COTS COMMS

The Library
Great Barrier Reef
Marine Park Authority
P.O. Box 1379
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A New Era: Acronym Apoplexy

The COTSARC is dead. Long live the COTSREC. Crown of thorns starfish (cots) research on the Great Barrier Reef (GBR) has moved into a new era with the change in advisory committees on cots research to the Great Barrier Reef Marine Park Authority (GBRMPA). Significant advances in some areas of cots research were made during the term of the Crown of Thorns Starfish Advisory Review Committee (COTSARC), however, as noted by Professor Don Anderson in his review of the program earlier in the year, there were a number of inefficiencies in the mechanisms of defining, operating and reviewing the program (see COTS COMMS Issues #2 and #3). The new advisory body, the Crown of Thorns Starfish Research Committee (COTSREC) met in July to consider proposals for research in this next phase of the program.

Twenty-six proposals requesting total funding of close to $1.6 million in this financial year were reviewed by the COTSREC for inclusion in the research program. The Federal Government had budgetted $750,000 for the program in 1989/90.

The COTSREC identified five major research categories at its July meeting:

1. Surveys and Coral/Starfish Dynamics
2. Reproduction and Larval Biology
3. Hydrodynamics, Recruitment & Terrestrial Inputs
4. Predation
5. Geology

Proposals were sent to at least two local and overseas experts for independent, external peer review and those falling into the areas of surveys (1), biology (2) and predation (4) were considered by working groups established by the COTSREC.

Murphy's (or is it McCarthy's in this instance?) Law prevailed with the pilots' dispute causing unforeseen delays in holding further committee and working group meetings. However with judicious use of Australia Post and Telecom services the program for 1989/90 has finally been decided and approved by the GBRMPA.

And the winners in their respective categories (with funding for 1989/90 and contact addresses for the principal researchers) are . . .

Surveys and Coral/Starfish Dynamics

Mr DA Fisk: An integrated study of hard coral regeneration and juvenile crown of thorns at Green Island. ($23,000) [Reef Research & Information Services; PO Box 5348; Townsville MC, Qld 4810]

AIMS: Broad-scale surveys of the crown of thorns starfish and its effects on corals along the Great Barrier Reef. ($240,000) [Dr PJ Moran; Australian Institute of Marine Science; PMB No 3; Townsville MC; Qld 4810]

Drs H Marsh & PJ Moran: Development of a robust method for determining the status of individual reefs with respect to outbreaks of crown of thorns starfish. ($11,500) [Zoology Department; James Cook University; Townsville; Qld 4811]

Dr TJ Done: Analysis of coral colonies, populations and communities: interpretation of outbreak history and projection of recovery. ($20,000) [Australian Institute of Marine Science; PMB No 3; Townsville MC; Qld 4810]

Dr BD Mapstone, Prof JH Choat & Dr H Marsh: An investigation of scales and magnitudes of variability in population densities of some coral reef organisms: Stage II in the development of long term monitoring procedures. ($165,565; $35,000 from cots research budget, remainder from GBRMPA's Research & Monitoring Section budget) [Marine Biology Department; James Cook University; Townsville; Qld 4811]

Reproduction and Larval Biology

Mr R Stump & Assoc Prof J Lucas: Age determination in *Acanthaster planci*. ($33,750) [Zoology Department; James Cook University; Townsville; Qld 4811]

Dr J Benzie: A pilot study to assess the utility of mitochondrial DNA as a genetic marker in crown of thorns starfish (*A. planci*). ($5,000) [Australian Institute of Marine Science; PMB No 3; Townsville MC; Qld 4810]

Dr LP Zann & Mrs V Vuki: Monitoring of recruitment of *Acanthaster planci* and community changes on Suva Reef and adjacent reefs, Se Vitu, Fiji Group, 1990. ($5,000) [GBRMPA; POBox 1379; Townsville; Qld 4810]

Hydrodynamics. Recruitment & Terrestrial Inputs

Mrs C Rasmussen: Anthropogenic influences on nearshore coral reefs, via mainland runoff, and correlations with spatial and temporal patterns in *Acanthaster planci* population explosions. ($10,000) [Sir George Fisher Centre; James Cook University; Townsville; Qld 4811]

Dr M James: Modelling approach to hydrodynamics and the large-scale dispersal of *Acanthaster planci*. ($36,000) [Department off Civil and Systems Engineering; James Cook University; Townsville; Qld 4811]

AIMS: Field surveys of crown of thorns starfish. ($11,000) [Dr PJ Moran; Australian Institute of Marine Science; PMB No 3; Townsville MC; Qld 4810]

Predation

Mr J Keesing: The role of predation in factors influencing the survival of small juvenile *Acanthaster planci* cultured in the laboratory. ($70,000) [Australian Institute of Marine Science; PMB No 3; Townsville MC; Qld 4810]

Dr LP Zann: The status of *Acanthaster planci* in the south Pacific and selected groups in the Indo-Pacific. ($5,000) [GBRMPA; PO Box 1379; Townsville; Qld 4810]

Dr LP Zann: The biology and ecology of the giant triton shell, *Charonia tritonis*, with particular reference to its role as a predator of the crown of thorns starfish *Acanthaster planci*. Phase I: Aquarium and pilot studies. (up to $10,000) [GBRMPA; PO Box 1379; Townsville; Qld 4810]

{*Dr Zann also wins the prize for the most verbose project title*}

The Predator Working Group met last Friday (20 October) and there are still a few details to be finalised in this area of the program. There will be a modelling component, to be proposed by Drs Hamish McCallum and Roger Bradbury. Researchers of a number of the empirical studies will be liaising with modellers to determine the data needed to be collected for input to models.

The research program also includes allowance for a post-doctoral position and two post-graduate awards in the area of Reproduction & Larval Biology as well as a post-doctoral position in fish feeding studies, initially to investigate gut contents of potential fish predators. Activities of the fish post-doc will, to a certain extent, be determined by the AIMS survey of Central Section reefs to locate juvenile cots next month.

No geological studies were recommended for funding this financial year, but this area will be reviewed at a workshop planned for May 1990. Using funds carried over from the last financial year Drs Flood (University of New England) and Frankel (University of Technology, Sydney) will be collecting surface and sub-surface sediments from the Far Northern Section of the GBR to look for evidence of previous aggregations of cots on reefs in that area. The COTSREC will meet after the workshop to consider future directions of geological studies and the program as a whole. Funds of $1 million p.a. have been guaranteed by the Federal Government for cots research in 1990/91 and 1991/92.

The COTSREC recommended against further studies on biological control on the basis that, because of the extraordinary complexity of the GBR, use of such agents was prone to innumerable unanticipated side-effects and there was a very high risk of things going wrong. The lack of precedents of biological controls in coral reef ecosystems was a major concern.

Future COTS COMMS issues will report on progress of funded projects and publications arising from them.

Lots of Questions, Few Answers

COTS COMMS #3 noted a workshop on the status of knowledge and future research directions in the cots research program was to be held in conjunction with the COTSREC meeting in July. Over 30 invited participants attended the day and a half workshop and contributed their thoughts on gaps in current knowledge needing to be addressed. The COTSREC members were most appreciative of the efforts of participants and those who could not attend but made written submissions. Abbreviated questions raised and gaps in knowledge identified at the workshop included:

Coral/Starfish Dynamics

Surveys:

* the use of Remote Operated Vehicles for deeper water surveys
* the need for techniques for assessing intermediate cots population densities
* the need for a suite of survey techniques to evolve with site changes during and following outbreaks
* how to survey cryptic juveniles
* the use of cots attractants as a survey tool
* application of remote sensing techniques
* the need for night surveys

* the importance of monitoring low density cots populations and following through a complete outbreak cycle
* the effects of cots on other ecological and management aspects of the GBR

Coral Recovery:

* the need for field data on coral recruitment, mortality *etc*
* problems of representativeness of small sample sites
* if cots outbreaks are natural phenomena, what are the benefits to the GBR

Biology

* fertilisation success
* larval dispersal
* larval nutrition (the role of DOM)
* predation on early life history stages
* transition from algal- to coral-feeding stages
* delayed metamorphosis?
* the need for more studies at the organismal level (nutrition, reproduction, growth, longevity *etc*)

Geological Studies

* northern and southern extents of previous outbreaks
* correlation of reef cots history with element density in surface sediments
* will geol. studies define frequency and intensity of outbreaks on a decadal scale
* geological sediment sampling for cots elements on overseas reefs

Controls

Non-Biological:

* early warning sites north of Green Island
* involvement of commercial operations
* behavioural and activity patterns of cots for more effective controls;
* use of chemical attractants for traps

Biological:

* detailed clinico-pathological studies
* transmission experiments
* infectivity and host specificity trials

Terrestrial Inputs

Agricultural Inputs:

* measurement of short and long term pulses
* interpretation of Bureau of Statistics data on agricultural applications
* importance of inputs to aspects of reef quality and dynamics

Coral Coring:

* coral core analysis on an annual basis with replication
* estimates of variability
* effects of nutrients other than P and K
* does the geological record show environmental changes

Nutrients & Water Quality:

* effects of increased nutrients on growth, survivorship, reproductive success and predators of cots
* effects of increased nutrients on corals
* possible effects of trawling near reefs

Recruitment *(see Biology also)*

* systematic studies on GBR
* possible northern GBR source reefs
* large scale, reef scale and fine scale hydrodynamic modelling
* further development of monoclonal antibody techniques
* use of larval traps

Predation

* what are the predators
* could they control cots population densities at various levels
* are the predators over-fished
* gut content studies need to be conducted on reefs with varying cots densities
* need for reared juveniles for predation experiments
* more information on the status of stock of reef fish
* study of functional responses of potential predators
* the meaning of sub-lethal arm damage

The new COTSREC program will go some way towards addressing some of these questions, but there's obviously no way a complete understanding of the phenomenon will be achieved in three years.

Anecdotal Observations

Meanwhile, projects initiated by the GBRMPA last financial year are continuing. Most (if not all) Australian readers of COTS COMMS should have received a questionnaire from Marine Bio Logic requesting details of personal observations of predation on cots on the GBR. The idea is to compile a database of first hand observations so that future studies on predators can focus on the most likely candidates for population regulation. At this stage there is very little evidence of species other than the giant triton, *Charonia tritonis*, regularly eating cots on the GBR.

Although anecdotal evidence is usually inadmissable in scientific works, the unpublished observations of experienced persons represent an important intellectual resource. Unless such observations are recorded that information will be lost.

If you haven't returned your questionnaire to Marine Bio Logic or the GBRMPA, please give it your urgent attention. Remember it is equally important to return completed forms if you haven't seen predation events so we can get some indication of the frequency with which predation occurs.

If you haven't received a questionnaire and would like to participate, please contact me. Maintaining the database will be an ongoing process. Observations from overseas reefs would also be useful. The report on the initial survey should be available by late November 1989.

Current COTS

Since the last issue of COTS COMMS, the AIMS Survey Team members have been "trolling for tiger sharks" around the Princess Charlotte Bay and Cape Grenville Sectors plus a few reefs off Townsville and Cape Upstart (July - August) and the Swains and Capricorn-Bunker Group (September - October).

No cots were sighted in the Princess Charlotte Bay or Cape Grenville Sectors. The reefs were generally in good condition with greater than 30% live coral.

Davies Reef in the Townsville Sector recorded an active outbreak of starfish, currently located on the central reef front. Individual starfish were also scattered around the perimeter. No starfish were seen on Chicken Reef to the north-east of Davies. In the Cape Upstart Sector Stanley Reef is currently experiencing an active outbreak. Although present over most of the reef, the cots are concentrated on the southern reef front. Only a few remnant starfish were seen on adjacent Old Reef. Both reefs have very low coral cover (less than 10%) around most of their perimeters.

Cots were sighted on several of the 21 surveyed reefs in the Swains Sector. Gannet Cay had an active outbreak on its western side where 71 starfish were counted over only 4 tows around the reef perimeter. Other reefs where cots were seen in small numbers (usually < 5) included Reef No. 22-186; Reef No. 22-112; Reef No. 22-114; Dicks Reef; Recreation Reef; Chinaman Reef and Reef No. 22-144. While no cots were sighted on the other reefs surveyed in this sector, many reefs had corals marked with scars most likely attributable to cots feeding activity. The reefs themselves appeared to be in generally good condition with moderate to high coral cover. Many had coral cover that reached 100% in patches and averaged 50% around their perimeters. The detached part of Reef No. 22-118 was a notable exception. An active outbreak of cots was observed on this reef in a 1987/88 survey. On the recent trip no cots were sighted but live coral was poor and the area was dominated by dead coral and soft coral.

No cots were sighted on any of the 6 reefs surveyed in the Capricorn Bunkers. Coral cover was generally moderate but tended to be patchy.

Two reefs in the Whitsunday group were manta towed and SCUBA searched for juvenile cots. Visibility was poor. No cots were sighted during manta tows and the SCUBA search turned up only one juvenile about 12cm in diameter. The AIMS survey team will be more intensively surveying reefs in this area for juveniles in the near future.

Konichiwa Keesing

John Keesing of AIMS has returned from a "fact-finding" visit with Professor Yamaguchi at the University of the Ryukyus, Okinawa, Japan to inspect tropical marine echinoderm and mollusc rearing facilities. Professor Yamaguchi's extensive experience in rearing a wide range of marine organisms is widely known. John will be attempting cots culture at AIMS next year.

John inspected five facilities used for rearing corals, sea urchins, turban snails, clams, spanner crabs and emperor fishes. He also dived at a number of sites around Okinawa, Awa, Ikei, Yamagawa, Hamamoto and Sesoko Islands.

John is hoping future collaborative research can be planned so that the staggered cots spawning seasons in Japan and on the GBR can be exploited to give 'two bites at the cherry'.

New Reports

COTS COMMS Issue #1 listed 59 reports based on projects funded through the GBRMPA's cots research program. Since that issue in February we have received some new additions to the list and I've uncovered a few I missed from the list. I can arrange copies if required. A complete up-to-date list will appear in a COTS COMMS next year.

Baxter, I. (1988)
Green Island Reef: Multidisciplinary study. December 1988 (Draft, 12pp).

Fernandes, L. (1989)
Biases associated with the use of the manta tow, a rapid reef surveillance technique, with particular application to the crown of thorns starfish (*Acanthaster planci).* July 1989 (Final, 104pp)

Flood, P.G. & E. Frankel (1989)
Search for evidence within subsurface sediments of the occurrence of previous aggregations of crown of thorns starfish on Heron Island Reef, southern Great Barrier Reef. May 1989 (Draft, 8pp)

Flood, P.G. & E. Frankel (1989)
Search for evidence within surface and subsurface sediments of the occurrence of previous aggregations of crown of thorns starfish. Part A: Capricorn Reefs. May 1989. (Draft, 12pp)

Flood, P.G. & E. Frankel (1989)
Search for evidence within surface and subsurface sediments of the occurrence of previous crown of thorns starfish skeletal material, Great Barrier Reef, Australia. Program 366: Heron Island; Program 368A: Capricorn-Bunker Section; Program 368B: Innisfail, Townsville, Cape Upstart, Whitsunday and Pompey complex Sectors. August 1989. (Final, 23pp)

Henderson, R.A. & P.D. Walbran (1989)
Research report on single element accelerator mass spectrometry dating of *Acanthaster planci* skeletal remains obtained from subsurface sediment. February 1989 (Draft, 10pp)

Matthew, P. (1989)
Oral history of reef fishing on the Great Barrier Reef with special emphasis on the effects of crown of thorns starfish. April 1989 (58pp)

Rasmussen, C. (1988)
The use of strontium as an indicator of anthropogenically altered environmental parameters. *In press in* Inter. Coral Reef Symp 6. (6pp)

Rasmussen, C. (1989)
Anthropogenic influences on nearshore coral reefs. via mainland runoff, and correlations with spatial and temporal patterns in *Acanthaster planci* population explosions. March 1989 (5pp)

What's in a Name?

Acanthaster planci has more common name aliases than I've had project reports submitted late (and I have to take my shoes off to count them). The crown-of-thorns starfish (Macquarie Dictionary); crown of thorns starfish (Webster and Australian National Dictionaries and most GBRMPA communications); Crown-of-thorns (AIMS) and a variety of hyphens and capitals in all combinations and permutations in the scientific literature and popular press. I'm proposing cots workers opt for a standard format for the sake of consistency. How about lower case and no hyphens? The crown of thorns starfish. Given that there seems to be no clear consistent epistemological reason for any particular form my suggestion is based on ease of typing. Most scientists aren't keyboard wizards. A space bar is easier to find than the hyphen key and the shift key is very close to return and control keys. Dr Baker, Director of AIMS, has formally proposed the hyphenated version on the basis that it is consistent with the Macquarie Dictionary and the Australian Government Style Manual. If anyone has strong, defensible feelings to the contrary I'd be happy to receive them.

Vital Statistics

Echinoderm enthusiast John Lawrence of the University of South Florida visited the AIMS in July to obtain cots with different numbers of arms to ascertain how arm number affects the amount of material and energy allocated to various body components.

He found that the body wall of the disc and the cardiac stomach are independent of arm number while the body wall of the arms, the cardiac pouches and the pyloric caeca increase with the increase in arm number. (One exception was on Bowden Reef off Townsville where there was no increase in pyloric caeca size with increasing arm numbers). John suspects the gonads would follow the same pattern of increase with arm number and have significant repercussions for gamete production.

What does it all mean?. To use John's words "*The question of biological significance remains.*" I'm sure John would be happy to receive any questions, suggestions or comments.

COTS COMMS is edited by Brian Lassig. Views expressed are not necessarily those of the Great Barrier Reef Marine Park Authority.

Contact for Comments, Questions & Contributions:

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RESEARCH FELLOW
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Australia's premier marine science research establishment, the institute is housed in a modern laboratory and workshop complex located on the north Queensland coast at Cape Ferguson, 50km south-east of Townsville.

Women and men are invited to apply for this Fellowship which is funded by the Great Barrier Reef Marine Park Authority as part of a coordinated and integrated research program on the crown of thorns starfish developed under the direction of the Crown of Thorns Starfish Research Committee (COTSREC).

The position will involve undertaking research on the reproduction and early life history of the crown of thorns starfish. The successful candidate will also work in close collaboration with a project involving the rearing of juvenile crown of thorns starfish at the institute. Adequate funds and resources will be given to support this research.

Details of the research to be undertaken will be determined by the Fellow, in collaboration with an advisory group. Likely subjects include:

* timing and extent of spawning
* fertilization success and adult density
* factors affecting reproduction
* dissolved organic material (DOM) as a larval food source
* larval behaviour and ecology

The successful candidate should have a Ph. D. and research experience in a related field, demonstrated ability in the rearing of marine larvae, a good understanding of larval ecology, reproductive biology and histology, and experience in undertaking field research, preferably in coral reef systems. A general knowledge of coral reef ecology would be an advantage.

The Fellow will be affiliated with James Cook University and will be expected to supervise a small number of postgraduate students and stimulate interest in the research area.

The position is expected to commence in November and finish in 30 June 1992 subject to satisfactory performance of the candidate and annual funding.

Conditions are those as specified for an "employee" under AIMS terms and conditions and include a 9 day fortnight. A salary in the range of $31,525 - $38,567 is offered. A district allowance is also payable.

Applications including a resume, evidence of formal qualifications and the names, addresses and phone numbers of three referees should be submitted to the Secretary, Australian Institute of Marine Science, PMB 3, Townsville MC, QLD 4810 by 11 November 1989.

Duty statement and selection criteria are available from Karl Dubravs, Personnel Manager on (077) 78-9319. Further information on the position can be obtained from Peter Moran on (077) 78-9334.

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