LIZARD ISLAND research station

LIZARD ISLAND RESEARCH STATION

newsletter 1993/1994

Proudly sponsored by the 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. The Foundation funds capital developments at the Station and directly funds research through the Lizard Island Doctoral Fellowship. Since its inception in 1978, the Foundation has raised over one million dollars to facilitate research on the Great Barrier Reef.

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Image Quest 3D

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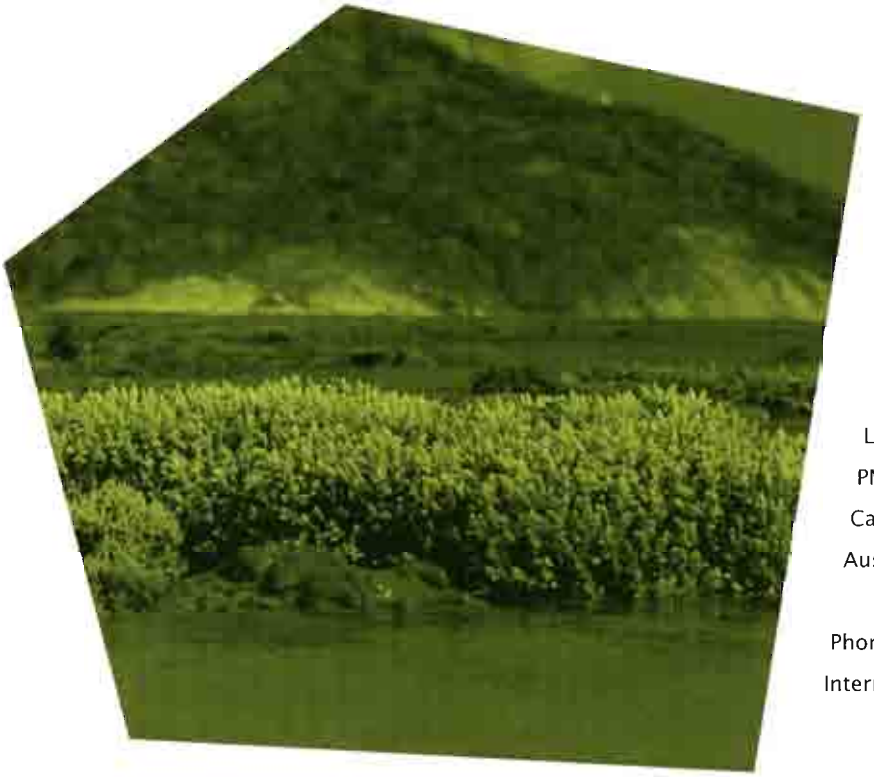


Bleached corals off the Research Station during very low tides in May 1994. Photo: Anne Hoggett

This newsletter covers the period from 1 July 1993 to 30 June 1994.

Please address any queries about the station to the Directors, Dr Lyle Vail and Dr Anne Hoggett at:

Lizard Island Research Station
PMB 37
Cairns Qld 4870
Australia

Phone and fax: (070) 60-3977
International: 61 70 60-3977

Situated in the pristine waters of the northern Great Barrier Reef, the Lizard Island Research Station provices housing and research facilities for scientists and educational groups. The Station is a facility of the Australian Museum and it supports research into all aspects of the biology, ecology, oceanography, geology, history, management and conservation of the Great Barrier Reef.

MISSION

Our mission is to increase understanding of the Great Barrier Reef by fostering high quality scientific research. Providing superior research facilities is central to the achievement of the mission.

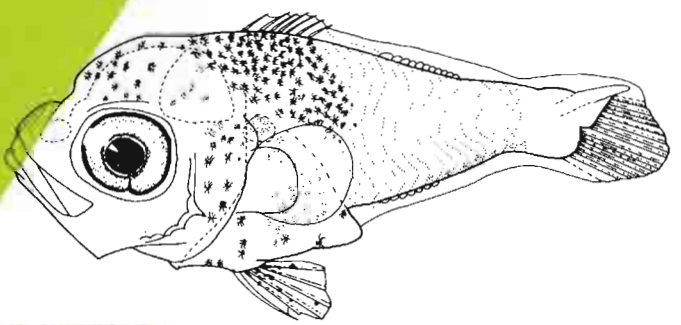
Large format natural history films made at Lizard Island

This year, a British film group visited the Station for three months to film live planktonic larvae and jellyfish for a series of feature films to be shown in Imax and Omnimax theatres worldwide. Leader of the Image Quest 3D team, Peter Parks, chose Lizard Island for this project because he had visited in the early 1980s and considered the location and facilities ideal. Although some underwater filming was done, most of the work took place in the lab. A large room was filled with specially designed cameras, benches, lighting and other equipment, all needed to capture images of creatures less than one millimetre long swimming in a drop of water on a microscope slide. These tiny animals will be projected to a size of tens of metres on the screen. The group also did some experimental three-dimensional filming of marine animals during their visit.

To tag a larval fish ....

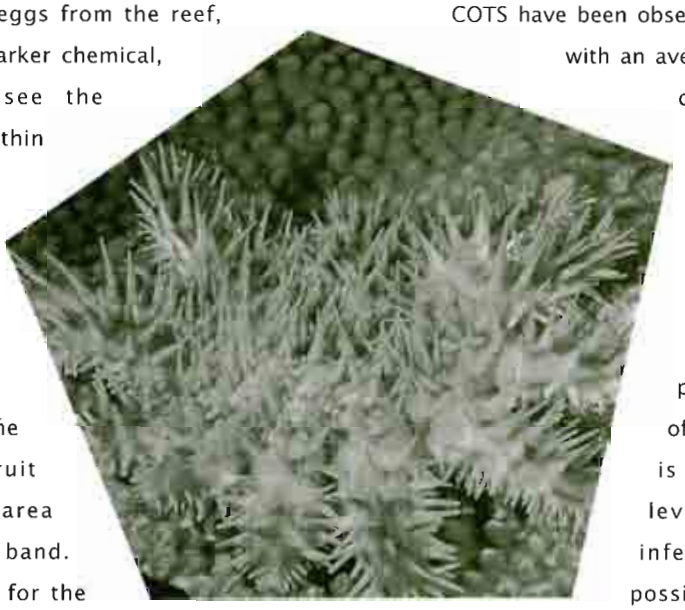
The population dynamics of reef fishes has been a controversial field of study for many years. Most reef fishes go through a planktonic larval stage (which means that they live in open water early in their lives) during which they can be carried by currents away from the location of their parents. This stage ends after a period of days, weeks or months when larvae settle onto the reef, a process known as recruitment. Central to the debate about how adult populations are structured and maintained is the source of larvae. Do larvae recruit back onto the same reef or part of the reef as their parents, or do they settle in a more distant locality? Many ecological models assume that larvae are dispersed away from their natal reef by water currents. However, studies on larvae themselves indicate behaviours that could modify the effect of currents on their movements. For at least some reef fish species, it now appears likely that larvae do not disperse far at all.

Up till now, there have been no direct studies on the fate of fish larvae in the sea because of the difficulty in marking and recapturing such small animals. This year, an established technique for marking adult fish was tried on the embryos of a damselfish species at Lizard Island by Dr Maria Milicich of James Cook University. The technique



A damselfish larva.

involves introducing a chemical into the body of a fish where it is taken up into growing bones and can be seen as a fluorescent band when viewed under a microscope with ultraviolet light. Damselfishes lay eggs attached by a sticky substance into holes in the reef, where they are fertilised and develop as embryos before hatching to become planktonic larvae. Maria collected fertilised damselfish eggs from the reef, bathed them in the marker chemical, and was able to see the fluorescent marker within the embryos. The next stage of the project will be to mark many embryos in this way, replace them onto the reef and to observe whether the young fish that recruit back into the same area have the fluorescent band. This work is planned for the coming summer.



Crown-of-thorns starfish. Photo: Lyle Vail

Crown-of-thorns starfish

There have been two series of crown-of-thorns starfish (COTS) outbreaks in the past 30 years. Both appeared to start in the northern part of the Great Barrier Reef and move southwards over a period of years. If outbreaks occur at regular intervals, then the next one can be expected to start soon. The Great Barrier Reef Marine Park Authority is attempting to determine the status of COTS on the Reef by two methods: manta-tow surveys carried out by the Australian Institute of Marine Science, and reports from reef-users through the COTSWATCH scheme.

At the Research Station, divers observed that the number of COTS around the island and at nearby localities appeared to increase this year compared to previous years. To quantify COTS sightings, a section was added to the Station's dive log in October 1993 asking divers to record the number of COTS sighted and whether or not the dive covered more than 50 metres of reef. Up to 18 COTS have been observed on a single dive, with an average of 0.6 COTS per dive (covering 50 metres or more) between October 1993 and June 1994. The data are being provided to the COTSWATCH program. The number of COTS at Lizard Island is still well below the level regarded as an infestation, but it is possible that we are now witnessing the beginning of the next outbreak. This is important because previous outbreaks have never been observed in the early stages.

The trigger (or triggers) for COTS outbreaks is still unknown despite enormous increases in our knowledge of their biology during the past ten years. One idea is that an increased supply of food to the larval stages may allow a greater proportion of the larvae to survive to adulthood. The food of COTS larvae is phytoplankton, microscopic plant cells that occur in seawater. In the clear waters of the Great Barrier Reef, natural phytoplankton levels are usually very low but the cells reproduce rapidly when nutrients are added to seawater. Nutrient levels can increase naturally, for example during cyclones when

nutrient-containing sediments are stirred up, or they can increase as a result of human activities, such as sewage outfalls and agricultural fertiliser run-off. Aspects of the "larval starvation hypothesis" were tested this year at the Research Station by Ken Okaji, a PhD student working at the Australian Institute of Marine Science. He raised COTS larvae in the laboratory, and fed different batches with different concentrations of algal food. Ken found that growth, development and survival of the larvae increase if the level of food is above that found in natural seawater.

Environmental monitoring by the Station continues

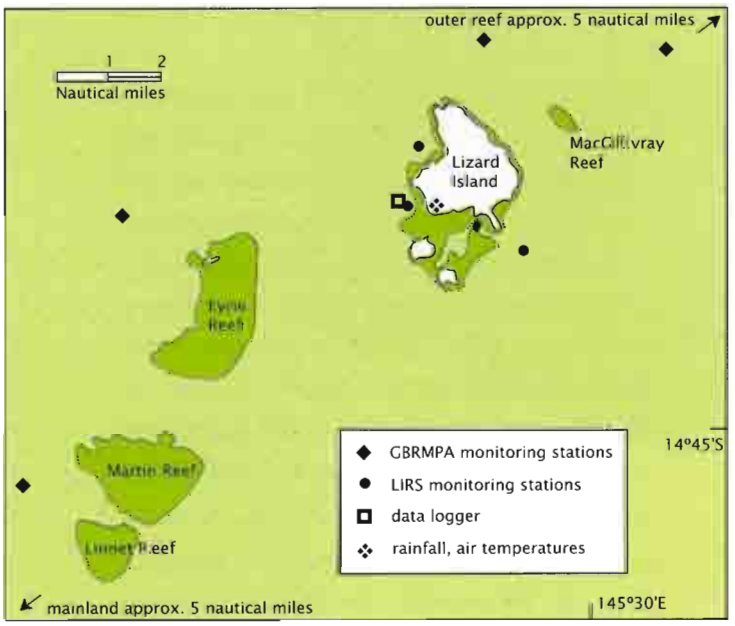
The Station continued its contract with the Great Barrier Reef Marine Park Authority (GBRPMA) this year to monitor water quality at four off-reef stations on a monthly basis. Parameters measured are salinity, temperature, turbidity, chlorophyll concentration, presence/absence of algal blooms, swell direction and height, wind direction and strength, and cloud cover. This forms part of GBRMPA's Reef-wide effort to detect any deterioration of seawater quality.

In addition to the GBRMPA stations, corresponding data from four stations close to Lizard Island also continued to be collected on a monthly basis this year.

Automatic logging of water temperature at Lizard Island commenced on 7 September 1993. The logger is situated on the bottom (about 2 m depth at spring low tide) at a back-reef site near the Station. It records the water temperature every 30 minutes, and it is intended to maintain this program indefinitely.

Maximum and minimum air temperatures and rainfall continued to be collected on a daily basis at the Station during the year.

All this data is available to researchers to assist their studies, although a fee may be charged to cover the time required to retrieve the information in a suitable format.



Federal government funding awarded

A grant of $315,000 was awarded this year by the Australian Research Council (Mechanism C) for a major upgrade to the aquarium system at the Station. This will be used to double the space available for aquaria (including the addition of some large tanks), to treble the capacity for seawater delivery and to provide: an air-conditioned culture room with laminar flow cabinet; grow-out facilities for both phytoplankton and zooplankton, and; some additional laboratory space and instrumentation. Construction of the new facility will begin in late April 1995. The

application to ARC was made in conjunction with James Cook University, and we are deeply indebted to Professor Howard Choat for his input. This grant represents the first contribution to the Station by the Federal Government.

Staff

There were no changes to the permanent staff during the year. Lyle Vail and Anne Hoggett continued as the Station's Directors. Lance and Marianne Pearce also continued as Maintenance Officer and Accommodation Officer, respectively, but they took leave for six months (from March to September 1994) to see what life is like on the mainland after almost six years on the island. Their positions were filled by Terry Ford and Lois Wilson during this period. Kellie Hellyer continued as Alex Vail's home tutor during 1993/94.

House extensions postponed

Extensions to Kirby and Suntory houses were planned for this year. However, the success of the aquarium grant proposal changed the timing because it is more efficient to do one large project than two smaller ones. The house extensions will now be done in April/May 1995. Each house will have one extra bedroom, the inside dining area will be enlarged, there will be a larger outdoor area, and there will be two new bathrooms with toilets! Yes, the days of the outdoor dunny at Lizard are numbered! The new toilets will be the composting sort, which avoid the problems of water usage and effluent disposal that are associated with septic tanks.

Improvements to diving facilities

Electrical wiring to the workshop area was upgraded this year so that our two large scuba compressors could be run at the same time. Previously, the wiring was capable of running only one large and one small compressor simultaneously. Filling is very efficient now with two quite new Bauer 12 cubic foot compressors hooked up (both with automatic dump valves), and it certainly needs to be efficient with researchers using up to 80 tanks a day during peak periods.

A new shed to house staff dive gear and hire gear was constructed this year. This helped to alleviate space problems for visitors by removing from the visitors' shed six sets of dive gear belonging to staff. A new visitors' shed is planned for construction in September 1994. It will be about one quarter larger than the existing shed and the space will be better organised. There will also be more rinsing tubs to help ease the bottleneck in this area, and two hot outdoor showers.

Diving update

During the year, 4,959 dives were logged, representing 5,665 hours underwater. Dives to depths of less than 16 metres accounted for 95% of all dives, with the most common depth range being less than 5 metres.

Lizard Island Management Plan

A complete management plan for Lizard Island will not be attempted in the short term, but a set of guidelines for marine activities will be developed. This is the decision of the Queensland Department of Environment and Heritage (QDEH), which controls the terrestrial National Park on Lizard Island and is the day-to-day manager of the Marine Park surrounding it. The Department's justification for this is that the major management problems are perceived to be in the marine area, and a set of guidelines is quicker to prepare than a complete management plan.

The scientific community contributed only 5 of the 39 submissions to QDEH concerning management issues at Lizard Island last year. This disappointing result contrasts with 15 submissions from commercial tour operators. Four of the five research-oriented submissions were made by organisations (the Lizard Island Research Station, the Australian Museum, James Cook University, and the Australian Coral Reef Society). Personal involvement by regular users of the Research Station would be extremely welcome in the next stages of the planning process, especially when the draft Guidelines document goes out for public comment, possibly in late 1994.

Divers and cod in the Cod Hole
Photo: John Cooper

Cod Hole survey

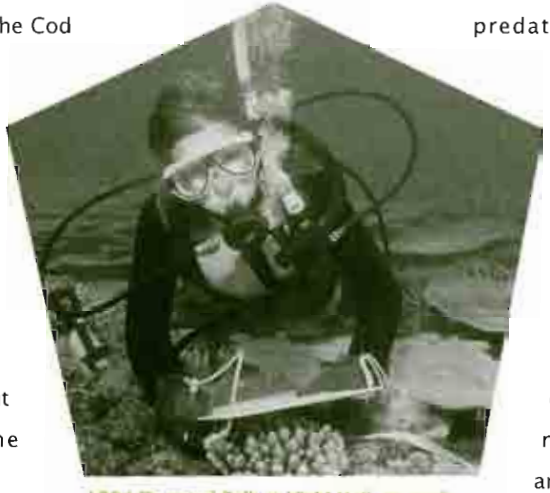
Information continued to be collected this year on usage, the fauna and environment of the Cod Hole by the crew of the Lizard Island Charters vessel Volare for the Research Station. Volare visits this internationally-renowned dive site several times each week. The attraction is the presence of many fish, including a group of large Potato Cod that allows divers to approach closely. Because the site is such a popular tourist destination, the monetary value of each Cod is enormous but very little is known about their biology and ecology so management of the site rests on a very poor scientific basis.

Data sheets representing 258 visits by Volare to the Cod Hole between April 1992 and May 1994 are now available. They show that usage of this once-remote site is high and that damage is occurring to both the reef and fish (see box).

Coral damage appears to have been done by anchors, as large pieces of coral have been found overturned or smashed under normal weather conditions. Many injuries observed on fish are located on the mouth or head, and the cause of these is likely to be altered feeding behaviour due to the widespread practice of fish feeding, or damage caused directly by the infrequent practice of hookless fishing. Damage to humans by fish also occurs at the Cod Hole: moray eels, in particular, have seriously injured at least two people in recent years.

Average number of vessels at the Cod Hole per visit	2.5
Average number of snorkellers per visit	7
Average number of scuba divers per visit	22
Proportion of visits in which new damage to the reef (hard corals) was observed	4%
Proportion of visits in which new damage to large fish was observed	13%
Proportion of vessels engaged in fish feeding	63%
Proportion of vessels engaged in hookless fishing	0.6%

The survey also records the presence or absence of recognisable individual fish, and it shows that some potato cod are absent from the Cod Hole for 2 to 3 months at a time. No-one knows how far these cod travel, but some divemasters claim to have seen recognisable individuals up to five nautical miles away. It is important to learn more about the movements of these fish as they require protection if they travel out of the National Park Zone surrounding the Cod Hole.



1994 Doctoral Fellow Vicki Hall at work on the reef crest. Photo: Lyle Vail

Lizard Island Doctoral Fellowship

The Lizard Island Doctoral Fellowship is funded by the Lizard Island Reef Research Foundation. Valued at $14,500 over three years, the fellowship covers bench fees at the Station as well as some funding for travel and equipment. This highly sought-after fellowship is open to PhD candidates conducting significant long-term field studies in a scientific discipline relevant to the Great Barrier Reef. For information about applications for the 1995 fellowship, see the last page of this newsletter.

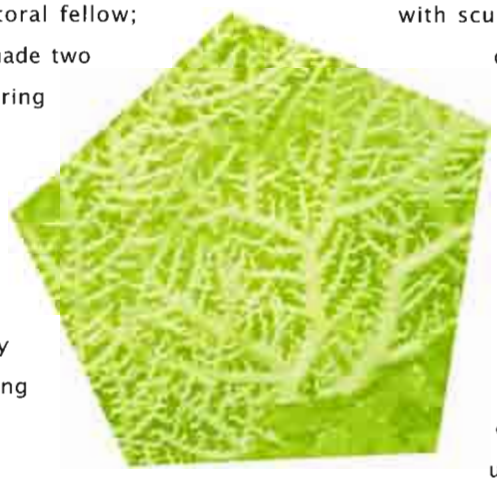
Update on Lizard Island Doctoral Fellows

Vicki Hall (James Cook University) was awarded the 1994 doctoral fellowship from a very strong field of applicants. Her thesis will document natural injury and recovery of artificial lesions in common reef-crest corals. This work has important implications for the management of coral reefs. Human usage of the reef may cause damage to corals by anchors, feet or fins, but "natural" damage also occurs through predation, wave action and sedimentation. To quantify and manage human impact, the level of "natural" damage and the extent to which recovery occurs must be understood. Vicki is examining the extent of natural injuries at sites around Lizard Island, and is monitoring the effects of artificial injuries on common reef-crest corals. She made five trips to the Station during 1993/94.

Dirk Zeller (1993 doctoral fellow; James Cook University) made three trips to the Station during the year to conduct his work on movements of coral trout. Dirk has developed the methodology of using ultrasonic tags with these fishes, and has made preliminary estimates of home range sizes

by following the movements of electronically tagged fish. In the coming year, he will be refining these estimates and tracking fish movements during the spawning season.

Lexa Grutter (1993 doctoral fellow; James Cook University) made two trips to Lizard Island during the year, completing the field work for her project on the feeding biology of cleaner wrasse in November. She is currently analysing data and writing up.



Vicki Nelson (1992 doctoral fellow; James Cook University) completed her field work on the demography of reef crest corals at Lizard in February 1993 and is currently writing up.

Alison Green (1991 doctoral fellow; James Cook University) submitted her thesis on wrasse biology and ecology in May 1994, just before leaving Australia to take up a position in American Samoa. Alison made a final trip to Lizard Island in April 1994 to remove field markers from the reef.

Campbell Davies (1990 doctoral fellow; James Cook University) completed his field work on movement patterns of large reef fishes in November 1992. Since then, he has been involved in the Great Barrier Reef Marine Park Authority's program on the effects of fishing, and has accepted a six-month fellowship in Italy. He has postponed submission of his thesis until after his return from Italy in late 1994.

Bench fees

Visiting researchers are charged a bench fee that covers self-catering accommodation, use of a small boat, laboratory and aquarium facilities, with scuba tanks and air fills for qualified divers. The fee is subsidised by the Australian Museum Trust. For visits longer than 28 consecutive days, a 10% discount applies to the whole period. These fees remain unchanged since 1991 and will be in force until 31 December 1994, after which fees for assistants will increase. Attractive rates are offered to groups of school and university students undertaking course work directed by teachers or lecturers from their own institutions.

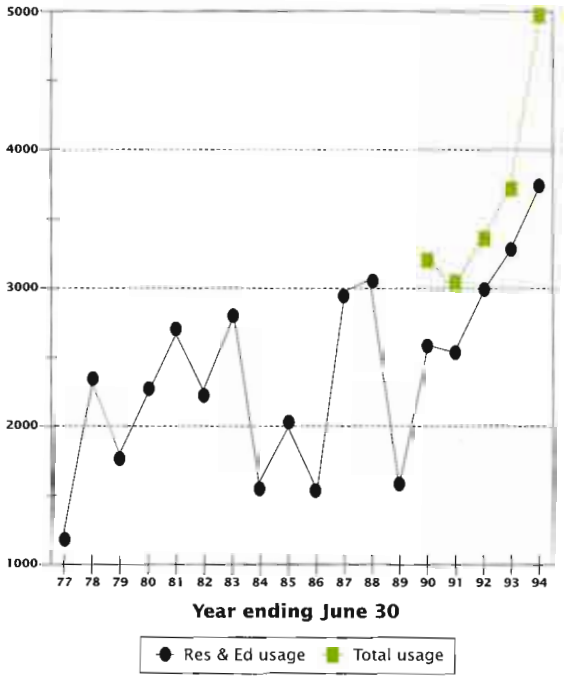
	During 1993/94	From January 1995
Full researchers	$75	$75
Assistants	$55	$65
Postgraduate students*	$29	$29
Assistants	$22	$25

*To qualify for the student rate, a person must be enrolled as a postgraduate student and be conducting research towards his/her thesis at the Station.

Visitor statistics

Usage of the Station has broken all records for the second consecutive year. The larger-than-usual difference between total usage (which includes commercial users and volunteers) and research/educational usage is due to a large commercial filming project that took place over

LIRS Usage



summer. With 4,973 user-days this year (an average of almost 14 people per day), usage of the Station increased by 33% compared to last year. Despite the increase in commercial usage this year, the emphasis on research at the Station continues. Fifty-five research projects were conducted during the year.

Volunteer program

The Research Station has operated with three to four full-time staff members for many years, but the usage rate and hence the workload has increased markedly over the past four years. It is largely through the assistance of volunteers that we have been able to keep things running smoothly and the buildings and equipment in good repair. This year, some major projects carried out by volunteers included renovating the microscope room, total refurbishment of Condor below the waterline, de-rusting and painting the exterior of Loomis house, painting three dinghies, repairing and painting the workshop roof, and painting two laboratories.

This year, we give our thanks to the following volunteers for their efforts: Frank Bürmann, Helen Burke, Claudia Canessa, Jeremy Cullen, Sabine Daume, Fabian Grutter, Pascal Grutter, Anja Hansen, Nerina Holden, Dorte Kaadner, Jorgfried Kirch, Claus Knudsen, Carolyn MacLulich, Jenny Molson, Matthew Orr, Amy Ritchie, Claus Simonsen, Jeremy Steane, Frank Umlauf, Rudolf Wagner, Stephanie Warrington, Geoff Williams and Carol Wilson.

Most volunteers visit for one to four weeks, giving four hours labour per day in return for accommodation. Volunteers must provide their own food and travel expenses. An enormous number of volunteer enquiries are received every year: the volunteers who are accepted are usually those who are in the right place at the right time. To ensure that researchers have priority for space at the Station, we confirm space for volunteers only within six weeks of the proposed visit. The maximum time that will be offered initially to volunteers is two weeks, which may be extended if space is available and if work performance is satisfactory.

Tours

Tours of the Station continued to be popular with island visitors on Mondays and Fridays at 9.30 am, and informal visits were also made by many people. During the year, the number of day visitors to the Station was about 1,400.

Special tours of the Research Station were conducted for: a group of Members of the NSW State Parliament (Environment and Planning Portfolio Group) led by the Hon. Terry Sullivan, Member for Wollongong; Madame Deng Nan, Vice-Minister of the State Science and Technology Commission of China; and the (then) Chairman of the Lizard Island Reef Research Foundation, Mr James Creer, with Mrs Creer and guests.

New initiatives from the Lizard Island Reef Research Foundation

Mr James Creer stepped down from his position of Chairman of the Foundation after three years service, and we thank him for his efforts on the Station's behalf. In his final action as Chairman, Jim hosted an excellent luncheon for Trustees and their guests at the Australian Museum's Rooftop in February 1993. We welcome Mr Kenneth Coles as the new Chairman of the Foundation; he has been a Trustee since 1991.

Under Ken's leadership, an exciting new plan to establish three categories of donors has been developed. The first category is Patrons, who are invited at the discretion of the Board in recognition of their substantial contributions to the affairs of the Foundation. Not surprisingly, most of the inaugural Patrons are long-serving Trustees of the Foundation. To Mr Ray Kirby, Sir John Proud, Mr Robert Purves, Mr Charles Warman and Mr Brian Wiesener we offer our congratulations and give thanks for their support over the years. The other inaugural Patrons are Henry and Jacqueline Loomis, whose support in the earliest stages of the Station's development was crucial. The second category of donors is to be known as Members (see next page), and recruitment is progressing well, with thirty two individuals or couples having signed up for 1994/95 as this Newsletter goes to press. The third category, to be known as Friends, will be developed next year.

Coral spawning. Photo: John Cooper

Another Foundation initiative is to celebrate the mass coral spawning that takes place on the Great Barrier Reef each year. This spectacular event - in which many different species of corals spawn at the same time - is a focus for research and filming activity at the Station and other localities on the Great Barrier Reef. The Foundation plans to celebrate this phenomenon with a dinner for Members (and prospective Members) in October 1994, and with a guessing competition - the Coral Spawning Sweepstakes. Timing of the spawning depends upon the moon phase, the time of day and the water temperature, so it is predictable to a certain extent. In the Sweepstakes, entrants will guess the date and time (within one hour blocks) that corals of the genus *Acropora* will reach their spawning peak at Lizard Island. Each entry into the Sweepstakes will cost $10, and the Directors of the Research Station will determine the winning date and time. The prize is a four night cruise for two aboard the "Reef Escape" to Lizard Island and other Reef locations, with first class air travel from Sydney or Brisbane. The prize is provided courtesy of Captain Cook Cruises, Qantas and Coles Myer Ltd. The first Sweepstakes will be run for the spawning expected to occur in late 1994.

Become a member of the Lizard Island Reef Research Foundation

Members of the Lizard Island Reef Research Foundation support research and provide funding for capital improvements at the Lizard Island Research Station. Membership is limited to only 100 people and runs from July to June each year. The $1,000 donation to the Lizard Island Reef Research Foundation for Membership is fully tax deductible.

Membership carries the following benefits:

- A chance to win a 5 night holiday for two at the Lizard Island Lodge with first class air travel from Sydney or Brisbane.

- A chance to win a stateroom for two on a 4 night cruise aboard the luxurious "Reef Escape" to Lizard Island and other locations on the Great Barrier Reef with first class air travel from Sydney or Brisbane.

- A chance to win a 3 night holiday for two at the Country Comfort Outrigger Hotel in Cairns with first class air travel from Sydney or Brisbane.

- A free entry into the Coral Spawning Sweepstakes.

- To all members who visit Lizard Island, a tour of the Research Station by the Directors, including a snorkelling expedition.

- An invitation to the exclusive Coral Spawning Celebration dinner to be held in October 1994 at the Australian Museum. Tickets will be $100 each and the dinner will be limited to Members, their partners and some prospective Members. There will be a guest speaker and all prizes will be drawn at the dinner.

- A complimentary copy of "Muse", The Australian Museum Society's magazine (six issues a year), which will carry a regular Lizard Island update.

- A colourful, enamelled membership badge attached to a keyring, inscribed on the back with the Member's number and the address of the Australian Museum.

The Foundation thanks the following companies for generously contributing prizes: Australian Resorts Pty. Ltd., Captain Cook Cruises, Coles Myer Ltd., Country Comfort Outrigger Hotel, and Qantas.

Research Projects and Participants

The following projects were carried out at the Station during the year. An asterisk (*) indicates the researcher is a postgraduate student.

Microbiology of timbers buried in lagoonal sediments

*Jodie Guthrie (University of Queensland, Brisbane) assisted by Cathy Roche and Loretta Davis

Photographic survey of sponge fauna

Dr Dagmar Barthel (Institüt für Meereskunde, Kiel, Germany) assisted by Dr Klaus-Gunther Barthel

Palaeontology and ecology of coralline sponges

*Gert Wörheide (Freie Universität, Berlin, Germany) assisted by Cornelia Sawert, Olaf Schlegel and Patricia Künzel, and accompanied by Maria Sawert

Distribution of benthic communities in reef caves in relation to light level

*Ralph Müller (University of Stuttgart, Germany)

Survey of marine sponge diversity

Dr John Hooper (Queensland Museum, Brisbane) assisted by Lisa Hobbs, Steve Cook, John Kennedy, Kirsteen Kennedy and Richard Lewis

Effects of physical damage on corals

*Vicki Hall (James Cook University, Townsville) assisted by Luke Smith, Fabian Grutter, Andrew Baird, Sherryl Fitzpatrick, Francis Pantus and Annabel Miles

Coral ecology

Dr Terry Hughes (James Cook University, Townsville) assisted by Liz Dinsdale and Kurt Bonair, and accompanied by Connor Hughes

Coral genetics

Dr Terry Hughes (James Cook University, Townsville) and Dr David Ayre (University of Wollongong) assisted by Rachel Standish, Liz Dinsdale and Luke Smith

Coral diseases

*Liz Dinsdale (James Cook University, Townsville)

Recruitment of corals and survivorship of fragments

*Andrew Baird (James Cook University, Townsville) assisted by Michael Purdey

Fate of coral fragments

*Luke Smith (James Cook University, Townsville)

Dispersal of clonal organisms

Dr Ron Karlson (University of Delaware, USA) assisted by Susan Karlson and accompanied by Henry and Tavenner Karlson

Reproductive biology of soft corals

*Micaela Hellström (University of Helsinki, Finland) assisted by Marie Egerrup, Adam Goldrick, Helmut Grossman, Russell Kelly and Chris Ryan

Water flow dynamics, larval dispersal and their effect on population structure of corals

Dr Barbara Best (Colby College, USA) with Dr Mimi Koehl, Dr Rachel Merz and Dr Steven Moore

Long-term monitoring of coral populations

Dr Terry Done (Australian Institute of Marine Science, Townsville) assisted by Emré Turak, Richard Schneider and Natalie O'Connell

Pilot study for coral reef rehabilitation program

Dr Ursula Kaly (James Cook University, Townsville) assisted by Rohan Pratt and Ellen Twiname

Taxonomy, ultrastructure and biochemistry of marine oligochaetes and their symbiotic bacteria

Dr Nicole Dubilier (Harvard University, USA), Prof. Christer Erséus (Swedish Museum of Natural History, Stockholm) and Prof. Dr. Olav Giere (University of Hamburg, Germany)

Stomatopod vision

Dr Justin Marshall (University of Sussex, England), Dr Tom Cronin and Nadav Shashar (University of Maryland, USA), and Dr Roy Caldwell (University of California at Berkeley, USA), accompanied by Elena Cronin

Ecology of coral-eating gastropods

*Robyn Cumming (James Cook University, Townsville) assisted by Greg Ferguson, Michael Marnane, Emma Bradshaw and Kate Schultz

Dr Justin Marshall measuring the spectrum of light reflected from a stomatopod. Photo: Lyle Vail

Novel toxins from cone shells

*Jon-Paul Bingham and Dr Peter Andrews (Centre for Drug Design and Development, University of Queensland) assisted by Barbara Collins, Heather Andrews, Sally Andrews and Susie Andrews.

Long-term monitoring of giant clam populations

Dr David Phillips (Acer Environmental, England) and Hilary Phillips

Interaction between echinoids and fish predators

*Steven Lee (University of California Santa Cruz, USA) assisted by Jeremy Steane

Rearing experiments with crown-of-thorns starfish larvae

*Ken Okaji (Australian Institute of Marine Science, Townsville) assisted by Marie Ito

Population dynamics of the pincushion starfish

*Kevin Grannum (University of Queensland, Brisbane) assisted by Daniel Torlach and Barbara Grannum

Sperm activation in echinoderms

Dr Richard Miller (Temple University, USA) assisted by Stephanie Warrington

Movement patterns of large reef fishes using telemetry

*Dirk Zeller (James Cook University, Townsville) assisted by Brenda Cook, Kath Kelly and Annabel Miles

Role of hormones in larval development of a damselfish species

Dr Mark McCormick (James Cook University, Townsville) assisted by Brigid Kerrigan, Craig Hutchings, Stephanie Warrington, Maria Hansen and Michael Fogg

Feeding biology of cleaner fishes

*Lexa Grutter (James Cook University, Townsville) assisted by Mark Johnson and Fabian Grutter

Feeding ecology of a wrasse species

*Jenny McIlwain (James Cook University, Townsville) assisted by Andrew Lewis

Dispersal of coral reef fish larvae

Dr Maria Milicich (James Cook University, Townsville) assisted by Jenny McIlwain, Stephanie Warrington, Axel Weis and Chad Lunow

Dynamics of larval supply of coral reef fishes to Lizard Island

*Kylie Pitt (James Cook University, Townsville) assisted by Dr Maria Milicich and Jenny McIlwain

Effects of habitat structure and physical disturbance on reef fish assemblages

Dr Geoff Jones (James Cook University, Townsville) assisted by Julie Martin and Giglia Beretta

Development and behaviour of early life history stages of damselfishes

*Kathy Kavanagh (James Cook University, Townsville) assisted by Jean-Luc Solandt

Predation on juvenile fish

*Julie Martin (James Cook University, Townsville) assisted by Mary Portefaix

Effects of habitat on population structure of a pomacentrid fish species

*Kath Kelly (James Cook University, Townsville)

Relationships between reef fishes and their habitats

*Craig Syms (James Cook University, Townsville) assisted by Sherryl Fitzpatrick, Kath Kelly and David Judge

Factors influencing demography of a fish population

*Jo Beukers (James Cook University, Townsville) assisted by Dave Wachenfeld and Lisa Kellogg

Swimming and sensory capabilities of larval and juvenile fishes

*Ilona Stobutzki (James Cook University, Townsville) assisted by Adrian Newton and Jess Morgan

Feeding biology of herbivorous fishes

Prof. Howard Choat (James Cook University, Townsville) and Dr Kendall Clements (University of Sydney) assisted by Lynda Axe, Michael Marnane, Emma Hutchison, Li-Shu Chen and Jayson Semmens.

Taxonomy of gobies

Dr Richard Winterbottom (Royal Ontario Museum, Canada) assisted by Dr David Bellwood, Cal Borden, Lynda Axe and Michael Marnane

Taxonomy of unicornfishes

*Cal Borden (Royal Ontario Museum, Canada) assisted by Dr Richard Winterbottom, Lynda Axe and Michael Marnane

Development of the digestive system in parrotfishes

*Li-Shu Chen (James Cook University, Townsville)

Morphological and colour pattern changes in juvenile parrotfishes

*Anne Crook (James Cook University, Townsville)

Population dynamics of coral reef fish

Dr Geoff Jones and Dr Maria Milicich (James Cook University, Townsville)

Molecular biogeography of fishes and collection of fish egg samples

Dr Ross Robertson (Smithsonian Tropical Research Institute, Panama) assisted by Dr Ursula Schoeber

Combined effects of competition and predation on small reef fishes

Dr Geoff Jones (James Cook University, Townsville) and Dr Mark Hixon (Oregon State University, USA) assisted by Dr Ursula Kaly

Male competition and female choice in a damselfish species

Dr Abby Schwarz (Langara College, Canada) assisted by Sonja Heilmeier and William (Charlie) Downey

Sediment loads and their implications for algal turf biomass and feeding biology of herbivorous fishes

*Steve Purcell (James Cook University, Townsville) assisted by David Hocking, Jamie Colquhoun, Jayson Semmens, Michael Fogg and Michael Emslie

Behaviour and sex change in an anemone fish

*Emma Bradshaw (James Cook University, Townsville) assisted by Sascha Brand

Distribution and abundance of sand-dwelling gobies

*Craig Hutchings (James Cook University, Townsville)

Feeding by damselfishes

*Adrian Newton (James Cook University, Townsville) assisted by Dr David Bellwood

Dr Maria Milicich and Kylie Pitt collecting fish larvae from a light trap. Photo: Mark Johnson

Demography of lethrinid and lutjanid fishes in the lagoon

*Vincent Hilomen (James Cook University, Townsville) assisted by Dr Garry Russ and Simon Wilkinson

Skin structure of a damselfish

Dr Barbara Nowak (University of Tasmania, Launceston) assisted by Jon Bryan

Effects of fishing on seabird populations

Dr David Milton (CSIRO, Cleveland) and Dr Geoff Smith (for CSIRO, Cleveland) assisted by Jenny and Ceska

Philosophy of marine park management

Dr Denise Russell (University of Sydney) with Hal Pratt

Filming marine organisms

Image Quest (UK): Peter Parks, Suzi Parks, Christopher Parks, Jonathon Watts, Simon Bywater, Tim Hellier, Pete Field, Bob Brock, Lois Wilson, Terry Ford, Roger Steene and Chris Parsons

Collection of educational materials

Prof. Cathy Busby (University of California Santa Barbara, USA) assisted by Dr Peter Kokelaar

Exploratory visit - stream and rocky shore ecology

Dr Barbara Peckarsky (Cornell University, USA) accompanied by Steven, Bryan and Alison Horn

Exploratory visit - reptiles

Dr Wade Sherbrooke (Southwestern Research Station, USA)

Cleanup of research sites

*Alison Green (James Cook University, Townsville) assisted by Li-Shu Chen and Anne Crook

Group visits

Students from Geelong College Preparatory School (Victoria): Rhys Bailey, Seamus Balkin, Andrew Clark, Duncan Coachman, Christopher Eagles, Monty Hamilton, Sarah Holberg, Warwick McCallum, Andrew Newlands, Anna Parker, Amber Richardson, Nicole Ronald, Ben Sullivan and Caine Tsang; led by teachers Stuart McCallum and Lynne Ord.

Students from University of Richmond (Virginia, USA): Lisa Enz, Debbie Erholm, Elisha Freifeld, Ilene Goldenberg, Erica Hove, Melanie Morgan, Karyn O'Hara, Jenny O'Loughlin and Charles Wright; led by Professor John Bishop.

Members of the Cairns and Far North Environment Centre: Barry Bennett, Anne Downey, Jim Downey, Sally Goodman, Gary Hardy, Jean Horton, David Merrall and Margaret Merrall.

Members of The Australian Museum Society (Sydney): Anne Caine, Leona Geeves, Jim Lumber, James Lumber, Theodora McKeown, Bunty Oldmeadow, Beverley Runcie, Don Runcie, Hendra Tatham, Denise Wilton and Noel Wilton; led by Dr Penny Berents and Peter Berents, and accompanied by Natalie Berents.

Students of SCECGS Redlands (Sydney): Katrina Glover, Amelia Goldsmith, Claire Kilham, Kim Knox, Anna Kouvelis, Claudine Martign, Sam Miller, Carolyn Prentice, Ali Prentice, Jane Schipalius, Adrian Sobolta, Leah Thomas, Helen Thorpe and Simon Van Der Voort; led by teachers Rachel Elphick and Mitch Johnson, and assisted by Don Elphick.

Staff and students of Ryde TAFE College (Sydney): Alan Dick, Peter Freeman, Ian Perkins, Christine Powell, Kristin Ryan, Phil Stewart, Graham Trewin, and Mike Williams.

Great Barrier Reef Aquarium Volunteers (Townsville): Elsbeth and Ched Twyman, Judy Dupont, Mick Jackes, Wendy and Chris Palfrey.

Other visitors

- Supporters who visited during the year were: Monica Kramer and Mauro Periccioli; John Gayler and party; Dick Smith and party; Uli Klauss; and Richard and Christine Wise.

- Mr Bruce Ziebell of the Rural Fires Board made a short visit to advise on the level of wildfire hazard at the Station, and to provide some firefighting training to staff.

- Mr Max Clark, a Cairns-based architect, made a site visit in preparation for designing the extensions to Kirby and Suntory houses.

Publications

This list contains 30 publications based on work carried out at the Station (or on RV *Sunbird* while it was owned by the Australian Museum) that have been added to the Station's collection this year. There are now 402 reprints, theses and books in the collection. All visiting scientists are invited to send two copies of papers resulting from work at the Station to be added. The Lizard Island reprint collection is a valuable resource for other researchers and for visiting educational groups. A complete list of contributions is available on request.

Bellwood, D.R., 1988. Ontogenetic changes in the diet of early post-settlement *Scarus* species (Pisces:Scaridae). *Journal of Fish Biology* 33: 213-219.

Choat, J.H. and K.D. Clements, 1993. Daily feeding rates in herbivorous labroid fishes. *Marine Biology* 117: 205-211.

Choat, J.H., P.J. Doherty, B.A. Kerrigan and J.M. Leis, 1993. A comparison of towed nets, purse seine, and light-aggregation devices for sampling larvae and pelagic juveniles of coral reef fishes. *Fishery Bulletin, U.S.* 91:195-209.

Dight, I.J. and W. Gladstone, 1993. Torres Strait Baseline Study: Pilot study final report June 1993. *Great Barrier Reef Marine Park Authority Research Publication* 29.

Done, T., 1992. Constancy and change in some Great Barrier Reef coral communities: 1980-1990. *American Zoologist* 32: 655-662.

Erséus, C., 1993. The marine Tubificidae (Oligochaeta) of Rottnest Island, Western Australia. *In: Proceedings of the Fifth International Marine Biological Workshop: The Marine Flora and Fauna of Rottnest Island, Western Australia*. F.E. Wells, D.I. Walker, H. Kirkman and R. Lethbridge (Eds.). Western Australian Museum, Perth.

Ferreira, B.P., 1993. Validation of the age and growth of large coral reef fishes (Serranidae and Lethrinidae) from the Great Barrier Reef, Australia, using tetracycline labelling. *Proceedings of the Seventh International Coral Reef Symposium* 7.

Gladstone, W. 1994. Lek-like spawning, parental care and mating periodicity of the triggerfish *Pseudobalistes flavimarginatus* (Balistidae). *Environmental Biology of Fishes* 39: 249-257.

Green, A.L., 1993. Damselfish territories: focal sites for studies of the early life history of labroid fishes. *Proceedings of the Seventh International Coral Reef Symposium* 7: 601-605.

Hall, V.R., 1992. Life history strategies of common reef-crest corals at Lizard Island. Honours thesis, James Cook University, Townsville.

Hoegh-Guldberg, O. and G.J. Smith, 1989. Influence of the population density of zooxanthellae and supply of ammonium on the biomass and metabolic characteristics of reef corals *Seriatopora hystrix* and *Stylophora pistillata*. *Marine Ecology Progress Series* 57: 173-186.

Hoegh-Guldberg, O. and G.J. Smith, 1989. The effect of sudden changes in temperature, light and salinity on the population density and export of zooxanthellae from the reef corals *Stylophora pistillata* Esper and *Seriatopora hystrix* Dana. *Journal of Experimental Marine Biology and Ecology* 129: 279-303.

Houbrick, R.S., 1992. Monograph of the genus *Cerithium* Brugiere in the Indo-Pacific (Cerithiidae: Prosobranchia). *Smithsonian Contributions to Zoology* 510: 1-211.

End of another day's field work at Lizard Island. Photo: Lyle Vail

Hutchings, P.A. and L. Bamber, 1985. Variability of bioerosion rates at Lizard Island, Great Barrier Reef: preliminary attempts to explain these rates and their significance. *Proceedings of the 5th International Coral Reef Symposium* 5: 333-338.

Kerrigan, B.A., 1992. Variability in the condition and size at settlement of a coral reef fish. *Proceedings of the Seventh International Coral Reef Symposium* 7.

Kiene, W.E. and P.A. Hutchings, 1994. Bioerosion experiments at Lizard Island, Great Barrier Reef. *Coral Reefs* 13: 91-98.

Leis, J.M., 1993. Larval fish assemblages near Indo-Pacific coral reefs. *Bulletin of Marine Science* 53:362-392.

Leis, J.M., 1994. Coral Sea atoll lagoons: closed nurseries for the larvae of a few coral reef fishes. *Bulletin of Marine Science* 54:206-227.

Maida, M., A.R. Carroll and J.C. Coll, 1993. Variability of terpene content in the soft coral *Sinularia flexibilis* (Coelenterata: Octocorallia), and its ecological implications. *Journal of Chemical Ecology* 19: 2285-2296.

McCormick, M.I., 1992. The influence of pelagic life history on the quality of tropical goatfish (family Mullidae) at settlement. PhD thesis, James Cook University, Townsville.

Mills, R., 1992. Aboriginal occupation of Lizard Island. Master of Letters in Cultural Management thesis, University of Sydney, Sydney.

Musso, B.M., 1992. Rates of skeletal degradation following death in three species of acroporid corals, on the northern Great Barrier Reef. *Proceedings of the Seventh International Coral Reef Symposium* 7.

Nelson, V.M., 1992. Patterns of diversity, cover and spatial arrangement of benthos at Lizard Island, Great Barrier Reef. *Proceedings of the Seventh International Coral Reef Symposium* 7.

Ponder, W.F. and R. de Keyzer, 1992. A Revision of the Genus *Diala* (Gastropoda: Cerithioidea: Dialidae). *Invertebrate Taxonomy* 6: 1019-75.

Purcell, S.W. and D.R. Bellwood, 1993. A functional analysis of food procurement in two surgeonfish species *Acanthothurus nigrofuscus* and *Ctenochaetus striatus* (Acanthuridae). *Environmental Biology of Fishes* 37: 139-159.

Reitner, J., 1993. Modern cryptic Microbialite/Metazoan facies from Lizard Island (Great Barrier Reef, Australia), formation and concepts. *Facies* 29: 3-40.

Smith, L., 1993. Asexual reproduction by fragmentation in corals: an experimental analysis. Honours thesis, James Cook University, Townsville.

Smith, G.C., 1993. Feeding and breeding of crested terns at a tropical locality - comparison with sympatric black-naped terns. *Emu* 93: 65-70.

Smith, G.C., 1994. Seabird islands no. 223: Nymph Island, Great Barrier Reef, Queensland. *Corella* 18: 53-55.

Uthicke, S., 1993. Untersuchungen zur Ökologie zweier sedimentfressender Holothurien, *Holothuria (Halodeima) atra* (Jaeger, 1833) und *Stichopus chloronotus* (Brand, 1835), im Riffbereich um Lizard Island, Australien, Institüt für Hydrobiologie und fischereiwissenschaft, Universität Hamburg.

LIZARD ISLAND RESEARCH STATION

Great Barrier Reef, Australia

DOCTORAL FELLOWSHIP 1995

The Australian Museum, in conjunction with the Lizard Island Research Foundation, is offering a three year Fellowship to a PhD student to support field work on the Great Barrier Reef based at the Lizard Island Research Station. The Fellowship is available to any student enrolled or about to enrol, in a PhD program. The recipient will carry out significant long term field studies in a scientific discipline relevant to the Great Barrier Reef. The inaugural Fellowships were awarded in 1984, and applications are now invited for the 1995 Fellowship.

The Fellowship is intended primarily to pay bench fees at the Lizard Island Research Station for several months field work per year over a period of up to three years. It may also be used to cover some travelling and freight expenses within Australia and to purchase a limited amount of equipment, but it may not be used for living expenses or salary. The total value of the Fellowship is A$14,500 ($4,833 per annum for three years).

The Lizard Island Research Station was established in 1972 by the Australian Museum to support research into all aspects of the biology, geology and hydrology of coral reef ecosystems. Air-conditioned laboratories, boats, diving equipment, running seawater aquaria, and accommodation units are provided at the Station. Lizard Island is situated in an extraordinarily diverse marine ecosystem which is carefully managed as part of the Great Barrier Reef Marine Park. The large size (7 square km) and height (360 m) of Lizard Island with its complex of smaller islands and reefs provides a wide variety of habitats and ensures that field work can proceed in all but the most extreme weather. Lizard Island (14^{o} 40'S, 145^{o} 28'E) is located near the middle of the 50 km wide continental shelf: near-by habitats include turbid coastal reefs, mid-shelf platform reefs, inter-reef soft-bottoms including extensive *Halimeda* beds, sheltered lagoons and high-energy ribbon reefs facing the Coral Sea. Yet, access is easy with many flights into Cairns from international and domestic ports, and daily flights from Cairns to Lizard Island.

CONDITIONS OF AWARD

The applicant must either be in receipt of a scholarship or provide documentation showing how living expenses will be covered during the proposed tenure of the Fellowship. An overseas student may wish to apply for a Fellowship for only one year in order to obtain comparative data with other geographical regions; this would be acceptable provided that the data from Lizard Island contribute significantly to our understanding of the Great Barrier Reef. Fellows are required to report on progress at the end of each year of the grant, and subsequent funding depends upon suitable progress.

INFORMATION

The Co-Directors
Lizard Island Research Station
PMB 37
CAIRNS QLD 4870
AUSTRALIA

Phone and Fax: 070 60 3977

APPLICATIONS

Six copies of the application should be sent to:

Joanne Shewan
Deputy Director's Office
Australian Museum
PO Box A285
SYDNEY SOUTH NSW 2000
AUSTRALIA

Internet: jeffl@amsg.Austmus.oz.au
Phone: 02 339 8224
Fax: 02 332 3656

CLOSING DATE 1 OCTOBER 1994

Please see application format and information on costs on reverse of this page.

APPLICATION FORMAT

1. Research Proposal

- Name of applicant
- Institution and Department
- Name of supervisor(s)
- Project title
- Objectives (100 words)
- Significance (100 words)
- Research Plan (maximum 5 pages)
  - . *Outline experimental design and methodology*
  - . *Show sequence of tasks on a yearly timescale*
  - . *Indicate work already completed*

- Financial details (maximum 2 pages)
  - . *Indicate the number of years for which funding is sought.*
  - . *Provide a detailed budget for each year for the whole project (not just the Lizard Island component), including bench fees, travel and other costs.*
  - . *Indicate which non-fellowship funding is already guaranteed and how remaining funding (including that for living expenses) will be obtained.*
  - . *Justify expenditure in terms of the research.*

2. Curriculum Vitae

- As well as usual personal, educational and professional information, include:
  - . *Summary of academic record and achievements*
  - . *Publications*
  - . *Date of enrolment in PhD program*
  - . *The name of a referee who may be contacted regarding the application*

3. Supporting Letter

A letter approving the project from the head of the university department where the applicant will be enrolled must be included with the application. Overseas students must also include a letter from their supervisor indicating the acceptability of overseas field work, and how closely involved the supervisor will be with the project.

COSTS

To assist in preparing budgets, the following costs involved in field work at the Lizard Island Research Station in 1995 are provided. All amounts are in Australian dollars.

DIVING: The Station's diving regulations require that all scuba dives are done by at least two divers; a boat attendant is also required under some circumstances. All projects requiring diving should allow for at least one dedicated assistant, for whom bench fees must be paid. Contact the Research Station for further details.

BENCH FEES: PhD students are offered a highly subsidised bench fee at the Lizard Island Research Station, which includes self-catering accommodation, laboratory and aquarium facilities, use of a small boat, and scuba tanks and weights for qualified divers. In 1995, the rate will be $29 per day for the student and $25 per day for each assistant. For visits of more than 28 consecutive days, the bench fee is reduced by 10% for the entire visit.

FOOD: Food must be ordered from Cairns for delivery by barge every two weeks or by air. Food costs are not covered by the Fellowship.

FREIGHT: Air freight from Cairns is expensive at about $2.00 per kg. Freight carried by the fortnightly barge is $8.00 per grocery carton-sized container. Freight expenses may be paid from Fellowship funds.

TRAVEL: Return airfare between Cairns and Lizard Island is $288. There is no scheduled surface transport.

Help

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