

## Crown-of-thorns RIP?

"But when the ... threat receded, "the member nations cut back on funding, international support tailed off, and the organization lost efficiency. Now they are so far down in personnel and equipment that it will take a while to get them back to the point where they can do an effective job." ... Not only has the diversion of attention and resources from the ... agencies left them short of vehicles, aircraft, equipment and supplies, but there has been a loss of expertise ... The issue is a much harder one to decide than what to do when a disaster occurs, and it poses a typical dilemma in development. Does the cost of maintaining an effective ... organization outweigh the risks of being unprepared for the next serious outbreak?" (Walsh 1986)

Does this situation sound familiar? The above quotes were used to describe a lack of readiness for anticipated locust outbreaks in Africa following a 20 year lull in the insect's cycles. The author went on to say that because of a long stretch of dry years which prevented serious locust outbreaks "Local control organizations in the region have lost their operational edge and research on the insects has lagged. Insecticides used in the past have been indicted as unsafe and alternatives have not been tested in Africa for effectiveness and safety."

Crown-of-thorns starfish numbers appear to be entering a similar worldwide recession. Surveys of the Great Barrier Reef over the last 12 months indicate about 3% of reefs are currently affected (compared with a peak of 16% in 1988/89). International reports of outbreaks appear to be limited to areas of Western Samoa, the Maldives, Vanuatu and New Caledonia (please let me know if you're aware of any others).

With the immediacy of problems removed, attention and resources are diverted elsewhere. A combination of declining starfish numbers on atolls where tourism is allowed and increasing awareness of other environmental pressures has resulted in the demise of the Maldives Ministry of Fisheries and Agriculture "COT Newsletter". The last issue (No. 16) was devoted to rubbish and

anchor damage. In his review of the GBRMPA's COTS research program last year, Dr Robert Johannes noted "one does not disband the army when the current war is over". Let's hope that the end of the "COTS Newsletter" is not symptomatic of a worldwide disbanding of the "COTS army".

### References

Johannes, RE (1991) A review of the crown-of-thorns starfish research program 1989-1991. Report to the Great Barrier Reef Marine Park Authority, April 1991.

Walsh, J (1986) Return of the locust: A cloud over Africa. *Science* 234(1): 17-19.

## 7th International Coral Reef Symposium

The 7th International Coral Reef Symposium to be held in Guam in June is likely to be the last ICRS (for some time) to have a session devoted to *Acanthaster planci*. Dr Peter Moran of the Australian Institute of Marine Science is organising the session which will include the following presentations:

De'Ath, G. and P. Moran: A summary of ecological data on the crown-of-thorns starfish.

Yokochi, H., S. Ueno, M. Ogura, A. Nagai and T. Habe: Changes of diel feeding pattern with population density and food availability for *Acanthaster planci* (L.): an experimental view.

Stump, R.J.W.: Age and growth of *Acanthaster planci* (L.) from the Great Barrier Reef, Australia.

Fagerstrom, J.A.: Impact and recovery of reefs from an *Acanthaster planci* outbreak, Moorea, French Polynesia.

Mezaki, S.: Changing environments of coral reefs after infestations by *Acanthaster planci* in the Ryukyu Islands, Japan.

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25 MAY 1992

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Keesing, J.K.: Role of *Acanthaster planci* in structuring reef communities in Okinawa, Japan.

Bradbury, R.H., R.M. Seymour and P.L. Antonelli: Is the Great Barrier Reef ecologically sustainable?

Fernandes, L., P.J. Moran and H. Marsh: A system for classifying outbreaks of crown-of-thorns starfish as a basis for management.

Lassig, B., W. Gladstone, P. Moran and U. Engelhardt: A crown-of-thorns starfish contingency plan.

The high proportion of Australian papers is obvious, and probably fairly representative of the concentration of research effort into COTS on the GBR. I'm interested in hearing from COTS researchers outside Australia to even up the balance. Please let me know of your current research so I can publicise it in future COTS COMMS issues and improve our international awareness.

### Operation Deja Vu

I've received very little response (a polite way to say one letter - thanks John, one person can make a difference!!) to my request in COTS COMMS # 8 for comments on what should be done in the event of another COTS outbreak episode on the GBR. The Contingency Plan is drafted and will be presented for discussion at the 7th ICRS, but I'm still very keen to get suggestions for management action (including research) that you feel should be regarded as high priority if outbreaks recur on the Great Barrier Reef (or elsewhere) in the future.

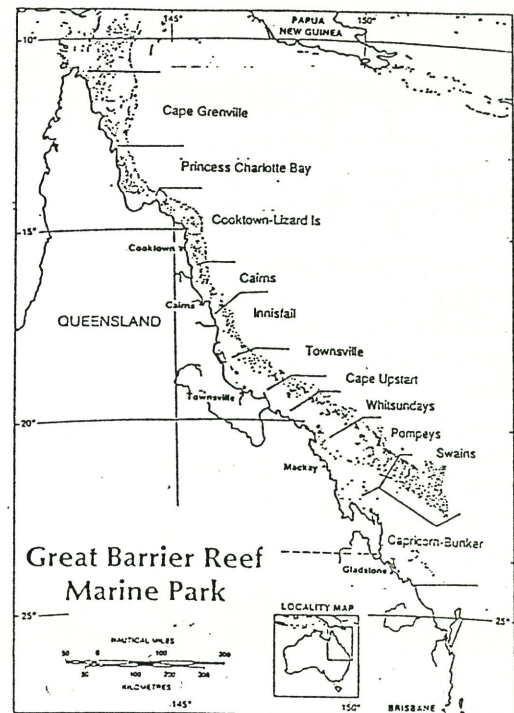
Priorities may vary depending on the interval between outbreaks - so please give some thought to what should be done if outbreaks are detected in say 5-10 years or after 10 years or more.

### Current COTS

Since the last issue of COTS COMMS, the AIMS survey team has visited reefs in the Cape Grenville, Princess Charlotte Bay, Cooktown/Lizard Island, Cairns, Swains and Capricorn/Bunker Sectors.

Seven reefs were surveyed in the Cape Grenville Sector, four for the first time. COTS were observed on three reefs though not in numbers that would be considered outbreaks. All COTS

observed were on the fringing reefs of midshelf continental islands (Sir Charles Hardy, Forbes and Quoin Islands). Coral cover was generally good (31-50%).



Six reefs were surveyed in the Princess Charlotte Bay Sector, two for the first time. Four of the surveyed reefs (No. 12-137, No. 13-124, Blanchard and Clack Reefs) had COTS, but none were considered to be outbreaks. All but one of the observed COTS were on mid-shelf reefs. Coral cover throughout this sector was generally moderate (11-30%), with some reefs showing signs of recovering from cyclone Ivor in 1989.

COTS were observed on six of the 14 reefs surveyed in the Cooktown/Lizard Island Sector, but only in low numbers. The abundance of feeding scars coupled with the cryptic nature of most COTS sighted suggests higher population levels on some reefs including Rosser, Startle, Reef No. 15-047 and perhaps Endeavour. Coral cover was moderate to good (10-50%). *Drupella* were noted in fairly high numbers throughout this sector and were apparently responsible for significant coral damage on some reefs. Black Band Disease was another major cause of coral mortality on three reefs (Rosser, Endeavour and No. 15-070). Both branching and tabulate *Acropora* were affected.

Seven reefs in the Cairns Sector were surveyed. COTS were recorded on only one reef (Hastings).

The degree of scarring however suggests larger numbers of COTS may be present. Coral cover throughout the sector was generally low to moderate (<10-30%), but some reefs had small areas of up to 50% coral cover.

No COTS were observed in the Capricorn/Bunker Sector and coral cover was recorded as good (31-50%). Previous surveys had shown a marked drop in coral cover for this Sector between November 1987 and October 1989 (see Recent Reports). Coral mortality was mainly limited to tabulate *Acropora* spp, but no source of mortality was evident.

Twenty-five reefs were surveyed in the Swain Sector, 15 for the first time. COTS were observed on 15 reefs and the number of outbreaks has increased from previous years, primarily in the northern areas of the Sector. New active outbreaks were observed on Reef No. 21-255 and No. 21-198. Gannet Cay continues to carry an outbreak which was first observed by the AIMS survey team in 1989/90. Despite extensive coral mortality the coral cover remains very high. Coral cover on reefs in the Swains Sector is generally good (31-50%) to very good (51-70%). A recent report from a dive operator in the area suggests that reefs in the Sector have suffered significant damage from cyclone Fran earlier this year.

### Life After COTS?

While there is a reefwide, downward trend in the number of COTS observed, another type of coral predator may be on the increase. High numbers of corallivorous snails (*Drupella*) have been recorded in some parts of the Reef. Recent surveys around Green Island, the Palm Islands off Townsville and in the Whitsunday Region have reported obvious, and in some cases quite significant damage to corals. Could there be yet another potential threat to the reefs of the GBR? This might just be the right time to have a closer look at the other corallivores.

### Recent Reports

Reports of projects funded through the GBRMPA's COTS research program received since the last COTS COMMS issue include:

"Widespread coral mortality on reefs in the Capricornia region of the Great Barrier Reef Marine Park" by IR Miller, AA Thompson, VJ Baker, DK Bass and CA Christie (AIMS)

"Monitoring of recruitment of *Acanthaster planci* and community changes on Suva Reef and adjacent reefs, Se Viti Levu, Fiji Group: 1991 Survey" by L Zann (GBRMPA)

"Modelling approach to hydrodynamics and the large-scale larval dispersal of *Acanthaster planci*" by L Bode, IJ Dight and MK James (James Cook University)

Copies of these reports are available from Mr Udo Engelhardt, Research & Monitoring Section, GBRMPA.

### COTS Workshop

Recognising the end of our current three year COTS research program, GBRMPA staff are organising a workshop to review results and discuss possible future research directions. Proceedings of the workshop "The Possible Causes and Consequences of Outbreaks of the Crown-of-thorns Starfish" will be published by GBRMPA.

Anticipated presentations include:

DOM and COTS larvae (T Ayukai of AIMS)

The role of DOM in the nutrition of the embryos and larvae of *Acanthaster planci* (O Heogh-Guldberg of University of Sydney)

*In situ* rearing of crown-of-thorns larvae (K Okaji of AIMS)

Predation on juvenile COTS (J Keesing of AIMS)

Predation by lethinids on COTS (H Sweatman of James Cook University)

Predation modelling (H McCallum of University of Queensland)

Links to the hydrodynamics - primary outbreaks, initial recruitment and patterns of dispersal (K Black of the Victorian Institute of Marine Sciences)

COTS in the Pacific (L Zann of GBRMPA)

Ageing of starfish (R Stump of James Cook University)

Consequences of outbreaks: relationships between spatial scales of outbreaks and temporal scales of recovery (C Johnson of the University of Queensland)

Scientific visualisation and the large scale population dynamics of *Acanthaster planci* (J Scandol of James Cook University)

Bioerosion of coral skeletons after COTS outbreaks (B Musso of James Cook University)

Coral recovery and unresolved questions about massive corals (T Done of AIMS)

The history and status of control efforts (W Gladstone of GBRMPA)

GBRMPA's philosophy on controlling COTS (G Kelleher of GBRMPA)

The crown-of-thorns starfish contingency plan (B Lassig of GBRMPA)

Papers presented at the previous workshop in May 1991 (Reproduction, Recruitment and Hydrodynamics in the Crown-of-thorns Phenomenon) should appear as a special issue of the Australian Journal of Marine and Freshwater Research before June this year.

### COTS Out of the Blue

In December last year AIMS was notified (and sent a specimen) of *Acanthaster planci* picked up by a trawler working off Night Island in the Far North Section of the Great Barrier Reef. The bottom was muddy and 20m deep. A lost COT or more fuel to the debate of the ability of COTS to move across inter-reefal areas in search of coral?

### COTS Eradication at Bait Reef

A small-scale eradication program of COTS at Bait Reef was continued in late February 1992. Staff from both the Queensland Department of Environment and Heritage (QDEH) in Airlie Beach and the Great Barrier Reef Marine Park Authority (GBRMPA) spent three days on Bait Reef in an attempt to control starfish numbers within the Special Management Area (SMA) at the southern end of the reef. The majority of COTS were found around a popular dive site - the "Stepping Stones". Using copper-sulfate injections, a total of 262 starfish was killed in this area. Most starfish were between 30 and 50 centimetres in diameter. However, a number of relatively small starfish (< 10 cm) were also recorded. Feeding damage was mainly restricted to extensive *Acropora* thickets located in deeper water (12-15 m) around the back reef slope, with very little damage apparent to massive corals.

The starfish population appears to be relatively large and probably includes a number of different year classes. This would indicate that the 'problem' is likely to persist for a number of years yet.

The Authority's current policy of limited intervention allows for small-scale control efforts in areas of particular importance to tourism or science. Bait Reef certainly qualifies in this respect, with a large number of dive operations frequently using the area. From our efforts it would appear that, to date we have been reasonably successful in keeping the Bait Reef population in check. However, there is a clear need to continue the program for some time.

### COTS Extension Program

Well, it's all happening on the 'extension front'! Our efforts to spread the word about COTS have resulted in a lot of activity over the past few months.

First, a new educational video dealing with the starfish issue was released. This was soon followed by a booklet providing an update on the latest research findings. And last but not least, we took the opportunity to get the latest information directly to some of the Marine Park users through involvement in a series of educational workshops in major regional centres along the Queensland Coast.

### COTS Video & Booklet

These all new productions provide a summary of the latest research findings into the crown-of-thorns starfish. The video entitled "*The Crown-of-Thorns Phenomenon*" includes some fascinating footage of starfish spawning and provides a detailed overview over the current state of play.

The booklet "*Crown-of-Thorns Starfish - Research Update 1991/92*" now supplements a previous publication entitled "*The Crown-of-Thorns Starfish*" which was published in 1987. A series of short articles by scientists working on the starfish phenomenon provides an insight into research conducted over the past few years. Topics covered include ageing of starfish, reproduction, larval dispersal, recruitment, feeding, impact on massive corals, recovery of reefs and the current status of outbreaks.

Both the video and booklet are available from GBRMPA.

## Reef Biology Training Courses

The Queensland Department of Environment and Heritage (QDEH) recently conducted a series of *Reef Biology Training Courses* aimed mainly at the staff of reef-associated tourism operations and QDEH. The courses focussed on the major regional centres along the Queensland coast between Bundaberg and Townsville.

The workshop-style format of these courses provided an ideal opportunity for informing a major group of reef users about the very latest on the crown-of-thorns starfish. A one hour slide presentation on the starfish was well received by the attendees. From the most frequently asked questions, it was clear that some of the early misconceptions about the starfish phenomenon are still very much alive and kicking.

Often, the patterns of spread and the degree of damage caused by the outbreaks were not fully appreciated. Questions relating to the ability of reefs to recover after an outbreak and possible ways of controlling starfish populations were amongst those most frequently asked. Hopefully, these courses will have made a contribution to correcting some of the commonly held uninformed views on the starfish.

In addition to providing the latest information, the courses were found to be an ideal venue for promoting the COTS survey forms. Clearly, members of reef tourism operations spend a lot of time in the Marine Park and may provide valuable information on the whereabouts of the starfish.

Just as a reminder to all you Marine Park users out there. How about taking a few of our survey forms out on your next reef trip? Please let us know about any starfish you come across or reefs where no starfish were seen. Particularly now, as starfish numbers are on the decline it is extremely important to have this kind of information. Your assistance is, as always, much appreciated.

### Eaters of COTS

Two years ago the GBRMPA commissioned a project to collate observations of predation on COTS on the Great Barrier Reef. The report ("Survey of marine scientists and other experts for anecdotal observations of crown-of-thorns predation" by consultants Marine Bio Logic) listed 69 predation events involving the giant triton (42%), maori wrasse (18%), lethrinids

(14%) and toadfish (12%). Since COTS COMMS #8 we have received another report from Russ Babcock (AIMS) that suggests toadfish may be a particularly persistent predator.

Russ was holding COTS in galvanised chicken-wire cages to starve them in the field. Most of the COTS so held were lost and cages damaged. Observations confirmed that the toadfish *Arothron stellatus* was responsible. A single large individual was observed biting through a cage to attack the undersurface of the starfish. Large holes were made in the cage, allowing the starfish to escape. Numerous spines were visible in the sand surrounding the cages, indicating that not all of the 30 missing starfish escaped, but had "leapt out of the frying pan into the fire".

We're maintaining a database of such events and would be very grateful to receive descriptions of any related observations researchers may make.

### Prodigal Ex-Coordinator Returns!

Leon Zann (former Coordinator of the GBRMPA's COTS research program 1985-1990) has returned from a two year exile (escape?) in Western Samoa. Leon worked through the FAO United Nations Development Program reviewing the state of fish stocks and fishing and developing fisheries management plans for the region. Leon's new role at GBRMPA is not yet finalised, but it won't involve COTS if he gets the deciding vote. Is there such an ailment as COTS burnout?

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COTS COMMS is edited by Brian Lassig with significant input from the other GBRMPA COTS team members - William Gladstone and Udo Engelhardt. Views expressed are not necessarily those of the Great Barrier Reef Marine Park Authority.

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