

Supported by the Lizard Island Reef Research Foundation  
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## Australian Museum Lizard Island Research Station Newsletter 2009



**Australian Museum**  
6 College Street Sydney NSW 2010 Australia  
t 02 9320 6000  
[www.australianmuseum.net.au](http://www.australianmuseum.net.au)

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## LIZARD ISLAND RESEARCH STATION NEWSLETTER 2009



### A facility of the Australian Museum

Published March 2010

#### Directors

Dr Lyle Vail and Dr Anne Hoggett

#### Lizard Island Research Station

PMB 37  
Cairns QLD 4870  
Australia

Phone: + 61 (0)7 4060 3977

Fax: + 61 (0)7 4060 3055

Email: [lizard@austrmus.gov.au](mailto:lizard@austrmus.gov.au)

[www.australianmuseum.net.au/Lizard-Island-Research-Station](http://www.australianmuseum.net.au/Lizard-Island-Research-Station)

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#### Environmental responsibility

LIRS newsletter is printed in Australia using vegetable-based inks on paper produced from well-managed forests and controlled sources.



## AUSTRALIAN MUSEUM DIRECTOR'S REPORT

During 2009 I was able to take some of my colleagues from the Council of Australasian Museum Directors to our Lizard Island Research Station and let them see first-hand this crucial piece of Australia's marine and coral reef research infrastructure.

To its credit, the Australian Government is investing heavily in research infrastructure in general. After a strong campaign by museums, the CSIRO and herbaria, we were able to convince the Government that the specimen information held in museums and other institutions is critical research infrastructure, as much as are telescopes and laboratories. This resulted in the \$38-million Atlas of Living Australia project, to make the knowledge held in our collections more accessible and useable.

The Australian Museum Lizard Island Research Station (LIRS) is playing a crucial part in this, as the data about the specimens collected at Lizard Island will become widely available through the Atlas. Priority is being given to information that addresses current problems and issues. The good management of Australia's coral reefs is high on that list. The Station is the base for one third of the C-Reefs project, part of the international Census of Marine Life. The information generated in the C-Reefs project will be incorporated into the Atlas and help us better understand how coral reefs are responding to activities such as fishing and tourism, to threats such as coastal run-off, and biggest of all, to global warming

The results of research conducted at the Station, combined with projects



such as the Atlas of Living Australia, illustrate the importance of museums like the Australian Museum in maintaining active, world-class research programs and facilities. In the case of Lizard Island, we could not do this without the excellent management of its Directors, Drs Anne Hoggett and Lyle Vail, or the unstinting support of the Lizard Island Reef Research Foundation. My thanks go to all of you.

**FRANK HOWARTH**  
Director, Australian Museum

## RESEARCH STATION DIRECTORS' REPORT

What a year it has been! Usage soared and research was in overdrive even as Loomis House and the all-important aquarium system were being extended and refurbished. These things are all thanks to the 30th Anniversary Development Project, which is now nearing completion.

Sustainability was a central pillar in planning for this major upgrade. Through thoughtful building design, LIRS has maximised passive cooling and minimised airconditioning. The houses are not airconditioned. Instead they are well ventilated and have wide eaves and verandahs. The roof of the Ian Potter Centre for Tropical Marine Research acts as a venturi to draw hot air from the central research area so that airconditioners in the labs and offices do not have to work as hard. Technology plays a part too. We chose inverter airconditioners for their efficiency, and their success is evident through

lower power usage. Four-stroke outboard motors use less fuel and produce fewer emissions than the older two-stroke technology and they are now being used effectively on the Station's larger boats. However, a trial on the dinghies showed that smaller four-stroke motors are not yet reliable enough for use in remote areas, so we have had to revert to two-strokes for these boats. This compromise is an example of the tension that exists between treading lightly on the environment and providing functional and reliable equipment.

An important upcoming project will reduce the environmental impact of electricity generation at the Station. While solar systems have provided hot water at LIRS for many years, electricity is still generated by burning diesel. Moving to renewable energy sources has been on the agenda for a long time so it is ironic that this is among the last of the 30th Anniversary



Development projects to be tackled. We need to be sure that such an important and expensive system will serve LIRS well into the future and we have considered many different technologies in a rapidly changing market. The sudden removal of a rebate for remote area installations means that additional funds must be raised. With the help of the Lizard Island Reef Research Foundation and its many supporters, we are confident that this project will be completed in early 2011.

**ANNE HOGGETT AND LYLE VAIL**  
Directors, Lizard Island  
Research Station



## NEW KNOWLEDGE

More than 70 publications based on work conducted at Lizard Island were added to the collection this year (see page 16). Taxonomy and systematics – defining species, describing new ones and discovering their relationships – is the subject of about a third of them. The remaining papers cover a wide range of coral reef biology and ecology.

One of the taxonomic publications is a 930-page book comprising 50 articles documenting the first major study of amphipods (small, bottom-dwelling crustaceans) in tropical Australia. Before its publication, less than 50 amphipod species were known from the Great Barrier Reef. Now, the number stands at 256, of which almost half are new to science. This work is the result of an impressive collaboration among international amphipod taxonomists. It was organised by the Australian Museum's Jim Lowry and enabled by the Department of Environment, Water, Heritage and the Arts, through the Australian Biological Resources Study, the

National Heritage Trust and TAMS, now Australian Museum Members. Fourteen taxonomists, from world leaders in their fields to postgraduate students, visited Lizard Island for two weeks in 2005 to discover the extent of its amphipod diversity by sampling intensively and sharing expertise during rough-sorting on site. That was the easy part! It is to the credit of this group that they kept the momentum to publish their extraordinary results in a consolidated manner and in a remarkably short time.

Cleanerfish remove and eat parasites from client fish. This relationship benefits both parties but it has not been clear until now how clients recognise cleaners and decide not to eat them. From a fish's perspective, blue and yellow are the colours that contrast most strongly with typical backgrounds, such as coral reefs and open water. Virtually all cleanerfish have these colours, often in association with a black lateral stripe which enhances the contrast. *'Cleanerfish have evolved some of the most conspicuous combinations of colours and patterns in the marine environment, and this is likely to underpin the success of the cleaner-client relationship on the reef'* (Cheney et al., 2009).

Mantis shrimp (stomatopods) are well-known to have amazing vision but recent work has shown that their eyes have capabilities that are even more astonishing than known previously. The ability to detect polarised light can be advantageous for things such as orientation, prey detection and predator avoidance. While many animal groups can detect linearly polarised light,



Kleinlogel & White (2008) have found that a stomatopod species can also detect circularly polarised light. Until this discovery, circularly polarised light had been thought to play no part in animal vision at all.

Coral bleaching leaves damselfishes more vulnerable to predation, apparently because their camouflage becomes less effective. *'Although the predator (species) actively avoided both bleached and recently dead corals, they were almost twice as likely to strike at prey associated with the stark white colonies of bleached corals'* (Coker et al., 2009).

Fish taxa vary in their capacity to use oxygen as water temperature increases. In experiments, cardinalfishes perform poorly, losing nearly half their respiratory performance at 31°C compared to that at 29°C, and virtually exhausting their capacity for additional oxygen uptake by 33°C. By contrast, damselfishes performed better, retaining more than half of their respiratory performance at 33°C compared to 29°C. *'The community structure of reef fish assemblages might change significantly as ocean temperatures increase'* (Nilsson et al., 2009).

Ocean acidification, which follows rising atmospheric carbon dioxide levels, interacts with elevated temperature to affect the aerobic performance of fishes. *'Coral reef fishes are sensitive to both higher temperatures and increased levels of dissolved CO<sub>2</sub>, and ... the aerobic performance of some reef fishes could be significantly reduced if climate change continues unabated'* (Munday et al., 2009).

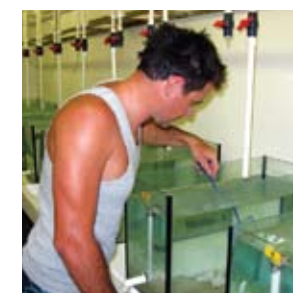
## FELLOWSHIPS

### FELLOWSHIPS FOR PhD STUDENTS

Since 1984, the Australian Museum has awarded fellowships to PhD students for field-intensive research at Lizard Island Research Station. These competitive fellowships are awarded to outstanding candidates conducting research that complements the Australian Museum's Science Research Strategy. Fellowships may run for up to three years and, in 2010, the value of each fellowship has increased from \$7000 to \$8000 per annum. Two fellowships commencing in 2010 were awarded.

#### The Ian Potter 2010 Doctoral Fellowship at Lizard Island

This fellowship is funded by The Ian Potter Foundation which also sponsored the Ian Potter Centre for Tropical Marine Research at Lizard Island. The 2010 award is the fourth Ian Potter Doctoral Fellowship.



**DARREN COKER**  
ARC Centre of Excellence for Coral Reef Studies and James Cook University

**Effects of climate-induced coral loss on coral reef fishes: the critical importance of live coral as habitat**

Corals are critical for the existence of many coral reef fishes because they provide food, shelter and cues for the settlement of larvae. The three-dimensional structure of corals also mediates important biological interactions among fishes such as competition and predation. A decline in the quality or quantity of coral habitat can therefore impact significantly on the abundance and diversity of coral reef fishes.

Corals are very sensitive to changes in environmental conditions, particularly increased temperature. Due to increasing thermal stress brought on by global climate change, corals are experiencing more frequent and severe bleaching events. Bleaching tends to have the greatest effect on the branching corals that provide so much of the structure used by many reef fishes. Degradation of live coral habitat has already had devastating effects on the abundance and diversity of many reef fishes and the full effects of climate change



Below: Cardinalfishes are likely to suffer as ocean temperatures increase.



on coral reef communities are yet to be realised. Darren aims to determine some of the likely impacts on reef fishes through degradation of their coral habitat. What happens to a fish whose coral home dies? Can it move to a healthy coral nearby or will it be excluded by the other fishes that already live there? And what if there are no other healthy corals nearby? We know that the larvae of reef fishes use various cues provided by corals to choose a place to settle on the reef – a very important decision in a young fish's life. Do degraded reefs provide the necessary cues? And if young fishes do settle onto degraded reefs, are they able to survive there? Results from Darren's research will improve predictions regarding longer-term impacts of climate change and coral bleaching on reef fish assemblages.

#### Lizard Island 2010 Doctoral Fellowship

The Lizard Island Doctoral Fellowship is funded by the Lizard Island Reef Research Foundation. The 2010 doctoral fellowship is the 40th awarded since the inception of the program in 1984.



**CHRIS GOATLEY**  
ARC Centre of Excellence for Coral Reef Studies and James Cook University

**The ecological role of sediments on coral reefs**

It is well known that herbivorous fishes have an important role in preventing the growth of large algae on reefs. Much less attention has been paid to algal



Above: Colourful fish are easier prey against a bleached coral background.



## FELLOWSHIPS

turfs, which exist between coral colonies on all coral reefs. Turfs are short filamentous or encrusting species of algae that are important in many reef processes. Like the larger fleshy species, turf algae can also compete with reef corals if not controlled by herbivores. Turf algae trap sediments and the length of the turf and the depth of the sediment seem to be closely linked. High sediment loads in algal turfs may prevent fish feeding on them, allowing the turf to grow and thus trap more sediment and be even less palatable for fish – a vicious circle.

Chris is investigating the impact of sediments on herbivory by reef fishes through experiments on the reefs at Lizard Island. In one set of experiments, he uses a device that is essentially a large underwater vacuum cleaner to remove sediment from turfs. He then uses underwater video cameras to compare the intensity of feeding by fishes on cleared areas with similar uncleared areas. Chris has already found that fish increase their feeding rates dramatically when sediments are removed from turfs in shallow water. This shows that sediments do limit feeding by reef fishes, at least in that habitat. In other experiments, he adds sediment to small areas of algal turf to investigate if increased sedimentation is likely to create longer turfs with deep, trapped sediments, which prevent new corals growing. He intends to use different levels of sediment addition and different sizes of particles to try to identify if there is a threshold after which fish stop feeding and the algae can grow unchecked.

### FELLOWSHIPS FOR POSTDOCTORAL RESEARCHERS

Two fellowships have been awarded for 2010 to early career postdoctoral researchers for field-intensive research at the Lizard Island Research Station. Valued up to \$8000 each, funding is provided by sponsors through the Lizard Island Reef Research Foundation. Research undertaken by the fellows complements the Australian Museum's Science Research Strategy.

The **Isobel Bennett Marine Biology Fellowship**, funded by the Hermon Slade Raiatea Foundation, was not awarded in 2010. It is anticipated that two Isobel Bennett Marine Biology Fellowships will be awarded in 2011.



#### John and Laurine Proud Fellowship at Lizard Island

This fellowship program was established in 2008 thanks to funding from the John and Laurine Proud Estate Trust. The late Sir John Proud was the founder and inaugural chairman of the Lizard Island Reef Research Foundation. He and his wife, the late Lady Laurine, were strong supporters of research at Lizard Island.



**DR NICHOLA RAIHANI**  
Zoological Society of London

The evolution of punishment and cooperation in nature

When we see juvenile meerkats provisioning their younger siblings or watch someone donate to charity, we are witnessing cooperation. Ubiquitous it might be, but cooperation is a puzzle and one that worried Darwin himself: if individuals do best by maximising their own success, then why should they invest in costly actions that benefit others? This question has been the focus of much attention in such disparate fields as psychology, economics and behavioural ecology. We now realise that, in humans at least, punishment is a potent force maintaining cooperation. Such punishment can take the form of financial sanctions or it can impose social costs in terms of harming the reputation of non-cooperative individuals.



**DR MAUD FERRARI**  
University of California, Davis

The effect of ocean acidification on predator-prey interactions in coral reef fishes



The drastic increase in atmospheric carbon

dioxide (CO<sub>2</sub>) is now affecting our waters. Carbon dioxide dissolves in water at a rate proportional to the amount available in the atmosphere, increasing ocean acidity as the concentration of CO<sub>2</sub> in the atmosphere increases. Recent research has shown that fish exposed to CO<sub>2</sub>-enriched water have impaired olfaction that causes them to be attracted to the smells of habitats that they normally avoid.

Prey that have never encountered a predator will often not avoid predators. However, when the odour of injured conspecifics (members of the same species) is detected in conjunction with the odour of a novel predator, the prey associates the two and learns to recognise the species as threatening. It then displays appropriate avoidance behaviour during subsequent encounters with that predatory species. This behavioural response is particularly important for reef fishes as they settle onto a reef since it helps them avoid potential predators.

Maud will investigate whether exposure to CO<sub>2</sub>-enriched water affects the response of new reef fish recruits to predators. Using pre-settlement reef fish caught in light traps, she will conduct laboratory experiments to determine if these fish have an impaired ability to 1) show proper anti-predator behaviour in response to injured conspecifics, and 2) use cues from injured conspecific cues to recognise novel predators. Depending on results from these experiments, field experiments may be conducted to test whether behavioural alterations found in laboratory studies result in a higher mortality of fish exposed to CO<sub>2</sub>-enriched water when they are exposed to natural predators. Understanding impacts on ecosystems due to environmental changes such as CO<sub>2</sub>-enriched water will help us predict and possibly mitigate the effects on biodiversity.

It is not yet clear whether punishment also plays a role in stabilising cooperation in simpler societies. Nikki will investigate the role of punishment in stabilising cooperation in cleanerfish-client interactions.

Cleanerfish maintain the health of numerous species of reef fish by removing ectoparasites from the surface of clients' skin. However, there is a conflict of interest between cleaners and clients since cleaner wrasse prefer client flesh to ectoparasites and so occasionally bite clients rather than clean them. Nikki's research will improve our understanding of the role of punishment in maintaining cooperation in fish and may provide insights into the evolution of similar behaviour in humans.

A better understanding of cleaner wrasse behaviour will be for maintaining and conserving coral reef biodiversity since the presence of these fish promotes reef fish diversity by more than 60%. These remarkable fish even affect the distribution of reef fish that do not interact with them by, in part, creating 'safe havens' at cleaner-fish stations where predators are less likely to attack.

#### The Yulgilbar Foundation Fellowship at Lizard Island

Established in 2009, this fellowship is funded by The Yulgilbar Foundation which is also a substantial donor to the Station's development program.

Top left: Collecting sand-dwelling crustaceans.

Top right: Green turtle.

Middle: Lizard Island Group. Photo Vanessa Messmer.



## FELLOWSHIPS



### RESEARCH BY FELLOWS IN 2009

Fellowships awarded in previous years supported the research of nine scientists at Lizard Island during 2009.

Lizard Island Doctoral Fellows	Roberta Bonaldo, James Cook University (2008) Jacob Johansen, James Cook University (2008) Rebecca Fox, James Cook University (2009)
Ian Potter Doctoral Fellows	Andrew Hoey, James Cook University (2007) Vanessa Messmer, James Cook University (2008) Alicia Crawley, University of Queensland (2009)
Isobel Bennett Marine Biology Fellow	Dr Megan Porter, University of Maryland Baltimore County (2009)
John & Laurine Proud Fellow	Dr Michael Berumen, Woods Hole Oceanographic Institution (2009, now at King Abdullah University of Science and Technology)
Yulgilbar Fellow	Dr Guillermo Diaz-Pulido, University of Queensland (2009, now at Griffith University)

010



Photo Gary Cranitch.

### PROFILE OF A FORMER FELLOW

#### DR JULIAN CALEY

Julian Caley was the 1988 Lizard Island Doctoral Fellow. For his PhD, he investigated mechanisms that enable coral reef fish communities to coexist. This was a foundation for his subsequent research career in Canada and Australia, where he has made substantial contributions to our knowledge of the ecological and evolutionary processes that generate and maintain biodiversity. While he continues to work with coral reef fishes, he has also used many other model taxa to test hypotheses. Julian has published more than 50 scientific papers of which at least 20 include work conducted at Lizard Island.

He is currently a Principal Research Scientist at the Australian Institute of Marine Science. One of his many roles is Principal Investigator on the Census of Coral Reefs Project, part of the international Census of Marine Life. This has brought him back to Lizard Island in recent years. Lizard Island is one of three Australian coral reef sites that have been selected for intensive study of biodiversity by C-Reefs scientists which include many taxonomists from Australian natural history museums. The last of three C-Reefs expeditions will take place in 2010.

## 30TH ANNIVERSARY DEVELOPMENT



The 30th Anniversary Development Project completed its fifth year of implementation in 2009. This \$4.75 million upgrade of the Station's infrastructure has been enabled by the Lizard Island Reef Research Foundation (LIRRF) and its supporters. In 2009, the following components were completed.

- The Sir John Proud Aquarium was extended and the seawater delivery system was completely overhauled. New pumps and inlet lines installed last year are providing much-needed redundancy in the supply system, and the aquarium can now accommodate more research. The upgrade of this key facility at LIRS was enabled by funding from the **Vincent Fairfax Family Foundation** and additional funding for some pumps was provided by **Friends of Conservation**.
- Loomis House was largely rebuilt and extended. It now provides accommodation for up to eight visitors in three bedrooms. This is the last of four visitor houses to be upgraded in recent years. It was funded by the **LIRRF**.
- A new dinghy, *Mimi*, was purchased in 2009 to become the seventh acquired under the 30th Anniversary development. *Mimi* was funded by the **John Villiers Trust**.
- Staged purchase of laboratory equipment continues, funded by the **Raymond E Purves Foundation** and the **Thyne Reid Foundation**. Items purchased in 2009 include a freeze-drier; a refrigerated incubator; a centrifuge; a block heater; heater/chiller units with pumps for use in aquaria; containers for liquid nitrogen, including a dry shipper; electronic balances; a pH meter; a voltage transformer; a video camera with underwater housing; and smaller items.
- Upgrade of the scuba diving facilities started with purchase of more than 20 new scuba tanks thanks to the **LIRRF**. The upgrade of diving facilities will continue in 2010 in tandem with refurbishment of the workshop.
- The **Research Institute for Sustainable Energy** (Murdoch University) assessed power generating options for the Station. Currently, all electricity is made using diesel-powered generators. The RISE study recommended a photovoltaic (PV) system to supplement the existing diesel system. The proposed new system, which is planned for 2011 if the necessary funds can be raised, will dramatically reduce the Station's carbon footprint and its reliance on diesel fuel.

Opposite top: Dr Guillermo Diaz-Pulido, 2009 Yulgilbar Fellow.

Above left: The aquarium system is now 50% larger.

Above centre: Loomis House.

Above right: A vented courtyard cools the Ian Potter Centre for Tropical Marine Research. Photo Vanessa Messmer.

07



# LIZARD ISLAND REEF RESEARCH FOUNDATION

## FOUNDER

Sir John Proud^

## PATRONS

Dr Des Griffin AM  
Mr Trevor Haworth AM  
Mr Raymond Kirby AO  
Mr Henry Loomis^ and Mrs Jacqueline Loomis Lady Proud^  
Mr Robert Purves AM  
Prof Frank Talbot  
Dr Charles Warman AM^

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Mr Kenneth Coles AM (Chairman)  
Mr Andrew Green (Secretary & Treasurer)  
Mr Charlie Shuetrim (Chairman, Appeal Committee)  
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The Hon Virginia Chadwick AO^  
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Mr Trevor Haworth AM  
Mr Frank Howarth  
Mr Chris Joscelyne  
Mr Vivian King  
Mr Raymond Kirby AO  
Mr Bill Page-Hanify AM  
Dr Cindy Pan\*  
Mrs Fiona Playfair  
Mrs Heather Power  
Mr Robert Purves AM  
Mr Michael Seyffer\*\*  
Mr David Shannon

^ deceased

\* New trustee as of June 2009

\*\*Resigned as of December 2008

The Lizard Island Reef Research Foundation was established to raise funds for the Lizard Island Research Station and to support research on the Great Barrier Reef. Since its inception in 1978, the Foundation has raised more than \$8 million for these purposes. The Foundation is the enabling force behind the 30th Anniversary Development Program and the Lizard Island Fellowships Program.

Ken Coles has been a Trustee of the Foundation since 1991 and Chairman since 1994. He is supported by an active board of Trustees which includes three people appointed by the Australian Museum Trust. We welcome Cindy Pan to the LIRRF as an AM Trust representative, joining fellow AM trust member Ronnie Harding and AM Director Frank Howarth. Cindy replaces Michael Seyffer, who stepped down from the board last year. We thank Michael for his input over the past two years. We also thank the Australian Museum's Gail McCarthy who has provided excellent administrative services to the Foundation for many years.

With sadness, we note that Trustee Virginia Chadwick died during the year. She joined the Board in late 2007 after retiring as Chairman of the Great Barrier Reef Marine Park Authority. In that position, she oversaw the monumental task of rezoning the whole Great Barrier Reef on the basis of the best scientific information available. The new zoning plan came into force in mid-2004 after two rounds of public consultation that generated more than 10,000 submissions each. Under the new zoning, the proportion of highly protected areas increased from less than 4% to more than 33%. This strategy has clearly been successful; after only 5 years, protected areas have more fish and fewer outbreaks of Crown-of-thorns Starfish. Virginia's leadership was pivotal in achieving this result. She made valuable contributions to the LIRRF during her short time on the Board.

Top left: Daniel Atkins produced some magnificent drawings on his visit to LIRS thanks to the Australian Projects Natural History Illustration Award.

Top right: Members Mike and Lou Hamshire are always keen to see what's going on at LIRS whenever they visit the island.

Right: Ian Reid and Jill Potts were pleased to see the outcome of support by the Thyne Reid Foundation when they visited in March.



## MEMBERS

Members of the Foundation donate \$1000 or more per year. They go into a draw to win a four-night holiday for two at the Lizard Island Resort, including airfares within Australia. Ownership of the Lizard Island Resort passed from Voyages Resorts to Delaware North Corporation during the year. We thank both companies for their generous support of this prize. Please see the inside back cover for Members and Friends of the Foundation.

This year, the annual luncheon for members in Melbourne was held at the Athenaeum Club on 13 May 2009 with 26 people attending. The annual dinner in Sydney was held at the Wharf Restaurant on 24 August, attended by 99 people. With late apologies from four people in Melbourne and six in Sydney, both functions attracted record attendance. The invited speaker on both occasions was the Australian Museum's Dr Jeff Leis. His entertaining and informative talks about larval fish research at Lizard Island over the past 30 years were very well received by both audiences. Congratulations and thanks to Ken Coles for organising these delightful gatherings that enable members and guests to keep in touch with the work being conducted at Lizard Island.



## HISTORY OF THE LIRRF

A beautifully illustrated book published this year, *Lizard Island Research – a Partnership*, explores the history of the unique relationship between the Australian Museum and the Lizard Island Reef Research Foundation that has resulted in development of Lizard

Island Research Station. The book is a testament to the continued success of the relationship. It was conceived and written by Charlie Shuetrim and published by the Australian Museum and the LIRRF. Charlie brought this intriguing story together from many sources, including memories of key players as well as documents. Copies of the book may be obtained through the Research Station and the Foundation.



## NATURAL HISTORY ILLUSTRATION

Daniel Atkins, a Masters student in Natural History Illustration at the University of Newcastle, was selected by his university for the Australian Projects Natural History Illustration Award in 2009. LIRRF Trustee Chris Joscelyne and his company Australian Projects generously provided the funds to enable Daniel to visit Lizard Island Research Station for two weeks in September. Daniel's project was to depict motion in fishes accurately. He prepared for his field work by studying fish anatomy using the collections at the Australian Museum. At Lizard Island, Daniel snorkelled daily on the reef making observations and taking photographs, then made beautiful drawings. Scientific visitors at LIRS at the time were intrigued to see the precise artworks appear and Daniel benefited from the opportunity to interact with scientists. We thank Chris and Australian Projects for enabling this innovative use of LIRS.

## VISITORS

People associated with the Lizard Island Reef Research Foundation who visited during the year include:

- Prof Elmar Messmer
- Charlie and Sandy Shuetrim
- Ian Reid and Jill Potts
- Michael and Karina Seyffer and their daughter Claudia
- James and Susan Kirby
- Frank Howarth with members of the Council of Australasian Museum Directors
- Fiona Playfair and Bill Winning
- Mike and Lou Hamshire.



FOR THE RECORD



NEW VIDEO ABOUT LIRS IN PRODUCTION

A video presentation is used almost daily to explain the work of the Station to island visitors. A new presentation is being produced to highlight improvements to facilities now that the 30th Anniversary Development Project is nearing completion. The LIRRF has generously provided the funds to enable this project and some key players are contributing their time pro bono. We thank independent science communicator Russell Kelley and production company Digital Dimensions for their assistance. New footage was shot throughout 2009 and the presentation should be complete by mid-2010.

USAGE

Usage soared in 2009 thanks to additional accommodation in the new Loomis House and increasing demand by core users (researchers, postgraduate students and student groups). Core usage was 6938 person nights for the year and total usage was 8162 person nights. In each of the months October, November and December 2009, the Station accommodated between 870 and 980 person nights. Only three months in the Station's history have exceeded 800 person nights and the previous monthly maximum was 844 person nights. Usage should remain at between 7000 and 8000 person nights from now on because no further increases in accommodation are planned.

BENCH FEES

Per person per night, including GST	2009	2010
Researcher	\$113.00	\$115.00
Researcher's assistant	\$100.00	\$102.00
Postgrad. student (own project)	\$44.00	\$45.00
Postgrad's assistant	\$39.00	\$40.00
School or university group	\$70.50	\$72.00
Commercial	\$212.00	\$216.00

STAFF

There were no changes to the permanent staff during the year. Lyle Vail and Anne Hoggett continued as Directors, and the maintenance positions continued to be shared on six-month rotation between Lance and Marianne Pearce (in summer) and Bob and Tania Lamb (in winter).

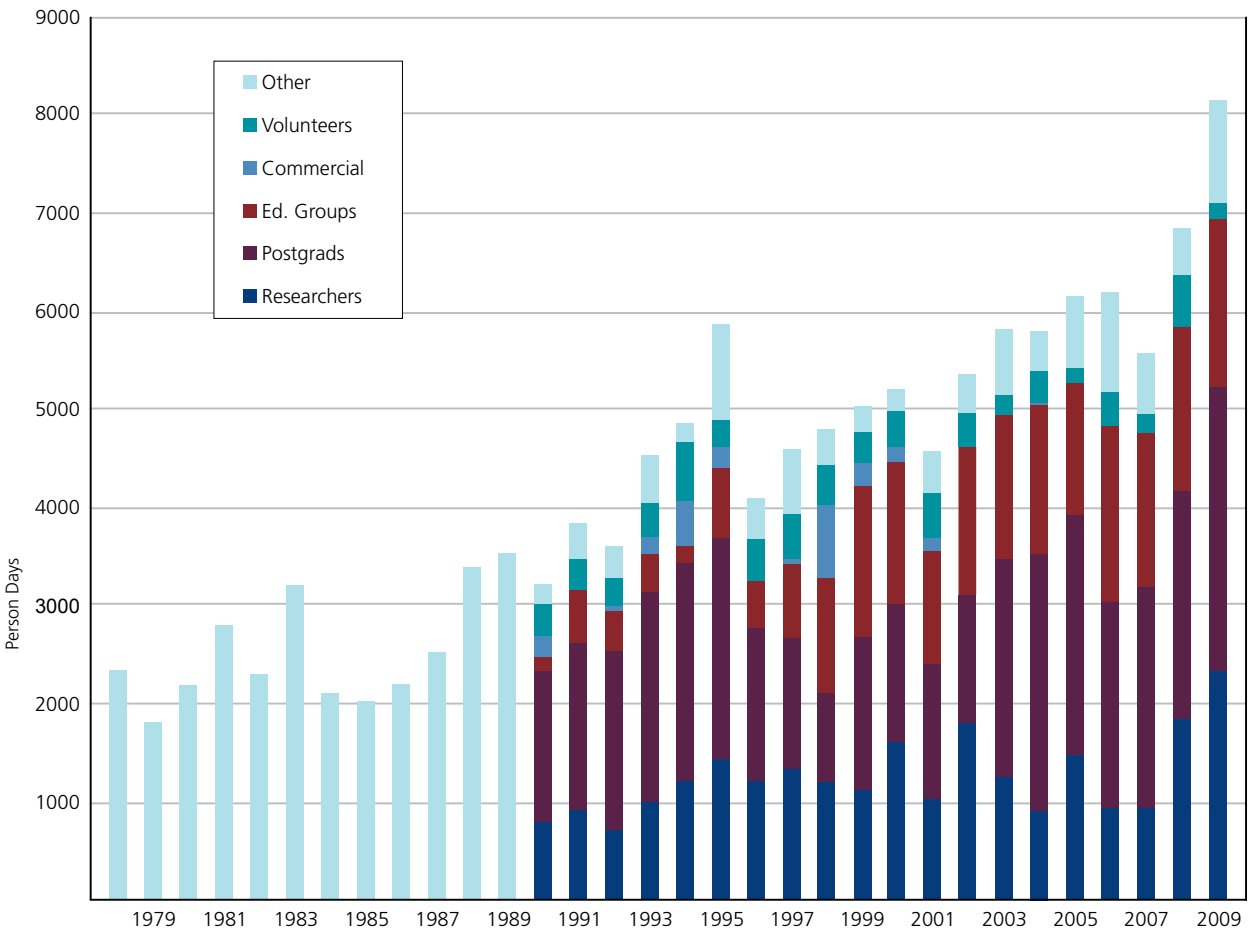
Additional staff are needed to cope with the increased workload caused by the upgrade program and by the increase in usage. Temporary and casual staff employed during 2009 were Snow Amos, Ian Andrews, Matthew Mitchell and Alex Vail.

TOURS

Tours of the Station are conducted for resort guests on Monday mornings. A tour for other island guests, mainly campers and yachties, is conducted between May and October at 11 am on Mondays. At other times, visitors are welcome to call into the Station to view the Sir John Proud Aquarium and courtyard displays, but guided tours are not available.

VOLUNTEERS

The following people provided valuable volunteer assistance with maintenance of the station in 2009: Marcus Boege, John Devlin, Elisa Distefano, Terry Ford, Sam Hammond, Scott Harte, Jarrett Hines, Renie Hood, Hannah Jensen, Jesse La France, Corina Lewington, Dominique McCowan, Yarema Reshitnyk, Maureen Wilson, Les Wilson, Lois Wilson, Helen Wodetzki, Holly Wodetzki, Peter Wodetzki and Dirk Zboralski. As well, we thank Charlie Makray for voluntarily continuing to provide First Aid training to LIRS staff. Our sincere thanks go to all these people for their help in making the Station run efficiently.



Top left: Island visitors at LIRS.

Top middle: The larval fish research team led by Phil Munday, Mark Meekan and Mark McCormick (back row, left to right).

Top right: Barker College students prepare for a snorkelling trip.

Middle: Perception of the coral reef environment is a theme of current research at LIRS.



VISITORS IN 2009

Left: In their first full year of operation, *Macquarie 1* and sister vessel *Macquarie 2* have proved excellent for both research and student group usage.  
Middle: Crown-of-thorns Starfish spawning.  
Right: Greg Torda installs settlement panels onto the reef for genetic studies on corals.



SCIENTISTS

**ROB ADLARD**, Queensland Museum  
Protistan parasites of teleosts and elasmobranchs: biology, transmission and identity

**TROND AMUNDSEN, ELISABET FORSGREN** and **STEFAN WALKER**, Norwegian University of Science and Technology  
Coral reef fish coloration: sexual selection, diversity and speciation

**SCOTT BAINBRIDGE**, Australian Institute of Marine Science  
Great Barrier Reef Ocean Observing System

**ANDREW BAIRD**, James Cook University  
Testing the adaptive capacity of corals to climate change: a demographic approach

**LINE BAY**, James Cook University  
Colour polymorphism and bleaching tolerance in *Acropora millepora*

**MICHAEL BERUMEN**, Woods Hole Oceanographic Institution and **DAVID RAUBENHEIMER**, Massey University  
Resources and fitness of coral-feeding butterflyfishes

**REDOUAN BSHARY**, University of Neuchatel  
Cooperative and cognitive aspects of cleaning symbiosis

**INGO BURGHARDT**, University of Bochum  
Impact of climate change factors on different zooxanthellate symbioses

**KAREN BURKE DA SILVA**, Flinders University  
1) Mating strategies of specialist and generalist clownfish  
2) Percentage of anemone clones to individuals  
3) Distribution of clownfish and their associated anemones

**ROY CALDWELL**, University of California, Berkeley

Stomatopod behaviour  
**JULIAN CALEY**, Australian Institute of Marine Science  
**JOHN AHEARN**, University of Melbourne  
**ARTHUR ANKER**, Florida Museum of Natural History  
**CLAUDIA ARANGO CARVAJAL**, Queensland Museum  
**JO BROWNE**, Museum Victoria  
**MAGDALENA BLAZEWICZ-PASZKOWYCZ**, University of Lodz  
**PHIL BOCK**, Museum Victoria  
**NIEL BRUCE**, Museum of Tropical Queensland  
**RAINBO DIXON**, Murdoch University  
**JULIAN FINN**, Museum Victoria  
**FRED GURGEL**, University of Adelaide  
**ANDERS HALLEN**, University of Wollongong  
**ROB LASLEY**, Florida Museum of Natural History  
**ASHLEY MISKELLY**, independent researcher  
**FRANCOIS MICHONNEAU**, Florida Museum of Natural History  
**MOLLY TIMMERS**, National Oceanic and Atmospheric Administration  
**CHARLOTTE WATSON**, Northern Territory Museum  
C-Reefs – Census of Marine Life

**KAREN CHENEY**, University of Queensland  
Evolution of coloured signals in marine organisms

**SHAUN COLLIN**, University of Queensland  
Vision and eye movements in bony fish and elasmobranchs

**SEAN CONNOLLY**, James Cook University  
Biodiversity of coral assemblages

**TOM CRIBB**, University of Queensland and **ROD BRAY**, Natural History Museum, London  
Helminth parasites of Great Barrier Reef fishes

**TOM CRONIN**, University of Maryland Baltimore County  
Polarization in twilight/nocturnal skies

**GUILLERMO DIAZ-PULIDO**, University of Queensland  
Understanding the sensitivity of crustose coralline algae to ocean acidification

**MARIA DORNELAS**, James Cook University  
Explaining coral species abundances: linking morphology to demography

**SIMON DUNN**, University of Queensland  
Effects of future ocean acidification on the physiology of hermatypic corals

**MATTHEW FELGATE**, University of Auckland  
**CAROL LENTFER**, University of Queensland  
**SIMON HABERLE**, Australian National University  
**JIM SPECHT**, Australian Museum  
Distribution, abundance and diversity of the Lapita cultural complex on the GBR coastline of Australia

**MAUD FERRARI**, University of California Davis and **DOUG CHIVERS**, University of Saskatchewan  
Predator recognition in coral reef fishes

**LEE FUIMAN**, University of Texas Austin  
Escape response performance of young reef fish

**NICHOLAS GRAHAM**, James Cook University  
Reef fish replenishment dynamics

**CAIT NEWPORT** and **PETER WALDIE** (for Alexandra Grutter), University of Queensland  
1) Effects of parasites on juvenile reef fish  
2) The energy budget of scarid cocoon production

**ANDREW JEFFS**,

University of Auckland  
Underwater sound at Lizard Island

**PAULINA KANIEWSKA**, University of Queensland  
The effect of ocean acidification on the coral host transcriptome

**ANDREW LEWIS** and **RICK BRALEY**, independent researchers  
Monitoring giant clam populations

**CATHERINE LOVELOCK, JOHN PANDOLFI** and **RUTH REEF**, University of Queensland  
Coral reef ecological stoichiometry

**JOSHUA MADIN**, Macquarie University  
Hydrodynamic disturbances on coral reefs

**JUSTIN MARSHALL, TSYR-HUEI CHIOU** and **MARTIN HOW**, University of Queensland  
Vision and signals in fishes and stomatopods

**MARK MCCORMICK**, James Cook University and **MARK MEEKAN**, Australian Institute of Marine Science  
1) Influence of temperature on behaviour and behavioural consistency  
2) Annual fish census at six sites at Lizard Island  
3) Impact of acidification on fish survival  
4) Selectivity in predation of coral reef fishes

**PHIL MUNDAY**, James Cook University  
Effects of ocean acidification on behaviour of reef fishes

**GORAN NILSSON**, University of Oslo  
1) Effect of temperature on respiration and reproduction in coral reef fish  
2) Effects of ocean acidification on reef fishes

**SHEILA PATEK**, University of California Berkeley  
Biomechanics and evolution of stomatopods

**DAVID PHILLIPS**, Independent researcher  
Long-term monitoring of giant clam populations

**MEGAN PORTER**, University of Maryland Baltimore County  
Barcoding larval stomatopod crustaceans for physiological, ecological and biodiversity studies

**MORGAN PRATCHETT**, James Cook University  
Bioerosion of dead coral

**CRAIG RADFORD**, University of Auckland  
Ambient underwater sound

**NICHOLA RAIHANI**, Zoological Society of London  
The role of punishment in stabilising cooperation among cleanerfish

**RUTH REEF**, University of Queensland  
Controlled clock genes in corals

**JACK SILVERMAN, KENNY SCHNEIDER**, Carnegie Institution  
**CHRISTIAN ANDREASSI, STEVEN DAVIS**, Stanford University  
**JONATHON EREZ, BOAZ LAZAR, ASAPH RIVLIN**, Hebrew University of Jerusalem  
**DAVID KLINE**, University of Queensland  
Lizard Island community metabolism study

**MARTA SOARES**, Instituto Superior de Psicologia, Lisbon  
1) The effect of cleanerfish tactile stimulation on the physiological response of their client fish  
2) The effect of cooperative behaviour on the brain cell expression of AVT and IT receptors of male and female cleanerfish

**ERIC TREML**, University of Queensland  
Connectivity of coral reefs

**HANS-JOACHIM WAGNER**, University of Tuebingen  
Control of eye movements in the

sandlance, *Limnichthys* sp.  
**DAVID ABREGO** and **ALLISON PALEY** (for Bette Willis), James Cook University  
Ecological significance of coral disease on the Great Barrier Reef

POSTGRADUATE STUDENTS

**TZO ZEN ANG**, University of Cambridge  
Social structure of *Centropyge*

**DANIEL ATKINS**, University of Newcastle  
Natural history illustration

**JOSCHA BENINDE**, University of Tuebingen  
Effect of enforced mating costs in a hermaphroditic sea slug

**ROBERTA BONALDO**, James Cook University  
Influence of herbivorous fishes on the benthic community structure of the Great Barrier Reef

**LAETITIA BRUN**, University of Neuchatel  
Personality in the context of cooperative behaviour in cleanerfish

**ANDREA BSHARY**, University of Neuchatel  
Social dilemma in fish: how do reef fish deal with a sabretooth blenny?

**CHRISTINE BUCKIUS**, University of Queensland  
Holothurian density and diversity assessment

**CONOR CHAMP**, University of Queensland  
Colour vision thresholds in marine fish

**KAREN CHONG-SENG**, James Cook University  
Are coralivorous fishes vectors of coral disease?



## VISITORS IN 2009

Left: Brynn Devine (front) and Danielle Dixon study the effects of pH on larval fish behaviour.  
Middle: Lizard Island viewed from Eyrie Reef.  
Right: Jairo Rivera Posada uses the new fume cabinet for his work on Crown-of-thorns Starfish pathogens.



**DARREN COKER,**  
James Cook University  
Effects of coral bleaching on coral-dwelling fishes

**ANDREW COLE,**  
James Cook University  
Effect of chronic fish predation on reef-building corals

**FABIO CORTESI,**  
University of Queensland  
Do the most conspicuous nudibranchs contain the most toxic chemicals?

**ALICIA CRAWLEY,**  
University of Queensland  
Assessing the risk of ocean acidification for the Great Barrier Reef

**INGRID CRIPPS,**  
James Cook University  
The effect of carbon dioxide induced acidification on the predatory ability and behaviour of coral reef predator *Pseudochromis fuscus*

**BRYNN DEVINE,**  
James Cook University  
Effects of ocean acidification on habitat selection of reef fishes

**MAYA DE VRIES,**  
University of California Berkeley  
Spearing kinetics of mantis shrimp

**DANIELLE DIXSON,**  
James Cook University  
Learned recognition of predators in fish species that provide parental care for their young

**ABIGAIL DOWNIE,**  
University of Queensland  
Patterns of trophic transmission of digenean trematodes in fishes of the Great Barrier Reef

**MAXI ECKES,**  
University of Queensland  
Sunscreen in coral reef fish; are MAA sunscreens exploited in the cleaner-client mutualism?

**WILL FEENEY,**  
James Cook University  
Predator-prey interactions on reefs

**KATE FELLER,** University of Maryland Baltimore County  
Oculae camouflage of stomatopod larvae

**REBECCA FOX,**  
James Cook University  
Ecosystem function of rabbitfishes – movement patterns of *Siganus lineatus*

**NAOMI GARDINER,**  
James Cook University  
Habitat selection by cardinal fish

**TOBIAS GERLACH,**  
University of Tuebingen  
Role of hypodermic injections as mate-manipulation in the sea slug *Siphopteron quadrispinosum*

**RICKY GLEESON,**  
University of Queensland  
Myxosporean parasites of elasmobranchs

**CHRISTOPHER GOATLEY,**  
James Cook University  
The ecological role of sediments on coral reefs

**ALONSO GONZALEZ CABELLO,**  
James Cook University  
Ecology of cryptobenthic reef fish assemblages in the Great Barrier Reef

**BEE GUNN,**  
Australian National University  
Genetic diversity of coconut palms

**HOLLY HEINIGER,**  
University of Queensland  
Myxosporean diversity in apogonids and *Zschokkella/ Myxidium* parasites of marine teleosts

**ANDREW HOEY,**  
James Cook University  
Fish-algal interactions: the role of herbivory in structuring algal communities across an exposure gradient

**JACOB JOHANSEN,**  
James Cook University  
Energetics of habitat choice in planktivorous coral reef fishes

**JAYDE KERSNOVSKE,**

University of Queensland  
Host specificity of *Helicometra* in fishes from Queensland waters: exceptional or misunderstood?

**ROLANDA LANGE,**  
University of Tuebingen  
Sexual reciprocity and traumatic mating in hermaphrodite sea slugs

**CARINE LEFEVRE,**  
James Cook University  
Ecology of cryptobenthic fishes on the Great Barrier Reef

**DOMINIQUE MCCOWAN,**  
James Cook University  
Coral bleaching susceptibility: a hierarchy of causes and consequences

**VANESSA MESSMER,**  
James Cook University  
Causes and consequences of fish diversity loss on coral reefs

**MATHEW MITCHELL,**  
James Cook University  
Chemical cues: the role of chemical alarm cues in coral reef fish

**ANITA NEDOSYKO,**  
Flinders University  
Clownfish host and non-host anemone toxicity

**CRYSTAL NELIGH,**  
James Cook University  
The effect of temperature on predator-prey behaviour

**AMIRA PARKER,**  
University of Queensland  
Secret communication using ultraviolet patterns in reef fish

**ANA PINTO,**  
University of Neuchatel  
Applying game theory and cognition to a cleaning mutualism

**DIANE RAPPAZ,**  
University of Neuchatel  
Do cleanerfish influence predators' behaviour towards prey?

**JAIRO RIVERA POSADA,**  
James Cook University  
Pathogenesis of Crown-of-

thorns Starfish

**JONATHON RUPPERT,**  
University of Toronto  
Community trophic structure and composition between habitats

**JENNI STANLEY,**  
University of Auckland  
Reef-sound-induced settlement in crab megalopae

**JESSICA STELLA,**  
James Cook University  
Threats to coral reef biodiversity due to climate-induced coral bleaching and ocean acidification

**DEREK SUN,**  
University of Queensland  
Ecological role of parasites in fish after settlement

**GERGELY TORDA,**  
James Cook University/ Australian Institute of Marine Science  
Assessment of ecological connectivity in corals: implications for their recovery from perturbations and adaptation to climate change

**JOOST VAN DAM,**  
James Cook University/ Australian Institute of Marine Science  
Interactive effects of water quality parameters and climate change on calcifying marine species

**PETER WALDIE,**  
University of Queensland  
Long-term direct and indirect effect of *Labroides dimidiatus* on the coral reef community

**PATRICIA WARNER,**  
James Cook University/ Australian Institute of Marine Science  
Population genetics of *Seriatopora hystrix*

**CHRISTINE WEAVER,**  
James Cook University  
Competition of damselfish

**SHELLEY WRIGHT,**  
University of New England  
Evaluating Holocene sea-level models

using fixed intertidal biological indicators on the central and north Queensland coast and islands

**RUSSELL YONG QI YUNG,**  
University of Queensland  
Sanguinicolid diversity of eggs as sentinels of infection

**MATTHEW YOUNG,**  
James Cook University  
Sea-urchin predation on the Great Barrier Reef

## UNDERGRADUATE RESEARCH STUDENTS IN 2009

**MAE LORTIE,**  
School for International Training  
Effects of temperature and pH on marine turf algae biomass accumulation

## STUDENT GROUPS

Brighton Grammar School, Australia  
Led by Dr Andrew Lewis

University of Texas Austin, USA  
Led by Dr Dean Hendrickson

Geelong College Preparatory School, Australia  
Led by Mr Stuart McCallum

RMIT University, Australia  
Led by Assoc. Prof. Gale Spring and Dr Brian Leonard

Haileybury College, Australia  
Led by Dr Andrew Lewis

Darwin High School, Australia  
Led by Mrs Rachel Elphick

Barker College, Australia  
Led by Mr Tim Binet

Queenwood School, Australia  
Led by Mrs Jane Valentine

World Learning, School for International Training, USA  
Two groups led by Dr Tony Cummings

## OTHER VISITORS

Filming for new LIRS video production  
Russell Kelley, Rachel Pears, Richard Fitzpatrick, Bess Manley and others

Lizard Island Reef Research Foundation  
Charlie and Sandy Shuetrim  
Wayne, Angus and Natalie Peters  
Thyne Reid Foundation  
Ian Reid and Jill Potts

Gathering educational materials  
Jim Stidham, Presbyterian College

Construction works  
Aaro Raappana, Kyle Barry, Jye Barry, Max Bryant and others

Research Institute for Sustainable Energy, Murdoch University  
Andrew Beveridge and Oscar Arteaga

Work experience  
Claudia Seyffer

Council of Australasian Museum Directors  
Margaret Anderson, Kate Clark, Graham and Irene Durant, Meredith Foley, Frank Howarth, Brian Lassig, Anna Malgorzewicz, Mary-Louise Williams and Dominic Wilson.

Australian Museum Facilities Manager  
Glenn Hodges

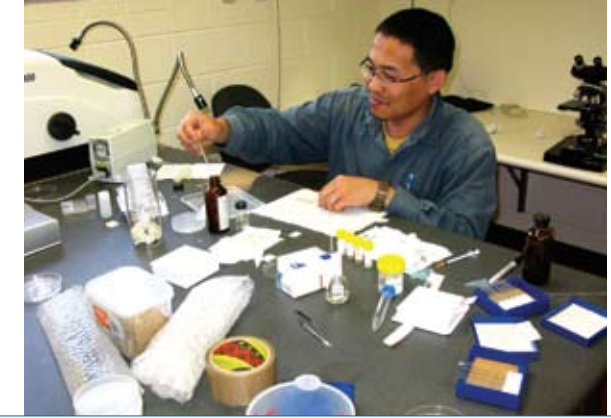
First Aid training  
Charlie Makray and Julie Armour

Documentary on climate change for French radio  
Caroline Lafargue

Reconnaissance for future projects  
Daniel Rabosky  
Daniel Ruzzante



## PUBLICATIONS



Seventy-three publications based on work carried out at the Research Station were received into the Station's collection during the year. The collection now comprises almost 1300 publications.

Affeld, S., S. Kehraus, H. Waegle and G.M. Koenig, 2009. Dietary derived sesquiterpenes from *Phyllodesmium lizardensis*. *Journal of Natural Products*, 72: 298-300.

Ball, A.D., K.J. Purdy, E.A. Glover and J.D. Taylor, 2009. Ctenidial structure and three bacterial symbiont morphotypes in *Anodontia (Euanodontia) ovum* (Reeve, 1850) from the Great Barrier Reef, Australia (Bivalvia: Lucinidae). *Journal of Molluscan Studies*, 75: 175-185.

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Barton, D.P., C. Beaufre, J.-L. Justine and I.D. Whittington, 2009. Polyopisthocotylean monogeneans from carangid fishes off Queensland, Australia and New Caledonia, with a description of *Heteromicrocotyloides megaspinosus*. *Acta Parasitologica*, 54: 205-217.

Bellwood, D.R. and C.J. Fulton, 2008. Sediment-mediated suppression of herbivory on coral reefs: decreasing resilience to rising sea levels and climate change? *Limnology and Oceanography*, 53: 2695-2701.

Benavides-Serrato, M. and T.D. O'Hara, 2008. A new species in the *Ophiocoma erinaceus* complex from the South-west Pacific Ocean (Echinodermata: Ophiuroidea: Ophiocomidae). *Memoirs of Museum Victoria*, 65: 51-56.

Blazewicz-Paszkowycz, M. and K. Zemko, 2009. A new species of *Metatanais* Shiino, 1952 (Crustacea, Tanaidacea, Paratanaoidea) from Australian coral reefs, with a redefinition of the genus. *ZooKeys*, 18: 129-141.

Bleidorn, C. N. Hill, C. Erseus and R. Tiedeman, 2009. On the role of character loss in orbiiniid phylogeny (Annelida): molecules vs. morphology. *Molecular Phylogenetics and Evolution*, 52: 57-69.

Bott, N.J. and T.H. Cribb, 2009. Prosorhynchine trematodes (Digenea: Bucephalidae) from epinephelins (Perciformes: Serranidae) on the Great Barrier Reef, Australia. *Systematic Parasitology*, 72: 57-69.

Bray, R., A. Waeschenbach, T.H. Cribb, G.D. Weedall, P. Dyal and D.T.J. Littlewood, 2009. The phylogeny of the Lepocreadioidae (Platyhelminthes, Digenea) inferred from nuclear and mitochondrial genes: implications for their systematics and evolution. *Acta Parasitologica*, 54: 310-329.

Bray, R.A., T.H. Cribb and J.-L. Justine, 2009. New observations on the genus *Hypocreadium* Ozaki (Digenea: Lepocreadiidae) in the Indo-West Pacific region, including the description of one new species. *Zootaxa*, 2110: 22-40.

Bruce, N.L., 2009. A new species of *Joeropsis* Koehler, 1885 (Isopoda, Asellota, Joeropsidae) from the Great Barrier Reef, Australia. *Crustaceana*, 82: 803-813.

Burger, M.A.A., T.H. Cribb and R.D. Adlard, 2007. Patterns of relatedness in the Kudoidae with descriptions of *Kudoa chaetodoni* n. sp. and *K. lethrini* n. sp. (Myxosporea: Multivalvulida). *Parasitology*, 134: 669-681.

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Cheney, K.L., 2008. The role of avoidance learning in an aggressive mimicry system. *Behavioral Ecology*, doi:10.1093/beheco/arn001.

Cheney, K.L. and N.J. Marshall, 2009. Mimicry in coral reef fish: how accurate is this deception in terms of color and luminance? *Behavioral Ecology*, 20: 459-477.

Cheney, K.L., A.S. Grutter, S.P. Blomberg and N.J. Marshall, 2009. Blue and yellow signal cleaning behaviour in coral reef fishes. *Current Biology*, 19: 1283-1287.

Cheney, K.L., C. Skogh, N.S. Hart and N.J. Marshall, 2009. Mimicry, colour forms and spectral sensitivity of the bluestriped fangblenny, *Plagiotremus rhinorhynchus*. *Proceedings of the Royal Society B*, 276: 1565-1573.

Cheroske, A.G., T.W. Cronin, M.F. Durham and R.L. Caldwell, 2009. Adaptive signaling behavior in stomatopods under varying light conditions. *Marine and Freshwater Behaviour and Physiology*, 42: 219-232.

Chuan-Chin, C., T.W. Cronin and N.J. Marshall, 2000. Eye design and color signaling in a stomatopod crustacean *Gonodactylus smithii*. *Brain, Behavior and Evolution*, 56: 107-122.

Coetzee, M.L., N.J. Smit, A.S. Grutter and A.J. Davies, 2009. *Gnathia trimaculata* n. sp. (Crustacea: Isopoda: Gnathiidae), an ectoparasite found parasitising requiem sharks from off Lizard Island, Great Barrier Reef, Australia. *Systematic Parasitology*, 72: 97-112.

Coker, D.J., M.S. Pratchett and P.L. Munday, 2009. Coral bleaching and habitat degradation increase susceptibility to predation for coral-dwelling fishes. *Behavioral Ecology*, doi: 10.1093/beheco/arp113

Coker, D.J., M.S. Pratchett and P.L. Munday, 2009. Does body colouration influence predation risk of coral-dwelling reef fish in bleached landscapes? *Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, July 2008*: 1281-1285.

Cole, K.S., 2009. Modifications of the reproductive complex and implications for the reproductive biology of *Gobiodon oculolineatus* (Teleostei: Gobiidae). *Environmental Biology of Fishes*, 84: 261-273.

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Davies, A.J., L. Curtis, A.S. Grutter and N.J. Smit, 2009. Suspected viral erythrocytic necrosis (VEN) in a juvenile blackbar triggerfish, *Rhinecanthus aculeatus*, from Lizard Island, Great Barrier Reef, Australia. *Marine Biodiversity Records*, 2: e149.

De Wit, P., E. Rota and C. Erseus, 2009. *Grania* (Annelida: Clitellata: Enchytraeidae) of the Great Barrier Reef, Australia, including four new species and a re-description of *Grania trichaeta* Jamieson, 1977. *Zootaxa*, 2165: 16-38.

Ferreira, M.L., N.J. Smit, A.S. Grutter and A.J. Davies, 2009. A new species of gnathiid (Crustacea: Isopoda) parasitizing teleosts from Lizard Island, Great Barrier Reef, Australia. *Journal of Parasitology*, 95: 1066-1075.

Fogelman, R.M., A.M. Kuris and A.S. Grutter, 2009. Parasitic castration of a vertebrate: effect of the cymothoid isopod, *Anilocra apogonae*, on the five-lined cardinalfish, *Cheilodipterus quinquelineatus*. *International Journal for Parasitology*, 39: 577-583.

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Goatley, C.H.R. and D.R. Bellwood, 2009. Morphological structure in a reef fish assemblage. *Coral Reefs*, doi 10.1007/s00338-009-0477-9

Gonzalez-Cabello, A. and D.R. Bellwood, 2009. Local ecological impacts of regional biodiversity on reef fish assemblages. *Journal of Biogeography*, 36: 1129-1137.

Gruber, D.F., R. DeSalle, E.K. Lienau, D. Tchernov, V.A. Pieribone and H.-T. Kao, 2009. Novel internal regions of fluorescent proteins undergo divergent evolutionary patterns. *Molecular Biology and Evolution*, 26: 2841-2848.

Grutter, A.S., 2008. Interactions between gnathiid isopods, cleaner fish and other fishes on Lizard Island, Great Barrier Reef. *Journal of Fish Biology*, 73: 2094-2109.

Gunter, N.L. and R.D. Adlard, 2009. Seven new species of *Ceratomyxa* Thelohan, 1892 (Myxozoa) from the gall-bladders of serranid fishes from the Great Barrier Reef, Australia. *Systematic Parasitology*, 73: 1-11.

Gunter, N.L., C.M. Whipps and R.D. Adlard, 2009. *Ceratomyxa* (Myxozoa:Bivalvulida): robust taxon or genus of convenience? *International Journal for Parasitology*, 39: 1395-1405.



## PUBLICATIONS

Heenan, A., S.D. Simpson and V.A. Braithwaite, 2009. Testing the generality of acoustic cue use at settlement in larval coral reef fish. *Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, July 2008*: 554-558.

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Hoey, A.S. and D.R. Bellwood, 2009. Limited functional redundancy in a high diversity system: single species dominates key ecological process on coral reefs. *Ecosystems*, doi: 10.1007/s10021-009-9291-z

Hoey, A.S. and D.R. Bellwood, 2009. Among-habitat variation in herbivory on *Sargassum* spp. on a mid-shelf reef in the northern Great Barrier Reef. *Marine Biology*, doi 10.1007/s00227-009-1309-8

Holmes, T.H. and M.I. McCormick, 2009. Influence of prey body characteristics and performance on predator selection. *Oecologia*, 159: 401-413.

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McCormick, M.I., 2009. Behaviourally mediated phenotypic selection in a disturbed coral reef environment. *PLoS One*, 4: e7096. doi:10.1371/journal.pone.0007096.

McCormick, M.I. and M. & Gagliano, 2009. Carry-over effects - the importance of a good start. *Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, July 2008*: 305-310.

Miller, T.L. and T.H. Cribb, 2009. *Gynichthys diakidnus* n. g., n. sp. (Digenea: Cryptogonimidae) from the grunt *Plectorhinchus gibbosus* (Lacepede, 1802) (Perciformes: Haemulidae) off the Great Barrier Reef, Australia. *Systematic Parasitology*, 74: 103-112.



Miller, T.L., A.J. Downie and T.H. Cribb, 2009. Morphological disparity despite genetic similarity; new species of *Lobosorthis* Miller & Cribb, 2005 (Digenea: Cryptogonimidae) from the Great Barrier Reef and the Maldives. *Zootaxa*, 1992: 37-52.

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Top left: Matthew Felgate (left) is assisted by John Charlie in his archaeological research.

Top right: Andy Hoey, 2007 Ian Potter Doctoral Fellow, sets up a video camera to find out which fish eat different kinds of fleshy algae. Photo: David Wachenfeld.

Bottom: Microatolls at Eyrie Reef.





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