begin first thorough investigation of ship grounding site](#)

16 April

[Funding for climate change research on coral reefs](#)

9 April

[World class protection boosts Australia's Great Barrier Reef](#)

22 February

[Abundance of sponges shows WA waters teeming with biodiversity](#)

4 February

**Great Barrier Reef Marine Park Authority**

[Interviews and evidence collected on coral damage offshore Cairns](#)

18 Jun 2010

[Local tourism operators keeping an eye on Reef health](#)

17 Jun 2010

[No changes to Great Barrier Reef Marine Park zoning](#)

11 Jun 2010

[Compliance efforts stepped up as Traditional Owners speak out against the use of illegal nets](#)

10 Jun 2010

[Sea country management forum kicks off today in Cairns](#)

28 May 2010

[Reef named in honour of Marine Park leader](#)

21 May 2010

[Impacts of the Shen Neng 1 grounding on the Great Barrier Reef](#)

05 Apr 2010



Photo: Chris Roelfsema

# Publications

## Publication list for 2010

Author institutions include:

AIMS: Australian Institute of Marine Science  
 AM: Australian Museum  
 ANU: Australian National University  
 CoE: ARC Centre of Excellence for Coral Reef Studies  
 CSIRO: Commonwealth Scientific and Industrial Research Organisation  
 GBRMPA: Great Barrier Reef Marine Park Authority  
 JCU: James Cook University  
 SU: Sydney University  
 SCU: Southern Cross University  
 UQ: University of Queensland  
 UTS: University of Technology Sydney

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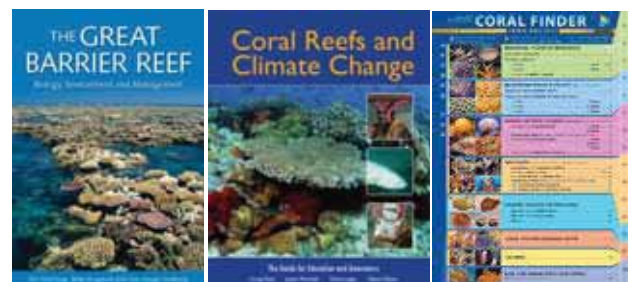


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# Reports from ACRS Student Research Fellows 2009

## Climate change and the future for coral reef fishes: impacts and adaptation

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### Introduction

Average sea surface temperatures are expected to increase up to 3.0°C by the end of this century due to global warming (Meehl et al., 2007; Poloczanska et al., 2008; Munday et al., 2009). Whether marine organisms have the capacity to cope with such a rapid increase in temperature is critical to understanding the likelihood of species persistence and population sustainability (Donner et al., 2005; Brierley & Kingsford, 2009; Hofmann & Todgham, 2010). There is increasing evidence that species located in tropical regions might be sensitive to temperature increases of just a few degrees, due to them having evolved in a relatively thermally stable environment (Tewksbury et al., 2008; Wright et al., 2009; Nilsson et al., 2009). Specifically, some tropical species exhibit a narrower

thermal reaction norm than related temperate species and this is expected to reduce their ability to cope with temperatures above their thermal optimum (Stillman, 2003; Tewksbury et al., 2007; Pörtner & Farrell, 2008). Consequently, understanding the potential for species to acclimate or adapt to rapid temperature change will be especially important for predicting the consequences of global warming for populations and communities of tropical species.

Thermal acclimation is one means of coping with increased temperature. Acclimation involves the phenotypic altering of physiological, behavioural or morphological characteristics to better suit an environment (Fry, 1967; Hazel & Prosser, 1974; Randall et al., 2000; Woods & Harrison, 2002). Previous research on temperature acclimation in marine fishes has primarily involved temperate species, which are likely to have a greater scope for acclimation than tropical species since they naturally experience a greater range of temperature fluctuations (Stillman, 2003). So far, only three studies have investigated thermal acclimation in tropical coral reef, and no metabolic acclimation was observed (Tullis & Baillie, 2005; Nilsson et al., 2009; Nilsson et al., 2010). However, since these studies only investigated the potential for acclimation in juveniles and adults over a short period (up to three weeks), the question of whether coral reef fishes are capable of developmental thermal acclimation remains unanswered.



Study species, *Acanthochromis polyacanthus* (photo: Dr. M McCormick)

## Methods

The ability of a common reef fish, *Acanthochromis polyacanthus*, to undergo developmental metabolic acclimation as a means of coping with tropical ocean temperatures that are predicted to occur over the next 50-100 years due to global warming, was tested. Specifically, fish were reared from shortly after hatching to maturity in present day and elevated temperatures (+1.5°C and +3.0°C) to determine if continuous exposure to elevated temperatures induced an acclimation response in their RMR at maximum (summer) and minimum (winter) temperatures. The experimental temperatures were chosen to represent tropical ocean warming that could occur around 2050 (+1.5°C) or by 2100 (+3.0°C) (Preston & Jones, 2006; Lough, 2007). In addition, the physical characteristics of the fish were measured to determine if acclimation had a significant physiological cost.



Temperature controlled laboratory

## Findings

Acclimation is an important mechanism for coping with a changing or fluctuating environment. While previous studies have found no evidence for thermal acclimation of metabolic rates in tropical reef fishes (Tullis & Baillie, 2005; Nilsson et al., 2009, 2010), we detected thermal acclimation through a reduction in resting oxygen consumption (RMR) in fish that had been reared from shortly after hatching to 1.5 years old at 3°C above average temperatures (but not in fish reared at 1.5°C above average temperatures). This indicates that at least some tropical reef fishes can undertake developmental plasticity to acclimate their resting metabolic rates as water temperatures increase due to global warming. The reduction in daily metabolic demands is likely to be beneficial by allowing redistribution of saved energy to other activities. However, fish acclimated to a higher than normal temperature were on average smaller than fish kept at present day temperatures, suggesting that increased temperature, or acclimation per se, incurred some physiological cost. Furthermore, fish at both elevated temperatures were in poorer condition than fish reared at present day temperatures. This demonstrates that even with acclimation, warmer sea temperatures are likely to have significant impacts on reef fish populations.

Thermal acclimation provides a mechanism that could assist tropical fish populations to cope with warming ocean temperatures. It seems likely that developmental acclimation will play a role in reducing the impacts of global warming, improving the chances that populations will persist across their present geographic ranges. However, acclimation has limitations and may not be sufficient for populations already living close to their thermal maximum, thus selection of thermally tolerant genotypes over multiple generations will also be vital. Even with acclimation, our results demonstrate that individuals in future populations will have reduced fitness, which will have significant ramifications for population sustainability.

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## High population connectivity across large geographic scales in two widespread coral reef butterflyfishes

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Worldwide, coral reefs are showing long term declines in coral diversity, coral cover and associated habitat structure (Hughes et al. 2003). Coral-feeding butterflyfishes (Family Chaetodontidae) are consistently among the worst affected of all reef fishes by coral loss (Wilson et al. 2006; Pratchett et al. 2008) and within this family, the species to show the greatest response so far is the chevron butterflyfish, *Chaetodon trifascialis* (Wilson et al 2006, Pratchett et al 2008). Severe and consistent declines in abundance have been reported for *C. trifascialis* following coral loss in several locations (e.g. Berumen & Pratchett 2006; Graham et al 2006). With degradation of reef ecosystems predicted to increase (Hoegh-Guldberg et al. 2007), *C. trifascialis* is likely to be at high risk of local extinction. However, recovery from local declines may be possible, depending on the spatial scale that populations are connected over and the proportion of new recruits originating from local or external sources (Jones et al. 2009).

Declining populations will be unlikely to recover if recruitment is predominantly from local sources and connectivity is low. But if population connectivity is high and a significant component of recruitment comes from external sources then recovery may occur via the long distance dispersal of recruits from unaffected areas (Hughes et al. 2005).

The related redfin butterflyfish, *C. lunulatus*, is also a widespread corallivore, yet has not shown the same declines in abundance as *C. trifascialis* following disturbance events on coral reefs (Berumen and Pratchett 2006). Comparison of the population genetic structure of *C. lunulatus* and *C. trifascialis* may further understanding of the mechanisms driving their differential responses to coral loss and enable prediction of their recovery potential in areas where local populations have declined.

This study compared the population genetic structure of *C. lunulatus* and *C. trifascialis* at 5 locations across the Pacific (Heron Island, Lizard Island, Papua New Guinea, New Caledonia and French Polynesia) using 11 polymorphic microsatellite markers.



**Chevron butterflyfish, *Chaetodon trifascialis***

For both species, genetic diversity was high across all populations and loci (*C. lunulatus*: He: 0.37 – 0.94; *C. trifascialis* He: 0.47 – 0.95). An analysis of molecular variance (AMOVA) revealed low but significant population structure among locations for *C. lunulatus* (RST = 0.0277,  $P < 0.0001$ ), but no significant genetic differentiation between populations for *C. trifascialis* (RST = 0.00266,  $P < 0.371$ ). Pairwise RST comparisons

indicated that the Papua New Guinea and French Polynesia populations were significantly different from all other populations for *C. lunulatus*, but there were no significant differences between the Lizard Island, Heron Island and New Caledonia populations. Pairwise RST comparisons of *C. trifascialis* populations indicated that there were no significant differences between any populations. A Bayesian clustering approach identified the most likely number of populations as two for both *C. lunulatus* and *C. trifascialis*, separating out the French Polynesia populations from all others.

These findings provide evidence for high levels of gene flow across large geographic scales in both species and suggest that there is substantial potential for recolonisation to occur in areas where populations are declining or have become locally extinct. Furthermore, these findings suggest that, despite its highly specialised ecology, the overall vulnerability and extinction risk of *C. trifascialis* is likely to be reduced due to the high connectivity between populations

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## Impact of Ocean Acidification on Sediment Dwelling Marine Calcifiers

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Climate change is expected to have profound impacts to near-shore marine ecosystems and their resident organisms [1]. The anthropogenic release of greenhouse gasses into the atmosphere, predominantly in the form of carbon dioxide (CO<sub>2</sub>), is resulting in more acidic conditions in the ocean's surface layer (reduced pH) and rising ocean temperature. As a consequence of this chemical shift, the abundance of carbonate ions (CO<sub>3</sub><sup>2-</sup>) is on the decline, reducing the capacity for calcifiers to produce their CaCO<sub>3</sub> skeleton [2]. *Halimeda* is a calcareous alga that has an important role for the growth of physical reef structures in systems such as Australia's Great Barrier Reef, producing 2.2 kg of CaCO<sub>3</sub> m<sup>-2</sup> y<sup>-1</sup> [3]. *Halimeda* is also a source of food for herbivores [4], is an important phototroph [5], and provides shelter and nursery grounds for invertebrates [6] on coral reefs. Under the climate change scenario, reef carbonate materials, including *Halimeda* plants and the reef substrate to which they attach, are expected to become weaker due to ocean acidification [7] and ocean warming [8]. This study aimed to investigate the effects of elevated CO<sub>2</sub> and temperature conditions on

photosynthesis and calcification of the calcifying algae *Halimeda macroloba* and *H. cylindracea*.

*Halimeda macroloba* and *H. cylindracea* were collected from Heron Island Southern Great Barrier Reef, Australia and randomly allocated to the combination of four temperature (28, 30, 32, 34°C) and four CO<sub>2</sub> levels (380, 600, 1000 and 2000 µatm; pH 8.1, 7.9, 7.7 and 7.4, respectively) (16 treatments in total) experiment tanks, equivalent to a range of future climate change scenarios. The tanks set at ambient pH levels of 8.1 and 28°C acted as controls. Photosynthetic efficiency and oxygen production were investigated using Pulse Amplitude Modulated (PAM) fluorometry and an oxygen microsensor. In addition, chlorophyll concentrations (a and b) were determined after five weeks of the experiment. Growth was measured using the buoyant weight technique and aragonite and magnesium calcite crystal size and density were determined using a scanning electron microscope.

There were no changes in the control treatments in all parameters. Elevated CO<sub>2</sub> profoundly influenced the photosynthetic efficiency, calcification and growth in all species. After five weeks at 34°C under all CO<sub>2</sub> levels, all species died. Chlorophyll a and b concentration in *Halimeda* spp. significantly decreased in 2000 µatm and 32 °C treatment. When exposed to 2000 µatm and 32 and 34 °C for 3 weeks, significant decreases in photosynthetic efficiency (FV/FM) were found. However, there were no changes in capacity of photoprotection (non-photochemical quenching yield (Y(NPQ))) and level of photoinhibition (non-regulated heat dissipation (Y(NO))). The rate of oxygen production declined at 600, 1000 and 2000 µatm in all temperature treatments for all species. It is suggested that heat stress may damage photosystem II and pH stress may disrupt the CO<sub>2</sub>



accumulation pathway at the site of Rubisco or interfere with electron transport [8, 9, 10]. The calcium carbonate crystal width of *H. maculosa* and *H. cylindracea* significantly decreased when exposed to elevated CO<sub>2</sub> at 1000 and 2000  $\mu$ atm. However, elevated temperature had no effect on the crystal width in these species. In addition, there was no significant difference in crystal abundance of *H. maculosa* and *H. cylindracea* among pH and temperature treatments. It is likely that the elevated temperature of 32°C and the pCO<sub>2</sub> concentration of 1000  $\mu$ atm are the upper limit for survival of these species at Heron Island on the Great Barrier Reef, Australia. Our findings suggest that these species of calcifying macroalgae will be highly vulnerable to the future climate change scenarios of elevated temperature and more acidic oceans.

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Photo: Craig Reid

## Nutritional status of scleractinian coral host influences photosynthetic capacity of *Symbiodinium* (Freudenthal)

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### Introduction

For coral symbioses sunlight is essential for a functional relationship between host cnidarian and algal symbiont. Up to 95% of the photosynthetically derived carbohydrate products are translocated from the algal-hosting gastrodermal cells into the host tissue (1). Coral organism are not just relying on the autotrophic food source, they can also retrieve food heterotrophically via active prey feeding (2). Metabolic endproducts from heterotrophy benefits the algal symbiont which is residing in a nutrient limited environment (3, 4).

When saturating irradiances and increased temperatures are prevailing, the algal symbionts photosystem experiences photodamage (5). The D1 protein is a de novo synthesised protein, which is a key protein within photosystem II. Under severe photodamage, the capacity to synthesise D1 protein diminishes and leads to a breakdown of the electron transport chain and therefore stops carbon fixation and photochemistry (6).

For the coral symbioses, photodamage means that no translocation of photosynthate will take place and the overall nutrient exchange will be limited (7). It was the aim of this project to

examine the significance of the nutritional status of the host under highlight stress conditions. It was hypothesised that nutritionally saturated host organisms are able to support the symbionts photosystem functionality. We examined two hard coral species where one of them is known to be a bleaching sensitive species *Pocillopora damicornis*, and one which is known to be more tolerant towards stress impact, *Pavona decussata*.

### Materials and Methods

Coral nubbins were collected at Heron Island lagoon. After three days of acclimation, nubbins were separated into single rearing containers, bubbled with ambient air and treatments were applied. In total four treatments were examined, where one set was kept under full sunlight and the other was reared in darkness - making up a total of 8 treatments. Corals were put into treatment conditions at night time and treated for 4 consecutive days. The treatments applied were as follows: (+) food and (+) D1 synthesis inhibitor (Lincomycin); (+) food; starved and (+) D1 synthesis inhibitor; starved. To determine the abiotic parameters of the incubation conditions, light intensity, daylight spectral intensity and temperature were recorded with logger equipment over the length of the experiment. Fed corals were given natural zooplankton assemblage, caught around Heron Island with addition of cultured *Artemia salina* to feed ~1000 individual L-1. Feeding treatments were allowed to feed 3 hours a day. Effective quantum yield values were recorded using a Diving PAM at midday on a daily basis. Corals were sampled and examined via steady-state light curves at 500 $\mu$ mol m<sup>-2</sup>s<sup>-1</sup> at night time, every 2 days. Wet and buoyant weights were recorded and zooxanthellae numbers counted. Further, the algal symbiont fractions were filtered, snap frozen in liquid nitrogen and stored at -80°C for

HPLC pigment analyses. Host fractions were analysed for protein content using Bradford assay. Subsamples of daily food rations were analysed with a TruSpec C/N analyser.

## Results and Conclusion

Daily spectral analyses showed that corals were receiving a midday maximum of  $1600 \mu\text{mol m}^{-2}\text{s}^{-1}$ , and an average light intensity of  $500 \mu\text{mol m}^{-2}\text{s}^{-1}$  of light per day. Analyses of the data gathered are currently underway. So far, steady-state light curves revealed that fed and starved corals showed no significant differences in photosynthetic capacity under given light conditions. However, trends can be seen in differing light energy quenching mechanisms between fed and starved corals. Data are indicating that *Pavona decussata* and *Pocillopora damicornis* are having different strategies to withstand increased light irradiances and the concomitantly enhanced temperature regimes.

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# Sedimentary influences on coral growth rates and carbonate production on inshore turbid zone reefs

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## Introduction

Inshore reefs on the Great Barrier Reef (GBR) are regularly exposed to high turbidity conditions and sedimentation considered harmful to clear-water marine biota. Despite these extrinsic environmental pressures, many inshore reefs support high coral cover (>30%) and diversity (>50 species; Fig 1), indicating a remarkable capability to deal with sediment stress either through adaptation or acclimatisation mechanism (Anthony and Larcombe 2000; Meesters, Nieuwland et al. 2002). In particular, corals have displayed a greater capacity to feed off suspended particles thereby overcoming temporary energy deficits caused by reduced light and photosynthesis (Anthony and Fabricius 2000). However, reduced coral growth rates have also been linked to high sediment loads (Dodge, Aller et al. 1974; Cortes, N. et al. 1985; Crabbe and Smith 2005; Ebeid, Hassan et al. 2009), suggesting that although corals are surviving, carbonate production rates maybe declining with increased sediment supply. Little is known on the consequences of altered feeding behaviours on carbonate production as well as on coral resilience to disease and borers.

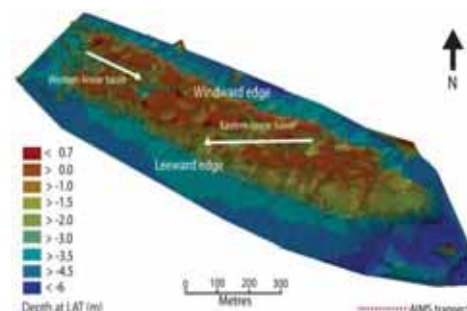
To date, few field studies have been conducted on inshore reefs compared to those growing in clearer offshore waters and, consequently, the influence of sedimentary processes on inshore reef ecology, growth and development remain poorly understood.



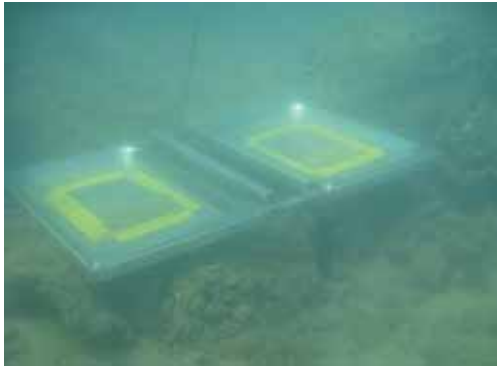
**Figure 1: High coral cover and diversity on an inshore turbid zone reef**

## Methods

Coral growth and skeletal densities of the dominant branching hard coral genera (*Acropora*, *Montipora* and *Turbinaria*) were measured in relation to spatial and temporal variations in sediment processes on Middle Reef, an inshore turbid zone reef situated on the central GBR. Coral colonies were stained in situ by injecting the Alizarin red S solution (10 mg/L) into a plastic bag secured firmly around the colony for 3 to 4 hours. Samples of stained corals were collected after 3 to 6 months, and analysed to determine carbonate production rates and densities for all corals, and linear extension rates for branching corals. Reef morphology was mapped using a single beam acoustic instrument to produce a digital terrain model of Middle Reef (Fig. 2) which was used to select four sites for assessing variations in sediment deposition and resuspension using a new design of sediment trap (Fig 3), and turbidity using a nephelometer. Wave and current data was also collected to determine spatial differences in local hydrodynamics within the reef which influence sediment processes.



**Figure 2: Bathymetric image of Middle Reef**



**Figure 3: Sediment trays in situ used to measure sediment flux**

### Results and preliminary conclusions

Middle Reef has a complex reef morphology aligned with the dominant north-westerly currents and characterised by a windward reef slope exposed to larger waves (>0.5 m) and stronger currents (>10 cm/s), a semi-exposed leeward edge and protected inner reef slopes. Coral growth rates and densities were spatially variable and were significantly correlated to depth and reef habitat (windward, leeward, inner slope). The mean linear extension for *Acropora* was 6.3 cm/yr. Highest linear extension rates (~12 cm/yr) were observed on the windward slope, in regions of low sediment deposition (<30 g/m<sup>2</sup>/day) and turbidity (<2 NTU), and lowest rates (3cm/yr) occurred in the sheltered inner slope regions characterised by fine sediment deposition (>100 g/m<sup>2</sup>/day) and fluctuating turbidity (>10 NTU). Highest carbonate production rates for *Montipora* were also observed on the windward slope whereas carbonate production rates for *Turbinaria* were highest on the leeward slope where turbidity levels were less stable (<10 NTU), and may indicate a higher tolerance to low light levels. *Acropora* skeletal densities were comparable to those observed on offshore clear-water reefs (~1 g/cm<sup>3</sup>). However, highest densities were measured on the reef flat and decreased with depth, a reflection of rapid light attenuation on turbid reefs.

This study demonstrates that coral growth rates can be high on inshore turbid reefs, but vary spatially due

to morphological influences on the local hydrodynamic and sedimentary regimes. Spatial differences in coral growth and skeletal density would result in variable gross carbonate production rates thereby influencing reef growth. Furthermore, significant variations in growth rates for the key reef builders at the small spatial scale will have important implications for paleoenvironmental reconstructions.

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# Climate change effects on the growth, calcification, and survival of juvenile corals: susceptibility to mortality by grazers

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## Introduction

Coral recruitment represents a crucial phase in the development of coral populations, important to the recovery of coral reefs affected by anthropogenic and natural disturbances (1). Successful recruitment is significant to the resilience of coral reefs, and degraded reefs often exhibit declining rates of coral recruitment through a combination of reduced adult fecundity, decreased settlement, and high rates of early mortality (2). Whilst evidence indicates that the effects of climate change adversely reduce the success of coral recruitment, empirical investigations into ecological interactions are limited (3).

The success of coral settlement and early post-settlement survival is a complex process, with the susceptibility of newly settled corals to different sources of mortality changing over time (4). Whilst the indirect effects of grazers are beneficial to newly-settled recruits by providing space for settlement and limiting early competition with algae (5), the direct effects of grazers on this size class are not well documented (6). There is direct evidence that both newly settled brooded and spawned corals are vulnerable to grazers when they are less than 6 polyps in size (7). Once a coral recruit has settled, ocean acidification results in decreased growth and calcification (8, 9), thus recruit susceptibility to the effects of predation need to be evaluated under near future scenarios of climate change. This study aims to investigate

the effect of ocean acidification on early coral growth and calcification, and how these affect their susceptibility to indirect mortality via herbivorous fish.

## Methods

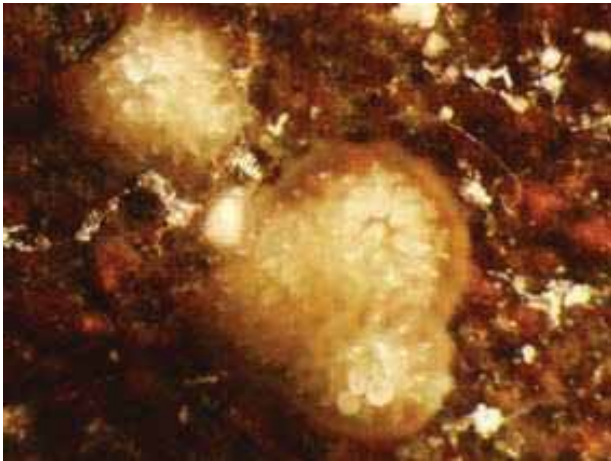
Coral larvae from spawned gametes (*Acropora cytherea*, *A. millepora*, *Montipora digitata*) were collected and reared 6-7 nights after the full moon (22/11/2010) at Heron Island Research Station in the southern Great Barrier Reef. Planulae were settled in ambient conditions onto preconditioned tiles (5 x 5 cm), after which they were scored and placed in experimental conditions. The newly settled corals are being grown in ambient (pH 8.04,  $p\text{CO}_2$  400 ppm), mid (pH 7.80,  $p\text{CO}_2$  780 ppm) and high (pH 7.60,  $p\text{CO}_2$  1300 ppm) ocean acidification scenarios (10) in an outdoor flow-through aquarium system. The acidification scenarios are achieved by injecting  $\text{CO}_2$  in to large sumps which feed seven replicate tanks per treatment. The newly settled corals are being grown for 2 months in the experimental conditions, during which time survival, growth and calcification are being quantified. At the end of the experimental growth period, the spat will be subjected to grazing experiments to determine any differences in vulnerability to herbivorous fish (*Salarias fasciatus* and *Ctenochaetus striatus*).

## Preliminary results

Total settlement of coral spat was very high in *A. millepora* (25000 individuals, Fig 1a) compared to *A. cytherea* (1150 individuals, Fig 1b) and *M. digitata* (2600 individuals, Fig 1c). Post settlement survival after two weeks was not affected by altered pH in any of the species (Fig 2). *Acropora millepora* had a mean mortality of ~45 individuals amongst treatments, whilst *A. cytherea* and *M. digitata* had mean mortality's of ~4 individuals amongst treatments. This work is continuing for 60 days more, after which differences in susceptibility to mortality via herbivorous fish will be quantified.



(a)



(b)



(c)

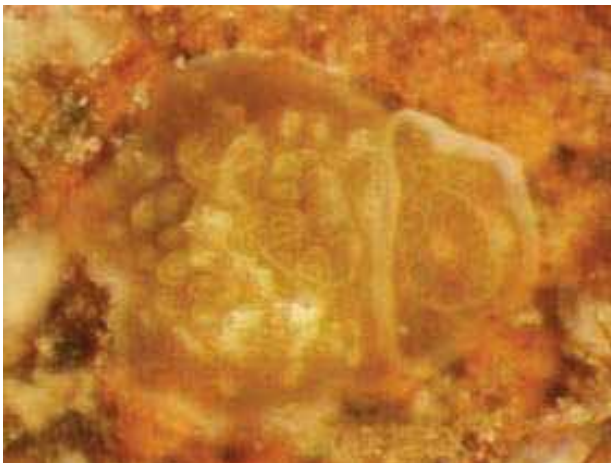


Figure 1. Images of settled *A. millepora* (a), *A. cytherea* (b), and *M. digitata* spat.

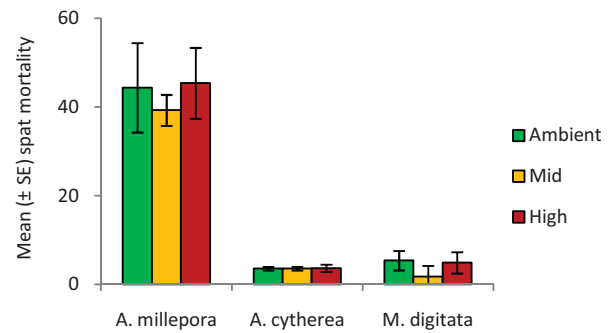


Figure 2. Mean (± SE) mortality of *A. millepora*, *A. cytherea*, and *A. digitata* after two weeks in ambient (pCO<sub>2</sub> 400 ppm), mid (pCO<sub>2</sub> 780 ppm), and high (pCO<sub>2</sub> 1300 ppm) CO<sub>2</sub> scenarios.

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## **Why we do the things we do**

The objectives of the Australian Coral Reef Society are to promote, develop and assist in the scientific study of all aspects and attributes of the Coral Reefs of Australia and, by means of publications, meetings, symposia and such other methods as may be considered appropriate, to provide for the exchange of information and ideas among those interested in coral reefs. We are also charged with the protection and conservation of the Coral Reefs of Australia. We typically approach these goals from the standpoint of support of student participation and mentorship.



**Photo: Chris Roelfsema**

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# THE GREAT BARRIER REEF

Biology, Environment and Management



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