Australian Museum Lizard Island Research Station
Newsletter 2008

nature culture **discover**

Australian museum
LIZARD ISLAND RESEARCH STATION

Supported by the Lizard Island Reef Research Foundation
Published March 2009

AUSTRALIAN MUSEUM
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Main cover photo: ©istockphoto.
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Frank Howarth's photo: Stuart Humphreys.

Design and Production Alison Murphy, Australian Museum Design Unit.

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AUSTRALIAN MUSEUM DIRECTOR'S REPORT

"If you build it they will come" might be a credible prediction for construction of a baseball field in the middle of a cornfield in Iowa but it is not necessarily applicable to a research station at the northern end of the Great Barrier Reef. In the same way it is not adequate justification for developing and maintaining extensive museum collections - even if both are world-class with outstanding international reputations. In both cases we can provide cost-effective incentives to ensure their use.

Research on the Great Barrier Reef is expensive relative to many other scientific pursuits. The high cost can be a significant impediment to the conduct of longer-term field-based research which is fundamental to understanding biological processes at this critical time as coral reefs worldwide face decline. For younger, early career researchers who have not had the opportunity to establish outstanding track records fundamental to winning substantial research grants, the costs can be prohibitive.

In this context, the support of the Lizard Island Reef Research Foundation by providing a range of fellowships to enable outstanding graduates and early career researchers to work at the research station is vital. The Museum has an identical approach to encourage researchers to work with our scientists and on our collections in Sydney. This suite of fellowships offers

incredible opportunities for researchers throughout the world to develop and share their expertise and knowledge. In so doing, they enhance the value of our amazing assets and contribute to the Museum's purpose – "to inspire the exploration of nature and cultures".

FRANK HOWARTH
Director, Australian Museum

RESEARCH STATION DIRECTORS' REPORT

Facilities at Lizard Island Research Station continue to improve as the 30th Anniversary Development Program unfolds thanks to the successful partnership between the Australian Museum and the Lizard Island Reef Research Foundation. This year, we completed two major projects: two visitor houses (Kirby and Suntory) were refurbished and the Sir John Proud Aquarium was improved by trebling its seawater pumping capacity and by installing systems to treat raw seawater in various ways. Next year, the final visitor house (Loomis) will be extended and refurbished and the aquarium will be extended to provide additional space that is needed so badly during peak periods.

Providing great facilities at LIRS is one thing; making sure that the best and brightest people have access to it is another. Field work on coral reefs is not an inexpensive undertaking and the substantial grants needed to enable it tend to gravitate to senior researchers. Recognising this, the LIRRF has a long history of providing funds to support field work by young researchers through fellowships awarded by the Australian Museum. Support for this program continues to grow, with the Yulgilbar Foundation joining The Ian Potter Foundation, the Hermon Slade Raiatea Foundation and the estate of John and Laurine Proud as supporters of this program. This year, no fewer than five new fellowships were awarded: two to PhD students and three to early-career scientists, as detailed inside.

In 2008, the building program did not displace normal activities as much as in previous years. This was

reflected in the highest usage on record, approaching the planned cap of 7,000 user nights per year. Research personnel comprised more than 63% of the total and student groups at 24% made up the bulk of the remainder. See the list near the end of this newsletter for the wide variety of institutions and countries represented, and the projects undertaken.

ANNE HOGGETT AND LYLE VAIL
Directors, Lizard Island Research Station

WHAT HAVE WE **LEARNED** THIS YEAR?

At least 63 publications based on research at Lizard Island appeared in the scientific literature in 2008 *(see page 16)*. Here are just a few of the highlights:

The diversity of life on coral reefs is huge and an enormous number of species are still unknown to science. Thirty new species of invertebrates were described from Lizard Island this year: 12 myxozoans, 10 flatworms, 3 amphipods, 2 isopods, and 3 sea slugs. What's a myxozoan? It's a phylum - a very major group - of animals that are parasites of fishes.

Evolutionary relationships within and among animal groups are being uncovered more quickly and with greater accuracy using molecular techniques in addition to traditional morphology. Relationships and evolutionary trends were uncovered in numerous animal groups at Lizard Island this year including coral gobies, parrotfishes, gnathiid isopods, sea slugs and naticid gastropods.

Left: Bumphead parrotfish.
Right: Diverse assemblage of reef flat corals.
Top: Eyespots indicate vulnerable babyhood.

Development of features such as the hard shell of tubeworms and a particular joint in the jaw of fishes can drive subsequent evolution in those groups. Papers on both these developments and their consequences appeared during the year, based in part on work carried out at Lizard Island.

Most coral reef animals start life as a free-living larva before settling onto the reef. A very different pattern has been discovered for a brittle-star species at Lizard Island. Instead of being spawned into the water, eggs are spawned into the female's respiratory chambers where they are fertilised, hatch and develop into juveniles. Although a handful of other tropical brittlestars are known to brood, this species is unique in having a larva of the type that is normally free-living.

Do "eyespots" on coral reef fishes really fool predators into thinking that the head is at the wrong end or that the animal is bigger than it is? Not really, according to a study at Lizard Island of a damselfish species that has distinct eyespots as juveniles which fade in adulthood. Instead, eyespots seem to signal "I am a baby and not a threat to you" to adults of the same species, possibly resulting in better protection and nutrition of the juvenile.

Corals routinely harbour many other organisms within their tissues. The relationships are complex and poorly understood - they may range from symbiotic to pathogenic. Work at Lizard Island published this year has shown that virus-like particles are a common part of this community of organisms found within corals, and they are found in both healthy and diseased corals.

Coral gobies live in small, stable groups within a single coral colony. There is only one male in the group and it breeds only with the largest female. The other individuals are smaller, non-breeding females who can change sex under suitable conditions. A series of studies conducted at Lizard Island has discovered why and how subordinates remain smaller and how monogamy has evolved. Dominant females attack subordinates when they grow too large. Subordinate females thus have to strike a balance between getting enough food to survive and effectively dieting so as not to grow large enough to invite attack. This results in the dominant female suppressing maturation of subordinates and preventing the male from breeding with other females.

FELLOWSHIPS

FELLOWSHIPS FOR PHD STUDENTS

Fellowships were awarded by the Australian Museum to two PhD students to support up to three years' field work at Lizard Island starting in 2009. The fellowships are each valued at $7,000 per year. They are awarded on a competitive basis to outstanding PhD candidates who will conduct field- intensive research at the Lizard Island Research Station. Their research will complement the Australian Museum's Science Research Strategy.

The Ian Potter 2009 Doctoral Fellowship at Lizard Island

Funding for this fellowship is provided by The Ian Potter Foundation. This is the fourth fellowship provided by The Ian Potter Foundation, which has also funded the Ian Potter Centre for Tropical Marine Research at Lizard Island.

ALICIA CRAWLEY
University of Queensland

Assessing the risk of ocean acidification for the Great Barrier Reef

Oceans are becoming more acidic due to increasing atmospheric CO_2: pH has dropped by 0.1 units since pre-industrial times and it is predicted to decline by a further 0.3 units by the end of this century. Acidification poses a real threat to the ability of corals and other marine calcifiers to build their skeletons because it reduces the availability of necessary chemicals in the water. Coral reefs are also affected by increasing temperature which can lead to coral bleaching through disruption of the relationship between corals and their internal plant symbionts. The impacts of ocean acidification on the photo-physiology of coral symbioses are poorly understood. Alicia will investigate the consequence of ocean acidification on the coral symbiosis. Her research will be conducted by complementary physiological and genetic measurements.

"Reef acidification" is likely to be different to "ocean acidification". At low tide, reef flats experience "reef acidification" on a daily basis. This is due to processes such as photosynthesis, respiration and calcification that change water chemistry while shallow water is pooled. At Lizard Island, Alicia will take field measurements of daily reef acidification under different environmental conditions in order to map areas at greatest risk. These results will provide predictive power for reef managers and will help identify areas that are at greatest risk from future reef acidification.

Lizard Island 2009 Doctoral Fellowship

The Lizard Island Doctoral Fellowship is funded by the Lizard Island Reef Research Foundation. The 2009 award is the 39th doctoral fellowship funded by the Foundation since the inception of the program in 1984.

REBECCA FOX
ARC Centre of Excellence for Coral Reef Studies and James Cook University

The functional ecology of rabbitfishes on the Great Barrier Reef

Rabbitfishes are characteristic of coral reefs of the Great Barrier Reef, Indo-Pacific and the Red Sea. Despite their widespread distribution and abundance, the ecosystem function of individual species and their roles

FELLOWSHIPS

in maintaining the balance between coral and algae on reefs are not well understood. In terms of their ecology, they are the least-studied of the four major families of nominally herbivorous fishes (parrotfishes, surgeonfishes, damselfishes and rabbitfishes) on coral reefs.

In many countries rabbitfishes form a significant part of the commercial and artisanal fishing catch. It is therefore important that we gain a better understanding of their ecological role since they can easily be over-exploited. This project will provide important information regarding the relative importance of rabbitfishes to the health of coral reef ecosystems.

Rebecca's study will:

- Determine the comparative feeding behaviours of common species of rabbitfishes at Lizard Island and relate these to the functional role played by each species.
- Use acoustic telemetry to determine the home range size, diurnal movement patterns and associated habitat use of several species of rabbitfishes.
- Produce an ecosystem function analysis of all nine species of rabbitfishes at Lizard Island based on their diet and feeding behaviour.

FELLOWSHIPS FOR POST-DOCTORAL RESEARCHERS

Fellowships were awarded by the Australian Museum to three early-career researchers. Valued at up to $8,000 each, funding is provided through the Lizard Island Reef Research Foundation. The fellowships are awarded on a competitive basis to outstanding candidates who obtained a PhD degree less than six years ago and who will conduct field- intensive research at the Lizard Island Research Station in 2009. Their research will complement the Australian Museum's Science Research Strategy.

Top: Dr Michael Berumen.

Isobel Bennett Marine Biology Fellowship

This fellowship is funded by the Hermon Slade Raiatea Foundation. It is named in recognition of Dr Isobel Bennett AO, one of Australia's eminent marine biologists who died in January 2008.

DR MEGAN PORTER
University of Maryland Baltimore County

Barcoding larval stomatopod crustaceans for physiological, ecological, and biodiversity studies

Stomatopods are crustaceans that are commonly found on coral reefs. They have been used as a model system for investigating Indo-Pacific marine biogeography and larval dispersal. Adult stomatopods are of particular interest because they have very complex visual systems.

Studies of larval genetic diversity within the Indo-Pacific have shown that a large number of undescribed stomatopod species exist in the region. DNA barcoding has successfully been used to assign hard-to-identify larval types to a particular species.

Megan's project will genetically characterize all of the described stomatopod species of the Lizard Island Group, linking both larval and adult morphologies. By systematically sampling stomatopod larvae from a wide range of sites at Lizard Island, the potential to discover new species is high. Importantly, this project will also provide valuable field experience for two new PhD students researching stomatopod vision.

John and Laurine Proud Fellowship at Lizard Island

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, supported the station for more than 30 years. Their estate continues to support this fellowship.

DR MICHAEL BERUMEN
Woods Hole Oceanographic Institution

Self-recruitment and the contribution of resource quality to fitness in coral reef fish

Measuring "connectivity" between reefs remains a challenge for managers and scientists despite the fundamental importance of these processes to sustaining a given population. Preliminary studies of reef fish have shown that self-recruitment - juveniles returning to the same reef as their parents - is more common than previously expected. This significantly affects local population dynamics and can be measured with extremely high spatial resolution using non-lethal genetic techniques.

Parentage analysis from a non-lethal fin clip for genotyping provides a unique measure of fitness by confirming the successful settlement of offspring from specific parents. Recruits can be monitored for survival and eventually their own reproductive success can be followed.

Michael's study species will be *Chaetodon baronessa,* a home-ranging corallivorous butterflyfish. Reefs around Lizard vary greatly in the "quality" of corals available to this fish resulting in differences in energy storage, growth, and longevity. He will use parentage analysis to assess reproductive success of fish from different areas around Lizard.

In addition to providing direct measurements of self-recruitment and connectivity of a pelagic spawning species, this study will identify which resources are influencing the fitness of reef fish. This work will provide information directly applicable to management: if we better understand the resources that lead to higher reproductive output, we can more efficiently create effective spatial management plans.

The Yulgilbar Foundation Fellowship at Lizard Island

Funding from The Yulgilbar Foundation to the Lizard Island Reef Research Foundation has enabled establishment of this fellowship. The Yulgilbar Foundation is also a substantial supporter of the capital development program at the Lizard Island Research Station. The inaugural Yulgilbar Foundation Fellowship was awarded this year.

DR GUILLERMO DIAZ-PULIDO
Centre for Marine Studies University of Queensland

Understanding the sensitivity of crustose coralline algae to ocean acidification

Plants known collectively as crustose coralline algae (CCA) make critical contributions to the construction of reefs by depositing a particular type of limestone, high-magnesium calcite. They build and cement the framework of coral reefs by binding adjacent substrata and by providing a calcified tissue barrier against erosion. CCA also induce settlement of coral larvae and other invertebrates on coral reefs.

CCA are extremely sensitive to increasing ocean acidification. There are 20 to 30 species of CCA at Lizard Island, encompassing a variety of morphologies, life strategies, ecologies and geochemical compositions. Therefore, it is likely that they will respond differently to acidification and some may be able to adapt in ways that we don't yet understand. Investigation of these factors will provide new insights into the impacts that coral reefs are facing in a period of rapid climate change.

FELLOWSHIPS

RESEARCH BY FELLOWS IN 2008

Fellowships awarded in previous years supported the research of ten scientists at Lizard Island during 2008.

Lizard Island Doctoral Fellows	Adel Heenan, University of Edinburgh (2007) Michael Holcomb, Massachusetts Institute of Technology (2007) Tom Holmes, James Cook University (2007) Roberta Bonaldo, James Cook University (2008) Jacob Johansen, James Cook University (2008)
Ian Potter Doctoral Fellows	Lynda Curtis, University of Queensland (2006) Andrew Hoey, James Cook University (2007) Vanessa Messmer, James Cook University (2008)
Isobel Bennett Marine Biology Fellow	Dr Line Bay, James Cook University and Australian Institute of Marine Science (2008)
John & Laurine Proud Fellow	Dr Morgan Pratchett, James Cook University (2008)

PROFILE OF A FELLOWSHIP ALUMNUS

DR KENDALL CLEMENTS

Kendall Clements was the 1987 Lizard Island Doctoral Fellow. His PhD research not only set the course for his career, it also sparked a new line of research that continues today. In the gut of surgeonfishes at Lizard Island, Kendall discovered a microorganism so large that it took several years for Kendall and collaborators Esther Angert and Stan Bullivant to convince the scientific community that it really is a bacterium. Several unique features have been discovered that allow this organism to overcome the size limitations of other bacteria *(Mendell et al., 2008; see Publications)*.

As well as his work with the "big bacterium", Kendall has contributed enormously to our knowledge of herbivory in marine systems and of the evolutionary relationships among herbivorous fishes. Kendall is currently Associate Professor in the School of Biological Sciences at the University of Auckland. He supervises many postgraduate students, maintains many active research collaborations and has so far produced more than 70 papers in peer-reviewed journals of which at least 17 include data collected at Lizard Island.

30TH ANNIVERSARY DEVELOPMENT

This major upgrade of the station's facilities continued during 2008, the fourth year of the project. The Lizard Island Reef Research Foundation has coordinated fundraising for this $4.75 million project which will be completed in 2011.

Achievements during 2008 were:

- Improvements to the supply of seawater to the Sir John Proud Aquarium, including additional intake lines, pumps, drains and associated electrical and switching systems. Funding for the aquarium upgrade has been provided by the **Vincent Fairfax Family Foundation** and additional funding for some pumps was provided by **Friends of Conservation.**
- Refurbishment of visitor houses, Kirby and Suntory, thanks to funding from the **Raymond N. Kirby Foundation** and the **LIRRF.** This included replacement of all windows, installation of insect screens, refurbishment of bathrooms, replacement of floor coverings and storage units in all bedrooms, and new solar hot water systems.
- Three new dinghies *Louise, Sam* and *Sarah* join earlier additions to make six dinghies in the fleet that are part of the 30th Anniversary development. *Louise* was funded by the **WV Scott Charitable Trust**, while *Sam* and *Sarah* were funded by **The Yulgilbar Foundation**.
- Another new dinghy has been ordered. It will be named *Mimi* and it is funded by the **John Villiers Trust.**
- Two larger new boats were also acquired in 2008. Named *Macquarie 1* and *Macquarie 2*, they can each carry up to 12 snorkelers within the Lizard Island group. They were purchased with funds from the **Macquarie Group Foundation** and the **LIRRF.**
- Purchase of a small utility vehicle for use by visitors and for maintenance purposes. It was funded by the **LIRRF**.
- Staged purchase of laboratory equipment continues, funded by the **Raymond E. Purves Foundation** and the **Thyne Reid Foundation**. Items purchased in 2008 include stereomicroscopes, cold light sources, camera fittings for microscopes, analytical balances, vortex mixer, fume cabinet, water bath, vacuum pump, air pump, seawater filtration and sterilisation system, immersion heaters and hot plate/stirrer.
- Installation of a new generator that will become part of a new hybrid alternative energy system in 2010, including replacement of the fuel distribution system to all generators. The new generator was funded by the **Trust Company**.
- Furnishing and fitout of the **Ian Potter Centre for Tropical Marine Research** was completed in 2008.

Left: The aquarium system is a vital resource for many research projects, shown here with Dr Morgan Pratchett.

Centre: Loading the new dinghy, *Sam*.

Right: Vanessa Messmer uses one of the new balances.

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^

TRUSTEES

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

* new patron in March 2008
^ deceased

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. It has raised almost $8 million since its inception in 1978. As well as supporting development of the station's infrastructure, it has enabled the Australian Museum to award 44 doctoral and postdoctoral fellowships with a total value of $542,000. Ken Coles has been a trustee of the Foundation since 1991 and chairman since 1994. He is supported by an active board of Trustees.

In July 2008, Foundation Patron Dr Charles Warman AM died aged 98. Dr Warman was a trustee of the Foundation since 1981 and he was a great friend and colleague of the Foundation's founder, the late Sir John Proud. He was an inventor whose legacy includes the Warman slurry pump that is used in mineral processing plants throughout the world. The directors' house at the research station is named Warman House in recognition of generous and long-term support provided by Dr Warman and his family.

Captain Cook Cruises, under the ownership of LIRRF trustee Trevor Haworth and his family, ran a weekly cruise between Cairns and Lizard Island for fifteen years. The company generously donated an annual LIRRF member's prize of a four-night cruise for two on the luxurious *Reef Endeavour* since 1993. It also provided transport for LIRS researchers at a highly discounted rate. Operations ceased in early 2008, marking the end of a local era. The trustees of the LIRRF made Trevor Haworth a Patron in recognition of his long-term support of the Foundation and of the Research Station.

MEMBERS

Members of the Foundation donate $1,000 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. The stay at the Lizard Island Resort is generously donated by Voyages Resorts. Please see the inside back cover for Members and Friends of the Foundation.

Each year, Foundation chairman Ken Coles organizes an event in Melbourne and Sydney for Foundation members. These occasions are to inform members about the research done at the Station and to thank them for their support.

A luncheon for 27 members and guests was held at the Athenaeum Club in Melbourne on 14 May 2008. The 2007 Ian Potter Doctoral Fellow, Andrew Hoey from James Cook University, spoke about his research at Lizard Island into interactions between herbivorous fishes and algae. His work is showing the importance of these fishes in containing excess algae that can overwhelm disturbed reefs.

Emeritus Professor Howard Choat was the guest speaker at the Sydney dinner that was held at the Wharf Restaurant on 15 September 2008. Before his retirement, Professor Choat was the Head of Marine Biology at James Cook University. He was pivotal in establishing this university as a world leader in coral reef research. Professor Choat, his colleagues and students, have conducted extensive research at the Lizard Island Research Station since the early 1980s. His fascinating talk to a crowd of 98 members and guests was about the importance of parrot fish in maintaining healthy coral reefs.

NATURAL HISTORY ILLUSTRATION

LIRRF trustee Chris Joscelyne and his company Australian Projects have generously agreed to fund a visit to LIRS by an honours student in natural history illustration from the University of Newcastle. The Australian Projects Natural History Illustration Award will enable the recipient to view living reef animals in their natural environment that will be the subject material of their illustrative works. The first award will be made in 2009.

OTHER ACTIVITIES

Dr Anne Hoggett, director of the research station, and Andrew Hoey, 2007 Ian Potter Doctoral Fellow, gave presentations to staff of Macquarie Group on 13 May 2008 in Sydney. The Macquarie Group Foundation has been a strong supporter of the 30th Anniversary Development program by providing funding for educational facilities and vessels used to transport student groups and researchers.

On 9 October 2008, Dr Anne Hoggett was a speaker at The Ian Potter Foundation annual lecture which was held at the Museum Victoria, Melbourne. Anne spoke on the impacts of climate change on coral reefs.

VISITORS

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

- Patron Rob Purves and his son Rhett
- Darvell and Barbara Hutchinson (winners of the 2008 Members prize)
- Rod and Margaret MacDonald
- Ken Coles and Rowena Danziger
- Charlie and Sandy Shuetrim and family members

Top: Rowena Danziger and Ken Coles (at front) with Lyle Vail and Anne Hoggett at LIRS.

Left: Trevor Haworth was presented with his patron's certificate at a luncheon with fellow trustees (from left) Andrew Green, David Shannon, Penny Berents, Chris Joscelyne, Ken Coles, Frank Howarth and Charlie Shuetrim. (Photo courtesy Charlie Shuetrim)

Right: A dinghy has been named after Ellie Shuetrim, shown here with her grandmother Sandy Shuetrim. (Photo: Charlie Shuetrim)

FOR THE **RECORD**

LIZARD ISLAND FIELD GUIDE

A project was started in 2007 to build a well-illustrated, web-based field guide to the organisms of Lizard Island. With seed funding provided by the Lizard Island Reef Research Foundation, Andrew Lewis has been engaged to develop the framework and provide content on common fishes and marine invertebrates. Anne Hoggett is working on the echinoderms.

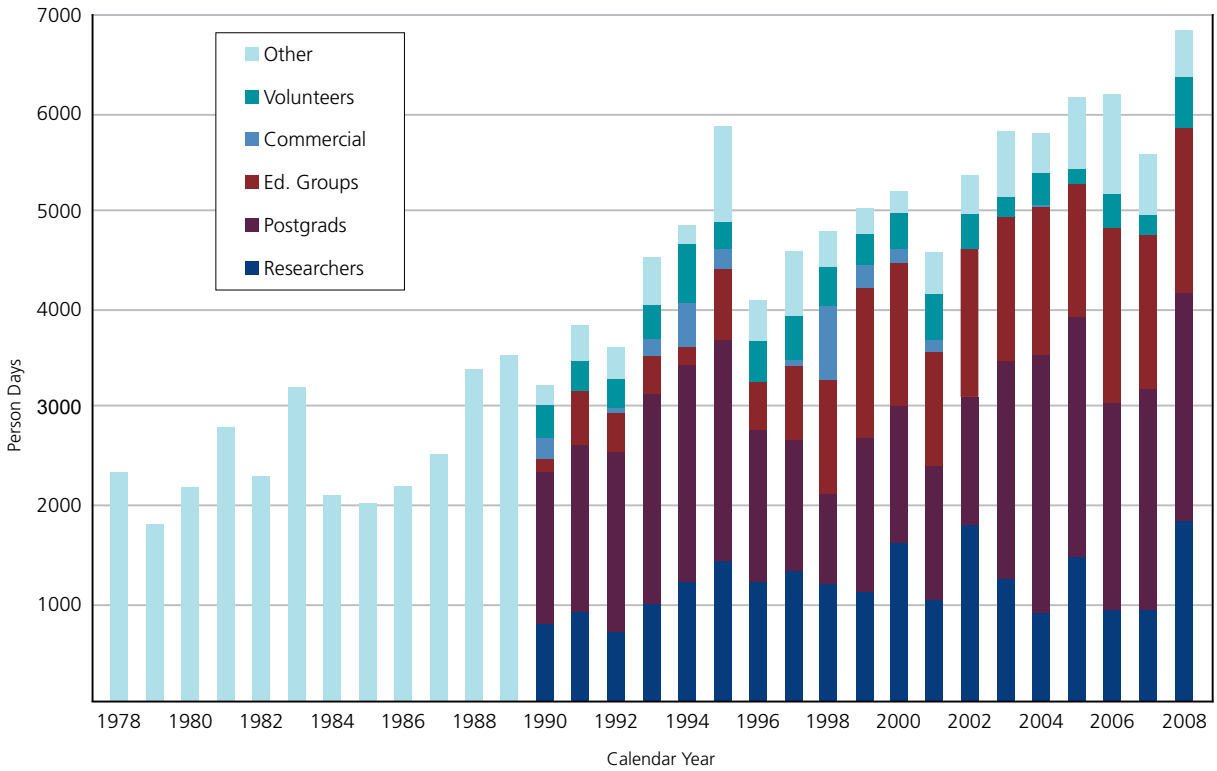
In 2008, the field guide started being used by student groups at LIRS and it has proved to be a useful tool. It will have a broader relevance as its taxonomic coverage develops. Checklists will be drawn from a long-term database of taxa known from Lizard Island based on museum specimens, published records, and of collections and observations made by researchers. The goal is to attract contributions to the guide from experts in various groups of organisms as they pass through LIRS.

ISOBEL BENNETT BOOK COLLECTION

Isobel Bennett AO died in January 2008 aged 98. As one of Australia's pioneering marine biologists, she wrote numerous books that spread enthusiasm about her subject, including several about the Great Barrier Reef. The annual Isobel Bennett Marine Biology Fellowship at Lizard Island, funded by the Hermon Slade Raiatea Foundation through the Lizard Island Reef Research Foundation, is a fitting tribute to her memory. This year, LIRS was proud to receive Isobel's personal copies of her own books and related correspondence, thanks to her sister Phyll Bennett. These will have pride of place in the station's Shuetrim Library.

USAGE

Both total usage and core usage (researchers, postgraduate students and student groups) reached record levels in 2008 at 6,779 and 5,923 person nights, respectively. This approaches the planned usage cap for the station after the upgrade program is completed (7,000 person nights).



BENCH FEES

Per person per night, including GST	2008	2009
Researcher	$110.00	$113.00
Researcher's assistant	$97.00	$100.00
Postgrad. student (own project)	$43.00	$44.00
Postgrad's assistant	$38.00	$39.00
School or university group	$68.50	$70.50
Commercial	$206.00	$212.00

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 work load caused by the upgrade program and by the increase in usage. Temporary and casual staff employed during 2008 were Lynda Curtis, Alex Vail, Warwick Bailie, Julie Bailie, Elizabeth Mow, Soojin Nam, Sung-A Baek and Philip Warner. Lance and Marianne Pearce also returned to the island separately for short periods during winter to help out.

TOURS

Tours of the station are conducted for resort guests on Monday and Friday mornings. A tour for other island guests, mainly campers and yachties, is conducted between May and October at 11 am on Mondays only. 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 2008: Jessie Ainsworth, Snow Amos, Nikki Bass, Finn Baumgartner, Dominique Bradbury, Christoph Braun, Barry Curtis, Daphne Curtis, Mikey Denner, Tanya Dragan, Gabriella Fink, Terry Ford, Fiona Grubb, Carmella Guiol, Brian Hall, Jarrett Hines, Renie Hood, Yvonne Kilroy, Martin Kinrade, Catherine Martin, Amanda Medress, Katie Nairn, Sarah Piddlesden, Tanya Rogers, Rachel Shapiro, Sophie Stojic, Paul, Chris van der Laan, Yoke van der Laan, Constantine Voyevidler, Toby Whitelaw, Lois Wilson, Helen Wodetzki and Peter Wodetzki.

As well, specialist services were provided on a volunteer basis by Allan Ross (microscope service and repair) and Charlie Makray (first aid training).

Our sincere thanks go to all these people for their help in making the station run efficiently.

Top left: Isobel Bennett at Lizard Island in 1974, rescuing a fledgling osprey. (Photo courtesy Phyll Bennett)

Top right: More than 1500 species of fish and 400 species of corals are known from Lizard Island. (Photo: Joao Krajewsky)

Right: Volunteers Sophie Stojic and friends worked hard with staff to install the new aquarium inlet pipes during low tides in July.

VISITORS IN 2008

SCIENTISTS

ROB ADLARD,
Queensland Museum
Myxozoans of the Great Barrier Reef

NADIA AURISCH (for Alexandra Grutter), University of Queensland
1) Cleaner fish in control of blood parasite infections
2) Investigation of cleaner fish functions and mutualism on host fish and fish parasite populations

ANDREW BAIRD,
James Cook University
Biodiversity of coral assemblages

LINE BAY,
James Cook University
and Australian Institute
of Marine Science
Colour polymorphism and bleaching tolerance in *Acropora millepora*

MICHAEL BERUMEN, Woods Hole Oceanographic Institution
1) Nutritional ecology of butterflyfishes
2) Resources and fitness of coral-feeding butterflyfishes

PETER BIRO,
University of Technology Sydney
Growth and metabolic correlates of personality traits in damselfish

INGO BURGHARDT,
University of Bochum
URSULA SHEPHERD,
University of New Mexico
Impact of climate change factors on different zooxanthellate symbioses

Top: Michelle Yerman, Claire Paris, Jean-Olivier Irisson and Jeff Leis with apparatus used to determine whether fish larvae can orient themselves without visual cues.

Left: The LIMER team recording water chemistry data near the reef crest.

Right: Members of the Barcode of Life team at work in the Purves Laboratory: Glenn Moore, Sally Reader and Amanda Hay.

KEN CALDEIRA, Carnegie Institute at Stanford University
JOSH CHAN, Carnegie Institute at Stanford University
JONATHON EREZ,
Hebrew University Jerusalem
DAVID KLINE,
University of Queensland
BOAZ LAZAR,
Inter-University Institute Eilat
TANYA RIVLIN,
Inter-University Institute Eilat
KENNY SCHNEIDER, Carnegie Institute at Stanford University
JACK SILVERMAN, Carnegie Institute at Stanford University
Metabolic exchange on reefs at Lizard Island (LIMER 2008)

JULIAN CALEY, Australian Institute of Marine Science
MAGDALENA BLAZCWICZ,
Museum Victoria
PHIL BOCK,
independent researcher
JOANNA BROWNE,
Griffith University
NIEL BRUCE,
Museum of Tropical Queensland
MERRICK EKINS,
Queensland Museum
KATHARINA FABRICIUS, Australian Institute of Marine Science
CHRIS GLASBY,
Northern Territory Museum
FRED GURGEL,
University of Adelaide
JOHN HUISMAN, University of Western Australia

LAETITIA PLAISANCE, Australian Institute of Marine Science
CHARLOTTE WATSON,
Northern Territory Museum
CReefs - Census of Marine Life

KAREN CHENEY,
University of Queensland
Evolution of aposematic marine organisms

SEAN CONNOLLY,
James Cook University
Coral demography

THOMAS CRIBB,
University of Queensland
ROD BRAY, The Natural History Museum London
Biogeography of Great Barrier Reef fish trematodes

JEREMY DE WAARD,
University of British Columbia
Inventory and barcode library of Lizard Island's Lepidoptera

MARIA DORNELAS,
James Cook University
Linking coral demography to coral shape

CHRISTOPHER FULTON,
Australian National University
Energetics of labriform locomotion

MONICA GAGLIANO,
James Cook University
and Australian Institute
of Marine Science
1) Maternal effects and ocean acidification effects on the development of coral reef fishes
2) Role and function of eyespots in coral reef fishes

TERRY HUGHES, ARC Centre of Excellence for Coral Reef Studies, James Cook University
Marine resilience workshop

ANDREW JEFFS,
University of Auckland
CRAIG RADFORD,
University of Auckland
Underwater sound at Lizard Island

JEFF LEIS, Australian Museum
CLAIRE PARIS,
University of Miami
JEAN-OLIVIER IRISSON,
University of Miami
Orientation in fish larvae

RICHARD LEWIS,
University of Queensland
Identification & characterisation of novel venom peptides in *Conus* sp

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

JOSHUA MADIN,
Macquarie University
Hydrodynamic disturbances on coral reefs

MARK MCCORMICK,
James Cook University
MARK MEEKAN, Australian Institute of Marine Science
1) The importance of attitude: behaviour and performance in the ultimate test
2) Selectivity in predation of coral reef fishes

PHILIP MUNDAY,
James Cook University
Climate change and coral reef fishes

GORAN NILSSON, University of Oslo
SARA OSTLUND NILSSON,
independent researcher
Effect of temperature on respiration and reproduction in coral reef fish

JOERG OTT, University of Vienna
Interstitial marine nematodes with bacterial symbionts: distribution and diversity

MORGAN PRATCHETT,
James Cook University
1) Effects of coral depletion on reef fishes
2) Bioerosion of dead coral

DIRK STEINKE, University of Guelph
JAY COSSEY, University of Guelph
MARTIN GOMON, Museum Victoria
DAVID HARDIE,
University of Guelph
JEFF JOHNSON,
Queensland Museum
OLIVER LUCANUS,
University of Guelph
GLENN MOORE,
Murdoch University
AMANDA HAY, Australian Museum
PETER LAST, CSIRO
SALLY READER, Australian Museum
BOB WARD, CSIRO
Barcoding of a coral reef fish community

LINDA TONK,
University of Queensland
Symbiodinium diversity of inshore *Symbiodinium*-bearing organisms on the Great Barrier Reef

HEIKE WAEGELE,
University of Bonn
Evolution of defensive structures and use of photosynthetic units

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*

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

PIM BONGAERTS,
University of Queensland
Intra reef genetic connectivity of Pocilloporidae

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

MIEKE BURGER,
University of Queensland
Host-parasite interactions between pomacentrid fishes and kudoid parasites

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

GILLIAN CLAGUE,
University of Queensland
Investigation of cleaner fish functions and mutualism on host fish and fish parasite populations

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

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

ALISON CRAWLEY,
University of Queensland
Monitoring coral productivity on the Great Barrier Reef

VISITORS IN 2008

NATALIE CRAWLEY,
James Cook University
Climate change and coral reef fishes

LYNDA CURTIS,
University of Queensland
Identification of haemogregarine blood parasites in coral reef fishes and their effect on host fish physiology

ULRICH DIRKS, University of Vienna
Symbiont transmission and trophosome development in *Paracatenula*

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?

ALBERT EISENBARTH,
RMIT University
Prevalence survey of anisakids (Nematoda: Anisakidae) in fish at Lizard Island

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

HARALD GRUBER,
University of Vienna
Biogeography and phylogeny of the family Retronectidae, Catenulida

NICOLE GUNTER,
University of Queensland
The diversity of Ceratomyxa on the Great Barrier Reef

KYRA HAY,
University of Queensland
Physiology of reef algae

ADEL HEENAN,
University of Edinburgh
Olfactory behaviour and response to coloured light of larval fishes

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

MICHAEL HOLCOMB, Woods Hole Oceanographic Institute
Diurnal cycles in coral growth

TOM HOLMES,
James Cook University
Selectivity of predation on juvenile tropical reef fish

JANET HUNTER,
University of Queensland
Transversotrematid trematodes of GBR fishes

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

ROLANDA LANGE,
University of Tuebingen
Density effects on mating behaviour in *Chelidonura sandrana*

REBECCA LAWTON,
James Cook University
Ecological versatility of butterflyfishes vs susceptibility to disturbance

KATIE LIBERATORE,
University of New Mexico
Effects of climate change on symbionts of nudibranchs, corals and forams

OONA LONNSTEDT,
James Cook University
Effect of body condition and ontogeny on the response of coral reef fishes to chemical alarm cues and their use as secondary predator attractants

MARISSA MCNAMARA,
University of Queensland
Monorchiids in chaetodontids

CAELUM MERO,
James Cook University
Determining the behavioural consistency of newly settled *Pomacentrus amboinensis*

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

CRYSTAL NELIGH,
James Cook University
Personality, performance, persistence: a case study on reef fish

JENNY OATES,
University of Cambridge
Mutualism in the cleaner wrasse *Labroides bicolor*

JASON PALLOT,
Macquarie University
Shark population assessments using a portable video-acoustic system

ANA PINTO,
University of Neuchatel
Bookkeeping in cleaner wrasse and their clients: image scoring and indirect reciprocity in cleaning mutualism

DENNIS SPRENGER,
University of Tuebingen
Female benefits of multiple matings in simultaneous hermaphroditic sea slugs

JENNI STANLEY,
University of Auckland
Orientation of larval reef fish to natural sources of underwater sound

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

ALEX VAIL, James Cook University
Non-lethal influence of predators on juvenile fishes

MATTHEW YOUNG,
James Cook University
Pilot study for sea urchin project

MAREN ZIEGLER,
University of Hannover
1) Influence of climate change on symbioses between marine invertebrates and zooxanthellae
2) Light adaptation in foraminiferal species housing different types of photosynthetic endosymbionts

Top left: Francisca Vermuelen with coral samples.

Top right: Roberta Bonaldo and Chris Goatley. (Photo: Joao Krajewsky)

Left: Jacob Johansen collects plankton to find out what is available to planktivorous fish.

UNDERGRADUATE RESEARCH STUDENTS

CARMELA CARRASCO,
University of New Mexico
Carbon and nitrogen cycling in soft coral and nudibranchs with *Symbiodinium*

NATALIE DAVIS,
School for International Training
Cleaner wrasse behaviour in relation to territory size and reef type

SHANNON FITZPATRICK,
University of New Mexico
Viral expression and community structure in the *Phyllodesmium lizardensis/ Symbiodinium* system

STEPHANIE MOQUIN,
University of New Mexico
Raising nudibranchs and octocorals

JIMMY O'HARE,
School for International Training
Prey selection and digestive efficiency in four species of planktivorous damselfish

TANYA ROGERS,
School for International Training
Corallivorous reef fishes as potential vectors of coral disease based on a study of dietary preferences

STUDENT GROUPS

Brighton Grammar School, Australia
Led by Dr Andrew Lewis

Ascham School, Australia
Led by Mr Edward Sze-Tu

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

University of Maryland, USA
Led by Dr Reid Compton

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

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

OTHER VISITORS

Lizard Island Reef Research Foundation
Rob Purves and Rhett Purves
Charlie Shuetrim, Sandy Shuetrim, Geoff Shuetrim, Alex Heath, Ellie Shuetrim, David Shuetrim and Lucy Crook

Review Committee
John Tanzer

Filming promotional material for proposed program Sea Life
Adam Docker, Red Earth Studio UK

Filming for 60 Minutes episode on cone shells
Damien Comerford and others, Nine Network

Construction works
Aaro Raappana, Dylan Fraser, Malcolm Stevens, Dean Crowe and Kevin Tschumy

Other contractors
Kevin Veness (Cairns Custom Craft)
Bruce Cox (BCCS)
Derek Foster (RoshTech)
Tony Doherty (Rogers Fibreglass)

Microscope service
Allan Ross

First aid training
Charlie Makray and Julie Armour

PUBLICATIONS

Ninety-five publications based on work carried out at the Research Station were received into the Station's collection during the year. The collection now comprises more than 1200 publications.

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Top: Light traps are used to collect fish recruits for many projects.

Left: Pim Bongaerts and assistant transplant coral fragments.

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Top: Low tide at Mermaid Cove. (Photo: Joao Krajewsky)

Left: Busy morning at the aquarium sorting fish recruits.

PUBLICATIONS

Pratchett, M.S., M.L. Berumen, M.J. Marnane, J.V. Eagle and D.J. Pratchett, 2008. Habitat associations of juvenile versus adult butterflyfishes. *Coral Reefs, 27:* 541-551.

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Top: Giant clam exposed at low tide. (Photo: Joao Krajewsky)

Left: Prof. Jonathon Erez.

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