Number 45, April 2016

Australian Coral Reef Society

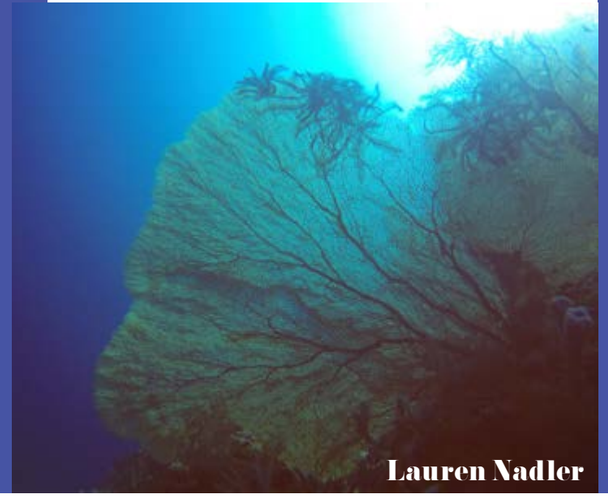
Look inside for:

ACRS news
the latest research
station updates
new publications
& conference highlights

2016

Cover photo by Tory Chase

Editorial foreword


Lauren Nadler

Dear Members,

2016 is not commencing well for reefs around Australia, especially in the northern section of the Great Barrier Reef and the subtropics. Last October, NOAA declared the third mass bleaching event; reefs around Hawaii were bleaching severely. The scientific community in Australia was following the NOAA bleaching outlook with apprehension over December and January, as the hot waters in the central Pacific were slowly approaching our shores. And then it happened, coral bleaching hit us… It was first reported around Lizard Island, then came news from the Solitary Islands, and now it seems that the intensity of this event in eastern Australia is beyond any seen in previous events.

The ACRS mailing list has been more active than usual with reports, pictorials and commentary by senior members of our community as well as ECRs. In the words of the ACRS President Prof David Booth, the reef is facing a "perfect storm" of unprecedented coral bleaching. With the green light for the Carmichael coal mine, the time for debate is over, and action is needed immediately. ACRS-listers have also suggested that in the midst of this negativity, practical and feasible goals need to be established to improve reef health. The ACRS council has produced a press release with bullet points that everyone can use when dealing with the press as well as a science-based policy plan for Australia's coral reefs with excellent and achievable policy goals (if the government lends an ear). The expansion of the Abbot Point port has also kept the ACRS council and many of our members busy writing submissions and reports. These press releases, submissions and reports, along with others in which ACRS has also been involved, such as the Great Barrier Reef Marine Parks Shark Control Program, and the Great Kimberley Marine Park can be found in the ACRS website.

ACRS continues the commitment to assist our student members and early career researchers develop the tools to become more competitive scientists. ACRS rewarded five student research awards (including the Danielle Simmons and Terry Walker awards). We also awarded 36 International Fellowships to PhD students and ECRs for travel to the 13th ICRS in Hawaii. Congratulations to all the recipients of these competitive awards! The newest ACRS initiative is a student writing retreat; this year 25 student members will be hosted on Magnetic Island, QLD, in May 2016. The goal of this workshop is to produce a first draft of a manuscript for publication. We hope to continue writing workshops every year. We would like to thank our councillors for the time and effort they volunteer to provide these resources. Your commitment, enthusiasm and professionalism is invaluable.

In 2015 the inaugural "ACRS Medal" was awarded to Dr Nicholas Graham, from James Cook University, for his outstanding contributions to science and conservation of Australian coral reefs. In 2016 the medal will go to an established researcher, the nominations closed at the end of March and the recipient will be announced at the AGM in May. It is our hope that the ACRS medal becomes a benchmark of excellence in Australian coral reef science and conservation.

Another highlight of 2015 was the return of our 89th Annual ACRS Conference to an island setting. Daydream Island hosted ACRS delegates from 28 – 31 July, including two full days of discussions and presentations and a superb fish identification workshop. During the conference and with much fanfare Prof Booth presented Dr Nick Graham with the ACRS Award. We also heard excellent talks from keynote speakers Mr John Gunn, Dr Elizabeth Madin, Dr Mark Erdmann, and Dr Charlie Veron. And as always, the photo competition was packed with breathtaking images, some of which you can see adorning the pages of this newsletter. This is a 'leap year' for ACRS conferences (we do not host one due to the ICRS scheduled in June), but we will hopefully see you all in 2017 !

As it has become tradition, the newsletter is full of relevant information for all our members, from the research stations' news, to student awards winners and highlights, comments on the conference, and "hot off the press" publications from colleagues. Our goal is inform our readership of what is going on in the world of coral reef science in Australia in a fun and exciting way. We hope that you enjoy reading it as much as we enjoy putting it together…

The editorial team
Tiffany Sih, Steve Doo and K-le Gomez

President's message


Margaux Hein

Since our last newsletter in April 2015, ACRS has been active on a number of fronts. I would first like to extend my grateful thanks to our crack team of Councilors for their work writing submissions, engaging with the pollies, organising conferences, bringing us into the age of social media, etc, etc.

Our chief social and scientific event, the ACRS 2015 annual conference was held at Daydream Island resort - I must say it was a good fit to have the meetings actually on the Great Barrier Reef! The Qld Minister for the Reef, Dr Steven Miles, took the time to travel to the conference and present to the delegates his passion to protect the reef. His talk was followed by a rigorous question session. Overall, the conference speakers delivered the message that ACRS members conduct some of the most exciting and relevant Reef research globally, and have fun doing it.

A focus of the last 18 months has been on the potential/real development of the Queensland coast and hinterland for coal extraction and export, including expanded and new coal port facilities that abut the GBR and World Heritage areas. ACRS has developed a number of submissions and a Report on these issues, available on our website. We are also very concerned at what is shaping up to be a monster coral-bleaching event. We sent three Councilors this year to the Science meets Parliament event, and they did us proud by linking with politicians to inform them of the issues facing Australia's coral reefs.

New ACRS initiatives to acknowledge and encourage excellence of ACRS membership include the ACRS Medal, and the soon to be held inaugural ACRS Student Writing Retreat. The ACRS Medal is a prestigious award to acknowledge the contribution of the winner to Reef science, particularly in Australia. In 2015 the award was for an ECR and went to Dr Nick Graham, and this year we have just closed nominations for the 2016 award to an established researcher - stay tuned for an announcement!

Finally, I look forward to a strong ACRS showing at the 13th four-yearly International Coral Reef Symposium in Hawaii this June, and to celebrate with a mai tai or three… **ALOHA!**

David Booth, ACRS President

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We post videos, pictures, papers from our members and ACRS news.

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Read our latest Scientist Commentary
By Dr Paul Marshall

Check out our latest press release

Read the ACRS policy plan

Photos by Margaux Hein

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Steve Doo
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Contact us: austcoralreefsoc@gmail.com

ACRS Student Writing Retreat

This year the Australian Coral Reef Society is hosting, for the first time, its very own Student Writing Retreat. Held in the idyllic, tropical setting of Magnetic Island, the retreat aims to provide its student members with an inspiring and 'remote' location in which they can produce a draft manuscript for publication whilst in the absence of modern-day distractions. The retreat will feature several writing workshops lead by academics from within the society, as well as several opportunities for student-based peer-review and feedback from workshop hosts.

22 student members from a broad array of universities, labs and research areas will attend the retreat in the week preceding the ACRS' Annual General Meeting (13th May). With such a diversity of researchers attending, the society looks forward to what promises to be a successful and stimulating retreat and hopes that momentum will continue to grow so that the retreat may become a permanent feature in the ACRS calendar.

Katie Motson

The time two Americans went to Parliament

Steve Doo and Lauren Nadler

Science meets Parliament is an annual event hosted by Science & Technology Australia (STA), with the goal of increasing communication between the country's top scientists and politicians. This event brings together scientists from many of Australia's societies and universities. Over the two-day event, STA conducted a variety of training workshops to improve the scientists' communication skills and organized meetings with parliamentarians. This year, ACRS councilors Lauren Nadler and Steve Doo represented the society at this event.

Over the first day, a whole range of topics related to science communication were covered. The day started with an inspiring talk by Prof. Brian Schmidt, Nobel laureate and Vice-Chancellor of the Australian National University, who encouraged scientists to maintain positivity in meetings with politicians and frame their research to illustrate how it will benefit Australia into the future. Other talks included turning your science into news, how to use science to shape public policy, and tips on how to get the most out of meetings with the members of parliament. The last session of the day included a dedicated time to practice one-minute research summaries to use during meetings with parliamentarians.

Later that night, Lauren and Steve attended a formal gala dinner at Parliament House, where the Hon. Christopher Pyne and Hon. Bill Shorten spoke about their plans for scientific policy in Australia. At the conclusion of the dinner, they had the opportunity to have a brief chat with Opposition Leader, Hon. Bill Shorten with Dr. Sue-Ann Watson (ACRS Councilor, and representing AMSA), and were asked to meet with his office the following day to talk about issues facing Australia's coral reefs.

The next morning, they had their scheduled meetings with members of parliament. Lauren Nadler had a productive meeting with the Hon. Warren Entsch, Member for Leichhardt, and Steve Doo met with Ms. Jill Hall, Member for Shortland. Lauren and Steve were both impressed by the openness and interest shown for science during these meetings.

The final day ended with an exciting meeting with the Opposition Leader, Hon. Bill Shorten. There, Lauren, Steve and Sue-Ann were able to talk to Mr. Shorten on ways to improve the health of coral reefs in Australia. This was an extremely productive time, and ACRS is continuing its efforts to open channels of dialogue with politicians to help shape the most productive policies possible for the health of Australia's coral reefs.

Special Bleaching Report

The Australian coral reef research community established a **National Coral Bleaching Taskforce** last November, in anticipation of a potential bleaching event this Austral summer. The National Coral Bleaching Network is convened by the ARC Centre of Excellence for Coral Reef Studies, in partnership with the Great Barrier Reef Marine Park Authority (GBRMPA), the Australian Institute of Marine Science (AIMS), and seven other organisations. Projections by the Australian Bureau of Meteorology and by NOAA suggested that bleaching could occur in March-April. ***Severe bleaching is occurring now in the Torres Strait, northern and central Great Barrier Reef, parts of the Coral Sea, Northern New South Wales and coastal NW Western Australia.***

The purpose of the taskforce is to foster collaborative research on bleaching and to coordinate the efforts of over 300 researchers. The geographic scope is Australia-wide, including tropical and sub-tropical reefs on the east and west coast. Part of the planning included an ongoing inventory of all of the existing data from many locations, especially information on two earlier mass-bleaching events in 1998 and 2002.

The taskforce will soon complete aerial surveys of the Torres Strait and Great Barrier Reef (GBR) Marine Park in a total of eight flights in a chopper and plane. Each flight is about 1000km long, scoring the extent of bleaching from the northern tip of the Torres Strait, to the southern offshore tip of the GBR, approximately 900 reefs. Multiple reefs zones within each reef have been assessed (upper slope, exposed and sheltered crest, inner and outer flat, patch reefs and lagoon). Ray Berkelemans' scoring scheme was used again to allow comparisons to the 650 reefs he scored in 1998 and 2002. The two observers on all flights in 2016 were Terry Hughes and James Kerry.

In 2016, the proportion of reefs in the top two bleaching categories is 3-4 times higher than 1998 or 2002. The northern 1000km of the GBR has been severely damaged from Port Douglas up to Papua New Guinea, and many corals there are dying. Reefs from Cairns to Bowen are more "moderately" bleached, closer to the intensity of 1998 and 2002. Minimal or no bleaching is happening on macro-tidal reefs near Mackay, on Lord Howe Island and in the Capricorn Bunker reefs.

Since mid-February, twelve research vessel trips have been conducted by JCU, AIMS and GBRMPA along the GBR providing site-level ground-truthing for the aerial surveys, and detailed information on the severity of bleaching at the colony level (ranging from zero to dying) along the GBR -including the Torres Strait- and in the inner Coral Sea. Many of these reefs are long-term sites repeatedly surveyed by AIMS and James Cook University researchers, allowing the taskforce to quantify shifts in species composition. In situ transects run last week by Morgan Pratchett show 50-75% bleaching on 14 reefs between Port Douglas and Cairns, matching the aerial survey scores. One underwater component includes measuring bleaching along depth gradients down to mesophotic reefs.

Other Taskforce teams are based primarily at Lizard, Orpheus, Heron and One Tree research stations. A sub-tropical network of researchers is investigating bleaching on the Solitary Islands and elsewhere on the east coast. Further work (chopper surveys and in situ surveys) is underway by the Torres Strait Regional Authority. GBRMPA's monitoring network of rangers, tour operators, etc. is also measuring bleaching and mortality. Bleaching is now well underway in northern nearshore parts of Western Australia, but not on Ningaloo Reef or further south. The AIMS-UWA-Curtin researchers will census offshore atolls.

The research so far has focused on the initial task of documenting the severity and footprint of the bleaching around Australia. The taskforce is now researching associated questions: on the GBR, how many reefs have bleached 0-3 times in 1998, 2002 and 2016 and whether the in situ bleaching patterns today diverge on reefs with different histories. Other research areas underway include the molecular, physiological and ecological responses of zooxanthellae, microbes, corals and fish, using data gathered before and during (and soon, after) the bleaching event.

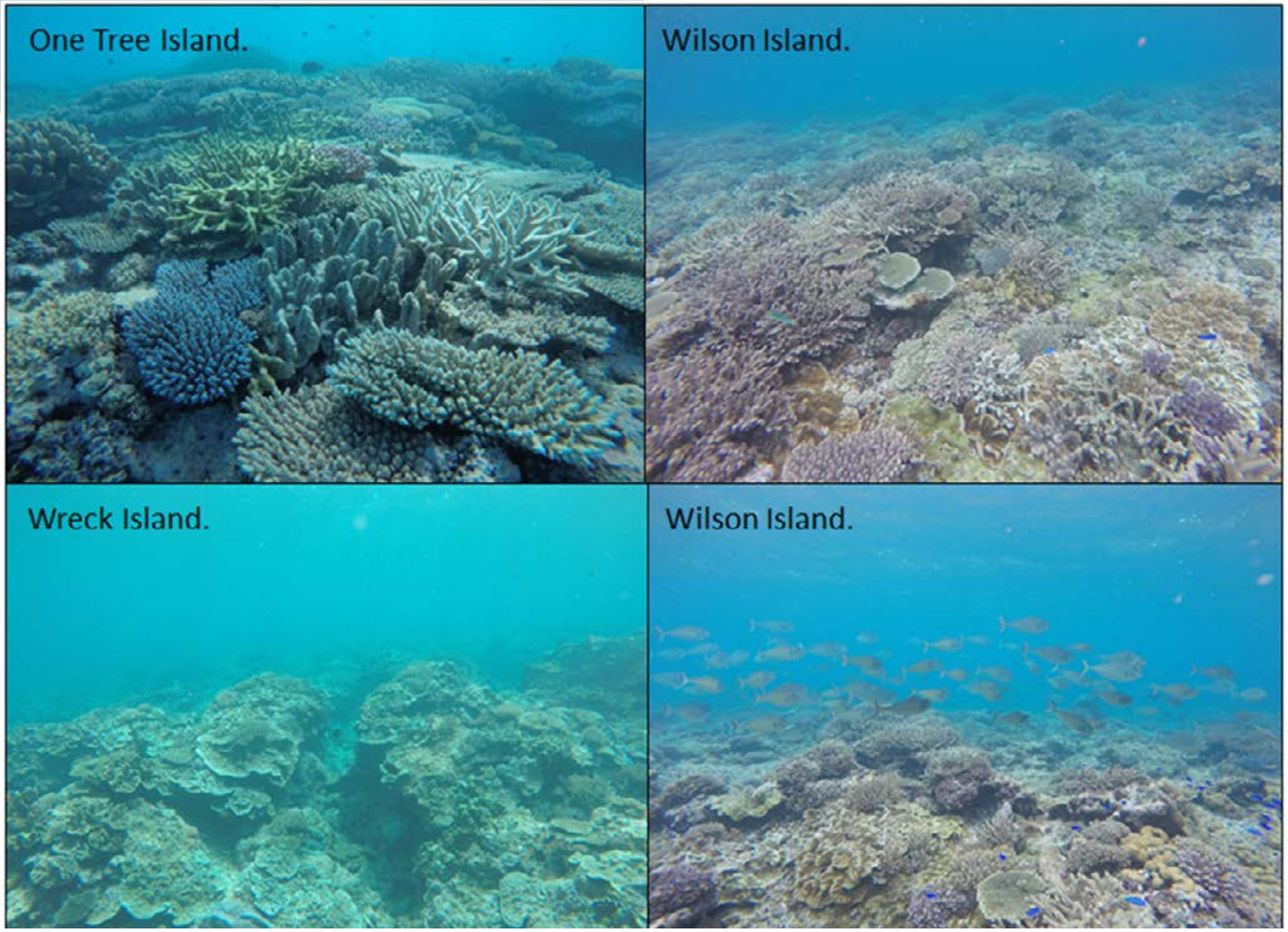
Members of Taskforce (and associated organisations):

Terry Hughes (ARC Centre of Excellence for Coral Reef Studies; James Cook University)
Russ Babcock (CSIRO)
Maria Byrne (University of Sydney)
James Gilmour (AIMS Perth)
Scott Heron (NOAA, Townsville)
Ove Hoegh-Guldberg (ARC Centre, University of Queensland)
Janice Lough (AIMS Townsville)
Ryan Lowe (ARC Centre; University of Western Australia)
John Pandolfi (ARC Centre; University of Queensland)
David Wachenfeld (GBRMPA)
Shaun Wilson (DPaW)
James Kerry (ARC Centre; Project Manager)

Images by Jessica Stella @GBRMPA taken at Wharton Reef (left) and Eden Reef (right).

What's happening in the south?

XL Catlin Seaview Survey visits the Capricorn Group, southern Great Barrier Reef.



The XL Catlin Seaview Survey through the Global Change Institute at The University of Queensland surveyed 11 sites across four coral cays (Heron, One Tree, Wilson, Wreck) in the southern section of the Great Barrier Reef (the Reef) from 22-27 March 2016. The southern Great Barrier Reef is a unique reef environment, with the Capricorn Group situated at the edge of the tropics near the Tropic of Capricorn (23°S). Throughout the calendar year, corals can experience temperature shifts of almost 10°C, where a 4°C shift can take place in as quickly as one month. This summer, anomalous sea temperatures associated with El Niño resulted in an increased risk of coral bleaching on the Reef. Recent GBRMPA, AIMS and James Cook University surveys have reported severe regional bleaching in the northern/central sections of the Reef.

Our team surveyed ~20km of reef across the southern Capricorn group and these reefs were in good condition. Surveys revealed little to no coral bleaching, with a total of <1% coral bleaching observed across all sites. Out of this small number, plating *Montipora* were the most affected. Some colonies of branching *Acropora* on the western portion of Heron reef were looking pale. However, this paling has been sighted in previous years, implying a possible seasonal or environmental influence, potentially characterizing the particular zooxanthellae composition in these colonies.

Table 1. Previous bleaching in the Capricorn group. **CRTR** - Coral Reef Targeted Research and Capacity Building Program; **GBRMPA** - Great Barrier Reef Marine Park Authority

Location	Bleaching	Source
2001-2002		
Heron Island south	1-25%	CRTR
Heron Island north	1-8%	CRTR
2005-2006		
Heron Island south	12-20%	CRTR
Heron Island north	5-8%	CRTR
One Tree Island	14%	GBRMPA
Wreck Island	16%	GBRMPA

*Obtained from publication: Weeks SJ, Anthony KRN, Bakun A, Feldman GC, Hoegh-Guldberg O. (2008). Improved predictions of coral bleaching using seasonal baselines and higher spatial resolution. Limnology & Oceanography 54(4): 1369-1375.

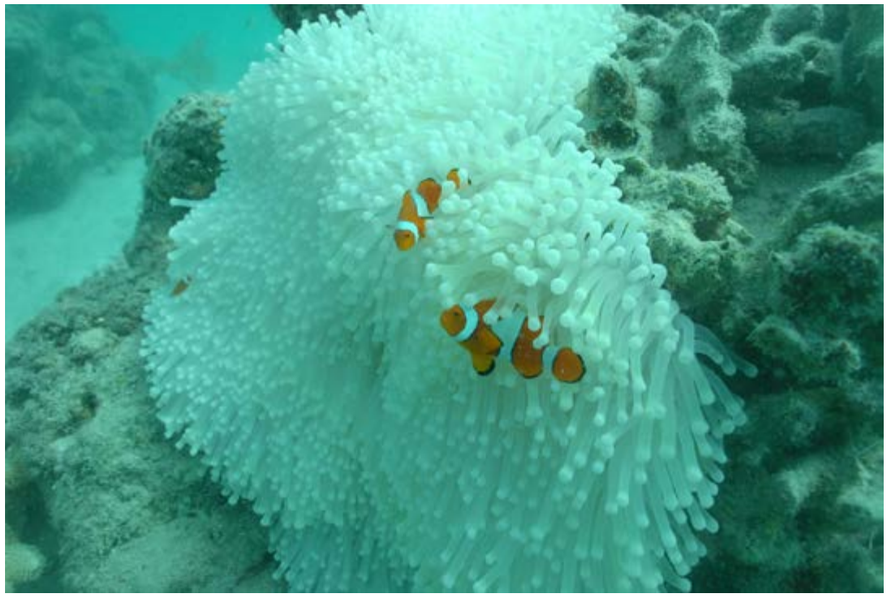
For comparison: In the austral summer of 2001-2002, Heron Island South (HIS) showed 1-25% bleaching and 1-8% for Heron Island North (HIN) (Coral Reef Targeted Research and Capacity Building Program (CRTR). In 2005-2006, HIS had 12-20% and HIN 5-8% bleaching, with 14% and 16% bleaching at One Tree Island and Wreck Island, respectively (CRTR and GBRMPA, obtained from Weeks et al. 2008).

This southern region of the Reef has been experiencing above average temperatures, continuing into autumn, however high winds were prevalent throughout the summer, possibly providing relief with overturning and mixing. Given these reefs are located on the shelf edge, exposure to oceanic water may also provide relief during times of thermal stress. More detailed analyses of the survey data and comparison with baseline surveys conducted in 2012 will be undertaken in the coming months. The current surveys form part of the ongoing XL Catlin Seaview Survey which has been designed to monitor change in reef health over time – the results of which are publicly available on the Global Reef Record.

Kristen Brown, Veronica Radice, Manuel Gonzalez Rivero,
Tyrone Ridgeway, Ove Hoegh-Guldberg.

Special Bleaching Report

Images by CoralWatch
Wen-Sung Chung and Justin Marshall



"Losing Nemo"

Anemone fish in bleached anemone

Octopus camouflages in bleached coral

Coral losing symbiotic algae

Massive *Porites* corals also bleaching

Reefs down to 25m are affected

Special Bleaching Report

Margaux Hein

Tory Chase

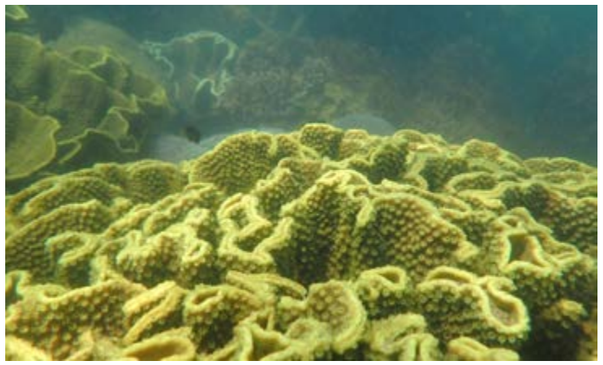
"Bleaching in the Lizard Island area is severe and widespread, affecting corals to at least 15 metres depth and probably deeper. It eclipses the 2002 event that was previously the worst on record in this area."

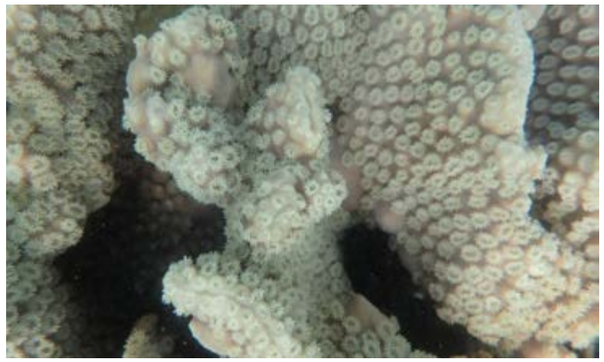
Dr Anne Hoggett

2016 bleaching event: *(top)* Lizard Island Research Station photos by M. Hein; *(bottom)* LIRS March 2016, images by T. Chase

Stress levels appear low on high latitude coral reefs of Hervey Bay, Queensland.

Ian R Butler, Tyson Martin & Amanda Delaforce





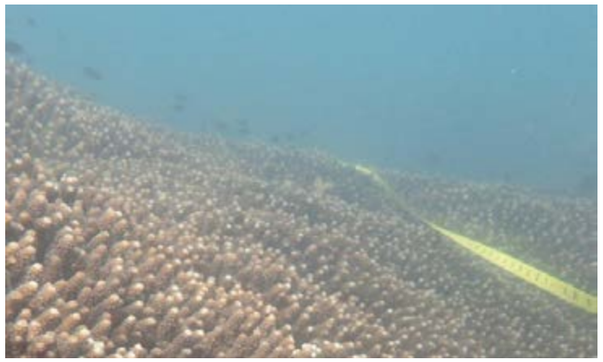


Fig. 1 Examples of coral colonies in Hervey Bay, Queensland April 2-3, 2016. (a) *Goniopora sp.*showing signs of stress with increased bleached columns. (b) *Turbinaria spp.* thrive in Hervey Bay (c) *Turbinaria peltata* (syn. *Duncanopsammia peltata*) looking unusually pale (d) Large expansive colonies of *Acropora digitifera* thrive at the more offshore locations in Hervey Bay. Photos by I Butler.

As the oceans warm and tropical creatures head to higher latitudes, it is a good time to remind Australians that there are substantial coral reefs south of the Great Barrier Reef and these may become very significant in the future. Hervey Bay is a good example of a high-latitude location with reefs hosting unique assemblages of corals. These coral reefs really suffered from the 2011 and 2013 floods, losing nearly 60% of coral (Butler et al. 2013, 2015). The El Niño driven low rainfall since then has provided a recovery period which appears to be continuing into 2016. While the unusually warm waters from November 2015 until recently may have suggested an impending bleaching event, fingers crossed, at the moment there are few signs of stress. In the last two days (2-3 April 2016), we have carried out surveys on eight nearshore reefs. Data are only anecdotal at this stage, but bleaching corals appear only slightly higher in number than usual. *Goniopora spp.* colonies, typically showing spotty colouration at the best of times, are looking unusually blotchy at only one location (Fig. 1 a). *Turbinaria spp*, which dominate many reef communities in Hervey Bay (Fig. 1b), look very healthy with the exception of *Turbinaria peltata* (*Duncanopsammia peltata*), which we consider to be unusually pale (Fig. 1c). Overall, coral growth appears substantial at most reef locations, particularly *Turbinaria mesenterina* which thrives in nearshore areas of Hervey Bay and shows no indication of any stress whatsoever. *Acropora digitifera* also appears to be thriving at the more offshore locations with no signs of stress (Fig. 1d). Nights have started to cool in Hervey Bay and we expect the waters to cool accordingly, before any significant bleaching occurs.

References:

Butler, I. R., B. Sommer, M. Zann, J-x Zhao and J. M. Pandolfi (2013). "The impacts of flooding on the high-latitude, terrigenoclastic influenced coral reefs of Hervey Bay, Queensland, Australia." Coral Reefs 32(4): 1149-1163.

Butler, I. R., B. Sommer, M. Zann, J-x Zhao and J. M. Pandolfi (2015). "The cumulative impacts of repeated heavy rainfall, flooding and altered water quality on the high-latitude coral reefs of Hervey Bay, Queensland, Australia." Marine Pollution Bulletin 96(1–2): 356-367

Special Bleaching Report

The bleaching event in the Solitary Islands

The coral bleaching event that is wreaking havoc in the northern part of the Great Barrier Reef is also being expressed along the subtropical coast of eastern Australia. Preliminary work being conducted in the Solitary Islands near Coff's Harbour in northern New South Wales, led by Professor John Pandolfi from the University of Queensland and the ARC Centre of Excellence for Coral Reef Studies, shows widespread coral bleaching with a number of coral genera feeling the heat. The hardest hit corals appear to be the pocilloporids, (*Pocillopora* in particular, but also *Stylophora*), and the genus *Turbinaria*. However, other taxa, such as *Porites* are also showing substantial bleaching.

Of particular concern is that in many places around the Solitary Islands, the two hardest hit corals are two of the most abundant. Moreover, some of the *Pocillopora* colonies are dying or have already died. Should mortality ensue for these two dominant corals on the reef, Australia's subtropical reefs could undergo major changes in their biotic composition. On the positive side, many of the hardest hit corals on the Great Barrier Reef, such as *Acropora*, are showing only minimal stress to the sub-tropical bleaching event.

Carrie Sims, Sun Kim, K-le Gomez, Brigitte Sommer, Maria Beger & John Pandolfi

Bleaching research trip to Fahey and Wharton Reefs, credit J. Stella @GBRMPA.

Bleaching up close

Credit Wen-Sung Chung and Justin Marshall @CoralWatch

New from BYOGuides

http://www.byoguides.com/reeffinder/

Review: Reef Finder

The 'Reef finder' is another excellent instalment in the visual identification toolkit developed by Russell Kelley and his team. Like the 'Coral finder' the 'Reef finder' is intuitive to use and enables identification of reef organisms via a visual index of obvious features.

I set myself a task to identify a few reef critters that I've seen while out diving over the past few months. First, an awesome long-bodied 'dragon' nudibranch from Lizard Island (pictured above). With Reef finder I quickly discover this is most likely an Aeolid by flicking to the 'Molluscs' pages and, more importantly for those with limited knowledge of reef taxa, I can easily navigate to the same page after a scan of the 'Sausages' in the Visual Index. Second, my favourite soft coral *Dendronepthya* (I saw a gorgeous bright magenta colony at Orpheus Island recently). I know that these colonies have polyps so I go straight to Reef Finder's 'Polyp plan' pages and find this genus on page 25. However, I struggled a little to get to the right page using only the Visual Index because my mental image of *Dendronepthya* lead me to the 'Shapes' section of the Visual Index instead of stopping first at the 'Tentacles' pages. (Note that here I learned a lesson about skipping forward without fully reading the instructions!). Finally, I look for the

Easy to use!

Identify anything by choosing what it looks like

the grumpy territorial surgeonfish *Acanthurus lineatus* (I surprised one on our transect at Pelorus Island in March). The visual index of fishes takes me to page 12 -13 showing 'Daytime foragers' and I find images of several surgeonfish species but not my stripey friend. So, overall, the Reef finder provides a comprehensive visual guide to reef critters. Most of the common and distinctive species are included and can be quickly identified using the visual index. Students taking our field courses at JCU over the past few years have found the Coral Finder to be extremely useful and I'm sure that the same will be true of the Reef Finder.

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URL: https://research.jcu.edu.au/portfolio/mia.hoogenboom1
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Find us on Facebook Biology of Reef Corals JCU

What's new?

AGM
Friday 13 May
2016
5-7pm

ATSIP 145-030
James Cook University

Nominate to be on the ACRS council today!

Support ACRS by donating today!

Become a member

Renew your membership

Background photo by Lauren Nadler

ACRS Research Awards:

Terry Walker Prize

Tiffany Sih

My PhD research uses underwater video, ear-bone chemistry, and tried-and-true fishery science techniques to examine tropical fishes living below depths of 100 m. Despite their vulnerability to expanding fisheries in the tropics we know surprisingly little about these fish communities, their biology (i.e. growth, age, and reproduction) and the nature of their ecological niches (i.e. what depths they live in, what habitat they prefer, and how their populations are structured) will be important for future conservation and fishery management.

I was the lucky recipient of the 2015 Terry Walker Prize by the Australian Coral Reef Society to fund fieldwork to study the biology of deepwater demersal fishes. The funds allowed me to charter a scientific fishing trip on Northern Conquest Charters (Townsville) and I took some keen fishing volunteers to sample deeper reefs on the edge of the continental shelf. The weather was beautiful and I could not have asked for better conditions 100 km offshore, or a better group of fishers. Fishing 250 m deep is physical work, but the enthusiasm never lagged. Combined we caught over 200 specimens from 14 species, mostly deepwater snappers. The deepwater tropical fish assemblage is a mixture of snappers, groupers, emperors and jacks, and this catch diversity is one of the primary concerns for fishery scientists. The overall diversity of the fishes, differential growth, varied reproductive strategies, and general lack of comparisons between fishes caught on the same gear at the same depths is all information that managers would like to have. *How best to manage a fishery when you cannot control what comes up at the end of the hook?*

Commercial fish catch from the Coral Sea

Pictures (this page) from fieldwork off the Queensland shelf-edge

Fishers (left to right):
CB with *Pristipomoides argyrogrammicus* (Ornate jobfish),
CH with *Etelis carbunculus* (Ruby snapper),
BL with *Pristipomoides filamentosus* (Rosy jobfish)

Across the Indo-Pacific, tropical deepwater fishes support important commercial and artisanal fisheries and have strong cultural and economic value. In Australia, there are relatively few commercial deepwater tropical fisheries vessels targeting deepwater fishes, however, these markets are expanding. Now deepwater tropical fishes can be seen in your local seafood markets, including nation-wide distributors like Woolworths and Coles. They are marketed as ruby snapper, rosy jobfish, goldband snapper, and bar cod, just to name a few. For sustainable management of deepwater fisheries resources, it will be important to provide managers with enough information to assess the sustainability of these fished stocks.

It is important as a consumer to not just ask where it is caught, but also how it is caught, how much by-catch is caught with it, and if these fishing methods are sustainable for the future. These deep water fisheries are relatively data-poor, and I am interested to see how the fishery and management evolves. What is surprising to me, as a burgeoning fishery scientist, is the lack of resolution in fishery catch data. While these are (sometimes) closely related species, on Australian catch records several species can be labelled as simply "tropical snapper" or "tropical grouper". These designations can apply to dozens of species! While this is easier for fishers, mixed-assemblage fisheries are often compromised by limited data, and among these species, biological characteristics may vary widely. In general, deep demersal fishes have low natural mortality, can be long-lived, slow to grow, and be later to mature to reproduce. These characteristics can make fisheries vulnerable to overexploitation and overfishing. *Do we manage a fishery by what information we have, or by what information we do not have?*

In my research funded by the Terry Walker Prize, I will be making initial estimates of age and growth, as well as examining gonads (sex organs) of the species. This will provide a more complete understanding of the biology of species targeted in Australia's deepwater tropical fisheries. In addition to the samples from the scientific sampling trip, I have been working with commercial and recreational fishers who have generously donated fish frames for this research. I will be comparing my estimates of the biology of populations in Australia to those available worldwide I will also be comparing the biology of different fish species caught together to see if it makes sense to combine these species in fishery catch records, future assessments and management. The data will contribute to my PhD thesis, it will be published in technical journals, and I will strive to communicate my results to resource managers so that we can fish smarter and sustain shelf-break fish populations in the future.

Goldband snapper *Pristipomoides multidens* for sale in my neighborhood Coles. All photos taken by Tiffany Sih.

Acknowledgements

I am truly appreciative of the Australian Coral Reef Society for granting me this opportunity for my research. This research was also funded by the ARC Centre of Excellence for Coral Reef Studies. I would like to thank my supervisors Professor Michael Kingsford, Dr Mike Cappo, Dr Ashley Williams and Dr Andrew Chin for their invaluable support. Thank you to the crew of Sir Reel Les, Chris, Cameron and Cliff. The best deep-reef fishers from Townsville to Melbourne (in order of number of samples contributed): Michael M., Chris, Ben, Andrew, Michael K., Sam, Brian and Rohan. Samples collected under a GBRMPA permit and animal ethics have been approved.

Figure 1: Heron Reef (top left) with the three sites from which cores were collected shown in red. Aerial view of the spurs and grooves near "Harry's Bommie" (bottom) with core locations marked (blue and red dots). An underwater view, seaward, down a groove at Harries Bommie with coral covered spurs either side (top right).

Figure 2: James Sadler with a small piece of core from the wall of a spur near "Libby's Lair".

Figure 3: One of the cores collected from "Libby's Lair"

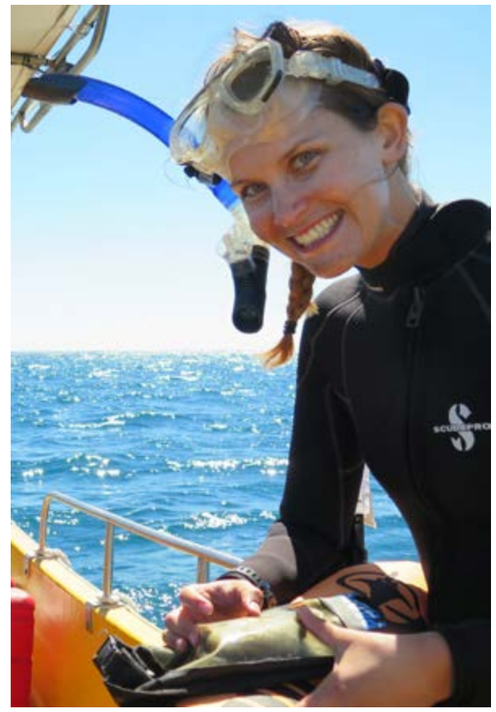
Danielle Simmons Award 2015

Getting into the grooves at Heron (literally!)

In 2015 I was the lucky recipient of the ACRS Danielle Simmons Award. This award allowed me to collect, what we believe to be some of the first, core samples from the spurs and grooves around Heron Reef. Figure 1 shows some of the spurs we cored at Heron from above and below the water.

Spurs and grooves (SaGs) are a characteristic feature of fore reef slopes worldwide. The spurs are parallel ridges of carbonate material (coral and algae) separated by regularly spaced channels (grooves). The SaG zone is one of the most biodiverse and productive zones of the reef and the features are believed to act as natural breakwaters regulating the hydrodynamic energy received by the adjoining reef. However, their formation and morphodynamics remains poorly understood and debated in the literature. These cores form part of my PhD research which aims to understand SaG formation and evolution in the southern Great Barrier Reef and French Polynesia.

We used a handheld drill, with a 70 cm long barrel, powered by air from a dive tank (Figure 2) to collect cores from the tops and into the walls of spurs. Overall, a total of 14 short cores (e.g. Figure 3) were collected from three sites on the windward and leeward sides of Heron reef (Figure 1). These cores have been logged, a process in which we identify the coral and algal assemblages down hole (i.e. into the past). Coral and algal samples have been selected and vetted for radio carbon dating at the Australian Nuclear Science and Technology Organisation (ANSTO). This information will provide insight into environmental conditions on the reef in the past and, hopefully allow us to unlock the secrets of spur and groove formation.



Stephanie Duce

Geocoastal Research Group, University of Sydney

grgusyd.org

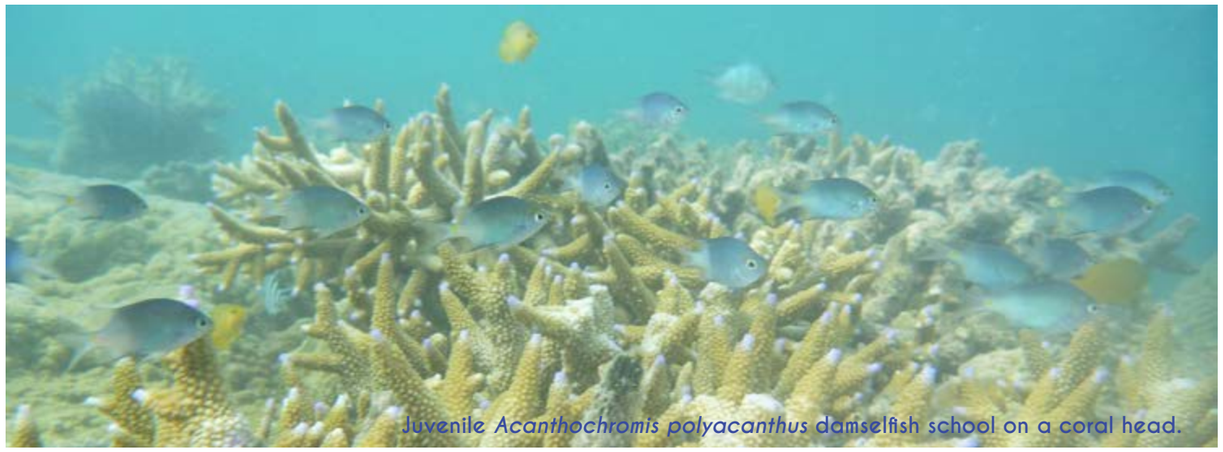
Acknowledgements:
Many thanks to my excellent field volunteers Belinda Dechnik and James Sadler and the Heron Island Research Station Staff. In addition to the Danielle Simmons Award, this research trip was funded by a Heron Island Research Scholarship to James Sadler.

For more information:

-Duce, S., Vila-Concejo, A., Hamylton, S., Bruce, E., Webster, J. M. (2014) Spur and groove distribution and relationship to relative wave energy, Southern Great Barrier Reef, Australia. Journal of Coastal Research, Special Issue No. 70, pp. 115-120
-Duce, S., Vila-Concejo, A., Hamylton, S., Webster, J. M., Bruce, E. and Beaman, R. J. (in review) A morphometric assessment and classification of coral reef spur and groove morphology. Submitted Geomorphology
-Duce, S., Dechnik, B., Sadler, J., Vila-Concejo, A. Hua, Q. and Webster, J.M. (in prep) Fore reef spur and groove growth and implications for reef platform evolution.

ACRS Student Research Award

Giverny Rodgers

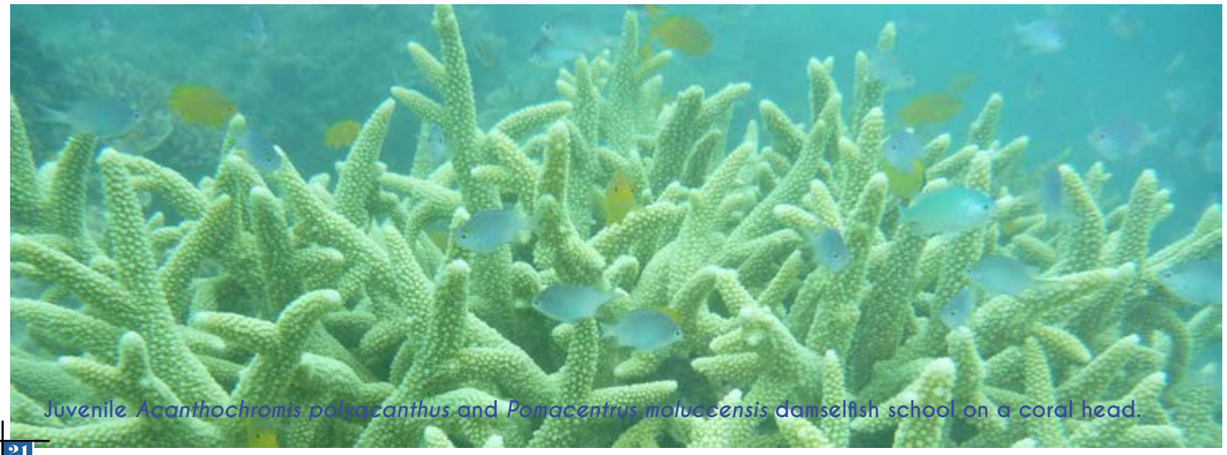


Juvenile *Acanthochromis polyacanthus* damselfish school on a coral head.

The effects of climate change induced ocean warming are expected to be felt most strongly by species living close to the equator, due to the thermally stable environments that characterise these locations. Studies show that elevated environmental temperatures can negatively affect reproductive output, growth rates and physiological performance of coral reef fishes, however the majority of research to date has been undertaken on fish populations from the middle and southern sections of Australia's Great Barrier Reef (GBR). Because many species span large geographical ranges and therefore naturally experience different local environmental conditions, this may limit our ability to make generalized predictions related to the impacts of climate change on marine organisms.

In my PhD I examine how near-equatorial populations of coral reef fishes may respond to the increases in ocean temperatures predicted to occur with climate change. My research has shown that the impacts of chronic increased temperature on metabolic performance, cell structure, blood chemistry and survival of near equatorial populations of coral reef fish are severe, when compared with central and southern GBR populations. My findings indicate an extremely narrow thermal performance range for near equatorial fish. For this reason, the capacity for plasticity or acclimation of thermal performance will be essential for near equatorial coral reef fish populations to persist under future climatic conditions. Understanding these non-genetic modifications are particularly important, as they are capable of operating over climate change relevant time scales.

In 2015, I received an ACRS student research award to investigate the present-day performance and the capacity for developmental acclimation (acclimation that occurs during early life stages) of near equatorial populations of three



Juvenile *Acanthochromis polyacanthus* and *Pomacentrus moluccensis* damselfish school on a coral head.

Adult *Acanthochromis polyacanthus* damselfish.

Coming in to land at Thursday Island, Torres Strait, the study site for this near equatorial research.

coral reef fish species (*Acanthochromis polyacanthus*, *Pomacentrus moluccensis* and *Pomacentrus wardi*) at both a biochemical and a whole organism level. The study aimed to determine the extent to which these populations are able to adjust the thermal performance of key metabolic enzymes and aerobic physiology, depending on the thermal conditions at which they have developed. I also aimed to determine whether or not improved performance in enzyme function directly relates to whole-organism aerobic performance in these populations.

Preliminary results based on aerobic capacity suggest that there may be some scope to deal with climate change relevant temperature increases in these coral reef fish populations, however near equatorial populations are still likely to be more vulnerable to temperature increases than their more southern counterparts. Life history and habitat choice of each species appeared to have a strong influence on their capacity for developmental acclimation, leading to the conclusion that scientists should consider the ecological niche of their study species when making generalisations about the effects of climate change, even on closely related species.

The next step in this research will be to investigate the function of key metabolic enzymes that control functions such as oxygen usage and locomotion. The level to which enzyme performance is linked to whole organism aerobic performance, and differences across latitudes and between species will be investigated. This multi-level approach aims to provide a more comprehensive look at acclimation capacity than previous single measure studies.

Sunset in Torres Strait, the study site for this near equatorial research; photo credit Megan Welch.

Acknowledgements:

I would like to thank the Australian Coral Reef Society for providing funding through the ACRS student award which covered the costs of the ongoing metabolic assays. Thank you to my supervisors M. McCormick, P. Munday, J. Donelson and J. Rummer. Finally thanks to all of the field and lab volunteers and to the JCU technical staff who have contributed to this project.

Phylogenomics of *Acropora* species in Western Australia

Natalie L. Rosser[1] and Luke Thomas[2#]

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Figure 1. The unusual coral reefs of the Kimberley region, Western Australia.

Background

Accurate phylogenies are vital for interpreting evolutionary history and adaptation, and documenting and managing biological diversity. Yet multiple gene geologies for the same set of closely related species may produce discordant trees as a result of incomplete lineage sorting, selective sweeps, natural selection, introgression or hybridization, which complicate interpretations of evolutionary relationships. In the scleractinian coral genus *Acropora*, the primary molecular phylogenetic markers have been the mitochondrial DNA Control Region (CR) and the nuclear PaxC intron, but these markers often yield different topologies which have been attributed to hybridization1-3. However, recent evidence suggests that PaxC may be influenced by selection on spawning time, and thus could distort phylogenetic inferences4. Phylogenies have traditionally been limited to a relatively small number of genes that could be reliably amplified with sufficient variation to resolve phylogenetic relationships, but cost-effective next generation sequencing (NGS) now offers genome-wide resolution. Here, we use a NGS approach to re-evaluate the evolutionary relationships in 20 species of *Acropora*, by comparing topologies from the mtDNA Control Region (CR), the PaxC intron and 10,034 genome-wide single nucleotide polymorphisms (SNPs), and test how this new approach compares to the original single-gene phylogenies.

Methods

Samples of twenty species of *Acropora* were collected from a wide variety of sites in Western Australia, ranging from the Houtman Abrolhos Islands (S28°) to the Kimberley (S15-12°) (Fig 1,2), and included three species with conspecific spring- and autumn-spawning colonies. The mtDNA Control Region (CR) and the PaxC 46/47 intron were amplified in polymerase chain reactions and sequenced using traditional Sanger sequencing. In addition, all samples were genotyped across a panel of single nucleotide polymorphisms (SNPs; n=10,034), generated by Diversity Arrays Technology, which represents a combination of DArT complexity reduction methods and next generation sequencing platforms (similar to the widely applied RAD-seq methodology). Phylogenetic relationships were estimated for the CR, PaxC and SNP datasets separately using a Bayesian statistical framework implemented in MrBayes 3.1.2 and maximum likelihood analyses in RAxML and PhyML 3.0.

Figure 2. Coral reefs in the Kimberley region of Western Australia are home to an exceptional diversity of *Acropora* species.

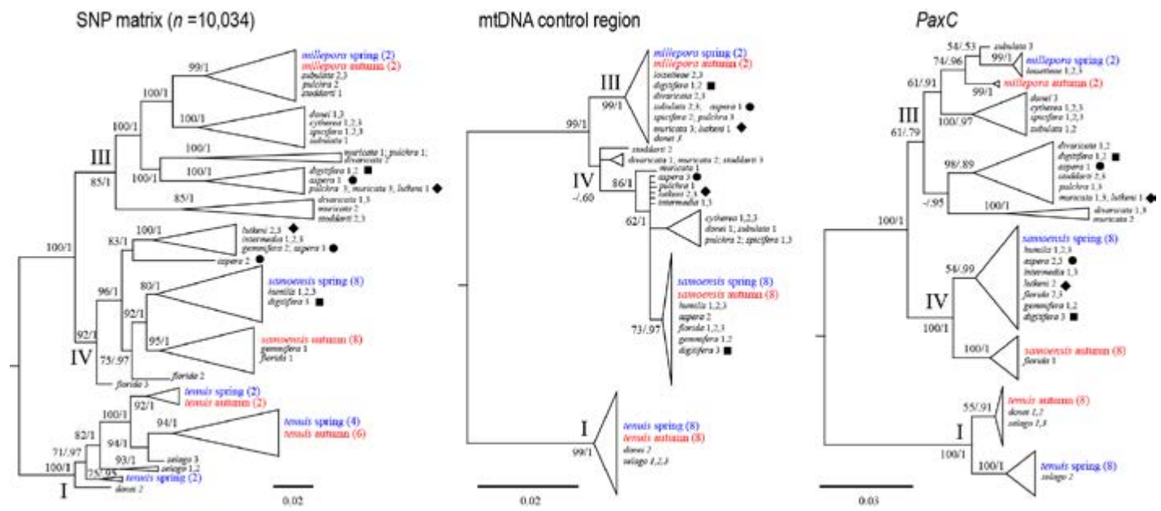


Figure 3. Comparison of phylogenetic trees in the genus *Acropora* using (a) 10,034 SNPs (b) mtDNA CR (c) PaxC with collapsed nodes to illustrate major patterns. Branch support values are maximum likelihood bootstrap values and Bayesian posterior probabilities (outgroups are not shown). Major *Acropora* clades are indicated by Roman numerals; spring and autumn spawners are shown in blue and red; symbols after species indicate polyphyletic lineages.

Preliminary Results & Discussion

Phylogenetic analysis based on genome-wide patterns of differentiation (SNP dataset) provided a much clearer picture of the relationships in *Acropora* compared to the single gene analyses of PaxC and the CR (Fig 3). High posterior probability values extended to finer relationships in the SNP tree and offered greater phylogenetic resolution than the CR or PaxC. The PaxC gene tree separated conspecific autumn and spring spawners into different genetic clusters in all three species containing autumn and spring spawners, yet this pattern was evident at the genome-level in only one species, suggesting incomplete reproductive barriers, or recent polymorphism in some species. The pattern in the PaxC tree is consistent with the previous hypothesis that the divergence of PaxC is influenced by spawning time in Acropora4. The two most likely scenarios to explain the divergence in PaxC and its association with different spawning times are either the PaxC intron and/or coding region are under selection associated with coral spawning season, or PaxC is simply a hitchhiker that is linked to other aspects of reproductive isolation. Further investigation is required to separate these two possibilities, providing a fascinating avenue for future research into genes that influence reproductive isolation and speciation in corals.

Acknowledgements

We wish to thank the Australian Coral Reef Society for the 2015 ACRS student award, and Prof Mike Johnson for funding this project. The results presented here are part of the following manuscript: Rosser NL, Thomas L, Stankowski S, Richards ZT, KenningtonWJP, Johnson MS. Phylogenomics provides a clearer understanding of evolutionary relationships in the reef-building coral genus *Acropora* (in prep).

References

1. van Oppen, M.J.H., et al. 2001. Mol Biol Evol 18:1315-1329
2. Marquez, L.M., et al 2002. Mol Ecol 11:1339-1349
3. Richards, Z.T., et al 2008. PLOS one 3:e3240
4. Rosser, N.L. 2015. Mol Ecol 24:5006-5019

Controlling Mesopredators: importance of intraguild behavioural interactions in trophic cascades

Maria del Mar Palacios

This research is one of the first to describe a risk-mediated process amongst 3 trophic-levels of reef fishes, but most importantly it highlights the role of behavioural interactions in the balance of marine food-webs. It also can serve to better predict the consequences of top-predator loss.

For more details, see:

- **Palacios MM, Warren D & McCormick MI. 2016a. Sensory cues of a top-predator indirectly control a reef-fish mesopredator. Oikos 125: 201-209.**
- **Palacios MM, Killen SS, Nadler LE, White JR & McCormick MI. 2016b. Top-predators negate the effect of mesopredators on prey physiology. Journal of Animal Ecology.**

The Research:

Small predators (mesopredators) are an important functional group on coral reefs; they are abundant, voracious and highly active. However, due to overfishing of larger predatory fish (their direct predator) mesopredators can nowadays become a threat to the balance of the ecosystem. Disproportionate increases in the mesopredators abundance and activity may lead to a depletion of the prey they target for food.

Using a 3-level food-web of reef fishes (coral trout> dottyback> damselfish juveniles; Fig. 1) I studied the extent to which mesopredator behaviour and foraging activity was indirectly controlled by:

- Predation risk from top-predators
- Behavioral interactions with multiple mesopredators

This research will help us better understand the net effect that a mesopredator-release may have on prey fish and how behavioral interactions among mesopredators may influence the magnitude of trophic cascades.

The Outcome:

Thanks to the 2015 ACRS research award and the 2015 Ian Potter doctoral fellowship at Lizard Island, I was able to run 2 field-studies and 9 laboratory experiments (Fig. 2).

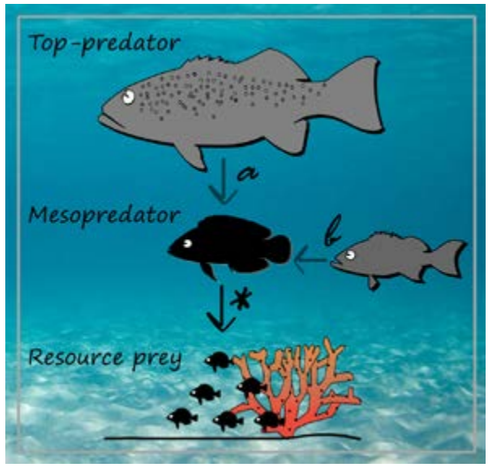
Results on predation risk:

Experiments for the first two chapters of my thesis showed that loss of predation risk from top-predators causes an immediate behavioural release of mesopredators (Fig. 3). Increases in mesopredator activity and foraging were found to reduce the space use of baby damselfish (Palacios et al. 2016a) and significantly increase their metabolic rate (oxygen consumption; Palacios et al. 2016b). These results suggest loss of top-down control in coral reefs may trigger trophic cascades in which the fitness of bottom-level resource prey may be severely impaired due to behavioural and physiological stress.

Results on multiple-mesopredator effects:

The third chapter of my thesis (in prep) is revealing that despite being ecologically similar, mesopredators of different species and/or hunting mode have differential impact on resource prey. Interestingly, it also shows that in most cases (4 out of 6) predator pairs cause more prey mortality than expected. Although data are still undergoing analysis, this suggests that behavioural interactions among mesopredators might enhance the magnitude of trophic cascades and cause even more mortality than initially thought.

1 Interaction between a mesopredator and its prey (*), which can be influenced indirectly by a top-predator (a) or another mesopredator (b).



2 Experimental setup at Lizard Island Research Station.

3 Screenshot from a trial examining the behavioural changes of a dottyback (mesopredator; bottom-right corner) exposed to a coral trout (top-predator, top-left corner). Lemon damselfish juveniles are used as resource prey.

Congratulations to THIS year's ACRS student research awards

Terry Walker Award:
Sybille Hess (JCU)
"The effects of suspended sediments on the physiology and ecology of coral reef fish"

Danielle Simmons Award:
Stephanie Gardner (UTS)
"The ecophysiology of dimethylsulfoniopropionate (DMSP) in coral reef ecosystems, from cells to communities"

ACRS Research Awards:
Eva McClure (JCU)
"No-take marine reserve performance under varying anthropogenic and environmental influences"

Sun Kim (UQ)
"The effect of changing climate on reproductive, physiological and genetic traits of corals"

Kennedy Wolfe (USyd)
"Anthropogenic impacts on tropical echinoderms of the Great Barrier Reef"

This year ACRS funded 36 travel awards for students attending the *2016 International Coral Reef Symposium* in Hawaii, USA. The ARC Centre of Excellence for Coral Reef Studies was a generous co-sponsor of 12 of these awards.

The ACRS Medal

ACRS will award a Medal (called **"The ACRS Medal"**) to either an Australian Established Researcher (ER, over 10 years since PhD awarded) or an Early Career Researcher (ECR, 10 years or less since PhD awarded), based on their contributions to science and conservation of Australian coral reefs on alternating years.

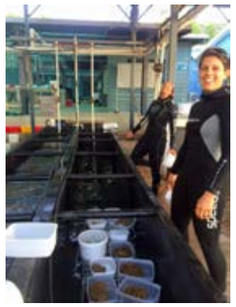
The 2015 ECR Awardee was Dr Nick Graham for his contribution to the study of large-scale ecological coral reef issues iincorporationg social and economical perspectives.

Congratulations Nick!

Orpheus Island Research Station


Aboriginal and Torres Strait Islanders in Marine Science (ATSIMS) program

Humpbacks in Pioneer Bay



Natalia Andrade & Wiebke Wessels

Natalia Andrade & Aurelie Moya. Tess Hill in the background

MB3210 coral ninjas

2015 has been a remarkable year for James Cook University's Orpheus Island Research Station. We are very proud to have hosted a diverse range of research including studies that examined:

- The recovery of benthic communities from Yasi,
- Role of herbivores in phase shifts,
- Interrelationships of fish and coral,
- Habitat use of sharks and rays,
- Coral disease,
- Coral genetics,
- Impact of stress on the calcifying machinery of corals,
- Effect of sedimentation on sponges

OIRS By the numbers:

Supported 19 research projects this year
Hosted 351 tertiary education students
Hosted 229 school students

We have been working hard to extend our reach to students from all disciplines. This year we were excited to host the future town planners of Australia from JCU's Environmental and Regional Planning course. The students were able to see first hand the implications of previous planning decisions in the Hinchinbrook region and were able to discuss how future developments can strengthen rather then damage its natural resources.

An international contingent of student's descended on the OIRS for the annual Masters of Development Practices intensive. It was a fascinating week as many of these students are already working to monitor and manage marine resources in places like Raja Ampat, Lombak, Bali and Vietnam. There was fantastic dialogue between the students, generous sharing of ideas and many stories of the various successes and challenges they have each faced whilst striving for conservation and sustainable resource management.

The Aboriginal and Torres Strait Islanders in Marine Science (ATSIMS) program delivered another inspiring expedition to OIRS. ATSIMS provides an engaging field-based science program to predominately Indigenous high school students with an aim of bolstering interest in tertiary studies in marine science. There is no substitute for seeing things first hand and we all remember our first snorkel on a reef, the first turtle our first glimpse of the elusive reef shark. These experiences ignited something in all of us and by the looks on the student's faces it certainly inspired them as well.

And finally, I have recently joined the OIRS team as the new station manager. For those that don't know me I am Dr. Jimmy White. I have been coordinating education and research teams for national universities, international non-government organizations and documentary companies for the last 10 years. I came directly to OIRS from the Antarctic Peninsula where I was joining Lindblad National Geographic on a month long expedition. The acclimatization was extreme to say the least.

My research interests focus on the use of novel technologies (acoustic telemetry, satellite tracking, baited remote underwater surveys) to investigate and answer complex ecological questions, documenting distributional overlaps between key species and anthropogenic impacts (e.g. compliance to regulation, commercial fishing, traditional use, habitat alteration or destruction) and the efficacy of marine park zonation to protect large mobile species.

In 2005, I came to OIRS and it was a highlight of my undergraduate at JCU. To come full circle and return here in 2016 as the manger is surreal and truly hasn't sunk in yet. I look forward to continuing to develop our education programs and facilitating your research here on OIRS.

Jimmy mugshot

Lizard Island Research Station (Australian Museum)

Lizard Island has taken a battering over the past few years: a COTS outbreak between 2010 and 2015, direct hits by two category 4 cyclones in consecutive years (Ita in 2014, Nathan in 2015) and now major coral bleaching. Virtually all corals shallower than 15 metres have some level of bleaching, many are stark white, and many have died. It is the same at all reefs in the area, inshore to outer reef. Surface water temperatures peaked in the last week of March but this event will clearly continue to play out for many more weeks.

Despite the devastation, research continues at the usual high level. In 2015, researchers from 38 institutions in 10 countries conducted 149 research projects, and 111 new publications were added to the LIRS contributions list. The Lizard Island Reef Research Foundation's web site, lirrf.org, provides frequent updates about research at LIRS and issues affecting the Reef.

Support for research also continues, thanks to the LIRRF. Three new postdoctoral fellowships and two new PhD fellowships have been awarded for 2016. The latter now include funding to enable the Fellows to present at an international conference in the second year. Grants for research aimed at controlling COTS populations started in 2015, thanks to a grant from the Ian Potter Foundation. A new single-shot control method using household vinegar has already resulted from this program. Many projects on COTS larvae were underway at the end of 2015 that will help our understanding of that crucial phase of the life cycle. More COTS grants have been awarded for 2016 and we are open to practical proposals any time this year.

Lizard Island Field Guide (lifg.australianmuseum.net.au/) is an open-ended project that aims to document all life in the area. It now includes nearly 1,500 species, is growing all the time, and free mobile applications are available.

New equipment obtained in 2015, thanks to the LIRRF, include a new tractor, a new dinghy, refurbishment of the Purves Lab, and new boat motors.

Dr Anne Hoggett & Dr Lyle Vail, Directors

Lizard Island Research Station

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Email: lizard@austmus.gov.au

Web: www.australianmuseum.net.au/Lizard-Island-Research-Station

Severe bleaching in the Lizard Island lagoon, 2 April 2016

Bleached and partially dead *Acropora*, Lizard Island lagoon, 2 April 2016.

COTS research continues at LIRS despite population crash in 2015.

Kimberley Marine Research Station, Cygnet Bay

The new year will be a busy one for KMRS. Milly Piggott, a PhD candidate from UWA, has returned to Cygnet Bay to continue her fish recruitment field work in the area, as well as to coordinate the intern program. Internships at KMRS are a relatively new initiative, and Milly has agreed to develop a structured program and new monitoring projects in the area. Interns will now be present year round focusing on both the oyster spawning for the pearl farm as well as the monitoring programs. Interns will also be available to visiting researchers for assistance in the field and lab.

One of the projects KMRS will be establishing is coral bleaching and health monitoring. Little research has been done regarding the corals that experience the extreme tidal changes around Cygnet Bay, and with this program KMRS will be able to create a baseline of coral data and track changes in the corals in the area. Verena Schoepf, researcher from University of Western Australia will be returning to continue her studies of corals in the area as well.

KMRS has deployed settlement plates around Cygnet Bay to determine the spatial and temporal variation in settlement of rock oysters. The study will evaluate the feasibility of commercially harvesting rock oyster species that occur naturally in the area.

A partially bleached branching coral in the Cygnet Bay area

Camera units: RUVS used by Milly Piggott and AIMS for fish recruitment studies.

Coral recruitment frame at Jalan Island near Cygnet Bay used by AIMS and Bardi Jawi Rangers for sampling coral settlement.

HERON ISLAND RESEARCH STATION

UQ researcher Dr Dorothea Bender tending to her coral and algae experiment

PhD candidate Katie Hillyer prepares her experimental coral samples

PhD candidate Katie Hillyer collecting corals on the reef flat

It was another busy year for research on Heron Island. With visitation increasing, we were kept busy with the ever changing needs of our researchers. We welcomed back many station regulars and also had the pleasure to welcome some new researchers to the island for the very first time.

The facility supported a wide array of research: from embryonic turtle studies, to the role of sea cucumbers, oceanographic studies and a range of climate change experiments. We welcomed Dr Michael Lesser from the University of New Hampshire who is studying nitrogen fixing in prokaryotes, while PhD candidate Laura Stoltenberg was a regular visitor as she undertakes her studies on carbonate sediment dissolutions. Coral spawning was a hectic time with researchers from Southern Cross University, University of Technology Sydney, Scintillon Institute and Griffith University all on site for the annual event. It is always exciting for the research station staff to see what experiments and studies will be occurring next and what role we can play to support them.

Keeping the facility to a high standard was a focus in 2015 with the station undertaking a large round of maintenance works. We also invested in new equipment and upgrading major assets, such as the rigid hull inflatable vessels. This work will allow us to continue to support our many researchers and their diverse activities.

We like to keep in touch throughout the year so keep an eye out for communications through our mailing list (sign up at http://lists.science.uq.edu.au/mailman/listinfo/island-research-stations) and updates on our website (http://www.uq.edu.au/heron-island-research-station/content/whats-happening). This year we also launched our Instagram account (@heron_island_research_station) to share with the wider community the beauty of this incredible place and to allow them to engage with the exceptional research occurring. We hope to be able to share more images of your research in 2016.

This coming year promises to be busy and productive. We look forward to seeing you back on the station and sharing with you the projects being undertaken as we continue to grow.

PhD candidate Sean Williamson measuring green turtle eggs

Elizabeth Perkins
Station Manager
Heron Island Research Station

MORETON BAY RESEARCH STATION

Loggerhead sea turtle wearing one of PhD student Owen Coffee's custom made faecal collection devices. Photo by Kathy Townsend

Kangaroos resting outside of Moreton Bay Research Station. Photo by Lucy Trippett

Moreton Bay is a population hot spot for the recently described Australian humpback dolphin (*Sousa sahulensis*). Photo by William Loh

2015 was an award winning year for MBRS, both for our researchers and staff. MBRS staff received multiple awards, given for achievements ranging from innovation through to wellness and safety. MBRS associated researchers Dr Chris Roelfsema, Dr Qamar Schuyler and Dr Kathy Townsend, all received Healthy Waterway Awards for work done on Moreton Bay's marine flora and fauna; Dr Roelfsema for his work on coral reef monitoring, and Drs Schuyler and Townsend for their work on the impact of marine debris on sea turtles.

Moreton Bay Research Station has been in the news this year, particularly in regards to some exceptional research. The news item about "turtles in swimsuits", highlighting the research of The University of Queensland (UQ) PhD student Owen Coffee, officially went viral. Owen is investigating the diet of adult loggerhead sea turtles. To do this, he holds the animals for 72 hours to collect their faeces. To assure that the entire sample is retained, faecal collecting devices were made out of second hand rash vests and a canvas collection bag. The story was featured in most major news outlets around the world, shared millions of times on social media and translated into multiple languages. It successfully raised the profile of Owen's work and the research station internationally.

Since its deployment in 2013, MBRS have maintained the Moreton Bay Array contributing data to the IMOS - AATAMS network which is of benefit to many researchers. A number of research projects have used the data collected this year. For example, JCU PhD student Daniel Zeh asked whether acoustic tracking is appropriate for air breathing marine mammals. Griffith University PhD student Chris Henderson is currently using the array to investigate the effectiveness of marine park protected areas.

Moreton Bay has been identified as one of the last remaining strongholds of the recently described Australian humpback dolphin (*Sousa sahulensis*). Ranked as a critical priority by DEHP, researchers working from MBRS, Dr Ina Ansmann (UQ) and Dr Liz Hawkings (Dolphin Research Australia), have been studying their habitat use and population dynamics within the region to improve conservation efforts around the species.

For more information on news and events at the Research Station, you can visit our web page (https://www.uq.edu.au/moreton-bay-research-station/content/whats-happening), sign up to our mailing list (http://lists.science.uq.edu.au/mailman/listinfo/island-research-stations) or follow us on our Facebook page (https://www.facebook.com/MoretonBayResearchStation/). We look forward to an exciting and productive 2016, filled with even more opportunities for collaboration, research and education and hope to welcome you back on Station in the near future.

Kevin Townsend
Station Manager,
Moreton Bay Research Station

Coral Bay Research Station

New signage highlighting our manta ray research activities.

Aerial view of the Coral Bay Research Station (foreground) at Coral Bay, Ningaloo Reef (photo courtesy of David Carter).

2015 was an eventful year for the Murdoch University's Coral Bay Research Station, with two cyclones passing directly over us and causing significant damage to the town of Coral Bay. Our station manager, Frazer McGregor, is also head of Emergency Services in the town, and headed up the clean-up and reconstruction efforts, allowing the town to re-open for tourists within a week; Frazer deservedly received special recognition from WA's Department of Fire and Emergency Services for his leadership. The station received some damage, with the roof of the patio area blown off. In spite of the serious damage to many parts of the town, repairs to the station were completed quickly and the station was operational throughout.

We were very busy throughout the year, with major international projects including Van Oord's Reef Guard coral rehabilitation program completing its final year of sampling with two months in Coral Bay during the coral spawning season. The one-year post-settlement monitoring program will end mid-2016. The Flinders University/Murdoch University Northwest Cape dolphin project also finished up at the end of 2015, ending three years of sampling. This project used the station Hilux and one of our boats for a six-month annual field campaign for three years, operating out of Exmouth.

We were excited to achieve success in a University of Queensland led ARC Linkage project studying manta ray distribution and ecology. The Coral Bay Research Station will be the WA base for this project, which aims to expand our knowledge of manta ray distribution to include the unstudied northwest of Australia, finally linking and filling in the gaps between the extensive datasets available for Coral Bay, Queensland and Indonesia. Key industry support from Austral Fisheries, the MG Kailis Foundation, Ningaloo Marine Interactions, Lady Elliot Island Eco Resort, and the Earthwatch Institute and collaboration between the University of Queensland, Deakin University and Murdoch University will expand our existing manta ray research program. A spin-off from the project includes twice-yearly Earthwatch expeditions to the station, providing additional data collecting opportunities and student support.

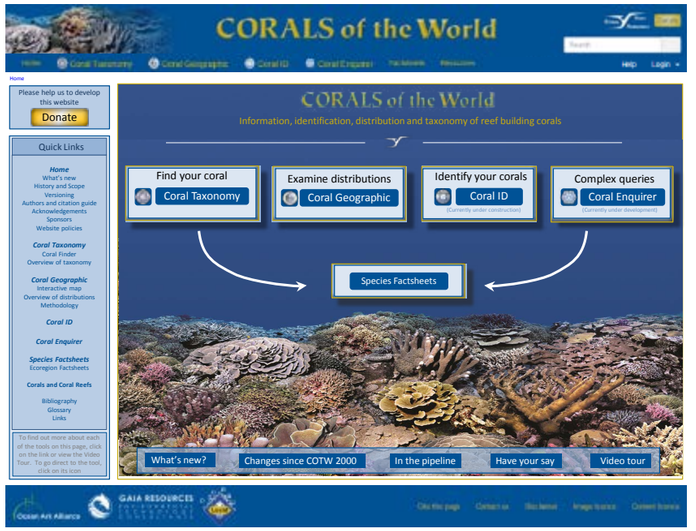
Numerous smaller projects used the station and its facilities throughout the year, as well as a repeat survey of Ningaloo Reef by the Reef Life Survey team from the University of Tasmania. We also had two university marine biology courses operating out of the research station, providing opportunities for undergraduate students to undertake field-based learning activities in a coral reef environment. The proximity of healthy, high-cover coral reef within wading distance of the shore makes Coral Bay an ideal location for undergraduate reef ecology studies.

2016 is shaping up to be another busy year, with a major coral spawning study underway led by Chris Doropoulos from CSIRO, and several student projects. The station has available accommodation for small groups, basic office and laboratory facilities, including a small library, three boats and a 4WD Hilux. Follow our news and activities on Facebook: Coral Bay Research Station and Project Manta WA.

Dr Mike van Keulen, Director, Coral Bay Research Station

Welcome to www.coralsoftheworld.com

Charlie Veron, Mary Stafford-Smith, Emre Turak and Lyndon DeVantier



Password protection will be removed prior to the ICRS in June. For those attending the ICRS this will enable you to preview the site, albeit in draft form, at your leisure.

An hour-long discussion forum will be held at the ICRS

When: Lunchtime, Monday, 20th June

Where: Kalakaua Ballroom, Convention Centre, Honolulu

Who: Everybody interested in corals!

Meeting agenda:

A) Charlie Veron and Mary Stafford-Smith will give a general outline of the website operations including how to get the most out of it, its strengths, weaknesses and future developments. You will get much more out of this if you have done the tour (see below).

B) A question and answer session. We want this to be a two way street. Clearly this is not a forum for discussion of individual taxa but it does provide an opportunity for brainstorming issues, past present and future.

Before you come to this meeting, we encourage you to:

1. Tour of the website by selecting 'Video tour' at the bottom right of the home page. It takes about 15 minutes.

2. Read our accounts of issues of interest.

3. Play with the website. You will find that many components are not yet operational but the following are and details are interlinked:

- **Species Factsheets**
- **Taxon Finder in the Coral Taxonomy menu**
- **Coral Geographic**
- **Explanatory articles, reviews, resource files and information pages of many types**

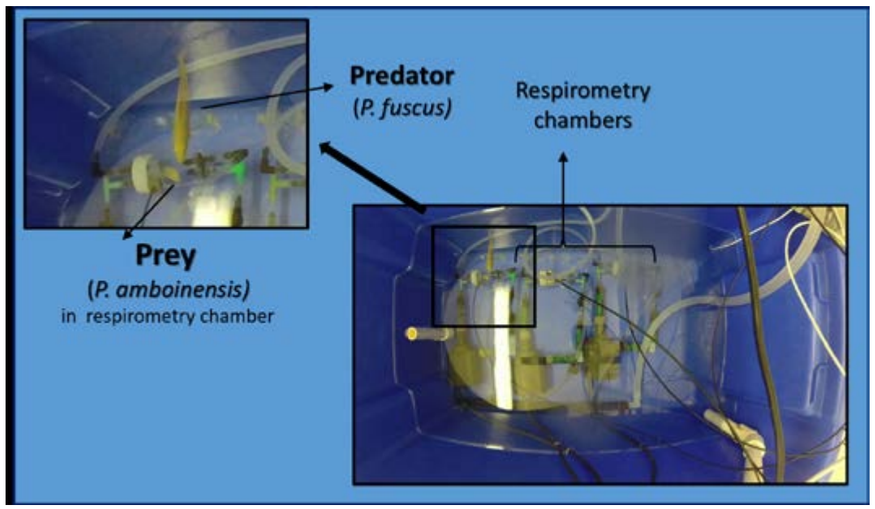
4. Note that the first completed version is still some way off:

- **a. Our full dataset will not be in any component at this time.**
- **b. Major components not yet included will be added sequentially.**
- **c. There will be updates of the whole website when needed.**

If you cannot come to this meeting but would like to contribute comments, information and/or photos, please contact Charlie Veron at j.veron@coralreefresearch.com

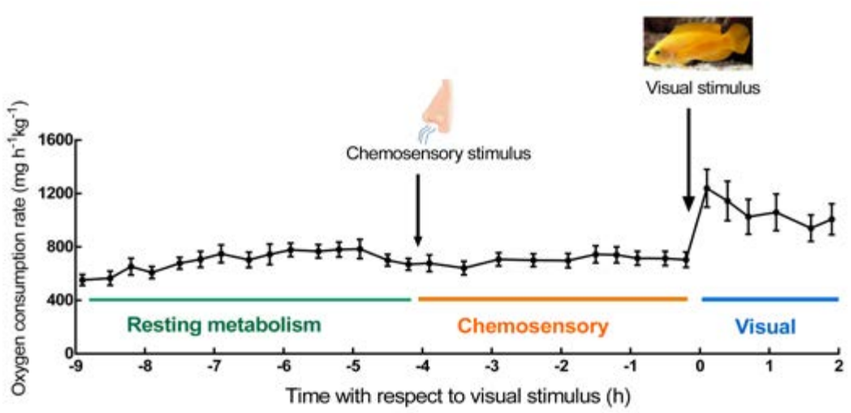
If you can come to this meeting please bring this material with you!

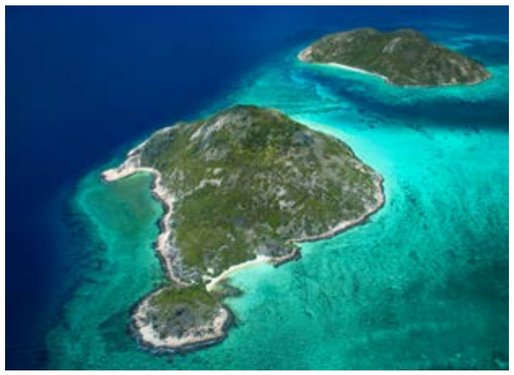
ACRS Members
Submissions



1 Photograph of respirometry experiment setup, showing *P. amboinensis* in respirometry chambers, and the predator (*P. fuscus*) swimming freely in the larger tank. This is an example of the visual predator stimulus.

2 Oxygen consumption of *P. amboinensis* in response to the chemosensory and visual stimulus of *P. fuscus*.





3 View of Palfrey and South Island in the Lizard Island Lagoon. Photo credit: David Hall.

"Seeing is believing"
prey respond metabolically to the visual cue of a predator

From the publication:
Boaden AE, Clark, TD (in press). Seeing is believing: metabolism provides insight into threat perception for a prey species of coral reef fish. *Animal Behaviour.*

Highlights
- **Metabolism aids in understanding of threat-perception in a coral reef fish.**
- **Fish display a metabolic response to visual but not chemosensory predator cues.**
- **Prey fish visually discriminated between predatory and non-predatory species.**
- **Physiological measures help to elucidate sub-lethal effects of predators on prey.**

Responding appropriately to predator threat is a critical survival skill for all organisms. Under-responding can result in death, while continually over-responding can waste precious energy reserves and compromise important life history attributes such as growth and reproduction. This trade-off becomes particularly pertinent in predator-rich environments such as coral reefs, yet almost nothing is known of the sub-lethal physiological responses that coral reef predators elicit in their prey. To address this knowledge gap, we measured the metabolic responses of a common coral reef fish (juvenile ambon damsel, *Pomacentrus amboinensis*) to chemosensory and visual stimuli of a common predator (adult yellow dottyback, *Pseudochromis fuscus*).

This study was conducted at Lizard Island research station, and used intermittent flow respirometry techniques to detect the metabolic response of *P. amboinensis* to the predator. Prey were housed in respirometry chambers, which allowed their oxygen consumption to be measured continuously as they were exposed to various predator stimuli (Figure 1). Since oxygen consumption is a reliable measure of metabolism, this approach allowed us to detect stress-induced increases in metabolism from the predator. We exposed *P. amboinensis* to the scent of *P. fuscus* by flushing the respirometry chambers with predator scented water to test responses to the chemosensory predator stimuli. The visual stimuli was achieved by introducing the predator to the larger aquarium that the respirometry chambers were housed in. This arrangement allowed the prey to see and smell the predator, but not be eaten by it during the experiment (Figure 1).

P. amboinensis did not respond metabolically to the chemosensory stimulus, but increased their oxygen consumption significantly in response to the visual stimulus (Figure 2). We introduced a similar sized a non-predatory wrasse (*Halichoeres argus*) to the tank as a procedural control, and to test whether *P. amboinensis* can visually discriminate between a predatory and non-predatory fish. We observed no metabolic response to the wrasse, and oxygen consumption was significantly lower with the wrasse present compared to the predator.

Data from this study indicate that *P. amboinensis* is adept at detecting predators and responding appropriately. Given that the prey we used were less than a month old, and that the predator and wrasse were similar in size and behaviour, this ability is impressive. These skills could be critical to survival in the wild, since increased oxygen consumption can aid in escape performance, but this "fight-or-flight" response can waste precious energy reserves if unnecessary. This study demonstrates a novel technique for detecting sub-lethal predator effects, and highlights the utility of using respirometry experiments to understanding ecological interactions of coral reef fishes.

What earthquakes can tell us about the future of coral reefs faced with rising seas?

Megan Saunders

Relevant publication: Saunders MI, Albert S, Roelfsema CM, Leon JX, Woodroffe CD, Phinn SR, Mumby PJ Tectonic subsidence provides insight into possible coral reef futures under rapid sea-level rise. *Coral Reefs* **35: 155–167.** http://link.springer.com/article/10.1007%2Fs00338-015-1365-0

Sea level rise of around 1 m is expected to occur by 2100. Coral reefs will be affected by sea-level rise because water level changes environmental drivers of coral distribution, such as periods of inundation and emergence, benthic light availability, and wave action. Coral reefs support the well-being and livelihoods of millions of people worldwide, so it is important to know how changing environmental conditions will affect their distribution and function. Predicting how reefs and other marine ecosystems will respond to the change in sea level is essential to devise science based management strategies for coastal areas.

Sea-level rise may act either as an opportunity or a stressor for coral reefs. Sea level rise may provide an opportunity for reefs which are presently constrained by shallow water – by allowing additional room for corals to colonize and grow. However, if rising seas outpace coral colony growth and coral reef accretion (the process of consolidation of corals, sand, and other materials into a hardened reef structure), then reefs will eventually drown, and no longer provide the functions that people rely on, such as fisheries and wave sheltering. This will be exacerbated if sea level rise causes changes in hydrodynamics or sedimentation on reefs which damage corals.

It is challenging to study sea level rise 'in situ' over ecologically meaningful scales, and most inferences of impacts of sea level rise on reefs come from geologic studies or models. We sought to find a location in the field where relative sea-level rise had occurred – that is, where the land had sunk relative to the sea surface. Large subduction earthquakes create these conditions. Where previously locked tectonic plates rupture, they create uplift over one plate, and subsidence on another. If subsidence happens in a shallow coastal area, the water level deepens.

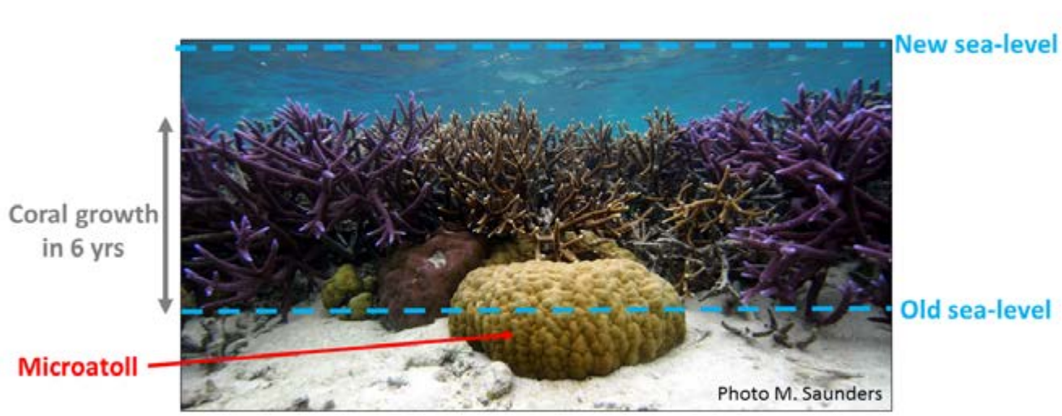
In April 2007 a magnitude 8.1 megathrust subduction earthquake occurred in Roviana Lagoon, Solomon Islands. Solomon Islands is a small Pacific Island nation located east of Papua New Guinea. The majority of people live a subsistence lifestyle based on rich marine resources. Subsidence of up to 1.5 m occurred over a relatively pristine coral reef flat as a result of the earthquake. In the years following subsidence local fisherman noted significant changes in the coral reef in the subsidence zone. In May 2013 we went to Roviana Lagoon to measure how the reef had changed in response to relative sea level rise.

We estimated the magnitude of subsidence by measuring the depth of microatolls. These are coral colonies which become flattened when their upward growth is constrained by low water levels, but resume upwards growth at the living edges of the colonies when sea level rises. Measuring the depth of the flattened surface relative to the new water depth allowed us to infer the magnitude of subsidence. The reef at our study site subsided by approximately 60 cm as a result of the earthquake, corresponding roughly to the magnitude of sea-level rise anticipated this century from climate change.

We then measured the change in the area of patches of dense live coral living on the coral reef flat. To do so we used satellite imagery from before (2003, 2006) and after (2009, 2012) the earthquake which were informed by field data collected during our field work. Live coral area doubled following subsidence, suggesting that increased water depth was beneficial for corals.

We then examined in detail areas of the reef flat which were occupied by dense live hard coral before and after the earthquake, areas which did not have much coral before and after subsidence, and areas of the reef which switched from non-living pavement before subsidence to live coral after subsidence. This allowed us to tease apart factors associated with reef response to deepening water. Areas that were more species diverse were not more likely to "turn-on" reef growth in response to deeper water. Conversely, areas of the reef which responded to relative sea level rise had lower species diversity, dominated by weedy coral species like *Acropora*. This suggested that the identity of species was more important than the number of species present in the community in determining ability to respond to environmental change. It also suggested a reorganisation of the reef flat community in response to deeper water.

Our study demonstrates that sea level rise can provide an opportunity for coral reef flats – if other environmental conditions are suitable. The next logical step in this research will be to identify how other stressors –such as pollution, warming temperatures, or overfishing – will affect the ability of coral reefs to respond to rising seas.



A *Porites* microatoll and branching *Acropora* in Roviana Lagoon, Solomon Islands, 6 years after a magnitude 8.1 subduction earthquake cause 60 cm subsidence on a relatively pristine reef flat. Coral on the reef flat expanded vertically and horizontally in response to deeper water. (Image Megan Saunders)

A Game of Thorns

Alternative control methods of Crown-of-Thorns outbreaks

From the publication: Boström-Einarsson, L. & Rivera-Posada, J. Controlling outbreaks of the coral-eating crown-of-thorns starfish using a single injection of common household vinegar. Coral Reefs 35, 223–228 (2016). Available online: doi http://dx.doi.org.elibrary.jcu.edu.au/10.1007/s00338-015-1351-6

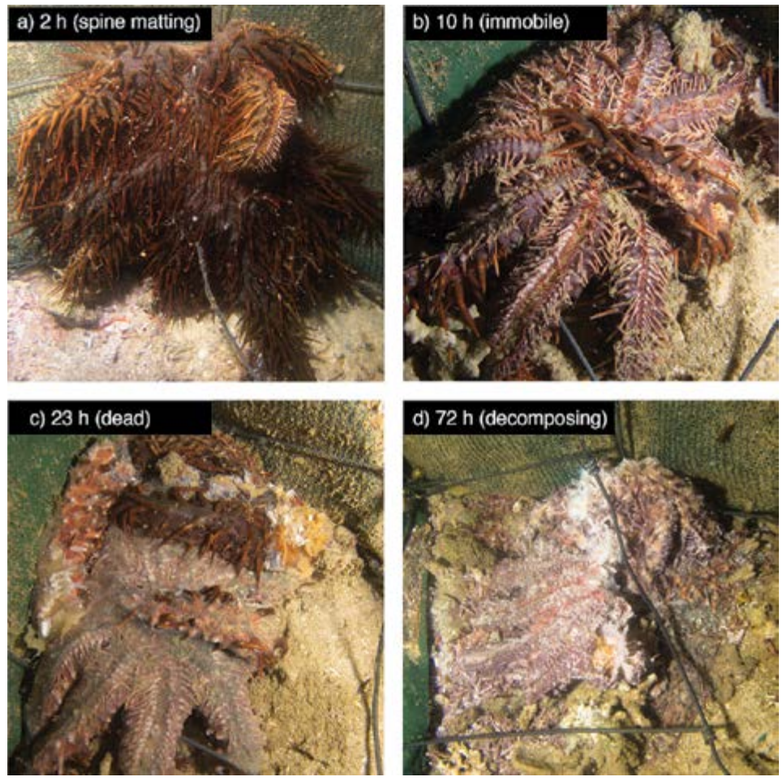
A recently published article by Lisa Boström-Einarsson and Dr. Jairo Rivera-Posada describes how normal household vinegar can be used in lethal injections of the crown-of-thorns starfish (COTS, *Acanthaster planci*). A single injection of 20ml of regular white vinegar at the base of the arm kills the starfish in less than 48 hours, with a 100% mortality rate. The method is equally effective as the current injection methods using bile salts, with the added benefit of being easy to access and use.

COTS Outbreaks

Outbreaks of the coral eating crown-of-thorns starfish are by now a familiar topic to most people who have a connection to the coral reef environment. In short, when populations of the highly fecund starfish explode, reefs can be stripped of their live coral cover in a matter of a few weeks. The current outbreak on the Great Barrier Reef (GBR) in Australia is the fourth recorded wave of starfish since the 1960's. COTS outbreaks are however a phenomenon which plague the entire Indian and Pacific Oceans. In fact, there has been records of outbreaks on most coral reefs in the region in the past few decades.

Control efforts

While the ideal solution to the COTS problem is to stop the outbreaks altogether, this may be easier said than done. To start with, there are significant knowledge gaps in what causes the outbreaks, and without knowing the exact cause it is difficult to address the problem. What we are left with are direct control efforts, those that manually remove COTS individuals one-by-one. This is a daunting task when faced with hundreds of thousands, if not millions of COTS in active outbreak areas. Previously employed methods involves manually removing individuals for disposal on land, cutting them into little pieces, fencing around select sites and injection with various chemicals. If these methods sound labour intensive and therefore expensive - it's because they are! Direct control methods are best viewed as a localised band-aid method, a way to save individuals reefs of particular importance. It is in this capacity they can be a highly effective tool to ensure specific reefs are safe from the barrage of encroaching starfish.



Degradation of the crown-of-thorns starfish *A. planci* after injection with regular household vinegar. Starfish injected with vinegar displayed a matting of the spines in the first few hours post-injection (a), followed by immobility (b), tissue necrosis and death (c). Decaying bodies of *A. planci* were often covered in a thick bacterial film in less than 24 hours post-injection (d).

Lead author Lisa Boström-Einarsson demonstrating injection method at Lizard Island Research Station.

Currently the preferred method for controlling starfish is by injection of a dilute bile salt solution, a bovine derivative of the cattle industry. The technique is deadly to starfish when administered underwater using agricultural injection guns. The development of this method represented a major improvement on previous methods in terms of effectiveness at killing COTS and efficiency of administration. However, access to bile salts can be difficult, subject to quarantine restrictions and require precise dilutions, mixing and storage. While this method has been successfully employed in countries with the ability to invest in large-scale control efforts, most developing countries with large reef areas lack the expertise and funding to implement effective control programs using bile salts.

Vinegar

We wanted to develop an alternative to oxbile with similar efficiency but that was easier to access, handle and store, as well as being more cost-effective.

Lead author Lisa Boström-Einarsson injecting starfish in Papua New Guinea

We tested the effectiveness of regular household vinegar as an injection chemical of COTS on two populations, in Papua New Guinea and Australia. We found that 20 ml of vinegar injected at the base of the arm stops the starfish from moving or feeding in <24 hours (ie 'functionally dead'), followed by complete mortality in <48 hours. We furthermore tested the safety of the injected COTS to other marine organisms in a transmission tank-experiment. 27 reef-associated species known to feed on or interact with decaying COTS were placed in tanks with injected starfish. No mortalities or signs of adverse effects were recorded in any organisms.

This study demonstrates that vinegar can be used as an effective method to cull crown-of-thorns starfish. The method provides a safe, cheap and widely available method specifically aimed at remote communities and/or developing countries where oxbile is not a feasible method. The vinegar-method to cull COTS is currently being used in Indonesia, the Maldives, Vanuatu and Papua New Guinea.

Deadly and beautiful! Close up of the spines of *A. planci*

Polychaete diversity at Lizard Island revealed

Pat Hutchings & Elena Kupriyanova,
Australian Museum Research Institute, Australian Museum, Sydney

Bispira manicata (Family Sabellidae) Photographed underwater at Lizard Island, with its feeding crown exposed Photo: Alexander Semenov

Composetae marmarata (Family Nereididae) photographed alive in the lab showing the distinctive front end of this polychaete, Photo: Chris Glasby

Lanice viridis (Family Terebellidae) photographed alive in the lab, after being removed from its tube, with its striped buccal tentacles fully extended and tufted brownish gills. Photo: Alexander Semenov

Coral reefs are characterised by a wide diversity fish and corals, yet many other groups, especially polychaetes, that are abundant and very common in the sediment, in amongst dead coral substrates, and algae/seagrasses on the reef, tend to be fairly cryptic. While large brightly-coloured spiralled radiolar crowns of the serpulid *Spirobranchus spp.* colloquially known as Christmas tree worms are commonly seen associated with live coral on reefs round the world, most reef-associated polychaetes are virtually invisible. While polychaetes are not very conspicuous on the reef, they play an important role in coral reef ecosystems, from bioturbating inter-reefal sediments, breaking down detritus, boring into dead coral creating habitats for many cryptofauna to serving as an important source of food for many species of fish, molluscs and crustaceans.

Polychaetes also have been widely used as pollution indicators in many marine habitats (reviewed by Dean 2008), but not much on coral reefs. As coral reefs are becoming increasingly impacted by climate change and declining water quality, especially in inshore waters, we suggest availability of good pollution indicators of the reef health becomes crucially important. Experimental studies have shown that the composition of polychaete communities associated with dead

Hydroides lirs (Family Serpulidae), worm extending from its calcareous tube embedded in coral substrate, revealing its branchial crown and modified filament forming an ornate operculum which when the worm contracts seals off its tube. Photo: Alexander Semenov

Odontoysllis marombiboor (Family Syllidae) Photographed alive in the lab, a few mm in length, voracious carnivore, with distinctive red eyes. Photo: Alexander Semenov

coral substrate change from inshore waters out to the outer barrier and into the Coral Sea (Hutchings et al. 2005; Osorno et al. 2005) associated with sediment levels in the water column. The current bleaching events occurring on the Great Barrier Reef will lead to an increase in the amount of dead coral substrate available for colonisation by boring communities which are dominated in their early stages by polychaetes (Hutchings 2011, Hutchings et al. 2014). What really prevents us from using polychaetes in monitoring the health for coral reef communities is our very limited data on diversity of coral-reef associated polychaetes. But help is at hand at least for the Great Barrier Reef polychaetes.

The Directors of the Lizard Island Research Station Dr Anne Hoggett and Dr Lyle Vail came up with an ingenious solution by proposing a polychaete workshop at Lizard Island immediately following the 11th International Polychaete Conference held in Sydney in August 2013. The workshop was supported by a grant from the Lizard Island Reef Research Foundation, which covered airfares, bench fees and subsistence for the researchers as well funds to cover open access of the resulting publication.

As a result of a two-week workshop involving 16 polychaete researchers from seven countries, 26 taxonomic papers have been published in an 800 page Zootaxa special volume with open access (Hutchings & Kupriyanova, 2015). This publication describes 91 new species from in 23 polychaete families, 67 new records for Lizard Island and the Great Barrier Reef, together with lists of previously reported species from the island, as well as keys and numerous illustrations to make it easier for non-specialists to identify their polychaetes.

This workshop really highlighted the value of hosting such dedicated workshops with 1640 lots of polychaetes collected from 121 sites around Lizard and surrounding areas. The participants ranged from well-established to early career researchers as well as a PhD student, to allow mentoring of the next generation of polychaete taxonomists. We also invited a professional photographer who worked with us in the field and in the laboratory taking photos of live specimens which were included in many papers. These photos and brief descriptions of the species will be uploaded into the Lizard Island Field Guide (http://lifg.australianmuseum.net.au/Hierarchy.html?hierarchyId=PVWrQCLG)

Polychaete diversity at Lizard Island revealed

Continued

In addition to revealing large numbers of previously unknown species, the workshop also highlighted the fact that this study really only represents the tip of the iceberg and many more species remain to be described in other polychaete families that were collected during the workshop, but not worked up. Over the next few years many papers documenting the polychaete fauna at Lizard Island will continue to appear. We are also encouraging other polychaete taxonomists to borrow the material collected and work up other polychaete families.

References:

Dean, H. 2008. The use of polychaetes (Annelida) as indicator species of marine pollution: a review. Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744) Vol. 56 (Suppl. 4): 11-38.

Hutchings, P.A., 2011. 'Bioerosion'. Hopley, D. (ed). Encyclopedia of Modern Coral Reefs–Structure, Form and Processes, Springer–Verlag, Berlin, Heidelberg, pp. 139–156

Hutchings, P.A., Peyrot–Clausade, M. & Osorno, A., 2005. Influence of land runoff on rates and agents of bioerosion of coral substrates. Marine Pollution Bulletin, 51: 438–447.

Hutchings, P.A. & Kupriyanova, E. 2015. Coral reef-associated fauna of Lizard Island, Great Barrier Reef, polychaetes and allies. (editors) Zootaxa Special Volume. 4019(1): 1-801 http://www.mapress.com/zootaxa/list/2015/4019(1).htm

Hutchings, P., Peyrot–Clausade, M. & Stuken, A., 2014. Internal macrobioerosion on five species of Acropora following the 1998 bleaching event: Implications for the long–term impact of bleaching on the Great Barrier Reef. Pacific Conservation, 19: 409–417.

Osorno, A., Peyrot–Clausade, M. & Hutchings, P.A., 2005. Patterns and rates of erosion in dead Porites across the Great Barrier Reef (Australia) after 2 years and 4 years of exposure. Coral Reefs, 24: 292–303.

Lygdamis nasutus (Family Sabellariidae)
Photographed alive in the lab having been removed from its compact sandy tube which is firmly cemented to the substrate. Photo: Alexander Semenov

Disparity between projected geographic ranges of rare species: a case study of *Echinomorpha nishihirai* (Scleractinia)

Tory Chase

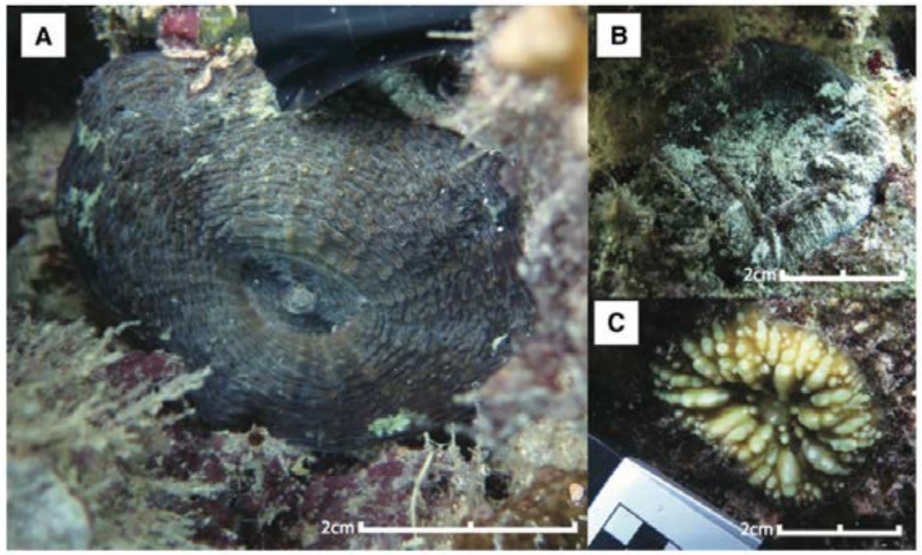
From the publication:
Hoogenboom, M, G Frank, S Blowes, T Chase, K Zawada and M Dornelas (2015). "Disparity between projected geographic ranges of rare species: A case study of *Echinomorpha nishihirai* (Scleractinia)." Marine Biodiversity Records 8:e147 (1-8)

Finding rare and cryptic species is a challenge!

As part of an extensive study on coral spatial distributions, a team of five led by Maria Dornelas and Mia Hoogenboom mapped and identified over 11,000 coral colonies at Lizard Island. Among these corals, a single corallum of the rare species, *Echinomorpha nishihirai*, was recorded; only one other published study has reported this species occurring on the northern GBR.

Rare and cryptic species can easily be missed during ecological surveys of coral communities. Not only are they one in a thousand, but they can be small, hidden, and easily pegged as another common species by untrained observers. It's like they don't want to be found! As a result, there is, of course, a disparity between the reported geographic range and the actual range of rare species in terrestrial and marine environments. The discrepancies in the species ranges reported in online databases are much greater for rare, compared with common, coral species. Species can be rare due to geographic range, habitat specificity, competitive ability, etc. Range maps and databases need to be continually updated leading to benefits for the field of biogeography on the whole.

Rare species can be difficult and painstaking to find, but the greater the challenge, the greater and more satisfying the reward. And in this case, the reward was a tiny, single, (ugly) green/grey coral. What a find!



A Solitary *Echinomorpha nishihirai* in a crevice on the reef crest between South and Palfrey Islands within the Lizard Island group.

B Solitary *Scolymia australia*.

C Singular polyp of *Lobophyllia pachysepta* from the same reef and similar habitat.

Ocean acidification is already suppressing reef calcification

Kennedy Wolfe

From the publication:
Albright R, Caldeira L, Hosfelt J, Kwiatkowski L, Maclaren JK, Mason BM, Nebuchina Y, Ninokawa A, Pongratz J, Ricke KL, Rivlin T, Schneider K, Sesboue M, Shamberger K, Silverman J, Wolfe K, Zhu K, Caldeira K (2016). Reversal of ocean acidification enhances net coral reef calcification. Nature, DOI: 10.1038/nature17155.

The pink seawater solution being pumped onto the reef flat (photo credit: Rebecca Albright)

Experiments on ocean change stressors such as warming and acidification have been at the forefront of coral reef research over the past few decades. Understanding the impacts of such stressors on coral reef ecosystems is pivotal for the establishment of appropriate and effective management strategies both today and into the future. New findings from an experiment conducted in the lagoon of One Tree Island, provide evidence from a natural reef setting that ocean acidification is already suppressing the growth of coral reefs.

The growth of coral reefs through time exists as a delicate balance between reef construction and reef destruction. Due to changes in seawater chemistry the calcification process will become increasingly difficult for marine organisms that calcify skeletons and shells. As a result, it is predicted that due to ocean acidification, coral reefs could switch from a state of net calcification to net dissolution sometime this century.

In the first study of its kind, a team of research scientists led by Rebecca Albright and Ken Calderia from the Carnegie Institution for Science, Stanford USA, and joined by the University of Sydney's Kennedy Wolfe, performed the first experimental manipulation of seawater chemistry in a natural coral reef ecosystem. Previous climate change studies on coral reefs have typically been conducted in the laboratory or closed-system mesocosms on the reef. They were able to document the natural 'real-time' response of a whole reef ecosystem in situ to changing ocean chemistry. Understanding this is essential when trying to predict how coral reefs may fare in the face of continued global climate change.

The yellow tank (right) is where we manipulated seawater to reach pre-industrial levels before pumping onto the reef flat study site (photo

Coral along the reef edge in One Tree Island's lagoon (photo credit: Ken Caldeira)

The University of Sydney's Kennedy Wolfe collecting water samples on the experimental reef flat (photo credit: Ken Caldeira)

The researchers manipulated the alkalinity of seawater flowing over a reef flat in One Tree Island's 'First Lagoon', by deploying a 15,000 L tank, adding sodium hydroxide, then pumping the resulting treatment onto the entire reef ecosystem. They took the reef's pH closer to levels estimated for pre-industrial times, based on estimates of atmospheric carbon dioxide from that era. In doing so, they pushed the reef back in time and were able to quantify reef calcification in response to a reversal in ocean acidification.

One Tree Reef provided the perfect habitat for this experiment, since during low tide, seawater slowly flows from inside the ponded lagoon across the reef flat towards deeper water. As a result, the researchers were able to pump their treatment on the inside of the lagoon and measure the reef response or "uptake" as the treatment crossed the reef flat.

By comparing calcification rates between current conditions (lower in pH) and pre-industrial levels (higher in pH), the researchers found that total reef calcification was 7% higher under pre-industrial conditions than those experienced today. Most other ocean acidification experiments manipulate seawater conditions based on pH levels predicted for the coming decades in order to understand the potential effects of future ocean conditions on organism performance. Most of these findings present a bleak reality for coral reef ecosystems in a future ocean. By taking a step back to pre-industrial times, these researchers were able to reveal that ocean acidification is already having a significant impact on the calcification of corals in today's ocean.

From the paper: Ricardo, G. F., Negri, A. P., Jones, R. J. & Stocker, R. That sinking feeling: Suspended sediments can prevent the ascent of coral egg bundles.

Scientific Reports 6, 21567 (2016). doi:10.1038/srep21567

That sinking feeling

G. Ricardo

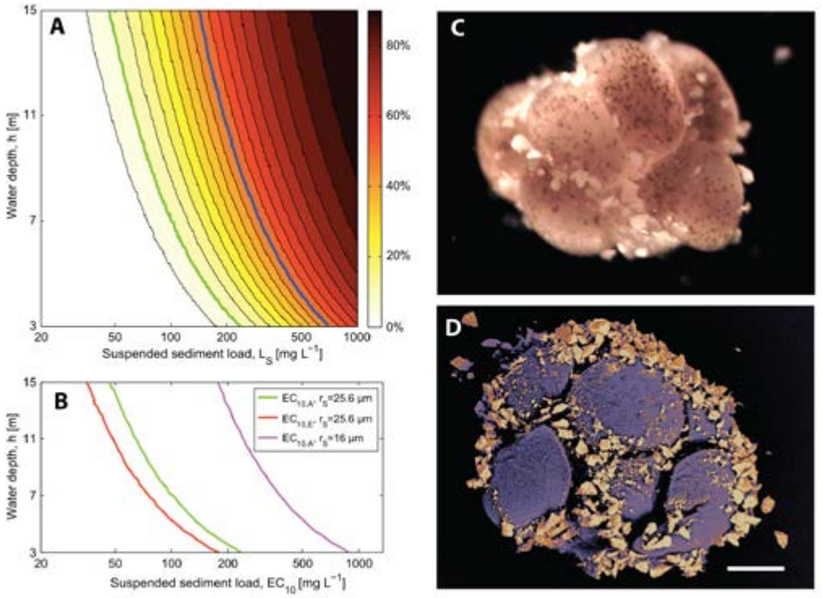


Fig. 1. Predicted reduction in the number of coral egg-sperm bundles reaching the water surface due to sediment ballasting, and microscopy of ballasted bundles after failed ascent. (A) Percent reduction in bundle ascent. Green and blue contours denote the SS loads that reduce successful ascents by 10% (EC10,A) and 50% (EC50,A), respectively. (B) EC10 values for ascent failure (EC10,A; green and purple lines, referring to two different sediment grain radii rS) and encounter failure (EC10,E, red line). (C) Optical microscopy image showing sediment grains attached to a *Montipora digitata* bundle. (D) Coloured backscatter scanning electron microscopy micrographs of *Acropora nasuta* bundle, showing sediment grains in yellow and biotic matter in purple. Scale bar = 200 µm.

Inshore reefs are regularly exposed to elevated concentrations of suspended sediments associated with natural resuspension events, runoff and dredging. While it has been recognised that suspended sediments can negatively impact coral recruitment, the vulnerability of critical reproductive stages prior to fertilisation have not been considered. In a recent paper, we demonstrate a previously unrecognized pre-fertilization mechanism that can markedly reduce the probability that coral gametes reach the water surface (where fertilisation takes place) in the presence of commonly encountered concentrations of suspended sediments.

Synchronised broadcast spawning of gametes is the dominant mode of reproduction in hard corals and the buoyancy of egg-sperm bundles is critical to maximise gamete encounters and fertilization at the ocean surface. We demonstrate that (i) during their ascent to the surface, the bundles can intercept suspended sediment grains that stick to their mucous coating, and (ii) under a broad range of realistic environmental conditions the ballasting effect of the sediment grains is sufficient to cause a sizeable fraction of bundles to sink and never reach the water surface. The detrimental impact of this loss of ascending bundles on egg-sperm encounters is magnified because the bundles carry both eggs and sperm, and the encounter rate is proportional to the product of their respective concentrations at the surface. Even for bundles that remain positively buoyant, reaching the surface is delayed, further reducing egg-sperm encounter probabilities, and hence fertilisation success. Observations of this mechanism are successfully captured by a mathematical model that predicts the reduction in ascent probability and egg-sperm encounters as a function of sediment load, depth and particle grain size. For reefs at 15 m deep, the model predicts that a coarse silt could reduce 10% of egg-sperm encounters at 35 mg L□¹, and for a reef at 5 m deep, reduce 10% of egg-sperm encounters at 106 mg L–1.

This is the first study to examine the effects of environmental pressures on the success of coral gamete ascent, which can have important flow-on effects for the recruitment success of corals following disturbance. This new mechanism intensifies the cumulative risk posed by other sediment and climate stresses on early life history stages of corals and could contribute to recruitment failure on nearby reefs. Furthermore, the mechanism and model we propose provides a blueprint for related processes in other marine organisms, including some echinoderms, molluscs and fish that rely on positively buoyant eggs for fertilization and are thus vulnerable to sediment ballasting.

Scientists discover rare sea snakes, thought extinct until recently, off Western Australia.

Blanche D'Anastasi

***Aipysurus pooleorum*, Shark Bay sea snake.**

Leaf-scaled sea snake.

True sea snakes (Family Elapidae: Subfamily Hydrophiinae) are predatory, live bearing, fully marine reptiles that form the most biodiverse group of marine reptiles on earth. There are ~70 species in two evolutionary lineages, the typically reef-associated *Aipysurus* group (11 species) and the typically inter-reefal *Hydrophis* group (>50 species) (Lukoschek and Keogh, 2006). True sea snakes inhabit shallow-water tropical and sub-tropical habitats throughout the Indo-West Pacific (Lukoschek et al., 2013). Australia is a biodiversity hotspot for true sea snakes, with ~35 species (including 11 endemic species) representing both groups. WA hosts 22 species, including nine *Aipysurus* group species, of which five are WA endemics, making it a global hotspot of sea snake endemism.

True sea snakes are chronically understudied and major knowledge gaps remain about their basic biology, ecology, connectivity and capacity for recovery from population declines. Consequently, little is known about the conservation status of sea snakes compared with other marine vertebrates (e.g. fish, mammals, and turtles). Global IUCN Red List assessments of extinction risk of 69 true sea snake species in 2009 classified 34% as Data Deficient (DD), highlighting the need for more knowledge about this group (Elfes et al., 2013). Four species (9%) were classified as threatened with extinction (Critically Endangered, CR; or Endangered, EN). Three of these, *Aipysurus foliosquama* (CR), *A. apraefrontalis* (CR) and *A. fuscus* (EN), are Australian endemics, previously thought to be restricted to a limited number of offshore reefs in the Timor Sea (Fig. 1). The assessment of high extinction risk for these three species was based on the dramatic and largely unexplained near extirpation of sea snakes at Ashmore Reef between the mid-1990s and 2010 (Guinea, 2007, Lukoschek et al., 2013).

A. foliosquama, the leaf-scaled sea snake and *A. apraefrontalis*, the short-nosed sea snake, were thought to be restricted to Ashmore and neighbouring Hibernia Reef (Lukoschek et al., 2013). They have not been recorded from either reef since 1998 and were listed CR under Australia's Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999) in 2011.

Rare sea snakes cont'd

Both species were presumed extinct, however, with a handful of records from coastal WA, there was a glimmer of hope, that there might be undiscovered populations. In 2013, Blanche D'Anastasi set out to address major knowledge gaps for true sea snakes in WA. She also wanted to see if she could find the missing sea snakes.

In collaboration with WA Department of Parks and Wildlife (WA DPaW) and WA Department of Fisheries (WA DoF), Blanche undertook SCUBA diving, snorkelling, manta-tows, low tide walks and created the Australian Sea Snakes national sighting program, to document the distribution and connectivity of true sea snakes.

Whilst out on a WA DoF vessel in Shark Bay in 2013, Blanche captured two little sea snakes. An assessment of the scale shapes and DNA showed that these were leaf-scaled sea snakes – one of the two species thought extinct. An ongoing collaboration with WA DoF led to the discovery of total of 15 leaf-scaled sea snakes, indicating that a breeding population was present.

Short-nosed sea snake, Exmouth Gulf (Ningaloo)

The discovery was profound, because it provides a second chance to protect a species thought extinct. The story becomes even more interesting, as the sea snakes were discovered in the lush seagrass beds of subtropical Shark Bay, some 1400 kilometres south of the snakes only known habitat in the Ashmore Reef complex. "We had thought that this species was only found on tropical coral reefs. Finding them in seagrass beds at Shark Bay was a real surprise. In future surveys for *A. foliosquama* definitely need to include seagrass and nearby habitats. This will help to get a more realistic sense of where these sea snakes are and what other kinds of habitat they require. Then we can focus our efforts on protecting the right places and the right habitats from human impacts." says Ms D'Anastasi.

A second extraordinary discovery occurred when WA DPaW Officer Grant Griffin, sent a photo of a pair of snakes taken on Ningaloo Reef to Ms D'Anastasi for identification in April 2013.

"We were blown away, these potentially extinct snakes were there in plain sight, living on one of Australia's natural icons, Ningaloo Reef," says Ms D'Anastasi.

"What is even more exciting is that they were courting, suggesting that they are members of a breeding population and hopefully producing the next generation of short nosed sea snakes."

Whilst these findings are exciting and provide incredible incentive to protect these two small range native species, reducing the effects of threatening processes and preventing future declines of sea snakes will be an ongoing challenge. The unexplained near extirpation of sea snakes from Ashmore reef highlights this challenge and demonstrates that marine reserves alone cannot prevent sea snake extinctions. Further research is required to understand what the key threatening processes are to sea snakes and how they cause populations to decline.

Undertaking the research required to find out what is making sea snakes decline will take time, but there are things that can be done in the meantime to better protect sea snakes. Examining the cumulative effects of existing human impacts, such as coastal and marine developments, will help determine how threatened particular populations or species might be.

It is also crucial to have a look at what developments are proposed in the future in areas where these two species of sea snakes occur. If there is a chance that these developments will significantly affect these critically endangered snakes, they need to be referred to the Commonwealth Environment Minister for further assessment and for public consultation, to determine how to prevent impacts.

Blanche's penultimate goal is to work with state and federal government agencies to prepare a sea snake research and conservation strategy that maximises the chances of successfully protecting Australia's unique sea snakes. In the meantime, Blanche will continue her research on the taxonomy, distribution and genomic connectivity of WAs endemic sea snakes. At present Blanche is analysing genomic connectivity and habitat data on *Aipysurus pooleorum*, the Shark Bay sea snake. This is the first major study on this small range endemic. The data will help determine how far these species move to breed and its capacity for recovery following declines.

Based on an original article edited by Felicity Harvey at Foundation for National Parks and Wildlife, one of Blanche's funding bodies.

The paper: New range and habitat records for threatened Australian sea snakes raise challenges for conservation by Blanche Renee D'Anastasi, Jean-Paul Hobbs, Colin A Simpfendorfer, Lynne Van Herwerden, Vimoksalehi Lukoschek is published in the journal, Biological Conservation http://www.sciencedirect.com/science/article/pii/S0006320715301786

Biography

Blanche is a passionate conservation geneticist and ecologist. She applies her research on threatened marine vertebrates to management and conservation. Blanche most recently received an award in memory of Dr Glen Almany, in recognition of her passionate pursuit of positive change by breaking down traditional barriers between science and community, industry and resource managers.

Blanche is currently undertaking a PhD project at the ARC Centre of Excellence for Coral Reef Studies on threatened Western Australian true sea snakes. She is using ecology and conservation genomics to find out how to best conserve sea snakes, which are mysteriously declining in marine reserves. Blanche is supervised by Dr. Vimoksalehi Lukoschek, Dr. Lynne van Herwerden, Prof. Colin Simpfendorfer, James Cook University and Dr. Jean-Paul Hobbs, Curtin University. Previously Blanche studied the genetic connectivity of the endangered narrow sawfish, during her Honours research.

Blanche has a background in conservation advocacy, law and policy, having worked primarily on coastal dolphin conservation, fisheries and marine reserve campaigns. She is a member of the IUCN Sea Snake Specialist Group and a contributor to the IUCN's Global Status Review of Sawfish. She is also a proud recipient of the prestigious Vodafone World of Difference Scholarship, which allowed her to undertake important conservation work. In the future Blanche plans to continue to work at the science-policy.

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Blanche releasing an olive sea snake. Photo credit: Graeme Petrie

A collaborative network for citizen science on the Reef

Citizen science has an important and evolving role in reef science, education and management. In 2015, citizen science programs represented eight out of 80 documented long-term marine monitoring programs in the Great Barrier Reef (GBR) World Heritage Area (Addison et al 2016).

Many more citizen science organisations actively engage community members in scientific research across the Reef's catchments and on the Reef. Despite the undeniable positive environmental, social, economic, educational, and policy contributions, further action is needed to maximise the potential of citizen science to benefit the Reef.

In 2012, a scoping study investigated the critical needs and opportunities for a more coordinated approach to citizen science across the GBR (Chin 2013). The Great Barrier Reef Citizen Science Alliance (Alliance) evolved as a response to this study. The Alliance network fosters collaboration, capacity building, advancement and action for citizen science that benefits the Reef. The goal is a strategic and collaborative approach to connect citizen science providers, researchers, Reef managers and the Australian community to tackle key Reef issues.

The initiative is hosted by the Great Barrier Reef Foundation, with support from corporate partner Boeing. In 2015, ten member groups from coastal and marine citizen science programs were actively engaged in the project.

Since launching in 2013, the Alliance has focused on establishing a strong foundation for the network. Activities have included: building pathways for enhanced communication through digital communications and consultations with stakeholders; capacity-building through professional development and funding opportunities; and supporting stakeholder engagement through National Science Week and ReefBlitz events to engage more than 10,000 people across the Queensland coast.

As the Alliance moves into the next phase of development, we would like to hear from you! In addition to supporting collaboration and capacity building, the network is planning to bring attention to advancement and action for citizen science. Plans for 2016 include research to document the value of coastal and marine citizen science, strengthening citizen science data applications, building innovative community engagement opportunities, and supporting frameworks to improve investment for strategic citizen science.

For more information, contact Jennifer Loder, info@greatbarrierreefcitizenscience.org.au.

Citizen science for the Reef

In 2015, citizen science programs across Queensland worked with volunteers and partners to collect, learn and share valuable information about the reef, coast and catchment.

Achievements from Alliance member groups in 2015 include:

• CoralWatch launched a new Data Entry App to streamline the data entry process for participants and provide instant feedback on results. The app has been downloaded by more than 475 people. Worldwide, CoralWatch volunteers surveyed over 26,098 corals from 32 different countries in 2015.

• Fitzroy Partnership for River Health helped five new schools and community groups secure waterway monitoring kits and training through a River Health Bursary. These groups will now be able to contribute citizen science data to the MyWater online data portal, supporting the Fitzroy Basin Report Card.

• The Great Barrier Reef Marine Park Authority enhanced all four Eye on the Reef citizen science tools. The Sightings App enabled extent & severity of coral bleaching to be reported; a Rapid Monitoring data dashboard is in development to integrate curriculum-aligned programs in Queensland schools; Tourism Weekly activity reports aided operators and managers to collaboratively track monitoring at key reef sites; and improvements in Reef Health & Impact Survey reporting improved data visualisation via Google Earth.

• MangroveWatch engaged a range of stakeholders across Queensland. The program launched the Port Curtis and Port Alma MangroveWatch program in partnership with Gidarjil Rangers to monitor the health of mangroves and tidal wetlands from the Fitzroy River to Rodd's Bay. The program will expand in 2016 to support development of a regional mangrove management plan for the Southern Great Barrier Reef.

• Project Manta undertook a 14,000km community engagement road trip to raise awareness about the national expansion of research and to discover where to best focus future activities. The trip garnered new information on potential aggregation sites around the Whitsundays and Lizard Island on the east coast, and Shark Bay and Broome on the west coast.

• Redmap volunteers documented uncommon marine species across Queensland. Sightings included nudibranch Phyllidia scottjohnsoni, recorded for the first time on the East Coast of Australia, as spotting the porcupine ray (Urogymnus asperrimus) on the southern GBR.

• Reef Check Australia released the Citizens & Reef Science report, showcasing data and projects from 2001-14. Case studies shared findings from more than 600 volunteer reef health monitoring surveys on the Great Barrier Reef and subtropical reefs of South East Queensland, as well as comparisons to the global program.

• Tangaroa Blue Foundation reached over 5 million items documented in the Australian Marine Debris Initiative Database. Clean- up results were translated into on-ground source reduction through programs such as diverting 90 cubic metres of plastic from Cape York landfill through new recycling program.

• Wildlife Queensland Coastal Citizen Science led the Logan River MangroveWatch Project, which involved training, data collection, assessment and presentations with over 50 student participating. The data will be used to inform Logan City Council's "Logan Rivers and Wetlands Recovery Plan".

References: Addison, P., Walshe, T., Sweatman, H., Jonker, M., MacNeil, A., Thompson, A., Logan, M. (2015) Towards an integrated monitoring program: Identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (118pp).

Chin, A. (2013) Citizen Science in the Great Barrier Reef: A scoping study TECHNICAL REPORT · JANUARY 2013 DOI: 10.13140/2.1.2542.7520

89th conference highlights

28-31 July 2015, Daydream Island, Whitsundays

Student presentation award winners (left to right): Theresa Rueger, Rene van de Zande, Maria Palacios, Taryn Foster, Lisa Bostrom-Einarsson, April Hall and Tessa Hempson. Below: Taryn receiving a dive computer with the Vicki Harriott Award; Kenny Wolfe receiving an iDive for best overall photo.

Student Award Winners

Our generous sponsors:

Australian Government
Great Barrier Reef Marine Park Authority

Australian Institute of Marine Science

James Cook University Australia

The University of Queensland Australia

Great Barrier Reef foundation

Taryn Foster

Vicki Harriott Award

The 2015 ACRS conference at Daydream Island was one of the highlights of my year and I think a perfect example of how a conference should be organized. I really liked that the conference was held on a small island rather than in a large city. There were only a couple of places to eat and hang out, which facilitated much more contact and socializing between the attendees and an overall more relaxed atmosphere. Having arrived from Perth and not knowing many people, it was great to meet some friends on the first day. I also think that it was beneficial to everyone to have the student day before the conference, as students were able to meet each other and find out what others were working on before the talks started. I enjoyed all of the talks at the student day, but I was at a stage in my PhD where Nick Graham's talk on efficiency and time management was particularly useful and I have incorporated some of his techniques into my daily work routine. I did a talk on my 3D imaging of coral recruit skeletons to show the deformities caused by ocean acidification. I was genuinely blown away by the interest it generated and the amount of support and positive feedback I received. I think sometimes sitting alone in your lab or at your desk, you forget that the things you are working on are amazing, which is another reason to get out there and share your work, even if it seems scary at the time! I was truly honoured to receive the Vicki Harriott Award for my presentation. Vicki's pioneering work at the Abrolhos Islands formed the basis for some of my work in that same spectacular place. Thank you to all of the people involved in organizing the conference, you did an exceptional job, particularly at keeping the vibe relaxed and supportive.

April Hall

Student presentation award winner

The 2015 ACRS conference was an invaluable and fun experience for me. The diversity of research projects on display, and the excellence of the presentations by coral reef scientists really showcased the incredible leadership role that Australian scientists play in coral reef research. The plenary talks were interesting, topical and inspiring. The social events were fun and well thought out, and the arrangement and organisation of the talks was great. I have attended ACRS several times, and always find it to be a truly worthwhile and rewarding experience. I thank the ACRS council for putting together another brilliant conference.

Tessa Hempson

Student presentation award winner

As I stepped onto the dock on Daydream Island, I was immediately swept up in an eager wave of excited marine scientists. After just two years of attending this event, many of the happy faces around me belonged to colleagues and mentors I now consider friends, making it feel more like a reunion than a work trip. This energy is what makes the annual ACRS conference such a unique and valuable experience for me. I have attended few other conferences where you have the opportunity to interact with many of the world leaders in coral reef research in such a supportive, unintimidating environment. The 2015 ACRS conference was a particularly unique experience, given that it was actually held on the iconic Great Barrier Reef – what a privilege to spend three days on an island surrounded by passionate coral reef scientists. The exceptional caliber of research presented was very inspiring, and I particularly enjoyed how the small scale venue allowed for meaningful discussions after many of the talks. The jovial social events also provided excellent opportunities to reconnect with colleagues, and make new connections for the future. The conference organisers did a superb job in every respect, with the program running seamlessly throughout. Thank you to everyone involved for making it such an outstanding event.

Maria del Mar Palacios

Student presentation award winner

The ACRS Conference at Daydream was a blast as it allowed us to take science right next to the coral reefs we all study and love. It was a completely enriching experience as I got to share the results of my research, hear inspiring keynote speakers, meet fellow PhD students and receive valuable feedback. The diversity of the sessions and talks allowed me to catch up on the fish ecology topics I like, but also on interesting research carried out on corals and ocean acidification. I particularly valued the informal and friendly atmosphere of this conference which due to its small size allows for relaxed interactions with all the speakers. Congratulations to the ACRS committee for putting together such an unforgettable conference!

Photo by Lauren Nadler

More ACRS conference fun

Student photo competition winners (left to right): Kristen Anderson, Peter Vize, Kennedy Wolfe, Maria Palacios, Ciemon Caballes.

Selina Ward

Report on the conference from a stablished researcher

It was fabulous to return to an island setting for our 2015 conference, which was at Daydream Island in the Whitsundays. Having the audience captive and surrounded by reef seems to bring out the best in us. As one of the main organisers of the conference, I would attract some scorn if I was too complimentary about the organisation of the event, but it ran smoothly and we enjoyed some really fabulous keynote addresses. Having Minister Stephen Miles open the conference was very positive as he was generous with his time and listened to the concerns of a great many delegates as well as giving an interesting perspective of his role and that of his government.

Our contributed papers sessions were full of excellent new research and lively discussion about topical issues. We welcomed the attendance of some NGO representatives who made great contributions to the event. The fabulous presentations from our student members were rewarded with many generously donated prizes including diving equipment, tours around the Whitsundays and research station bench fees.

As usual our social functions were a buzz of excited conversations accompanied by some excellent food and beverages. The setting, overlooking the ocean and the lovely gardens of Daydream Island was pretty hard to beat.

For those more senior members of our community who haven't attended an ACRS conference in recent times, it is definitely time to rethink and come along to our next one.

Kerry Cameron

Student presentation award winner

It is a rare and marvellous experience to wander down a torch-lit stairway at sunset onto a private beach on the Great Barrier Reef and find it packed with an excited crowd of excellent people who can all speak coral. As an early career researcher, I was a little star struck at meeting some of the luminaries in our field, but found all of them to be friendly and approachable. It has certainly been a lot more satisfying citing each since knowing them as a red wine/white wine/beer person rather just an initial and last name.

In addition to lots of great networking opportunities, the presentation program at ACRS15 was also fantastic. The keynote speakers were diverse in topics and style, with each presenting very interesting bodies of work and offering us useful challenges for the future. The sessions were also nicely structured within topics of interest and I found there were only a few times where I was really torn about which competing talk to attend. I very much appreciated the considered feedback and questions after my talk on coral recruitment, the presentations were a great opportunity for all students to explain their work in a supportive environment. Presentations from senior researchers and the reef management agencies were also highly informative, it was great to hear about the latest on-water initiatives from people who are actively involved.

So thanks to the conference organisers for pulling together such a great few days of science sharing at a beautiful location, I'm looking forward to the next one!

Lisa Bostrom-Einarsson

Student poster award winner

This was my second ACRS conference and Daydream Island did not disappoint! The venue was great, providing an intimate setting for the inspiring talks. The organisers hit a perfect mix of well-structured sessions, social events and activities. The plenaries were engaging and inspiring and the long lunches were very useful for networking and meeting with distant collaborators. All in all ACRS15 was a fantastic event and provided a fantastic setting for disseminating world-class coral reef research! I'm grateful for the opportunity to present both an oral presentation and a poster, and thankful for the Best Poster Award.

Photo Competition

Best Overall: Kennedy Wolfe

Science-in-action: Peter Vize

Best turtle photo: Kristen Anderson

Diversity: Ciemon Caballes

Macro: Maria del Mar Palacios

More ACRS conference fun

"Back to the Reef"

Manuel Gonzalez Rivero

Thoughts from an Early Career Researcher

Last July, we gathered once again for one of the longest running yet familiar scientific symposiums in the country, the Australian Coral Reef Society Conference. This time, and for a change, we met on the reef: a common system that unites us as a community.

Following the society's motto – bringing major conservation issues to the attention of governments and general public – this conference convened the exciting participation from the local government, national institutions, NGOs, Universities and general public. It came in a particularly crucial time for discussing the governance of reef systems nationwide, when the GBR world heritage title was being questioned.

High-level dialogues were triggered by interesting plenary talks, ranging from the local governance on the GBR to novel applications of technologies, shifting systems and the role of paradigms in modern science. This was just the appetiser to a range of quality talks and poster presentations that were a clear demonstration of the strength and diversity of reef science produced in Australia. By the end of the two days, the conference served, as usual, to reinforce and establish long-collaborative networks across research and reef passionate individuals nationwide – a great cocktail of science, conservation advocacy and, of course, socialisation among colleagues.

This is perhaps one of the most high spirited meetings that we have the pleasure of partaking in every year. The intimate settings of the ACRS meetings provides a rare opportunity for both professional and students, at different levels of their career, not only to present our research but also to communicate our ideas in a highly amenable setting.

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LOOK FORWARD TO OUR NEXT CONFERENCE IN 2017

Tethys Images generously donated the thank you gifts for our keynote speakers

Tethys Images - comprising early-career scientists and ACRS members Tom Bridge, Ed Roberts and Matt Curnock – is a photographic alliance that specialises in nature and underwater still imagery. They share passion for the tropical and marine environments that they study, which is reflected in their stunning and diverse photographic portfolios. Last year, over a few craft beers, they decided to pool their resources and make their imagery and services available to a wider audience.

In a short time, their artistic imagery has been sought and used by a large and growing number of scientific, management and conservation organisations around Australia and internationally. Their coral reef photos adorn the pages of GBRMPA's Outlook and Annual Reports, the Australian Institute of Marine Science's latest National Marine Science Plan, a range of JCU and CSIRO reports and publications, the covers of several prominent academic journals including Proceedings of the Royal Society B and AMBIO, and even an upcoming collection of stamps from Australia Post. Their images have accompanied several recent international media stories over the last year about the Great Barrier Reef and also promoting research activities and science discoveries by JCU and CSIRO scientists.

What distinguishes Tethys Images from other professional and aspiring nature photographers is their science background, their detailed understanding of the subjects they shoot, and their willingness to share their images free of charge for a worthy cause. They care passionately about their photography subjects, they have a compelling story to tell about every one of their photographs, and they enjoy seeing their images used to benefit science, education and conservation of the natural environment.

Contact: info@tethys-images.com

Website: http://www.tethys-images.com/

Australian Coral Reef Society

Founded in 1922

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Email: austcoralreefsoc@gmail.com
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Photo by Lauren Nadler

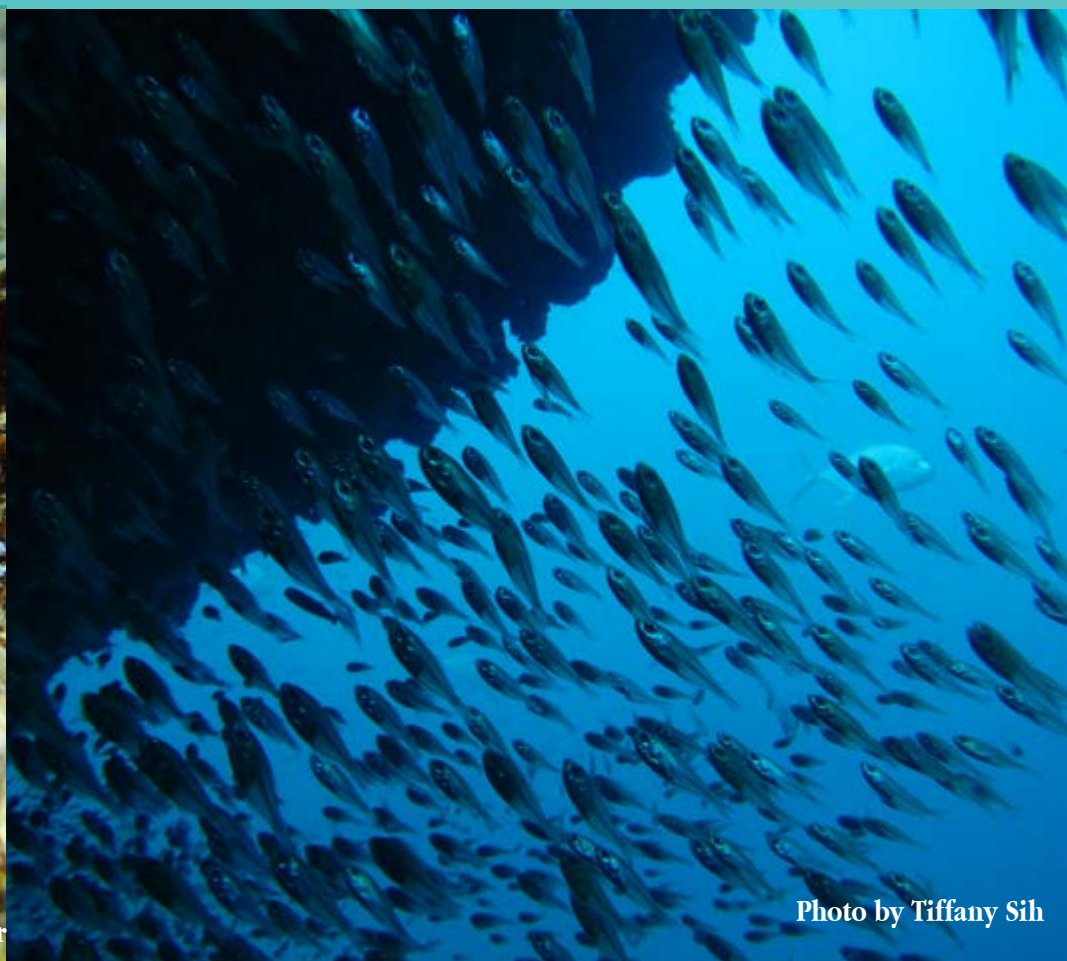
Photo by Tiffany Sih