NEWSLETTER OF THE RESEARCH AND MONITORING SECTION

REEF RESEARCH

Great Barrier Reef Marine Park Authority

VOLUME 6 No. 1 MARCH 1996

Editorial

This edition of Reef Research is another mixed bag of interesting information. James Aston describes the process of data being converted to information and ultimately knowledge; Raine Island, one of the greatest turtle and bird nesting sites in the Marine Park, rates a mention and the Chairman addresses what has been a perennial problem; that of manipulative research and the impacts that it may have. Even I have put finger to keyboard to summarise part of the workshop that was held regarding the condition of the Great Barrier Reef World Heritage Area.

This workshop was a starting point for an extensive review of our state of knowledge as well as the state of the World Heritage Area itself. A major report is planned to be published toward the end of this year that will assist managers and researchers in planning a way forward into the next century. Of considerable importance is the plan to use the report to identify gaps in knowledge and to prioritise the efforts that are going to be required to maintain or, indeed, improve the quality of the World Heritage environment. Issues that I haven't reported on in this article, but which will be a significant part of the final report, include the 'softer' sciences that relate to visitor experiences, wilderness, the many kinds of values that people place on the Area and levels of use. Hopefully these will be summarised in future editions of Reef Research. While the report is intended to give a holistic snapshot of the Area, it will still need to be put into the context of the political and social mores of the time to be of true value.

Steve Raaymakers raises an interesting point in 'Slick Talk' regarding the use of computer simulations and resource inventories as one of the tools that can be used to combat oil spills. He writes that he has 'as yet been unable identify a case where operational use of a computer model in a particular real-life spill has demonstrably resulted in decreased environmental impact from the spill'. Now, I suspect that he may well be correct and I, too, would like to hear from anyone who wishes to take up the challenge and show how modelling has been the effective tool that it is invariably cracked up to be.

Ed.

REEF RESEARCH is published quarterly by the Research and Monitoring Section of the Great Barrier Reef Marine Park Authority (GBRMPA).

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Editor ..... Steve Hillman
Assistant Editor ..... Kim Davis
Design & Art ..... Andreas Wagner
Printed by ..... Imageprint (Tville)
ISSN 1037–0692

Formatted in DTP program QuarkXPress 3.3 on Apple Macintosh. Printed on recycled paper.

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NOTES FROM THE CHAIR -

The great big laboratory (with the blue lid) in the east

There is no more focussed group in the community than scientists seeking to test hypotheses, or find answers to fundamental questions. For the Marine Park Authority obtaining the knowledge base for sound management decision making is a strongly held goal but how that information is obtained can be controversial.

Some of the information we need is descriptive and is based on observational techniques. Water quality data sets are a case in point. However, other information designed to answer 'what if', or 'can we' questions may fall into the category of manipulative research. The scientist might say that the only way to answer the questions is to manipulate some aspect of the natural system and measure it against controls.

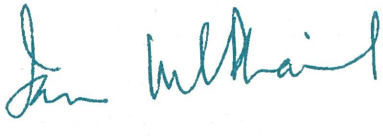
Volumes exist on the philosophy and ethics of research, and it would be unwise of me to enter into the debate. However, two observations occur to me. First, there are 'good' things and 'bad' things that affect the broader community perception of the tolerability of manipulative research. Crown-of-thorns starfish can be manipulated for ever. The public sees them as 'bad', therefore any indignities visited on them by researchers are entirely justifiable. Other aspects of the natural system are 'good', thus any manipulative work is seen as unconscionable and intolerable. Yet I suspect the ethical issue is the same.

Second, it is a serious requirement to test the need for any manipulative research carefully. The paradox in destroying or modifying some element of the natural system in order to gain knowledge for positive management is a difficult one to explain sometimes. It is also important, that where such research is permitted, it is cast in the framework of a greater good. (I know this drags us into a debate over pure science or curiosity-led research actually being the source of the basic knowledge and discoveries in so many cases in the history of science). For us though, both the Australian Institute of Marine Science and the CRC Reef Research Centre are established to undertake strategic science. In the case of the latter, specifically directed towards providing the knowledge base for management.

Nevertheless what can be said quite definitely is that the CRC Reef Research Centre and the Great Barrier Reef Marine Park Authority question closely all proposals for manipulation. By the time the Effects of Line Fishing experiment commences, it will probably be the most widely consulted experimental design in the history of science. Trivial applications, or proposals that are based on curiosity alone are readily discarded by the management and the Directors of the CRC Board. However, it needs to be clearly understood that the Great Barrier Reef Marine Park Authority sees the conservation of the natural system as its primary goal, therefore any activity that places a part of that system at risk must be scrutinised closely. Ironically this could well lead to charges that we stand in the way of knowledge, and exhibit anti-scientific tendencies, for which re-education, particularly of the Chair, is urgently needed. In spite of this, results that can reasonably be obtained by inference from other knowledge or have other non-manipulative experimental designs alternatively available, are to be preferred.

Decisions need to tread a fine line, and are largely a matter for judgement. Sometimes a manipulative experiment to discover 'something' has far less impact than allowing a particular use of the environment to continue in ignorance of its long-term impacts.

The stark reality is that society does not see the scientist as omnipotent, nor that his or her research is automatically justified simply because someone claims a need to have it done. From my point of view, because conservatio the prime task of the authority, we only agree to destroy or alter natural phenomena, in order to gain knowledge unobtainable in any other way.



UPDATE - *Chris Crossland*

CENTRE ACTIVITIES

The new year began with crown-of-thorns starfish, and the announcement of a new outbreak (see Udo Engelhardt's COTS COMMS). Following a resolution from last November's Crown-of-Thorns Starfish Research Committee (COTSREC) meeting in early February, CRC Reef Research Centre and the Great Barrier Reef Marine Park Authority invited media representatives to Arlington Reef, off Cairns, to rendezvous with Udo and his volunteer team of divers. The scene resembled the type of doorstop press conference that used to take place on the steps of old Parliament House, but this time on the Great Barrier Reef. Congratulations are due to Udo, who handled every television, radio and press question with expertise and aplomb, and thanks from this Centre to Great Adventures who made *Reef Prince* available for a media briefing, and *Ocean Spirit II* who transported the contingent to Arlington and back.

In December the Extension team, together with the CRC for Freshwater Ecology and Management, organised the first ever meeting of those people responsible for communications in 13 separate Cooperative Research Centres whose chief concern is with the environment. Communication is a fundamental element of CRCs, especially those deliberately established for the public good.

Key resolutions will be put to the CRC directors' meeting in Sydney in April. These are:

- that more effort should be coming from Canberra to explain to the general public and the national media the concept and purpose of the CRC National Program, and
- that a baseline communication audit be undertaken with all CRCs to determine levels of awareness, effectiveness of information transfer and degree of stakeholder understanding about the national program.

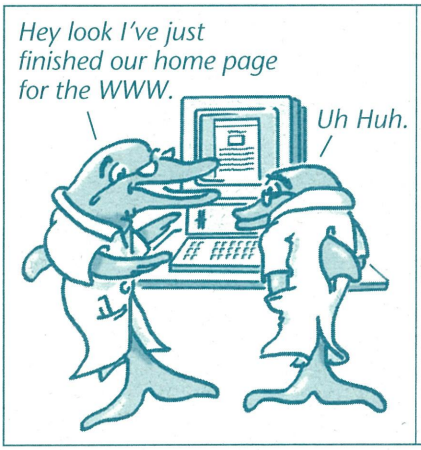
All researchers and others involved in this Centre can contribute to communicating our identity by introducing yourselves, whether by letter, phone or in person, as coming from the 'CRC Reef Research Centre', not simply as from 'the CRC'. 'CRC Reef' is also fine - anything to distinguish ourselves from the four others operating in our region (Aquaculture, Sugar, Tropical Rainforests and Savannas) and the 66 other Centres established nationally.

RESEARCH ACTIVITIES

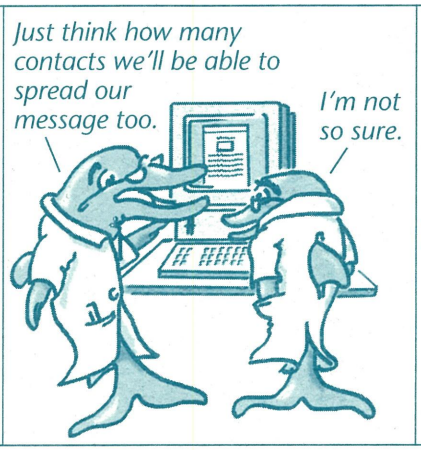
Tourists - Market Segmentation

A strong cooperative link has developed between the Department of Tourism at James Cook University and the Queensland Tourism and Travel Corporation (QTTC). Data from the 1993-94 Queensland Visitor Survey by the QTTC have been given to a research team from the James Cook University Tourism Department and Purdue University, USA. Cluster analysis has been conducted on the data to identify groups of visitors to Queensland and the Great Barrier Reef region.

Coralations



Nets Working



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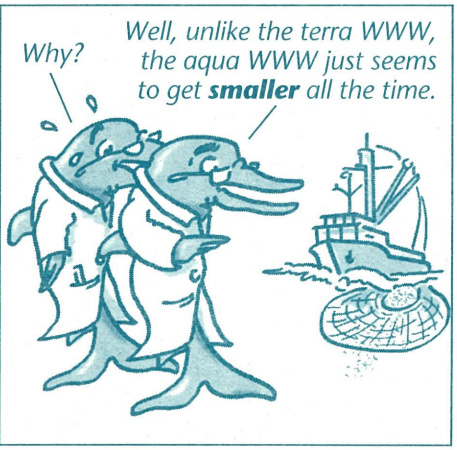

The first cut of the data has identified six distinct groups (clusters) with homogenous characteristics, all of them significantly different from the rest. The segments have been named as:

- active beach resort users
- low involvement group
- relaxation oriented beach group
- barrier reef/rainforest group
- touring and sightseeing group
- active nature lovers.

In the Cairns/Far North region, the visitors are action people, with 32% of visitors visiting the Great Barrier Reef. They also visit the rainforest in equal numbers and join tour and sightseeing trips.

Townsville has a moderately even spread of visitors, with the two largest groups coming from the low involvement group and touring and sightseeing segments. Warm, sunny weather and the quiet relaxing nature of the region are important attractions to visitors.

In the Mackay/Whitsunday region the relaxation oriented beach group and the low involvement group comprise nearly 50% of the tourist market, while in the Fitzroy region the low involvement group and the touring and sightseeing group comprise 60% of the tourist market.

The data analysis is of direct use to the tourism industry in identifying the attributes which attract visitors to each region. It means that there is potential for encouraging greater numbers of the less well-represented segments by developing and promoting the range of activities which interest them. All tourism regions of Queensland have been analysed and the results will be published as a Data Publication through the QTTC. The tourism team will receive the 1994-95 data from the QTTC shortly and, when they have two sets of data, will begin to conduct regionally specific and much more detailed analyses, beginning with the far north Queensland region.

The Core of the Matter

Janice Lough and Dave Barnes at the Australian Institute of Marine Science (AIMS) have contributed their knowledge of coral growth over centuries to the State of the Great Barrier Reef World Heritage Area Report being coordinated by the Great Barrier Reef Marine Park Authority. The ability to measure centuries-long records of annual growth contained in massive coral skeletons provides a means to objectively identify background variability in coral growth, and assess recent growth trends against a historical perspective.

Annual growth rate, annual average density and annual calcification were measured in cores removed from 35 very large colonies of the reef-building coral, *Porites*. The longest record dates from AD 1479 with the 10 largest colonies providing data covering the years 1746 to 1982. Average calcification for these colonies is significantly related to sea surface temperature variations on the Great Barrier Reef during the 20th century. The long coral record dramatically lengthens our perspective on long-term variability. Features of the 237-year record of these 10 colonies, which cover the length of the Great Barrier Reef, include high sea surface temperatures/coral calcification in the late 18th century and low sea surface temperatures/coral calcification in the early 19th century. This low growth period is not matched in any of the subsequent record.

There is no indication of recent, unusual declines in annual calcification that might be attributed to human activities. In fact, Lough and Barnes' report that the 20th century witnessed the second highest 50-year period (1927-1976) and the third highest ten-year period (1964-1973) of calcification across the full record. A decline in average calcification since this peak may simply represent a return to long-term average conditions. Calcification and possibly reef performance appear to be highly variable at time scales much longer than decades.

Postscript

Finally, it's good to know that we are being watched. *New Scientist* is anxiously awaiting our report into the spawning activity of coral trout, but I'm sorry to say they've gone quite frigid on us - little bits are frozen solid in the freezer. Full and frank information will be forthcoming however. Keep watching this space.

CRC Reef Research Centre

An unincorporated joint venture between:

Association of Marine Park Tourism Operators
Australian Institute of Marine Science
Great Barrier Reef Marine Park Authority
James Cook University
Department of Primary Industries

established under the

Cooperative Research Centres Program

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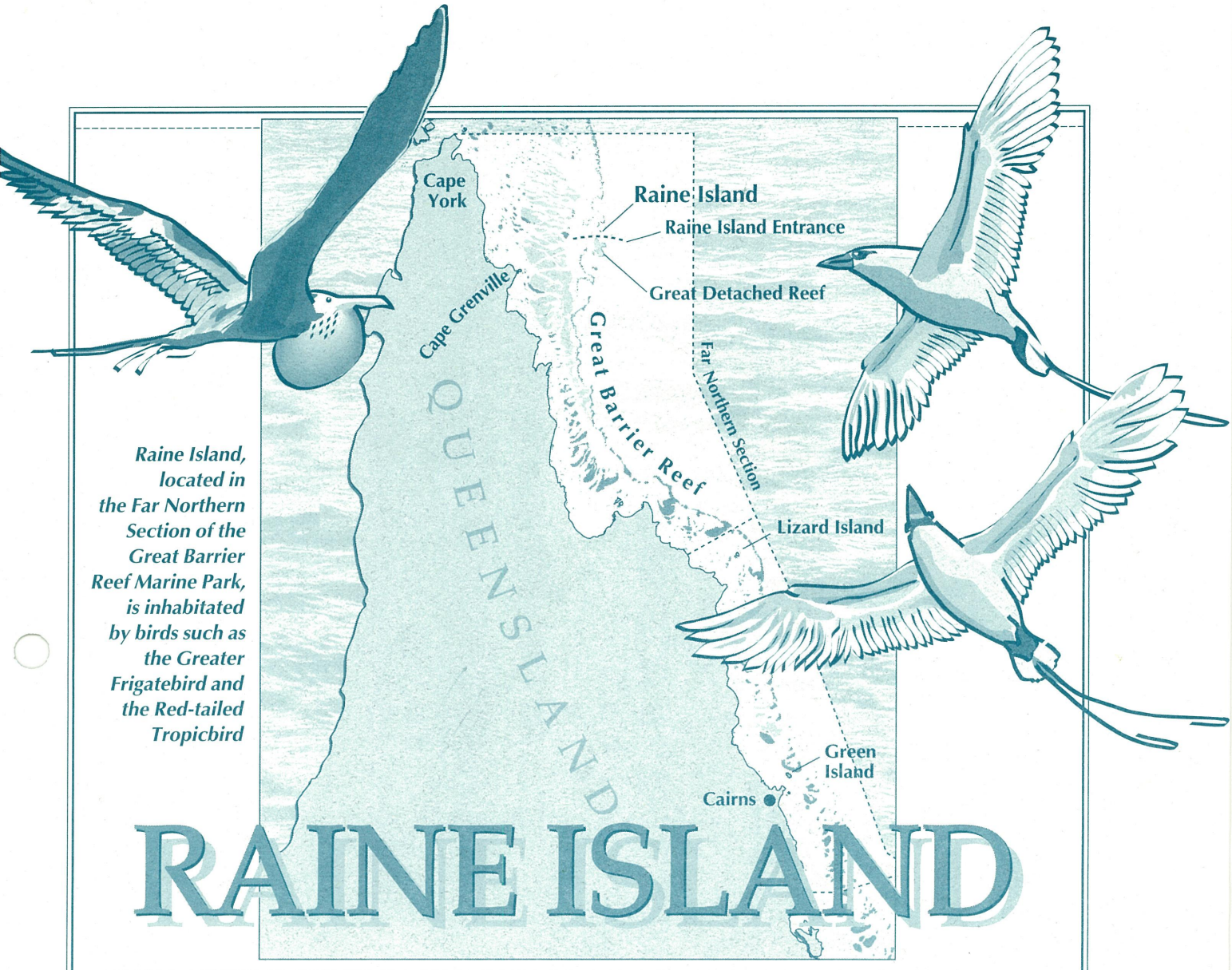


Raine Island, located in the Far Northern Section of the Great Barrier Reef Marine Park, is inhabitated by birds such as the Greater Frigatebird and the Red-tailed Tropicbird

Gabi Caswell
Raine Island Corporation

INTRODUCTION

Raine Island lies approximately 120 kilometres east-north-east of Cape Grenville, Cape York, at the outer edge of the Great Barrier Reef. It is just off the eastern edge of the continental shelf, next to a shipping channel known as the Raine Island Entrance.

Raine Island Corporation is a self-funding non-profit organisation established under the auspices of the *Meaker Trust (Raine Island Research) Act 1981*, to promote research into, and the preservation and protection of, the nature and the environment of Raine Island (11°36'S, 144°01'E), Moulter (11°26'S, 144°00'E) and Maclennan (11°22'S, 143°48'E) cays and the surrounding seas.

Raine Island is within the northern Great Barrier Reef World Heritage Area. A stone beacon was constructed in 1844 by convict labour using the island's phosphate rock and timbers from the *Martha Ridgeway*. The beacon is considered one of the most important historical monuments in the Great Barrier Reef Marine Park and is listed on the State Heritage Register and the Commonwealth Register of the National Estate.

ENVIRONMENT DESCRIPTION

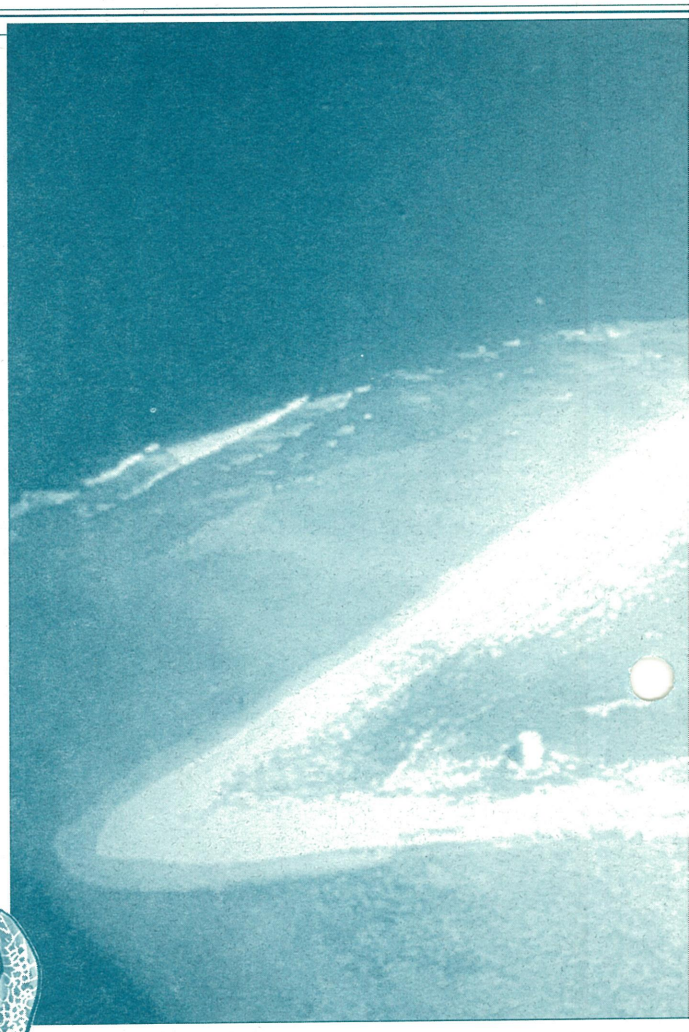
Raine Island, as a detached section of the edge of Queensland's continental shelf and in the middle of a major reef passage, is unusual along the Great Barrier Reef. Its associated reef supports rich and

diverse coral communities which show a greater affinity to those of the Coral Sea reefs than to those of the Great Barrier Reef (Lassig et al. 1993).

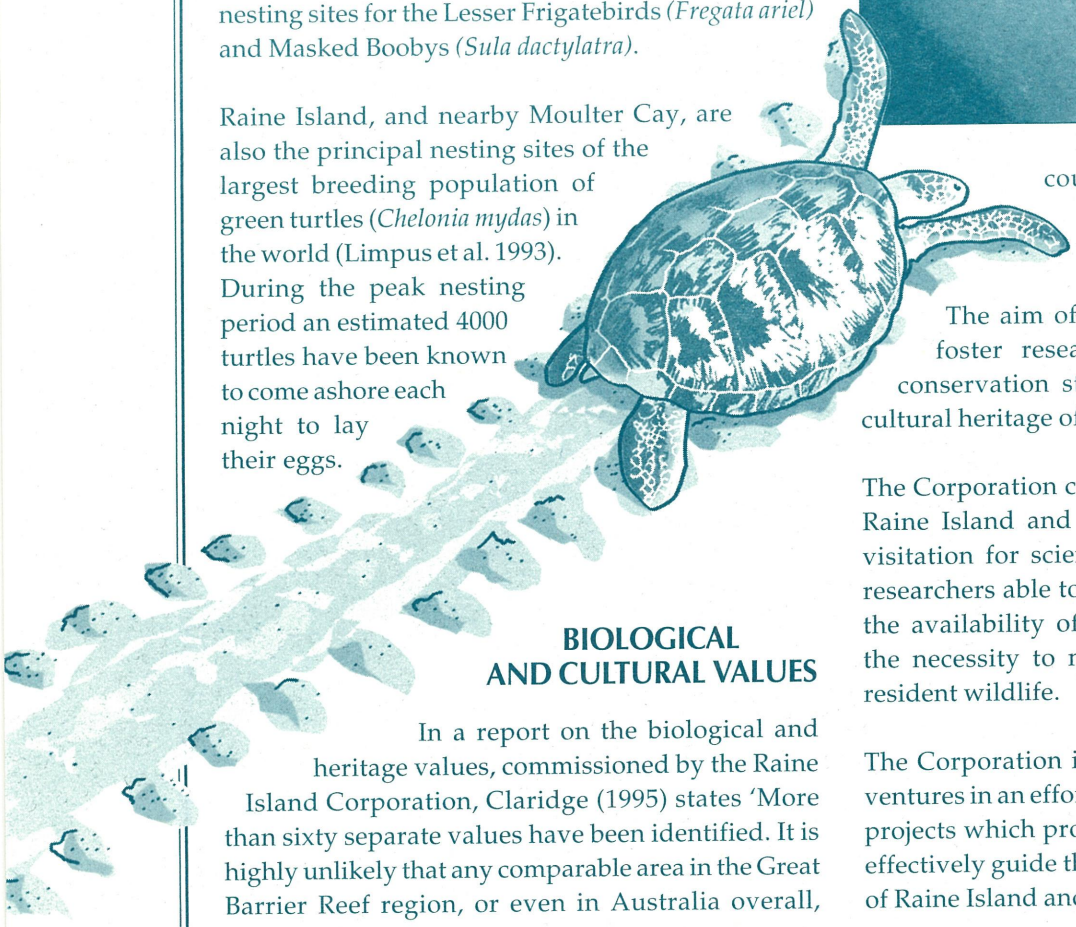
Raine Island is a vegetated coral cay dominated by low herbaceous annual vegetation (Batianoff et al. 1993). The cay is comprised of a central core of phosphate rock surrounded by sand and extensive fringing reefs.

The island holds special significance as a seabird breeding and roosting site. It is considered as the most significant tropical seabird breeding site in the Great Barrier Reef (Taplin and Blaber 1993).

The central core of phosphate rock forms a small cliff above the beaches of the cay, producing rock ledges used by Red-tailed Tropicbirds *(Phaethon rubricauda)* as nest sites. Behind the cliff is a vegetated ridge frequented by nesting Brown *(Sula leucogaster)* and Red-footed *(Sula sula)* Boobys. The island was extensively mined for guano in the 1880s, leaving a shallow depression in the centre of the cay, providing nesting sites for the Lesser Frigatebirds *(Fregata ariel)* and Masked Boobys *(Sula dactylatra)*.



Raine Island, and nearby Moulter Cay, are also the principal nesting sites of the largest breeding population of green turtles (*Chelonia mydas*) in the world (Limpus et al. 1993). During the peak nesting period an estimated 4000 turtles have been known to come ashore each night to lay their eggs.



BIOLOGICAL AND CULTURAL VALUES

In a report on the biological and heritage values, commissioned by the Raine Island Corporation, Claridge (1995) states 'More than sixty separate values have been identified. It is highly unlikely that any comparable area in the Great Barrier Reef region, or even in Australia overall, could match the number and breadth of values associated with Raine Island and its environs.'

The aim of Raine Island Corporation is to foster research and develop appropriate conservation strategies for the biological and cultural heritage of Raine Island and its environs.

The Corporation currently funds one trip a year to Raine Island and is looking at ways to increase visitation for scientific purposes. The number of researchers able to join each trip is limited both by the availability of funds for project support and the necessity to minimise human impact on the resident wildlife.

The Corporation is exploring various cooperative ventures in an effort to increase the range of research projects which provide data for the Corporation to effectively guide the management and conservation of Raine Island and its environs.

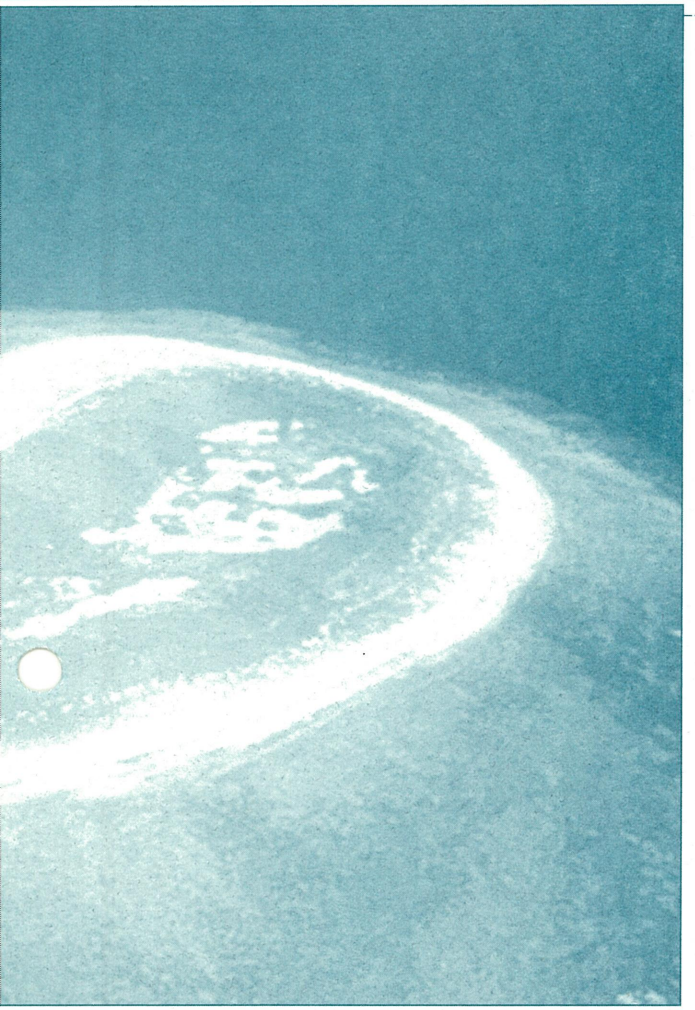


Photo by J. O'Dyer

PLEASE NOTE

To preserve the biological and cultural value of Raine Island, and to minimise the disturbance to the resident population of turtles and seabirds, tourism is not permitted on the Island. Raine Island Corporation administers applications for visitation and permits must be gained before visiting Raine Island, Moulter or Maclennan Cays.

References

Batianoff, G. N., Hacker, J. B., Miller J. D. & Price, I. R. 1993, 'Vegetation on Raine Island', in *Raine Island and Environs, Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature,* eds K. H. Zevering & C. E. Zevering, Brisbane, Raine Island Corporation, pp. 33-38.

Claridge, G. 1995, A risk assessment for Raine Island and environs in relation to values of the natural and cultural environments, Report for Raine Island Corporation, Brisbane.

Lassig, B., Ayling, A., Birtles, A., Done, T., Drew, E., Kelly, G. & Wilkinson, C. 1993, 'The benthic communities of Raine Island', in *Raine Island and Environs, Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature,* eds K. H. Zevering & C. E. Zevering, Brisbane, Raine Island Corporation, pp. 21-32.

Limpus, C., Miller, J. D. & Parmenter, C. J. 1993, 'The Northern Great Barrier Reef green turtle, *Chelonia mydas,* breeding population, in *Raine Island and Environs, Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature,* eds K. H. Zevering & C. E. Zevering, Brisbane, Raine Island Corporation, pp. 47-50.

Taplin, A. & Blaber, S. J. M. 1993, 'Seabird breeding population studies at Raine Island', in Raine Island and Environs, Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature, eds K. H. Zevering & C. E. Zevering, Brisbane, Raine Island Corporation, pp. 51-56.

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YOUR 'TWO BOBS WORTH'

ITS JOURNEY THROUGH A BUREAUCRACY

James Aston

Have you ever wondered where your input ends up in a Government Agency? Contrary to popular belief, it doesn't necessarily fall into a black hole. There is a light at the end of the tunnel! In this article, the Great Barrier Reef Marine Park Authority (the Authority) is used as a case study to illuminate how information progresses from one point to the next and ultimately contributes to the decision-making process within a small government agency.

Professor Graeme Kelleher, past Chairman of the Authority, once said that competent management of the Great Barrier Reef relies on sufficient information for sensible decisions to be made regarding its appropriate uses and restrictions that may need to be placed on those uses (Kelleher 1981). Decision making in this context requires a flow of 'information' where raw data is processed to become information, then knowledge and ultimately wisdom (see figure 1).

The demands for information are different across the different sections of the Authority. For example, the assessment of impacts from major commercial developments requires sufficient detail about the design, construction and operation of a proposed development in order to initiate monitoring programs and other actions that the operator will need to take to identify and minimise any unacceptable impacts to the coral reef environment. Information for environmental impact assessment of a particular project tends to focus on a particular site within a short, defined time period.

Similarly, the initial phase of the management planning process requires the identification of issues of concern (usually over a large area and long time-frame), and the gathering of the best available information on the area's resources, and use of those resources, so that sustainable use practises can be established. It involves as much participation and consultation with all visitor and interest groups, as is necessary and practical, to bring their knowledge and cooperation into the process (GBRMPA 1993). The aim is to reduce the degree of uncertainty in decision making as much as possible within the available resources. In the past, the planner has only had time to prepare simple descriptions of the physical, biological and socio-economic characteristics of an area. These descriptions can be expanded upon so that an area is described not just on a site by site basis but in terms of the significance to world heritage area 'values'.

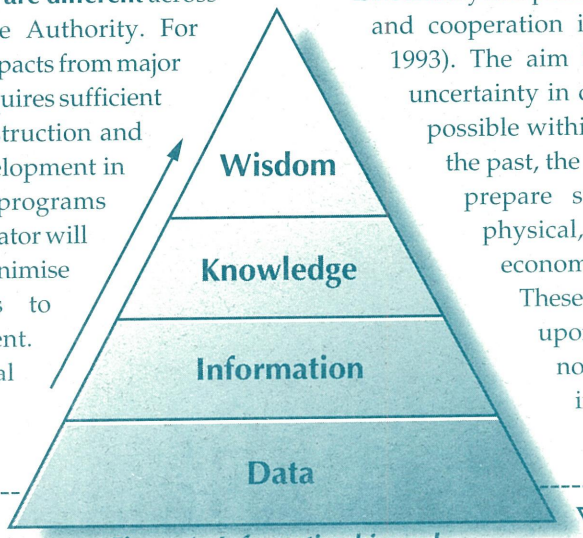


Figure 1. Information hierarchy

Within each of the sections of the Authority, staff deal with information at different levels and in a variety of formats in order to advance that information within the organisation. For example, an assistant project officer will generally be responsible for pre-processing raw data. This step may involve entering raw data on a database. A common step is to have the data organised by a computer specialist. The computer specialist may also develop a user friendly interface for the dataset. In the Authority the corporate database management system is Oracle, a relational database management system. Oracle Forms is often used as an interface to the data although software programs such as Microsoft Access and Q&E are also increasingly being used.

The pre-processed data is then given to project officers to ensure that it is compact and manageable. The information may be weighted, optimised and summarised to increase its relevance and usefulness to those senior officers who are responsible for preparing policy. Currently, this process is largely subjective but this may change with the expansion of datasets and further development of decision support systems.

If there is a requirement to involve the public in any aspect of a Marine Park management program, the information gathered to date is attractively packaged so it can be quickly absorbed at a glance and easily understood. This is usually the job of graphic designers, publications officers and cartographers, although image processing software has made this task within the reach of any computer-literate person. Advice and input from individuals and groups outside the agency is used within a legislative framework to further develop policies and management practices for the Marine Park.

Often there is a need to instigate new research to help answer particular questions. Research and monitoring staff work with other scientists from private consultancies, universities or other agencies to obtain and interpret information relevant to the understanding of the Great Barrier Reef and implementation of Authority programs, not just 'for the sake of science'. However, there is concern among many scientists that the theoretical foundation and role of pure research is compromised with this approach, since many of humanity's greatest discoveries have occurred by chance rather than by design.

Most research contracts and grants with the Authority stipulate that the relevance of the research project be explained in terms of implications for the planning and management of the Great Barrier Reef. This attempts to capitalise on the researcher's knowledge of the subject as well as bridge the gap between a raw result and what might be useful to management. The decision to fund a research project depends, among other things, on its relevance to current management issues, the power of the design, and the ability of the researcher to successfully carry out the research.

The information needs of the Authority are also stipulated in the Corporate Plan, which outlines the one- and five-year goals and targets for each program area. To date, most research projects have been instigated by staff of the Authority and the emphasis has been on the collection of ecological information as well as on threatening processes and events. Due to resource constraints and methodological limitations, the research tends to be species specific and limited in scale. The enormous degree of spatial and temporal variation within the Great Barrier Reef system generally prevents extrapolation of the findings to other areas, except as anecdotal argument. For this reason, the focus for research is now on acquiring larger scale and longer term datasets.

Sometimes, for any number of reasons, data never makes it to the decision-making stage. For example, the data may have already served its purpose as 'background information' for a larger project. In other cases, differences in the functions of each of the sections of the agency may have resulted in research products being developed which are suitable for making resource management decisions but which are unsuitable for developing management plans. For example, an inventory of coral species on a particular zone of a reef over time will be an integral part of a monitoring program for a commercial operation but of limited use in a planning exercise for a whole reef. On the other hand, the cultural differences between scientists and reef managers may result in new and innovative solutions to old problems.

Outside the Authority, differences in visions and work practices both at an inter-agency, corporate and at an individual level have led to similar problems. Public and non-government groups may also have different objectives, different modes of organisation and operation, different perceptions of reality and different degrees and kinds of power to shape events (Kelleher 1983). Recently, however, many of these differences have been overcome through the development of the

25 Year Strategic Plan for the Great Barrier Reef World Heritage Area and through the formation of the CRC Reef Research Centre.

In the past, the integration of knowledge of the interactions between the users of the reef and the reef as a biological system has been done subjectively in the minds of the policy and decision makers. However, as decision makers increasingly need to deal with greater volumes of information coupled with the drive for greater accountability in the public service, the Authority has developed a Geographic Information System (GIS) with the aim of integrating and manipulating diverse datasets, thus providing quick responses to strategic questions about the resource and use of the resource. The GIS has enabled geo-referenced data to be extrapolated, interpolated, and modelled against other data from elsewhere and the results made available in easily understood forms such as maps, graphs and tables.

While the GIS has offered an integrated perspective, there are some serious hurdles to be overcome before its full potential is realised. Most notable of these is the need for the policy and decision makers to work more closely together with GIS specialists to specify outputs and outcomes, not just in the early stages of project formulation but throughout the life of the project. In some cases this may involve considerable trialing of datasets and database management systems. A logically structured database accompanied by full descriptions of the datasets will help specify the degree of confidence that can be placed on decisions.

As in most other organisations, there is still much that can be done to improve the management of information in the Authority. We need to continue to develop the technology to help us manage information better concurrently with data quality auditing processes. We also need to develop the various levels of expertise to drive the technology not just by one specialist group within the organisation, but right through the organisation. Time needs to be set aside to allow experimentation with the technology and the datasets and to explore the possibilities generated by further manipulation of the data.

Managing information better will mean continually prioritising and updating our information. This process can be achieved by developing and maintaining alliances with all of our 'clients' and implementing processes which facilitate an understanding of client needs. A greater degree of equity would be introduced into government decision-making processes if key non-government organisations, especially Aboriginal and Torres Strait Islander communities, were plugged into the Commonwealth government information management network (Auble 1994 and Rakai 1994).

The assessment of information needs is a two-way process and no one party should assume that they understand what the other's needs and wants are. It relies on all players in the process having an understanding of the priorities for the use of information, while realising that information may serve more than one objective. One of the challenges for staff of the Authority is to build on strategic datasets and develop the skills for routine use of those datasets in policy and decision making. This involves providing feedback on the quality of information at each of the levels of the information hierarchy as well as challenging the specifications and utility of the information that is available. It is essential to have the structure, networks and mechanisms in place to enhance this process and ensure information ends up in the right hands. These mechanisms will continue to affect and be affected by the political and organisational climate and culture.

References

Auble, J. A. 1994, Leveling the GIS Playing Field: Plugging in Non-Government Organisations and Local Governments, *AURISA* '94, Sydney, 21-25 November 1994, pp. 223-230.

Great Barrier Reef Marine Park Authority 1993, Guidelines for the preparation of management plans - discussion paper, Unpublished, ed. J. Aston, 27 pp.

Kelleher, G. G. 1981, 'Research needs for coral reef management planning' in *Proc. 4th Int. Coral Reef Symposium,* Manila, vol. 1, pp. 231-236.

Kelleher, G. G. 1983, Informational needs for managing the Great Barrier Reef Marine Park, Unpublished staff paper, pp. 1-18.

Rakai, M. 1994, Land information and traditional societies, *GIS User,* No. 8, pp. 51-54.

When 'Slick Talk' first appeared as a news column in *Reef Research* June 1992, the intention was that the column would provide regular updates on developments specifically in the scientific research and environmental impact areas of marine oil pollution.

Australia generally has a very low level of activity of scientific research relating to marine oil pollution, and many of the appearances of Slick Talk have covered broader topics such as oil spill incidents, contingency planning, and legislation and enforcement.

In this issue we return to a scientific focus with an update on oil pollution work being carried out at the Australian Institute of Marine Science (AIMS).

AIMS leads with OILMAP

Computer-based oil spill trajectory models to predict the likely path and fate of an oil slick, linked with computerised coastal resource atlases to provide an assessment of areas likely to be impacted, protection priorities and response options, have been under development for over two decades. The use of such models is only recently moving away from the research and development phase to become a fully functional, operational component of the spill response tool box.

Oil spill response arrangements in Australia provide for a national oil spill model operated by the Australian Maritime Safety Authority (AMSA) in Canberra, and State-based coastal resource atlases, some of which also have trajectory modelling capabilities, operated by environmental or marine pollution agencies in each State.

In addition, the oil industry, especially the offshore exploration and production industry, has been very active in developing and implementing computerised models and atlases for their areas of operation, as a supplement to the Federal and State Governments' efforts.

AIMS has been involved in all of these areas. In early 1993 AIMS began marketing OILMAP in Australia. Developed in the United States, OILMAP is a user-friendly DOS based system which combines trajectory and fate modelling with a Geographic Information System (see Slick Talk # 5, *Reef Research*, June 1993).

Dr Brian King, an oceanographer with AIMS, has been working on improving the modelling capability of OILMAP since 1993. King has linked with the Australian Bureau of Meteorology (BoM) and Graeme Hubert of

Global Environmental Modelling Services (GEMS), to integrate the basic OILMAP package with a number of more sophisticated atmospheric and oceanographic prediction systems.

Driven by OILMAP as the front-end, the integrated system uses a Bureau of Meteorology model to provide wind predictions for up to four days in advance, and a GEMS three-dimensional hydrodynamic model, linked with tidal data, to provide accurate surface current predictions.

The move to a three dimensional hydrodynamic model has significantly improved the accuracy of trajectory predictions. Because oil slicks are generally water surface phenomena (unless extremely rough seas push the oil down as in the 'Braer' spill off the Shetland Islands in 1993, or the oil weathers, mixes with sediment and debris and sinks), oil spill models have traditionally been two-dimensional and depth averaged only. This ignores the fact that water movements through depth and in the vertical plane can significantly affect surface flow and therefore the movement of an oil slick.

The AIMS OILMAP/BoM/GEMS system was field validated by hindcasting the 'Iron Baron' spill in Tasmania last year, and the results have led King to claim that it is 'the most accurate oil spill prediction system available in the world'. King is looking to publish his validation results later in 1996.

AMSA has recently reviewed its national oil spill modelling capability, with a view to upgrading or replacing the now somewhat dated OSSM system which has served the National oil spill plan for many years. AMSA is also looking at integrating oil spill trajectory and search and rescue drift modelling capabilities.

The AIMS OILMAP/BoM/GEMS system, with input from CSIRO and the National Tidal Facility, has been selected by AMSA as the winning contender. It is encouraging to see what is essentially an Australian development, devised by scientists from some of Australia's leading oceanographic institutions, become the Australian national oil spill prediction system.

On the industry front, King has successfully marketed OILMAP to West Australian Petroleum (WAPET), Apache Energy Corp, BHP Transport, BHP Petroleum, Esso Australia, MAXUS Energy and BHP Vietnam, with systems now up and running for the exploration, production and/or terminal operations conducted by these companies.

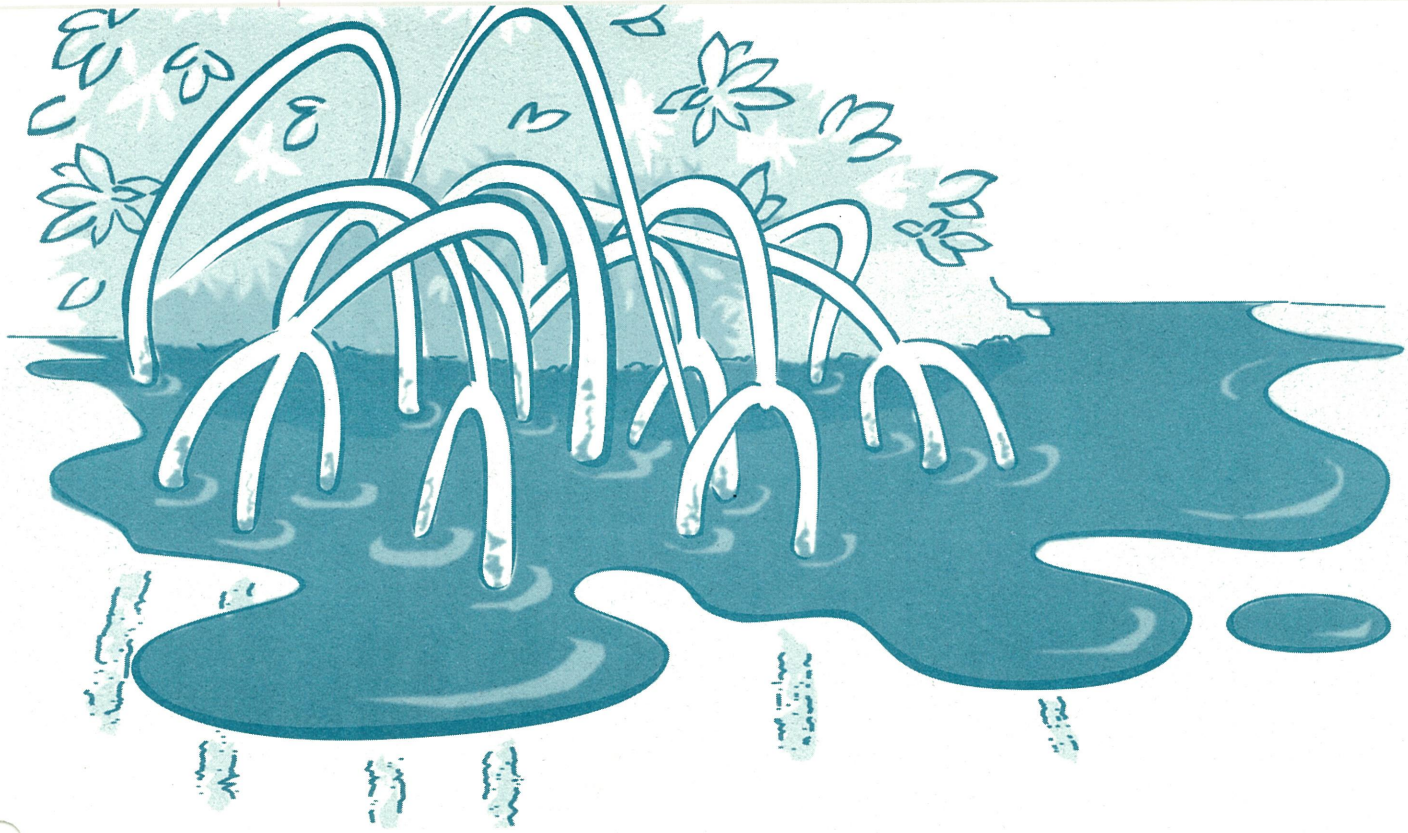
Such advances in spill prediction capabilities can only be welcomed by spill response authorities. However, despite an ongoing review of literature, I have as yet been unable to identify a case where operational use of a computer model in a particular real-life spill situation has demonstrably resulted in decreased environmental impact from the spill. The over-riding objective of preventing or minimising environmental damage in oil spill response must be borne in mind when considering sophisticated and expensive oil spill response tools such as computer models. I wish to extend an invitation to readers to send any published papers which unequivocally show that use of a model in a particular incident has actually protected the environment to a larger degree than if the model was not used at all.

AIMS probes impacts of oil on mangroves

The Australian Institute of Marine Science, under the auspices of the CRC Reef Research Centre, has been successful in securing funding from the Australian Petroleum Production and Exploration Association (APPEA) and the Energy Research and Development Corporation (ERDC), to undertake a three-year research program into the effects of oil, dispersants and oil/dispersant mixtures on Australian mangroves.

The AIMS research team is led by Dr Norman Duke and includes Dr Kathy Burns. Both scientists have researched the effects of oil spills on mangroves in Panama. Duke says that the AIMS program will be very much management oriented, seeking to provide clear, practical recommendations to oil spill response authorities on the protection, clean-up and restoration of mangroves.

For example, experience gained by Duke in Panama indicates that the highest priority should be given to protecting, or if impacted by oil, cleaning and restoring, the outer fringe of mangroves specifically. If the outer fringe can be retained, inshore mangroves have a greater



chance of re-establishing naturally as they will be protected from physical disturbance. Caution must of course be exercised in transposing the findings of overseas research to the Australian situation, and one of the objectives of the AIMS research is to provide data which is directly relevant to Australia.

The AIMS research consists of a number of components to be conducted over three years. Initial short-term studies will look at the effects of oil, dispersants and oil/dispersants mixtures on mangrove seedlings in a controlled laboratory/nursery situation. Testing the effects of oil/dispersant mixtures is important as mangroves are more likely to be exposed to these rather than to straight dispersant in a real-life response scenario. Oil and dispersant types used will be those most likely to be spilt/used in tropical Australia.

Concurrent studies will be conducted in the field. A suitable field site has yet to be identified. Duke says that they are trying to find mangrove areas which are already earmarked for removal, for example as part of port development plans, so as to minimise the impacts of the research. Anybody who is aware of potentially suitable research sites should contact him (see below). AIMS will of course obtain all necessary environmental approvals before proceeding with any field studies.

Another component of the research plan is re-visiting old spill sites around Australia to investigate long-term effects. Factors such as mangrove regeneration and hydrocarbon levels in mangrove sediments will be measured, using standardised assessment protocols, to enable the modelling of impacts and recovery over time.

The whole program will be wrapped up with a synthesis of results and presentation of recommendations to authorities for incorporation into national oil spill response arrangements.

I have often argued that effective protection of the environment from oil pollution in Australia is limited by a dearth of scientifically derived information that is geographically relevant. This limitation forces scientific and environmental support personnel to provide advice to response managers without the benefit of certainty or at best based on overseas data. This initiative by APPEA and ERDC represents one of a number of recent positive steps being taken by various organisations to fill the data gaps.

What is still needed, however, is a truly national, integrated and coordinated oil spill research and development program with clearly established research objectives, priorities, strategic direction and formalised funding structure, under the auspices of the National Plan to Combat Pollution of the Sea by Oil.

(Steve Raaymakers is currently Environment and Communication Manager with the Ports Corporation of Queensland. The views expressed through his continued authorship of 'Slick Talk' are not necessarily those of the Ports Corporation nor GBRMPA.)

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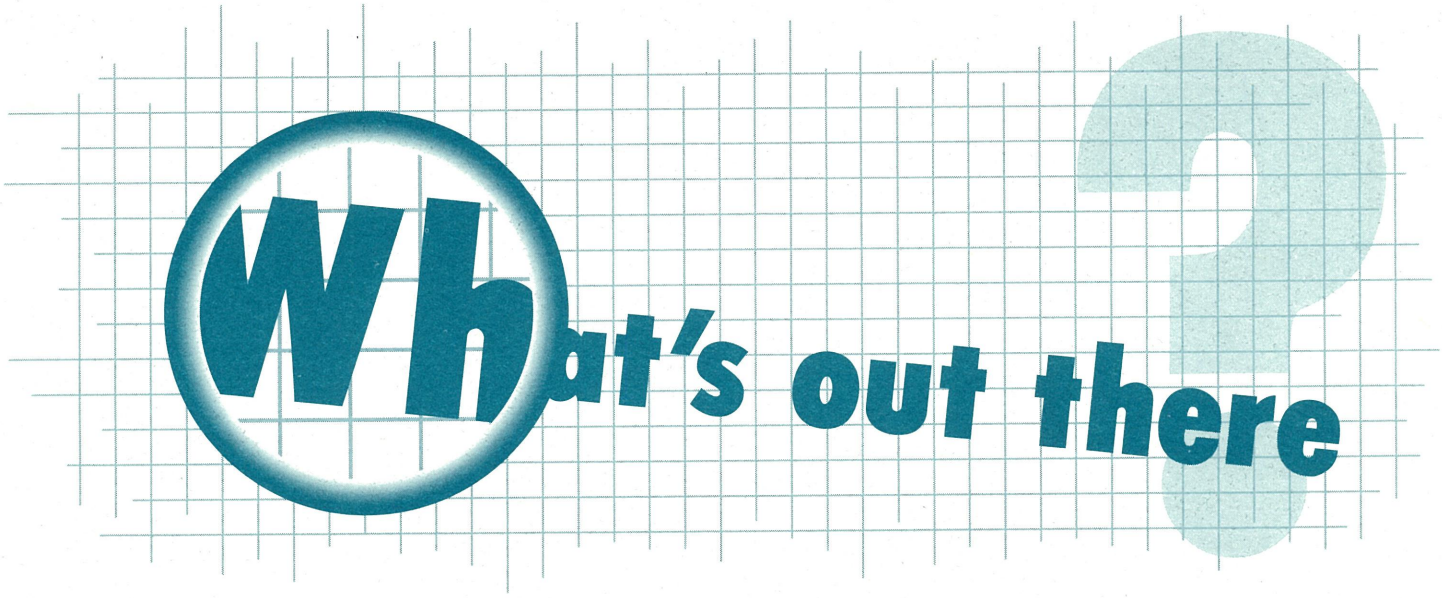
Dr Brian King
Phone (077) 53 4268
Fax (077) 72 5852

For further information on the AIMS Mangroves and Oil Spills Project contact:
Dr Norman Duke
Phone and Fax (077) 21 5640



THE STATE OF THE GREAT BARRIER REEF WORLD HERITAGE AREA REPORT

Steve Hillman

Introduction

In 1994 the Great Barrier Reef Marine Park Authority decided, as part of its research and monitoring program, to prepare a report that would summarise the present knowledge base with regard to the status of the Great Barrier Reef World Heritage Area. It was anticipated that the report would be completed by the end of 1996, the twentieth year of the Authority. I am pleased to report that the production of the report is presently on schedule. While being an initiative of the Authority, the project is supported by the CRC Reef Research Centre, the Queensland Department of Environment and Heritage, the Queensland Fisheries Management Authority and the Australian Institute of Marine Science.

Progress to date

As a first step in the production of the report, experts in a number of fields were asked to prepare reports that would be assembled into a technical document covering many aspects of the Great Barrier Reef World Heritage Area. They were also asked to prepare abstracts and give 15-minute presentations at a workshop that was held in Townsville in November 1995. These abstracts have been published as a stand-alone summary document. It is envisaged that a further output from the project will be a 10-page colour brochure that will consist of graphical and pictorial representations of the status of the Great Barrier Reef as of 1996.

The presentations at the workshop were many and varied. They included papers on:

- long-term monitoring of benthos, fish, climate change, sediments and water quality;
- the present status of seagrasses, mangroves, fringing reefs, algae, fish and reef benthos;
- crown-of-thorns starfish;
- the status of endangered species such as turtle, dugong, crocodiles and some seabirds;
- the status of both commercial and recreational fisheries;
- management arrangements for fisheries;
- the quality of reef tourism and the impacts of these uses of the World Heritage Area;
- reef tourism usage, values and experiences;
- catchment management;
- day-to-day management; and
- legislation and planning.

The state of knowledge that exists for the above categories is extremely variable as would be expected for such a large area only small parts of which have been studied in detail for a relatively short period of time,

Photo by Len Zell

and there was some dissension between workshop participants as to the 'health' of the ecosystems that occur in the Area. Despite this apparent uncertainty, a number of preliminary outcomes from the workshop are presented below.

Workshop outcomes

(Note - this article will only examine ecological aspects of the state of the World Heritage Area although future issues of *Reef Research* will consider other items of interest).

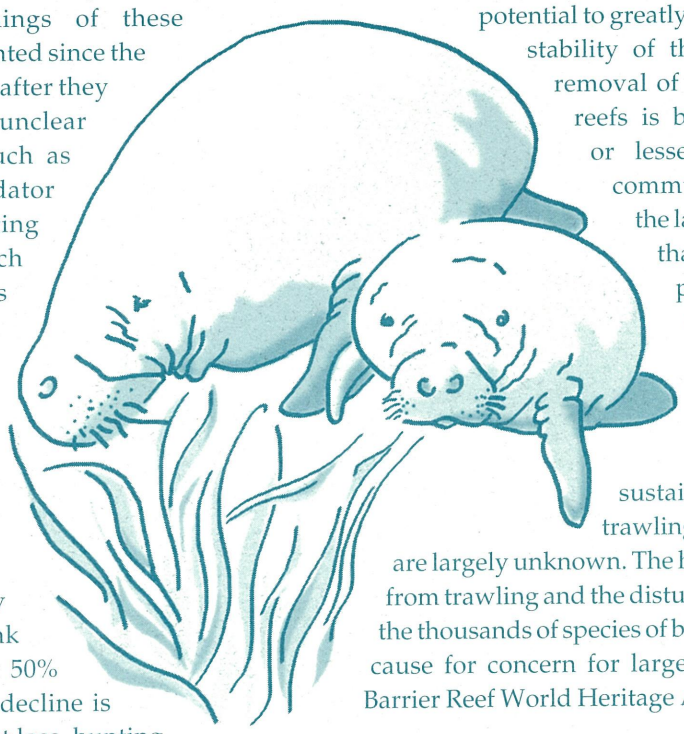
SO WHAT IS THE STATE OF THE GREAT BARRIER REEF WORLD HERITAGE AREA?

From an ecological perspective indications are that it is still in good shape, although a number of individual species are considered at risk. Results presented by Dr Tony Ayling based on visual counts of a number of groups of fish (all *Plectropomus* spp., lethrinids, lutjanids and chaetodontids) indicate that, for the predatory fish, numbers per hectare have remained stable through time while the chaetodontids, which are obligate coral feeders, have fluctuated in response to coral destruction by crown-of-thorns starfish. Another finding was that there was no statistically significant difference in numbers of fish found on reefs that have been protected from line fishing when compared with those that are zoned to allow fishing, which calls into question both the effectiveness of closures and the need for them.

Some of the most diverse reefs with the highest coral cover in the Great Barrier Reef World Heritage Area are found in the relatively turbid waters that are found inshore and concern has been expressed on many occasions that fringing reefs have deteriorated badly due to increased sediment and nutrient run-off into the Great Barrier Reef lagoon.

Information was presented about the reef-flats by Dr David Wachenfeld that showed their condition at present compared with that as seen in historical photographs taken as much as one hundred years ago (see *Reef Research* Vol. 5, No. 3). Although, of the reef-flats studies, some appeared to have deteriorated badly (four sites), some are indeterminate (four sites), and seven show little or no evidence of change. Quantitative work on fringing reef slopes has been undertaken by Dr Ayling throughout the Great Barrier Reef World Heritage Area over the past 15 years and this shows there has been no degradation in terms of either hard coral cover or species composition over that period.

The crown-of-thorns starfish has been responsible for some of the greatest impacts on the Great Barrier Reef. It is still not known if outbreaks are natural events and, if they are, then the infestations should not be viewed as an adverse ecological event. As regular readers of the COTS COMMS section of this newsletter will be aware, another cycle of the coralliverous starfish, *Acanthaster planci*, is presently beginning. It appears to be following a similar pattern to the previous two cycles, although the beginnings of these occurrences were never documented since the outbreaks were only discovered after they were in full swing. It is still unclear whether human influences (such as water quality changes or predator removal) are exacerbating outbreaks and targeted research into possible causes of outbreaks is still required to better understand the phenomenon.



Of concern, is the status of dugong populations in the region. While populations in the northern part of the Great Barrier Reef World Heritage Area appear to be relatively stable, numbers south of Dunk Island have declined by about 50% over the past eight years. This decline is likely to be attributable to habitat loss, hunting and mortality in gill nets and varies from area to area. This suggests that dugong and the seagrass habitats require special protection. Seagrass habitats have been mapped for all the shallow areas of the Great Barrier Reef World Heritage Area and surveys in deeper water have recently commenced. About 4000 square kilometres of shallow water seagrass has been mapped and there is an estimated 2000 square kilometres in deeper water. Seagrasses are known to be important areas of primary production and, as well as providing food for dugong and turtles, are nursery areas for many species of fish and crustacea. Although it is thought that impacts are low to moderate, seagrass beds are ephemeral and it is important to increase our understanding of the scale and consequences of natural and anthropogenic impacts.

Also of concern is the status of the various turtle populations that have the Great Barrier Reef World Heritage Area as part of their habitat. All stocks are considered to be endangered or vulnerable and, although many of the threats to these wide-ranging animals are from regions outside the Great Barrier Reef World Heritage Area, harvesting by indigenous people, incidental kills by the commercial fishing industry, boat strikes and effects of lines and ropes are significant impacts that occur within the World Heritage Area. A lack of data for most species impedes management but, given the status of all turtles, it is necessary that they be protected to a greater degree than is presently the case.

Fisheries, both recreational and commercial, are one of the major uses of the region and have the potential to greatly affect the ecological stability of the area. Continued removal of top predators from reefs is bound, to a greater or lesser extent, to alter community dynamics and the large areas of benthos that are swept in the prawn fishery give cause for concern. While it appears that the present level of reef fishing may be sustainable, the effects of trawling in inter-reefal areas are largely unknown. The high level of by-catch from trawling and the disturbance or removal of the thousands of species of benthic organisms are cause for concern for large areas of the Great Barrier Reef World Heritage Area.

All of the above suggests that although the overall Great Barrier Reef World Heritage Area is still relatively pristine, there are a number of described threats and many more potential threats. The knowledge that we have and, just as importantly, the lack of knowledge in many spheres requires that management agencies take into account the precautionary approach when considering usage of the area. With luck, there will be an article on the state of the Great Barrier Reef World Heritage Area with regard to usage and management next issue.

OCEAN RESCUE 2000 - MEETING THE CHALLENGES OF TOMORROW, TODAY

Dianne Vella-Below
Education Officer Ocean Rescue 2000

Australia's marine environment is amongst the most diverse of any country in the world. Cold southern waters and warm northern waters provide a range of environments ranging from temperate kelp forests to tropical coral reefs. The protection and subsequent conservation of such areas is essential, while still allowing access to, and use of, marine resources and sites.

The challenge today is to achieve ecologically sustainable use and maintenance of marine biodiversity. A significant contribution to achieving this is by expanding the existing system of marine parks and reserves (known as marine protected areas, or MPAs) to ensure that representative examples from each environment are conserved. Also, areas which are particularly important to marine species, as their preferred habitat, need to be maintained to ensure future generations can thrive. This includes fish stocks which require protection.

Communities can sometimes be hesitant about such changes, fearing that their access to, their use of, and the commercial value of the area may dwindle if an MPA is established. Others can be highly supportive of the concept. The main difference seems to be due to a lack of understanding about the benefits of the declaration process and the knowledge that the opportunity does exist for them to become involved.

Ocean Rescue 2000 has been working since 1991, in collaboration with State and Territory governments to create a National Representative System of Marine Protected Areas. The Commonwealth Department of Environment, Sport and Territories (DEST), the Great Barrier Reef Marine Park Authority (GBRMPA) and the Australian Nature Conservation Agency (ANCA) are working together to provide policy and technical guidance and management to the States and the Northern Territory. This has led to the development of strategic State, Territory and Commonwealth approaches to the development of marine protected areas in the relevant jurisdictions. Included in this work has been the development of geographic information systems and coastal atlases, installation of underwater trails, data collection and inventory, community involvement initiatives and habitat mapping.

As education forms an integral part in ensuring a successful outcome, the Authority was commissioned to produce a video as part of the National Education Program (which the Authority manages) for Ocean Rescue 2000. This video was designed to assist planners, conservation groups and government agencies to understand the process involved in establishing a marine protected area. A series of case studies were used to highlight the process of establishing marine protected areas. Examples include the Great Barrier Reef Marine Park (Queensland), Ningaloo Marine Park (Western Australia) and The Solitary Islands Marine Reserve (New South Wales).

The challenge today is for scientists, managers and user groups to work together to ensure the conservation of these representative areas. By working together, this can be achieved and protection of these marine environments ensured for future generations.

Further information about the video kit can be obtained by contacting Dianne Vella-Below at the Great Barrier Reef Marine Park Authority (Townsville office).

COTS COMMS

Udo Engelhardt

This issue of COTS COMMS has a heavy bias toward the most recent findings of the various crown-of-thorns starfish (COTS) monitoring programs reflecting my current preoccupation with assessing the latest COTS outbreak episode on the Great Barrier Reef. A close examination of COTS surveys recently conducted in the Cairns Section of the Great Barrier Reef Marine Park has led to the inescapable conclusion that a third major outbreak event has commenced in this part of the Reef.

Photo by Udo Engelhardt

At a press conference in Townsville in November 1995, the chair of the Crown-of-Thorns Starfish Research Committee, Professor Graham Mitchell, outlined the current status of COTS populations on the Great Barrier Reef and abroad. Significantly, recent trends of increasing starfish populations on the Great Barrier Reef appear to coincide with similar increases in many other parts of the Indo-Pacific region. It seems that we are not alone in having to face up to the effects of a new outbreak cycle.

Some comfort may be taken from the fact that we have detected this outbreak at a much earlier stage than previously possible. Those who might be directly affected should benefit from the increased lead time available to prepare for the changing situation on the Reef. Reef-based tourism operations in particular have been able to initiate local-scale controls at an early stage. An ongoing commitment to conducting these strategic controls in important areas should ensure that valuable diving and snorkelling sites can be protected and maintained. The controls strategy project currently under way at Lizard Island (conducted by Reef Research & Information Services and Lizard Island Research Station) will shed some additional light on the best and most effective way to use the established method of injecting starfish with a sodium bisulphate solution.

FINE-SCALE SURVEYS (CRC REEF/GBRMPA)

At the time this edition of COTS COMMS was written, the fine-scale surveys for 1995-96 were still in full swing and the first three trips of this year's sampling program have already confirmed the anticipated trends. Regular readers may recall that at the end of the 1994-95 season a number of survey reefs in the northern parts of the Cairns Section were classified as Incipient Outbreaks (IO). These reefs were characterised by the presence of relatively

large numbers of juvenile and immature starfish. Classification of these reefs was based on the assumption that most of the observed juveniles would survive and become part of the mature population in 1995-96. It appears that this assumption has been a valid one with our northern survey reefs showing the expected increases in the densities of mature populations. The bottom line is that the majority of mid-shelf reefs between Lizard Island and Port Douglas now support either localised or reef-wide outbreaks. Average densities of mature starfish on these reefs are typically three to ten times above the sustainable threshold of approximately 30 mature starfish per hectare.

Again, the 1995-96 surveys detected substantial numbers of juvenile starfish on many reefs indicating that the current situation is likely to worsen over the next couple of years or so. Currently, starfish activity appears largely restricted to mid-shelf reefs. COTSWATCH reports indicate that, at this stage, outer shelf reefs support only low numbers of starfish. A more detailed summary of the results for 1995-96 will appear in the next edition of COTS COMMS. Stay tuned!

COTSWATCH - REEF-USER SURVEY SCHEME

In my memory, 1995 will be fondly remembered as the most successful year yet of this valuable public participation program. Thanks to the ever increasing number of dedicated COTSWATCHERS the scheme has gone from strength to strength. A record number of completed forms has greatly increased our knowledge of the geographic extent of recent population increases. Nearly **650** individual site reports were received in 1995. A sincere thank you goes to everyone who has contributed to the success of the Reef-user scheme. A list of all known contributors in 1995 follows:

G Bennett / Cairns, **S Wood** / Mission Beach, **J Anderson** / Cairns, **J Cowie** / Freshwater, **J Cruise** / QDEH Gladstone, **K Roach** / Cairns, **R Vanstan** / Cairns, **S Singleton** / Cairns, **R Stutely** / Townsville, **G Svensson** / Cairns, **F Muir** / QDEH Cairns, **J Low** / QDEH Cairns, **M Short** / QDEH Cairns, **G Kelly** / QDEH Cairns, **C Williams** / QDEH Cairns, **S Martin** / QDEH Cairns, **J Haig** / QDEH Cairns, **G LaPraik** / QDEH Cairns, **G Connett** / Port Douglas, **A Van Welderen** / Cairns, **G McGarry** / Cairns, **A Lloyd** / Ingham, **D Anderlini** / Whiterock, **G Manahan** / Cairns, **K Larsen** / Cairns, **D St John** / Earlville, **M Schaer** / Cairns, **P Ward** / Cairns, **J Purcell** / Cairns, **B Knuckey** / QDEH Gladstone, **J Olds** / QDEH Gladstone, **K Menkens** / Cairns, **L Lamb** / QDEH Townsville, **C Dunk** / Townsville, **F Gunst** / Edmonton, **C Hopkins** / Cairns, **B Kahn** / Port Douglas, **R Miller** / Port Douglas, **P Wright** / Port Douglas, **K Jesienowski** / Port Douglas, **D Cowie** / Freshwater, **N Purdy** / Cairns, **B Legg** / Rockhampton, **E Green** / Cairns, **S Svensson** / West End, **S Simpson** / Port Douglas, **K Burns** / Cairns, **D Ball** / QDEH Airlie Beach, **G Byron** / QDEH Rockhampton, **P O'Neill** / QDEH Rockhampton, **R Schutte** / Cairns, **W Kibble** / Cairns, **J Thompson** / Airlie Beach, **R Moran** / Kuranda, **A Marshall** / Port Douglas, **S Richards** / Cairns, **B Heinrich** / Proserpine, **R Reddacliff** / Stratford, **B McCormack** / Parramatta Park, **J Richter** / QDEH Rockhampton, **K Cutmore** / QDEH Gladstone, **A Frisch** / Townsville, **R Buck** / QDEH Mackay, **S Moon** / Cairns, **G Johnstone** / Port Douglas, **P Pilkington** / Lizard Island, **I Stapleton** / Cairns, **R Toff** / Cairns, **G Rochester** / Cairns, **P Harvey** / Mission Beach, **A Lloyd-Cahill** / Smithfield, **S Whelan** / Earlville, **J Stoddart** / Cremorne, **J Green** / Cairns, **I Drayton** / Lizard Island, **K Steinbeck** / Holloways Beach, **G Leeon** / Cairns, **J Richardson** / Cairns, **J Ashmore** / Cairns, **S Fisher** / Mackay, **M Abela** / Hermit Park, **C Purdon** / QDEH Townsville, **D Wiseman** / Cairns, **C Taylor** / Earlville, **G Lane** / Trinity Beach, **S Woodford** / Cairns, **R Adolf** / Palm Cove, **C Schoenberg** / Townsville, **D Robb** / Dingo Beach, **J Weisgerber** / Cairns, **M Allen** / Cairns, **M Greet** / Port Douglas, **R Graafsma** /

Cairns, **B Tatchull** / Cairns, **P Heatherwick** / Port Douglas, **L DeVantier** / Townsville, **E Turak** / Townsville, **T Rouphael** / Townsville, **J McKay** / QDEH Cairns, **W Oxley** / Townsville, **M Smith** / Cairns, **J Ayres & S Waterczyk** / Indian Head Park, **P Erasmus** / Townsville, **I Fleetwood** / Gladstone, **Z Wreid** / Gladstone, **Staff on 'Undersea Explorer'** / Port Douglas, **D Walkden** / Townsville, **M Portefaix** / QDEH Cairns, **R Clarke** / QDEH Cairns, **W McFarlane** / Cairns, **N Gill** / Worcester, **D Pana** / Trinity Park.

AUSTRALIAN NAVY DIVERS

Our understanding of the COTS phenomenon relies heavily on knowing what is actually happening out there on the Reef. Whilst broad- and fine-scale surveys of COTS cover a substantial number of reefs, additional information coming in from other parts of the Reef is much needed and always appreciated. The latest edition to our growing army of COTSWATCHERS actually comes courtesy of the Australian Navy. A bunch of dedicated volunteer divers from the Operations Support Department of HMAS *Albatross* led by sub-lieutenant Dwayne Kirk have offered their services to assist in surveying 'new' grounds. By the time you read these lines, the Navy team will have completed a week-long survey of selected reefs in the Cairns to Innisfail area. Well done guys.

BROAD-SCALE SURVEYS (AIMS)

The AIMS monitoring team recently returned from their annual surveys of reefs in the Swain and Capricorn Bunker sectors of the Marine Park. The status of COTS populations in these southern sectors remains largely unchanged. All survey reefs retained the classification assigned after last year's surveys. Two reefs (22-088 and Horseshoe Reef) in the Swain sector continue to support active outbreaks, with small numbers of starfish also being recorded on another six reefs. Strong signs of coral recovery following an outbreak in 1993-94 were evident on Gannet Cay Reef. A population of COTS has been present on this reef for at least the past 10 years. Following the peak of an outbreak a few years ago, recent reef recovery at Gannet Cay has resulted in an increase in the median coral cover from category 1 (11-30%) up to category 2 (31-50%) this year.

Only limited COTS activity was recorded on reefs in the Capricorn Bunker sector. However, the monitoring team notes that while only a few starfish were recorded, they are the first sightings of COTS in this sector for many years.

NEW CROWN-OF-THORNS STARFISH BROCHURE

The CRC Reef Research Centre, in conjunction with the Great Barrier Reef Marine Park Authority, recently released a new popular-style pamphlet updating the latest COTS situation on the Reef. This glossy full colour fold-out publication provides brief overviews of some important topics relevant to the COTS phenomenon such as the recent history of outbreaks, the current status of COTS on the Great Barrier Reef and abroad, GBRMPA's policy on controls, as well as some basic facts about the biology of the animal. The pamphlet is being widely distributed to Reef-users along the Great Barrier Reef. Copies are available direct from the Education and Information Section at GBRMPA, the CRC Reef Research Centre and various offices of the Queensland Department of Environment and Heritage.