

INTRODUCTION

The crown-of-thorns starfish (*Acanthaster planci*), subject of intense scientific, public and political debate over the past 30 years, has attained a notoriety unprecedented among coral reef organisms. Despite more recent concerns over pollution and extensive development, it has been the most consistently controversial issue in the management of the Great Barrier Reef (Kenchington, 1987). Since 1962 when large numbers of the starfish were first recorded at Green Island off Cairns in North Queensland, two distinct waves of outbreaks have caused widespread damage to the Great Barrier Reef (GBR). The first recorded episode moved north and south from Green Island and, over the next 15 years, spread as far south as reefs off the Whitsunday Islands. Some isolated reefs in the Swain Group (off Gladstone) were also affected. After a two year gap in reported outbreaks, large numbers of starfish were again observed at Green Island in 1979. This episode has continued to the present.

During the most recent surveys off the Whitsunday Islands (April 1990) by the Australian Institute of Marine Science (AIMS), a large crown-of-thorns starfish (commonly abbreviated to COTS) population was recorded on one of 24 reefs surveyed in the area. Reconnaissance surveys by the AIMS since 1985 have indicated that up to 30% of reefs on the entire Great Barrier Reef have been affected to some extent by the starfish during the latest episode.

Concern over the fate of the GBR during the first recorded episode of COTS outbreaks (1962-1977) led to the formation of three review committees, convened to determine the degree of threat to the Reef and to recommend on required research. Two of these reviews (Walsh et al., 1971; 1975) were sponsored jointly by the Australian and Queensland Governments. The third ad hoc committee (Walsh et al., 1970) was convened by the Australian Academy of Science at the request of the Great Barrier Reef Committee.

Increasing concern over the second series of outbreaks of the crown-of-thorns starfish and damage to the Great Barrier Reef prompted the GBRMPA to establish another advisory body - the Crown of Thorns Committee. Members of this committee included Professor K. Back of James Cook University (Chairman), Dr J. Lucas (James Cook University), Mr G. Kelleher and Mr R. Kenchington (GBRMPA), Dr J. Bunt (AIMS), Mr R. Pearson (Queensland Fisheries), Professor J. Thomson and Dr R. Endean (University of Queensland). The Crown of Thorns Committee met twice in 1980 and recommended four major research directions before disbanding:

- * GBR-wide surveys of COTS and coral damage;
- * COTS population dynamics;
- * Reef sediment analysis for evidence of outbreaks over geological time;
- * Documentation of past human activity on the GBR.

Research in some of these areas was funded by the GBRMPA in the early 1980s, but because of commitments to zoning plans and lack of resources, a formal program of research was not instigated. The Crown of Thorns Committee was reconvened by the GBRMPA, with additional members representing a broad range of disciplines, in April 1984. Membership of this committee (The Crown of Thorns Starfish Advisory Committee, COTSAC) is given in Appendix 1. Terms of reference for the COTSAC were:

- * "To review the results of research into crown of thorns starfish and relevant aspects of coral ecology, with particular reference to research published or conducted since 1980."
- * "In the light of reports of the current incidence of crown of thorns starfish, and in the light of Great Barrier Reef Marine Park Authority reports and surveys, to advise on future research and monitoring directions with particular reference to cost and feasibility."

- * "To advise on possible research programs or projects relevant to management and/or understanding of the relationship between crown of thorns starfish and coral reefs."
- * "To advise on a program for keeping the public informed on the crown of thorns starfish phenomenon and research and management actions which are being undertaken in relation to it."

On considering available information from research conducted prior to 1984, the COTSAC noted that the current level of research activity was unlikely to lead to a short term (3-5 years) resolution of the questions raised by *A. planci* outbreaks on the Great Barrier Reef (COTSAC, 1985). To address this deficiency, the Committee identified a number of research initiatives which it believed should be implemented immediately. Research in the following areas was recommended:

1. risk analysis to contribute to assessment of the need for controls
2. monitoring the effectiveness of existing control techniques
3. feasibility of developing more efficient control techniques such as biological control by predators or pathogens
4. review of monitoring techniques for crown-of-thorns starfish and corals
5. surveys of selected reefs
6. oral history of human use and of experience of the Great Barrier Reef
7. surface and soft sediment cores to evaluate evidence of prior outbreaks
8. analysis of existing field data and modelling studies (leading to identification of priority research)
9. high priority research
10. testing of hypotheses regarding human factors which may trigger or exacerbate outbreaks
11. use of geological techniques of climate reconstruction to identify past periods when climatic conditions resembled those prevailing during recent outbreaks
12. economic and social consequences of outbreaks

The Committee recommended the research program be coordinated by the GBRMPA and supported by funding of approximately \$3 million over five years (see Appendix 2 and 3 for the COTSAC's summary and recommendations).

In July 1985 the Federal Government gave the GBRMPA \$971,000 for the first year of the program. This funding was distinguished from the normal GBRMPA appropriation and was termed COTSAC money. A Record of Understanding was established between the GBRMPA and the AIMS in which it was agreed the Authority would coordinate all projects related to management and policy development and the AIMS would be responsible for mainly ecological research. Funding was thus given to the AIMS by the GBRMPA under the terms of the Record of Understanding.

To advise on a program of research and review progress of the program, the GBRMPA established the Crown of Thorns Starfish Advisory Review Committee (COTSARC). Membership of this committee is given in Appendix 1. Terms of reference for the COTSARC were:

1. To review, at least annually, the results of research into crown-of-thorns starfish and relevant aspects of coral ecology with particular reference to research conducted in the research program as a result of the COTSAC recommendations (the COTS Research Program).
2. In the light of progress reported in "1" above and other relevant information and reports of current incidence of crown-of-thorns starfish, to advise and recommend on priorities for future research and monitoring in the COTS Research Program, including reference to cost and feasibility.

3. To advise on a program for keeping the public informed on the crown-of-thorns starfish phenomenon and research and management actions which are being undertaken in relation to it.

Following a COTSAC recommendation, advertisements for expressions of interest and research proposals were placed in the Australian press. Responses were reviewed and a research program recommended by the COTSARC. This research program was approved by the GBRMPA in February 1986.

The Federal Government allocated additional funds to the research program on an annual basis over subsequent years to the 1988/89 fiscal year, but at no stage committed funds beyond a one year period (Zann & Moran, 1988). Annual funding for the program from contributing sources is shown in Table 1.

A summary of the ecological research, coordinated by Dr Peter Moran of the Australian Institute of Marine Science, has already been published (Moran & Johnson, 1989).

This report is a companion to Moran and Johnson's report in providing an overview of the management-related projects which were coordinated by the GBRMPA from December 1985 to June 1989. Although the COTSAC had recommended appointment of a full-time coordinator for the program, the position was not formally filled because of restrictions in Australian Public Service staff levels. Coordination of the management-related projects was undertaken for most of the period on a full time basis, by Dr Leon Zann, Senior Project Manager with the GBRMPA.

Following criticism in the media of the GBRMPA's handling of the crown-of-thorns starfish issue in December 1988, the then Minister for the Arts, Sport, the Environment, Tourism and Territories, Senator the Honourable Graham Richardson, requested a review of the COTSAC research program. This review was undertaken by Professor D.T. Anderson, Challis Professor of Biology at the University of Sydney in early 1989 (refer Appendix 4 for summary of findings and recommendations). Terms of Reference for Professor Anderson's review were:

1. To review the Great Barrier Reef Marine Park Authority's present policy for managing the Marine Park in terms of the developing knowledge of the crown-of-thorns starfish and in particular the Authority's policy of limiting direct intervention to areas of special scientific and tourist interest. [The Authority's policy, adopted in 1985, states that "until more information is available, direct management intervention in the crown-of-thorns phenomenon should be limited to tactical control measures designed to protect corals at specific sites of importance for tourism or scientific research. The policy is based on the proposition that it would be irresponsible to interfere in natural processes on a large scale. If human activity could be shown to be responsible for causing or exacerbating outbreaks, the Authority would attempt broadscale control of outbreaks and to modify or stop responsible activities.]
2. To review the adequacy of the mechanisms for defining, reviewing and operating the crown-of-thorns starfish program.

The report concluded that the COTSAC research program had been defined, reviewed and operated in an efficient and productive manner and that the GBRMPA's policy for COTS control is soundly based, taking into account current knowledge of COTS populations on the Great Barrier Reef (Anderson, 1989). Professor Anderson recommended the program be continued for another 3-5 years at a dedicated and committed funding level of at least \$1million a year. He also recommended changes to the review committee to give that committee a more effective role in determining, in consultation with the GBRMPA, the pattern of expenditure of these funds.

Following a commitment by the Federal Government to provide additional funding for a further 2-3 years, the GBRMPA implemented Anderson's recommendations and established a new advisory committee under the chairmanship of Professor John Swan, the Crown of Thorns Starfish Research Committee (COTSREC). The COTSAC era had ended.

References

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Table 1

Funds allocated to management-related (M-R) and ecological (ECOL) projects since 1985 by the four main contributors to the COTSAC program.

AGENCY	FUNDING (\$A 000s)									
	1985/86		1986/87		1987/88		1988/89		TOTAL	
	M-R	ECOL	M-R	ECOL	M-R	ECOL	M-R	ECOL	M-R	ECOL
COTSAC	413	558	234	531	227	553	209	356	1,083	1,998
GBRMPA **	40	---	40	---	40	---	108	---	228	---
AIMS	---	259	---	497	---	534	---	526	---	1,816
MSTG	50	73	49	82	na	na	na	na	99	155
Total	503	890	323	1,110	267	1,087	317	882	1,410	3,969

COTSAC Crown of Thorns Starfish Advisory Committee, Great Barrier Reef Marine Park Authority
 GBRMPA Great Barrier Reef Marine Park Authority, Research & Monitoring Section funds
 AIMS Australian Institute of Marine Science
 MSTG Marine Science and Technologies Grants

** GBRMPA contributed the salary of the Acting Program Coordinator (1985-1989).
 The Authority also provided approximately \$66,000 for COTS research
 initiated prior to the COTSAC program. This funding is not included in this table.

na Information not available

[Table adapted from Zann and Moran, 1988]