GREAT BARRIER REEF MARINE PARK AUTHORITY

Technical Report GBRMPA - TR-1

MANAGEMENT OF DUGONG: AN ENDANGERED MARINE SPECIES OF TRADITIONAL SIGNIFICANCE

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SUMMARY

Because of its inherent value as a food item, the dugong has occupied a significant role in the life styles of north-east coast Queensland indigenous people. The need for management of dugong, an endangered species found within Great Barrier Reef waters, is established. The Great Barrier Reef Marine Park Authority has indicated its commitment to conservation of endangered species. Successful management must be based on sound research, developed in conjunction with relevant government agencies & "user" groups, and interpreted by effective education programs. Existing research programs in Australia and information needs related to dugongs are outlined. Only by "user" involvement in the development of an integrated research, management and education program will the dugong population of northeast Queensland be able to be conserved and used on a sustainable basis.

Keywords: Great Barrier Reef Marine Park Authority, dugong, endangered species, traditional use, user involvement, research, management, education

Technical Reports are intended for detailed papers which represent the Authority's position

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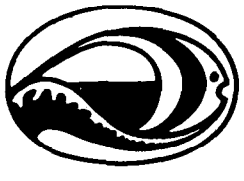

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TABLE OF CONTENTS

MANAGEMENT OF DUGONG: AN ENDANGERED MARINE FOOD SPECIES OF TRADITIONAL SIGNIFICANCE

THE NEED FOR USER INVOLVEMENT IN AN INTEGRATED PROGRAM OF RESEARCH, MANAGEMENT AND EDUCATION.

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1. THE PROBLEM

1.1 Endangered Species : the Dugong

The dugong (Dugong dugon), the only strictly herbivorous marine mammal, is one of only four existing members of the order Sirenia (sea cow), all of which are listed in the IUCN Red Data Book as species which are vulnerable to, or in danger of extinction.

Life history studies of dugong indicate that the dugong has a lifespan of up to 60-70 years, a minimum pre-reproductive period of 9-10 years, with the female bearing one calf at a time at intervals of 3 to 7 years. According to Marsh (1984), low juvenile and adult mortality rates are required to maintain a dugong population.

> "Even the most optimistic schedule of reproduction and juvenile mortality demands an adult survivorship of about 90% per year for population maintenance."
>
> (H. Marsh, 1984)

Dugong dugon have historically ranged throughout the sub-tropical and tropical coastal and island waters of the Indo-West Pacific Region and have generally been hunted to very low levels throughout this range. A major proportion of the world's remaining dugongs occurs in northern Australia. Aerial surveys completed between 1974 and 1979 established that sizeable herds of dugongs inhabit the shallow coastal waters of eastern Queensland and southern Papua-New Guinea.

1.2 Exploitation

Dugongs from this area along the coast appear to be under pressure from indigenous hunting which is made more efficient by modern technology; by illegal killing and by incidental captures in gill nets and shark nets. (Marsh and Heinsohn, 1982).

1.3 Cultural Significance

For some coastal Australian Aborigines and Torres Strait Islanders, dugongs have traditionally been a highly-prized source of meat and they are still exploited for this purpose. Because dugong hunting requires a fair degree of skill, success in this field brings important social status to the hunter. (Nietschmann, 1982).

Dugongs are featured in the creation story of many of the indigenous people across the north of Australia.

Chase (1980) discussed the dugong as a "prestige good", and the role of "conspicuous giving" and distribution of dugong meat among the sandbeach people of Cape York Peninsula.

> "Resource exploitation by indigenous peoples represents more than securing just the resource. It is part of socialization, moral education, the teaching of social and economic responsibilities, an expression of skill and ability."
>
> (Nietschman, 1982, p.28)

With dugong functioning in an important co-ordinating role in the culture of these societies (Anon, 1981), any regional scarcity or extinction of dugong populations in areas where dugong hunting occurs traditionally, would be likely to contribute to community disruption as well as to constitute a significant reduction in world dugong numbers.

2. NEED FOR MANAGEMENT

2.1 A Need for a Management Program Incorporating Conservation and Reasonable Use of the Resource

The vulnerability of the dugong population and the significant cultural role of dugongs in some indigenous societies illustrate the need for and the challenge to conserve the dugong population while enabling reasonable use of the resource. The need for an integrated program of research, management and education in relation to dugongs on the north-east coast of Queensland is addressed in this paper.

2.2 Responsibility

The extensive range of dugongs and relative isolation of those taking the resource makes enforcement of regulations difficult. The co-operation of the "users" is thus necessary for any management scheme to be successful. Responsibility for management then, lies not only with government organisations that have jurisdiction and interest in the resource, but also with the individuals and communities which are involved in the take of dugongs. An integrated program of research, management and education must be developed with participation of all involved parties. A similar approach was developed and applied with some success in Papua New Guinea from 1974-1980. (Hudson, 1981)

3. INFORMATION NEEDS

Existing research programs relating to dugong and traditional hunting and fishing in Australia are summarised in Appendix One.

Some guidance on information needed to develop policy and an integrated program may be drawn from the International Whaling Commission (IWC) experience (1982) in development of appropriate management policy for subsistence hunting of the Bowhead Whale by Alaskan Eskimos. A dugong protection program which allows possible harvesting on the basis of sustainable yield will initially hinge on research in the areas of wildlife science and cultural anthropology. Basic requirements outlined below are adapted from the IWC experience (1982).

3.1 Wildlife Science Requirements

(a) the estimated present population size for a given area; any trends in population size (population dynamics).

(b) estimates of net recruitment rates (involving life history studies) and relationship of the recruitment rate to population size (population dynamics).

(c) the number of annual removals from this population and by whom.

(d) location of habitats; documentation of human activity which has resulted in or may result in habitat degradation, alteration, or destruction and the trend for the dugong population as a result.

(e) the relationship between marine animals taken: hunting for dugong is often done coincidentally with turtle hunting.

(f) new harvest regimes that might be considered for the target species.

(International Whaling Commission, 1982, p.4)

Many of these aspects have already been studied to some extent. There are, however, identifiable gaps in the information accumulated to date in the developing field of dugong management.

3.2 Examples of Information Gaps - Wildlife Science

Population Dynamics:

Though aerial surveys conducted since 1974 confirm that sizeable populations of dugongs occur around northern Australia, the information gained from these aerial surveys should be considered qualitative rather than quantitative. Recently, more rigorous survey methods, including a systematic sampling regime, were applied by Marsh et al (1984) in Torres Strait aerial surveys. According to Marsh, methodology for dugong aerial surveys needs to be improved further by experimental development.

The information to date also gives little indication of population trends.

> "It is not known whether dugong numbers are increasing, decreasing or stationary at any of the major dugong habitat areas that have been identified."
>
> (Marsh, 1984, p.2)

Precise techniques for monitoring the status of various populations over time need to be developed.

The need for commitment to continuity of research has been identified by UNEP (Marsh et al, 1983) and the area of population dynamics is an obvious example of this need.

Recruitment Rates in relation to Population Dynamics:

Recent experimentation in construction of population models to determine the annual rate of increase of stable dugong populations (Marsh et al, 1984) has introduced a valuable component to determining the trends in dugong populations. Refinement of such models will depend on further research on life history, particularly mortality schedules and breeding cycles.

Annual Removals:

Dugongs are protected by legislation in Queensland except for subsistence hunting by indigenous people on reserves.

In addition, as of November 1984, within the Cairns Section of the Great Barrier Reef Marine Park, "traditional inhabitants" were required to apply for permits from the Great Barrier Reef Marine Park Authority for traditional hunting of dugong. The permit system was used to monitor dugong catch for the first time by HopeVale community during Christmas school vacation period 1983-84. A number of conditions were attached to the required permit. In conjunction with Queensland National Parks and Wildlife Service, day-to-day managers for the Marine Park, the conditions were discussed and accepted by the Hope Vale Council as well as by dugong hunters. Two of the conditions attached to the hunting permit are relevant to documentation of annual removals from the population:

- One dugong to be taken per hunter; total quota for the whole community to be 20 dugong.

- Catch data sheets to be completed for each dugong taken, for collection by Great Barrier Reef Marine Park Authority.

Evidence from the recent Torres Strait survey suggests that the Torres Strait dugong population cannot sustain the present rate of take (Marsh, et al, 1984).

On the whole, though, present information on the number of dugongs taken per year by subsistence hunting, incidental catch and illegal exploitation on the northeast coast of Queensland is sketchy and mainly anecdotal. The appropriate management authorities need to devise a scheme for recording more accurate take of dugongs by all means.

Habitat:

Dugongs occur in warm, shallow (to 15m depth), sheltered, inshore and reefal areas where they can feed on extensive beds of seagrasses.

The Great Barrier Reef Marine Park Authority has acknowledged the importance of conservation of the seagrass habitat by introducing restrictive zoning of important habitat areas in both the Cairns and Far Northern Sections of the Marine Park.

To date, there has been no consistent mapping of seagrass beds in northern Australia. However, Dr Ian Poiner (CSIRO) is presently involved in a program of mapping seagrass beds in Northern Australia.

D. Claasen (GBRMPA) and Dr D. Jupp (CSIRO) have been experimenting with use of satellite imagery in identification of seagrass in the Great Barrier Reef Region. Further identification of habitat is required for appropriate application of management measures.

The effects of chemical pollution and siltation due to dredging on the dugong habitat needs to be examined. Pesticides have been found in dugong tissue from dugongs taken off Townsville (H. Marsh, pers. comm., 1983). Results of further study may provide information on the impact on reproduction of the species, as well as implications for the health of those taking dugongs for food.

Relationship between Marine Animals Taken:

Trips undertaken by indigenous people are usually considered successful if either a dugong or turtle is taken, though a dugong is more prestigious. Therefore as dugong numbers decrease or control of harvest increases, more pressure will be placed on the turtle population, also an endangered species. Recent information on take of turtles in the Torres Strait suggests that turtles are already under fairly severe pressure. (Marsh, et al, 1984). The "opportunistic" nature of this multi-species fishery is important. The nature and impact of this relationship on both numbers and harvest rates of dugongs and turtles needs to be investigated further.

New Harvest Regimes:

Study of conservation measures that have been employed traditionally can provide assistance in devising effective new harvest regimes. Johannes (1978) illustrated that almost every basic resource conservation measure devised in the West was in use in the tropical Pacific centuries ago: closure of fishing areas, closed seasons during spawning, size restrictions, holding excess catch in enclosures until needed, restrictions on taking turtles and birds and their eggs, and limited access to a fishery. Though a few recent examples are known, gear restrictions, probably the oldest form of fisheries regulation in the West, seem to be the rarest form of conservation practised in Oceania.

Historically, one of the most widespread regimes in Oceania was that of reef and lagoon tenure. The right to fish in a particular area was controlled by a clan, chief, or family, who thus regulated the exploitation of their own marine resources. Fishing rights were maintained from the beach to the seaward edge of the outer reefs. (Johannes, 1978).

Tenure systems have also been recorded from Arnhem Land, Northern Territory, Australia (Pers. Comm., S. Davis, 1983) to Daru, Papua New Guinea (B. Hudson, 1983), and to east Cape York.

Recent research by Johannes and MacFarlane (in press, 1984) has led to documentation of traditional sea rights in the Torres Strait Islands, with emphasis on Murray Island.

Chase (1978) discussed clan territories in the Princess Charlotte Bay area and Nesbit area to the north with clearly defined boundaries extending beyond land across marine environments and including offshore islands, sandbars and reefs.

The Great Barrier Reef Marine Park Authority is presently providing funds for A. Smith to document current and traditional hunting and fishing practices at Hope Vale community and other communities on east coast of Cape York. Aborigines' preference for "fat" animals can be indicative of breeding periods and the state of food sources. Factors affecting resource usage and implications for management are being investigated.

Prior to the introduction of modern technology, the adaption of the cultural system, and a larger external human population affecting the resource, these traditional management measures appeared to work. The acceptability of traditional conservation measures and their applicability in the present day, needs to be explored further. The study of traditional harvest regimes falls with the disciplines of both wildlife science and cultural anthropology.

3.3 Cultural Anthropology Requirements

Policies for management of dugong populations are, in reality, oriented to managing the human interactions with the endangered species.

> "Understanding a conservation system means understanding not only the nature of what is being conserved, but also the viewpoint of the conserver. Knowledge of this second element is essential if we are to comprehend a system of resource management employed by a people whose perception of their environment differs from our own." (Johannes, 1978, p.349).

Guidelines used by the I.W.C. technical committee, and a critique of these guidelines by Mitchell and Reeves (1980), form the basis for the following suggestions for a possible "cultural anthropology" approach to dugong management. It involves study of the role of the dugong harvest (past and present) in cultural activities and in the cultural identity of the Aboriginal and Islander people and of the relationship of this harvest to their well-being. This should provide insight into the relationship between the cultural survival of the indigenous community and the biological survival of the dugong. Information gained in the following areas would significantly aid in the development of policies and appropriate management schemes.

Suggestions for Research in Cultural Anthropology:

(a) basic definitions of terms such as Aboriginal, Islander, traditional, subsistence.

(b) geographic distribution of the resource "users" and geographic relationship with the resource.

(c) technology used for hunt : pre-contact, transition and present.

(d) degree to which it is used for subsistence; extent of participation in cash economies.

(e) the role in diet and health regime.

(f) the place of dugong hunting in:

- myth, ritual (pre-contact and transition);
- material culture;

- status and role definitions within the group and between the group and outsiders;
- socialisation of children to the group's social and cultural norms;
- and maintenance of identity and quality of self-perception of members of the group.

(g) level and nature of acculturation of the group to other cultures, norms and life-styles in general.

(h) potential impacts from:

- change in number of dugongs harvested and in level of effort required or allowed in terms of gear, hunting time and location
- shift in hunt from dugongs to turtles or other marine resources
- increase in level of technology for hunting
- entry of more individuals from the group into hunting.

(i) extent to which communities or possibly even clan or family groups may have to be considered on an individual basis; differences in degree to which individual communities or families maintain link with past.

3.4 Information Gaps - Cultural Anthropology

Definiton of "traditional"

The term "traditional" has been used to define in law who can participate in the fishery. Most definitions of "traditional" are circular in nature, using the term in describing the definition. For example, in the Cairns Section Zoning Plan (1983), "traditional hunting" is defined as "the taking, otherwise than for purposes of sale or trade, in an area by a traditional inhabitant or a group of traditional inhabitants of animals other than fish, ... in accordance with Aboriginal tradition or Islander tradition, as the case may be, governing the entry and use of that area by that traditional inhabitant or group of traditional inhabitants". (sec. 2.1)

Later on in the Zoning Plan (sec. 4) it is specified that the means of hunting, the numbers of animals to be taken, and the need for conservation of endangered species shall be given regard when considering application for a permit for traditional hunting in the Marine Park. Though this definition of "traditional" allows for flexibility, it does not give much guidance when considering permit conditions and leaves it open to interpretation.

In Parks Canada National Marine Parks Draft Policy it is proposed that traditional uses of renewable marine resources by local residents will be permitted provided such activities do not destroy natural values and meet one or more of the following conditions:

- activity is a traditional/subsistence resource use by local people
- activity is of cultural value in illustrating traditional man/sea relationships to visitors
- activity is a treaty right or native claims settlement (2.2.9).

However, it is also proposed in the Draft Policy that no take of endangered species be permitted in National Marine Parks.

It can be argued that the term "traditional" should allow for the evolving nature of tradition. For instance, due to European settlement and contact, not only did the method of access to the catch change with the introduction of power boats, but associated hunting techniques also changed. These adapted methods and techniques of hunting should be considered "traditional", as traditions evolve. Pursuing the argument then, traditional areas of use could be expanded to include those areas used post-European settlement. Likewise certain economic activities, such as trochus collecting in the Great Barrier Reef Region (or the fur trade in Canada) could be considered as traditional.

Mitchell and Reeves (1980) offered definitions of subsistence in review of the Bowhead whale situation.

The definition of "tradition" in legislation varies from State to State across Australia. Fisher (1984) suggests that the purpose or underlying method rather than the technology used should be the decisive criterion. She states that defining "tradition" in terms of residential requirements is undesirable.

> "Where policies of dispersal or displacement have made such demonstrated attachment impossible or extremely difficult to demonstrate (for example in parts of Queensland), then such a limitation may be too stringent." (Fisher, 1984, p.85)

She adds, though, that in certain circumstances, it may be necessary to restrict hunting and fishing to traditional methods or technologies and uses the case of dugong in the Great Barrier Reef Marine Park as an example.

For the purposes of resource management, there is a need to establish a hierarchy of possible restrictions based on the term "traditional". In discussion with Aborigines and Islanders the appropriate level of restriction for hunting should be determined and this should be described explicitly.

General review of literature

A brief review of literature relating to cultural anthropology of Aboriginal/Islander communities adjacent to the north-east coast of Queensland has revealed that some relevant and valuable work has been completed, primarily by anthropologists. However, not enough information on each community has been provided to complete the picture on the prime cultural anthropological components of this issue. For example, Anderson discussed traditional subsistence patterns (1979) and multiple enterprise economy (1980) in the Bloomfield River area (Wujal Wujal). Chase discussed the role of dugong in the culture, the cultural continuity of knowledge (1980), and clan territory extending into the marine environment (1978) in Lockhart River and Princess Charlotte Bay areas. Sutton and Rigsby (1982) presented information on control of land and resources and succession to rights in land, languages, totems, and so on among the Aboriginal people of Cape York Peninsula. Nietschmann (1982) discussed the role of resource exploitation among Torres Strait Islanders. A. Smith (1984) has been collecting ethnobiological information on marine resources utilized by Hope Vale residents including indigenous taxonomies for marine species and techniques of marine resource appropriation and management.

4. THEORY OF PARTICIPATION

With use of wildlife biological and cultural anthropological information, a prime challenge is to develop management programs which can be applied consistently from community to community while taking into account regional dugong population dynamics and individual community needs.

To be successful, any management scheme should be acceptable to all parties.

> "Resource management schemes are of little value if they are not culturally palatable to those they are meant to benefit." (Johannes, 1981)

At a workshop on dugongs held in 1981, Aboriginal and Islander participants recommended that "all plans for protected areas or reserves for the conservation and protection of the dugong be discussed with those communities likely to be affected to ensure that the greatest possible agreement is achieved". (Anon., 1981)

An integrated research program and management scheme must continue to be developed in order to adequately include the "users" and have the desired effect of allowing harvesting on a sustainable basis.

> "Cultures are dynamic and resilient, changing in response to the prevailing conditions, but the way in which the changes are introduced affects the final outcome. A natural change in the environment produces a very different reaction to a mandated change imposed from outside. It is therefore very important that the people concerned must be involved in any research and management activities. The exact dimensions of change in a culture caused by policy decisions cannot be predicted in advance of the event."
>
> (I.W.C. p.7)

5. PARTICIPATION IN AN INTEGRATED PROGRAM OF RESEARCH, MANAGEMENT AND EDUCATION

Many opportunities exist for involving the "users" or "interactors" - Aborigines and Islanders, as well as commercial fishermen - in development of a scheme. A few examples of related research, management, and educational activities are listed below.

Involvement of the "users" in development of the scheme will provide opportunity for additions to the list and prioritization.

Research and Monitoring	
Harvest data	. recording catch data - biologist accompanying hunters or fishermen in the field to familiarize these people with data needs.
Analysis of specimen material	. collecting and preserving specimen material (training).
Traditional knowledge	. recording local knowledge of those with appropriate experience regarding marine resources, encouraging experienced hunters to pass on the knowledge.
Role of dugong in diet	. school children keeping records of diet.
Role of dugong in culture	. recording myths, ceremonies, collecting evidence of material culture.
Monitoring dugong population dynamics	. training indigenous people in monitoring techniques.
Management	
Zoning Plan or Management Plan formulation	. input from key groups on usage and catch, characteristics of dugong biology and behaviour, location of dugong habitat, and community needs.
Complementary management	. input from key groups such as dugong hunters when developing policy regarding dugong catch, quotas or permits with conditions.
Education/Interpretation	
Interpretation	. training indigenous people as marine park officers and fisheries officers with specialty in interpretation.
Education	. input from key groups in development of pamphlets, posters, or videos illustrating dugong life history or concern for dugong as endangered species.
Interchange	. dialogue between dugong hunters and administrators as educational experience for both.

The focus in this paper has been primarily on the development of management schemes to allow for indigenous use of dugongs in north-east Queensland. However, most of the proposals regarding research, management, education are applicable to other "user" groups and to much broader geographic areas. Aerial surveys to determine dugong population trends and mapping of seagrass habitat need to be completed for the entire northern coast of Australia. The take of dugong by both indigenous people and others likewise needs to be monitored. Impact of gill-netting on dugong populations needs to be clarified. The disciplines of economics, social anthropology, and wildlife science can be usefully applied to the fishing industry relationship with dugongs. Educational programs can be applied to a wide range of "interest" groups.

In relation to this broader scope, two components remain the same. First, "user" (or interactor) involvement is essential to development of a successful integrated program. Secondly, the responsibility for continued development of the integrated program lies with the responsible government agencies working together with "user" groups.

6. RESPONSIBILITY FOR DEVELOPMENT OF AN INTEGRATED MANAGEMENT PROGRAM

Government agencies with jurisdiction regarding taking of endangered species along northeast Queensland are the Commonwealth agency, Great Barrier Reef Marine Park Authority and Queensland agencies which are responsible for administering the Queensland Fisheries Act.

Much of the east coast dugong habitat is within the Great Barrier Reef Marine Park. The opportunity for management of this resource is provided through the Great Barrier Reef Marine Park Act 1975 which requires that Zoning Plans for the Marine Park consider conservation as well as reasonable use of the Region's resources. A public participation program is an integral part of the zoning process. Apart from developing Zoning Plans and specific management plans for Sections of the Marine Park, the Great Barrier Reef Marine Park Authority has a commitment to a substantial information/education program and research and investigation relevant to its management responsibilities. (Great Barrier Reef Marine Park Authority, 1981). The Authority is also committed to "complementary management" in conjunction with Queensland Government agencies responsible for day-to-day management within and adjacent to the Marine Park.

The Queensland Fish Management Authority has indicated its concern by coordinating an Intergovernmental Committee on Take of Endangered Species to make recommendations for policy and management of dugongs and turtles. It has actively encouraged discussions between groups of north-east coast Aborigines and Islanders. Recommendations are expected from this Committee by the end of 1984.

Both the Great Barrier Reef Marine Park Authority and the responsible Queensland Government agencies can provide support to Australia's international obligation to the 1972 Convention concerning the Protection of the World Cultural and Natural Heritage in relation to the terms under which the Great Barrier Reef was included on the "World Heritage List".

The government agencies, then, have the responsibility to ensure that development of an integrated management scheme is initiated and that essential research be continued and expanded. Most importantly, these agencies have the responsibility to ensure the participation of those individuals and communities that interact with the resource in ongoing development of the management scheme. The mechanisms for involvement are already in place. It is those communities which will be the prime tangible beneficiaries if a management scheme is successful.

7. CONCLUSION

Based on its inherent value as a food item, the dugong has a significant role in the life style of northeast-coast Queensland indigenous people. Because dugong is vulnerable to extinction there is a need to develop a program to manage the threats to its existence. Most of the northeast coast dugong habitat is within the Great Barrier Reef Marine Park. Relevant Queensland government agencies have indicated their concerns for dugong. The Great Barrier Reef Marine Park Authority has indicated its commitment to conservation of endangered species, where conservation means "wise use in perpetuity". A successful dugong management program must be based on continuity of sound research. It must be developed in conjunction with relevant government agencies and "user" groups. It must be interpreted by means of effective education programs. Only by "user" involvement in the development of an integrated research, management, and education program will the dugong population of northeast Queensland be able to be used on a sustainable basis.

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APPENDIX ONE

Existing Research Programs relating to Dugong and Traditional Hunting in Australia

- as of February 1984

EXISTING RESEARCH PROGRAMS RELATING TO DUGONGS AND TRADITIONAL HUNTING IN AUSTRALIA

Research Project	Funding Agency	Principal Researcher(s) & Assistants	Project Completion Date	Description of Project
Torres Strait Fisheries Study	Commonwealth D.P.I.	Dr R.E. Johannes CSIRO Wallace McFarlane	1986	. 17 inhabited islands . relative importance of marine life in diet . distribution and hunting pressure on marine life . harvest methods . traditional fishing rights . conflicts between traditional fishing and other activities . traditional knowledge of marine resources . evolution of traditional fishery to present
Field Study to Monitor Dugongs Killed by Members of the Hopevale Aboriginal Community in January 1984	GBRMPA	Dr H. Marsh J.C.U. Geoffrey Kelly	June 1984	. obtain specimen material from dugongs taken for work on life history and reproduction . dugong catch characteristics . hunting techniques and hunting location
Life History and Reproductive Biology of the Dugong	AMSTAC-FAP	Dr H. Marsh B. Hudson L. Marsh	December 1984	. determining characteristics of Torres Strait Island dugong catch in terms of age and sex structure, longevity, age-specific fecundity, etc. . to construct a population model to estimate the effect of the present level of hunting on dugong members in this area
Use of Photogrammetric Techniques - pilot study	Fund for Animals	Dr H. Marsh	ongoing	. evaluate the potential of vertical aerial photography to provide information on dugong life history, behaviour and habitat usage
Evaluation of Seagrasses as food for dugongs; functional morphology of the digestive system	Monash University J.C.U. GBRMPA	Janet Lanyon	December 1986	. determine seasonal variation in the quality and abundance of seagrasses in the Townsville area . examine the functional morphology of the dentition and digestive tract of the dugong in relation to plant breakdown and digestibility . investigate any correlations between seagrass nutritional status and timing of breeding/movements in dugong populations

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Traditional Uses of Marine Resources by Aboriginal Communities on the East Coast of Cape York Peninsula	GBRMPA	Andrew Smith	Stage I July 1985 Final June 1987	. document current and traditional hunting and fishing practices at Hopevale, Wujal Wujal, Yarrabah and Lockhart River . acquire indigenous knowledge of biology and behaviour of tropical marine food resources in GBRMP . evaluate factors affecting resource usage . investigate need and implications for management of resource use
Aerial Survey - Torres Strait	ANPWS	Dr H. Marsh	Stage I March 1984 further work anticipated	. aerial survey of dugongs in Torres Strait to provide a minimum population estimate to be considered in relation to estimates of current harvesting levels . to provide a reliable index of relative density of dugongs in various parts of Torres Strait as a basis for monitoring population changes . to assess dugong habitat selection and utilization . to determine dugong group sizes . to map seagrass beds (to be ground truthed by Dr I. Poiner, CSIRO) . to identify potential sanctuary areas
Analysis of Coastal Surveillance Data to determine fishing patterns	Raine Island Trust	Dr H. Marsh Brydget Hudson	June 1984	. to use Coastal Surveillance sightings to analyse seasonal and temporal changes in fishing patterns in Torres Strait
Writeup of data on management of Daru dugong fishery	J.C.U.	Brydget Hudson	July 1984	. analysis of hunting and other data on 450 dugongs caught on Warrior Reef by Kiwai . analysis of social and cultural, historical data . integration with reef use
Aerial survey of dugong	Northern Territory Conservation Commission	Peter Bayliss	ongoing	. aerial survey of dugong from Davy Reef to Maningrida Reef including Melville Island, Bathurst Island and Croker Island areas . collection of data on Aboriginal harvesting of dugong

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Seagrass bed surveys	CSIRO Division of Fisheries	Ian Poiner	June 1984	. prawn nursery habitat . Torres Strait and east coast Cape York
Aerial survey of seagrass beds and ground truthing - Far Northern Section, GBRMP	GBRMPA	Len Zell Dan Claasen	December 1984	. mapping of seagrass beds . 8 ground truth sites between Starcke River and Jacky Jacky Creek, including Corbett Reef
Use of satellite imagery to identify seagrass	CSIRO GBRMPA	David Jupp Dan Claasen	Phase 1 - June 1984 ongoing	. evaluate capability of Landsat and Coastal Zone Colour Scanner for locating submerged aquatic vegetation
Monitoring of Coastal Surveillance Data of Kimberley coast	W.A. Fisheries and Wildlife	Bob Prince	initial stages	
Dugong hunting by Aboriginal groups living in the north west of Western Australia	National Aboriginal Conference		initial stages	
Study of dugong behaviour in Shark Bay	Fund for Animals	Paul Anderson	ongoing project in abeyance	. seasonal patterns of dugong movement within the Bay . reproductive behaviour and social integration . predation of dugong by killer whales