NEWSLETTER OF THE RESEARCH AND MONITORING SECTION

REEF RESEARCH

Great Barrier Reef Marine Park Authority

VOLUME 1- No.2 DECEMBER 1991

EDITORIAL

The Great Barrier Reef region is arguably the most extensive and pristine coral reef system in the world. As such it provides, paradoxically perhaps, an ideal environment for scientific study of the various factors that tend to degrade the quality of the system. These factors range from those that are totally beyond the control of managers such as cyclones through to those that are entirely of anthropogenic origin such as the building of structures on the reef.

This issue of Reef Research examines a number of topics specifically related to the degradation of the Great Barrier Reef and the work that is being done to investigate, monitor and, in some cases, mitigate against impacts. Some of the causes of impacts such as crown-of-thorns starfish are of great complexity, are on large spatial and temporal scales and will require decades of multidisciplinary effort if the processes are to be understood. On the other hand, small scale impacts of the type caused by tourist pontoons, for example, are relatively straightforward to investigate.

While the imposition of minimal impacts to enhance people's appreciation of the reef environment is generally easily justified there are other human uses of the region that are cause for greater concern. One of these activities is the use of the sea for the dumping of waste materials and a case study is described in the following pages.

It should be borne in mind that for a very large number of people who view the reef the small scale effects that they see will largely affect their appreciation of the region as a whole. Therefore it is important that areas of heavy tourist use and localised effects are monitored even though the effects may be slight in a reef wide, ecological sense.

The monitoring of impacts on such a large system is a mammoth task and will need to continue for many years on a variety of temporal and spatial scales. This can only occur with continuing support and commitment at a government level and this is dependent upon support from the wider community both nationally and internationally.

Ed

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Readers are invited to submit material for publication, inclusion is the decision of the Editor, all contributions or inquiries should be addressed to:

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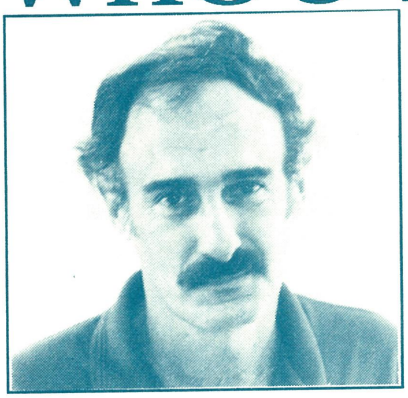
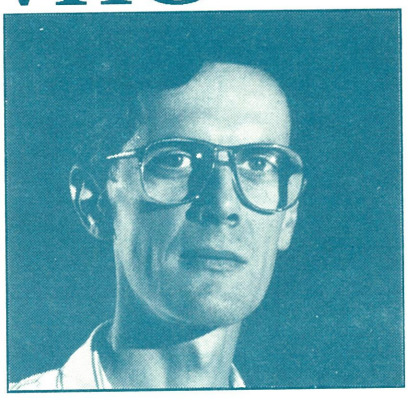
WHAT'S IN THIS ISSUE

WHO'S WHO



Jon Brodie

Jon Brodie has been with GBRMPA for eighteen months and prior to that worked at James Cook University and at the University of the South Pacific, Fiji. He is now second-in-charge of the Research & Monitoring Section and coordinator of the Water Quality Program. He has considerable experience in environmental analytical chemistry, marine environmental monitoring programs and international institutional arrangements in the marine environment.



David Lawrence

David graduated from James Cook University with a doctorate in material anthropology in 1989. The subject of the doctoral research program was the customary economic relations between the Torres Strait Islanders and the coastal Papuan people of the Fly estuary and the southwestern coast of Papua New Guinea. Additional qualifications include an Arts degree in Asian history and languages, a masters degree in political science, and professional library and museum qualifications. David commenced with GBRMPA in 1988 and was the Authority's librarian and editor of the REEF database until 1990. Currently he is coordinator of the Torres Strait baseline study. David also has long term research interests in the Western Province of Papua New Guinea and has keen interests in indigenous rights, subsistence economic strategies and customary trade in small scale societies in Melanesia.

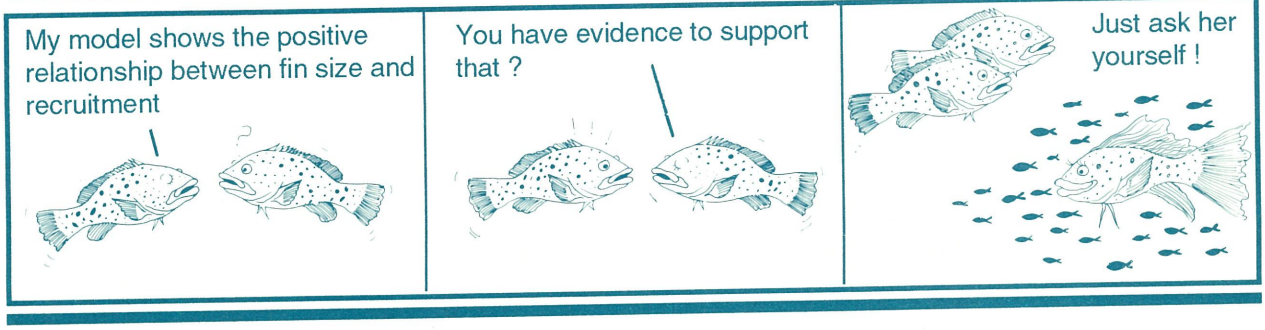
NEW SECTION STAFF

Andy Steven - *Assistant Project Officer - Water Quality Program*

Richard Schneider - *Assistant Project Officer - Monitoring*

John Robertson - *Assistant Project Officer - Monitoring*

Coralations **Stock Assessment Simplified** **Pongase**



MONITORING OF DREDGE SPOIL DISPOSAL IN THE GREAT BARRIER REEF REGION

- A CASE STUDY

Steve Raaymakers

A significant feature of the Queensland coast is a lack of deep natural harbours. As a result all the major Queensland ports are located at the mouths of rivers or inlets with access from the sea across the shallow coastal "shelf" via dredged channels. Due to ongoing siltation these channels and the ports themselves require annual dredging in order to maintain navigable depth. The dredge spoil is typically disposed of by dumping at sea.

This dumping is regulated by the *Environment Protection (Sea Dumping) Act 1981* with conditions requiring monitoring of environmental impacts usually attached to the Sea Dumping Permit. The Research and Monitoring Section of GBRMPA plays a significant role in the monitoring of dredge spoil disposal in the Reef Region. This role is discussed below in a summary of the Section's involvement in the monitoring of dredge spoil disposal by the Townsville Port Authority.

DREDGING ACTIVITIES

The Port of Townsville dredges between three and five hundred thousand tonnes of sediment from the port and port entrance channel (Platypus Channel) every year. This is carried out primarily by a trailer suction dredge and a smaller grab dredge and dumb barge. The dredge spoil is dumped at an offshore dump site between Cape Cleveland and Orchard Rocks by the trailer suction dredge and at an inshore dump site about three kilometres off the mouth of Ross River by the dumb barge.

ENVIRONMENTAL CONCERNS

The effects of increased sedimentation and turbidity on coral reefs have been relatively well documented and are generally adverse. Significant fringing reefs exist along the south east coast of Magnetic Island and may be impacted by increased sedimentation and turbidity generated by the dredging and dumping operations. Also, increased turbidity and settlement of soft muds can impact on the amenity of Townsville beaches as well as those of Magnetic Island. Often material dredged from ports can contain various chemicals and heavy metals which may be released into the marine environment during dredging and dumping or distributed by mobilisation of sediment particles.

PERMITS AND MONITORING REQUIREMENTS

The Townsville Port Authority is required to obtain an annual Sea Dumping Permit from the Commonwealth Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT) in order to dump their dredge spoil at sea each year. As the Cleveland Bay dump sites are outside of the Great Barrier Reef Marine Park GBRMPA has no direct jurisdiction over the dumping activities. GBRMPA does however act as an adviser to, and agent of, DASETT and the Research and Monitoring Section has been strongly involved in the design and development of environmental monitoring programs associated with the

dumping. It also acts as the Project Manager on behalf of the Townsville Port Authority.

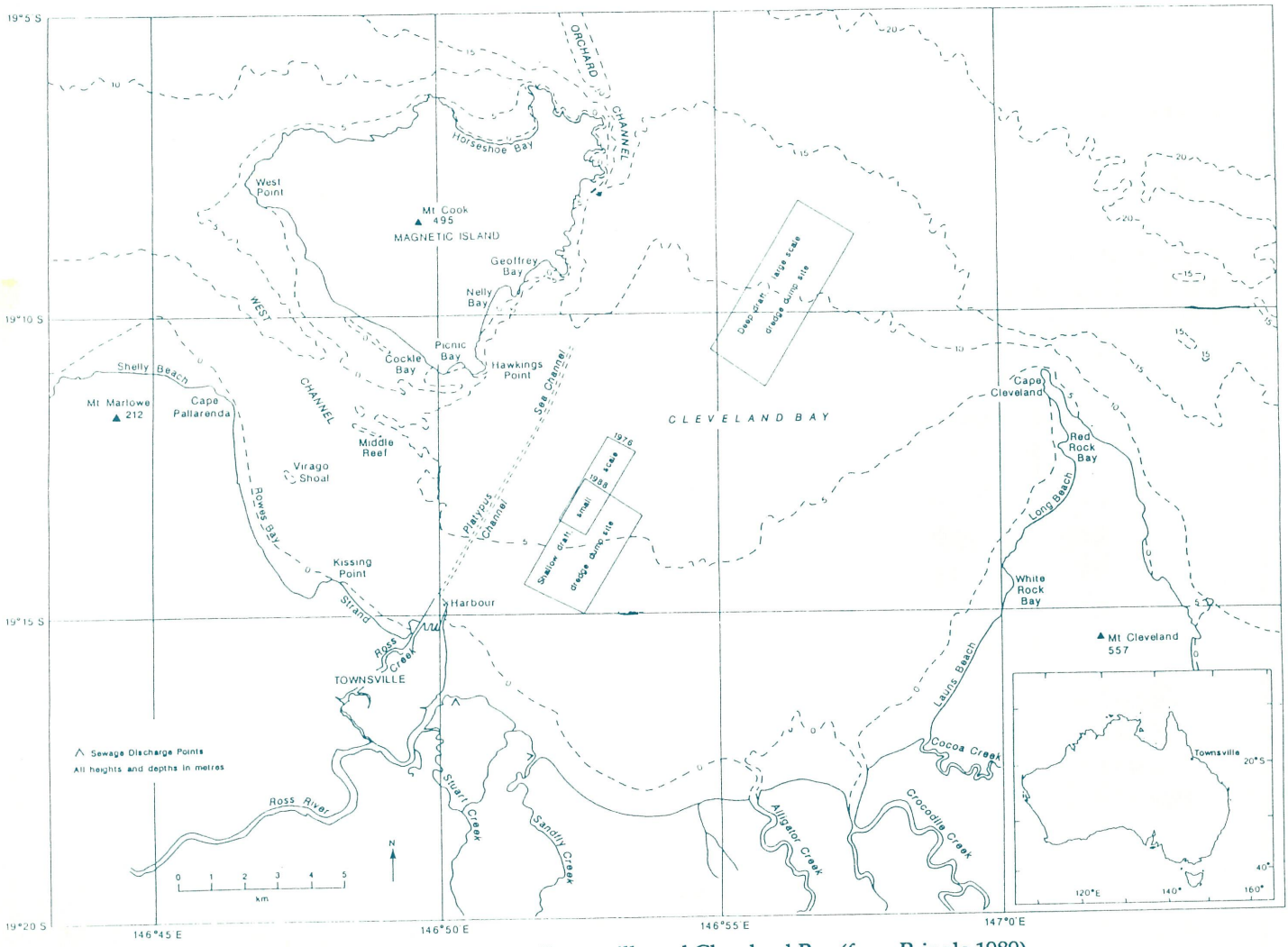
RECENT MONITORING

In 1990 the Townsville Port Authority contracted a joint team of oceanographers and sedimentologists from the Australian Institute of Marine Science and the James Cook University to carry out the monitoring studies required by the Sea Dumping Permit. The study was titled "Water Circulation and the Fate of Dredge Spoil, Cleveland Bay, Townsville" and the objective was to determine whether material moved away from the offshore dump site both during and after dumping, and if it did, where it moved to, with a view to determining the potential for impact on the fringing reefs of Magnetic Island and other sensitive sites in Cleveland Bay. The study consisted of three main components:

1. running of a hydrodynamic model to simulate water circulation in Cleveland Bay and thus likely movement of dumped spoil,
2. collection of wave, wind and current data to verify the model `and give an indication of physical parameters affecting spoil movement, and
3. monitoring of the movement of high density fluid-mud layers away from the dump site across the sea bed using nephelometers. All field work was completed by the end of 1990 and the draft final report is currently under review.

CURRENT STUDIES

As mentioned above dredge spoil contaminated with chemicals and heavy metals can pose environmental problems. The Port of Townsville handles significant shipments of nickel, copper, zinc and lead in various forms. Detailed analyses of the material to be dredged must be provided to DASETT each year in the Sea Dumping Permit application to allow assessment of the suitability of the material for disposal at sea. Material from around the nickel ore unloading berth has been found to contain elevated levels of nickel and therefore is disposed of into a bunded reclamation area rather than dumped at sea.



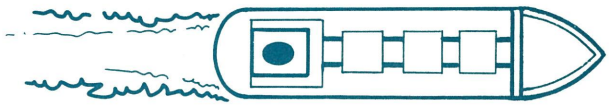
Location map of Townsville and Cleveland Bay (from Pringle 1989)

As part of ongoing monitoring the Townsville Port Authority is funding James Cook University to carry out a study of the distribution of heavy metals throughout Cleveland Bay. Sampling sites are located in the port itself, along the shipping channel, at the dump sites and along the reefs of Magnetic Island, with controls in Bowling Green Bay and at Orpheus Island. Due to the possibility that any observed elevated levels of heavy metals may not necessarily come from port operations, the Townsville City Council have also undertaken to contribute funding to the study with sampling occuring off the Council's sewage outlet at Sandfly Creek. As with other DASETT required sea dumping monitoring this project is also managed by GBRMPA Research and Monitoring staff on behalf of the Port Authority and City Council. With the first report due in March 1992 management will then have a more comprehensive data set on heavy metals in Cleveland Bay for use in developing management decisions.

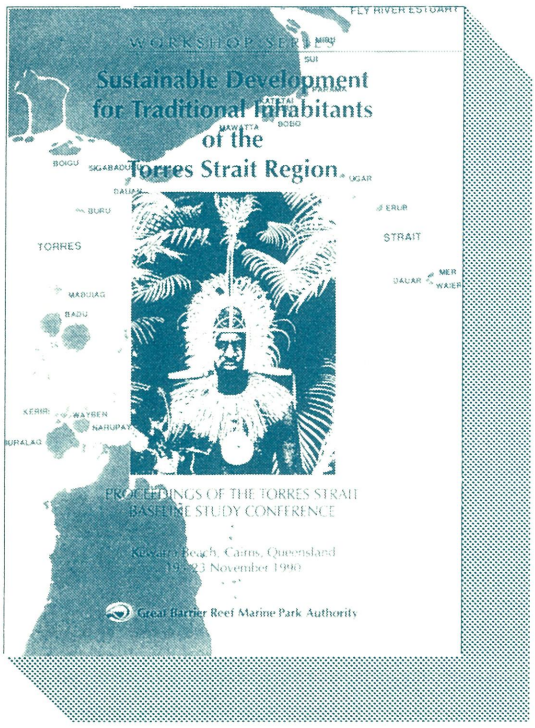
MANAGEMENT ACTION

The suitability of the Townsville offshore spoil dump site in relation to possible environmental impacts has been under question for some time and the final results of the monitoring will enable a clearer assessment of its suitability for further dumping in the future. As a follow-on the Townsville Port Authority is now required to carry out a comprehensive study of all possible dredge spoil disposal options in order to develop a long term strategy using the most environmentally acceptable spoil disposal sites and methods. Options to be investigated include moving the dump site further offshore out of Cleveland Bay away from sensitive sites, and terrestrial disposal into a bunded reclamation area to create land for port development.

The involvement of GBRMPA Research and Monitoring in the monitoring of dredge spoil disposal in Cleveland Bay demonstrates an important function of the Section; that is to design, develop and manage monitoring programs in order to provide information for management action.



TORRES STRAIT BASELINE STUDY

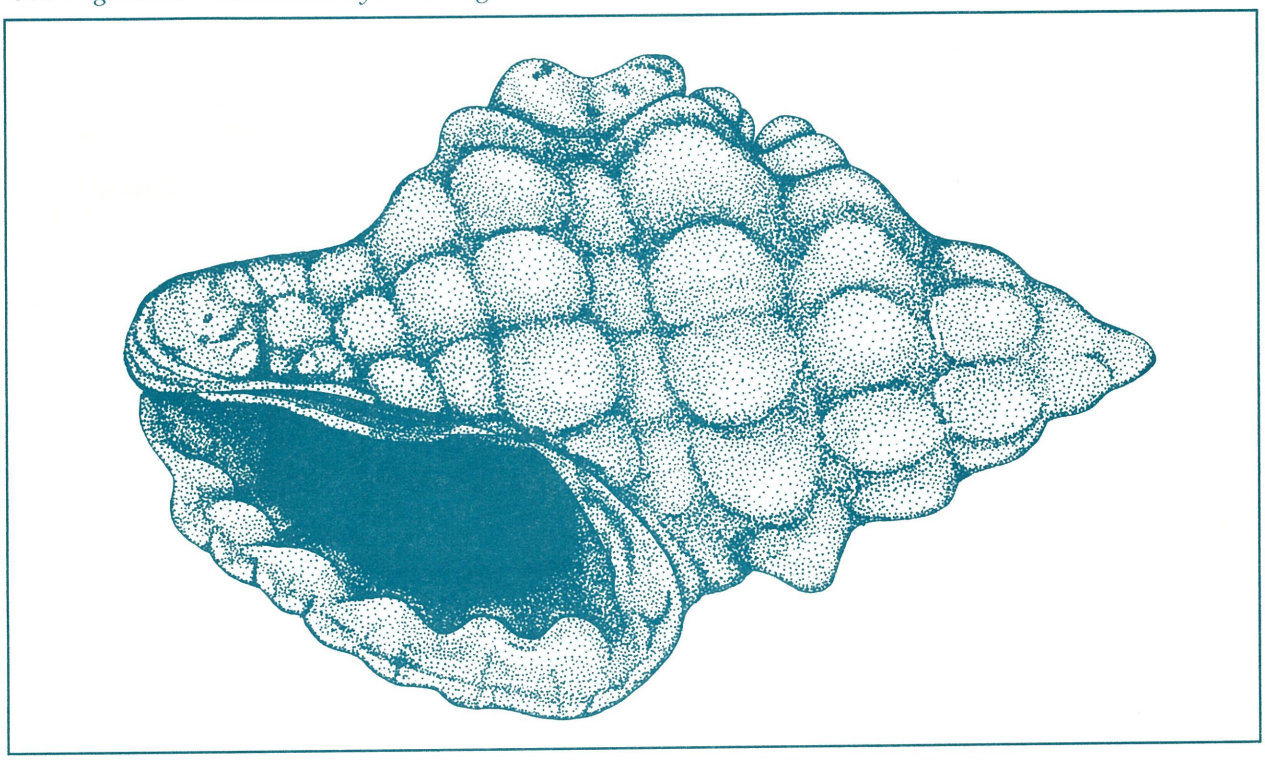


The proceedings of the Torres Strait Baseline Study conference, held in November 1990, have now been published by the Authority. The 41 papers published in the proceedings volume have been divided into three sections; Biological Environment, Physical Environment and Human Environment. Papers were presented on a variety of topics all relevant to current research in the Torres Strait region. The baseline study was instigated in response to concerns expressed about possible effects of mining operations in the Fly River Region on the Torres Strait marine environment. (See Reef Research Sept 1991) The proceedings will therefore be relevant to anyone interested in understanding complex environmental, biological and physical factors which impact on Torres Strait. The Torres Strait is an interesting and unusual place as well as being the meeting place of a number of cultural groups and consequently social & cultural issues are also addressed.

Copies of the publication may be obtained from the Coordinator of the study, Dr David Lawrence (077-818868).

CORALLIVOROUS GASTROPODS OF THE GREAT BARRIER REEF

Udo Engelhardt Illustrations by Doris Engelhardt.



Corallivorous gastropods have caused extensive damage to the coral communities of some reef systems in the Indo-Pacific Region. Large, destructive numbers of these coral-eating snails have been recorded on the reefs of Miyake-Jima in southern Japan, Mactan Island in the Philippines and at Enewetak Atoll in the Marshall Islands. However, the most dramatic and extensive damage observed to date has occurred off the coast of Western Australia, where large numbers of the muricid gastropod *Drupella cornus* have been responsible for the widespread and severe denudation of reefs in the Ningaloo Marine Park. Surveys by Dr Tony Ayling (SEA RESEARCH) and the West Australian Department of Conservation and Land Management in 1987 and 1989 have demonstrated widespread mass mortality of corals in the affected areas. In some parts of the reef the corals were completely destroyed, while most areas experienced a 60% to 70% reduction in coral cover.

The corallivorous gastropods of the genus *Drupella* feed on their coral prey by rasping off tissue with their highly specialized radular 'tongue'. Microscopic examination of the dead coral skeletons reveals a characteristic damage pattern resulting from this particular type of feeding. At a macro-scale, entire coral colonies often show highly distinct feeding scars which are easily distinguishable from those left behind by other coral predators such as the crown-of-thorns starfish (*Acanthaster planci*). Typically, an obvious white line separates the living from the already dead part of the coral colony. This white line represents the most recent feeding scar. Dead coral skeletons are quickly covered by algal growth.

Corallivorous *Drupella* exhibit a pronounced feeding selectivity, with the fast growing corals of the genera *Acropora, Montipora* as well as most pocilloporids being preferred over massive-type corals such as favids and poritids. Feeding is commonly nocturnal with a more cryptic behaviour being displayed during the day when aggregations of the snails can be found at the base of the coral colony or hidden deep between its branches. Both the cryptic behaviour during daytime and the fact that snail densities are often highest in shallow, back-reef areas probably reflect responses to predation pressure,

particularly by invertebrate-feeding fishes.

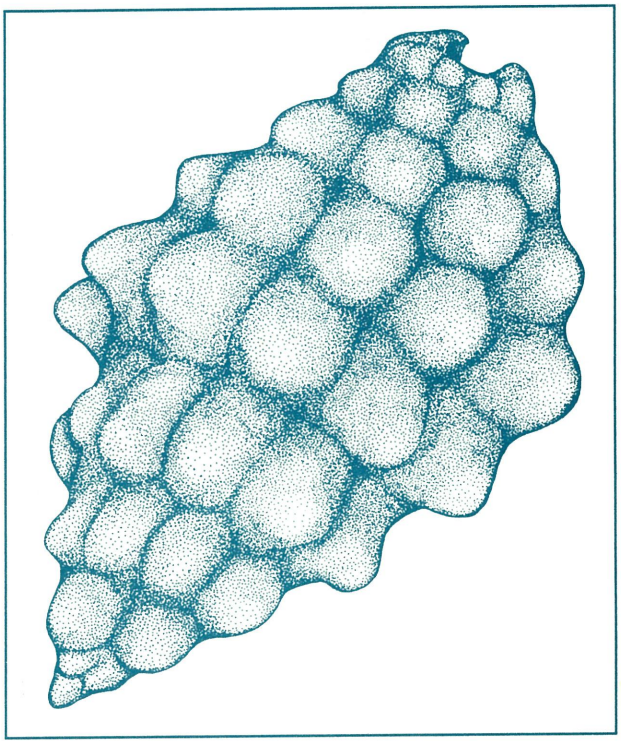
Although many muricid gastropods are obligate coral feeders, other trophic types are also well represented in this group of molluscs. Several different species of generally similar appearance may be found occupying the spaces between coral branches, some of which are likely to be algal rather than coral 'grazers'. Correctly identifying the many species in this assemblage is often extremely difficult and detailed examination in the laboratory may be required.

Recent surveys conducted in the Cairns Section of the Great Barrier Reef Marine Park have provided some information on the abundance of corallivorous gastropods and their effects on the coral communities. Based on his latest survey Dr Tony Ayling estimates that up to 26% of all damaged coral colonies observed showed signs of predation by corallivorous gastropods. A previous survey of reefs in the same Section found an average density of 3 actively grazed colonies per 10 square metres of reef. However, more extensive damage was recorded on some reefs, namely Davie Reef off Princess Charlotte Bay and in some areas around Lizard Island. *Drupella rugosa* was identified as being the dominant species of corallivorous gastropod on the Great Barrier Reef. The much larger *Drupella cornus* was also recorded with possibly several other species complementing what appears to be a relatively diverse assemblage of gastropods.

Results available to date indicate that corallivorous gastropods are often an abundant and important part of the benthic reef communities of the Great Barrier Reef. At this point in time there is no indication that the Great Barrier Reef is threatened by a large-scale outbreak of corallivorous gastropods, similar to the one observed in Western Australia.

Our knowledge, however, of the biology and ecology of corallivorous gastropods is sketchy and a number of Australian scientists are currently trying to answer some of the important questions. In Western Australia, the Department of Conservation and Land Management, as well as the local universities, are conducting research into the genetics, reproduction and growth of *Drupella cornus*. The corallivorous gastropods of the Great Barrier Reef are being studied by researchers at James Cook University in Townsville. Ms Robyn Cumming is investigating gastropod assemblages associated with corals, while Mr Angus Thompson is conducting a study into aspects of feeding of these corallivores. The Great Barrier Reef Marine Park Authority has provided Mr Thompson with financial assistance through its Augmentative Grants Scheme.

There is a clear need for more research and comprehensive surveys to establish the extent of the problem on the Great Barrier Reef. The



findings of these research projects will hopefully provide the Great Barrier Reef Marine Park Authority with important information needed for the management of the Marine Park.

Additional information on the corallivorous gastropods of the Great Barrier Reef can be obtained by contacting the Research & Monitoring Section of the Great Barrier Reef Marine Park Authority.

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PONTOONS

KEEPING THE TOURIST INDUSTRY AFLOAT.

Rick Schneider

Since the installation and operation of the first tourist pontoon on John Brewer Reef in 1983, pontoons have proved a popular option with developers and currently represent the most widespread "on-reef" developments. Pontoons are a major feature of tourist usage on the GBR and use of them is likely to continue into the future. In order to correctly manage the marine park and assess permit applications it is important that GBRMPA should understand the impacts associated with their use and develop methods to minimise these impacts.

The popularity of pontoons is not surprising given the wide range of facilities available to reef visitors at them. A typical pontoon facility operates as a base for day trip passengers from which they can view the reef, go snorkelling and diving, observe fish from underwater observatories and go out on trips in semi-submersible or glass bottomed craft. These various facilities coupled with the increased accessibility of the reef from pontoons combine to provide the reef visitor with a more intimate reef experience than could be achieved from a boat based reef trip.

PREDICTED IMPACTS OF PONTOONS

Possible impacts to the reef environment from the establishment and operation of a pontoon facility can be grouped into four general categories:

1) Impacts associated with the placement of the pontoon and its moorings:
   a) Establishment of the moorings. Anchors, mooring blocks and auger "screw- in" moorings are all possible mooring options which may be employed.
   b) Placement of the anchor chains can cause damage to coral and other benthos.
   c) Manoeuvring the pontoon prior to placement of the pontoon can result in coral bumping. Additionally, prop wash from tugs may stir up sediment and deposit it on reefs.

2) Direct physical impacts of the pontoon
   a) Anchor chain abrasion. Slack generated in the anchoring chains at low tide will allow them to swing, destroying corals and other benthos in their path.
   b) Dragging of the entire anchoring system causing damage to benthic communities.

3) Other influences of the pontoon:
   a) Effects of light shading on the coral and other benthic communities. Although the most intense impacts are expected directly underneath the pontoon, the changing angle of the incident sun and the lateral movement of the pontoon will shade peripheral areas resulting in impact to a larger area than that of the pontoon itself.
   b) Attraction of fish through surface encrustation, algal growth on the pontoon and its inherent action as a Fish Attraction Device.
   c) Sedimentation. The restriction of flow beneath the pontoon and the introduction of particles from roosting sea-birds and fish feeding may cause higher sedimentation levels in the vicinity of the pontoon.
   d) Introduction of anti-foulants and other materials from the support vessel.
   e) Nesting of sea-birds on the pontoon may elevate nutrient levels.
   f) Bumping of semi-submersible craft or glass bottomed boats may cause coral damage.

4) Tourist activity on the pontoons:
   a) Fish feeding to attract fish for tourists to view from observatories.
   b) Fin damage. Snorkellers, swimmers and divers may cause coral damage with their fins while swimming or by standing on coral to rest.
   c) General pollution. This would be expected to have a number of components but could include; glass and metals from bottles and cans, urine, sunscreens and food scraps.

STEPS TAKEN TO MINIMISE IMPACTS

Recently, permit assessment requirements for pontoons have been revised by the GBRMPA's Environmental Impact Management Section to provide a framework for impact assessment and monitoring of pontoons on a biological, engineering and socio-economic level.

Many of the impacts outlined above can be minimised through environmentally sensitive siting, although there is usually some trade off involved as pontoons must be situated close to reefs in order to fulfil their function. The use of an Environmental Supervisor (as is now required as part of the pontoon's permit conditions) during the siting operation has been shown to have a clear effect on minimising installation impacts. On a day to day basis, good management practice and the education of reef users can reduce impacts.

MONITORING

If the impact cannot be eliminated or minimised to acceptable levels then a monitoring program is required. Current monitoring programs are designed to:

a) Ensure predicted impacts do not exceed permitted levels.
b) Test the accuracy of predictions of the impacts.

FINDINGS OF PREVIOUS MONITORING STUDIES

The monitoring studies which have been done to date show that the major impacts associated with pontoon operations are:

a) The anchor and chain movement. Chain movement in particular is a common feature of pontoon operation.
b) The shading effect. Decreases in live coral cover and possible changes to community structure have occurred in some instances.
c) The attraction of fish (principally through fish feeding). This has occurred at all monitored sites although the extent and nature of attracted fish has varied. This attraction has several components, daily migrants and new residents as well as a both grazing fish and predators are attracted to the pontoon. These attracted fish disrupt local community structure and may, through their depletion from surrounding areas, affect community structure on a wide-scale.
d) Fin Damage. Damage by snorkellers, divers and swimmers has consistently been observed and may be a problem at some sites.

While the above effects have been monitored at appreciable levels at all sites, their extent has varied. This has also been the case with other predicted impacts, some of which have occurred at perhaps deleterious levels at some reefs but have been negligible at others. Thus there is a degree of variability in the responses to pontoons at different sites.

THE FUTURE

Monitoring requirements and procedures for pontoons have evolved as awareness of the extent and nature of impacts has grown. Since the commencement of pontoon monitoring studies, methodologies and analysis techniques have improved. The effect of pontoons, particularly on fish populations, are highly site dependant, and the extent and nature of the impact will differ at each site. Currently monitoring is based around the possible impacts identified prior to installation. However, as more information on predicted and actual impacts is obtained from ongoing monitoring programs, the Authority will alter the scope and intensity of its monitoring requirements as needed. This process of "continuous review" will ensure that monitoring is maintained at the most appropriate level.

COTS

NEW PROJECTS IN THE CROWN-OF-THORNS STARFISH RESEARCH PROGRAM

COTS

Dr William Gladstone

An overview of the COTS program was given last issue and details of some of the new projects commencing this year are:

HYDRODYNAMIC MODEL TESTING

An oceanographic model to explain the spread of crown-of-thorns starfish (*Acanthaster planci*) outbreaks was developed by researchers from James Cook University (JCU) (Ian Dight, Maurice James and Lance Bode) in the current crown-of-thorns starfish research program. The so-called 'sink-source' model predicts patterns of connectivity among reefs based on larval transport by currents.

Some of the predictions of the sink-source model will be tested by Dr John Benzie of Australian Institute of Marine Science (AIMS) using estimates of gene flow among reefs. Theoretically, the degree of genetic homogeneity among populations on sink and source reefs should be higher than for less well connected populations.

Gene frequencies will be estimated from either protein electrophoresis or mitochondrial DNA (mDNA). Crown-of-thorns starfish have proved difficult animals for mDNA techniques so John will use the blue starfish *Linckia* as a model for crown-of-thorns starfish. *Linckia* has a similar larval duration and morphology as *A. planci* and so should be an adequate model.

Some of the questions to be addressed are:

(1) Are some reefs more closely connected biologically than others?

(2) Are sets of closely connected reefs highly or completely isolated from other such sets implying they be treated as separate systems, or is there sufficient gene flow implying reasonable biological exchange among such sets to allow them to be treated as one larger system for management purposes?

(3) To what extent do present oceanographic processes control the biological relationships among reefs?

STARFISH LARVAE: IDENTIFICATION AND CAPTURE

The ecology of the very early life history of *A. planci*, from their time as planktonic larvae to settlement, is important in understanding the spread and causes of outbreaks. Progress in this area has been hindered by difficulties in collecting larvae or newly settled starfish, and their identification since most starfish larvae look similar.

The objectives of Ms Katrina Roper's (Zoology, JCU, in collaboration with Deakin University)

PhD research are:

(1) to further the cross-screening of existing monoclonal antibodies and to develop more monoclonal antibodies against several species of starfish as a method of identifying the larvae

(2) to develop and trial methods of collecting plankton samples in and around reef systems with the aim of obtaining 'wild' asteroid larvae

(3) to use the collection devices in conjunction with a specific identification system to study the temporal and spatial dispersal patterns of COTS.

In his recent review of the COTS research program Dr Bob Johannes (CSIRO) highlighted the potential for techniques developed in this project to contribute to many other areas of marine research such as fisheries population biology.

THE MOVEMENT OF ACTUAL STARFISH OUTBREAKS DURING THE 1980's - UNIFICATION OF THE OCEANOGRAPHY AND BIOLOGY

Dr Kerry Black's (Victorian Institute of Marine Science) research in the COTS research program has been concerned with explaining the spread of outbreaks. He has conducted field experiments on circulation around individual reefs and developed validated numerical simulations of circulation, dispersal and retention cells around clusters of reefs. He has also hindcast, using tidal constants, longshore currents in the central GBR for the last 25 years.

Kerry is now combining this data with data collected and analyzed by Dr Peter Moran (AIMS) and Mr Glenn De'Ath (JCU) on the locations, intensity, and spread of movement of *A. planci* outbreaks during the 1980's.

The aim of the project is to model the movement of COTS outbreak migration during the 1980's in the Cairns and Central Sections of the Great Barrier Reef Marine Park using computer simulations of larval dispersal driven by real winds and currents.

ASSESSING THE ROLE OF DISSOLVED ORGANIC MATTER AND BACTERIA IN THE NUTRITION AND ENERGETICS OF *Acanthaster planci* LARVAE

A. planci outbreaks could be the result of massive settlement events following improved larval survival. Increased food availability (in the form of Dissolved Organic Matter (DOM), bacteria, or phytoplankon) resulting from enrichment of reef waters by nitrogen, phosphorus and organic compounds is a possible mechanism.

The objective of this project is to evaluate the importance of DOM and bacteria as nutritional sources for *A. planci* larvae. The research will be undertaken by T Ayukai (AIMS), O Hoegh-Guldberg (University of Southern California, University of Sydney from 1992) and J Welborn (University of Southern California). They plan to measure DOM uptake, bacterivory and energy requirements of *A. planci* larvae and ambient levels of DOM and bacteria.

The study will be done in five parts:

(1) DOM uptake by *A. planci* larvae

(2) Bacterivory by *A. planci* larvae

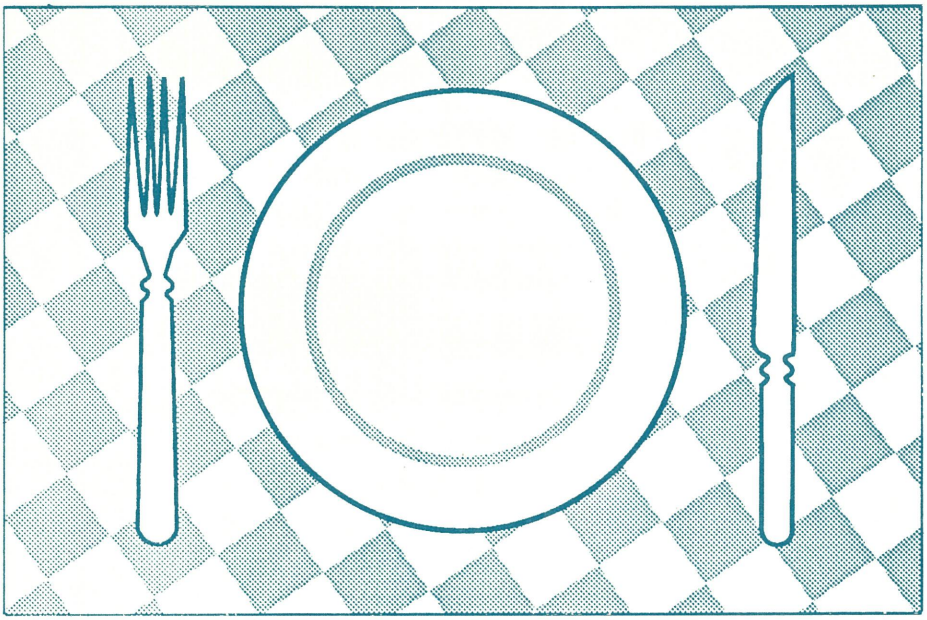
(3) Energy requirements of *A. planci* larvae

(4) Cross-shelf variation in DOM levels

(5) Cross-shelf variation in bacterial abundance

PhD research by Mr Ken Okaji (AIMS) on nutrition of the early life stages of *A. planci* is also being funded; details of the project will be given in a future issue of Reef Research.

A SHORT COMMUNICATION



EPICURIAN CORALS

A.D. Pongase

In April 1991 two of the Section's researchers, Steve H and Steve R, set off on an adventure to the alleged global epicentre of coral reef evolution (the Republic of the Philippines) to participate in a collaborative research effort looking at, among other things, the feeding behaviour of fungiid corals.

Upon arrival in Manila the two Steves joined forces with Jay Maclean of ICLARM and settled into the research base at the Maclean headquarters in Valle Verde.

No time was wasted in getting the experiments up and running, and the three researchers were soon crouched vigilantly in front of the specimen tanks, little brown bottles in hand, proffering a smorgasboard of tasty morsals such as prawn, carrot, lettuce and capsicum to the tentaculated mouths of the monopolyp fungiids.

It soon became apparent that these little corals' mums had versed them well in the importance of greens to a balanced diet, as articulate tentacles hardly hesitated to manoeuvre pieces of prawn, lettuce and carrot into hungry mouths! Capsicum was, however, rejected.

Amazed at their incredible discovery, and checking the number of little brown bottles accumulating next to the specimen tank to ensure that they were not seeing things, the researchers determined that it was necessary to scientifically verify their findings in the field, in case the vegetarian habits of the captive corals were simply the result of a personal identity crisis from being kept in a tank. An expedition was therefore mounted to the Batangas coast where fungiids were known to abound.

Unfortunately no fungiids in feeding mode were encountered, and it could only be assumed that their mum's had not told them about how important it was to eat carrot if you wanted curly tentacles.

However it was agreed that further research was warranted, and a proposal is being drafted to enable the two Steves to return to the research area and continue their important work. Given the vital management implications of the preliminary findings - carrot eating corals could play a vital role in the biodegradation of the ubiquitous diced carrot associated with tourist vessels in the Great Barrier Reef Marine Park - it seems likely that funding will be approved.