



Lizard Island Research Station

Newsletter 2000

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Lizard Island Reef  
Research Foundation

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## Lizard Island Reef Research Foundation

The Lizard Island Reef Research Foundation is an independent trust established to raise funds for the Station and to support research on the Great Barrier Reef. Its major commitments are to the Doctoral Fellowships program and to capital development of the Station. Donations to the Foundation are tax deductible within Australia and attract a partial subsidy from the NSW State Government through the Australian Museum Trust. More than \$1.9 million has been raised by the Foundation since its inception in 1978.

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\* appointed September 1999

\*\* appointed since January 2000

<sup>^</sup> deceased

Donors who have provided support in the current year are acknowledged and thanked in the body of the Newsletter.



## Lizard Island Research Station Newsletter 2000

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**Directors**  
Dr Anne Hoggett and Dr Lyle Vail  
All photographs by Lyle Vail or Anne Hoggett unless  
otherwise indicated.



# Research and Education

## Doctoral Fellowships

The Lizard Island Doctoral Fellowships program is fully funded by the Lizard Island Reef Research Foundation and is awarded by the Australian Museum. Each new Fellowship is now worth up to \$6,000 per year for up to three years. The Fellowship is awarded to a PhD candidate conducting significant long-term field studies in a scientific discipline relevant to the Great Barrier Reef who will make effective use of the Lizard Island Research Station's facilities. Applications are peer reviewed and we sincerely thank all reviewers for helping us award the Fellowship.

The 2000 Doctoral Fellowship was awarded to Ulrike Siebeck of the Vision, Touch and Hearing Research Centre at the University of Queensland for her project entitled "Neuroethology of colour and colour communication of reef fishes". Ulrike made three visits to Lizard Island in 2000 and will complete her fieldwork early in 2001.

Normally, a single new Lizard Island Doctoral Fellowship is awarded each year. However, funds were available to support two PhD students to start new Fellowships in 2001. Heather Patterson is currently enrolled at the University of Sydney but will soon transfer to James Cook University in Townsville. She has access to two years of funding for her project "Isotopes, early life history, and potential self-recruitment of coral reef fishes" (see "Where do coral reef fishes come from?"). Rebecca Fisher is enrolled at James Cook University and she also has access to two years of funding for her project "The behavioural capabilities of tropical reef fish larvae: implications for dispersal during the pelagic phase" (see "Are baby fishes competent swimmers?").

Jackie Wolstenholme of James Cook University (1999 Doctoral Fellow) will finish the last season of fieldwork for her PhD in late 2001. Her project "Species boundaries in scleractinian corals" addresses one of the most basic questions in coral reef biology: where does one draw the line between coral species? During the summers of 1999/2000 and 2000/2001, Jackie was the coral expert at the Station during the annual spawning event. As well as making her own exciting discoveries, she has been an important source of information for other visitors to the Station regarding coral spawning.

Further information about the Lizard Island Doctoral Fellowship is available on our web site. Closing date for applications for the 2002 Doctoral Fellowship is 1 October 2001.

## Where do coral reef fishes come from?

Knowing where coral reef fishes originate is important if they are to be properly managed. The dogma is that coral reefs are open systems where currents and winds bring larvae to a particular reef from multiple source reefs. However, recent studies at Lizard Island and elsewhere suggest that reefs rely heavily on locally-retained larvae to seed populations (self-recruitment).

Heather Patterson of Sydney University (soon of James Cook University) will examine the question of self-recruitment in reef fishes by utilising trace element signatures in otoliths (ear bones) as natural tags of natal reefs. Otoliths are commonly used to age reef fishes because bands are laid down as the bone grows, similar to rings in tree trunks. Heather will be looking at the chemical composition of otoliths at different distances from the centre and relating this to the chemical composition of the environment at the time the bone increment was laid down. She will be funded from 2001 for two years of research at Lizard Island by the Lizard Island Reef Research Foundation under the Lizard Island Doctoral Fellowships program.

Heather will use specimens in early life stages from two species of reef fish (*Acanthochromis polyacanthus* and *Pomacentrus coelestis*) in her study. *A. polyacanthus* is the only species of pomacentrid fish that does not have a pelagic larval phase, so all larval *A. polyacanthus* that are found on a particular reef have never lived on any other reef. In contrast, *P. coelestis* is like most reef fishes because it has a pelagic larval phase that allows dispersal to other reefs. To find out where the parents of young *P. coelestis* live, Heather's research uses the novel approach of ground-truthing the chemical "signatures" of individual reefs by examining otoliths from *A. polyacanthus*, then comparing these signatures with those found in otoliths of *P. coelestis*. Sampling the core



Jackie Wolstenholme (right) and colleague study reproduction on closely related species of Acroporid corals.

Uli Siebeck investigates the ability of fish to see ultraviolet light.



region of the otolith of this species should provide a chemical signature from its reef of origin. In addition, a chemical profile of the fish can be determined by sampling from the core outward to the edge of the otolith. This should allow Heather to determine life history features of the fish such as its residence time near a particular reef.

It is possible that chemical signatures within otoliths vary with time, between nearby reefs, and of course between widely spaced reefs. To determine the stability of chemical signatures in otoliths, Heather will collect otolith samples twice during each recruitment season over two consecutive years at Lizard Island and on several reefs nearby. A similar sampling routine will occur at One Tree Island on the southern part of the GBR for comparison of chemical signatures in reefs several thousand kilometres apart.

By combining chemical information derived from otoliths with data on ocean currents, Heather will be able to determine if retention mechanisms aid in the self-recruitment of fish larvae. Her research is timely given the current interest in marine protected areas since patterns of reef connectivity will be important in determining the appropriate design for marine reserves.

## Are baby fishes competent swimmers?

Rebecca Fisher of James Cook University is using field and aquarium facilities at Lizard Island to conduct research on her project entitled "The behavioural capabilities of tropical reef fish larvae: implications for dispersal during the pelagic phase". Her work expands on studies by 1995 Doctoral Fellow Dr Ilona Stobutzki, now at CSIRO, and it complements the extensive research on fish larvae undertaken at Lizard Island by Dr Jeff Leis and colleagues from the Australian Museum. Rebecca will be funded from 2001 for two years of research at Lizard Island by the Lizard Island Reef Research Foundation under the Lizard Island Doctoral Fellowships program.

Most coral reef fishes possess a dispersive larval phase. This phase lasts for several days or weeks and during this time the larvae may travel considerable distances before

settling onto a reef. The distribution and abundance of reef fishes is thus significantly influenced by the dispersal of their planktonic larval stage.

The traditional view is that fish larvae have very little influence over their dispersal patterns and that currents are responsible for the dispersal of larvae to and from reefs. Recent studies have revealed that reef fish larvae have excellent sustained swimming capabilities and considerable potential for modifying their dispersal patterns by active swimming. These studies, however, have concentrated on the swimming abilities of reef fish in their late pelagic phase.

Rebecca's research is examining the development of swimming abilities of coral reef fishes from hatching through to settlement. Until recently, investigations into the swimming abilities of younger stages of larval reef fishes have been limited by difficulties in obtaining living individuals in the field in good condition. Newly-available larval rearing techniques now provide a means of determining the swimming capabilities of larval fish throughout their development. By hatching and rearing larvae under controlled conditions it is possible to obtain live specimens of known age and parentage, in good condition, and at all developmental stages. Using captive rearing techniques, Rebecca plans to determine how swimming ability develops with age in a range of reef fish taxa.

At present, many management decisions regarding reef fish populations are based on assumptions concerning the extent of connectiveness of reefs. Rebecca's research will provide data that test these assumptions and this will enable management decisions to be based on more robust models. Thus, as well as improving our knowledge of coral reef ecology, Rebecca's work has important implications for the practical management of reef fish populations.

Rebecca Fisher shows her larval fish swimming chamber to Jon Allen, Lance Pearce, and Bob Podolsky





# Lizard Island Reef Research Foundation

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## Developments funded by the Foundation

One of the Station's primary functions is to provide excellent facilities for scientists and educational groups at Lizard Island. This means continual improvement of infrastructure which is only possible with support from the Foundation.

The major project for which funds have been raised over the past few years is a replacement house for maintenance staff. Funds are now available for this project and planning is underway for construction to commence in 2001.

In the 1999/2000 financial year, the Foundation contributed \$80,000 to the Research Station. This enabled the Station to:

- Support the field work of two PhD students under the Lizard Island Doctoral Fellowships program.
  - Purchase a new 40 kVA diesel generator to replace a 27 kVA generator. The Station's three generators are now 27, 40, and 60 kVA in size. This configuration allows for relatively cost-effective generation of power when visitor numbers are low and it provides for ample capacity during peak usage. Investigations into use of solar power for at least some of the Station's energy requirements are on-going.
  - Purchase a new 4.93 metre dinghy with 25 hp outboard motor and safety equipment. This dinghy is named *Jacque* in honour of Mrs Jacqueline Loomis. Henry and Jacqueline Loomis, who are Patrons of the Foundation, donated the funds to purchase this boat. This dinghy is extremely popular with researchers since it is stable and has low sides, which is useful for lifting diving equipment and other gear over the side. Our goal is to have all the Station's dinghies of this design.
  - Trade in each of the Station's twelve outboard motors after about 2 years service to ensure reliability and ease of maintenance.
- Trade in the Station's 4WD vehicle when it was two years old in May 2000. Its trade-in value after two years is excellent since the vehicle is well maintained and has exceptionally low mileage - not surprising when there is only 2 km of track on the island!
  - Purchase two new computers with software and peripherals.
  - Commence designing the new staff house to be constructed in 2001.
  - Complete a major upgrade of electrical wiring from the main switchboard to four houses (Warman, Talbot and Loomis houses and the maintenance staff house).
  - Pay boat survey costs and purchase a life raft to comply with new state boating regulations.
  - Replace the polycarbonate roof over part of the Sir John Proud Aquarium due to severe cracking of the original.
  - Provide a major service for one of the Station's two scuba compressors.
  - Convert a former store-room into a computer room for visitors.
  - Replace one of three freshwater header tanks.
  - Upgrade the beach fuel shed.

## Members' Dinner in Sydney

This year's annual dinner for Foundation members was held on 26 July 2000 on the rooftop Terrace of the Australian Museum. It was attended by about 70 members and their guests. The dinner is not intended as a fund raising activity but rather as a social event at which members and their guests can learn more about the relevance of work at the Research Station. Dr Paul Willis of the ABC Science Unit gave a very lively and informative talk on the importance of scientific research. The function was a great success thanks in large part to organisers Ken Coles, Rowena Danziger and Anders

Research dinghy *Jacque* donated by LIRRF Patrons Jacqueline and Henry Loomis of Florida, USA.



William and Andrew Duplessie are the youngest Members of the Lizard Island Reef Research Foundation.



Ousback. As in the past, wine for the dinner was generously donated by Universal Wines and Fesq & Company.

In 2001, the members' dinner will be held on 17 September at the Wharf Restaurant.

### US Fundraising Dinner

In 1999, James Duplessie and his sons, William and Andrew, made a brief visit to the Research Station while staying at the Lizard Island Resort. As a result of that visit, James decided that he wanted to support research on coral reefs by hosting a fundraising event in his home community. A dinner for about 50 people was held in May 2000 at the picturesque Belle Haven Country Club on the shores of Long Island Sound in Greenwich, Connecticut.

Speakers during the evening were James Duplessie, Research Station Director Dr Lyle Vail, and the Station's 1997 Doctoral Fellow Dr Andrew Baker who is now a conservation researcher in New York City. All funds raised at the dinner were donated to the Lizard Island Reef Research Foundation. The Duplessie family sponsored all costs incurred, including catering for the dinner and travel for Andrew and Lyle. The Station thanks the Duplessies and all those who supported the event for their generosity.

One of the highlights of the evening was the award of a Patrons' certificate to Henry and Jacqueline Loomis on behalf of the Lizard Island Reef Research Foundation. Henry and Jacqueline are the inaugural supporters of the Research Station as they provided the seed capital to establish it in the early 1970s. They now live in Florida and made a special trip to attend the function.

### Melbourne luncheon

The Foundation's third annual lunch was hosted by Ken Coles in Melbourne on 9 May 2000. Station Director Dr Anne Hoggett gave a presentation on the status of coral reefs and the research being done at Lizard Island. Like the annual dinner, this function is not intended as a fundraiser but as a thank you to existing donors and as

a means of interesting others in the Foundation's work. The Station's thanks go to Ken for his very generous gesture in funding this lunch personally, including travel to Melbourne for himself and Anne Hoggett.

### Members' prizes

Members of the Foundation are automatically entered into a draw for two fantastic prizes. One is a four-night stay for two at the Lizard Island Resort with return air fares to Lizard Island from Sydney, and the other is a four-night cruise for two to Lizard Island aboard the Captain Cook Cruises ship *Reef Endeavour* with return air fares to Cairns from Sydney. These prizes are generously sponsored by P&O Australian Resorts and Captain Cook Cruises, respectively. In 2000, Trevor and Geraldine Haworth won the Resort prize and Alan and Lynne Rydge won the cruise on Reef Endeavour. The Rydges were not able to take up their prize and they have kindly offered to raffle it to raise additional funds for the Foundation.

### New US-based foundation

Ken Coles and American trustee Jim Bildner investigated obtaining tax deductibility for donations from US citizens. As a result, formation is underway of a new foundation in the USA with complementary goals to those of the Lizard Island Reef Research Foundation. The new foundation should be set up by early 2001 and this will greatly enhance fundraising within the USA.

### Foundation visitors

Two couples who are members of the Foundation visited the Research Station during their stays at the Resort during 2000. Melbourne members Susan and Lynton Morgan visited during August and US members Bill and Judy Higgins visited during November. It is always a pleasure to be able to show members something of the Station's work and how we spend their donations.

Dr Paul Willis speaking at the Members' dinner in July 2000.



# Donations - thank you!

The following individuals and organisations have donated funds or made in-kind donations to the Lizard Island Reef Research Foundation during 2000. Members each contributed \$1,000 or more during the year, while Friends contributed sums of up to \$1,000. Special donors to the staff housing project are indicated with an asterisk (\*) and gifts in kind are indicated with a plus sign (+).

## Members

Coral & Ian Ackery  
Antoinette Albert  
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Neil Balnaves  
Penny & Peter Berents  
\*James & Nancy Bildner  
Terry & Robin Bolin  
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Bill Winning  
and one anonymous member

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Takako Takeuchi  
Peter Thompson & Patricia O'Connor  
Sandra Wilson  
and many anonymous donors



Dolphin joins the ride.  
(PHOTO: IMAGE QUEST 3-D)



Professor Ron O'Dor of the University of Dalhousie, Canada in the Purves Laboratory analyzing migratory data from tagged cuttlefish.



## For the record...

### New Australian Museum connection

During the Australian Museum's recent reorganisation, the Research Station became part of the Deputy Director's area of responsibility. Patrick Filmer-Sankey took up that position in November 2000. Formerly Director of the Museums and Art Galleries of the Northern Territory and before that, Director of the Newcastle Regional Museum, Patrick was also a research student at Lizard Island in the Station's early days and worked in the invertebrate section of the Australian Museum. Patrick is a passionate advocate for science and we at the Station look forward to working with him.

### Publicity

- A book about research and researchers at Lizard Island by Sneed Collard was published this year (see *Publications*). Based on Sneed's visit to the Station in late 1998, it is aimed at high school students and it presents a true and entertaining picture of the life and work of the Research Station. Copies of the book will be available for sale at the Station in 2001.
- An ABC TV documentary about Lizard Island was filmed by Dr Richard Smith and colleagues in late 2000. The 50 minute program will concentrate on the work of several researchers and will probably be aired during 2001.
- WIN News from Cairns visited the Station in late 2000 to film several short stories about research projects. These were intended to be broadcast locally over several nights.
- In May 2000, Anne Hoggett was interviewed on ABC radio about the Research Station's work.

### Tropical Marine Network

The Australian Museum is one of four operators of island research stations on the Great Barrier Reef who have entered into a partnership known as the Tropical Marine Network (TMN). The other partners are James Cook University (Orpheus Island Research Station), University of Queensland (Heron Island, Low Isles and Moreton Bay Research Stations) and University of Sydney (One Tree Island Research Station). During 2000, a business plan was developed and presented to the Federal government; a link with the Great Barrier Reef Research Foundation was forged, and; moves were made towards formalising

the TMN by developing a draft joint venture agreement. The three university partners are also progressing with development of a new marine science course to be taught jointly by the three institutions.

### Chemicals

Several years of accumulated laboratory chemicals and chemical waste were sorted and removed from the island during the year. We were grateful to have the voluntary services of Dr Sara Piddlesden, a biochemist, for this job. Leigh Windsor of James Cook University provided expert advice on how to dispose of various chemicals and allowed the Research Station to send a significant proportion of them to him for proper disposal. Scientists who bring chemicals to the Station will now be responsible for taking them off when they depart or for paying for their proper disposal.

### Other activities, issues and initiatives

- Negotiations continued with the Queensland Government for a **new lease** over part of Lizard Island National Park. A final draft was agreed to in October 2000, pending legal advice to the Australian Museum.
- Discussions were held with the Great Barrier Reef Marine Park Authority about issuing a **general research permit** to the Research Station. Assessment of the Station's application is well advanced and the permit should be issued in 2001. It will enable some researchers to collect small numbers of non-protected animals and plants without the need to apply for their own permit. However, it will not cover controversial projects or those that require collection of a large number of specimens.
- The Station's **web site** was extensively rewritten during 2000 and should be online by May 2001. It will include many new features, including detailed information about planning trips to Lizard Island and a meeting-place for researchers who need volunteer field assistants and aspiring research volunteers.
- A display about the Station was presented at the Australian Museum's **Open Day** in May. The theme was "Colour" and we thank vision researchers Uli Siebeck and Dr Justin Marshall of Queensland University for materials used in the display, and especially Uli who travelled to Sydney to talk about her research on the day.



University of Guelph students conduct research in the Purves Laboratory.

- The Station is a member of the **Lizard Island Management Advisory Committee** and this year it contributed to discussions about access to reef areas by boutique cruise ships.
- Research Station staff are officers of the **Lizard Island Rural Fire Brigade**.
- Representation was made to the Director of the Qld Environmental Protection Authority and the Qld Minister for Environment and Heritage concerning a **proposed development** on the island.

### Staff

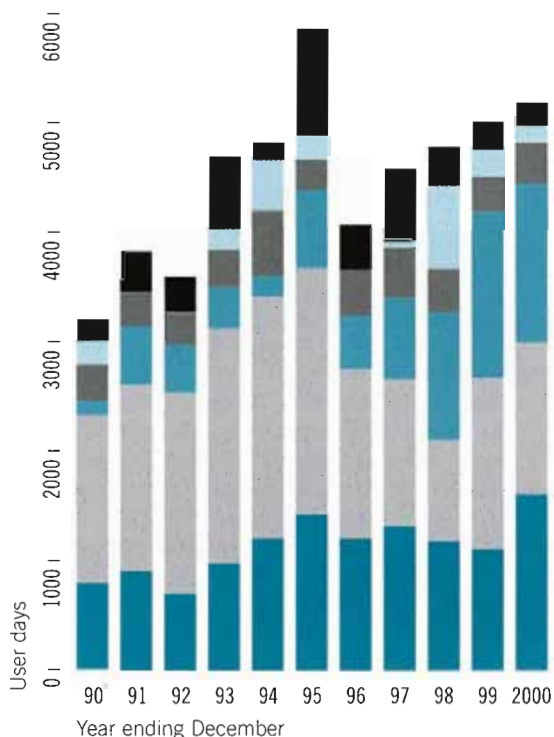
August 2000 saw Anne Hoggett and Lyle Vail celebrate 10 years as Directors of the Research Station. It was a year of big changes for the Hoggett/Vail family as their son, Alex Vail, began Year 9 at a school in Sydney. Alex was four years old when the family moved to Lizard Island and until 2000 he had done all his schooling on the island through distance education under the supervision of home tutors. To help smooth the transition to a mainstream school, Anne and Lyle took turns working in Sydney during 2000 so that Alex could attend as a day boy. Alex will become a boarder at the school from 2001 when both Anne and Lyle will again be based at Lizard Island.

The other two positions are filled by a couple who are in charge of the Station's maintenance duties. During the past three years, these positions have been filled by two couples, each working for six months of the year. Lance and Marianne Pearce have occupied the positions since 1988 and Bob and Tania Lamb since 1998. Rotating maintenance couples every six months has worked very well as each changeover brings renewed enthusiasm as well as each couple's unique combination of skills and interests. Lance and Marianne travelled to Brazil during 2000 to visit former Lizard Island researchers, Beatrice Ferreira, Mauro Maida, and Karen Diele. Bob and Tania spent their off-duty time during 2000 on the mid-north coast of NSW and travelling within Australia.

Several volunteers are to be especially thanked this year for acting in lieu of staff or for providing professional services. Renie Hood and Snow Amos assisted Lance and Marianne while Anne and Lyle were both off the island in January 2000. Sara Piddlesden helped Bob and Tania in a similar way during Anne and Lyle's joint absence in September 2000, and also dealt with a stockpile of laboratory chemicals using her biochemical expertise. In April 2000, Zoli Florian gave all the Station's microscopes a thorough service and continued to provide sound advice on all things related to microscopy. Zoli has been contributing to the Station's well-being in this way for many years.

### Usage

Usage of the Station during 2000 by its core users (researchers, postgraduate research students, and educational groups) was the highest on record at 4,456 person nights. Overall usage during the year was the second highest on record after 1995.



### Lizard Island Research Station Usage

- Researchers
- Post Graduates
- Education Groups
- Volunteers
- Commercial
- Others



Drs Phil Munday and Fredrieke Kroon at the dive shed.



### Bench fees

Researchers and educational groups are charged a bench fee that is subsidised by the Australian Museum Trust and the Lizard Island Reef Research Foundation. The fee covers shared, self-catering accommodation, use of a small boat, most laboratory and aquarium facilities, and scuba tanks and air fills to qualified divers.

The bench fee increased for the first time in nine years on 1 January 2000 to cover increasing costs, and again on 1 July 2000 due to introduction of the GST. Starting on 1 January 2002, fees will be increased annually to cover inflation. Researchers of a certain age may remember paying \$30 *per week* in 1974! The fee schedule from January 2000 to December 2001 is (A\$ including GST, per person per night):

Researcher	\$ 88.00
Researcher's assistant	\$ 77.00
Postgrad student (own project)	\$ 33.00
Postgrad's assistant	\$ 29.70
School or university group	\$ 55.00
Commercial	\$ 165.00

For people staying longer than 28 consecutive days, a 10% discount applies to the whole of their bench fee.

Other costs involved in conducting research or bringing an educational group to the Station include airfares from Cairns to Lizard (see *Flights to Lizard Island* below), barge freight for food and other supplies from Cairns (\$11 per grocery carton) and food (the supermarket bill plus a small cartage fee for delivery to the barge depot.) Use of most laboratory and aquarium facilities is included in the bench fee although extra charges may be incurred for use of equipment that draws a lot of power or uses additional fuel. Use of a small self-drive boat is included in the bench fee, but if a larger boat is needed, the additional fuel cost is recouped on a distance basis and it is usually necessary to hire a staff boat driver at \$55 per hour. Scuba tanks and air fills are included in the bench fee for divers qualified according to the Station's regulations. Weights and belts are available to all visitors at no extra charge. High quality snorkelling gear, wetsuits, regulators, and BCDs are available for hire at reasonable rates. Prices include GST and are in Australian dollars.

### Volunteer program

This popular program has been running for at least 15 years and twenty to forty people participate each year. Volunteers give four hours manual work each day. The work is maintenance, not research, but many volunteers are recently qualified biologists who are eager to live on a field station, experience the coral reef environment and mix with researchers. Volunteers must pay their own travel expenses and arrange for their own food supplies. To enable volunteers to donate their services, shared accommodation is provided free of charge at the Station. In general, only two volunteers are accepted at any one time on a space available basis. Opportunities are greatest from mid-February to mid-June and from August to September. More details about the program are available on our web site.

### Monitoring

- Daily rainfall data are available from 1979; daily maximum and minimum air temperature are available from 1989; and wind speed and direction and air pressure are available from 1996.
- Water temperature data from loggers at 2 metres depth are available from 1993 and at 0 and 6 metres depth from 1995.
- Records of crown-of thorns starfish numbers observed by divers from the Research Station since 1993 are available.
- Human usage and numbers of potato cod at the Cod Hole have been recorded since 1992.

### Lizard Island Resort redevelopment

Since May 1999, the Lizard Island Resort has been operated by P&O Australian Resorts. From January to July 2000, the Resort was closed for major refurbishment. The old Anchor Bay guest units were moved to the staff village, greatly improving staff accommodation, and new guest units were constructed along the beachfront. New guest units were also built on Sunset Ridge overlooking First Beach, joining the four units that were constructed there in 1995. A fully renovated restaurant and bar area, a new manager's house, a new sewage treatment plant, and greatly enlarged maintenance and utilities area completed the refurbishment. The Resort still caters for up to 80 guests at a time, as it has since the previous refurbishment in 1995.



Professor David Meyer of the University of Cincinnati, Ohio was one of the first scientists to use the Station in the early 1970s. Since then he has made numerous visits, most recently in early 2000 to conduct research on crinoids.

### Flights to Lizard Island

Scheduled flights did not operate between Cairns and Lizard while the Resort was closed during the first half of 2000. Access to the Research Station was challenging during this period: researchers either chartered aircraft privately or they joined charters organised by the Resort. Access to the Resort's charter flights was greatly appreciated by Station visitors and staff. Scheduled flights resumed in July when the Resort re-opened. Initially, these were operated by Transtate Airlines although shortly afterwards Transtate merged with Macair.

Lizard Island is now serviced by Macair. There are either one or two flights a day depending on demand. Bookings can be made through Qantas, any travel agent, or directly with Macair in Cairns (Monday to Friday only) on +61 7 4035 9722. In late 2000, the full economy airfare was about \$535 for the round trip. A 3-day advance purchase fare is also available for about \$400. This fare is not refundable but it is changeable provided Macair is notified about 24 hours prior to departure. Inquiries about fares for group charters should be made directly with Macair.

### Tours

Tours of the Station for island visitors have been conducted twice a week since about 1985. Formal tours were cancelled during the first half of 2000 while the Lizard Island Resort was closed. Tours re-commenced in late July 2000 with a modified schedule. Tours for Resort guests are conducted on Mondays and Fridays from 9.30 to 11 am. A separate tour for other island visitors, mainly campers and yachties, is conducted from 11 am to 12.30 pm on Mondays only. The tours are popular and an effective means of communicating the research being done at the Station.

A special tour was conducted for Richard Hein, CEO of P&O, and the P&O board on 17 August 2000.

Another special tour was given on 10 September 2000 to Senator Robert Hill, (Federal Minister for the Environment), Virginia Chadwick (Chair of the Great Barrier Reef Marine Park Authority) and members of Association of Marine Park Tourism Operators, including David Windsor and Bob Thomas.

Tours for other groups with a special interest in the Research Station were also given occasionally during the year.

### Introduced animals

Lizard Island suffers from many introduced plants that are considered as weeds, but so far, it has no viable populations of introduced vertebrate animals. Vigilance is required to maintain this status. Two cane toads were found and captured at the Resort in early 2000, presumably having hitched a ride on one of the many barge-loads of building supplies. Despite a thorough search by Resort staff and the Qld Parks and Wildlife Service, no other toads were found. Two breeding pairs of European starlings were also found on the island in October 2000 but they have not been seen since the original observations. Both cane toads and starlings would have an enormously adverse impact on the wildlife of Lizard Island if populations became established.

### Cyclone Vaughan

Cyclone Vaughan triggered the first full cyclone preparation at the Station in two years during April 2000, only a few days after cyclone Tessie caused havoc in Townsville. Vaughan was category 3 and heading straight towards the island early in the month but it died out quickly without causing any severe weather at Lizard. However, severe weather was experienced on 28 April in the absence of a cyclone - all dinghies had to be removed from the water in the early hours due to heavy rain and strong winds. This event was remarkable for the number of terns that were caught out: the dinghies and sheltered areas on land were full of birds.

## Volunteers

Snow Amos  
Malcolm Anderson  
Carolyn Annerud  
Kirsten Annerud  
Caroline Bergman  
Jonathon Burcher  
Lyndsey Dodds  
Chris Findlay  
Zoli Florian  
Martin Ham  
Martina Hardensvard  
John Hicks  
Alana Hinze

Renie Hood  
Chris Inksun  
Paul Murphy  
John Parker  
Heidy Parks  
Sara Piddlesden  
Buffy Pittar  
Michael Purvis  
Elizabeth Rehm  
Dino Saban  
Cassandra Trimble  
Yvonne Van Der Munnik  
Miriam Vigar

Volunteers Alana Hinze and Heidy Parks





# Research Projects and Participants

The following research projects were carried out during the year. Project leaders who are postgraduate students are indicated with an asterisk (\*).

## **Phylogeny of *Symbiodinium*-like zooxanthellae (January 2000)**

Xavier Pochon (University of Geneva, Switzerland) assisted by Jackie Wolstenholme

## **Collect sponge samples (August 2000)**

Dr John Hooper and Dr Gert Wörheide (Queensland Museum, Brisbane)

## **Species boundaries in scleractinian corals (January, November, December 2000)**

Jackie Wolstenholme\* (James Cook University, Townsville) assisted by Xavier Pochon, Ken Martin, Jason McKenzie, Karen Tuit, Dr Paul Detwiler, Marie Kospartov and Dean Richards

## **Reticulate evolution in corals: population-species architecture of the *Acropora nasuta* group (January 2000)**

Jason McKenzie\* (James Cook University, Townsville) assisted by Jackie Wolstenholme

## **A multi-scale investigation of the size structure of coral populations (January/February, June 2000)**

Marie Kospartov\* (James Cook University, Townsville) assisted by Morgan Pratchett, Michael Berumen, Carol Daniels and Rachel Pears

## **Population dynamics of corals (January/February 2000)**

Morgan Pratchett as field leader for Prof. Terry Hughes' project (James Cook University, Townsville) assisted by Michael Berumen and Marie Kospartov

## **Science and management issues related to coral bleaching (October 2000)**

Prof. Denise Russell (University of Wollongong) assisted by Hal Pratt

## **Fertilisation and breeding compatibilities in corals (November 2000)**

Molly Lalor (School for International Training, USA)

## **Bioerosion and coral substrates (October/November 2000)**

Dr Pat Hutchings (Australian Museum, Sydney) and Aline Tribollet (Centre d'Océanologie de Marseille, France)

## **Parasites of coral reef fishes (December 2000)**

Dr Tom Cribb (University of Queensland, Brisbane) and Dr Rod Bray (The Natural History Museum, London, UK) assisted by Trudy Wright

## **Seeking an evolutionary/ecological explanation for the diversity of gastro-intestinal helminths of acanthurid fishes (December 2000)**

Clinton Chambers\* (University of Queensland, Brisbane) assisted by Trudy Wright

## **Invertebrate migration between adjacent habitats: seagrass vs corals (November 2000)**

Dr Chris Kitting (California State University, USA) assisted by Duncan Rasmussen

## **Taxonomic studies of Polychaeta (March 2000)**

Dr Greg Rouse, Dr Lars Jermiin, Eva Lewy (University of Sydney) and Dr Fredrik Pleijel (Museum Nationale d'Histoire Naturelle, Paris)

## **Energy budgets of tropical and temperate squid and cuttlefish using radio acoustic positioning telemetry (February/March 2000)**

Dr George Jackson (University of Tasmania, Hobart) and Prof. Ron O'Dor (Dalhousie University, Canada) assisted by Julian Finn and Jill Aitken

## **Long-term monitoring of giant clam populations (February/March 2000)**

Dr David Phillips (Fenviron, UK) assisted by Jackie Robinson

## **Determining which gastropod families have statoliths (May/June 2000)**

Dr Rob Day and Annette Silbereisten (University of Melbourne)

## **Envenomation of prey by *Conus* spp (May/June 2000)**

Dr Bruce Livett (University of Melbourne) assisted by Dr Bev Bencina, Dr Robyn Bradbury, Heather Gayler, Dr Barbara Howlett, Dr Geoff Howlett, Prof. Tony Klein, Suzanne Klein, Dianne Livett, Dr Peter McTigue, Catherine McTigue, Philip Taylor-Bartells and Jordan Taylor-Bartells.

## **Interactions of alpha conotoxins with neuronal nicotinic acetylcholine receptors (May/June 2000)**

Megan Polidano\* and Dr John Down (University of Melbourne) assisted by Dr Bev Bencina, Dr Robyn Bradbury, Heather Gayler, Dr Barbara Howlett, Dr Geoff Howlett, Prof. Tony Klein, Suzanne Klein, Dianne Livett, Dr Peter McTigue, Catherine McTigue, Philip Taylor-Bartells and Jordan Taylor-Bartells.

## **Isolation of putative conotoxin genes from molluscivorous species of *Conus* (May/June 2000)**

David Sandall\* and Dr Ken Gayler (University of Melbourne) assisted by Dr Bev Bencina, Dr Robyn Bradbury, Heather Gayler, Dr Barbara Howlett, Dr Geoff Howlett, Dr Tony Klein, Suzanne Klein, Dianne Livett, Dr Peter McTigue, Catherine McTigue, Philip Taylor-Bartells and Jordan Taylor-Bartells.

## **Characterisation of conotoxin genes from vermivorous species of *Conus* (May/June 2000)**

David Keays\* and Dr David Satchell (University of Melbourne) assisted by Dr Bev Bencina, Dr Robyn Bradbury, Heather Gayler, Dr Barbara Howlett, Dr Geoff Howlett, Dr Tony Klein, Suzanne Klein, Dianne Livett, Dr Peter McTigue, Catherine McTigue, Philip Taylor-Bartells and Jordan Taylor-Bartells.

## **Biology and systematics of lucinid bivalve molluscs (November 2000)**

Dr John Taylor and Emily Glover (Natural History Museum, London, UK)

## **Molecular evolution of vision in ostracods (February 2000)**

Todd Oakley\* (Duke University, USA)

## **Gnathiid isopod habitat - analysis of benthos of reefs at Lizard Island (July/August 2000)**

Rachel Ball (University of Wales, Swansea, UK)

## **Distribution of gnathiid isopods at Lizard Island (July/August/September 2000)**

Steve Box (University of Wales, Swansea, UK)

## **Biology of stomatopod crustaceans (October 2000)**

Prof. Roy Caldwell (University of California at Berkeley, USA)

## **Neuroarchitecture of the stomatopod eye (October/November 2000)**

Sonja Kleinlogel\* (University of Queensland, Brisbane) assisted by Kylie Jennings

## **Functional morphology of reef-dwelling crinoids: living models for the Cretaceous crinoid *Uintacrinus* (February 2000)**

Prof. David Meyer (University of Cincinnati, USA)

## **Pinnule swelling in comatulid crinoids: an adaptation to bidirectional current changes (February 2000)**

Dr Tom Baumiller (University of Michigan, USA)

## **Palatability of crinoid viscera to fishes (February 2000)**

Dr Tom Baumiller (University of Michigan, USA)

## **Phylogeny of Crinoidea (March 2000)**

Dr Greg Rouse, Dr Lars Jermiin, Eva Lewy (University of Sydney) and Dr Fredrik Pleijel (Museum Nationale d'Histoire Naturelle, Paris)



**Testing new methods to estimate growth in holothurians (June 2000)**

Dr Sven Uthicke (Australian Institute of Marine Science, Townsville) assisted by Michael Browne

**Impact of crown-of-thorns starfish on coral reefs (undergraduate report) (July 2000)**

Will Leeper (University of Newcastle-upon-Tyne, UK)

**Fertilisation success in the brittlestar genus *Macrophiothrix* (November/December 2000)**

Dr Richard Miller (Temple University, USA) assisted by Damian Allen and Rory Lynch

**Evolution of gamete characteristics in the brittlestar genus *Macrophiothrix* (November/December 2000)**

Dr Bob Podolsky (University of North Carolina, USA) assisted by Damian Allen

**Egg size, larval ecology and development in the brittlestar genus *Macrophiothrix* (November/December 2000)**

Jon Allen\* and Dr Bob Podolsky (University of North Carolina, USA)

**Growth and allometry of shallow water crinoids (November 2000)**

Dr Paul Detwiler (San Diego State University, USA)

**Spawning and development of brittlestars and sea cucumbers (December 2000)**

Dr Maria Byrne, Paulina Selvakumaraswamy and Christian Ramofafia (University of Sydney) assisted by Paulina Cisternas, Suzi Renn and Suzanne Long

**Growth rates of *Holothuria nobilis* (December 2000)**

Dr Sven Uthicke (Australian Institute of Marine Science, Townsville) assisted by Dr Britta Schaffelke

**Recovery of fish and coral populations from disturbance by crown-of-thorns starfish (January/February 2000)**

Morgan Pratchett\* (James Cook University, Townsville) assisted by Michael Berumen & Marie Kospartov

**Effect of long-term eradication of crown-of-thorns starfish from patch reefs**

Dr Lyle Vail and Dr Anne Hoggett (Lizard Island Research Station) assisted by Lance Pearce, Marianne Pearce, Bob Lamb, Tania Lamb, Lyndsey Dodds, Martina Hardensvard, Will Leeper and David Randall.

**Impact of fish feeding on soft bottom invertebrates (January/February 2000)**

Dr Mark McCormick (James Cook University, Townsville) assisted by Vimoksalehi Lukoschek, Andrew Hoey and Leane Makey

**Recruitment dynamics of tropical fishes (January /February 2000)**

Dr Mark McCormick (James Cook University, Townsville) assisted by Vimoksalehi Lukoschek, Andrew Hoey and Leane Makey

**Biochemical characterisation of coral reef fishes and invertebrates (May 2000)**

Erin Corstorphine\* (University of Guelph, Canada)

**Effect of small predators and interference competitors on fish community structure of small patch reefs (January 2000)**

Glenn Almany\* and Michael Webster\* (Oregon State University, USA)

**Neuroethology of colour on the reef (January, August, October/November 2000)**

Uli Siebeck\* (University of Queensland, Brisbane) assisted by Guy Wallis, Kylie Jennings and Nerina Holden

**Ecology of herbivorous fishes (January 2000)**

Prof. Howard Choat (James Cook University, Townsville) assisted by Line Bay and Will Robbins

**A biogeographic analysis of life history features in the family Labridae (January 2000)**

John Ackerman\* (James Cook University, Townsville)

**Implications of swimming ability on habitat use and feeding ecology in wrasses (January 2000)**

Christopher Fulton\* (James Cook University, Townsville) assisted by Amara Thomas

**Larval fish behaviour (January/February, November/December 2000)**

Dr Jeff Leis (Australian Museum, Sydney) assisted by Brooke Carson-Ewart, Amanda Hay, Uli Siebeck, Tove Lemberget and Danielle Annese

**Habitat influence on the condition of butterflyfishes (January/February, April, June 2000)**

Michael Berumen\* (James Cook University, Townsville) assisted by Morgan Pratchett, Marie Kospartov, Matt Williams, Jodi Salmond, Danielle De Vere and Laura Jordan

**Genome size in tropical fishes (May 2000)**

David Hardie\* (University of Guelph, Canada)

**Effect of cleaner fish on parasite virulence (May/June, July, December 2000)**

Dr Lexa Grutter (University of Queensland, Brisbane) assisted by Jan-Maree Murphy and Mark Johnson

**Long-term effect of cleaning on gnathiid isopods (May/June, July, August, September, November 2000)**

Jan-Maree Murphy\* and Dr Lexa Grutter (University of Queensland, Brisbane) assisted by Rachel Ball, Steve Box and Anthony O'Toole

**Markets and cognition in the cleaner fish mutualism (May/June/July 2000)**

Dr Redouan Bshary (Max Planck Institute for Behavioural Physiology Seewiesen, Germany) and Dr Lexa Grutter (University of Queensland, Brisbane) assisted by Sabine Tebbich

**Bi-directional sex change in coral-dwelling gobies (June 2000)**

Dr Phil Munday (James Cook University, Townsville) assisted by Mikaela Bergenius and Jessica Seebauer

**Colour dimorphism in pseudochromids (June 2000)**

Justine Rosbergen\* (James Cook University, Townsville) assisted by Niklas Taylor, Mikaela Bergenius and Dr Phil Munday

**Comparative demography and life history features of serranid fishes and implications for fisheries and conservation management (July, September/October, December 2000)**

Rachel Pears\* (James Cook University, Townsville) assisted by John Ackerman, Jake Kritzer, Phillipe Ziegler and Richard Evans

**Evolution of phenotypic plasticity (July/August 2000)**

Dr Julian Caley (James Cook University, Townsville) assisted by Ashley Frisch

**Effect of nutrition on reproduction in the damselfish *Pomacentrus amboinensis* (July/August 2000)**

Amanda Badger\* (James Cook University, Townsville) assisted by Dr Julian Caley and Ashley Frisch

**Evolution of geographical ranges in tropical reef fish (July/August, September/October 2000)**

Karin Buechler\* (James Cook University, Townsville) assisted by Dr Julian Caley, Phillipe Ziegler and Richard Evans

**Trophic states of blennies (September, December 2000)**

Shaun Wilson\* (James Cook University, Townsville) assisted by Becky Fisher

**Latitudinal trends in the life history and age structure of *Pomacentrus moluccensis* (October 2000)**

Shalan Bray\* (James Cook University, Townsville) assisted by Phillipe Ziegler and Richard Evans

**Effects of line fishing - visual surveys (October 2000)**

Dr Tony Ayling (Sea Research, Daintree) assisted by Warren Nott and Gabriel Codina and accompanied by Dr Avril Ayling, Bliss Ayling, Zenica Ayling and Melba Nott.

**Colours of the reef: what do they mean? (October 2000)**

Dr Justin Marshall (University of Queensland, Brisbane) accompanied by Sue Maguire



**Vision in fishes (October 2000)**

Dr George Losey (University of Hawaii, USA) accompanied by Judy Losey

**Ultraviolet effects of fish mucus (October 2000)**

Jill Zamzow\* (University of Hawaii, USA)

**Function of ultraviolet vision in coral reef fishes (October 2000)**

Scott Erdmann\* (University of Hawaii, USA)

**Body size, ecology and life history of wrasses (October/November 2000)**

Marc Hubble\* (James Cook University, Townsville) assisted by Krista Chin

**Distribution, abundance and behaviour of wrasses at Lizard Island (November 2000)**

Kelsi Backus\* (School for International Training, USA)

**Behavioural capabilities of tropical reef fish larvae (November/December 2000)**

Rebecca Fisher\* (James Cook University, Townsville) assisted by Pernille Hansen and Rochelle Ferris

**Effect of habitat quality on the level of stress hormones in the spiny damselfish, *Acanthochromis polyacanthus* (November/December 2000)**

Prof. Ned Pankhurst (University of Tasmania, Launceston) assisted by Harry King, Quinn Fitzgibbon, Dr Tish Pankhurst and Mal Evetts, and accompanied by Sam Pankhurst and Mike Pankhurst

**Condition and persistence of coral reef fish recruits (November/December 2000)**

Dr David Booth (University of Technology, Sydney) assisted by Ralph Alquezar

**Physiological mechanisms of early development of fishes (December 2000)**

Dr Mark McCormick (James Cook University, Townsville) and Dr Igor Nechaev (Russian Academy of Science, Moscow) assisted by Paul Costello

**Ontogenetic changes in habitat utilisation in the common fusilier (December 2000)**

Dr Brigid Kerrigan (James Cook University, Townsville) assisted by Sitthixay Dithavong and accompanied by Jeff Lane

**Ecological morphology of labrid fishes (December 2000)**

Dr David Bellwood (James Cook University, Townsville) accompanied by Orpha, Hanna and Oliver Bellwood

**Functional feeding morphology of Pomacanthidae and Chaetodontidae (December 2000)**

Nicolai Konow\* (James Cook University, Townsville)

**Anthropogenic impacts on seabirds (transfer to Rocky Islets study site) (January 2000)**

Chris Parker, Rachel Smolinski and Ms Jewel joining Dr Emma Gyuris (James Cook University, Townsville)

**Review of sewage treatment plants in the Great Barrier Reef Marine Park (July 2000)**

Jo Johnson and Michelle Devlin (Great Barrier Reef Marine Park Authority, Townsville)

**University group (March 2000)**

Two groups of students from the School for International Training (USA) led by Dr John Grant, April Landale, Dr Andrew Lewis and Dani Lewis, and assisted by Melissa Varoy and Dave Williamson

**University group (April 2000)**

Students from the School for International Training (USA) led by Dr John Grant, Dr Andrew Lewis and Dani Lewis, and assisted by Dave Williamson

**School group (April 2000)**

Students from Geelong College Preparatory School (Victoria) led by Stuart McCallum, Chris Mitchell and Sue Scott

**University group (April/May 2000)**

Students from the University of Guelph (Canada) led by Dr Paul Hebert and Dr Jim Ballantyne

**University group (June 2000)**

Students from Michigan (USA) under the auspices of James Cook University, led by Dr Andrew Lewis & Ed Eberle

**School group (June/July 2000)**

Students from Ascham School (Sydney) led by Jane Valentine, Andrew Powell, Bridget Gant, Jill Lumsdaine and Jol Valentine

**University group (July 2000)**

Students from RMIT University (Melbourne) led by Dr Brian Leonard and Prof Gale Spring

**University group (August 2000)**

Students from University of Maryland (USA) led by Prof. Lee Hellman, Peggy Wolf, Wendy Higgins and Bill Higgins

**University group (October 2000)**

Two groups of students from the School for International Training (USA) led by Dr Andy Lewis, Heidi Hock and Dr Jack Grant

**Research for magazine article (June 2000)**

Seika Mori and Koichi Fujiwara (Japan)

**Documentary filming (July 2000)**

Kellie McKeown (Discovery Channel, USA) with three crew members

**Documentary filming - "Islands" (October/November, December 2000)**

Dr Richard Smith, Matt Cadwallader, Claire Thomson (ABC TV Natural History Unit, Melbourne) with Assoc Prof David Bellwood (James Cook University, Townsville), Jane Pinsker and Danielle Anese

**Microscope service (April 2000)**

Zoli Florian (Townsville)

**Site visit for house design (April 2000)**

Joe Higham (Atherton)

**Work experience (June/July 2000)**

Martina Hardensvard (Sweden)

**Transfer to research vessel (July 2000)**

Rachelle Nino and Claire Wong (Australian Institute of Marine Science, Townsville)

**First aid training for staff (July 2000)**

Charlie Makray (First Aid Training Services Australia) accompanied by Julie Armour

**Reconnaissance visit (August 2000)**

Dr Bruce Williams (Centre for Rainforest Studies, Yungaburra, Qld) accompanied by his family

**Round-the-world pedal-boat expedition (August 2000)**

Kenny Brown, April Ardrell and two others

**Reconnaissance visit (September 2000)**

Alison Moore (CRC Reef Research Centre, Townsville)

**Royal visitor (October/November 2000)**

Crown Prince Frederik of Denmark accompanied by Jeppe Handwerk, Steen Christiansen and Birger Petersen

**Reconnaissance visit (November 2000)**

Dr Sandy Tudhope (visitor to Australian Institute of Marine Science, Townsville) accompanied by Meriwether Wilson, Pauline Turner, Colin Chilcott and Terry Scoffin



# Publications

The following 44 publications based on work carried out at the Research Station were received into the Station's collection this year. All visiting researchers are urged to send two copies of papers resulting from work at Lizard Island to be included in this collection.

- Arnal, C., 2000.**  
Ecologie comportementale de la symbiose poisson nettoyeur/poisson client: motivations et honnêteté. PhD thesis, University of Perpignan, France.
- Arvedlund, M., K. Larsen and H. Winsor, 2000.**  
The embryonic development of the olfactory system in *Amphiprion melanopus* (Perciformes: Pomacentridae) related to the host imprinting hypothesis. *Journal of the Marine Biological Association of the United Kingdom*, 80: 3599/1-7.
- Arvedlund, M., M.I. McCormick and T. Ainsworth, 2000.**  
Effects of photoperiod on growth of larvae and juveniles of the anemonefish *Amphiprion melanopus*. *Naga, The ICLARM Quarterly*, 23(2): 18-23.
- Arvedlund, M., M.I. McCormick, D.G. Fautin and M. Bildsoe, 1999.**  
Host recognition and possible imprinting in the anemonefish *Amphiprion melanopus* (Pisces: Pomacentridae). *Marine Ecology Progress Series*, 188: 207-218.
- Arvedlund, M., I. Bundgaard and L.E. Nielsen, 2000.**  
Host imprinting in anemonefishes (Pisces: Pomacentridae): does it dictate spawning site preferences? *Environmental Biology of Fishes*, 58: 203-213.
- Antonius, A., 1999.**  
*Halotolliculina corallisia*: a new coral-killing ciliate on Indo-Pacific reefs. *Coral Reefs*, 18: 300.
- Baird, A.H. and T.P. Hughes, 2000.**  
Competitive dominance by tabular corals: an experimental analysis of recruitment and survival of understory assemblages. *Journal of Experimental Marine Biology and Ecology*, 251: 117-132.
- Bay, L.K., 1999.**  
Interactions among the territorial behaviour, spatial distribution and habitat use of four congeneric damselfishes (*Dischistodus*: Pomacentridae). Honours thesis, James Cook University, Townsville.
- Bellwood, D.R., 1996.**  
Coral reef crunchers. *Nature Australia, Autumn*: 48-55.
- Böhm, F., M.M. Joachimski, W. Dullo, A. Eisenhauer, H. Lehnert, J. Reitner and G. Wörheide, 2000.**  
Oxygen isotope fractionation in marine aragonite of coralline sponges. *Geochimica et Cosmochimica Acta*, 64(10): 1695-1703.
- Bray, R.A. and C.B. Chambers, 2000.**  
A new macradenine, *Zobrasomatrema pichelinae* n.g., n.sp. (Digenea: Lecithasteridae), from tangs (Perciformes: Acanthuridae) off the southern Great Barrier Reef, Queensland, Australia. *Systematic Parasitology*, 46: 105-109.
- Bray, R.A. and T.H. Cribb, 1998.**  
Lepocreadiidae (Digenea) of Australian coastal fishes: new species of *Opechonia* Looss, 1907, *Lepotrema* Ozaki, 1932 and *Bianium* Stunkard, 1930 and comments on other species reported for the first time or poorly known in Australian waters. *Systematic Parasitology* 41: 123-148.
- Bray, R.A. and T.H. Cribb, 2000.**  
The status of the genera *Hysteroleclithoides* Yamaguti, 1934, *Neotheltrum* Gibson & Bray, 1979 and *Machidatremia* LeUn-RÉgagnon, 1998 (Digenea: Hemiuroidea), including a description of *M. leonae* n.sp. from Australian waters. *Systematic Parasitology*, 46: 1-22.
- Chiao, C.-C., 2000.**  
The influence of natural reflectance and illuminant spectra on the design and evolution of animal color vision. PhD thesis, University of Maryland, USA.
- Chiao, C.-C., M. Vorobyev, T.W. Cronin and D. Osorio, 2000.**  
Spectral tuning of dichromats to natural scenes. *Vision Research* 40: 3257-3271.
- Chiao, C.-C., T.W. Cronin and D. Osorio, 2000.**  
Color signals in natural scenes: characteristics of reflectance spectra and effects of natural illuminants. *Journal of the Optical Society of America*, 17(2): 218-224.
- Chisholm J.R.M., 2000.**  
Calcification by crustose coralline algae on the northern Great Barrier Reef, Australia. *Limnology and Oceanography*, 45(7): 1476-1484.
- Collard, S.B., 2000.**  
Lizard Island: Science and Scientists on Australia's Great Barrier Reef. Franklin Watts, New York.
- Cumming, R.L., 1999.**  
Predation on reef-building corals: multiscale variation in the density of three corallivorous gastropods, *Drupella* spp. *Coral Reefs*, 18: 147-157.
- Cumming, R.L., 2000.**  
Distinguishing predation injuries inflicted by *Drupella* and *Acanthaster*. *Reef Encounter*, 27: 12-13.
- Cumming, R.L., 2000.**  
Do large aggregations of *Drupella* lead to population outbreaks? *Reef Encounter*, 27: 13-15.
- Darling, K.F., C.M. Wade, D. Kroon, A.J. Leigh Brown and J. Bijma, 1999.**  
The diversity and distribution of modern planktic foraminiferal small subunit ribosomal RNA genotypes and their potential as tracers of present and past ocean circulations. *Paleoceanography*, 14(1): 3-12.



**Darling, K.F., C.M. Wade, I.A. Stewart, D. Kroon, R. Dingle and A.J. Leigh Brown, 2000.**

Molecular evidence for genetic mixing of Arctic and Antarctic subpolar populations of planktonic foraminifers. *Nature*, 405 (4 May 2000): 43-47.

**Dubilier, N., R. Amann, C. Erséus, G. Muyzer, S.Y. Park, O. Giere and C.M. Cavanaugh, 1999.**

Phylogenetic diversity of bacterial endosymbionts in the gutless marine oligochaete *Olavus loisae* (Annelida). *Marine Ecology Progress Series*, 178: 271-280.

**Fisk, D.A. and M.C. Power, 1999.**

Development of cost-effective control strategies for crown-of-thorns starfish. CRC Reef Research Centre Technical Report 25: 1-63. CRC Reef Research Centre, Townsville.

**Fulton, C.J., 2000.**

The relationship between swimming ability and habitat use in wrasses (Labridae). Honours thesis, James Cook University, Townsville.

**Grutter, A.S., 1999.**

Cleaner fish really do clean. *Nature*, 398 (22 April 1999): 672-673.

**Grutter A.S., 1999.**

Infestation dynamics of gnathiid isopod juveniles parasitic on the coral-reef fish *Hemigymnus melapterus* (Labridae). *Marine Biology*, 135: 545-552.

**Heyward, A.J. and A.P. Negri, 1999.**

Natural inducers for coral larval metamorphosis. *Coral Reefs*, 18: 273-279.

**Hughes, T.P., A.H. Baird, E.A. Dinsdale, N.A. Moltschanivskyj, M.S. Pratchett, J.E. Tanner and B.L. Willis, 2000.**

Supply-side ecology works both ways: the link between benthic adults, fecundity, and larval recruits. *Ecology*, 81(8): 2241-2249.

**Kavanagh, K.D., 2000.**

Larval brooding in the marine damselfish *Acanthochromis polyacanthus* (Pomacentridae) is correlated with highly divergent morphology, ontogeny and life-history traits. *Bulletin of Marine Science*, 66(2): 321-337.

**Kianten, S.O., 1998.**

Does morphology predict ecology in coral reef fishes? Honours thesis, James Cook University, Townsville.

**Leis, J.M., 2000.**

Out of the blue. *Nature Australia, Spring*: 52-59.

**Loosey, G.S., A.S. Grutter, G. Rosenquist, J.L. Mahon and J.P. Zamzow, 1999.**

Cleaning symbiosis: a review. Pp 379-395 in: Almada, V.C., Oliveira, R.F., Goncalves, E.J. (Eds.), "Behaviour and conservation of littoral fishes". I.S.P.A.: Lisbon, Portugal.

**Munday, P.L., 1999.**

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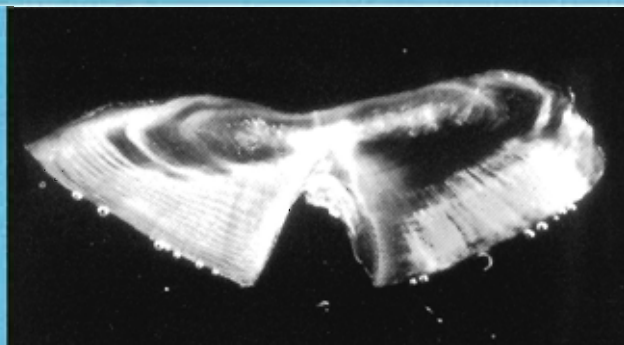
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Otolith (ear bone) from coral trout. Concentric bands are used to age fish like growth rings on trees. Otolith is 6mm wide. PHOTO: DIRK ZELLER

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