REEF RESEARCH

GREAT BARRIER REEF MARINE PARK AUTHORITY

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NEWSLETTER OF THE RESEARCH AND MONITORING SECTION

Editorial

This is a very 'newsy' issue of the newsletter with a varied offering of articles despite something of a concentration on the International Coral Reef Symposium that was held recently in Panama City.

The Panama 'Olympics', as it has been dubbed by many, heralds the 1997 'Year of the Reef' during which the international community is supposed to focus on the state of the world's coral reefs. If previous 'Years of ...' are anything to go by, then chances are that it will be a time of rhetoric but little else. This would be a great pity given the massive amount of work that needs to be done if the coral reefs of the world are to be brought back from the degraded state to which they have been reduced by all kinds of over-exploitation, pollution and destructive fishing practices. Further, it would be disappointing if the focus were to be on further monitoring of the decline of reefs at the expense of educating people about their importance. As I said at a UNEP workshop in Bangkok last year, '... (we) may care to reflect on the fact that for many years we, as scientists and environment lovers, have known what kills coral reefs and we have observed and recorded their deaths. What we haven't done is get the message through to the entrepreneurs, engineers, accountants, decision makers and the public in such a way that they will accept that the costs of development include high standards and consequent financial costs or result in the death of the environment. A number of existing programmes will continue to record those deaths. An essential role for us all is to ensure that the public, politicians and government and professional decision makers understand the constraints and operate within them.'

Whilst it is tempting to preach from Australia, where the pressure on coral reefs is minimal and we have the luxury of management arrangements that are largely supported ▶

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Editorial

continued from front page

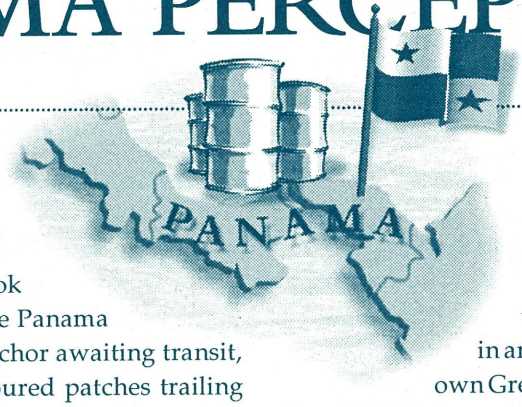
by the users of the reef, I urge those who will be focusing attention on the coral reefs during 1997 to consider the particular circumstances of other countries and cultures. I expect that there are a whole raft of Australians who given a stick of dynamite and a hungry family would find it necessary to use the former to feed the latter. The real pity of destructive reef exploitation is that much of it is to feed the industry barons sitting in high-rise offices in Hong Kong, Singapore, or perhaps Sydney – local communities cannot afford Muro-ami operations it seems to me. That said, I am buoyed up by some shifts in the concentration of effort to protect reefs by the education of communities about the resource, and the empowerment of local communities to manage what is an essential part of their lives. The last article in this issue, the CRC Update, notes that problems with reefs are 'predominantly social problems requiring political solutions', a view with which I concur. Unfortunately, the same article also notes that at the Panama symposium 'there was a noticeable lack of socioeconomic research presentations about coral reefs' which is worrying when, the position that I agree with is that, 'understanding and managing people – their habits, traditions, expectations and needs – is often more important for coral reefs than understanding the natural processes of reefs'.

Well, after five and a bit years, this will be the last *Reef Research* that I edit since I am leaving for what I hope will be greener pastures with the Ports Corporation of Queensland. For this issue I had major assistance from Vicki Nelson and Kim Davis to complete the task. Vicki has also moved on to private enterprise but Kim will hold the fort and edit future issues of the newsletter. I wish all who have assisted me with the newsletter, the many contributors and, of course, all our readers the very best in the future. Cheers.

Ed.

with Steve Raaymakers

PANAMA PERCEPTIONS



The flight-path into Panama City for the recent 8th International Coral Reef Symposium (ICRS) took us over the Pacific entrance to the Panama Canal. Of the 25 large ships at anchor awaiting transit, five had slicks and rainbow-coloured patches trailing downstream.

Despite ongoing chronic ship-sourced pollution and continuing occurrences of acute releases, the scientific community has not yet afforded this threat to coral reefs the research priority it may deserve.

Of the 700+ papers presented at the 8th ICRS, only two dealt with oil pollution, and only three others referred to impacts of shipping.

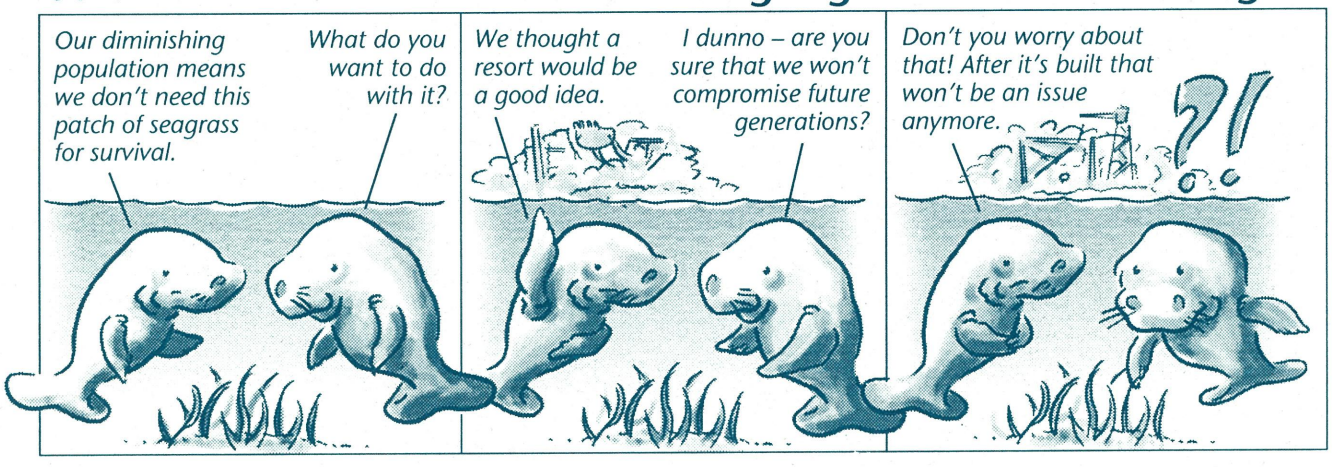
In Slick Talk #18 we look at the latest research findings from Panama on the effects of oil on tropical marine ecosystems, as presented at the 8th ICRS. The abstracts of the two relevant papers are presented, with some additional comments. The results of this research provide a welcome boost to knowledge of the impacts of oil in an area with many similarities to our own Great Barrier Reef region, where there is a significant paucity of relevant data.

The oil spill theme is then left momentarily for some summary comments on three ICRS papers which referred to other shipping impacts, including the physical impacts of grounding on reefs and the effects of dredging.

Bahia las Minus Spill, 1986

In April 1986, 10 to 16 million litres of medium crude oil escaped from a shore-based refinery into Bahia las Minus on the Caribbean coast of Panama. While devastating in its effects on fringing coral reefs, seagrass beds and mangroves, the spill presented an unprecedented

Coralations **Resortful Dugongs** **Pongase**



opportunity for the advancement of science. The Smithsonian Tropical Research Institute's (STRI) Galeta field station was located right in the middle of the 80 kilometres of oiled coastline, and STRI had surveyed the area the year before.

Ongoing research and monitoring of the affected coastline has been a major force of STRI's marine program in the last ten years. Analysis of this data and the effects of an earlier tanker spill in the same area in 1968, has provided possibly the best understanding of the impacts of oil anywhere in the tropics. A paper was presented by Guzmán at the 8th ICRS summarising the latest results in relation to reefs.

Oil spills and their effects on coral reefs: Panama after ten years of recovery

H.M. Guzmán, Smithsonian Tropical Research Institute, Box 2072, Balboa, Panama.

There have been few studies on the ecological, social and economical effects of oiling on tropical reef ecosystems. The vulnerability of reefs to oil pollution continues to be controversial due to lack of long-term field data and suitable geographical scale in contrast to short-term microcosm data. In most cases comparative data analyses are futile. Panamanian reef habitats and coral species are to some extent similar to Caribbean, Gulf of Mexico, and southeastern United States reefs. The initial ecological assessment of the 1986 oil spill in Panama showed detrimental effects on corals such as, decrease in coral cover, low recruitment, impairment of gamete production, and low growth rates. After ten years of chronic pollution, due to slicks originating from oil trapped in mangrove sediments and new spills, reefs are still deteriorated, and recruitment rates for some important Caribbean reef-building species suggest very long recovery times.

Related studies have shown that mangrove damage was also severe and mangroves are still contaminated ten years after the spill. Two scientists currently with the Australian Institute of Marine Science (AIMS), Norman Duke and Kathy Burns, were involved in the post-spill studies and further information can be obtained from them (contact AIMS, fax +61 77 72 5852). STRI has also recently published a comprehensive report on the studies carried out (contact STRI, fax 507 32 5978).

Tropical Effects of Oil/Dispersants

Two years prior to the Bahia las Minus spill, a team from Nova Southeastern University in Florida had commenced a range of studies on an experimental spill at Bocas del Toro, also on the Caribbean coast of Panama, around 200 kilometres north of Bahia las Minus.

The focus of this work was on the effects of oil, dispersant and oil/dispersant mixtures on corals, seagrasses and mangroves in a controlled field situation. The inclusion of dispersants and oil dispersant mixtures is of significant value, as their use in tropical areas is still controversial due once again to limited data on their effects.

A paper was presented at the 8th ICRS presenting the results of this work and a 10 year reassessment.

The effects of oil and oil dispersants on tropical ecosystems: a 10 year update

R.E. Dodge, A.H. Knapp, B.J. Bacca, S.C. Snedaker and T.D. Sleeter, Nova Southeastern University Oceanographic Centre, 8000 N, Ocean Drive, Dania, Florida, USA

An experimental oil spill was conducted on the Atlantic coast of Panama (Bocas del Toro) in 1984. Separate treatments to three individual sites included: dispersed oil at 50 parts per million for 24 hours, oil-only (4 barrels) for 48 hours, and no exposure (reference site). Each site contained mangroves, seagrass and corals. The first two and a half years of monitoring are compared with a 10 year reassessment in 1994. Findings complement those of an extensively studied major oil spill off the Atlantic coast of Panama (Galeta) in 1986. The 10 year reassessment revealed the seagrass community had recovered to pre-spill conditions at both the oil-only and dispersed oil treatment sites. For reefs, total organism coverage (and other parameters) decreased significantly following dispersed oil treatment and remained depressed at the two and a half year monitoring. There were no significant oil-only effects on coral reefs. Reefs in the dispersed treatment appeared to have recovered to pre-spill levels after 10 years. Mangrove effects were significant at the oil-only site. There has been some mangrove recovery after 10 years, however chronic effects of oiling continue.

Interestingly, the findings of the Bocas del Toro experiment complemented those of the extensively studied Bahia las Minus spill. There are obviously several extremely valuable lessons to be learnt from the work in Panama for oil spill response in the Great Barrier Reef region. Relevant personnel involved in protecting the Reef from oil pollution would find the reports on this work extremely valuable. Of particular value is information to assist identification of protected priorities, response options, rehabilitation techniques and dispersant use decision making in reef, seagrass and mangrove areas.

It is encouraging to note that the findings of the work in Panama support the rationale behind the 'Great Barrier Reef Marine Park Authority's Policy and Guidelines for the Use of Oil Spill Dispersants' which were developed largely in the absence of relevant data in 1991 (see Slick Talk # 13, *Reef Research*, June 1995).

Coral Contact

Two papers at the 8th ICRS discussed the effects of vessel groundings on coral reefs. B.G. Hatcher of the Caricom Fisheries and Resources Assessment and Management Program (CFRAMP) Resource Assessment Unit in the West Indies concluded that chronic, small scale, high frequency groundings of small vessels pose a greater threat to coral reefs than do acute ship groundings.

In his paper on the management of the Ras Muhammed Marine National Park in Egypt, A.A. El-Sammak concluded that 'navigation accidents are among the most uncertain problems to the coral reefs of the park'. When considering the unexplained spate of ship groundings in the Great Barrier Reef recently, one can not help but consider that the same may apply equally here. An interesting difference in the approach to ship groundings by authorities in the Great Barrier Reef and Egypt is the willingness to take effective enforcement action. In a recent ship grounding in Ras Muhammed the Egyptian authorities impounded the vessel and would not release it until compensation for reef damage had been paid. The final figure paid to Park management was equivalent to $15 000 per square metre of reef damaged! Ships that have grounded in the Great Barrier Reef region are left to sail with relative impunity.

Dredge Damage

The impacts of dredge generated turbidity and sedimentation have been the subject of intensive monitoring at several ports in the Great Barrier Reef region in recent years. The results of some of this work have lead to claims that dredging threats may not be as severe as previously thought, and monitoring of new projects should not be required, or at least be reduced. However, an ICRS paper by G. Hodgson from Binnie Consultants in Hong Kong provides a sobering reminder of the need to assess impacts on a project specific basis, and to be cautious about generalising from studies of other projects and areas. Sedimentation from massive dredging for the new Hong Kong airport has completely buried coral reefs and severely impacted on seagrass beds.

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

Shoalwater Bay update: DISCOVERING THE FORGOTTEN WETLANDS

Ray Berkelmans

The Inquiry into Shoalwater Bay, which considered the relative merits of military, conservation, fishing and mining use of the area, concluded that Shoalwater Bay has wetlands of exceptional value and that it is an important scientific reference area. Resource surveys commissioned by the Great Barrier Reef Marine Park Authority after the Inquiry in support of management planning for this area are putting substance to these conclusions and show that they are not overstated. Here are some preliminary results of projects currently under way.

Seagrass studies

Warren Lee Long, Len McKenzie and Rob Coles

Detailed surveys of seagrass meadows were conducted using helicopter reconnaissance, aerial photos, satellite imagery and dive surveys. A total of 126 ± 8 km^2 of seagrass habitat was mapped in the spring survey which was conducted in October 1995. This figure is nearly double the estimate of seagrass coverage found in the broad-scale surveys conducted in 1987 and represents around 5% of the total inshore seagrass habitat in the Great Barrier Reef Region. It is by far the largest seagrass area south of Cooktown and compares with 50 km^2 in the Hinchinbrook area, 47 km^2 in Cleveland Bay and 61 km^2 in the Whitsunday area, based on the 1987 broad-scale survey data (GBRMPA Geographical Information System). The dominant seagrass communities consisted mainly of *Zostera capricorni* (54% cover) and *Halodule/Halophila* (44%). A significant finding of this survey was that the most of the seagrass meadows (75%) were restricted to the intertidal banks and drainage channels, up to 0.7 m above mean sea level (figure 1). This has special implications for the management of the large turtle and dugong populations which rely on these meadows for their food. Turtles and dugongs are restricted in their feeding times to high tides, a feature supported by the stranding of literally hundreds of turtles on the low tide. The restricted distribution of seagrass beds makes dugongs and turtles especially vulnerable to conflicting human activities on the intertidal mud banks, such as gill netting. Under provisions of the Queensland Fisheries Regulations, gill netting on the foreshore in Shoalwater Bay was banned in late 1995.

The Shoalwater Bay seagrass beds are likely to be significant to regional fisheries production.

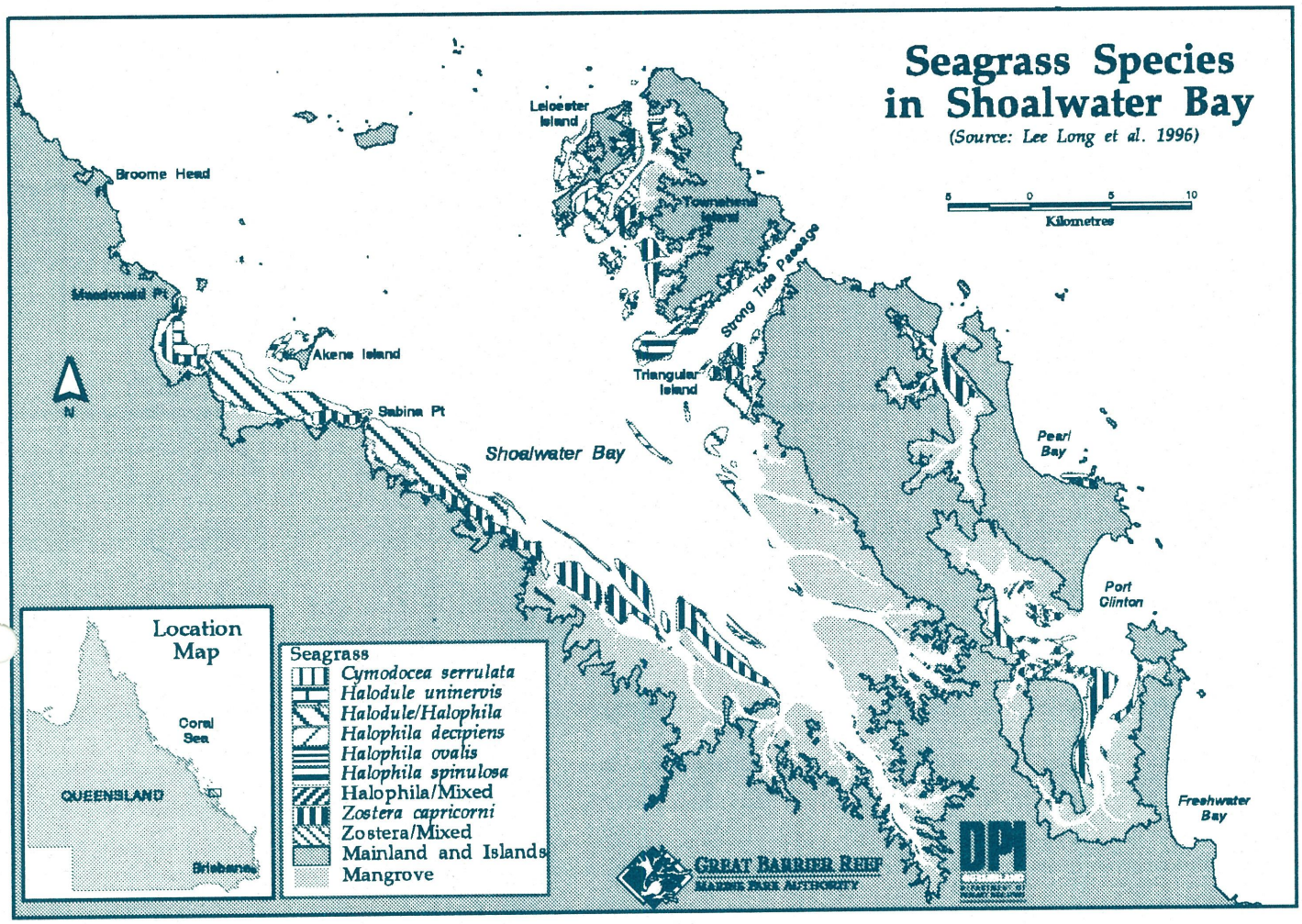


Figure 1. Major seagrass communities of Shoalwater Bay

Commercially important prawns were found at each of the seagrass beds which were sampled and represented 99% of the prawns sampled. The western king prawn was the most abundant of the commercial species, but the true endeavour prawn, red endeavour prawn and brown tiger prawn were also common in the seagrass beds. The abundance of other invertebrates and juvenile fish found in beam trawl samples also indicate a significant source of food in local marine food webs.

Monitoring sites were established on selected meadows which are intended for survey every two years. A complete post-wet season mapping survey was undertaken in April 1996, the results of which are currently being analysed.

Fringing reef surveys

Tony Ayling

Although Shoalwater Bay is mostly known for its wetlands, it contains over 50 islands (most are tiny islets), many of which have fringing corals reefs. None of these reefs had been surveyed prior to the Inquiry.

Eighteen reefs were surveyed and ranked according to their ecological value (Done 1995). Coral cover was very variable ranging from sparse (7%) on fringing reefs dominated by the macroalga, *Sargassum*, to high (66%). Most fringing reef community types were dominated by acroporids and *Montipora* species, but extensive stands of *Turbinaria frondens* were also common. For most species of coral, sizes were smaller than those found in most fringing reefs, but for plate-forming *Acropora*, many unusually large colonies were found (up to 5 m in diameter!). Many colonies of *Turbinaria frondens* were also found in the size class 2–5 m, the largest single colony

Mumford Island in the north-east of Shoalwater Bay is typical of most of the islands in the area being made up of a series of granite/basalt islets with small beaches with a surrounding fringing reef.

measuring 4.55 m x 3.85 m! The best reefs (in terms of bioconstuction and biodiversity) were generally found in the north-east of Shoalwater Bay.

The diversity of corals was moderately low with a total of 87 species found in Shoalwater Bay (over a total of 25 diving hours), compared with 120 species found in inshore fringing reefs in the Cairns area (30 diving hours), 131 species at Dent Island in the Whitsunday area (2 diving hours) and 143 species around Cape Tribulation fringing reefs (10 diving hours). However, a number of species were found which are considered 'rare' on the Great Barrier Reef (Veron 1986), although some may be common in temperate waters. These include *Acanthastrea hillae, Acanthastrea bowerbanki, Favia maritima, Acropora glauca, Acropora solitariensis* and *Turbinaria bifronds*. These species were found at nearly all sites. Another interesting feature of coral diversity was the notable absence of many species, and indeed whole genera, which are found on most fringing reefs to the north. These include *Echinopora* (all species), *Pectinia* (all species), *Oxypora* (all species), *Pavona* (all species), Fungidae (all genera, except *Podabacea crustacea*), *Millepora tenella, Merulina ampliata, Porites cylindrica, Acropora humilis* and *Acropora gemmifera*.

Fisheries review

Fisheries Group, Queensland Department of Primary Industries

The Shoalwater Bay area supports only small scale commercial, charter and recreational fisheries compared to the rest of the Queensland east coast, but the fisheries are important to the local economy. The area covered by Shoalwater Bay, however, is disproportionately large in relation to the total commercial fish catch. The low catch is probably a result of a number of factors, including the remoteness of the area, the large number of Defence Closures, the zoning restriction to trawling in most of Shoalwater Bay proper (General Use 'B') and navigational difficulties due to the large tidal range in the area (up to six-metre tides).

In terms of the proportion of Queensland's total commercial fish catch, the Shoalwater Bay area contributes around 1% of the state's finfish, of which blue salmon is the dominant species. An average of 16 tonnes of blue salmon are caught annually, representing around 12% of Queensland catch. Other major species in the finfishery are shark, barramundi, mullet and grey mackerel, each representing between 0.3–3% of the state's catch (figure 2). With the exception of shark and mackerel, almost all finfish are caught by gill netting. This has resulted in an unknown, but probably large, number of dugong deaths in the area. The restriction on gill netting on the foreshore in Shoalwater Bay, which was proclaimed in late 1995, may reduce future effort and catch in this fishery.

The trawl fishery effort is concentrated immediately east of Shoalwater Bay between Townshend Island and Corio

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PUBLICATION	$
SPECIAL PUBLICATION SERIES (ISSN 0810-6983)	
Guide to the identification of seagrasses in the Great Barrier Reef Region. Janet Lanyon. Townsville, GBRMPA, 1986. [Cover title: Seagrasses of the Great Barrier Reef] (Special Publication Series (3)) 54 pp. ISBN 0 642 52489 0	9.10

Bay with total prawn catches averaging 85 tonnes per annum, representing around 1% of the state's total prawn catch. Banana and endeavour prawns are the dominant species caught. Banana prawn are the major species caught and represent around 46% of the total prawn catch in the Shoalwater Bay area. However, catches have been highly variable from year to year, ranging from 7 to 85 tonnes between 1988 and 1994, and show a strong positive correlation with rainfall. By-catch from trawling is undocumented for this area, except for incidental capture of turtles. A voluntary logbook program (Queensland East Coast Otter Trawl Fishery) shows that 14 turtles were caught between 1991 and 1994 in the Shoalwater Bay area, but none died.

Other fisheries of note are the mud crab fishery which averaged around 29 tonnes per year between 1988 and 1994, which represents around 8% of the Queensland

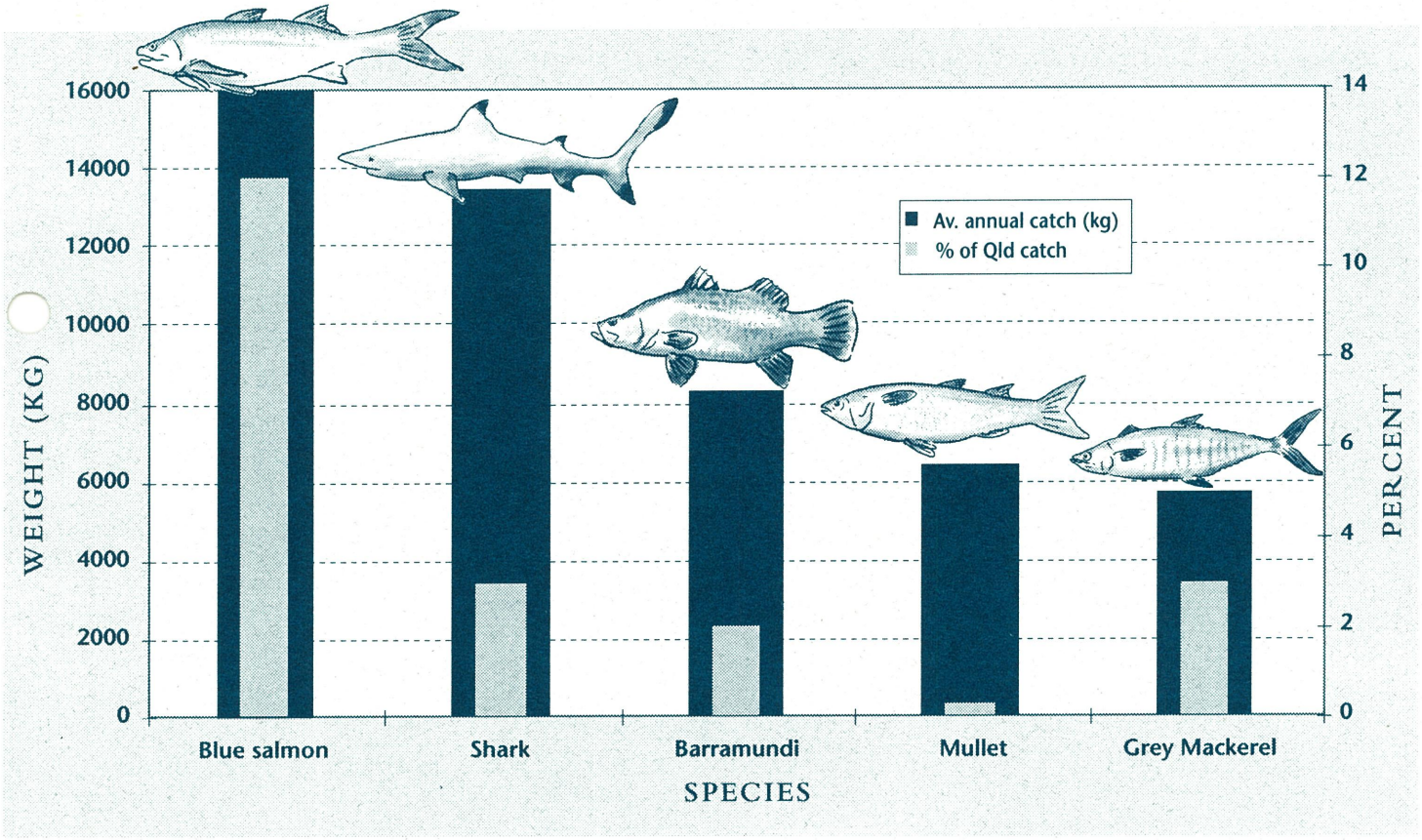

Figure 2. Average annual finfish catch and its relative importance to total Queensland production

catch, and the oyster fishery which averaged around 7% of the state's catch.

The status of exploited fish stocks are unknown. Catch statistics from the Queensland commercial fishing database, C-FISH, show highly variable catches for most fisheries over the six years between 1988 and 1994 and allow no conclusions to be drawn.

Most of the commercial species caught are mangrove/estuarine specialists and, given the vast area of mud banks, seagrass beds, couch flats and mangrove forests in Shoalwater Bay, it is likely that the intertidal habitats contribute appreciably to fisheries resources. However, the extent, value and nature of the interaction between nursery/habitat areas and fisheries production is unknown.

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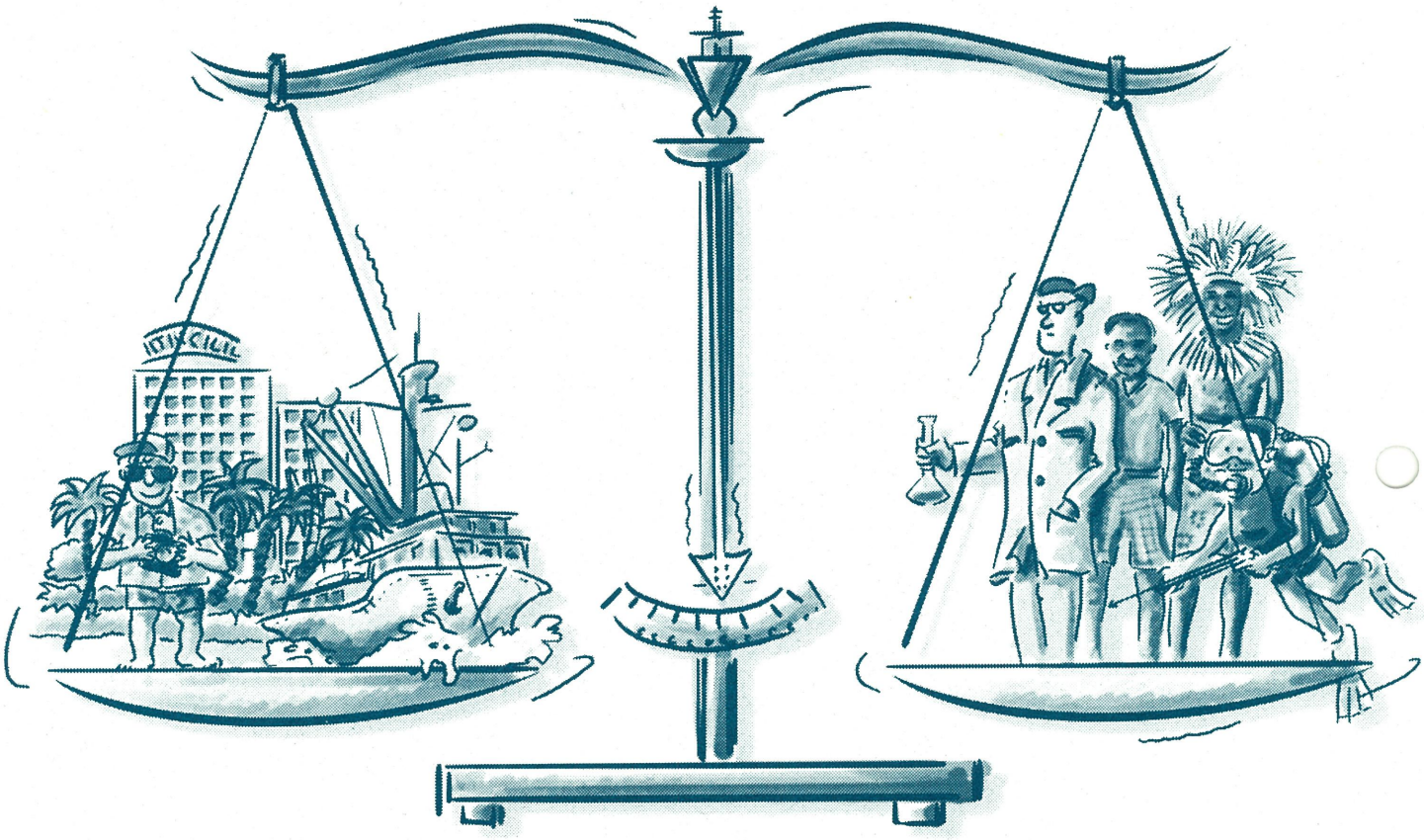
Done, T.J. 1995, 'Ecological criteria for evaluating coral reefs and their implications for managers and researchers', *Coral Reefs*, 14:183–192.

Veron, J.E.N. 1986, *Corals of Australia and the Indo-Pacific*, University of Hawaii Press, Honolulu, 644 pp.

KEEPING OUR BALANCE

Mark Simmons and Linden Woodward



The Great Barrier Reef is important to many different community groups. Reef tourism is the single largest industry and visitors come from all over the world to marvel at the reef's beauty; locals enjoy recreational boating, diving and fishing; Aboriginal and Torres Strait Islander people have cultural and spiritual connections with the reef; scientists have much to learn about the complexity of marine ecosystems; and our commercial fishing industry depends on a healthy marine environment.

We need careful management to balance all these different interests in the Great Barrier Reef. Everyone will benefit from planning that makes our use of the reef sustainable – both ecologically and economically.

Public concern

In 1995 a series of public meetings were held from Bundaberg to the Daintree to discuss future planning for the Marine Park. Groups and individuals gave detailed comments. **The key issues raised were:**

- the potential for unmanaged and dramatic increases in tourism,
- a concern that tourism was displacing other users at some sites,
- problems of anchor damage to the reef, and
- general concern for the quality of the natural environment.

These issues are being tackled in three ways:

- management plans for the most heavily used areas of the reef,
- codes of best environmental practice for all reef users, and
- policy on specific issues, e.g. dugong conservation, water quality, tourism use.

Plans of management have now been developed for the popular Cairns/Port Douglas and Whitsunday areas, where more than 85% of reef tourism is concentrated. These new plans apply to everyone who visits the reef. For most people it won't make much difference to how they use the reef. Fishing will still be allowed in the same areas, and zones will remain unchanged.

Planning for everyone

The plans will help make sure that anyone's time on the reef will have as little impact as possible on the natural environment. They will also help avoid conflict between different users, by indicating where large vessels are permitted and where smaller boats can go to get away from the crowd.

A cornerstone to the management plans is the establishment of six different reef settings. The settings range from intensively used sites to low use areas where only small groups are permitted. Some very sensitive areas could be subject to additional restrictions.

Doing the 'right thing'

Best environmental practices have been developed with the reef users to help increase awareness of how anyone can minimise the impact of their activities on the reef. Activities include waste disposal, reef walking, fishing, diving and whale watching. While regulations are already in place to control some aspects of these activities, public education of what the 'right thing' is and how to operate in the Marine Park are still essential components of Marine Park management.

Reviewing the plans

A management plan for a place as large and complex as the Great Barrier Reef Marine Park needs constant review. We need to adapt our approach as new issues come to light and as our knowledge of the reef grows. Input from the community helps to keep management efficient and effective.

To this end Regional Marine Resources Advisory Committees (see article below) have now been established along the coast from Bundaberg to Cooktown. They are one of the principal mechanisms by which local communities can become an integral part of the management process. Their activities are linked by a single coordinator within the Great Barrier Reef Marine Park Authority.

REGIONAL MARINE RESOURCES ADVISORY COMMITTEES ACTING LOCALLY

Deb Postle

Regional Marine Resource Advisory Committees bring together all major groups with an interest in their local marine environment along the Great Barrier Reef World Heritage Area. The concept started in 1988, when, responding to a need for a community voice in marine management decisions and practices, a State Member of Parliament brought together a group of people in the Yeppoon community to establish the Capricornia Coast Area Fisheries Advisory Committee. The Great Barrier Reef Marine Park Authority (Authority) recognised the value in the concept and established another ten groups called Regional Marine Resources Advisory Committees (RMRACs). These new committees cover the area from Bundaberg to Cooktown. As a result of this establishment, the Authority has been given an insight into the issues that affect these coastal communities. This has been an invaluable management tool for the Authority when considering the future planning needs of these areas.

Point of Contact

The RMRACs bring together local marine user groups such as local and other government agencies; commercial and recreational fishing groups; tourist operators; conservationists and Aboriginal and Torres Strait Islander groups. This ensures that broad cross sections from local communities are able to put forward their points of view at RMRAC meetings.

Subjects discussed are varied, reflecting local concerns and may cover anything from dugong, water quality concerns or fisheries issues. If the Authority needs feedback on local concerns about a particular issue that impacts upon the Great Barrier Reef Marine Park, then the RMRACs are consulted for their views. Generally the Committees meet every six weeks. However, if there is a pressing need a special meeting may be called. The Committees are also very keen to learn more about the

marine environment that they volunteer their time to conserve. Researchers and scientists are encouraged to talk to the Committees about their research findings.

Recent Workshop

A workshop recently brought together the Chairs and representatives from each of the RMRACs to clarify the roles and relationships between management agencies and the RMRACs and to establish procedural guidelines, as well as encouraging networking between RMRAC representatives. The workshop was opened by Dr Ian McPhail, Chair of the Authority. Dr McPhail spoke on the importance of two-way communication between the Authority and the RMRACs in maintaining the health of one of the few remaining large-scale healthy reef systems left in the Indo-Pacific region.

Current Status

The northern Committees have been very active recently with the offshore Cairns planning in full swing – both Cairns and Port Douglas regions have established working groups which report back to the RMRAC on issues raised with the plans proposed for the area. This move to establish working groups has now set a precedent for other RMRACs to follow when dealing with specific issues that require a great deal of time to work through. Airlie Beach has successfully established a working group to look at best environmental practices at Bait Reef. Cooktown is now working on a planning exercise involving offshore reefs. This planning exercise in Cooktown, involving all affected user groups may become a template for all RMRACs to follow in order to respond to a proposed plan of management.

Ms Deb Postle, Project Officer in the Education/ Information section of the Authority, is the coordinator for all the RMRACs and is the main conduit to and from the Committees and the management agencies. The list below gives the contact for the Chair of each of the Committees to enable direct contact but Ms Postle may be contacted to discuss relevant issues.

1. Cooktown

Cooktown Region Marine Resources Advisory Committee

Chair: Ian McCollum, PO Box 300, Cooktown Qld 4871
Phone (070) 69 5300

2. Port Douglas

Douglas Marine Resources Advisory Committee

Chair: Grahame Connett, PO Box 105,
Port Douglas Qld 4871
Phone (070) 99 5327, Fax (070) 99 5680

3. Cairns

Cairns Region Marine Resources Advisory Committee

Chair: Blue Bulling, PO Box 1777, Cairns Qld 4870
Phone 019 774 281, Fax (070) 51 8493
Phone (070) 52 3819, Fax (070) 52 1493

4. Mission Beach

Mission Beach Region Marine Resources Advisory Committee

Chair: Dave Nissen, Mission Beach Road,
Mission Beach Qld 4854
Phone (070) 68 8137, Fax (070) 68 8429

5. Ingham

Hinchinbrook Region Marine Resources Advisory Committee

Chair: Bill Whiteman, PO Box 14, Cardwell Qld 4816
Phone (070) 66 8270, Fax (070) 66 8271

6. Townsville

Townsville Region Marine Resources Advisory Committee

Chair: Mike Reynolds, c/- James Cook University,
Townsville Qld 4811
Phone (077) 81 4221, Fax (077) 81 5176

7. Airlie Beach

Whitsunday Coastal Advisory Committee

Chair: Tony Fontes, PO Box 180, Airlie Beach Qld 4802
Phone (079) 46 7435, Fax (079) 46 5194

8. Mackay

Mackay Regional Marine Resources Advisory Committee

Chair: Serge DePinto, 44 Macalister Street,
Mackay Qld 4740
Phone (079) 51 1244, Fax (079) 57 2095

9. Yeppoon

Capricornia Fisheries Advisory Committee

Chair: Mike Prior, c/- 21 Stevenson Street,
Yeppoon Qld 4703
Phone (079) 39 1838, Fax (079) 39 3290

10. Gladstone

Gladstone Region Marine Resources Advisory Committee

Chair: Neil Bennett, 6 Birmingham Close,
Gladstone Qld 4680
Phone (079) 72 3966, Fax (079) 72 3167

11. Bundaberg

Bundaberg & the Coral Isles Marine Park Advisory Committee

Chair: Carl Moller, 27 Sinclair Street,
Bundaberg Qld 4670

COTS COMMS

Udo Engelhardt

COTS in Panama

Reef scientists from around the world are breathing a collective sigh of relief. The Olympic Games of Coral Reef Science, or as they are more commonly known, the International Coral Reef Symposium, are again behind us. Some 1400 delegates recently converged on Panama City in Central America to present and discuss the very latest in reef research. Yes, you've guessed it, the crown-of-thorns starfish (COTS) issue was one of the many hotly debated topics. As it turned out, COTS was one of the eleven (!) concurrent sessions on the first day of the symposium. Interestingly, the organisers had lumped it into a mini symposium entitled 'Pest Organisms' (I sometimes wish that people were a little bit more open minded!). Anyway, we had some very interesting presentations on COTS, followed by, at times, heated discussion. It was great to see that COTS can still get the adrenalin pumping. To give you a bit of a feel for the variety of research that was reported on, I have listed the available abstracts of all papers that were dealing with COTS. Happy reading.

Food limitation in the growth and development of crown-of-thorns starfish larvae in the Great Barrier Reef

T. Ayukai [1], K. Okaji [1] and J.S. Lucas [2]
[1] Australian Institute of Marine Science, PMB No. 3, Townsville MC Qld 4810
[2] Department of Zoology, James Cook University, Townsville Qld 4811

A carbon budget model was developed based on existing data of metabolic rates and uptake kinetics for phytoplankton (>2 µm), and dissolved free amino acids (DFAA) – two important food sources for the larvae of COTS. The model, in conjunction with three years of data on the ambient concentrations of these food sources in the Great Barrier Reef, suggest that COTS larvae are unable to meet even half their basal metabolic requirements in both reef and inter-reefal waters. Comparison of results from semi-natural rearing experiments with the field data also suggests that the growth and development of COTS larvae are usually food-limited, but the extent is not as severe as the model predicts. In detail, the critical food concentration for COTS larvae to achieve their optimal growth and development was in the range between 0.5 and 0.8 µg chlorophyll L^{-1} (as an overall measure for ambient food environments). Chlorophyll concentrations of this level do not commonly occur in the Great Barrier Reef.

Crown-of-thorns starfish controls: New techniques and strategies

U. Engelhardt and B.R. Lassig
Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville Qld 4810

Previous research demonstrated that injection of individual COTS with saturated copper sulphate solution was the most cost-effective technique available for local COTS control operations. Concerns over the environmental toxicity of copper sulphate led to trials of alternative chemicals that were effective, cheap, safe to use and environmentally friendly. A commonly available swimming pool chemical (Dry Acid or sodium bisulphate) met all of these criteria and is currently being used in localised COTS control operations on the Great Barrier Reef. Current research is aimed at identifying the most cost-effective strategy for applying this technique.

Crown-of-thorns starfish outbreaks in the northern Great Barrier Reef

U. Engelhardt and B.R. Lassig
Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville Qld 4810

Twice in the last 35 years COTS outbreaks originated in the northern Great Barrier Reef and subsequently spread southwards to affect a significant proportion of the 2900 reefs comprising the Great Barrier Reef. The exact geographical origin, the scale and the mechanisms responsible for the development of the outbreaks are largely unknown. Intensive surveys of 24 reefs in

the area were initiated following reports of increasing COTS numbers. In 1994–95 nearly half of the reefs surveyed were classified as having active or incipient outbreaks on reef or local scales. Analysis of the survey results, in combination with population dynamic studies, suggests that the outbreaks developed simultaneously on reefs spread over at least two degrees of latitude as a result of several 'good' years of recruitment. More widespread outbreaks appear likely.

Acanthaster plagues: Real or social constructs?

J. Sapp
Department of Science Studies, Atkinson College, York University, 4700 Keele Street, North York, Ontario, M3J 1P3, Canada

The history of the controversy surrounding *Acanthaster planci* outbreaks illustrates the difficulties of distinguishing between anthropogenic disturbance and natural fluctuations. The view that the outbreaks were new and therefore anthropogenically-caused competed with a view that large aggregations were natural phenomena and that their discovery as a 'plague' was merely a socio-technical construct due to the rise of environmentalism and the use of a new technology: SCUBA. Divergent ecological concepts regarding the stability and fragility of coral reef communities also underlay divergent views about the cause and cure for the outbreaks. The political nature of the debates further helped to polarize positions into two extremes: anthropogenic cause and necessary control measures versus natural cycles and no controls.

Commercial fishes as predators of adult *Acanthaster planci*

H. Sweatman
Department of Marine Biology, James Cook University Qld 4811
(now at Australian Institute of Marine Science, PMB No. 3, Townsville MC Qld 4810)

One theory of the causes of recent *Acanthaster planci* outbreaks is that human activity has reduced predation pressure on the starfish; in particular, that intense fishing has reduced the population levels of fishes that prey on *A. planci*. While small juvenile starfish are logically more vulnerable, the only documented cases of predation by commercially exploited fishes involve adult starfish. I examined the gut contents of 98 *Lethrinus* spp. caught within 500 m of high densities of adult *A. planci* in the southern Great Barrier Reef. None contained any *A. planci* remains but the size of the sample means that significant rates of predation cannot be excluded on statistical grounds.

COTSWATCH

Here, as usual, are the latest vital statistics for the COTSWATCH Reef-user scheme for the period from 1 May to 12 August 1996. Well, these valuable sighting reports just keep coming in at a nice steady rate. For the above period, the COTS program received 167 completed survey forms presenting information on 242 individual sites on some 93 different reefs from throughout the Marine Park. According to these reports, the main focus of both starfish activity and COTSWATCH reporting remains in the Cairns Section, with most records coming from some of the more heavily frequented mid-shelf reefs between Cooktown and Innisfail.

Many thanks to all the new and/or regular COTSWATCHERS out there for continuing to supply important and valuable updates on recent COTS developments in 'their' parts of the Reef.

Valued contributors for the period from May to August 1996:

A Hollis / DoE Heron Island; **A Van Welderen** / Cairns; **C Purdon** / QDoE Townsville; **C Schonberg** / AIMS, Townsville; **C Williams** / QDoE Cairns; **Anonymous staff on Coral Princess Cruises**; **D Robb** / Dingo Beach; **D Wang** / Baltimore USA; **D Wiseman** / Brinsmead; **DA & BA Breen** / Townsville; **F Chapman** / QDoE Pallarenda; **G LaPraik** / QDoE Cairns; **G Wetstead** / Cairns; **H Malcolm** / QDoE Pallarenda; **I Stapleton** / Nimrod, Cairns; **IR Fleetwood** / Gladstone; **J Purcell, B Jewel, D Blackshaw, J Wells, O Schapendonk, R Aiello, R Schutte, R Westaway & S Woodford** (all Great Adventures Cruises / Cairns); **J Wright** / Culburra; **Jim Thompson** / Airlie Beach; **Kai Hoppe** / Kiel GERMANY; **M Abela** / Pure Pleasure Cruises; **M Allen** / F.V. Seafari Cairns; **M Burnham** / QDoE Lucinda; **M Ford** / QDoE Lucinda; **M Short** / QDoE Cairns; **M Smith** / Moonlighting II Cruises, Trinity Beach; **M Wilson** / Whitsunday All Over, Airlie Beach; **P Heatherwick** / Port Douglas; **R Tan** / SINGAPORE; **R Toff** / Cairns; **S Goodhew** / Cairns; **S Moon** / Ocean Spirit Cruises, Cairns; **S Richards** / Captain Cook Cruises, Cairns; **W Legg** / Rockhampton; **W Mahon** / Clifton Beach.

CRC Reef Research Centre

UPDATE - *Chris Crossland*

Centre Activities

Planning for the Great Barrier Reef Science, Use and Management Conference, 25–29 November 1996 is well advanced, the Centre is now on-line on the Net, and the walking wounded have all returned from the Panama International Coral Reef Symposium. Don Alcock's report follows.

As we conclude our third year of operation, there have been some real advances in the science the Centre is producing, and a tangible benefit in the merging of research teams across disciplines and institutions.

Research Activities

Tenshi Ayuki's Technical Report on the *Relationship between Dissolved Free Amino Acids and Crown-of-thorns Starfish* has indicated that there is none.

The Effects of Fishing team have produced two reports for the Queensland Fisheries Management Authority (QFMA) analysing the logbook data provided by commercial and by recreational line fishers, and have provided the first evidence about the state of the fishery for the QFMA, which proved to be seminal in their calls for public input to the management of the line fishery.

Ken Woolfe and Piers Larcombe have been examining the effect of terrigenous sediment on the distribution of reef carbonates. Water clarity and sediment supply to the coastal ocean appear to be relatively inconsequential in the establishment of coral reefs, which are more strongly controlled by sediment accumulation, and hence substrate availability, than they are by sediment supply alone. Sediment accumulation is, in turn, partly controlled by local oceanography and sediment transport.

Paul O'Neill, of the Department of Environment in Rockhampton, with others, has presented preliminary results of 12 years of six-monthly monitoring of the masked booby *(Sula dactylatra)*, the brown booby *(Sula leucogaster)* and the silver gull *(Larus novaehollandiae)* in the Swain Reefs. Significant declines in the numbers of adults and nests of the brown booby, and in the number of adult silver gills, were detected, although human factors did not appear to have been influential. Reductions in food supply, probably associated with elevated sea surface temperatures induced by El Niño appear to be the most likely cause.

Gregg Brunskill at the Australian Institute of Marine Science and Stewart Walker at James Cook University have been collaborating in taking grab samples and sediment cores from Upstart and Bowling Green Bays. In cores taken off Cape Bowling Green, in the plume of the Burdekin River, they have discovered a large spike of mercury which was deposited between 1870 and 1890 – the years in which Charters Towers and Ravenswood were in full gold production. So history really is written in mud.

The need for good politics, and science.

Panama International Coral Reef Symposium report

by Don Alcock

Australia's coral science community made a big impact on the world scene recently with nearly 100 participants from 'down under' giving presentations, ranging from adaptations to zooxanthellae, to record-breaking crowds attending the International Coral Reef Symposium in Panama.

An estimated 1400 international coral reef scientists from more than 60 countries gathered in Panama for the five-day symposium which, because it is held every four years, has been dubbed the 'Coral Reef Olympic Games'. And a game it was too, as players competed for attention and seating throughout the hectic program. Following each morning's plenary session, the group swarmed through the convention centre, dividing into often overcrowded smaller rooms for a choice of eleven concurrent sessions. It was an exercise in time management, selective science themes and crowd control.

Many speakers reported on the serious decline of coral reefs globally, especially reefs near shallow shelves and dense populations. The scientific community has been raising concerns over the serious decline of reefs for some years. Damaged or destroyed reefs can be found in more than 93 countries, with coral reefs in Southeast Asia, East Africa and the Caribbean seemingly at the greatest risk. Mangrove depletion is prevalent in many countries, and in places massive mortality of seagrasses has resulted from a combination of changes in ambient conditions and the susceptibility of seagrasses to increased organic loadings from domestic, industrial and agricultural wastes. Many countries with coral reef ecosystems have limited trained staff and/or the capacity to apply scientific management principles to protect their reefs. At the same time, coral reef research has not always provided information useful to managers or policy makers as they endeavour to take timely action.

Reports on the two-year old International Coral Reef Initiative (ICRI) provided a positive focus on the actions necessary to reverse this worrying trend. This informal world network of United Nations programs, regional organisations, multilateral lending institutions and non-government organisations (NGOs), who have pledged support for strong regional partnerships, continues to grow through ICRI workshops and other activities.

Dr John Ogden, president of the International Coral Reef Committee, said in his keynote address, 'political indifference is the primary reason preventing countries from effectively protecting and managing their coral reefs... marine parks and reserves are a good first step, but the marine environment must be managed as a total ecosystem which is heavily influenced by human activity along the coastal zone'.

While Australia continues to enjoy an international reputation as a world leader in coral reef science and management we must not become complacent. Regional partnerships between government agencies, scientific institutions, NGOs and user groups – such as those developed by Australia's 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area and the CRC Reef Research Centre – certainly emerged as the preferred management model for better understanding and conserving the world's coral reefs.

Summarising how science can help produce data for long-term marine management, Dr Ogden claimed coral reef scientists are being overwhelmed by demands for information from coastal management agencies.

'Environmental problems on coral reefs throughout the world, caused by overfishing, coastal pollution, eutrophication, erosion and urban development cannot be solved by good science and technology alone. They are predominantly social problems requiring political solutions,' he said.

One interesting observation was the noticeable lack of socioeconomic research presentations about coral reefs during the symposium. This is one area the CRC Reef Research Centre is trying to enhance as part of its applied research program over the next few years. It seems understanding and managing people – their habits, traditions, expectations and needs – is often more important for coral reefs than understanding the natural processes of reefs.

At the end of the symposium, more than 1200 participants signed a pledge to support the International Year of the Reef in 1997, a global effort to protect reefs through research, education and conservation. During 1997, International Year of the Reef programs will take place around the world – mostly projects initiated at the local level – including research to assess the condition of coral reef sites from the Bahamas to the Philippines, and educational programs using schools, public aquariums, television, radio and the World Wide Web to inform the public about our valuable coral reefs.

It's now up to us to continue leading innovative research, education and sustainable use activities for the Great Barrier Reef World Heritage Area.

Let's keep it Great.

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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