An Ethnobiological Study of the Usage of Marine Resources by Two Aboriginal Communities on the East Coast of Cape York Peninsula, Australia.

Thesis submitted by

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Andrew J. Smith

4 December 1987

ABSTRACT

This thesis considers the role of contemporary Aboriginal marine ethnobiological knowledge and practices in Western biology and resource management, with specific reference to Aborigines living on the east coast of Cape York Peninsula, Australia. The historical and current marine hunting and fishing practices, and the ethnobiological knowledge of tropical marine food resources of Hopevale and Lockhart River Aboriginal communities are documented. There is also an applied objective which dictated both the communities chosen and the focus of the study: to provide the Great Barrier Reef Marine Park Authority (GBRMPA) with recommendations that could be used in the development of a management programme for the usage of marine resources in areas of the Great Barrier Reef Marine Park (GBRMP) adjacent to Aboriginal communities; with special reference to the management of Aboriginal hunting of dugongs (*Dugong dugon*) and sea turtles (*Chelonia mydas, Eretmochelys imbricata*).

In comparison to the marine biological information Johannes (1979b, 1980, 1981b) acquired in Palau, the information obtained from Hopevale and Lockhart River lacked detail. To account for these differences I have employed Goodenough's notion of the culture pool and identified factors influencing Aboriginal marine environmental knowledge. In considering these factors I have developed the concept of a continuum of ethnobiological knowledge through different communities/societies.

Different ethnobiological research strategies for Aboriginal communities are discussed. The strategy used should be based upon careful consideration of the objectives to be achieved and the

communities involved. I argue projects with a biological orientation should focus on topics in a number of Aboriginal communities, while those with specifically management orientated objectives will require careful consideration of the problems to be addressed prior to determining the appropriate research strategy.

The history of dugong management by GBRMPA at Hopevale is summarised, and the major management problems and their origins are discussed. The combined dugong harvest by Aboriginal hunters from Hopevale and Lockhart River is substantially less than the estimated sustainable yield, based on recent dugong population estimates. The present traditional harvest *per se* is unlikely to be damaging the dugong population in the northern GBRMP region. However, due to the dugong's low reproductive rate, it will be at least a decade before aerial surveys will be able to confirm the status of the dugong population. Therefore, a conservative management policy for dugongs is recommended while acknowledging the rights of Aboriginal hunters. The problems experienced by GBRMPA in managing Aboriginal dugong hunting at Hopevale were used to evaluate potential difficulties for GBRMPA in attempting to manage Aboriginal turtle hunting. The management of a resource exploited by people with a different cultural perception of that resource, can successfully occur (as appears to be currently happening at Hopevale and Lockhart River) when the authorities concerned are willing to demonstrate flexibility and adaptability in their management programmes.

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1.0 INTRODUCTION

Marine resource management and conservation programmes in the tropics have, until recently, ignored the potential value of traditional knowledge possessed by indigenous communities. The inclusion of ethnobiological studies is now becoming accepted as important in developing management programmes for regions where artisanal/subsistence fishermen comprise one of the major users (Hanks, 1984). As resource management involves regulating the behaviour of those groups whose activities affect that resource, local needs, aspirations and cultural values must be recognised and incorporated. If management regimes are to be successful in indigenous communities, legislation should take account of local traditions wherever possible, in order to gain greater public support and thus easier enforcement (Johannes, 1984; Robinson, 1986). An essential step in this process is the recognition and documentation of traditional fishing and marine hunting knowledge.

1.1 Research Aims

This thesis considers the role of contemporary Aboriginal marine ethnobiological knowledge and practices in Western biology and resource management, with specific reference to Aborigines living on the east coast of Cape York Peninsula (CYP). My interest in this topic was inspired by the work of Johannes in Palau (Belau) in the Pacific; especially his book 'Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia' (Johannes, 1981b) and his paper (Johannes, 1981a) on working with fishermen to improve coastal tropical fisheries and

resource management. In Palau, Johannes set out:

> "...to discover what Westerners can learn about tropical marine ecosystems and their resources by investigating the knowledge and actions of native fishermen and by observing their impact on these resources." (Johannes, 1981b:ix)

The literature on the Pacific Islands contains many references to canoes and fishing techniques, but very little as to why islanders use the fishing techniques they do or what knowledge they possess of their marine resources (Johannes, 1981b). This paucity of information is, in part, due to anthropologists interested in ethnobiology having focussed primarily on terrestrial ecosystems; and biologists having largely ignored the traditional knowledge possessed by artisanal fishermen (Johannes, 1981b).

As a biologist, Johannes (1981b:x) noted that:

> "The kind of research described in this book [Johannes, 1981b] offers a shortcut to some basic natural history data we need in order to understand these vast and valuable resources [i.e. tropical marine resources]. Such information has to be quantified and blended with more sophisticated forms of biological research (e.g., population dynamics, behavior, physiology, genetics) before it can be put to optimum use, and this is no small matter. But I gained more new (to marine science) information during sixteen months of fieldwork using this approach than I had during the previous fifteen years using more conventional research techniques. This is because of my access to a store of unrecorded knowledge gathered by highly motivated observers over a

period of centuries."

Johannes (1981a) provides some examples of the potential benefits to biologists of working with traditional fishermen, such as: the recognition of unappreciated resource areas and their vulnerability to damage through coastal development (Johannes, 1980, 1981b); important aspects of the biology of target species (Johannes, 1978b, 1980, 1981b); relevant local oceanic phenomena (Johannes, 1981b); the local cultural acceptability of proposed management schemes and local traditional conservation practices of continuing value (Johannes, 1978a, 1981b).

As a biologist, I was interested in determining to what extent marine ethnobiological studies, like that carried out by Johannes in Palau, are applicable to Fourth World[1] peoples, specifically Australian coastal Aborigines. Is there the same depth of marine biological and environmental knowledge? Is that marine resource knowledge important for management and conservation programmes to be successful in those communities?

To address these questions I set the following objectives:

1. To document the current and historical marine hunting and fishing practices of the Aborigines living in communities on the east coast of Cape York Peninsula;

2. To acquire indigenous knowledge of the biology and behaviour of tropical marine food resources in the communities studied;

3. To use the above information (a) to evaluate the reasons for differing fishing practices and knowledge between

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[1] Fourth World: refers to cultural minorities on the economic and political fringe of a dominant national society which may itself be First, Second or Third World (Nietschmann, 1985).

communities; (b) to evaluate the factors that act to limit or encourage marine resource usage by those Aboriginal communities; (c) to assess the possible need for, and methods of, management of marine hunting and fishing practices; and (d) to assess the need for further investigation of possible impact on the Aboriginal communities, due to marine resource management;

Further, there was an applied objective which dictated (1) the two communities chosen, Hopevale (Fig. 3.1) and Lockhart River (Fig. 4.1), and (2) the focus of the study:

4. To provide the Great Barrier Reef Marine Park Authority (GBRMPA)[2] with recommendations that could be used in the development of a management programme for the usage of marine resources in areas of the Great Barrier Reef Marine Park (GBRMP) adjacent to these Aboriginal communities; with special reference to the management of Aboriginal hunting of dugongs (***Dugong dugon***) and turtles (***Chelonia mydas***; ***Eretmochelys imbricata***).[3]

1.2 Ethnobiology

In the social science literature, 'ethnoscience' has been defined as "...the study of systems of knowledge developed by a given culture to classify the objects, activities, and events of its universe" (Hardesty, 1977:291). Social science studies, however, usually concentrate on the effects that the available ethnoscientific information has had on the parent culture, rather than on the environmental knowledge itself. Such studies rarely emphasise the 'objects' or 'activities' *per se*.

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[2] See Appendix 1 for an outline of GBRMPA's aims and functions.
[3] The GBRMPA has been given specific responsibility for endangered species within the Park. There was concern about the possible overexploitation of dugongs by Aboriginal hunting in the Hopevale region (see Section 7.2.3).

The definition of 'traditional knowledge and practices' that I have used in this thesis is based on Hill, Pernetta and Rongap (1982). That is, 'traditional knowledge and practices' are the sum of the empirical knowledge and practices which belong to a community and are generated, stored, acquired, communicated and used by its members for productive activity. This broad definition encompasses knowledge and practice in both their implicit and explicit dimensions.

The term 'ethnobiology' is used here to refer to the acquisition of biological information from people who are intimately involved with the resource, such as artisanal fishermen.

Most biologists either ignore or else summarily dismiss 'ethnobiology' and 'ethnoscience' as fields which an anthropologist or sociologist might examine, but which are of no practical value beyond the social sciences (Pernetta and Hill, 1982).

On the other hand, anthropologists have generally had insufficient training in the biological sciences to allow them to effectively utilise indigenous ecological knowledge (Vayda and Rappaport, 1968). Johannes (1981a:678) suggests that:

> "...the ideally equipped researcher would be well versed not only in marine environmental subjects but also in social science. Such individuals are rare, and the collaboration of marine scientists and social scientists in such studies is thus especially desirable."

1.2.1 A Comparison Between Indigenous and Western Science

Freeman (1985) argues that both indigenous systems and western science rest on the same foundation - namely empirical evidence. Both systems place value on the systematic accumulation of detailed observations and the abstraction of norms from disparate data sets. At this point he considers the systems diverge. The indigenous system assesses deviations from the norm in a qualitative sense, for example, animals become fewer, or fatter, or there are relatively more young animals. All this information provides important evidence of trends in the status of the population. If an individual fisherman observes events that are unfamiliar, or the significance of which is unclear, there are usually others with experience of other times and places who can assist in interpreting the evidence. The sum total of a community's empirically-based knowledge is often considerable in breadth and detail, and at times stands in marked contrast to the attenuated data available from scientific studies of the same populations (Freeman, 1985).

Similarly, Webb and Smyth (1984:103) have used the term 'Aboriginal science', which, they say:

> "...is simply Aboriginal Knowledge of the natural world. It is an integral part of culture, and is transmitted through culture in all its forms. Its analogy with western science comes from its focus on natural phenomena, and from its power and predictive value in dealing with the local environment. Further, Aboriginal science is reactive: it incorporates new knowledge by processes of both cultural adaptation and cultural rationalisation. These processes are similar

to the responses of the western scientific community to new information and ideas."

The general aim of ethnobiological studies is to integrate modern and traditional science to enhance current biological knowledge.

1.3 A Review of Ethnobiological Studies

1.3.1 General

There is no one research discipline that encompasses ethnobiological studies (I. Smith, 1979). Ethnobiology is an area where anthropology and biology merge; however, little has been done besides descriptive taxonomies (Ellen, 1982). An additional problem is that information on traditional marine resource usage is extremely scattered, often superficial, and usually has been obtained obliquely (Dye, 1983). This stems from the undervaluation of traditional knowledge concerning the environment. With some exceptions (e.g. Johannes, 1978b, 1980), few studies have attempted to record traditional marine knowledge and practice for its scientific merit.

Early ethnographies usually emphasised aspects of traditional culture such as subsistence patterns, kinship, religion, and politics. For example, studies which mention traditional fishing, e.g. Malinowski (1922), usually treat it tangentially, relating it to the culture in question, rather than to the target species. The most valuable early accounts relating to traditional fishing in the Pacific are usually limited to descriptions of selected fishing techniques and their associated ritual (e.g. Nordoff, 1928 and 1930; Malinowski, 1918). Similarly, historical accounts written by explorers,

missionaries, traders or administrators, generally only mention fishing in passing.

In an attempt to overcome these deficiencies, recent research by anthropologists, biologists and geographers has provided some detailed knowledge of aspects of traditional fishing, such as: specific fishing techniques (Dye, 1983; Falanruw, 1968; Johannes, 1981a, 1981b; Morril, 1967; N.Smith, 1981), marine tenure systems (Johannes, 1978a, 1986; Sudo, 1984), biological and environmental knowledge (Hill, 1978; IWC, 1982; Johannes, 1978b, 1980, 1981a; Morril, 1967; N.Smith, 1981), conservation practices (Johannes, 1978a; Nietschmann, 1977, 1985, in press), artisanal fisheries (Bailey, 1982; Emmerson, 1980; Neal, 1982; Pauly and Smith, nd; I.Smith, 1979, 1980) and management practices (Johannes, 1978a, 1981a). However, such knowledge has been documented for relatively few regions (e.g. Palau: Johannes, 1981b; Niuatoputapu: Dye, 1983; Virgin Islands: Morril, 1967; Amazon: N. Smith, 1981).

1.3.2 Australia

Research on Aboriginal and Torres Strait Islander marine resource usage has tended to be anthropological or archaeological rather than biological. Most studies have concentrated upon particular groups or communities (e.g. Anderson, 1979; Chase, 1980a; Davis, 1985a; Nietschmann, 1982, 1983), or on only one particular aspect of marine resource usage (e.g. Bradley, nd; Davis, 1981a, 1981b; Meehan, 1977b; Thomson, 1934).

The literature on marine usage by Aborigines and Torres Strait Islanders can be loosely grouped into six categories. They are:

- general accounts and observations by early explorers and settlers;
- archaeological and material culture studies;
- general anthropological studies, i.e. ethnographies;
- directed anthropological studies on marine cultural ecology;
- research arising from land/sea rights claims and associated legislation;
- biological studies on marine resources used by Aborigines and Torres Strait Islanders.

Each of these categories will be briefly discussed, outlining the major studies and their contributions.

(i) Early Explorers and Settlers:

Prior to European settlement some northern Aboriginal groups had contact with Asian fishing boats, for example, the Macassan beche-de-mer fishermen (F.Rose, 1961). However, Aborigines on the east coast of Cape York Peninsula were free from overseas contact prior to European 'discovery' (Chase, 1981b).

Dampier on his visit to the west coast in 1688 noted that the groups he observed used fish and shellfish, but he considered their usage of marine resources to be rudimentary (Masefield, 1906). During their voyage up the east coast, Cook and Banks recorded observations on Aboriginal fishing, especially during their enforced stay at the Endeavour River (Fig. 3.1)(Beaglehole, 1955, 1962).

After European settlement, explorers' and early settlers' records made reference to Aboriginal marine resource usage, although these were often oblique (e.g. Jack, 1922). These

accounts contained only minor references to fishing techniques, with a minimum of ethnographic description, especially in the general travel/adventure literature (e.g. Anon, 1943; Jay, 1919; Patterson, 1939; Petrie, 1932; Sunter, 1937). However, they are of value in identifying some of the resources, techniques and areas used, as well as demonstrating Aboriginal resistance to foreign encroachment on these resources (see Reynolds, 1982).

(ii) Archaeological and Material Culture Records:

Archaeological records provide valuable insights into Aboriginal marine resource usage, but are a source of information often ignored. Beaton (1978, 1985) has discussed the Great Barrier Reef region, and Princess Charlotte Bay (14°25'S 143°56'E) on CYP. Rowland (1984, 1985) has looked at Aboriginal food resources of the Keppel Islands (23°08'S 150°56'E) and at Aboriginal fish-hooks. Hall (1982) has been studying pre-contact Aboriginal marine adaptation in Moreton Bay (27°25'S 153°20'E). Campbell (1982) has studied fish traps in the Hinchinbrook Island area (18°22'S 146°15'E), and Bowdler (1976) has looked at shell middens. Minnegal (1984a, 1984b) studied dugong bones from Princess Charlotte Bay in relation to the butchering process.

Material culture studies, often included within early ethnographies, provide some information on general Aboriginal use of the sea. There appears to be more literature on techniques and technologies than on other aspects of Aboriginal marine usage. The Cambridge Anthropological Expedition to the Torres Strait (Haddon, 1904, 1908, 1912, 1927) recorded considerable amounts of data on dugong hunting techniques, equipment and magic.

Some workers have concentrated on equipment, such as fish

hooks and harpoons (Massola, 1956, 1964) used by Aborigines and the distribution of this equipment around the Australian coast. Other workers recorded techniques as well (e.g. Banfield, 1909; MacPherson, 1933, 1935). Roth (1901a) prepared a paper on 'Food: its search, capture, and preparation' by Aborigines in northern Queensland, which lists records of terrestrial and marine food usage with some useful annotations on seasonality and behaviour of the target species.

(iii) Ethnographic Sources:

Anthropological studies of contemporary Aboriginal communities are concerned with matters such as language, kinship, marriage, religion and totemism and other aspects that are perceived to constitute a group's 'culture'. Such studies have not seriously considered the processes of interaction within the environment (Chase and Sutton, 1981).

Thomson's (1934, 1956) work on dugong hunting, fishing and the culture of coastal Aborigines on CYP, was perhaps the only ethnography that specifically addressed marine usage.

Anderson (1979, 1980), Chase (1980a) and Williams (1982) studied coastal Aboriginal groups; however, the main focus of their research was not marine-orientated. Chase (1980a) mapped coastal estate boundaries. He noted that these continue out to sea to include islands, reefs, cays, sandbanks and seagrass beds. He also recorded data on traditional marine and terrestrial resource exploitation, as the landscape is considered by Aborigines to be coextensive with its food and other resources (Chase, 1980a).

(iv) Marine Cultural Ecology:

Chase and Sutton (1981:1820) argue that:

> "There have been few systematic investigations of those areas where marine as well as terrestrial environments were heavily exploited, and where the resource base was bountiful rather than restrictive."

In recent years there have been a number of anthropological researchers who have begun to address marine cultural ecology questions. Chase (1978, 1980b) and Chase and Sutton (1981), provide examples of CYP Aboriginal populations to demonstrate the ecological processes of coastal peoples, and to show the considerable range of interactions across a variety of coastal habitats.

Other anthropologists have concentrated on specific aspects of marine resource use. For example, Meehan (1977a, 1977b, 1977c, 1982) carried out detailed analyses of the role of shellfish in a group of coastal Northern Territory Aborigines. Bradley (nd) recorded the Yanyuwa Aborigines' knowledge and beliefs concerning dugongs and turtles. As a corollary to a research programme on the Aboriginal perception of the environment in north-eastern Arnhem land, Davis (1981a, 1981b) notes the movements of fish, and the habits of barramundi in the Crocodile Islands area (11°40'S 135°16'E). Davis (1983, 1985b) outlines the traditional management of the littoral zone among the Yolngu Aborigines of north Australia.

In the Torres Strait, the first research directed at traditional marine resource usage was by Nietschmann , an American geographer based on the island of Mabuiag (09°57'S 142°10'E)(Nietschmann, 1977, 1982, 1983, 1985; Nietschmann and

Nietschmann, 1977, 1981). These papers discuss traditional sea territories, living resource usage and resource rights. Nietschmann (1982:3) suggests that as only some resources are recognised and relevant to a cultural group, then "...resources are cultural appraisals and as such cannot be disengaged from the cultural context." He further suggests that "...conservation of the cultural resources may be critical in promoting and achieving conservation of the biological resource." (Nietschmann, 1982:5). Nietschmann's work comes closest to developing an understanding of Aboriginal or Islander marine based culture in relation to economic, social and environmental factors.

(v) Sea-Rights Claims:

The numerous Aboriginal land/sea rights claims, especially in the Northern Territory (N.T.), have prompted considerable marine orientated research in recent years. These claims have resulted in researchers having to examine Aboriginal marine usage, territorial claims and religious beliefs in relation to the environment.

Woodward's (1974) report on Aboriginal Land Rights in the Northern Territory, recognises that Aboriginal land claims should also include sea rights as Aboriginal people see land and sea as continuous, and consider the distinction between land and sea as an arbitrarily imposed European classification. The N.T. has the only legislation recognising that Aborigines have sea rights (N.T. Aboriginal Land Act 1978). The legislation does not, however, recognise absolute Aboriginal ownership. The Northern Land Council submissions for land claims or applications for sea closure provide useful sources of information on Aboriginal

marine usage (e.g. Avery and McLaughlin, 1977; Dreyfus and Dhulumburrk, 1980), as has Green and Turner's (1984) submission to the W.A. Aboriginal Land Inquiry for the Bardi Aborigines. Also, Davis (1983) considers the subject of Aboriginal claims to coastal waters in north-eastern Arnhem Land.

The Australian Law Reform Commission's report on the Recognition of Aboriginal Customary Laws (LRC, 1986) considers the recognition of traditional hunting, fishing and gathering rights. The report discusses traditional hunting, fishing and gathering practices; the current Australian legislation; and the securing of hunting, fishing and gathering rights.

(vi) Marine Biological Research:

Aborigines and Islanders in northern Australia legally exploit some protected species, such as dugongs and turtles. Data on harvest rates and also indigenous knowledge of the resources and environment, are thus essential for the development of management programmes. Information on dugong exploitation dominates the biological literature concerning some Aboriginal and Torres Strait communities, especially from the Papua New Guinea (PNG) side of the Torres Strait. Hudson (1981, 1982, 1986a, 1986b) and Olewale and Sedu (1982) discuss the collection of biological data from the Daru (PNG) market (09°05'S 143°12'E), the development of management plans through community education and involvement, and the formation of the Maza Wildlife Management Area. Marsh (1986a) discusses the status of the dugong in Torres Strait.

Very few biologists have worked with Aborigines to acquire marine biological information. Anderson and Heinsohn (1978)

attempt a survey of the views of coastal inhabitants (including Aboriginal communities) on dugong status and behaviour. Marsh, Gardner and Heinsohn (1980-81) record the hunting and distribution of dugongs in the Wellesley Islands (16°26'S 139°42'E) and the implications for conservation.

Other marine species used by Aborigines and Islanders have received much less attention. Turtles in the Torres Strait are briefly discussed by Limpus (1981), Limpus and Parmenter (1986), Prescott (1986) and Spring (1982). Kowarsky (1982) used a questionnaire to determine the level of subsistence hunting of turtles throughout Australia, and to assess the importance of turtles to traditional hunters.

Currently, the federal Department of Primary Industry (DPI) is funding the Torres Strait Traditional Fisheries Study, the first specifically ethnobiological project in Australia. Its objectives are to provide information on (1) the relative importance, distribution and harvest intensity of the various marine resources used; (2) the harvesting methods; (3) traditional use rights in the fisheries (TURFs); (4) conflicts with other fishing activities; traditional biological knowledge; and (5) the evolution of the traditional fishery. The study also aims to formulate policy alternatives for securing sustained yield exploitation of those stocks which constitute important components of the fishery. Some of the results are becoming available, for example, Johannes and MacFarlane (1986) on traditional fishing rights in the Torres Strait.

1.3.3 The Relevance of Traditional Fisheries Research

Traditional fisheries tend to be distinctive in nature, and

due to various environmental, geographic and cultural differences, no one fishery is representative of any other.

Johannes (in press) suggests that the costs of gaining the information necessary for conventional fisheries management of all these sub-fisheries could easily exceed the economic benefits. Also, the costs of effective enforcement of the resulting fisheries regulations would be disproportionate to the benefits. What are the possible justifications for carrying out research on such fisheries? Possible justifications have been identified by Johannes (in press) and can be broadly grouped on economic, political, conservation-related and scientific grounds.

(i) Economic Justification:

"It is not economically viable to carry out research on all resource stocks used in traditional fisheries. However, there are often sound economic reasons for studying the parts of the fishery involving certain high-value species important to traditional fishermen, or to commercial fishermen and traditional fishermen who compete for the same stock"(Johannes, in press). Some examples would include traditional fisheries for rock lobsters, barramundi, trochus and mackerel.

(ii) Political Justifications:

These can be varied, but most would relate to resolving boundary disputes and/or fair resource allocation. The exclusion of other users by Aboriginal communities for certain areas in land/sea right claims recently has gained in importance with decisions upholding some Aboriginal claims in the N.T.. At

present very little is known or published concerning traditional sea rights in Australia (Johannes, in press).

Such information is now of importance to fisheries administrators, due to the potential exclusion of commercial fishermen from areas under claim. In Oceania, where traditional sea rights are well-developed, numerous disputes have already occurred (e.g. Wright, 1985).

(iii) Conservation-related Justifications:

Australia has an international responsibility to protect populations of endangered species. The dugong and green turtle are both taken legally by Aborigines and Islanders across northern Australia (see Section 7.2.2). At present there are very few data on actual harvest rates. There have been fears that with changed technology these species are being over-harvested. Until more research on the indigenous take is undertaken, management authorities will be planning in ignorance.

(iv) Scientific Justification:

A further justification for traditional fisheries research, is that from a biological aspect, this type of research can identify and provide an array of basic biological research projects that can be carried out in the context of applied fisheries (Johannes, in press).

1.3.4 The Relevance of Ethnobiological Studies to the Great Barrier Reef Marine Park

A number of Aboriginal communities on CYP are situated adjacent to the Great Barrier Reef Marine Park. Three are adjacent to the Cairns Section of the Park: Yarrabah (16°54'S 145°52'E), Wujal Wujal (Bloomfield River; 15°56'S 145°21'E), and Hopevale (Fig. 3.1); and one, Lockhart River (Fig. 4.1), is next to the Far Northern Section of the Park. All these communities utilise marine resources in their areas.

Despite having been resettled in missions and communities, the coastal Aborigines of Cape York Peninsula still retain and use their considerable knowledge of traditional fishing practices, even if on a part-time basis (Chase, 1978). This knowledge is relevant to the management of the Marine Park.

In particular, dugongs and green turtles form an important part of the culture and diet of coastal Aborigines in many parts of northern Australia. Dugongs are listed as vulnerable in the International Union for the Conservation of Nature and Natural Resources (IUCN) Red Data Book (Thornback and Jenkins, 1982). Aerial surveys conducted from 1976 to 1985 established that the Starcke River area (Fig. 3.1) is probably one of the most important regions in the world yet identified for dugongs (Heinsohn and Marsh, 1981; Marsh, 1986b; Marsh and Heinsohn, 1982; Marsh, Heinsohn and Hudson, 1983). For this reason, the area between Lookout Point and Jeannie River has been designated as a Scientific Research Zone (Fig. 3.1) by the GBRMPA.[4] Recreational activities, fishing (other than permitted traditional fishing and hunting) and collecting are excluded from this area.

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[4] See Appendix 1 for the objectives of the different GBRMP Zones.

Historically, the resources of this Scientific Research Zone, especially the dugongs and turtles occurring on the seagrass beds near the mouth of the Starcke River have been exploited by the indigenous peoples of the area. Current management plans (GBRMPA, 1983) recognise the rights of the indigenous residents of the Hopevale community to fish and hunt in this area. The GBRMPA is committed to review management plans after the zoning plan has been in operation for five years.

A Marine Park Authority decision (MPA 59/13), recognised that an understanding of the indigenous marine biological knowledge within this community will be necessary to gain the cooperation of the people for the successful management of the dugong population of the northern part of the Cairns Section. This study aims to provide this information and parallel information for the Lockhart River community (see also Smith, 1983, 1985, 1987).

1.4 Definitional Problems

The terms 'traditional' and 'subsistence' have received considerable attention in the literature (Anderson, 1980; Baldwin, 1984; Chase, 1980b; IWC,1982; LRC, 1986; Mitchell and Reeves, 1980; Nietschmann, in press). They have been used to describe such a large number of differing situations that they have become a source of much misunderstanding (even among the experts). To many 'traditional' connotes a pre-contact (usually European contact) cultural condition, assumed to have been unchanged before contact and severly altered after contact (Nietschmann, in press). The problems involved with using the terms 'traditional' or 'subsistence' exploitation have been

exacerbated through the lack of a shared understanding of the terms. Most existing legislation pertaining to marine hunting and fishing in Australia is based on these ill-defined generalisations. As a result most legislative definitions of 'traditional' are to some extent self-referencing in nature, using the terms in describing the definition. This often makes the intention of the legislation uncertain, such that it can be interpreted as broadly or narrowly as desired (Baldwin, 1984; LRC, 1986).

An example of this is the definition of 'traditional hunting' (for dugong and turtle) in the Cairns Section Zoning Plan of the Great Barrier Reef Marine Park (1983:3):

> "...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, crustaceans, echinoderms and molluscs in accordance with Aboriginal traditions 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."

There has been considerable discussion of the practical problems of applying such definitions (see Baldwin, 1984; IWC, 1982; LRC, 1986; Mitchell and Reeves, 1980). From these discussions there appear to be five areas which need to be considered in relation to elaborating the terms 'traditional' and 'subsistence'. They are:

(a) who: race/ethnicity/cultural integrity;

(b) why: the purpose, including the product or end-use;

(c) how: the methods and technology used;

(d) where: residential or other nexus with areas;

(e) when: what time criteria, if any, should be used.

(a) Who: the 'right' to hunt should perhaps be vested in cultural groups rather than individuals, as it implies that the group would take responsibility for the management and discipline as it has a past and a future while the individual has neither in the same sense.

In relation to cultural groups and 'traditionalism', Chase (1980b:83) suggests we should

> "...reject the 'culture as whole' approach, and talk more productively of cultural continuities or discontinuities in various aspects of Aboriginal life. These continuities or discontinuities can consist of beliefs within the community."

Nietschmann (in press) asks if an indigenous group was more traditional in the year 500 than it was in 1200? He goes on to quote Albert Wendt:

> "Is there such a creature as '<u>traditional culture</u>'? If there is, what period in the growth of a culture is to be called 'traditional'? If 'traditional cultures' do exist in Oceania, to what extent are they colonial creations? What are authentic cultures?...Should there be ONE sanctified/official/sacred interpretation of one's culture? And who should do the interpreting? (1978:1)."

(b) Why: The Australian Law Reform Commission (LRC, 1986) suggests that within the notion of 'traditional' hunting and fishing there tends to be an emphasis on purposes such as 'subsistence', 'consumption', or 'sustenance'. The Commission

considers that the broader notion of 'subsistence' should be preferred, provided that, in addition to the nutritional sense, it also allows for products to be used in ceremony, exchange and in satisfying obligations to kin and family. Therefore the major purpose which would be excluded from 'subsistence' use would be any take for purely commercial reasons. However, I feel it needs to be acknowledged that a grey area can exist between kin obligations and commercial interests.

(c) **How:** when methods and technologies are discussed in relation to 'traditional' marine hunting, most people immediately conjure up images of dugout or sailing canoes, hunting platforms, nets and ropes constructed of bush materials, spears and harpoons, and so on. It would be unrealistic and impracticable in many situations to require only pre-contact methods and materials to be used, for example, enforcing the use of dugout canoes in dugong and turtle hunting.

The Law Reform Commission (1986:181) considers that:

> "...in determining whether an activity is 'traditional', attention should focus on the purpose of the activity rather than the method. Thus the question which methods or technologies are to be regarded as 'traditional' is, for most purposes, a subordinate one."

Particularly destructive technologies, however, may be excluded outright. Under certain circumstances, such as exploiting rare and endangered species, hunting and fishing may need to be restricted to relatively or even strictly 'traditional' methods or technologies (LRC, 1986). For example, there are indications that the use of harpoons in dugong hunting by the Bardi people at

One Arm Point (W.A.) is a post-European contact technique; prior to this dugongs were apparently caught by hand (Prince, 1984). Other factors may also be relevant, such as whether the person was entitled to hunt or fish under their customary laws (LRC, 1986). For these situations careful study to determine what methods were traditional in specific locations would be necessary prior to imposing such restrictions.

There are a number of uncertainties as to the overall effectiveness of aluminium boats and outboard motors when dugong hunting. Obviously mobility and searching ability are greatly increased, however, the extra noise,[5] cost and unreliability (of the motors and fuel), tend to work against the hunter (Anderson, 1982; Chase, 1981a; Marsh, Gardner and Heinsohn, 1980-81; Prince, 1984; Tucker, 1984).

The actual methods of capture are usually part of a highly complex system of knowledge, beliefs and attitudes, and hence the adaptation of modern technologies does not necessarily mean the system has lost its impetus, nor that a resource will automatically be exploited at a level greater than occurred before European influence (Chase, 1981a; Johannes, 1978a).

(d) Where: it has been suggested that residential requirements are undesirable, especially where policies of dispersal and displacement to reserves and missions make this requirement extremely difficult or impossible to demonstrate (LRC, 1986). This area relates more to the question of Aboriginal land and sea rights, and has been extensively reviewed by the Law

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[5] An immature male dugong caught and tagged with a VHF transmitter in October 1986 and retagged in May 1987 (Marsh, 1987), has become progressively more difficult to approach by outboard powered boat (Dr H.Marsh, *pers comm*).

Reform Commission (1986).

(e) **When**: the time component was briefly addressed in relation to cultural groups (see (a) above), with which it is closely associated. Certain features of cultural groups must be kept in mind when discussing any time criteria for 'traditional'/'subsistence' (the following are adapted from an IWC report on Aboriginal/subsistence whaling, 1982):

1. cultures are dynamic and are therefore changing continually;
2. members of a cultural group often have minimal difficulty identifying with their culture as it evolves;
3. loss or substitution of elements does not necessarily lessen the viability of a culture, providing the essential elements, as recognised by the group members, remain substantially as required;
4. substitution is ordinarily employed so as to ensure cultural continuity when faced with change;
5. the ability of a group to respond adequately to change can be seriously affected by the manner in which change is introduced;
6. the most threatening situation occurs when an introduced change profoundly affects a number of the essential elements of a culture.

Therefore the terms 'traditional' and 'subsistence' should only be used if their inherently dynamic nature is accepted. As a practical approach to the definitional problems, Baldwin (1984) recommends that for the purposes of resource management, a hierarchy should be established of possible restrictions based on the term 'traditional'. These should be determined through discussions with the relevant groups, the level of restrictions

being explicitly described. I would further suggest that the derived hierarchy be open to regular review by both the authorities and the people concerned, to compensate for the dynamic nature of cultural groups. This would permit the hierarchy to be altered such that the resultant restrictions could be adjusted in either direction, depending upon the prevailing circumstances.

In conclusion, I am of the same opinion as the Australian Law Reform Commission (LRC, 1986) that attention should focus on the purpose of the activity rather than the method. Traditional hunting and fishing should not be limited to the taking of food for 'sustenance'. The broader notion of 'subsistence' should be preferred, providing that, in addition to the nutritional sense, it also allows for products to be used in ceremony, exchange and in satisfying obligations to kin and family. It is in this sense that 'traditional' and 'subsistence' are used in this thesis.

2.0 RESEARCH METHODOLOGY

2.1 Background

I carried out a brief feasibility study in late June 1983 to assess the potential for a long term marine ethnobiological project at Hopevale (see Smith, 1983). The results of that study indicated that it would be both feasible and desirable to carry out an ethnobiological project, especially due to the community's utilisation of the dugong population in the Starcke River region. The Aboriginal Council gave permission for the project and provided considerable support.

In August 1984, I visited the Lockhart River community in company with two elders from Hopevale who had distant relatives at Lockhart River. The trip was to assess the possibility of working at Lockhart River to acquire comparative data for Hopevale. The Aboriginal Council expressed interest in the work, and gave permission for the study.

2.2 Literature Research

A general literature search was carried out using the facilities of the James Cook University Library in November and December 1983.

More detailed literature searches were later undertaken using the facilities and personnel of the Australian Institute of Aboriginal Studies, the National Library and the Australian National University libraries in Canberra, the Queensland State Library, the University of Queensland libraries and the Queensland State Archives. Collectively these institutions

contain a large proportion of the literature and personnel necessary to gain an historical perspective of the east coast Cape York Peninsula Aborigines. Both early Government records and anthropological accounts were studied for biological information which may have passed unrecognised, and also for the historical and cultural background necessary for working successfully in Aboriginal communities.

Drs J. Haviland and L. Devereaux's excellent historical database for Hopevale (and the earlier Cape Bedford missions), containing Government and mission records and letters, was used to extract further historical information.

2.3 Field Work

I undertook four periods of field work for this project: January to March 1984 (Hopevale); May 1984 to March 1985 (Hopevale); September to December 1985 (Lockhart River); and January to February 1986 (Hopevale). Thus a total of 16 months were spent at Hopevale, and three months at Lockhart River.

For Hopevale, these phases encompassed three summer marine hunting and fishing periods as well as most of an annual cycle of fishing seasons. During these periods, my time was divided fairly evenly between Hopevale itself and the various beach camps used by the community. Whilst in Hopevale, I lived in a tent on the property of an Aboriginal family with whom I ate my meals. My time at the beach camps was determined by the movements of Hopevale residents, especially the informants with whom I worked. Most weekends and all public holidays were spent at the beach camps or out fishing. In addition, I spent considerable time staying with the few permanent residents of the beach camps at

Elim and Manbaa (see Fig. 3.1).

My time at Lockhart River coincided with the pre-wet season calm weather, when a considerable amount of marine hunting and fishing occurs. At the request of the Executive Officer (Queensland Department of Community Services) I stayed in the guest house rather than with an Aboriginal family. The majority of my time was spent on fishing and marine hunting trips, the remainder on interviewing informants.

During all field work, I adhered to the code of behaviour outlined by the Australian Institute of Aboriginal Studies (1980).

2.3.1 Biological Methods

Whenever possible, data and specimen material were obtained from dugongs caught, to determine their size, age, reproductive status and diet as described in Marsh (1980), Marsh, *et al* (1984b) and Marsh, *et al* (1984c). In addition, peduncle measurements (circumference and dorsal angle) were obtained as a basis for designing a tether for VHF and satellite PTT transmitters, which are being used by Marsh to study dugong movements (see Marsh, 1987).

When I was not present during butchering of dugongs, a number of hunters co-operated by bringing me the dugong heads, from which I extracted the skulls and tusks for later analysis.

The following were monitored and evaluated: (1) the number of dugongs caught, (2) size and sex composition of the catch, (3) who was doing the hunting, (4) the hunting techniques, (5) when the hunting was occurring and (6) for what reason.

Whenever possible, measurements and specimens were also

obtained from any marine turtles caught. The measurements included tail and curved carapace lengths. The specimens collected were the eyes, reproductives and stomach contents. These were fixed in 10% neutral buffered formalin. The data and specimens were forwarded to Dr C.J. Limpus (Queensland National Parks and Wildlife Service (QNPWS)).

Data were also obtained (when possible or practical) for fish and marine invertebrates caught or collected. These data included (1) the species, (2) the size, (3) the sex (where applicable) and reproductive status, (4) where they were caught, (5) when they were caught, (6) the quantity caught, (7) how they were taken, (8) who caught them and (9) for what purpose.

2.3.2 Ethnobiological Methods

I used the first phase of the field work (January to March 1984) to develop rapport with the members of the Hopevale community and to gather certain basic anthropological information, including (1) basic data on household composition and genealogical links, (2) co-operative networks operating in marine resource exploitation, and (3) place names and site locations of significance to the project. I was able to assess the informant pool and to develop a working competence in hearing and transcribing the sounds of ***Guugu Yimidhirr*** using Dr Haviland's unpublished Guugu Yimidhirr/English dictionary and two of his language papers (Haviland, 1979a, 1979b). I maintained a general field work journal, daily diary, photographic record and transcribed all tape-recorded interviews.

The second phase of the field work involved more intensive and directed interviewing. The general informant pool consisted

of approximately 48 men and five women; the key informant pool comprised ten men, selected for their marine knowledge and/or their ability and interest in fishing or marine hunting. There is therefore a distinct bias towards male-orientated information and activities.

The formal interviews were based on the development research sequence outlined by Spradley (1979, 1980), whereby a series of descriptive, structural and contrast (verification) questions were asked over an extended period of time. Informant reliability was tested by asking two series of questions on fishing or on the biology of fish or other animals: (a) questions to which the answers were already known and (b) plausible questions to which the informant could not possibly know the answers (Johannes, 1981a).

The types of ethnobiological information which were collected on dugongs, turtles, fish and invertebrate marine resources included:

(1) the indigenous taxa for such species and the total number of categories known and recognised: these were compared with scientific designations for the same localities;

(2) the uses of such species, for example (a) food, (b) non-food economic, (c) medicinal, (d) social and religious;

(3) knowledge of the biology and ecology of different species, such as life histories and behaviour;

(4) knowledge and techniques of marine resource appropriation;

(5) knowledge and techniques of management and manipulation of the physical marine environment.

This information was used to reconstruct former systems of marine resource exploitation through historical records and the

remembered experiences of the elder members of the community.

All my fishing and marine hunting trips occurred in company with Hopevale residents. In most cases I accompanied them on trips they had organised, however, at times I invited them to accompany me to specific locations. This aspect of the field work was based largely on the method of participant observation (Spradley, 1980). I was an active participant in order to check on the validity and reliability of information derived from interview materials.

Due to the brevity of my stay at Lockhart River, more time was spent in participant observation. Interviews were more directed and were aimed primarily at acquiring information for comparison with Hopevale. Very little time was spent obtaining information on marine resource taxa and structure of classifications, as this work has already been covered by Dr A. Chase (unpublished, see Chase, 1980a:258). Most emphasis was placed on acquiring information on (3), (4) and (5) above. The general informant pool consisted of approximately 14 men and one woman; the key informant pool comprised five men, selected for their marine knowledge and/or their ability and interest in fishing or marine hunting. Again, there was a distinct bias towards male-orientated information and activities.

2.4 Data Analysis

2.4.1 Biological

All dugong specimens collected were forwarded to Dr H. Marsh (JCUNQ) for processing and analysis. The stomach contents were analysed by Ms J. Lanyon (JCUNQ) using the technique outlined in

Channells and Morrissey (1981). The reproductive specimens were analysed by Marsh using the techniques outlined in Marsh, *et al* (1984b) and Marsh, *et al* (1984c). For age determination, one tusk for each animal was bisected longitudinally and prepared as per Marsh (1980) and the growth layer groups counted. A specimen of each aged tusk was returned, with an explanation of how to 'read' the tusk, and its age, to each hunter who allowed a tusk to be collected.

All turtle specimens were forwarded to Dr C.J. Limpus (QNPWS) for processing and analysis. The reproductive status was based on the criteria outlined in Limpus and Reed (1985a).

Mollusc and some crustacean specimens were sent to the Queensland Museum for identification and storage.

2.4.2 Ethnobiological

The ethnobiological information and interview transcripts were incorporated into a database management system for easier handling, assessing and comparison. This information was compared and related to the historical and current material available.

2.5 Limitations on the Research

2.5.1 General

Ethnobiologically orientated studies have a number of inherent limitations, such as:

(1) Problems of different cultural perspectives: it was, for example, difficult for some Aborigines I worked with to comprehend the western notion of conservation and its resultant

management regimes (see Section 5).

(2) There are sometimes cultural impediments: some information relating to fishing and marine hunting is considered confidential or secret by the owners of that knowledge. That confidentiallity should be respected. Knowledge often represents power and status to the owners; its disclosure could weaken that position. Cross-cultural communication can create problems if not approached properly (see Von Sturmer, 1981).

(3) Indigenous knowledge of the marine resource may often be incomplete. It may also be influenced in various ways by social, magical or religious beliefs. European contact, and the impact of modern technology may also corrupt this knowledge (Webb and Smyth, 1984). Dugong hunting at Hopevale, for example, has been considerably influenced by the commercial take for the dugong oil industry in the early 1900s.

(4) At times the 'culturally-correct' information supplied during interviews, may be markedly different to what actually occurs in reality. On a few occasions I was told by informants the 'proper way' to do something, and then later observed the activity being carried out in a different manner.

(5) Not all indigenous fishermen are valuable sources of information. The best fishermen (i.e. recognised as such within the community) and the older fishermen, are usually the most knowledgeable. A greater proportion of my time was therefore spent with the older fishermen and hunters.

(6) Informants may provide information they believe the researcher wants, or that would make the informant appear more important. By checking, whenever possible, the reliability of information received in interviews, I found the key informants' information extremely reliable. They always told me if they were

uncertain or did not know something.

(7) The degree to which fishing or hunting activities are influenced by the presence of a researcher can be difficult to determine. For example, my presence on dugong hunting trips at Lockhart River possibly restrained some hunters from using rifles to kill dugongs after harpooning. (I was informed that rifles were used on at least two occasions during the period of my field work at Lockhart).

(8) By concentrating on male-orientated information and activities, information from a major source, women, remains unrecorded.

(9) Being associated (unintentionally or deliberately) with Government bodies, especially enforcement agencies, usually has a negative effect. By arriving at Hopevale at the same time as the introduction of the GBRMP dugong hunting permits, I was unavoidably associated with the restrictions as I was partly working on dugongs and had a University-labelled vehicle.

2.5.2 Logistical

The logistical problems of attempting to cover numerous beach camps, fishing and hunting activities, and landing sites spread over more than 180km of coastline, restricted direct information collection considerably. With the exception of dugong and turtle take, no detailed quantitative consumption data on marine resources were collected; qualitative estimates, however, were made.

2.5.3 Problems Which Affected The Objectives

(1) During the first few weeks of the initial field work phase at Hopevale (January to February, 1984), the objectives proposed for that time were largely unrealisable due to the general discontent and confusion within the community concerning the dugong hunting permits introduced by the GBRMPA in late 1983. The timing of my arrival in the community was sufficiently close to the date of implementation of the permit system for the two to be inextricably linked in the eyes of most members of the community. Some considered Marsh and myself to be 'spies for the GBRMPA'.

After discussing the situation with Marsh and at the suggestion of a number of Hopevale residents, it was decided to temporarily alter the direction of the field work and document the community's reaction to the management initiatives associated with the GBRMP. The matter was referred to the Chairman of the GBRMPA before proceeding. The details are contained in Marsh, Smith and Kelly (1984e). As a result, there was a greater emphasis placed on recording information on dugongs and turtles in the subsequent field work.

After this period I developed the necessary rapport with members of the community, although there remained, to a slight degree, some confusion as to the exact purpose of my work, primarily with people in the community with whom I was not involved.

(2) The fourth field work phase at Hopevale (January to February, 1986) was hindered during the first few weeks by the following rumours and misunderstandings concerning my work. They had three causes:

(a) A misinterpretation of an abbreviated and distorted version of a James Cook University press release about my research project in a Brisbane newspaper, the 'Sunday Sun' (15/12/85). This resulted in a misunderstanding of what my work actually involved.

(b) A misunderstanding arising from a meeting between the Hopevale Council and QNPWS, causing a rumour that I was trying to stop all dugong hunting.

(c) I was once again unavoidably linked with GBRMPA's dugong permit system.

These problems were cleared up after about two weeks, however, they considerably affected my work plans for the remaining field work time.

(3) No such problems were encountered at Lockhart River. The GBRMP Far Northern Section Zoning Plan had not yet come into effect. Thus there were no resultant restrictions or problems with which I could be associated. As a result of the problems encountered at Hopevale, it was decided during GBRMPA's public participation process for the Far Northern Section, to delay considering restrictions on dugong hunting until information was obtained from this study.

There are a number of points which arise from these problems:

(1) They demonstrate the *reactive* nature of ethnobiological field work. The ability to be able to accommodate quickly to changing circumstances is essential for these studies.

(2) Aboriginal communities require clear information when being presented with new situations such as management programmes.

(3) These problems affected this study through the time lost

in having to disassociate myself from GBRMPA and its restrictions, and in establishing (Jan. 1984), and then re-establishing (Jan. 1986) the rapport necessary to obtain a flow of information.

(4) As a direct result of the problems with the dugong hunting permits, I spent considerably more time and effort collecting information on dugongs and dugong hunting than was originally proposed.

3.0 THE CURRENT AND HISTORICAL MARINE HUNTING AND FISHING PRACTICES OF THE HOPEVALE COMMUNITY INCLUDING A SUMMARY OF THE ETHNOBIOLOGICAL KNOWLEDGE OF MARINE FOOD RESOURCES.

3.1 Historical Aspects of Marine Resource Utilisation: a General Account

3.1.1 Language

The language used at Hopevale is ***Guugu Yimidhirr***. Haviland (1979a, 1979b) provides a detailed account of the history and structure of the language. It is his orthography which is followed in this report (although any errors are solely my responsibility due to my minimal grasp of the language). A brief outline of the phonology used in this report is given in Appendix 2.

Prior to European invasion, the speakers of ***Guugu Yimidhirr*** inhabited a territory extending from the Annan River north to the mouth of the Jeannie River, and west to the Normanby River area, called Battle Camp (Fig. 3.1)(Haviland, 1979a). They also laid claim to many reefs and islands (including Lizard Is) off the coast (Haviland,1979a; Terwiel-Powell, 1976). This territory consisted of 32 named locales, each with a dominant family group (Haviland, 1979b). The ***dhalun-dhirr*** ('with the sea') dialect was spoken along the coast from Cape Flattery south to the Annan River. The remainder spoke the ***waguurr-ga*** ('of the outside') dialect (Haviland, 1979b).

Since the establishment of Hopevale in 1949, children have learnt to read and write only in English. Although most people speak ***Guugu Yimidhirr***, not many are comfortable using just ***Guugu Yimidhirr***, and so utilise many English words and phrases (Haviland, 1979a).

3.1.2 History

The following outline of the history concentrates only on the usage of marine resources. It is based primarily on information obtained from journals, letters, reports and the database of Drs J. Haviland and L. Devereaux. For more detailed historical accounts of early contacts, the circumstances through which the Cape Bedford Aboriginal reserve was established, and the history of the Lutheran Church Mission, see Beaglehole (1955, 1962), Haviland and Haviland (1977, 1980), Pike (1979), G.Rose (1978), Terwiel-Powell (1976), and Woolston (1970). Additional historical information on the marine resources used is included in the relevant sections of this report.

(i) Captain Cook: 1770

The first recorded contact with the ***Guugu Yimidhirr*** people was in June 1770, during Captain Cook's forced stay at the Endeavour River (Beaglehole, 1955, 1962; Woolston, 1970). Banks records finding "...old frames of Indian houses and places where they had dressed shellfish in the same manner as the Islanders."(Beaglehole, 1962:63). Almost three weeks later no contact had been made, but recently vacated Aboriginal camps were often found with evidence of seafood around the camp fires (Beaglehole, 1962).

The first contact with the Aborigines occurred after Cook and his party had been camped for 23 days in the river. Four Aborigines appeared spearing fish, two of whom crossed over in a small outrigger canoe. Various gifts were offered to the Aborigines. These failed to make any impression, until, almost

accidentally, a small fish was thrown to them, producing an instant reaction of delight, and they immediately brought the other two people across the river (Beaglehole, 1962). Each man carried two spears and a wommera. (The description of the latter corresponded very closely to the design commonly in use today). On the Aborigines' return visit the next day, they handed over a fish which Banks believed was in return for the one they received the day before (Beaglehole, 1962; Woolston, 1970).

The one altercation between Cook's crew and the Aborigines occurred over the turtles that the crew of the 'Endeavour' had been acquiring for their coming journey. A number of Aborigines showed great interest in the 12 turtles on the deck. The next day ten Aborigines arrived carrying a large number of spears. They first asked for the turtles. They became angry when refused, and attempted to remove some of the animals, but were stopped by the crew. The Aborigines then suddenly went ashore and set fire to the grass to windward of some stores on the beach. Cook fired on them, but later that day managed to reestablish cordial relations (Beaglehole, 1955, 1962). Woolston (1970) suggests that a misunderstanding of Aboriginal resource ownership by Cook and his crew was the cause.

Although Cook discovered a harpoon head in one of the turtles caught by his crew, he could not believe that the canoes were capable of being used to capture turtles (Beaglehole, 1955; Woolston, 1970). Banks described the turtle harpoon as consisting of a hard wooden head, 8 to 15 inches (20-38cm) long with a barb which fitted into a wooden pole 8 to 9 feet (2.4-2.7m) long and as thick as a man's wrist. The harpoon head was attached to the pole by a line 3 to 4 fathoms (5.6-7.3m) long (Beaglehole, 1962). This description corresponds very closely to that given by Roth

(1901a) 130 years later, and to those currently in use (Woolston, 1970).

Banks concludes his observations by saying:

> "For food they [Aborigines] seem to depend very much tho not intirely upon the Sea. Fish of all kinds, Turtles and even crabs they strike with their Lances very dextrously...I can witness who several times saw them through a glass throw their Spear from 10 to 20 yards and generally succeed...Besides...we saw near their fire places plentiful remains of lobsters, shell fish of all kinds..." (Beaglehole, 1962:127-8).

It appears that the people of this area had at least four main methods of acquiring marine foods in the late 18th century: collecting (e.g. sea urchins, shellfish); spearing (e.g. fish, crabs); line fishing; and harpooning (e.g. turtles). It is also evident that these people were heavily dependent on marine foodstuffs.

(ii) The Establishment of the Mission

Until the discovery of gold in 1872 at the Palmer River, contact with whites was rare and cursory (Terwiel-Powell, 1976). Within five months of the opening of the Endeavour River mouth as a port to serve the gold-fields in October 1883, there were two tracks cut to the gold-fields, with estimates of no less than 1000 men coming or going on the tracks at any one time. The Palmer gold-field population was 2500 and expected to reach 5000 by the end of that October (Haviland and Haviland, 1980).

However, the already established beche-de-mer fishing industry[1] and the encroaching farming and pastoral settlement interfered with local Aboriginal life far more than the miners (Haviland and Haviland, 1980).

An area of 20,250 hectares of agriculturally worthless land between the Endeavour and McIvor Rivers was gazetted in 1881 as an Aboriginal reserve (Haviland and Haviland, 1980; Terwiel-Powell, 1976).

In 1886, when a Lutheran missionary, the Rev John Flierl, arrived in Cooktown, the European population was very antipathetic towards Aborigines (Haviland and Haviland, 1980; Terwiel-Powell, 1976). Flierl decided to establish a mission approximately 40km by sea north of Cooktown. He named this place Elim (see Fig. 3.1).

(iii) The Mission Period 1886 to the present:

The government assisted the new mission with buildings, tools, seeds and free rations for 12 months (Haviland and Haviland, 1980). However, the Reserve land was agriculturally worthless and each crop tried failed (Haviland and Haviland, 1980). The missionaries hoped to cultivate gardens and to provide enough food to keep the Aborigines from stealing mission food crops. Missionary Pfalzer "...considered it counter-productive to encourage Aboriginals to fish and hunt to supplement dwindling rations: 'what they catch on the side they eat on the side, and

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[1] No precise date is known as to when this fishery commenced in Queensland, however, by the 1880s some regulations were being introduced (Curtis, 1980). Macassans were thought to have collected beche-de-mer in northern Australia as early as the 16th or 17th centuries, but did not fish the Torres Strait or eastern CYP (Mulvaney, 1966).

if they ever have lots to eat by themselves, they don't turn up for work either'."(Haviland and Haviland, 1980:131). During the early years of the mission's history, it appears that marine hunting and fishing, although to some extent discouraged by the missionaries, provided a large portion of their diet. Pfalzer noted the Aborigines' skill at turtle hunting and the patience and skill required to make harpoons. The harpoon rope was still being made from wood fibres, but the head was of iron. Further, Pfalzer noted that around October/November was a favourable time for fishing, with many Aborigines attracted to Elim[2] (KM 88 #1 8/11/1887).

The poor agricultural land at Elim forced the mission to move to a better gardening area on the southern slopes of Cape Bedford in 1888/89. This new station was called Hope Valley (Haviland and Haviland, 1980; Terwiel-Powell, 1976).

Relations between the government and the mission went through a series of changes. In 1889, the mission was granted an annual subsidy of £200. In 1893 this subsidy was cut off (Haviland and Haviland, 1980). The mission struggled to survive on what they could produce, on uncertain funds from Neuendettelsau in Germany and emergency grants from the Lutherans in South Australia (Haviland and Haviland, 1980). In 1897, £5 per month was granted for Aboriginal relief (Haviland and Haviland, 1980). Later that year an annual subsidy of £100 was granted on the condition the mission took in Aboriginal 'waifs and strays' (Haviland and Haviland, 1980). This was the beginning of the displacement of many Aboriginal children to the mission from other parts of Queensland.

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[2] The newsletter was dated November, which would correspond to the blue-tailed mullet migrations.

In 1898, the purchase of a 110m fishing net was authorised by the Queensland Government (QSA Pol/1 6/1898). The net proved to be one of the mission's more productive gifts. The mission continued to struggle to produce agricultural crops, and continued to look for other means of supporting themselves.

At this time there was considerable discussion about the use of Aboriginal labour on boats in the beche-de-mer and pearl shell fisheries (Haviland and Haviland, 1980). There were numerous cases of mistreatment being recorded, including a number of deaths in the Cape York region (Roth, 1900). For a more detailed account see Haviland and Haviland (1980) and Chase (1981b). Roth's 1903 report mentions that the Cape York Peninsula beche-de-mer fisheries had been in progress for thirty years, the Aboriginals were hopelessly demoralised, and were by then virtually dependent upon the trade for their existence.

In 1900, the two sub-stations, Elim and Hope Valley joined, Hope Valley becoming the main mission site (Haviland and Haviland, 1980). Also at this time the mission was given a small (1.53 tonne) cutter, the 'Wabul', by the Home Secretary (Roth, 1900).

In Roth's annual report for 1901, he mentions that the fishing net continued to prove of great service. However, in the same report he says, "...the reserve...is so poor that it is only in October and November that they can possibly obtain even a fair living out of the native foods (yams and fish)." (Roth, 1902).

In 1904 funds were granted for the mission to purchase a larger boat, as the 'Wabul' was too small and unseaworthy, having sunk several times (Roth, 1903a, 1904). This new eight tonne boat was called the 'Kiora'.

By 1912 Missionary Schwarz wanted to sell this boat and

purchase a smaller motor launch capable of entering the mouth of the McIvor River (ND 582 25/10/1912). The purchase of the launch 'Hiawatha', did not occur for a further two years (KMZ 27/12/1912; ND 586 14/2/1914).

In 1912 the Home Secretary (Hon J. G. Appel) presented the mission with another fishing net, which proved to be a valuable means of adding to the food supply. The mission Aborigines much preferred their own food to that supplied by the missionaries (Howard, 1913). There is no mention of whether the first net was still being used.

The 1914 report from Howard (Chief Protector of Aborigines) provides the first indication that the mission was able to sell some of their marine produce. However, the information available about which resources were used, the amounts taken, and the incomes received by the mission for marine produce, is incomplete. From about 1914 until 1935, the beche-de-mer industry provided one of the major sources of income for the mission.

Other marine industries that were tried were pearl shell collecting by the men at Elim (KMZ 2/11/1915); trochus shell (first noted in mission records in 1915; then 1930/31; then again in 1951-53); and dugong oil.

According to informants, the dugong oil industry operated between Lookout Point and just north of the Starcke River (Fig. 3.1). The capture of dugongs for oil appears to have continued at least until 1932, then intermittently until evacuation because of the war in 1942. An attempt was made to revive the industry in 1951-53, in conjunction with the trochus shell fishery, but was abruptly ended when the 'Joallen', the mission boat at that time, was wrecked.

Although these enterprises helped provide financial support

to the mission, other fishing activities, often carried out simultaneously, provided additional food for the people, e.g. fishing (especially with nets) and the opportunistic capture of turtles from the reefs.

Fishing activities played an important part of mission life. At the completion of their education (to Grade 4) the boys had a choice of working on the boats[3] or on agricultural activities (Terwiel-Powell, 1976).

The whole community (approximately 250 people) was evacuated to Woorabinda[4] in 1942 for 'security' reasons, with disastrous results to their health: 28 people died within a month and a further 35 died during their stay. After their return in 1949 to the new mission site at Hopevale (Fig. 3.1), there were plans to restart the fishing industries (fish, trochus, dugong oil) in 1951, despite the distance of the new mission from the sea (O'Leary, 1951, 1952). The 12.5m vessel 'Joallen' was used. In 1952, £591 were received from trochus shell; and in 1953, seven tons of trochus shell and 255 litres of dugong oil (I estimate from at least 14 dugongs) were collected (O'Leary, 1952, 1954). These plans foundered in 1953 when the 'Joallen' sank (O'Leary, 1954).

One Hopevale resident attempted to revive the fishing industries by building an 11m boat, with three dinghies and a crew of 12. (HHL, 1973; O'Leary, 1960). During the boat's brief period of use in the early 1960s, it was used for fishing, some turtle hunting, and for dugong oil and meat (the meat was occasionally brought back to the mission by vehicle from the Starcke River area) (HHL, 1973).

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[3] There were a total of nine boats owned by the mission from 1900 to 1942.

[4] Woorabinda is a Government Aboriginal settlement situated approximately 200km inland from Rockhampton (Fig. 3.1).

According to informants, crocodile hunting was carried out by a few men in the coastal rivers and creeks in the 1960s and early 1970s.

Hopevale residents regularly spent their holidays fishing and hunting at Elim and Alligator Creek area. The popularity of these activities increased as the roads and means of transport improved, especially in the 1970s. Outboard motors became increasingly available around this period, and were used to get to Conical Rock for turtles, and also for the occasional dugong hunting expedition further north (HHL, 1971).

Oyster farming was attempted near the mangroves at Elim in 1979 for two years, however, the project failed.

3.1.3 Conclusion

Information from Cook's stay and the mission records show that the ***Guugu Yimidhirr*** people (both the original inhabitants and those sent there as children during the period of the Queensland Government's policy of displacing children of mixed descent onto missions), have had a close association with the marine environment. However, the mission policy of separating children from their parents into dormitories (Haviland and Haviland, 1977, 1980; Terwiel-Powell, 1976), coupled with the devastating effects of the removal of the whole community to Woorabinda, has certainly severely reduced the amount of information on marine resources available within the community. The activities in which the mission was engaged (dugong, beche-de-mer, trochus, turtle, net fishing) and the resources the children were able to utilise on their afternoons off (e.g. sea urchins, some fishing) are the subjects about which most

information has been retained.

3.2 Description of the Hopevale Region

The Hopevale Aboriginal Trust Area (formerly 'Reserve Area') extends from approximately the north bank of the Endeavour River, north to North Sand Hill (Fig. 3.1). Hopevale community is situated about 50km north of Cooktown, and 26km by road from the beach at Elim. In July 1986 the community was granted the 'Deed of Grant in Trust' for the area. In 1986, the Hopevale population was approximately 670, with a number of children away at boarding schools and transient workers at Cape Flattery Silica Sand Mine, Cook Shire, and southern towns.

3.2.1 Climate

The region is centred on latitude 15°S. The climate is characterised by a tropical wet season between December and the end of April, when approximately 85% of the total average annual rainfall (≈1780mm) occurs. This is followed by a dry season between May and December, characterised by predominantly strong south-easterly winds. The wet season is characterised by predominantly north-westerly winds associated with the north Australian monsoon, with the occasional occurrence of cyclones. Table 3.1 shows the basic meteorological information for Cooktown as an indication of general conditions, but may not accurately represent conditions for the whole study area (Bureau of Meteorology, 1975).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YEAR
Av.Max.Temp. (°C)	31.2	31.0	30.0	28.8	27.2	25.9	25.3	26.3	27.5	29.1	30.6	31.3	28.7
Av.Min.Temp. (°C)	24.3	24.0	24.0	23.2	21.9	20.1	19.0	20.2	21.4	22.7	23.8	24.3	22.4
Mean Relative Humidity (%) 9am	78	81	80	76	76	76	76	73	69	68	69	72	75
3pm	71	72	74	71	70	70	67	66	63	63	64	67	68
Mean Rainfall (mm)	369	368	391	209	75	52	27	30	16	23	64	160	1784

Table 3.1: Selected climatic data for Cooktown (Bureau of Meteorology, 1975).

The geological and vegetation types are described in Pye and Jackes (1981). Briefly, there are five major vegetation environments within the coastal area of the Trust Area: foredune; dune open heath; sandplain open heath; dune swamp; and closed forest/low closed forest (Pye and Jackes, 1981).

3.2.2 Marine Habitats

There is a considerable variety of marine habitats adjacent to the Trust Area. Open ocean beaches extend from the Endeavour River to Indian Head, Nob Point to South Cape Bedford, from the mouth of the McIvor River to Cape Flattery, and between the mouth of Blackwater Creek and Lookout Point (Fig. 3.1). These are open to the predominant south-easterly winds for eight to nine months of the year.

Mangroves occur along the Endeavour River, in the bay west of Cape Bedford, at the McIvor River, and with extensive stands from North Sand Hill to the 'Hummocks'.

Seagrass beds occur in the bay west of Cape Bedford, the bay west of Cape Flattery, and in most areas from Lookout Point to Murdoch Point (see Coles, *et al*, 1987).

Rocky shores are found from Indian Head to Nob Point, Allen Point, and around Cape Bedford, Cape Flattery and Lookout Point.

Fringing reefs are found off Bala, Manbaa, south of the McIvor River, and Murray Point. Beor Reef is the main inshore reef. The main accessible offshore reefs are Boulder and Forrester Reefs. A number of islands with fringing reefs are accessible: Conical Rock, Two Isles, Three Isles, Low Wooded Isle and Murdoch Island. Lizard Island and the islands nearby were also used historically. Three rivers, the Endeavour, McIvor and Starcke occur in the region. Numerous small creeks are spread along the coast. The most extensive complex of mangrove creeks occurs from Lookout Point to the 'Hummocks'.

3.3 General Marine Usage in the 1980s

3.3.1 Seasonality

The present usage of the marine environment by Hopevale Aborigines is on a part-time basis. This is a common feature of traditional and artisanal fisheries (Emmerson, 1980; M.Smith, 1977). Marine activities are governed primarily by such things as school/work vacations, public holidays, the availability of employment, road and sea conditions and GBRMPA restrictions. A large proportion of the community grasp most opportunities to carry out some marine-orientated activity. A further influence is the seasonality of the resources, for example the blue-tailed mullet (***Valamugil seheli***[5]) season prompts men to fish the rivers at every opportunity (Fig. 3.2). Those who are unemployed or

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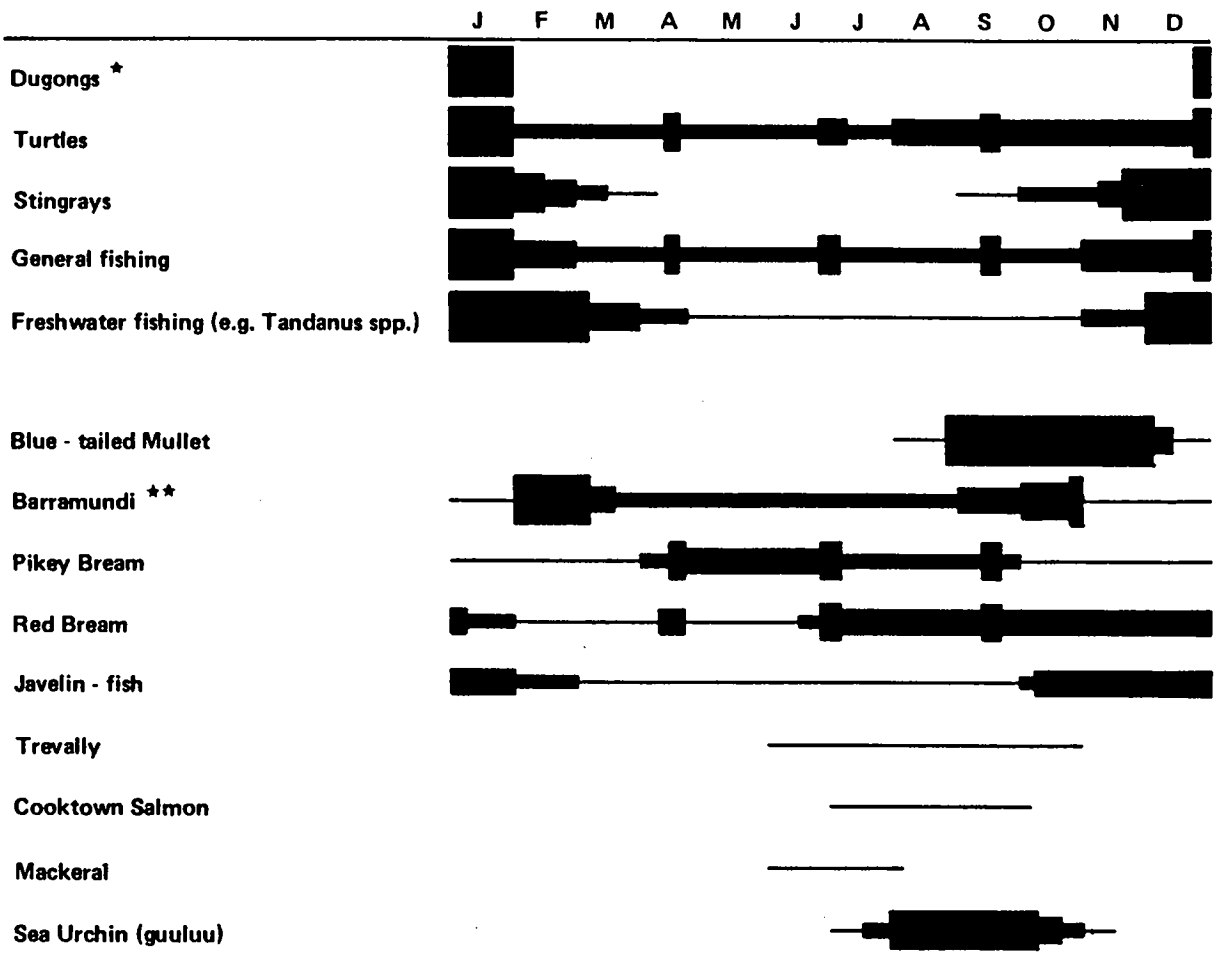
[5] A list of scientific, common and ***Guugu Yimidhirr*** names can be found in Appendix 3.



* limited by GBRMPA permit

** most people observe the closed season (1/11 to 31/1)

Figure 3.2: Seasonal availability and exploitation of some marine resources by the Hopevale community

retired often spend extended periods living down at the beach camps, or away on brief fishing trips. Their reasons for doing so include: escaping community life for a while, to supplement store-bought food, and occasionally to catch fish to sell.

3.3.2 Locations

The locations of the ten main aggregations of beach camps (Fig. 3.1) are determined primarily by the availability of freshwater, but social factors also contribute. The grouping of people in the beach camps is based primarily along kinship lines, tempered by socio-economic factors. For example, until recently (approximately 1986) only those families with a four-wheel-drive (4WD) vehicle or access to a 4WD vehicle, were able to live at the beach camps north of Cape Bedford due to the nature of the road. In contrast, those living south of Allen Point were able to drive conventional vehicles to the beach. Beach 'houses' are occasionally sold, with the buyers either removing the house materials to another site, or simply occupying it where it stands. Most beach houses, especially those used regularly are quite substantial constructions (Fig. 3.3), but those used only rarely (primarily south of Cape Bedford) are more temporary.

3.3.3 Boats and Vehicles

External sources of employment and income such as Cape Flattery Silica Sand Mine, Cook Shire Council and relatives living in Cairns and other southern centres, have enabled Hopevale families to acquire both 4WD vehicles and boats with outboard motors over the last ten years or so.

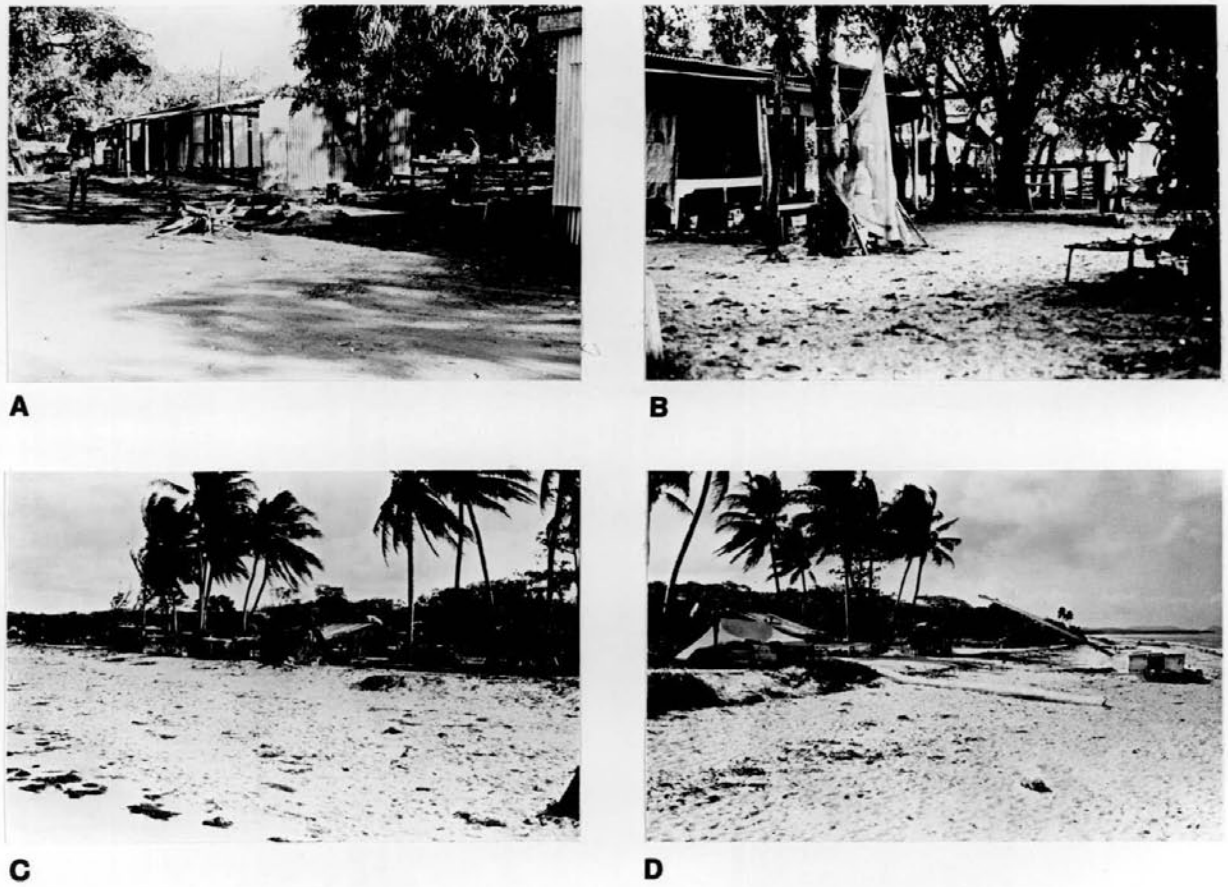


Figure 3.3: Beach camps used by Hopevale people at (a) Alligator Ck south of Cape Bedford and (b) Elim north of Cape Bedford; and by Lockhart River people at Quintell Beach (c) and (d).

In January 1986, there were at least 33 boats in the community. The size range was 3.1m to 4.9m, the most common type being 4.3m aluminium dinghies. In addition, five boats were made of fibreglass and one of wood. The larger boats had front steering which is advantageous when turtle or dugong hunting. Virtually all boats had outboard motors. These ranged in size from 9.9hp to 60hp, the most common sizes being 25hp to 40hp. Not all outboards motors or boats were serviceable at the same time. Minor repairs to outboard motors were carried out by the owner or someone in the community. However, for major repairs the motors had to be sent to Cairns. The 3.7m and some lighter 4.3m dinghies were capable of being loaded onto 4WD vehicles for overland trips to fishing and hunting areas. In January 1985 there were at least 43 4WD vehicles in the community, although some were in poor repair.

3.3.4 Fishing and Marine Hunting Equipment

Five types of fishing and marine hunting equipment are currently used. They are: fishing spears; harpoons; fishing lines; nets; and spearguns. The first three were recorded by Cook and Banks as being used in 1770 (Beaglehole, 1955, 1962) and were still in use at the time of the establishment of the mission in 1886. However, by then they had incorporated modern materials such as metal harpoon heads, spear tips, and hooks in their construction (Roth, 1901a). The general techniques used by Aborigines in northern Queensland for acquiring food have been briefly outlined by Roth (1901a). Specific techniques will be discussed in the relevant sections on marine resources.

(i) **Fishing spears** (Fig. 3.4a): (***galga*** or ***banydyarr***) consist of a bamboo shaft, 2.2m to 2.5m in length, with four sharpened, barbless, wire prongs, bound and fixed into the hollow shaft, the end of the prongs butting against the last node of the bamboo. The wires are attached with a resin made from the roots of the ironwood tree (***Erythrosphleum chlorostachys***), or occasionally with bitumen. A second type of spear, rarely used, has a single heavy wire prong with no barbs, and is used on large fish only.

Spears are mostly thrown with the use of a spear-thrower (***milbiirr***), which is a piece of flat, shaped wood 70cm to 75cm long, with a notched wooden peg (***mingu***) butt jointed perpendicularly at one end, onto which the spear-end is hooked for throwing. Spear-throwers are usually made by each fisherman. Considerable skill and patience are required to use spear-throwers effectively due to the movement, refraction, and distortion of the target in the water. The ***milbiirr*** gives the thrown spear considerably more power and accuracy. Two or three spears and a ***milbiirr*** are always carried whenever going near the coast or in a boat. They are not used by women.

(ii) **Harpoons** (Fig. 3.4b): are used for taking dugongs and turtles. The shaft (***gugini***) is usually made of strong, heavy mangrove wood (often ***Bruguiera gymnorrhiza***), about 3m to 4m long, and approximately 6cm diameter at the thickest end, tapering to 3cm or 4cm. The thick end usually has a 5cm to 8cm sleeve of metal pipe, to prevent the wood from splitting on impact. A hole is made in the thick end to receive the detachable harpoon head and packed with rag used to ensure a firm fit. The opposite end of the shaft occasionally has a slit through the end. This is to allow the harpoon rope to pass through so as to prevent the loss

A

B

C

D

Figure 3.4: Types of fishing and marine hunting equipment currently used: (a) fishing spears (photo: Hopevale); (b) harpoon (Hopevale); (c) set net (Hopevale); (c) hand spear (Lockhart River.

of the shaft overboard after striking the animal. There are two types of harpoon heads. The turtle harpoon head (***gurradhan***) is usually made from a three-cornered file with barbs cut into it, and is 10cm to 12cm long. The dugong harpoon head (***banydyarr***) consists of three short prongs (8cm to 10cm) made from 15cm nails or similar sized wire. A short rope, with a loop in the free end, is bound to the end of the head and fixed with bitumen. The head can then be attached or detached from the dugong/turtle rope (which also has a loop in the free end; the other end being attached to the dinghy) as required. The rope size varies, but the preferred length is 15m to 20m, and 8mm to 10mm in diameter.

(iii) **Fishing lines**: are always commercially available nylon hand lines of varying breaking strains with lead sinkers and steel hooks of various sizes. Wire trace or heavy nylon trace is used on heavier lines. The most common rig has a single hook terminally, with a sinker tied 20cm to 40cm above the hook. Occasionally a very large hook ('groper hook') is set in estuaries on heavy rope with a thick wire trace. Some trolling lines are used, but are not common.

(iv) **Nets**[6] (Fig. 3.4c): there are basically three types of nets in use: set nets of 10cm to 15cm mesh of monofilament nylon (these are sometimes used as drag nets); bait nets of 2cm mesh size (for dragging - especially for prawns); and commercially available 1.8m and 3.6m cast nets.

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[6] The Community Services (Aborigines) Act (1984) exempts Aborigines who are residents of Trust Areas from fishing legislation; a similar provision is contained in the Queensland Fisheries Act (1976).

(v) **Spearguns:** are used mainly on reefs for crayfish and fish by young men. They are small, single rubber, commercially bought guns. Masks are the only complementary equipment used with spearguns.

3.4 Usage of Marine Resources

3.4.1 Dugongs

(i) History[7]

The first reference in any historical material to dugongs being consumed by ***Guugu Yimidhirr*** Aborigines, was in a 1887 newsletter from Missionary Pfalzer mentioning about 150kg of dugong being eaten in two days (KM 88 #1 8/11/1887). He also notes that only men were allowed to eat dugong. Cook and Banks (Beaglehole, 1955, 1962) noted the harpooning of turtles by ***Guugu Yimidhirr*** people in 1770, and it would be reasonable to assume they were also taking dugongs at that time.

The first record of dugong oil was in 1928/29 when the mission received £3 for it (LCA 6/1929). This data corresponds with oral history accounts of the origin of the dugong oil industry. The amount of dugong oil produced by Aboriginal labour is unknown, as the records kept by the Queensland Department of Community Services (then Dept of Native Affairs) are not accessible. According to Aboriginal hunters involved, no record of numbers taken were kept. In 1930 Dr (later Sir Raphael) Cilento recommended both internal and external use of dugong oil

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[7] Reconstructed from written historical material as well as remembered Aboriginal history.

as a protective measure against tuberculosis (TB) amongst Aborigines (LCA 6 16/6/1930). In the financial year 1929/30 the mission earned £28 for dugong oil (LCA #2 6/1930). The report of the Chief Protector of Aborigines (Bleakley, 1930) notes that in 1929 the mission augmented its "...food supplies by catching a large number of dugong, from which 180 gallons of dugong oil were sent to market." Informants said that approximately four gallons can be extracted from a fat female dugong, so at least 45 dugongs were taken that year.

All dugongs caught for oil were taken between Lookout Point and just north of the Starcke River. The main camps were set up inside the creek adjacent to North Sandhill (Fig. 3.1). The men were taken up by boat (at various stages the 'Pearl Queen', 'Spray' and 'Ramona' were used) to the camps early in the year. Between 16 and 30 men, mostly married men, appear to have been involved. The starting time and duration of the stay seems to have varied from year to year, but in general appears to have been for approximately six months, or slightly more, in the middle of the year. The dugongs were caught from small wooden dinghies with harpoons. With two to four people per dinghy and about four or five dinghies. The boats worked mostly at night, whenever the weather and tides permitted. Spring tides were favoured. One or two dugongs were taken per dinghy per night. The hunters used sound, phosphoresence, and moonlight to locate the animals. Estimates of numbers taken are difficult to determine: one informant believes about 200 were taken per year for the three to four years he was involved; another informant kept a personal tally for one year in the 1930s - he caught 19 and another man 20 dugongs. The dugongs were butchered, boiled down to extract the oil (using a Government-supplied extraction

boiler), and the meat was then teased out, dried and sent back to the mission for food. The capture of dugongs for oil appears to have continued until at least 1936, then perhaps intermittently until the community was evacuated in 1942. The actual intensity of dugong hunting from 1928 to 1936 appears to have varied considerably, being inversely related to the effort put into the other mission-run marine industries (beche-de-mer, trochus). The limited number of boats and experienced crew, as well as fluctuating market prices, largely controlled which industry was exploited.

After the return from Woorabinda, plans were made in 1951 to revive the dugong oil industry (O'Leary, 1951, 1952). In 1953, 255 litres of dugong oil (at least 14 dugongs) were collected and sold (O'Leary, 1954). These plans came to an abrupt end in 1953 when the mission vessel sank (O'Leary, 1954).

In 1955/56, irregular trips were made to the Starcke River area. In one month in 1955, informants said approximately 150 dugongs were taken for oil and meat, but generally only irregular trips were made taking three or four per trip. From 1956 to 1960 no-one could remember any hunting having occurred.

The early 1960s saw another attempt to revive the oil industry when a Hopevale resident built an 11m boat. As well as other fishing activities, its three dinghies were used to hunt dugongs in the Starcke River area for oil and also meat (occasionally taken to the mission by truck) (HHL, 1973). In one month in 1961 or 1962, approximately 120 dugongs were taken for oil and meat.

The mid to late 1960s saw the introduction of both outboard motors and the use of rifles. Initially, rifles were used to kill the dugong after harpooning, however, occasionally dugongs were

shot without harpooning. This method was found to be unsatisfactory as animals would sink after shooting and be lost. Outboard motors were first used to get to the hunting area, after which oars would be used for the actual hunt, but eventually motors were used throughout. Informants estimated that only about five dugongs per year were taken during this period, primarily for meat. In 1968/69, and again in 1975/76, requests were made for specific amounts of dugong oil to be supplied to a 'Cairns Laboratory' via the State Government. From the late 1960s to the late 1970s, only the occasional weekend trip occurred for subsistence/recreational purposes, yielding about five dugongs per trip.

The early 1980s saw a resurgence in dugong hunting, with new dinghies and more powerful motors, especially at Christmas time and around the school/work holidays. Informants variously estimate the numbers taken by the community to have been in the order of 25 per year. These dugongs were caught for subsistence/recreational purposes, not commercial. According to informants, rifles were again used by some people, and at times considerable amounts of meat were being wasted.

In summary, there appears to have been three general phases of dugong hunting by the ***Guugu Yimidhirr*** people: (1) the subsistence hunting of pre-contact until the mid-1920s; (2) the commercial hunting by the mission for dugong oil to sell to the Government from about 1928 until 1936, again in 1951 to 1953, and sporadically since then; and (3) the subsistence/recreational take from the mid-1950s to the present.

(ii) Current Uses

Dugongs are now caught primarily for their meat, and secondarily for the oil which is used as a remedy for almost any aches, pains or illnesses. Dugong oil is taken internally or rubbed on externally, mostly by older adults. It may also be used for cooking if enough is available. Dugong hunting also serves as a culturally-identifiable activity, and therefore has an important social function (see Section 5.0).

(iii) Seasonality of Hunting

Most informants involved with the dugong oil industry in the 1920s and 1930s considered the best months for hunting to be May to July. They believed that dugongs aggregated and spent more time inshore during the winter months, whereas they dispersed during the warmer summer months.

Prior to the introduction of the GBRMPA permits in 1984, hunting was occurring mostly during the Christmas school/work holidays (December-January) by boat from the beach camps. During the year, overland trips were made on long weekends, or at other times by those not working. Since the introduction of permits, dugong hunting has been restricted (as a result of negotiations with GBRMPA) to a four-week period in late December to January (Fig. 3.2).

(iv) Locations

Most dugongs are caught from Lookout Point north to the Jeannie River, in approximately one to three metres depth of

water (i.e. usually within a couple of kilometers of the coast)(Fig. 3.5). They are most abundant in this area. Rarely are they taken further north than this. Occasionally an animal may be caught between Cape Flattery and Lookout Point. There have been sightings and the rare capture of dugongs near the beach camps, but mostly these are single animals and difficult to catch. Single animals are considered by most hunters to be mainly males, and to have poorer quality meat.

(v) Hunting Technique

Dugong hunting from the beach camps in January, typically involves a coastal voyage of about 50nm (90km) to the Starcke River area (a distance equivalent to that from Townsville to Orpheus Is., or Brisbane to the Gold Coast). Usually dinghies go up in pairs in case of mechanical problems, but not always. If the wet season rains are late starting, for example in 1986, some hunters may drive overland to go hunting.

Hunting always occurs from dinghies using the harpoon described in Section 3.3.4. When hunting, the harpooner stands on the prow of the boat, and searches for signs of dugongs such as direct sighting (or sound) of a surfacing dugong as it breathes, or indirect signs such as plumes of disturbed water, fresh pieces of floating seagrass, or unusual garfish activity (garfish feed on matter disturbed and produced by feeding dugongs).

No specific search patterns were evident on any hunting trips I observed. The boats are driven at a slow speed within the hunting area, generally with the most experienced hunter giving directions. After sighting a dugong, the harpooner indicates its direction with the harpoon, or by hand signals to the driver. The

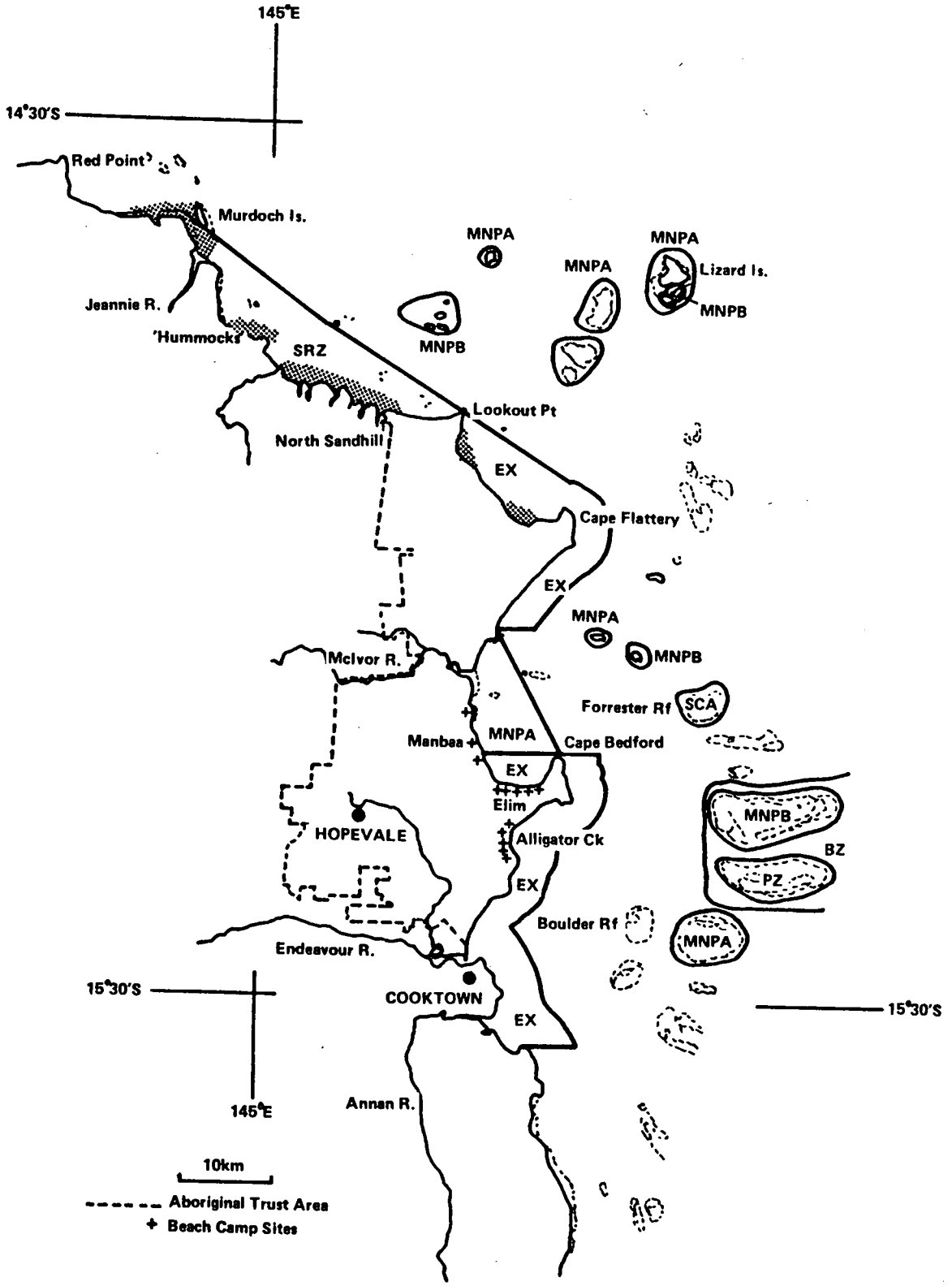

Figure 3.5: Areas used for dugong hunting by Hopevale Aborigines (see Fig. 3.1 for key to GBRMP Zones)

driver must maintain smooth acceleration, deceleration and turning so as not to unbalance the harpooner and to keep the dugong in sight. If the water is very turbid and the dugong cannot be seen underwater, each time it surfaces the dugong is run down and chased until it tires. In shallow water, the 'boils' on the water surface caused by the fleeing dugong's tail are used to follow the animal. The boat is kept between the animal and the deeper water to force it into shallower water where escape is difficult.

When the dugong is adjacent to the bow of the dinghy, the harpooner aims at the mid-dorsal surface, usually forcing the harpoon nearly vertically downwards to make use of the shaft's weight and to prevent the harpoon head from deflecting off the animal's back (Fig. 3.6a). The harpooner does not jump off the boat with the harpoon, as occurs in some other localities, such as the Torres Strait (Nietschmann, 1983).

The motor is cut after the animal is harpooned. The dugong is then played until it tires, and pulled in against the boat. A rope is attached around the peduncle as soon as possible. After harpooning, dugongs struggle to varying degrees. Those that have been chased and tired out before harpooning put up very little fight; fresher animals, and (according to informants) large male dugongs, can be difficult to retrieve. The flukes are then pulled out of the water against the gunwale of the boat by one or two men, so that the animal is ventral side up and unable to breathe (Fig. 3.6b). Drowning took from 10 to 20 minutes after harpooning in the five cases I observed. The large male dugongs are considered the hardest and most dangerous to restrain while drowning.

An incision is made in the upper lip of the dead animal. A

A

B

C

D

Figure 3.6: Dugong hunting techniques: (a) harpooning a dugong (Lockhart); (b) 'lassoing' a dugong (Lockhart); (c) drowning a dugong by restraining it ventral side up against the boat (Hopevale); (d) butchering of dugongs is carried out immediately after capture (Lockhart).

rope is passed through the incision to secure the head to the bow of the boat and the tail to the stern for towing to shore. This incision technique developed during the oil industry days and was used to secure dead animals to mangroves, to be picked up by the rowing boats on their return to the main camp.

Harpooning is generally a male activity, however, I have observed women on two dugong hunting trips.

Dugongs are butchered with knives immediately after they are taken ashore. When time and weather permit, the following butchering method is generally followed. The animal is rolled out of the water and the harpoon head cut out of the hide. It is then rolled onto its dorsal surface and washed down to remove the sand. The dugong is opened ventrally, and a rectangular section of the ventral surface (including skin and body wall from level with the flippers to just above the genital opening) is removed. This is considered the prime cut of meat. The viscera are then removed, with care taken to cut around the anus before removing the intestines to avoid contaminating the meat. Some hunters keep the stomach, heart, liver and occasionally the kidneys. The remainder is either discarded into the sea, or left on the beach. The tail is removed whole just posterior to the anal opening. The skin is removed followed by the meat around the ribs and backbone and finally the ribs. The oral disc is cut off the head. The head, dorsal skin, flippers and the backbone are discarded, unless they are wanted for boiling in order to extract the oil. The meat is cut into small pieces and rubbed with coarse salt to preserve it. If time or weather do not permit complete butchering, the ventral flap is removed, the animal gutted, and then cut into two or three sections and loaded into the dinghy which is immediately driven back to the beach camps, where the

butchering process is completed. Dugong meat is cooked by roasting, frying, boiling or baked in a 'kapmari' (ground oven).

A dugong hunting trip may last from one to three days, depending on the weather and availability of dugongs. Due to the large fuel costs involved, most hunters try to maximise their chances of locating dugongs by waiting for suitable winds and tides. Spring tides, with the highest tide in the daytime (especially late afternoon or early evening) are preferred as more dugongs are believed to move inshore feeding on these tides.

(vi) Catch Data

The dugong catch data for Hopevale hunters have been summarised in Tables 3.2[8] and 3.3.

1984 season: During the three weeks from January 3rd, at least 14 dugongs (3 females; 10 males; 1 of undetermined sex) were caught by 10 hunting groups. Nine dugongs were caught in the area between Murdoch Is. and the mainland (Fig. 3.5). Three were caught near the Hummocks and one south of Starcke River. At least one dugong was caught on eight of the expeditions, although not all hunting groups were successful. On one trip the hunter lost a dugong after harpooning it and could not continue because of a shortage of fuel. Another boat foundered because of engine failure; the catch deteriorated and was dumped.

Seven skulls plus the reproductive organs from two animals were collected. Data on four dugongs caught in previous years are included in Table 3.2. Marsh recorded two males, six adults and three juveniles of unknown sex, amongst the remains of the

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[8] Table 3.2 is located after the Appendices.

previous year's hunting, on the beach at the Hummocks. In October, one dugong was taken out of season near the Starcke River.

1985 season: 17 dugongs were taken in the Starcke River area, plus two between Lookout Point and Cape Flattery (the latter were taken outside the Marine Park, one by a permit holder, the other by a non-permit holder). A total of 20 dugong hunting trips were made; three were unsuccessful. I collected the following as outlined in Section 2.3.1: skulls (15); eye lenses (9 animals); stomach/mouth contents (7); reproductive organs (7). Tail stock measurements were obtained for seven dugongs. Of the 19 animals caught, 15 were female. One male was caught in the Hummocks area and tied up (allegedly alive) by the hunter overnight. After returning to kill the dugong next morning, the hunter reported that it had escaped. It was observed rotting amongst the mangroves by another hunter on a subsequent trip a week later.

1986 season: At least[9] 13 dugongs (6♀; 6♂; 1?) were caught in the Hummocks area. During this season six of the 13 dugongs were taken on hunting trips where the people involved drove to the Starcke River and then went hunting by boat, as opposed to the usual long boat trip from the beach camps. At least four overland trips (each involving a number of hunters) and nine boat trips occurred, three of the latter were unsuccessful. Complete specimens and measurements were collected from three dugongs and skulls only from four others.

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[9] More dugongs may have been taken after my departure in early February due to extensions granted by GBRMPA/QNPWS to some permit holders.

1987 season: As a result of the alterations to the GBRMPA permit system, records were kept by hunters and tusks retained for age determination. These were collected afterwards by QNPWS rangers. Their data showed that 27 dugongs (15♀; 12♂) were taken. Tusks from seven animals were collected.

Thus between January 1984 and February 1987, a total of 74 dugongs (38♀; 33♂; 3?) were taken by Hopevale hunters. Of these, one was taken out of season, two were wasted (one due to engine failure; one was 'lost'), and two were taken outside the Marine Park boundaries.

	NO. OF DUGONGS CAUGHT			
SEASON	FEMALES	MALES	UNDETERMINED	TOTAL
1984	3	10	2	15
1985	14	5		19
1986	6	6	1	13
1987	15	12		27
TOTAL	38	33	3	74

Table 3.3: Number and sex of dugongs caught by Hopevale hunters from January 1984 to February 1987.

(vii) Biological Data

As far as could be judged from the small sample collected, the reproductive data are consistent with information from other parts of north Queensland (Marsh, *et al*, 1984d), with respect to the age of sexual maturity and calving season. The data indicate that dugongs of all ages, including reproductively-active females, were hunted. A newly-pregnant female was hunted in the 1984 season. In the 1985 season the catch included at least two lactating females, one of which had recently given birth, and three females in oestrous.

The mean age of the female dugongs taken for which there are age data (n=21), was 30 years (S.D.=16.4), and the range 3.5 to 64 years old. Due to wear on male tusks, only minimum age estimates can be made on erupted tusks. The age range of those sampled (n=8) was 4.5 to 30+ years old.

From my observations I am confident that Hopevale hunters were not hunting selectively, except perhaps in very rare circumstances by older more experienced hunters. Most hunting occurred in extremely turbid water, and since animals could not be followed and observed underwater, hunters opportunistically harpooned any available animal.

The sex ratio of the catch for the period January 1984 to January 1987 was 38 females:33 males, which is not significantly different to a 1:1 sex ratio (x^2 =0.23, 1 df, $0.5<p<0.75$). However, some of the individual seasons showed marked differences.

The sex ratio for the 1984 season was 3 females:10 males (Table 3.3). These were caught over a more diverse area than those in the following season. In the 1985 season, 14 of the 19 dugongs caught were female. Assuming a 1:1 sex ratio, as indicated by most large samples of dugongs (Marsh, *et al*, 1984b,1984c; Hudson, 1986a), the probability of this occurring was 0.022. If the animals caught in the area south of the Hummocks are considered separately, the sex ratio is even more striking: 13 of the 15 animals caught being female (p=0.003). This suggests that female dugongs may on occasions concentrate in the rich feeding grounds between the Starcke River and the Hummocks, an area favoured by the hunters.

There are suggestions of the same pattern of female aggregation occurring in a very similar area near the mouth of

the McArthur River in the Northern Territory; dugongs stranded by the storm surge accompanying Cyclone Kathy when it passed through this area in March 1984 were predominantly females and young calves (Marsh, *et al*, 1984a).

The overall results support the 1:1 sex ratio assumed for dugongs, but the marked difference in ratios for some individual seasons implies that aggregations of females occur periodically. During an aerial survey in November 1984, Marsh (1985) found 60% of the observed dugongs (C.Bedford to C.Melville) were more than 20km from the coast, the largest group being eight animals. However, a Coastal Surveillance flight about ten days later, reported a large aggregation of dugongs sheltering behind Murdoch Island during rough weather. If dugongs (especially females) do concentrate in certain areas, this has important consequences for management. Any aggregations of dugongs in areas used for hunting facilitate their capture, providing an opportunity for excessive exploitation. It is therefore clearly important to obtain more data of this type.

These results suggest that sustainable yield calculations should be calculated assuming the worst possible scenario, which would be that all the animals caught will be adult females.

(viii) Summary of the Ethnobiological Data

The following ethnobiological data will concentrate on information relevant to dugong management. Most of this information is derived from hunters' observations (especially from the oil industry days) and also from information which the 'old people tell us' (i.e. passed down from previous generations). Some information is purely conjecture, and I have

identified it as such.[10]

Ethnoclassification: The following are the *Guugu Yimidhirr* terms (including descriptive terms) currently in use or recognised:

girrbadhi - dugong, generic term

munhaarri - dugong, coastal dialect [rarely used]

ngaanhdhu - adult female [also = 'woman']

ngama-dinggaar - adult male

gabirr-nhila - juvenile female

yarrga-nhila - juvenile male

nguwaal-ga - just mated; bad taste and smell

gulnggul/manhdhay - 'heavy'/pregnant

yambunh - any young animal [not just dugongs]

warrgaaygu - 'lots', 'many' [not just dugongs]

Movements: Dugong movements are believed by informants to depend upon the tides and weather. During the spring high tides dugongs come right in against the mangrove zone to feed. Full and new moons are considered the best for hunting. One informant was more specific: the first-quarter to the full moon is good for hunting; the last-quarter is poor; as are the first and second high tides of the new moon, but from the third tide, hunting is good. During neap tides dugongs tend to remain in deeper water. More dugongs come in on the night-time spring high tides, than the day high tides.

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[10] Very little is known by biologists about dugong behaviour. As field verification of behaviour was not possible or practical, the information on behaviour has not been varified by the author.

During rough weather dugongs tend to aggregate inshore, whereas under calm conditions they spread out further offshore. The wind direction is believed to influence the direction in which they move when aggregated.

Movements are also influenced by seasons. During the cooler dry season, dugongs are found to aggregate inshore, presumably due to the strong south-easterly winds. These were the best months for hunting during the oil industry days. With the warmer weather (commencing about August) groups tended to disperse and move into deeper water, returning again into groups about May. No informant knew if major migrations of populations occurred along the coast. As one hunter said 'dugong hard to follow-up, where they go.'

Dugongs are found all along the coast adjacent to the Trust and hunting areas, but the greatest aggregations occur in the area from North Sandhill to the Jeannie River. In the past, there have been occasional sightings of large herds in the deeper water between the islands offshore. The old males tend to be found alone along the coast and in including the offshore reef areas. They tend to remain in one area, even when the seagrass seasonally decreases, at which time the herds disperse.

Feeding Behaviour: Hopevale hunters believe dugongs feed on one 'kind' of seagrass (***Halodule spp***), and eat both the leaves and the rhizomes by digging them up. Dugongs will feed right up to the mangroves on spring tides. All informants agreed that seagrass biomass varied seasonally, but disagreed as to the exact season.

Marsh, *et al* (1982) found that the diet of a sample of 95 north Queensland dugongs consisted of mostly seagrasses of all

available genera. ***Halodule*** was found in 95% of stomachs, followed by ***Halophila*** (89%), ***Cymodocea*** (61%), and ***Thalassia*** (39%). Seagrass rhizomes were present in all stomachs. Generic composition probably reflected that of the seagrass beds in the areas where the dugongs were captured (Marsh, *et al*, 1982). Dugongs are not well adapted to consume algae, but probably ingest them incidentally with seagrass (Marsh, *et al*, 1982).

Behaviour: Dugongs are considered to have excellent hearing and poor eyesight. They usually do not flee unless surprised from behind. If one animal takes flight, all leave. The hunters believe that dugongs have learnt to avoid powerboats.[11]

In shallow water dugongs breathe by exposing only their nostrils above the water, and in deep water they 'roll' exposing a large portion of their dorsal surface as they dive. Anderson and Birtles (1978) describe four modes of surfacing: 'low horizontal' (shallow/calm water); 'roll' (deep water); 'high horizontal' (rough water); 'vertical' (calm and rough). The last allows dugongs to visually and acoustically survey above-water surroundings.

The parallel scars found on dugongs' dorsal surfaces are considered to be from fighting, inflicted by male tusks. No fighting has been observed directly, only inferred from noises made at night. Other scars are believed to be caused by rubbing on hard substrates. The large white scar areas on the backs of some animals are considered a sign of old age (just as grey hair on Aborigines is considered a sign of old age and respect). No specific cause for this type of marking was given except 'old age'.

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[11] See section 1.4, footnote 5.

Herds of dugongs containing many more than 100 animals were noted from the dugong oil industry period. Herds are believed to be composed of mostly females, calves and young males, under the control, and possibly the protection of older males. When the herd disperses, 'family' groups of a female and her offspring remain together. The female-calf bond is strong. If a female is caught the calf will remain with the mother, attempting to suckle; if the calf is caught, the mother will remain with the calf until she is either caught or chased away. Males of reproductive age and old males are expelled from the herd. If hunters find a solitary animal, it will most probably be male.

The informants believed that only disease and old age kill adult dugongs, but sharks and crocodiles take young dugongs. 'Waterfat' dugong, that is with oedematous fat and muscle, have been noted by hunters from Mornington Island (Marsh, 1980), Lockhart River (see Section 4.4.1) as well as by some Hopevale hunters. These animals are considered poor or sick, can be male or female, and are not eaten. One Hopevale hunter harpooned a 'stray', reasonably healthy looking dugong 'some time ago', which had ***maamba buurraay*** (oedematous fat). He examined the animal and found a lump of 'pus' about 15cm in diameter within the flesh at the posterior end of the ribcage on its side. At the time both he and the hunter with him believed it was due to the animal having been hit by a 'bull' dugong, although no marks were evident externally.

Life History: Males are identified (by older more experienced hunters) by being more tapered posteriorly, while females are fatter and rounder, or have a calf with them. No one could identify a live pregnant female unless she was extremely

large immediately prior to giving birth. Old animals are identified by the white scar. Most hunters believe there is a 1:1 sex ratio, although herds tend to have more females than males.

Most informants believe there is a special area for breeding and suspect it to be the Noble Island area, but provide no evidence for these assumptions. Some consider there to be a diffuse mating season, variously described as May to August. Marsh, *et al* (1984d) found that in the Townsville-Cairns area, dugongs calve from August-September through December. Only three Hopevale people said they had observed mating. On one occasion the animals were vertical in about two metres of water with their tails down, and the male and female's ventral surfaces touching. The other description was similar, but the dugongs were 'leaping out of the water'. There is a belief that a number of males will fight for a female, with possibly more than one male mating with her. Some dugongs have been caught which were believed to have just mated, or to be 'in season', and due to a bad smell and taste, could not be used for anything. There were three remembered occurrences of this, all during winter months.

No one has observed dugongs giving birth, but suspect it occurs in the shallows, away from sharks.

If a pregnant female is caught, the foetus is eaten too. No twins have been noted; and no one had any idea of the period of gestation. Young calves are seen all through the year, but more are observed from August to November. They believe calves are weaned at 'teenager size', but no reference to assumed age was given.

Pre-Mission Conservation Practices: There were no known conservation measures specifically aimed at preserving dugongs,

although one informant firmly believed that 'old people' did not take females with calves. There were, however, a number of cultural restrictions and technological limitations which acted indirectly. The eating of dugongs (as well as other 'big' meats such as turtles, stingrays and large mullet) was restricted to adult males. There was considerable magic and ritual concerned with dugong hunting, and the activity could not be carried out by just anybody at anytime. The technological limitation of canoes, especially in the rough seas prevalent during the eight to nine months of the south-easterly winds, helped keep hunting pressures low. Dugong hunting was considered a very dangerous and highly-respected activity. Details of those restrictions and rituals have now been virtually forgotten, primarily due to the influence of 100 years of mission life. Forty-two years after the ritual eating of dugong was observed (KM 88 #1 8/11/1887), commercial harvesting took place and meat was being eaten by both sexes. The mission helped breakdown social restrictions on hunting and the consumption of dugong meat. This influence probably peaked with the hunting of dugong for commercial reasons in the 1920s.

3.4.2 Turtles

(i) History

The first recording of green turtles (*Chelonia mydas*) being used by *Guugu Yimidhirr* speaking people, was by Cook and Banks in 1770 near the Endeavour River and the islands just north of there (Beaglehole, 1955, 1962). One altercation between Cook's crew and the Aborigines occurred over the turtles that the crew of the Endeavour had been acquiring for their coming journey. Although Cook discovered a harpoon head in one of the turtles caught by his crew, he could not believe that the canoes were capable of being used to capture turtles (Beaglehole, 1955; Woolston, 1970). Banks recorded visiting a low island near Lizard Island, where he found "...heaps of Callipashes [carapaces] which were piled up in several parts of the islands." On another island nearby, the Master "...saw vast plenty of turtle shells, and so great plenty had the Indians had when there that they had hung up the fins with meat on them in trees, where the sun had dried them so well that our seamen eat them heartily." (Beaglehole, 1962:104).

After the establishment of the mission, turtles were still consumed. In 1887, Missionary Pfalzer noted that four men ate a whole green turtle in one afternoon (KM #5 89-89a 4/2/1887). Initially the consumption of turtle meat was restricted to the men. In 1896, Missionary Poland recorded two young men bringing turtles for the males only. If the men gave any to their women, then they believed the women would disappear far out into the high seas (KM 28 #6 1896). Turtle hunting was a dangerous activity when canoes were used. Roth (1900) mentions that six deaths by drowning had occurred to the missionaries' knowledge

(i.e. since 1886), when trying to cross to the reefs for turtles. This also indicates the high value placed on turtle meat.

By the early 1900s, however, the mission boat was being used to catch turtles to supplement the mission's food, and the restrictions on women eating it began to break down under the influence of Missionary Schwarz.

Turtles were also caught opportunistically to supplement food during the years the mission boats were engaged in marine industries. Since the return from Woorabinda, there has been a constant subsistence catch of green turtles. Informants were, however, unable to estimate the numbers that have been taken.

Hawksbill turtles (***Eretmochelys imbricata***) have historically been caught for food, however, they are considered to be highly poisonous unless butchered in a specific way by a man who has been trained in the technique. Currently, there are only two old men considered capable of doing this, neither has butchered a hawksbill for food for many years.

(ii) Current Uses

Green turtles are caught primarily for their meat. Meat is usually shared out amongst the families of the hunters. For special occasions such as weddings, dance festivals, and official functions, a number of turtles will be caught and served. Occasionally carapaces are cleaned, dried and preserved, and used as exchange or gifts with relatives and friends living in southern centres. At times shells are also sold (illegally) in Cooktown - a large, good quality shell can earn up to $70. Turtle eggs are collected from the mainland beaches whenever a nest is found. Usually only one or two nests a year are discovered.

Hawksbill turtles are occasionally taken solely for their carapaces. When cut properly to remove the poisonous sections, the meat has been described as 'sweet'.

Loggerhead turtles (*Caretta caretta*) are considered edible, but their meat is of very poor quality and taste, and so they are avoided. A flatback turtle (*Natattor depressa*) was caught a number of years ago, however, nobody present knew if it was edible.

(iii) Seasonality of Hunting

Green turtles are caught all year round, however, the favoured hunting periods are during the turtle mating season (August to December) and during the Christmas holiday period (Fig. 3.2). Female turtles are considered fattest[12] in the mating season. Males are considered poor during the mating season and are avoided. They are caught at other times of the year, especially January, but are generally considered inferior to females.

(iv) Locations

Green turtles are caught both along the coast and on the reefs (Fig. 3.7). The most popular coastal areas are: the mouth of the McIvor River, Conical Rock, the bay northwest of Cape Flattery, and from North Sandhill to just north of the Starcke

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[12] When Aborigines describe marine resources as 'fat', this can refer to a number of conditions, such as: high fat content (e.g. turtles; fish); high quality fat deposits (determined by taste and smell. e.g. dugongs); animals with ripe reproductive organs (e.g. mullet; sea urchins); enlarged internal organs (e.g. oil-rich stingray livers); or combinations of these conditions.

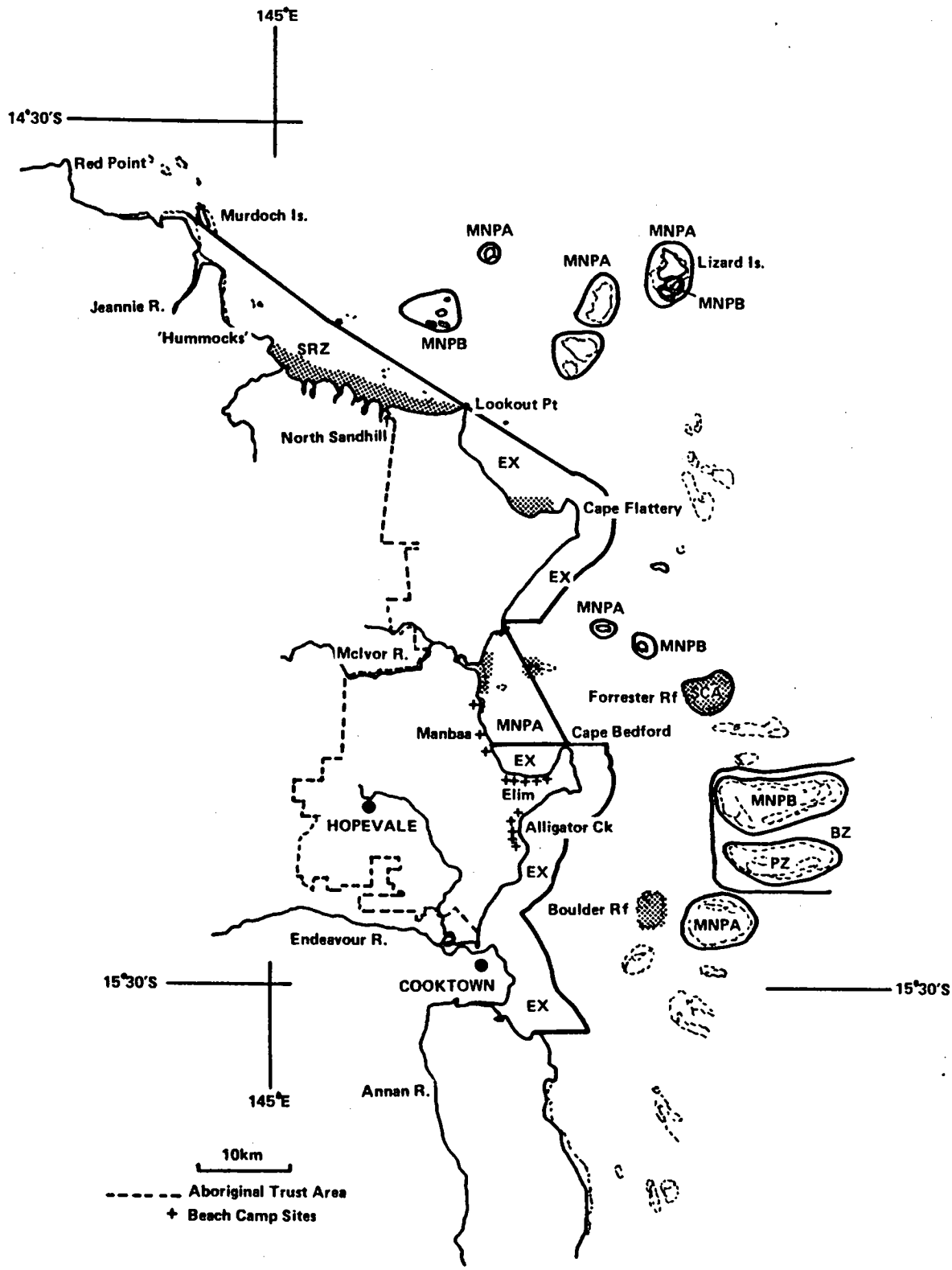

Figure 3.7: Areas used for turtle hunting by Hopevale Aborigines (see Fig. 3.1 for key to GBRMP Zones)

River. The main offshore areas are Boulder and Forrester Reefs, occasionally Egret and Startle Reefs are also visited. Preference for different areas is determined primarily by weather and sea conditions.

(v) Hunting Techniques

Turtle hunting in the Starcke River area usually involves an overland trip in the dry season. Hunting always takes place from dinghies. Two methods are used: harpooning and 'bulldogging'. The harpooning technique is virtually identical with that for dugongs, except that a different harpoon head (***gurradhan***) is used (see Section 3.3.4). Turtles are caught in water no deeper than 2m to 2.5m. When the turtle is adjacent to the bow of the boat, the harpooner aims at the middle of the carapace. He forces the harpoon vertically downwards to make use of the shaft's weight and to prevent the head from deflecting off the carapace (Fig. 3.8a).

If a hawksbill turtle is harpooned, it must be struck on the side or hunters believe the poison will be released and ruin the meat. Once the hawksbill turtle is in the boat, the harpoon hole in the carapace must be plugged immediately, or it is believed that any other meat in the boat will be contaminated.

The 'bulldogging' technique is used when the shell is wanted intact, if the turtle is to be kept for a long period before butchering, or if no harpoon is available. The turtle is chased and herded by the boat, keeping it in shallow water (1m to 2m), until it begins to tire. When it is adjacent to the bow of the boat and beginning to slow down, one person dives above, but slightly in front of the turtle, grabbing the carapace at the

Figure 3.8: Turtle hunting techniques: (a) harpooning a turtle (Hopevale); (b) 'bulldogging' a turtle (Lockhart); (c) bringing a turtle to the boat after 'bulldogging' (Lockhart); (d) securing a turtle after harpooning (Hopevale); (e) removing the plastron during butchering (Hopevale); (f) turtle meat after butchering (Hopevale).

anterior end with one hand, the other hand pushes the posterior end down, thereby forcing the turtle to the surface (Fig. 3.8b). Usually a second person will then jump in to assist in bringing the turtle to the boat (Fig. 3.8c). This method is employed primarily by the younger men.

After the turtle is harpooned or 'bulldogged', the motor is cut and the turtle pulled to the boat and secured by a rope around a fore-flipper (Fig. 3.8d). The turtle is then lifted into the dinghy. If a harpoon has been used, the harpoon head is removed and the hole in the carapace stuffed with any available cloth. If the turtle is considered poor (i.e. not fat, or too old - subjective estimates, varying with different hunters), male, or the wrong species, then the hole in the shell is plugged with some cloth and the turtle released. The fatness of a green turtle is determined by looking behind the hind flippers and around the neck, the skin should appear a yellowish colour and fat. If the hunter is still unsure, he makes a small nick behind the rear flippers to check the fat. Females are sought selectively. Long tail length is the indicator of males. A 4.3m dinghy carrying three people may take up to three turtles before returning to the beach. Turtles are often tied to mangroves in the shallows, with ropes around their fore-flippers, to keep them alive for up to a couple of days. They are then butchered at a time when the meat can be quickly refrigerated or frozen.

Turtle hunting is a male activity, however, I know of one instance of a woman harpooning a turtle.

Turtles are butchered ashore. They are flipped onto their backs, washed to remove sand, and usually knocked out with the blunt end of an axe prior to bleeding. The carotid arteries on either side of the neck are cut with a knife and allowed to

bleed. The fore-flippers are then removed at the first joint. The plastron is cut around from front to back. The pectoral muscles are then carefully cut away from the plastron, so that it is free of meat when removed. The pectoral and abdominal muscles and associated fat are removed and then the scapula, anterior coracoid, humerus and associated muscles. The gall bladder is very carefully removed and discarded. The intestine, oesophagus and trachea, liver, lungs, and eggs (if present) are retained for eating. The whole intestine is split longitudinally with the thumb and washed in seawater. An axe is used to cut through the pelvic girdle. Each flipper is then dissected out with the half girdle attached. The femurs are disarticulated by twisting, and the flippers cut off later. The fat is pared off the inside of the carapace. Occasionally the neck muscles and tail muscles are removed. The inside of the carapace is scraped to remove all the remaining flesh. The blood is sometimes collected too. Turtles are cooked by frying, boiling or in a 'kapmari'.

There is a greater utilisation of the viscera from turtles for food, than occurs with dugongs. This may be due to turtles having been for subsistence use only, whereas dugong usage had been considerably influenced by commercial exploitation.

Turtle eggs are collected whenever a nest is found on mainland beaches. Special trips to the islands for eggs are not made. The eggs are located by poking the area where a turtle has laid with a long stick. Usually only one or two nests are found each year.

(vi) Catch Data

During the period of field work (January 1984 to February 1985; late December 1985 to January 1986) at least 109 green turtles were taken (39♀; 8♂; 62?) and at least two hawksbill turtles. I estimate that another 10 to 15 turtles may have been taken which I did not know about, or was unable to confirm. A summary of the results are shown in Table 3.4 and Figure 3.9.

DATE CAUGHT	SPECIMEN #	SEX	AGE* CLASS	CURVED CARAPACE LGTH(cm)	TAIL LGTH(cm)	BRED PREVIOUSLY	SEASON** FOR NEXT BREEDING	LOCATION CAUGHT
28/06/84	Q10004	F	J	38.5	-1.5	-	-	nth of Hob Pt
10/08/84	Q10006	F	J	51.0	0.0	-	-	mouth of McIvor R.
12/01/85	Q10018	F	SA	77.0		-	-	Forrester Reef
27/09/84	Q10011	F	SA	86.0	7.0	-	-	nth of Cape Flattery
27/09/84	Q10010	F	SA	96.0	7.5	-	-	nth of Cape Flattery
29/09/84	Q10014	F	SA	97.0	8.0	-	-	nth of Cape Flattery
27/09/84	Q10013	F	SA	99.0	7.0	-	-	sth of Starcke R.
3/01/84	Q123	F	A	100.0		Y	1984	?
8/01/85	Q10017	F	A	100.0	9.0	Y	>1984	Conical Rock
3/01/86	Q10036	F	SA	101.0	7.0	-	-	mouth of McIvor R.
20/09/84	Q10009	F	SA	102.0	10.0	-	-	nth of Starcke R.
12/01/85	Q10020	F	A	102.0	10.0	Y	>1984	Forrester Reef
19/01/85	Q10021	F	SA	102.0	10.0	-	-	Forrester Reef
14/01/84	Q10001	F	A	105.5	12.5	Y	1984	off Cape Bedford
10/06/84	Q10002	F	A	108.0	11.5	N	1984	sth of Starcke R.
19/09/84	Q10007	F	A	113.0	13.0	Y	>1984	sth of Starcke R.
27/09/84	Q10012	F	A	113.0	9.0	Y	>1984	sth of Starcke R.
10/06/84	Q10003	F	A	114.0	11.0	N	1984	sth of Starcke R.
4/01/86	Q10037	F	A	114.0	14.0	Y	>1986	mouth of McIvor R.
19/09/84	Q10008	F	A	119.0	12.0	Y	>1984	sth of Starcke R.
8/01/85	Q10016	F	A	119.0	13.0	Y	>1984	Conical Rock
?/01/84	Q125	F	A			?	1984	?
4/01/85	Q10015	M	J	51.0	0.0	-	-	nth of Starcke R.
19/01/85	Q10022	M	SA	90.0	14.0	-	-	Forrester Reef
18/01/85	Q10023	M	SA	94.0	12.0	-	-	Forrester Reef
12/01/85	Q10019	M	A	101.0	31.0	-	-	Forrester Reef

* Age Classes: J=juvenile; SA=sub-adult; A=adult

** >1984 = preparing to breed in a future season, but not in the 1984 season.

Table 3.4: A summary of the results for green turtle specimens collected from those caught by Hopevale hunters. The turtles are listed according to sex and carapace length.

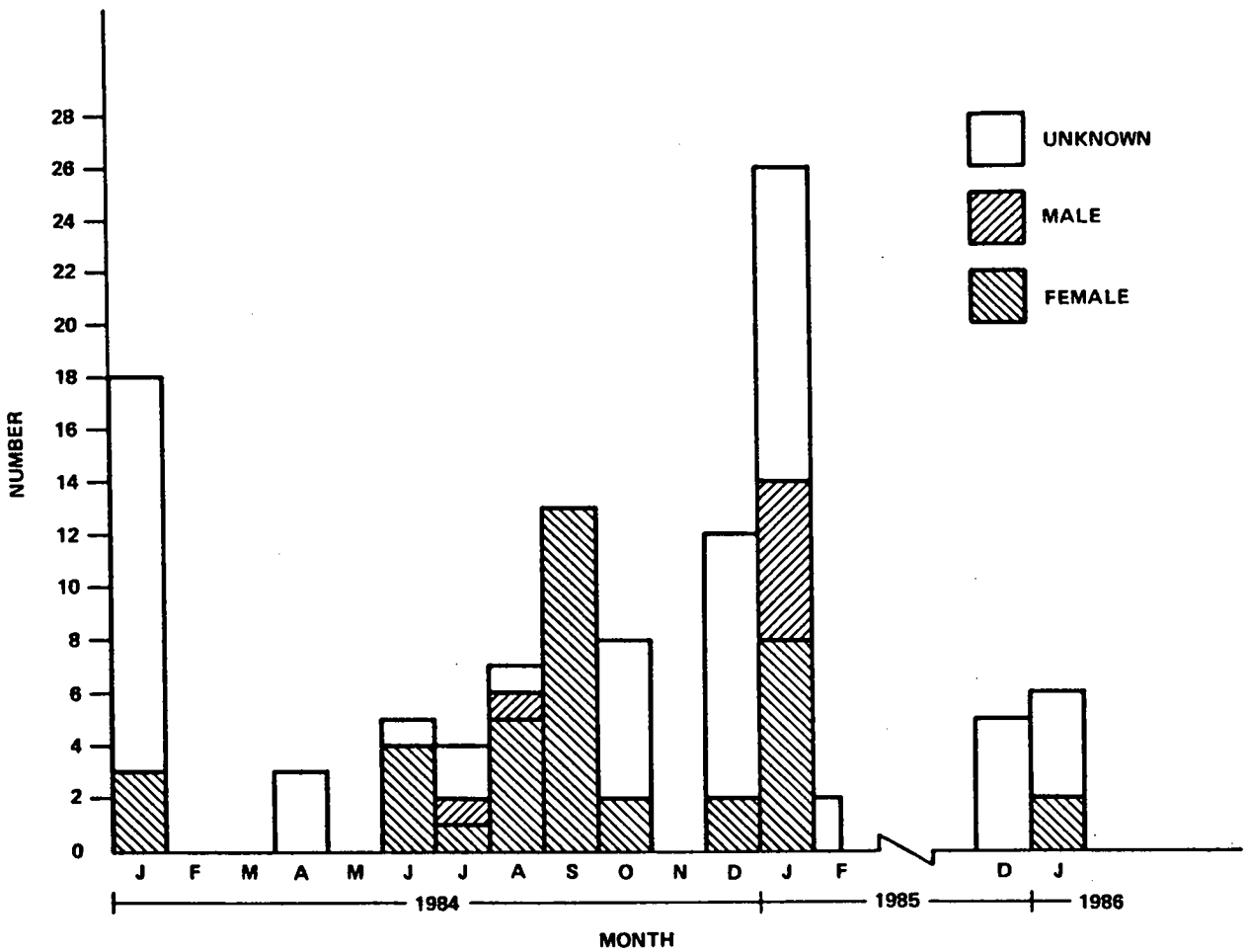

Figure 3.9: The number of green turtles caught each month by Hopevale hunters during the field work (Jan. 1984 - Feb. 1985; Dec. 1985 - Jan. 1988)

Measurements of curved carapace length, tail length (from carapace), and reproductive and stomach samples were taken from 26 (22♀; 4♂) green turtles and one loggerhead turtle (the latter was washed up on the beach).

(vii) Biological Data

If the minimum curved carapace length for an adult green turtle is taken as 91cm (Dr C. Limpus, *pers comm;* Limpus and Reed, 1985a), then six of the females and two of the males were immature adults. Of the green turtles examined, two of the females and one of the males were immature, eight females and two males were subadults and 12 females and one male were mature adults (Table 3.4).

All of the five adult female turtles sampled prior to September 1984 were preparing to breed in the coming breeding season (1984), those sampled during and after September (six animals) were not. This indicates that the Starcke River region is a feeding area, from which breeding females migrate prior to mid-September. Courtship and mating were observed to commence in August. Turtles preparing to breed that coming season, would have begun migrating around that time. More samples are required to gain a better indication of the turtle population structure and dynamics in the area.

In contrast to dugong hunting, selection does occur, based primarily on turtle tail length and fatness. By selecting for short-tailed turtles, hunters tend to take predominantly females, but there is also a chance of immature adult males being taken. The sex ratio of green turtles caught indicates that either very few adult males were in the area, or the hunters were selective;

it is possible that both these factors were involved. The sex ratio of the green turtles stranded at McArthur River (N.T.) by Cyclone Kathy in 1984, was exceptionally biased towards females (Limpus and Reed, 1985b). The Starcke River region is a very similar habitat and therefore the population sex ratio may also be naturally biased towards females (c.f. dugong sex ratio in the McArthur River area, section 3.4.1 (vii)).

Two green turtle tag returns from the Hopevale region indicated that at least some of the population nest at North West Island (Capricorn Group; 23°18'S 151°42'E). This fits with other tag recoveries for the general region (Limpus and Parmenter, 1986).

(viii) Summary of the Ethnobiological Data

Ethnoclassification: The following are the *Guugu Yimidhirr* terms currently in use or recognised:

ngawiya - green turtle (***Chelonia mydas***)

ngabuy - green turtle; 'north' language; [rarely used]

maamiingu - female green turtle

buunhdha - male green turtle

dyiilgarr - small green turtle

dyin.gurrmala - medium green turtle

dyaadyuunggan - mating, 'stuck' turtles

gaarraadhal - loggerhead turtle (***Caretta caretta***)

dagu-balay - flatback turtle (***Natattor depressa***)

yalnga - hawksbill turtle (***Eretmochelys imbricata***)

gumbuudhaga - unidentified; very rarely seen; ?Pacific Ridley turtle (***Lepidochelys olivacea***)

Life History: The sex ratio is variously considered to be either 1:1 or slightly biased in favour of females, depending on the time of year.

Mating is observed to commence about August and continues into December. Turtles are believed to couple and remain 'stuck', floating for days, as pairs can be found on successive days. Dr C. Limpus (*pers comm*) says the female will mate with a number of males (who tend to remain in a fixed area) as she passes on her breeding migration, and that the animals seen floating on successive days would probably be the female with different males. Hunters know that these coupling pairs can be approached very easily.

Females are known to lay eggs on Rocky Islets and on Two Isles (Fig. 3.1), as well as the mainland beaches from about October onwards. Laying is believed to start earlier on the islands than the mainland. Nests are known to contain about 100 or so eggs. No one knew what happens to the turtles from the hatchling stage until they re-appear on reefs at about the 30cm carapace length size.

Only crocodiles, sharks and diseases are believed to kill turtles.

Movements: Green turtles move with the high tides onto the seagrass beds near the mangroves, or onto the reef flats. Rising spring tides are considered best for hunting, although hunting occurs on all tides; if no turtles are found, the tides or weather are blamed. During rough weather more turtles are caught near the McIvor River mouth. The breeding migrations of females were not generally known to occur, although some females were believed to move away to lay eggs. One turtle was caught in the

1950s with a harpoon head in it that was different to those used by Hopevale hunters. The description of the harpoon head does not correspond to those in use on the east coast around that period, which suggests movements of turtles of considerable distances.

Seasonal Condition: Females are generally fat all year, but fattest in the breeding season. Males are in poor condition prior to and during the breeding season, but are fat around January. They are considered edible when fat, but otherwise are described as 'hard as cardboard'.

Behaviour/Ecology: Green turtles eat seagrasses and algae only. Those caught on the reefs taste slightly differently to those caught inshore, although no taste preference was expressed. Mabuiag Islanders in the Torres Strait consider the 'reef-dwelling green turtle' to be 'bad' turtles, with poor fat - thin and black in colour (Nietschmann and Nietschmann, 1981).

Turtles are considered by hunters to be able to stay underwater longer, and to be harder to kill than dugongs, due to their 'three hearts'.[13]

Hawksbill Turtle Poison: Hawksbill poison is considered by Hopevale hunters to be the most potent naturally-occurring poison available, and is referred to in a number of 'old time' stories. The poison is believed to be in the 'gall' and is caused by the turtle eating 'coral'.

Limpus (1987) has summarised the available information on poisoning from eating turtle meat. He found that in different

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[13] Turtle hearts have three distinct chambers: left and right atriums and the ventricle, these are considered by Hopevale Aborigines to be 'three hearts'.

areas, different organs must not be cut during preparation. Some of these organs include the gall bladder (e.g. at Hopevale), urinary bladder, or a 'poison gland' in the ventral thoracic region (e.g. at Lockhart River). Hawksbill poisoning does not appear to be a geographically uniform occurrence. Most fatalities from turtle poisoning occur within the Indo-Pacific region (Limpus, 1987). Limpus (1987:191) further notes:

> "The toxin responsible has been named chelonitoxin but it has not been isolated or studied. Good clinical studies of the effect of the toxin also are lacking. It is assumed to be a neurotoxin. While the apparent central neurological effects in the life threatening stages of severe turtle poisoning are reminiscent of ciguatera, the pronounced interaction with the upper gastro-intestinal tract during earlier stages is not. It cannot be assumed that the same toxin is involved in turtle and ciguatera poisoning."

The toxicity is sporadic, occurs at any time of the year and its origin is unknown (Limpus, 1987). Researchers are of the opinion that the toxin is derived from poisonous marine algae or invertebrates consumed by the turtle (Limpus, 1987). It appears that not all parts of a poisonous hawksbill turtle are equally toxic, although empirical evidence is lacking (Limpus, 1987). Silas and Fernando (1984) have reviewed the clinical aspects of sea turtle poisoning.

3.4.3 Elasmobranchs and Teleosts

(i) History

Cook and Banks observed Aborigines spearing fish in the Endeavour River in 1770 (Beaglehole, 1955, 1962). The dilly bags carried by the Aborigines contained, amongst other things, "...some fish hooks and lines, shells to make them of, points of darts and resin..." (Beaglehole, 1962:130). Banks notes:

> "Their fish hooks are made of shell very neatly and some exceedingly small; their lines are also well twisted and they have them from the size of a half inch rope to almost the fineness of a hair made of some vegetable. Of netting they seem to be quite ignorant." (Beaglehole, 1962:131).

In 1898 the purchase of a fishing net for the mission was authorised by the Queensland Government (QSA Pol/1 6/1898). The 110m net was used once or twice a week for 22 to 25cwt (1100-1250kg) of fish in October[14]. It would be highly unlikely that this quantity of fish would be caught at other times of the year. The work was hard but missionary Schwarz considered the Aborigines liked it as they could see immediate food coming in (ND 433 #3 12/10/1898). Missionary Poland writes that the fishing net yielded enough to feed 15 to 20 for a meal, sometimes two meals (KM 441 20/12/1898).

Roth (1900) reported:

> "...The fishing net supplied by the Government continues to prove its service, quite 1 1/2 tons of

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[14] The time of year suggests that a large proportion of those fish would have been mullet which migrate along the coast at that time of year.

fish having been captured by its means, any surplus over temporary requirements being salted for subsequent use. On the south side of the Cape [Bedford] it is impossible to use any net for nine months out of the twelve, in consequence of the rough seas, with the south-east winds. Its operations had therefore hitherto been limited mainly to the north-west side, but even here, owing to the dangerous condition of the Mission dinghy - any native canoe being of course, too light to carry it - it could only be used at one particular well-sheltered spot, which had to be cleared carefully of snags...now [with the new mission cutter]...the net can be worked anywhere, but especially at the mouth of the McIvor River, where the fish supply would appear to be endless."

If fish were scarce then the Aborigines attributed this to women having broken the tabu on eating mullet or stingray (Roth, 1903a). Success in fishing and hunting, was believed to be enhanced by:

"...a piece of quartz crystal coiled up in hair or grass, so that no one can see it is carried about by anyone...The crystal is supposed to be a bone, or part thereof, of a man, is usually found on old burying grounds, and is to be looked for during the night-time: the wooden or bamboo handle to which the quartz is often attached is hollow, and supposed to be filled with human blood taken at night out of a living person. Among these same natives anyone who carries about with him a piece of human hamstring (wrapped up usually in

bark) is sure to have luck hunting." (Roth, 1903a)

It was beliefs such as these that the missionaries attempted to eliminate by placing the children into dormitories.

The Home Secretary (Hon J.G.Appel) in 1913 presented the mission with another fishing net, which proved to be a valuable means of adding to the food supply (Howard, 1913). It is unclear whether this net replaced the previous one, or was in addition to it.

Fishing activities played an important part in mission life. From the early 1900s, the girls from the dormitory were given every Thursday afternoon off to fish, usually at the nearby beach. The boys were allowed to do the same on Wednesday afternoons and on Saturdays (Terwiel-Powell, 1976).

In 1970 a refrigeration unit was set up at Elim to be used in conjunction with net fishing, the produce being sold to the butcher's shop at Hopevale (HHL, 1970). This continued at least into the early 1970s (HHL, 1971).

(ii) Current Uses

Fish are caught for food, with some low quality fish being used as bait. All edible fish are kept by the fishermen. Quite small fish are often used in 'soups'. For a while in early 1984 when excess fish were caught in nets they were sold to the community butcher's shop for resale within the community. In May 1984, small amounts of barramundi fillets were bought by the butcher's shop for $3/kg, and mixed fillets brought $1.20/kg. Late in 1984 the church began leasing their cafe, which sold mostly fish and chips, for one month periods to families. Each family attempted to supply their own fish through netting.

With the introduction of the barramundi closed season from November to February (although Aborigines in Trust Areas/Reserves are exempt[15]), a number of people attempted to stock-up their home freezers prior to the closure. At other times fish are generally shared within families.

Most fish are filleted and fried. Small fish are either boiled, fried whole or roasted on hot coals. Mullet are always boiled.

Sharks and rays are caught seasonally and usually prepared as ***buunhdhaarr***: the liver and flesh are washed then boiled separately, minced and mixed together. ***Buunhdhaarr*** can be eaten straight or mixed with onion and made into rissoles for frying.

(iii) Seasonality

Seasonality is an important determinant of which fish species are exploited. Figure 3.2 shows some of the more commonly sought species and their seasons. There appears to be a preference for 'fat' animals which have the greatest calorific value. Certain behavioural traits may indicate that a species is fat, for example the ***Valamugil seheli*** (blue-tailed mullet) breeding migration.

Occasionally, floral indicators are used to indicate the season for some species. The flowering of an ***Acacia sp*** indicates the blue-tailed mullet season. This species is sought only during their breeding migrations which occur September to early December.

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[15] Most Hopevale Aborigines were unaware that they were exempt from fisheries regulations. Size or sex restrictions on catching marine species were also generally not known.

After the first thunderstorm of the wet season, various species of stingrays are considered to be in season. The actual time varies for different species. Their livers are checked upon capture, a large, white/pinkish, oily liver indicating that an animal is suitable to eat. Similar criteria are used for evaluating small shark species.

Other fish are sought all year, for example considerable numbers of small bream (***Acanthopagrus berda***) and grunters (***Pomadasys hasta, P. opercularis***) are taken by hand lines and nets in mangrove creeks and rivers.

Barramundi (***Lates calcarifer***) were caught all year until the introduction of the closed season. Now most people avoid catching barramundi during the closed season from November to February, largely due to fear of prosecution, even though this is unfounded.

Fishing activities are influenced to a great extent by outside factors such as school and work holiday periods, the road and sea conditions, and GBRMPA restrictions on some areas. A number of retired or unemployed people spend considerable time engaged in fishing activities.

The south-easterly winds which predominate from about April to October/November, severely restrict fishing and hunting activities due to the rough seas.

(iv) Locations

Areas from the Annan River north to the Jeannie River are used in fishing activities (Figs. 3.10 and 3.11a). Netting occurs mainly in the areas adjacent to the beach camps from Elim to the McIvor River, in the McIvor River, and occasionally in the creeks

in the Starcke River area.

Line fishing occurs along the whole coast, especially the inshore and fringing reefs, and the creeks and rivers.

Spearing occurs in the Endeavour, McIvor, and Starcke Rivers, and all the tidal creeks. The area near the mouth of the McIvor River is a popular place for stingrays. With the right weather conditions producing calm seas, spearing of fish (e.g. mullet, trevally) occurs off the beaches.

The areas of heaviest use are the McIvor River (hand lines; nets), the 'Wharf' creek at Cape Bedford (hand lines), the Endeavour River (spearing blue-tailed mullet), and the beaches from Elim to the McIvor River (netting).

(v) Techniques of Appropriation

Fishing techniques currently used include: spearing (with a spear thrower - ***milbiirr***), netting, line fishing, and spear-guns. All of the 'pre-contact' fishing techniques described by Cook and Banks (Beaglehole, 1955, 1962) are still in use today; only some of the materials the equipment is made of have altered, for example steel fish hooks have replaced shell hooks.

Spearing: Spears are used either from the bows of small boats up rivers and creeks (e.g. when after blue-tailed mullet), or from the beaches, with the fishermen often wading into chest-deep water (e.g. after stingrays). Fish and stingrays are speared at distances up to 15m or more by experienced throwers, but more commonly from 5m to 10m away (Fig. 3.12). Considerable skill and patience are required to use spears effectively. Allowances must be made for refraction, and the movement of the target.

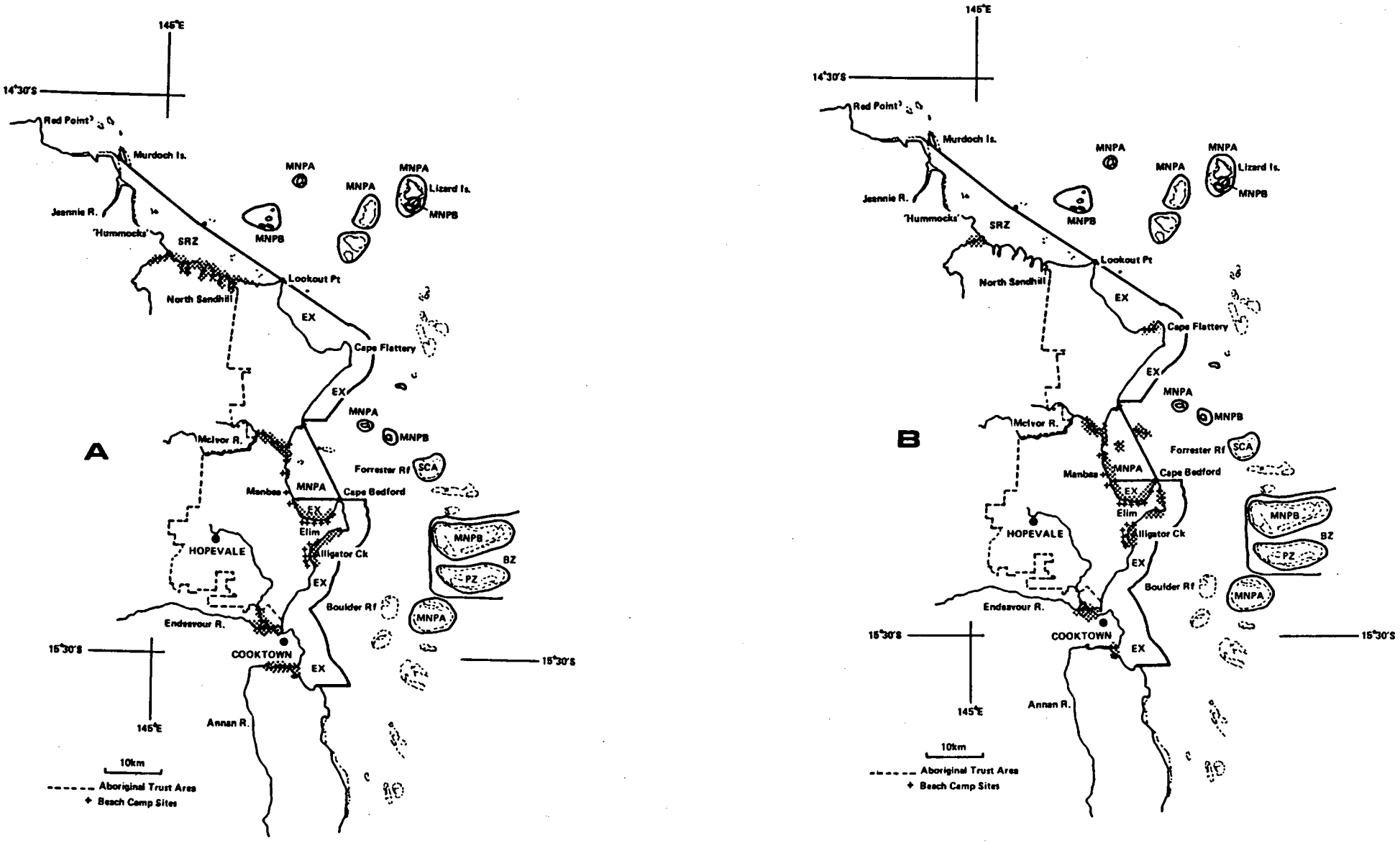

Figure 3.10: Areas used for spear fishing (A) and for line fishing (B) by Hopevale Aborigines (see Fig. 3.1 for key to GBRMP Zones)

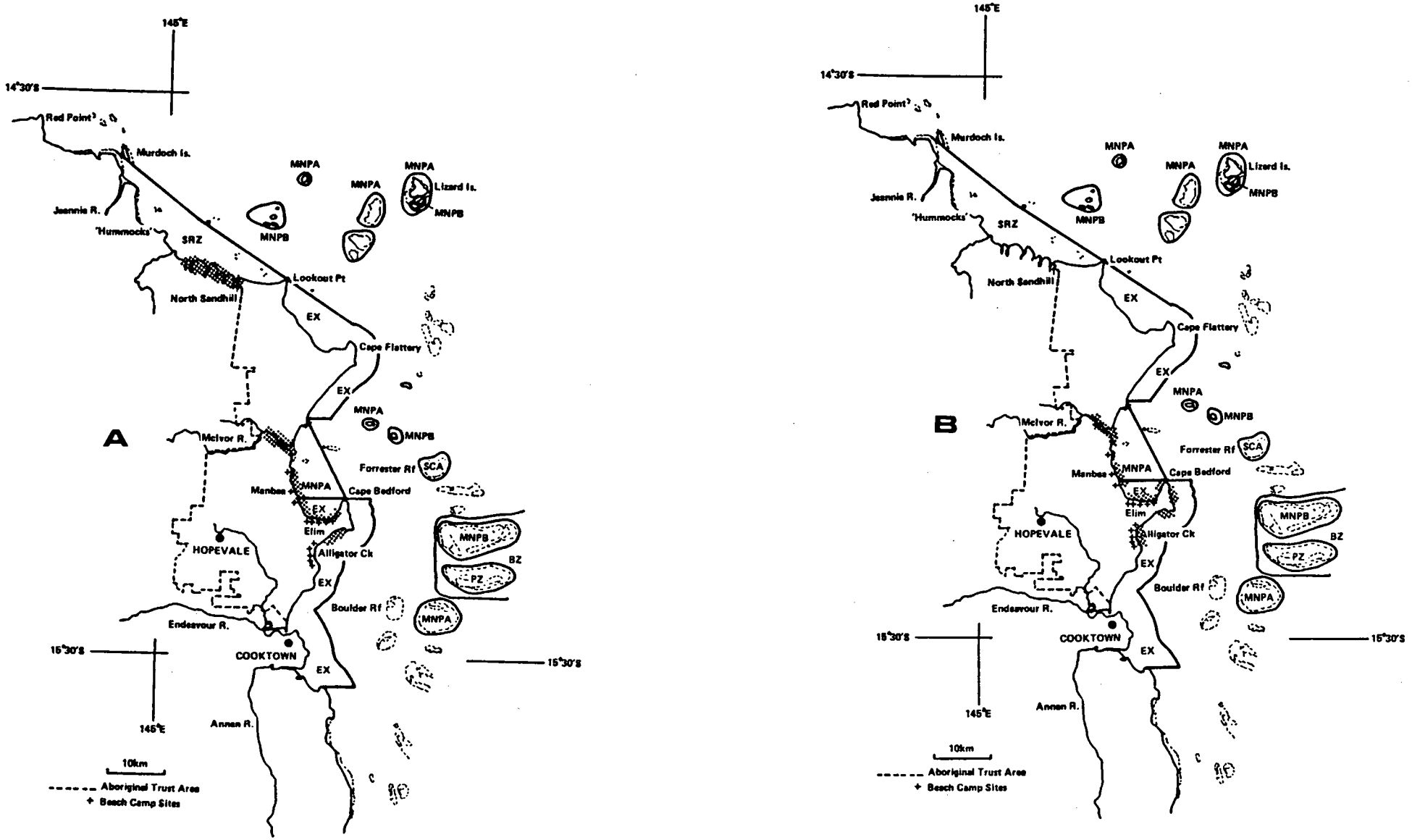

Figure 3.11: Areas used for net fishing (A) and for collecting (B) by Hopevale Aborigines (see Fig. 3.1 for key to GBRMP Zones)

Behavioural knowledge of the target species is used to locate and spear it. Spearing is the domain of males, with young boys practising on small shovelnose rays and crabs. There are, however, a few males who do not know how to make fishing spears or use them properly, for example, those who consider themselves ***waguurr-ga*** ('of the outside'), and also some young males who appear uninterested in learning.

Nets: Three main types of nets are used: set nets, bait nets and cast nets (see Section 3.3.4). The set nets are usually positioned perpendicular to the shore line in the intertidal area and checked on every low tide. They are used mainly during spring tide periods, and moved regularly, however, during the Christmas break some are permanently set. Set nets are also used in the rivers such as the McIvor River and the larger mangrove creeks in the Starcke River area (Fig. 3.11a). They are used most often at night, and at times are set right across the river or creek. The same nets are at times used as drag nets by attaching poles at either end.

Nets of large mesh size (10-15cm) are usually dragged off the more open beaches. The small mesh bait nets are used near mangroves to catch bait, including prawns in the wet season.

Cast nets are used along the shoreline to catch bait, although if sufficient fish are caught, the catch may also be used to make 'soups'.

Line fishing: Line fishing is the most common method of fishing. Most hand-lining occurs off the rocky shores, the beaches and in the estuaries. It also occurs on the inshore reefs along the coast and, weather permitting, at Conical Rock

Figure 3.12: Spearing technique using a spear thrower (milbiirr) (Hopevale).

(Fig. 3.10b). Whenever possible, boats are used and anchored over the inshore reefs, or up the creeks and rivers. All people can participate in this activity. The most common baits are hermit crabs (*Clibanarius spp*), a bivalve (*Asaphis violascens*), fresh fish, or occasionally frozen bait (prawns, squid) from Cooktown. Large set lines are used in the rivers to catch gropers.

In general, spring tide periods (especially around the full moon) are preferred. Within these periods the rising tides in the early morning or late afternoon are favoured, although line fishing will be attempted anytime.

Spear guns: These are used by younger males to spear reef fish and especially crayfish. Divers usually use a face mask only. Diving occurs mostly from boats on reefs during the Christmas period. It is not a very common activity.

(vi) Biological and Ethnobiological Information[16]

There was a general feeling amongst some of the middle-aged people (primarily those who grew up at Woorabinda), that most information about fishing knowledge, such as where and when to fish has been forgotten. They said the last really knowledgable men died in the 1950s. The increasing usage of nets would have contributed to this discontinuity of knowledge as less fishing skill is required to achieve good catches.

Ethnoclassification: The *Guugu Yimidhirr* terms for the elasmobranchs and teleosts recognised and/or used are listed in Appendix 3. There were 24 terms for elasmobranchs, consisting of

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[16] Only the major taxa caught will be briefly discussed, basic information on the other species is included in Appendix 3.

11 species, four generic terms, and nine unidentified or unconfirmed terms. For the teleosts, there were 97 terms, six of which were possible variations of the same term. Of the 91 remaining terms, 47 were for species, 20 were generic terms, and 24 were unidentified or unconfirmed terms. There were two species caught and eaten for which there were no ***Guugu Yimidhirr*** terms.

General Information: The fishermen believe that fish which are fat and heavy with roe have greater amounts of mucus on their body surface than fish that are poor or spent. They also consider that fish become 'blown' if left out in the moonlight; once exposed the fish is believed spoiled. Great efforts are made to cover fish on moonlit nights.

The primary Aboriginal cure for stonefish (***Synanceia horrida***) and other marine stings such as from stingrays, is to insert the affected area in very hot water containing ashes, preferably mangrove root ashes, until the pain is relieved. The very hot water would denature the protein by itself (two minutes at 50°C, Edmonds, 1976). The ash may, however, assist by altering the pH, which would also assist in the denaturing process (Edmonds, 1976). Two-thirds of the stingray species inject a protein venom which can be denatured by immersion in hot water (Williamson, 1985).

Elasmobranchs: Stingrays are caught seasonally, from about October until March or April (Fig. 3.2). The commencement of the stingray season, that is when they are considered 'fat' and edible, is indicated by the first thunderstorm of the wet season, or the arrival of the Torres Strait pigeon (***Ducula spilorrhoa***). The actual time varies for different species of stingray, but is

indicated by the state of the stingray's liver. If the liver is large and a pink/white colour, then the animal is considered edible (Fig. 3.13). Livers are described as 'full' (*yumuurr*), 'poor'/'black' (*ngamu*), or in between (*gudurrmugu*). The latter are considered edible, but the liver will not mix properly when boiled and then mixed with the minced flesh.

Young stingrays tend to be 'fatter' for longer than the adults. Some stingrays, such as *Dasyatis sephen* (cowtail ray) or *Aetobatus narinari* (spotted eagle-ray), may be taken prior to the recognised season, as occasionally one is found that is considered edible. Therefore 'test' spearing of stingrays tends to occur just prior to the recognised season. If a stingray has a poor liver, it is discarded or, rarely, used as bait. Stingrays with two caudal spines are generally considered inedible, for example, *Amphotistius kuhlii* (blue-spotted stingray) and *Taeniura lymna* (blue-spotted fantail ray). Mobulidae are also considered inedible.

The favoured species are: *Dasyatis sephen* (cowtail ray); *Urogymnus asperrimus* (thorny ray); *Himantura uarnak* (long-tailed ray); and *H. granulata* (mangrove ray). Other species taken occasionally are: *Aetobatus narinari* (spotted eagle-ray); *dhunbadyi* (species unidentified); and *gurraynydyi* (species unidentified). During the 1984/85 Christmas period, at least 18 stingrays were taken, probably more.[17]

Aborigines believe all stingrays and sharks give birth to numerous live young in the shallows along the shore, mostly

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[17] It was not possible to estimate the quantity of fish taken or consumed during the period of my field work due to the logistical problems of covering large numbers of beach camps (at least ten, often more) and fishing locations over more than 180km of coastline. Therefore only qualitative information and subjective estimates of the relative takes were recorded.

A

B

Figure 3.13: Checking stingray livers to determine if they are in season: (a) dark liver: therefore not in season (Lockhart); (b) large white/pink liver: therefore in season (Hopevale).

during the wet season (December to March). Elasmobranchs use claspers to transfer sperm to the female to fertilise the eggs in the oviduct, after which they may either be retained (live-young bearers: ovo-viviparous or viviparous), or laid on the sea bed (oviparous) (Bone and Marshall, 1982). The Rajidae (skates) and four families of sharks are oviparous: Heterodontidae (Port Jackson Sharks); Rhincodontidae (whale-shark); Orectolobidae (carpet-sharks, some viviparous); and Scyliorhinidae (dogfishes, one species viviparous) (Bone and Marshall, 1982). Therefore most elasmobranchs observed by Aborigines would bear live-young. Breeding aggregations of stingrays or sharks are called ***gulmunbi***.

Rhynchobatus djiddensis (white-spotted shovelnose ray) and ***Rhinobatos batillum*** (common shovelnosed ray), are both regarded as edible (***R. djiddensis*** being considered the better of the two), but neither is a preferred food. They are more often speared for bait, or by young boys as practice targets.

Sharks are less commonly eaten. Their seasonal acceptability is less defined than that of stingrays, but is also indicated by the state of their livers. They are eaten mostly during the wet season. When small sharks are caught, they are prepared the same way as rays (see 3.4.3 (ii)), although the flesh is washed more than that of stingrays. Small ***Carcharhinus spallanzani*** (black-tip shark) were eaten. A few other small shark species caught were grouped together as ***yungan*** by the Aboriginal fishermen, however, I was unable to identify them in the field before they were consumed.

Mugilidae: Mullet, especially blue-tailed mullet, are much sought after fish. From September to mid-December, the blue-tailed mullet are caught during their breeding migration along

the coast and into the rivers. They are nearly always speared either in the Endeavour or McIvor Rivers, or when they run in schools along the beaches on either side of Cape Bedford (Fig. 3.10a). All the blue-tailed mullet I examined in late November 1984 were very close to spawning, with gonads filling most of their body cavity. The size range of a sample (n = 15) was from 1.9 to 3.8 kg whole weight (mean = 2.8 kg). Numbers caught per boat (2 to 4 people) per trip (about 3 to 4 hours) varied considerably. With good conditions and accurate spearing, 30 or more could be taken in a couple of hours, usually, however, the number was less than ten per trip. The majority of those taken in the second week of December had spent gonads. This tends to indicate that spawning may have occurred around the full moon in early December. However, no Hopevale fishermen had seen or heard of spawning aggregations at any time. This may be explained by the limited time during which fishing occurs. Trips are held during the day only, preferably when the tide is rising in the morning, the favoured hunting period being on the turn of the high tide. If spawning occurred during late afternoon or at night then it would be missed. Grant and Spain (1975a) delimited the spawning season for blue-tailed mullet caught near Townsville as October to December. They also gave the minimum body length of 300mm as the minimum size for maturity. Running ripe females were caught in the estuarine shallows and their spawning was hypothesised to occur there (Grant and Spain, 1975a).

The Hopevale fishermen use the flowering of an ***Acacia sp***, ***Grevillea mimosoides*** (and possibly ***Grevillea striata***), and a ***Melaleuca sp*** as indicators of the blue-tailed mullet season.

Informants remembered extremely large schools of blue-

tailed mullet running north along the coast in the early to mid-1900s. One sandhill just north of Cape Bedford is named on the basis of its use as a lookout for these schools, which were speared from the beach by groups of men. These large schools are no longer observed.

Some blue-tailed mullet are known to remain in the rivers throughout the year, these are referred to as ***bubu-gudyin***.

A knowledge of blue-tailed mullet behaviour is used to catch these fish. During low tide the mullet are believed to feed in the deeper parts of the river closer to the mouth, or to move out of the river completely and swim up the coast (early in the season). With the incoming tide, the mullet move up the river. Around the turn of the tide they tend to sit singly or in compact groups of two to five fish just under the surface, under overhanging mangrove branches (called ***dharran.gal***). They tend to face into the current or angled towards the bank. Occasionally their caudal and dorsal fins break the surface. Aboriginal fishermen use their knowledge of this behaviour to catch the mullet. The fishermen travel slowly in a dinghy (by either rowing or idling the motor) just out from the edge of the mangrove overhangs, with one person on the bow with a spear (Fig. 3.14). When this person sights one of the groups of mullet he can spear them relatively easily. The best tides for this technique are spring high tides in the morning. I was unable to locate any reference to this blue-tailed mullet behaviour in the biological literature. Banfield (1909:59), however, in a paper on north Queensland Aboriginal fishermen, does note that "Mullet (if tradition is to be credited) were seldom caught by hook and line, but were speared among the mangroves at high tide - a practice which prevails to this day."

A

B

C

Figure 3.14: Spearing blue-tailed mullet (Valamugil seheli): (a) and (b) using a behavioural trait to locate and spear the mullet during high tide near Hopevale; (c) spearing the mullet as they move down the river as the tide runs out (Lockhart).

The other mullet species caught regularly is *Liza vaigiensis* (diamond-scale mullet). It tends to be caught more often running parallel to the beaches in small schools, and less commonly in estuaries. These mullet are speared or netted. They are considered 'fattest' in September to December/January, around the same time as blue-tailed mullet. One female speared in mid-January was running ripe. Others caught in a net in mid-February were spent. Grant and Spain (1975b) believe diamond-scale mullet to be a deep-water spawning fish, with spawning suspected to be in February. Diamond-scale mullet have been observed by Aborigines to swim slowly through 'red tide' (*Oscillatoria sp*) slicks with their mouths open feeding. This could not be confirmed.

Twice during my field work, reliable informants told me they had recently observed mullet driven into very shallow water by dolphins (unknown species), enabling the mullet to be speared by the fishermen.

Other mullet species are taken for bait (see Appendix 3).

Barramundi: The most commonly sought fish is *Lates calcarifer* (barramundi). Most are caught in nets, with the rest being speared or caught on lines. Set nets are used in the McIvor River, mangrove creeks, and perpendicular to the beaches. Spears are occasionally used for barramundi in estuarine creeks. They are caught on baited lines mostly in freshwater creeks. All barramundi caught are kept irrespective of size.

Excess barramundi caught in early 1984 was sold to the butcher shop: in February 10.4kg and in May, 6.8kg of fillets were sold.

Barramundi are believed by Aborigines to breed 'up creeks or

in lagoons' in the wet season. T.Davis (1985) found that salinity, not topography is the main factor for barramundi spawning location. Russell and Garrett (1985) could find no evidence of a single major spawning site in north-eastern Queensland, and suggest that spawning takes place near lower estuaries and coastal foreshores between October and February. The post-larval barramundi move into nearby brackish and freshwater swamps, which act as nursery grounds (Russell and Garrett, 1985). The juvenile barramundi move from these swamps around April into tidal creeks, where they remain for up to nine months before dispersing into the estuary, up rivers or along coastal foreshores (Russell and Garrett, 1985).

3.4.4 Invertebrates

(i) History

In 1770 Banks records finding "...dressed shellfish..." in an Aboriginal camp near the Endeavour River (Beaglehole, 1962:63). A party that had been sent to find a channel to the north, landed in a bay about 15km north of the river and disturbed a group of Aborigines who had been cooking "sea eggs" (sea urchins: most likely ***Stomopneustes variolaris***) (Beaglehole, 1955). Banks, whilst on a trip up river found a recently vacated camp where "...near their oven, in which victuals had been dressed since morn, were shells of a kind of Clam."(Beaglehole, 1962:89-90).

After contact with the Aborigines was finally made, Banks observed a large shell (***Melo sp***) which was used for baling in the canoe (Woolston, 1970). The Aborigines' dilly bags contained

shells and fish hooks made from shells (Beaglehole, 1962).

Banks concluded the Aborigines depended greatly on the sea for food. He had seen crabs being speared, and remains of crayfish and a variety of shellfish beside their fires (Beaglehole, 1962). On Lizard Island, Banks noted the presence of "...piles of shells the fish of which had I suppose been their food." (Beaglehole, 1962:103).

The mission entered the beche-de-mer industry in 1914, and it provided the main source of income from then until about 1935 (LCA accounts for the Hope Valley Mission 1914-1932; Chief Protector of Aborigines/Director of Native Affairs reports 1914-1954). The bay at Elim as well as the offshore reefs in the area were worked with the mission boats. Initially, an outside boat captain who was an experienced beche-de-mer and trochus fisherman was employed, but in 1926 one of the Aborigines, George Bowen, was put in charge (LCA #2 4/9/1926). In 1926, Theile, a church administrator on a visit to the mission, noted that the two main species of beche-de-mer collected were ***Holothuria scabra*** (chalkfish) in the shallow waters , and ***Actinopyga miliaris*** (blackfish) in the deeper waters; the market price for chalkfish was £80/ton (season's catch about 10-12tons), and £250-300/ton for blackfish (season's catch about 5tons)(LCA 14 27/7/1926).

Other marine industries that were tried were pearl shell (£125 in 1915) by the men at Elim (KMZ 2/11/1915); trochus shell (***Trochus niloticus***: first mentioned in 1915; then 1930/31; then again in 1951/53).

In 1952, an attempt was made to revive the fishing industries: £591 were received from trochus shell; and in 1953, seven tons of trochus shell was collected (O'Leary, 1952, 1954). This industry ceased with the sinking of the vessel in 1953

(O'Leary, 1954).

Oyster farming was attempted near the mangroves at Elim in 1979 for two years. However, although oyster larvae settled on the cones used as settlement surfaces, the juveniles failed to mature. Informants said the enterprise was closed down after a DPI/Fisheries Inspector confirmed that juveniles were unlikely to mature using that technique and location.

(ii) Current Uses

Marine invertebrates are presently used only for food or as fishing bait. The former uses of a number of species are however, still known.

(iii) Seasonality

Most mollusc species have certain periods when Aborigines consider them 'fat'. However, with the diminished use of most species as a food source, the times of these periods are now known only for those species that are still collected for food.

Oysters (***Saccostrea cucullata/commercialis***?; ***Saccostrea tuberculata***?) are considered 'full' about May to August. They are also believed 'fat' when there are 'red tide' (***Oscillatoria sp; yumu***) blooms. The mussels ***Polymesoda coaxans*** and ***Batissa violacea*** are generally believed 'fat' from about June to September. However, all these molluscs are eaten whenever the opportunity arises to collect them.

The mud crab, ***Scylla serrata***, and the sand crab, ***Portunus pelagicus***, are taken all year round, but are considered fattest in the winter months (June to August), especially around the full

moon. The amount of 'fat' (*mirrbi*) can be checked by opening the abdomen, or by removing a spine to check for 'red fat'. Roth (1903a) recorded that at Cape Bedford crabs were believed to be good only when caught during the full moon. He does not record whether they were taken at other times too.

Painted crayfish, ***Panulirus ornatus***, are mostly taken on the inshore reefs during the extreme spring low tides of the dry season, when the reefs are exposed (Fig. 3.15a). A few are taken by diving during the Christmas holiday period.

Prawns, mostly ***Penaeus merguiensis*** (banana prawns), are caught during the wet season with bait nets.

The two types of sea urchins eaten, ***Stomopneustes variolaris*** (Fig. 3.15b) and an unidentified species (***bingabinga***) have definite seasons when the gonads are developed. ***Stomopneustes variolaris*** is 'fat' (ripe) from approximately July to about September. The season corresponds to the flowering of ***Eucalyptus phoenicia***, ***Grevillea pteridiifolia*** (golden parrot tree) and ***Acacia crassicarpa***, which are used as seasonal indicators. The other species of sea urchin is in season from about September to about December.

The sea anemone, ***Cryptodendrum adhaesivum*** (Fig. 3.15c), is considered 'fattest' in June.

(iv) Locations, Appropriation and Ethnobiological Information

All ethnoclassification terms currently used or recognised are listed in Appendix 3. There were 50 terms for molluscs, however, five of these referred to the same category. Of the remaining 45 terms: 16 were identified species; nine generic terms; and 20 unidentified or unconfirmed. The

A

B

C

D

Figure 3.15: Some of the invertebrate marine resources which are exploited: (a) painted crayfish (Panulirus ornatus) (Hopevale); (b) sea urchin (Stomopneustes variolaris) (Hopevale); (c) sea anemone (Cryptodendrum adhaesivum) (Hopevale); (d) oysters (Saccostrea sp) (Lockhart).

crustaceans had seven categories: three species; three generic terms; and one unidentified species. Echinoderms consisted of eight categories: two species; two generic terms; and four unidentified or unconfirmed. There were nine categories of coelenterates, however, four of those refer to corals/coral reefs, and two to stinging hydroids. The remaining three consist of one species and two generic terms.

The large ***Saccostrea spp*** are primarily collected at low tide from the prop roots of mangroves (***Rhizophora spp***) near the 'Wharf' creek at Cape Bedford (Fig. 3.11b). They are cooked in the hot coals of a fire until the shell opens, and are then eaten. For small oysters clustered on the rocks, a fire is made on top of them and moved around as the oysters cook and open. This method is rarely used now.

The saltwater mussel, ***Polymesoda coaxans***, is collected at low tide by digging in the mangrove mud at the base of mangrove roots. They are collected mostly from the McIvor and Endeavour Rivers, but occasionally from the mangroves on some of the islands (Fig. 3.11b). The mussel, ***Batissa violacea***, is collected from the 'waterfall' up the McIvor River. Both these mussels are cooked by boiling.

The small mussel, ***Asaphis violascens***, is a commonly used bait. It is dug up at low tide from the coarse sand amongst the rubble at the 'breakwater' on the southern side of Cape Bedford.

The crabs, ***Scylla serrata*** and ***Portunus pelagicus***, are speared, irrespective of size or sex, by probing crab holes on the intertidal flats at low tide. Mud crabs are also speared by torch light amongst the mangrove roots on a rising tide. Crabs are commonly used by young boys for spearing practice. Crabs are prepared by boiling in saltwater.

Clibanarius spp (hermit crabs) occupying *Telescopium telescopium* and *Terebralia spp* shells are collected, often by the sack-full from the mangroves at low tide for use as bait. The crabs are removed by smashing the occupied shells. The mouth of the McIvor River and behind the 'Wharf' creek are the most common locations.

Painted crayfish, *Panulirus ornatus* (Fig. 3.15a), are speared with fishing spears during the extreme low tides in winter, when one very small reef (20m to 30m) off the 'coloured sand' (*Ngumanbigu*) just north of Elim, is exposed. In a five week period in July and August, at least 20 to 24 large crayfish were speared there. The Aborigines believe that the crayfish come from the closest fringing reef at *Bala*, about 1km away, to replace those speared. They are prepared by boiling in saltwater.

Banana prawns, *Penaeus merguiensis*, are caught by dragging bait nets on the incoming tides at the junction of the mangroves and the beach just north and south of Elim. Small prawns are used as bait, larger ones are boiled and eaten.

The sea urchin, *Stomopneustes variolaris* (Fig. 3.15b), is collected at low tide from under rocks and rocky ledges in the intertidal zone on the eastern and southern sides of Cape Bedford (Fig. 3.11b). The yellow 'tongues' of gonads can be eaten raw, or the whole animal can be put amongst hot coals for a few minutes to cook, either with or without the mouth removed, then opened and the gonads eaten. This food is considered extremely rich.

The other edible species of sea urchin (*bingabinga*), is only rarely collected now. It involves diving below the intertidal zone where *Stomopneustes variolaris* is found. It has short spines and is found amongst the algae.

The sea anemone, *Cryptodendrum adhaesivum* (Fig. 3.15c), is

collected on the intertidal mud flats at low tide in shallow water (about 15cm). The animal is dug out of the mud carefully so that it does not retract, and placed in a bucket of water. It is returned to the beach where it is quickly inverted and the tentacles rubbed on the sand to discharge the nematocysts, then washed until all the mucus is gone. It is usually cooked in a 'kapmari' (ground oven) or in hot coals. It can then be preserved by smoke drying. Sea anemones are currently only eaten by the older members of the community.[18] Previously, it was used to cure ringworm infections: the tentacles were gently rubbed on the affected area, and within three days the fungal infection was said to disappear.

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[18] I found they had a taste very similar to shellfish, however, its colour was a sickening green, which made it unpopular with some of the younger people.

4.0 THE CURRENT AND HISTORICAL MARINE HUNTING AND FISHING PRACTICES OF THE LOCKHART RIVER COMMUNITY INCLUDING A SUMMARY OF THE ETHNOBIOLOGICAL KNOWLEDGE OF MARINE FOOD RESOURCES: A COMPARISON WITH HOPEVALE.

4.1 Historical Aspects of Marine Resource Utilisation: a General Account

4.1.1 Languages

Standard English is taught in school and most people can understand it. However, the dominant speech form at Lockhart River is a creole, which includes vocabulary items from the traditional languages. The Aboriginal languages/dialects which are spoken by approximately equal numbers of people at Lockhart today are ***Umpila*** and ***Kuuku-Ya'u***, although only the elderly people are effective speakers due to the predominance of Lockhart creole (Chase, 1980a; D.A.Thompson, 1976).[1]

4.1.2 History

This review will concentrate on the main historical events, with an emphasis on marine activities. For a detailed account of the history of contact, intrusion and European control, see Chase (1980a, 1981b). Table 4.1 (after Chase, 1980a:129) summarises the historical phases of the European contact and influence.

Information on the earliest contact period in northeastern CYP is scarce. Those involved, such as early beche-de-mer fishermen, were not inclined to keep records.

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[1] David Thompson (1976) describes the distribution of the dialects of north-eastern Cape York Peninsula. Chase (1980a) has summarised the linguistic research conducted in the area.

Table 4.1: Historical phases of European contact and influence (after Chase 1980:129).

DATE	FOREIGN ACTIVITY	KEY FOREIGNERS	ABORIGINAL PERSPECTIVE OF PAST	RESIDENCE PATTERN	FEATURES PERCEIVED BY ABORIGINES
Early 1800s	Exploration	Jack, Kennedy, naval ships	*yilaun*("Dreamtime"), Captain Cook-time	Traditional bush living	Mythological past; creation of Aboriginal European interaction, first exposure to European goods
1870-1908	Early entrepreneurial activity	European and Japanese luggermen, Islander crews, miners	*poula-kuna; asthanthana*	Modified bush living with small concentrations in dry seasons at coastal fishing bases and mines	Raids by Native and European police. Attachment to friendly coastal visitors. Freedom to move around
1908-1923	Consolidation and expansion of entrepreneurship	Hugh Giblet, miners, luggermen, government officials	Giblet-*kuna* or Giblet-time	Concentration of area population at Lloyd Bay for dry season, breakup into smaller groups along coast for wet season	Protection under charismatic European. Understanding of Aborigines by a European. Young people first start to lose touch with own individual homelands
1924-1938	Mission establishment	M.Rowan	Rowan-*kuna* or Rowan-time; Start-mission-time	Permanent settlement residence. Groups brought in over time Holidays in bush	Ceremonial life first actively discouraged. Mission acted as refuge for individuals in traditional conflicts. D.Thomson reactivates ceremonies among northern people
1942-1944	2nd World War	troops	war-*kuna* or war-time	Population leaves mission and forms three camps along coast	Freedom from European control, but partial dependence for some supplies
1950-1960	Post-war mission Christian Cooperative	J.Warby	Warby-*kuna* or Warby-time	Mission residence, but old sub-villages amalgamated into one residence group. Holidays in bush	Sectional interests destroy Cooperative, ceremonies discouraged. upsurge of Island dancing. First generation born not to use traditional language
1963-1964	Anthropology	L.West	Monty-*kuna* or Monty-time	Mission residence, but sub-village formed around West's camp	Northern ceremonies revitalized, other traditional activities recreated. Church opposition
1965-1971	Direct governmental control	P.Killoran	Killoran-*kuna* or Government-time	Plans for distant resettlement, but acceptance of Iron Range site	"bullyna" by government, direct attack on indigenous lifestyles, broken government promises
1971-1977	Direct government control. Anthropology Culture Foundation	Managers and staff. A.Chase L.Bennet	*apa-kuna* or lately-time, new-site time	Settlement living, end of old pattern of settlement. Holiday period in the bush. Beach camping but contracted after beer canteen introduced	Wrong way of life and residence. Escalation of fighting and drinking. End of contact with bush Ceremonies revitalized through sympathetic Europeans and the start of "festival" attendance Awareness of other Aboriginal communities in northern Australia

It has been assumed that there had been contact between Aborigines and Torres Strait Islanders prior to the first European contact, due to the influence evident in the far northeastern Aboriginal material culture and ceremonies (Beckett, 1972; D.Moore, 1972; Thomson, 1933). Chase (1980a) considers this cultural influence extended as far south as Princess Charlotte Bay.

First recorded European contact was by Bligh in 1789 at Cape Direction, Restoration Island and Cape Grenville while on his epic journey to Timor after the mutiny on the 'Bounty' (Chase, 1980a).

During the remainder of the 18th and early 19th centuries, contact was only intermittent. The first overland expedition was Kennedy's in 1848, followed by Jack's in the 1870's. In 1879, Jack found Aboriginal men at Temple Bay with an ability to use 'broken English' resulting from interaction with beche-de-mer fishermen (Jack, 1915). Neither of these expeditions provided information on Aboriginal marine resource usage.

The discovery in the late 1800's of pearl shell beds in the Torres Strait, coupled with the established beche-de-mer fishery on the east coast, resulted in large numbers of Aborigines from eastern CYP being employed on the luggers as shallow water divers (Chase, 1980a). The marine-oriented coastal peoples were recognised as the best lugger crewmen (Reid, 1954). There was, however, considerable conflict between the Aboriginal crews and the masters (Chase, 1980a; Haviland and Haviland, 1980).

Howard (1909), the Chief Protector of Aborigines at the time, noted that 40 Lloyd Bay men were employed on Japanese luggers. Chase (1981b) found that the old men he interviewed who had worked on these Japanese luggers looked back on those times

with great nostalgia. Due to the way they treated the Aboriginal crews, the Japanese were ranked highest of the non-Aborigines with whom the Lockhart men had had contact. Employment on non-Japanese beche-de-mer and pearl shell luggers was extremely risky.[2]

The Anglican mission of Lockhart River was established just south of Cape Direction in 1924. This resulted in the gathering together of Aboriginal groups which had settled around old coastal lugger camps north of Princess Charlotte Bay (Chase, 1980a). The mission was established partly to provide protection against the excesses of lugger recruitment, and to relieve what was considered to be the desperate plight of Aborigines in the area (Chase, 1980a).

The mission vessel was used to collect pearl shell, but by 1927 had only produced modest results (Chase, 1980a). The late 1920's and early 1930's saw most men employed away in the beche-de-mer and pearl shell fisheries, the mission surviving on garden produce and on fish, dugongs and turtles caught from the mission launch (Chase, 1980a).

It was during this period that Thomson carried out his studies in this area. His description of the importance of dugongs in social and economic life (see Thomson, 1934) was discussed earlier (Section 1.3.2). It is interesting to note that:

> "...Thomson was ***not*** dealing with people defiantly living their lives in the traditional way despite a European presence, as his texts and photographs suggested. His informants were in fact either residing

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[2] See Haviland and Haviland (1980), Roth (1900) and Chase (1980a, 1981b) for detailed descriptions of the unscrupulous use of Aboriginal labour in these fisheries.

at the Lockhart River Mission or were camped at the Stewart River mouth, close by a sea-port and a cattle station." (Chase, 1980a:86)

By 1936, few Aborigines still occupied their traditional areas in northeastern CYP, and as Chase notes:

> "It is this period [1924-1942] that older Lockhart people blame today for the decline of their traditional culture, as seen in the disuse of dialects, the failure to hold initiation ceremonies regularly, and the ignorance of new generations in the knowledge of their countries." (Chase, 1980a:117)

The beche-de-mer and pearl shell fishing industries ended with the outbreak of the Second World War. The mission was abandoned and the Aborigines told to return to their bush camps (Chase, 1980a). This enabled Lockhart people to move closer to their home territories, providing an opportunity for mission-born children to be educated about territories and traditional culture (Chase, 1980a).

After the war, the Aborigines were brought back to the mission. There was a resurgence of trochus fishing, with the demand for men exceeding the supply. Surprisingly, the Superintendent of the mission at that time, considered it important to encourage traditional skills in language, bushcraft and marine hunting (Chase, 1980a).

In the 1950's trochus fishing became the major economic activity of the mission, using one purchased and two rented luggers (Chase, 1980a). However, in 1957, by which time the market for trochus had dropped, two of the luggers foundered within days (Chase, 1980a).

Chase (1980a:124) notes that:

"By the 1950's, a generation of younger mission-born men had grown up. Most of them had spent their adult life working out of Lockhart on luggers, and they were ignorant of the traditional ceremonies and dances."

The early 1960's saw some mission men engaged in the crocodile hunting trade along the coast from dinghies.

Negotiations, kept secret from the Aborigines, between the Anglican Church and the Director of the Department of Native Affairs (now Department of Community Services) were held in the early 1960s to transfer control from the church to the state. Initially all people were to be moved to Bamaga (at the northern tip of CYP), and some families did move in 1964. The majority, however, refused to leave the region due to their traditional affiliations (Chase, 1980a). In 1967 the state took over control of the mission, and by 1970 the population had been relocated to an alternative site near Iron Range (Chase, 1980a).

From this outline of the Lockhart River peoples' history, a number of factors relevant to marine usage should be noted:

- Aborigines of the Lockhart region have had a complex and sustained contact with outsiders since the late 1800s, especially through working on luggers involved with the beche-de-mer, pearl shell and trochus fisheries.

- An Aboriginal population survives at Lockhart which identifies strongly with the northeastern CYP area by tradition (Chase, 1980a).

- Due to the considerable periods of employment of mission men on luggers, a situation developed where most men were away from their society for long periods. Chase (1980a:130) believes that "This brought about sharp discontinuities in particular areas of traditional knowledge and behaviour." Some aspects of

marine knowledge would have benefited by the lugger employment, however, discontinuities in areas of specific local knowledge would have occurred.

- The relocation to Iron Range separated people from actual beach living, and the large number of deaths among old people since then has removed many of the people who had detailed knowledge of their 'countries' (Chase, 1980a).

4.2 Description of the Lockhart River Region

The Lockhart River Trust Area (formerly 'Reserve') extends from Cape Sidmouth north along the coast to the barge landing on Quintell Beach adjacent to Lockhart River community, then inland around the northern side of the community and down the Claudie River, inland again and north to the Pascoe River (Fig. 4.1). The western boundary is founded by the upper reaches of the Wenlock River. Lockhart River community is situated about 2km from the sea. Access to the community is by plane to the nearby Iron Range airstrip, or by the Kennedy Road which joins the Peninsula Developmental Road north of Coen. Access by vehicle is restricted to the dry season and usually to four-wheel drive vehicles. A barge arrives from Cairns approximately once a month with freight. The Lockhart River population in 1985 was approximately 350.

4.2.1 Climate

The Trust Area extends from approximately latitude 12° 33'S to 13° 25'S, and the community is about 12° 48'S. The climate is characterised by a tropical wet season between December and late

April when approximately 85% of the total average annual rainfall (≈2050mm) occurs. This is followed by a long dry season between May and December when strong, predominantly south-easterly winds prevail. Table 4.2 shows the basic climatic data for Iron Range airstrip adjacent to the community (Bureau of Meteorology, 1975).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YEAR
Av.Max.Temp. (°C)	31.3	30.8	30.1	29.3	28.3	27.2	26.7	27.8	28.7	30.0	31.6	32.0	29.5
Av.Min.Temp. (°C)	23.4	23.2	23.4	22.0	21.5	19.8	18.4	19.0	19.6	20.2	22.0	23.1	21.3
Mean Relative 9am Humidity (%) 3pm	83 74	86 75	84 76	81 70	84 77	85 76	85 72	81 73	74 67	69 61	67 60	72 65	79 71
Mean Rainfall (mm)	374	386	466	289	113	67	39	18	14	17	60	206	2049

Table 4.2: Selected climatic data for Iron Range Aero (Bureau of Meteorology, 1975).

Immediately inland from the coast are low dune ridges extending for up to two kilometers with associated dune swamps. Further inland are eucalyptus and melaleuca open and closed forests to the foothills of the mountain range. The range is typified by areas of dense rainforest. The coastal plain is cut by numerous rivers and creeks, often fringed with patches of rainforest.

4.2.2 Marine Habitats

There is a considerable variety of marine habitats accessible from Lockhart River community. Beaches open to the predominant south-easterly winds extend south from Cape Direction, and there are other smaller beaches near Cape Griffith and Cape Weymouth (Fig. 4.1).

The greatest concentration of mangroves occurs from the Claudie River mouth south to the Lockhart River mouth which consists of a wide mangrove delta. Numerous creeks and rivers occur along the coast which have associated mangrove stands. Seagrass beds occur in Lloyd Bay inside Cape Direction, as well as in Weymouth Bay (see Coles, *et al*, 1987). Rocky shores occur on all the capes and headlands along the coast. There are a number of mainland islands situated along the coast with associated fringing reefs, and mangroves on some of the protected sides. Inside Cape Direction are extensive intertidal sand and mud flats. Numerous fringing and inshore reefs occur in the area, as well as offshore reefs and associated cays.

4.3 General Marine Usage in the 1980s

4.3.1 Seasonality

Fishing and marine hunting activities at Lockhart River are influenced primarily by the weather and the seasonality of the marine resources, for example, the Cooktown salmon and blue-tailed mullet migrations (Fig. 4.2). The influence of work and school commitments is less than at Hopevale, as a smaller proportion of the population is employed.

4.3.2 Localities

Due to the community's proximity to the beach, daily fishing or hunting trips are possible. From the late wet season (about April) until about May, numerous people move to temporary beach camps (Fig. 3.3). Chase (1980a) describes the organisation and benefits of these beach camp dwellings. Since 1976, the European

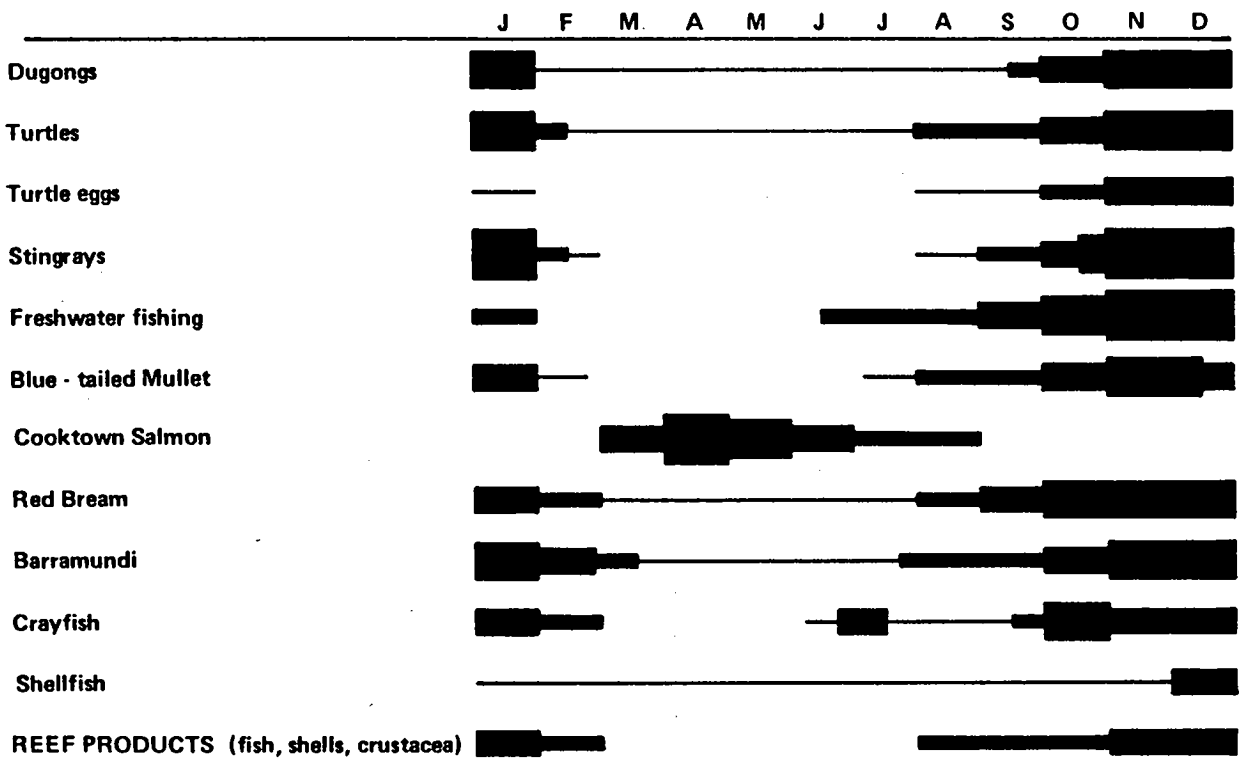

Figure 4.2: Seasonal availability and exploitation of some marine resources by the Lockhart River community (includes information from Chase, 1980a: 154)

administrators have attempted to discourage the use of these camps which they consider unhealthy and an eye-sore (Chase, 1980a). They were, however, still being used during my field work in 1985, when camps were located from the Claudie River to Quintell Creek.

Some families with access to a boat visit the old mission site at Second Red Rocky Point for weekends of fishing and marine hunting. This was partly to escape community life and also to keep contact with the old mission site.

The accessibility of fishing localities to Lockhart people is much lower than for Hopevale Aborigines due to the lack of vehicles and boats.

4.3.3 Boats and Vehicles

During my field work, Lockhart Aborigines had only four dinghies with outboard motors. The largest was a 5.2m fibreglass boat with a 75hp motor. The other three consisted of one 4.3m dinghy and two 3.7m dinghies. There was one other 5.2m fibreglass boat which was under repair, and at least four other 3.7m dinghies without motors or serviceable motors. There were only three serviceable 4WD vehicles owned by Aborigines. The boats and 4WD vehicles owned by the non-Aboriginal staff were not available or accessible to Aboriginal members of the community. By contrast, Hopevale Aborigines owned approximately 33 boats and 43 4WD vehicles during the period of my field work.

4.3.4 Fishing and Marine Hunting Equipment

There were five types of fishing equipment in use at

Lockhart River during my field work. They were: spears; harpoons; fishing lines; nets; and hand spears. All of these occur at Hopevale, however, there were slight differences in the equipment and its usage.

(i) **Fishing spears:** The spears are similar to Hopevale's except that the shaft is made of wood rather than bamboo (Fig. 3.4). A variety of woods are used for the spear shafts, including both inland and coastal species. Some species used are: ***Hibiscus tiliaceus***, ***Macaranga involucrata*** and ***Neolitsea australiensis***. There are two types of fishing spears: the most common is the four-prong spear, the other a single heavy wire. Spear-throwers are used in spearing.

(ii) **Harpoons:** The harpoons and harpoon heads are the same as for Hopevale, although the shaft does not have the slit in the thinner end through which the rope passes to prevent loss of the shaft (Fig. 3.6a).

(iii) **Fishing lines:** Fishing lines were all nylon hand lines of varying breaking strains, with lead sinkers and metal hooks of various sizes. The most common rig was the same as for Hopevale, with the hook tied at the terminal end of the line and a sinker 20cm to 40cm above it. Unlike Hopevale, hand lines with lures were common, and used mostly for barramundi in creeks and rivers. Trolling lines, with silver spoon lures, were also used regularly. Fishing lines, hooks and lures were bought at the community store.

(iv) **Nets:** There was at least one 10cm mesh monofilament

nylon set net owned by a Lockhart Aborigine, however, during my field work it was being held by the police as it had been borrowed by a European and used illegally. Bait nets were used to obtain small fish for bait as well as to eat.

(v) **Hand spears:** are used for spearing crayfish (Fig. 3.4d). They consisted of a short (≈60cm) wooden shaft, with a single thick (≈6mm) wire prong attached to one end, and a loop of surgical rubber attached to the other. These were not used at Hopevale.

4.4 Usage of Marine Resources

4.4.1 Dugongs

(i) History

Dugong have not been commercially exploited for oil in the Lockhart River region. The earliest detailed paper which refers to dugong hunting in that area was by Thomson (1934). He studied a small group of Aborigines living at the mouth of the Stewart River, and later the ***Kuuku Ya'u*** (see Section 4.1.2 re Thomson's work). He describes the hunting technique used from dugout double outrigger canoes, the butchering and meat distributing process, the equipment, and the magic and ritual involved with hunting.

An indication of the level of dugong hunting in the 1930s can be gained from Thomson (1934:239):

> "Their reputation as dugong hunters is well founded, for during the whole of the first period that I spent with the tribe, May - July, 1928, and November -

December of the same year, the camp was never for any length of time without dugong meat."

The harpoon and harpoon-head most often used then were similar to those currently used, although the harpoon head had four wire prongs instead of three. Thomson (1934) also describes other types of harpoon heads which were used, especially the single prong with a barb. One elderly informant said that they used to have a single, long wire prong which was used in the 'nose' (disc) to tie the animal up for towing. Dugong hunting mostly occurred during the day, although on calm, moonlight nights some hunting occurred (Thomson, 1934). After getting within range, the harpooner leapt overboard to drive the harpoon firmly home. At the first opportunity a rope was secured around the animal's tail, the tail held and the animal drowned (Thomson, 1934). Some old informants said they used to put a second harpoon into the animal, ideally on the first breath after harpooning, and pull up on the second line, otherwise, they were told by the 'old people', that they would lose the dugong.

The animal was butchered and the meat divided in a particular way (Thomson, 1934), which is discussed later in relation to the current techniques.

Considerable magic and avoidance behaviour was associated with dugong hunting (Thomson, 1934). Magic could be specific or ritualised actions aimed to produce success, or avoidance behaviour by the hunter or others (e.g. women) to prevent bad luck. Thomson (1934:251) says: "The belief of a skilled harpooner in the efficacy of this magic is a powerful psychological influence [on the hunter]." Avoidance behaviour was also a means through which reputations could be maintained if the hunt was unsuccessful. The former practice of the ***Kuuku Ya'u*** of eating

human flesh was a rite or sacrament to make a man fearless and give special prowess in dugong hunting (Thomson, 1934). Thomson (1934) further describes a dugong increase ceremony which used to be carried out by ***Kuuku Ya'u*** speakers at a 'dugong stone' at Mosquito Point.[3]

"Chief amongst the practices that bring 'bad luck'...are the burning of the hide of the dugong, the use of its blood to dye the shafts of spears, and the touching or carrying of the body or bones of the dead." (Thomson, 1934:253). Chase (1980a:260) mentions how "...the windpipe of a dugong...is a powerful potential sorcery object which, if it fell into the wrong hands, could be used against the harpooner." One old informant told me that his 'grandmother' had told him to keep the windpipe and tongue of the dugongs he caught for 'good luck'. He said he had filled a 'bag' when at the old mission site with 'maybe 40 or 50 throat', as it was the 'custom'.

The collection of dugong bones into piles for later use on graves was discussed by Thomson (1934:254), one grave:

> "...was situated on a little low headland on the south bank of the river near its mouth, and 50 or 60 yards from the sea, facing eastwards towards the dugong grounds of Princess Charlotte Bay that the hunter had known so well. The grave was five feet six inches in length and three feet across. It was constructed entirely of dugong bones, and contained parts of the skeletons of at least eight animals. The vertebrae and small bones were piled up on the centre of the grave and were completely encircled by the ribs arranged with

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[3] Bradley (nd) describes a current dugong increase site and ceremony for the Yanyuwa at Borroloola, N.T.

their vertebral ends inwards, the skulls of the animals were placed at the head of the grave."

Older informants told me the ribs were kept and used as a sign of the prowess of the hunter.

Severe restrictions on eating dugongs were imposed in former times. Although partially relaxed by Thomson's time, it was the privilege of old, 'big' men or initiated men. No women or young men were allowed to see, eat or even smell dugong cooking (Chase, 1980a; Thomson, 1934). These restrictions were consciously lifted at Lockhart in about 1940, during a period of food shortage at the mission (Chase, 1980a). Dugong meat was publicly shared by a 'big man' with his wife and children, and since then the meat has been freely available to all people (Chase, 1980a). Informants at Hopevale could remember no such public-taboo breaking occurring at their mission.

(ii) Current Uses

Dugongs are caught for the meat they provide, and also for the oil (although this is a secondary purpose). The dugong oil is used as a general remedy and occasionally for cooking. Dugong hunting also serves an important social function (see Section 5). The uses are identical to Hopevale's, although less oil is collected and used.

(iii) Seasonality of Hunting

Dugongs are hunted all year round, whenever weather, sea conditions and tides allow (Fig. 4.2). The dugong 'season', when meat quality is considered best, is November to January, when the

seagrass biomass is greater. Any calm periods during October are also utilised for hunting.

(iv) Locations

Most dugongs are caught just south of the old mission site, between First and Second Red Rocky Points (Fig. 4.3). They are also taken inside Cape Direction, in Lloyd Bay and on a small reef (*Wayki*) off Cape Direction. With suitable weather, dugongs are also hunted from near the Pascoe River north to Temple Bay.

(v) Hunting Techniques

Hunting occurs from dinghies which leave and return to the beach adjacent to the community, usually on the same day. All except one of the 15 dugongs caught during my field work were taken during the day. Each dugong was butchered on a suitable beach close to where it was caught. If hunting occurs at night, during the new moon, the phosphorescence of the tail is used to locate the animal. If there is a full moon, clear and clean water, the shape of the dugongs can be seen in the water.

The actual hunting technique is identical to the one used by Hopevale hunters (Fig. 3.6), and use the same indicators - direct sighting, floating seagrass, disturbed/turbid water, and garfish (especially at night). There appears to be an absence of any search pattern. Due to the relative clarity of the water compared with the Starcke River region, once an animal is sighted it is easier to keep it in sight underwater and to herd it inshore while tiring it out. Although the water clarity permitted selection to occur, in all cases observed (five), once a dugong

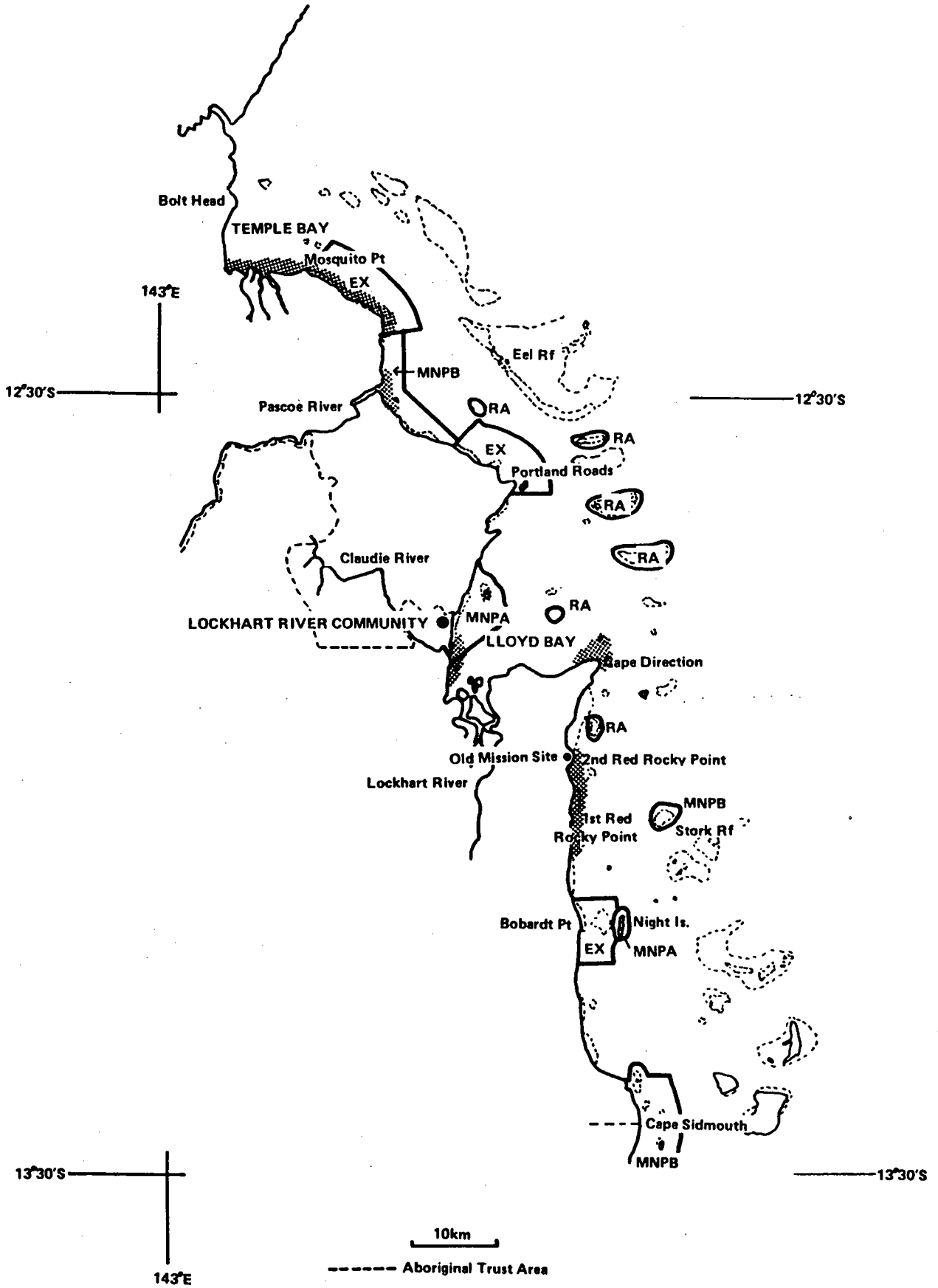

Figure 4.3: Areas used for dugong hunting by Lockhart River Aborigines (see Fig. 4.1 for key to GBRMP Zones)

was sighted, an attempt was made to catch it. In all the observed captures, once the animal was harpooned and a rope placed around the peduncle, the animal was tied with the rope to the stern of the boat and drowned by towing it ashore. Some hunters said they still use the 'old way', i.e. the tail held on the gunwale to drown dugongs, but the 'new way' was easier. Hunters informed me that rifles were used to kill animals after harpooning on at least two occasions during the period of my field work. Older hunters did not approve of this as it was not 'proper' and they believed it made the meat tougher.

Another method of capture, which is gaining popularity amongst the younger hunters, is lassoing. The dugong is chased and tired out, then one person jumps overboard and places a lasso over the dugong's head (Fig. 3.6).The rope is then pulled tight by another person on the boat. This method was apparently used occasionally on the old crayfish boats for fresh meat - one informant said an animal caught this way at times lived for up to a week on the deck of the boat.

Dugongs are butchered immediately after being taken ashore (Fig. 3.6). None was brought back whole to the beach camp area during the period of my field work. The method currently used differs from those described by Thomson (1934) and Chase (1980a). No incision is made to check the quality of the meat prior to butchering. The animal is rolled out of the water and onto its ventral surface. It is washed down to remove sand. The harpoon head is cut out of the hide. Shallow cuts are made in the skin to mark where the dugong is to be cut. The initial cut runs from the top of the disc down the mid-line of the dorsal surface to the peduncle. Transverse cuts are marked immediately posterior to the flippers across the dorsal surface, and across the anterior end

of the peduncle. The tail is removed at the peduncle mark. The skin and associated blubber of the torso are cut along the lines marked and then folded outwards, the meat being left intact. Alternatively, the skin, blubber and meat down to the ribs are removed intact from the mid-dorsal line to the mid-lateral line between the anterior and posterior transverse marks. The remaining skin and blubber, without flesh, is cut and folded back as in the other method. The meat along either side of the vertebrae, and the flesh around the ribcage (if the first method is used) are removed. The skin and blubber are then cut and peeled back from the head and shoulder region, leaving the flesh intact. The flesh is removed from this region and the head severed, and the disc removed. The head and tail are both retained, the former for meat and for oil, the tail stock (minus flukes) for meat.

The carcass is rolled over and the chest meat removed by cutting around the edge of the ribcage. The viscera are removed. The 'light gut' (small intestine), heart, kidneys and liver are retained. The remaining viscera are discarded into the sea. The ribs are broken off the backbone individually. The meat is then cut up into strips about 30cm by 7cm, and loaded onto the boat. Left on the beach are the skin and blubber of the head, shoulders and some of the torso, and the vertebrae. Any foetuses are retained and eaten as at Hopevale, especially by the older people. Dugong meat is cooked by boiling, frying, roasting or in a 'kapmari'.

The method of removing the hide and flesh together in longitudinal strips as described by Thomson (1934) and Chase (1980a) is no longer used. The 'old, proper' way has been

replaced by the 'Islander' ('Torres Strait Islanders'[4]) way. Most older informants believed the 'old' way divided the meat more fairly, and used everything, rather than wasting the hide, as now occurs. Chase (1980a) describes how the head and tail were always discarded as inferior meat, and the meaty skeleton left. With the current method, the only parts of the skeleton left are the vertebrae. The head and tail are now usually used for meat, and the skull is sometimes boiled for oil. Chase (1980a) also describes how the dugong's windpipe was a potentially powerful sorcery object, and that care was taken by the hunter to collect and dispose of it safely. In each instance that I observed the lungs, with windpipe attached, were thrown into the shallows and left. Butchering is still primarily carried out by the harpooner or countrymen (i.e. traditional, geographically close kin - see Fig. 5.1) of the harpooner, however, I did see cases where non-countrymen assisted to a minor degree.

The meat is still distributed as described by Chase (1980a), with primary, secondary and tertiary distribution (Fig. 4.4). There have been reports of dugong meat being sent to Bamaga and Weipa by plane in return for alcohol, but during my stay there was no evidence of this occurring. People (including relatives) from Weipa did drive over three times during my stay to catch dugongs, but were only successful on one occasion.

Dugong hunting is a strictly male activity. Women may be taken in the boat to the general area, but are dropped ashore to 'chuck a line' (line fish), while the men hunt.

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[4] The description of dugong butchering by Nietschmann (1977, 1983) for Mabuiag Is. in the Torres Strait is different to what the Lockhart Aborigines describe as the 'Islander way'.

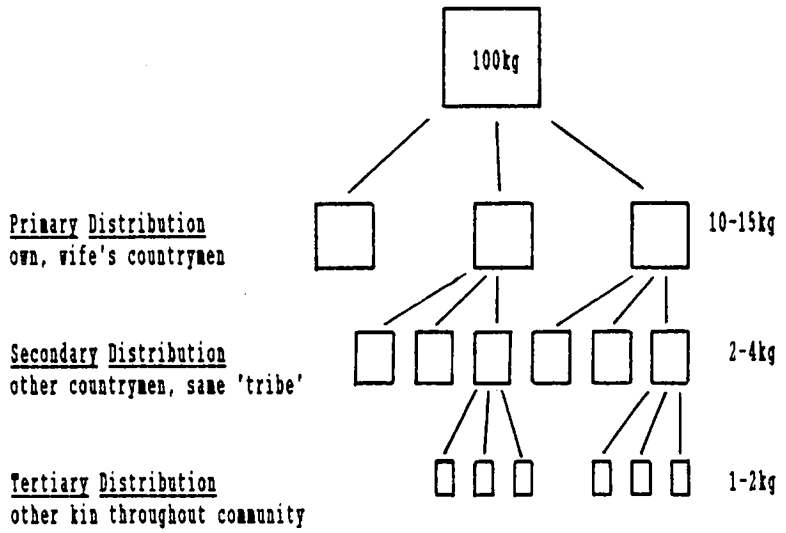

Figure 4.4: Distribution of dugong meat to countrymen and other kin in the community (After Chase, 1980a:261).

(vi) Catch Data

The dugong catch data for Lockhart River hunters have been summarised in Table 3.2 (located after Appendices).

In approximately three months (late September to late December, 1985) 15 dugongs (4♀; 11♂) were caught. In addition, there was a report of two dugongs (one a pregnant female) being caught just prior to my arrival, and at least four dugongs being taken by Weipa Aborigines in the Pascoe River area during October. These are included in Table 3.2. Chase (1981a) reported that in a favourable three month period (August to October, 1974) 18 dugongs were taken. Estimates of annual catches cannot be extrapolated from these data due to the seasonal variability of hunting, and the unpredictable availability of boats for hunting.

Of the dugongs confirmed taken, eight were caught near Red Rocky Point; four near Cape Direction; one near the Claudie River mouth; and two between Stoney and Mosquito Points (Fig. 4.3).

I know of five unsuccessful dugong hunting trips between September and December 1985. However, only two of those returned empty handed; the others caught turtles.

I acquired a total of 13 skulls plus complete reproductive and other specimens from five animals. In comparison, a total of 33 skulls and 12 sets of reproductive specimens were collected from Hopevale.

(vii) Biological Data

The data indicate that dugongs of all ages, including reproductively-active females, were hunted. A near-term pregnant female was reportedly taken just prior to my arrival, and at least three cows with calves were taken.

The mean age of the female dugongs taken for which there are age data (n=4) was 33 years (S.D.=14.0), and the range 19 to 46 years old. The age range for the males sampled (n=7) was 5.5 to 23+ years old.

There was the potential for selection to occur during hunting as the clarity of the water allowed the animals to be observed for a few minutes before harpooning. However, my observations, and the catch data, indicated that an attempt was made to catch any dugong encountered. Two of the calves of the cows caught were chased but escaped; one looked too small to survive alone.

The sample size of 15 was too small to draw any conclusions or make comparisons to Hopevale, based on the 4♀:11♂ sex ratio.

(viii) Summary of the Ethnobiological Data

The following ethnobiological information will concentrate on a comparison with Hopevale. A summary of the comparison of the Hopevale and Lockhart River ethnobiological information on dugongs with the biological literature is provided Section 4.5.

Ethnoclassification[5]: The following *Kuuku Ya'u* terms are from Chase (1980a:259), and are still in use:

watayi - dugong

- *wangkinytya* - male dugong
- *ngulpityi* - old, male dugong; rogue dugong
- *wuympityi* - young female dugong, has calved
- *pi'ikityi* - young female dugong, has not calved
- *thu'ityi* - pregnant female dugong
- *thanama* - mature female dugong
- *yin'ampayma* - old female dugong

- *thukiinyu* - herd of dugong

The Lockhart language has more specialised lexical categories for dugongs than the Hopevale language does. One possible reason for this may be that during the Hopevale oil industry period, less interest was paid as to the particular type of dugong caught, as they were for oil not food. With the

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[5] Due to the brevity of my stay at Lockhart River, and as Chase (1980a:298) has already collected extensive ethnoclassification data, taxonomies were not studied except for general usage when fishing and hunting. The terms used in this chapter are derived from either Chase (1980a) for dugongs, or for fish, from Rev. D. Thompson (*pers comm*). All were checked with informants to ascertain if they were still currently known. However, any mistakes are mine alone.

continuity of dugong hunting by Lockhart Aborigines for food, the type and quality of dugong caught has always been extremely important. This is possibly reflected in the retention of these specialised terms. The difference could also reflect a greater cultural focus on dugong hunting in the pre-contact period by the Aboriginal groups in the Lockhart River region.

Movements: Dugong movements are believed by Lockhart hunters to depend upon tides and food availability. Local movements are considered to be governed by the tides. During the spring tides dugongs feed right inshore, the new moon being considered best. When the tide is low, they move well out from the coast. One place dugongs are said to be found during low tides is ***Wayki*** (Lighthouse Reef), which is about 1nm north of Cape Direction.

When on the feeding grounds at night, informants believe dugongs tend to aggregate closer together, but spread out more during low tide and when on the feeding areas during daytime.

Large scale movements are believed to be determined by the state of the seagrass beds, the dugongs moving to better food. During winter and again in January/February, more are seen in the hunting areas. During January/February they are found around the Red Rocky Points area. One informant believes that when they move from one area to the next, for example Cape Direction to First Red Rocky Point, they move 'outside' (i.e. not in the shallow inshore waters) and do not stop to feed on the way. The seagrass beds near the old mission site were known to 'come and go' and 'change' every few years. During the wet season growth of seagrass, dugongs are considered 'fatter'. The main hunting season (November to January) is dictated by the fatness of animals and the relatively calm seas during this period, rather

than a greater abundance or aggregation of dugongs.

Major movements of dugong populations are unknown, and no one knew if the Stoney Point 'mob' is the same as the First Red Rocky Point 'mob', or even if a herd of dugongs seen one day are the same as another seen nearby the next. It is known that dugongs can be found near the outer barrier reefs. This would be knowledge gained from the time spent on luggers. Details of these offshore locations are, however, unclear.

Dugongs are said to have been plentiful in Lloyd Bay before trawlers and outboard motors became common. The decrease in dugong numbers has been attributed to trawlers and the noise of outboard motors.

Feeding Behaviour: Lockhart hunters believe dugongs feed on two 'types' of seagrass, ***Halodule spp*** and ***Halophila spp.*** The dugongs eat the leaves and dig out the rhizomes. On spring tides they will feed right up to the mangroves, and at times have been found feeding in both the Claudie and Lockhart rivers. Hunters believe the dugongs use the rushing water of the spring tides to help clear away the substrate from the rhizomes when feeding.

Behaviour: Dugongs are credited by Aborigines with excellent hearing, poor eyesight, and the ability to swim fast for a short distance. Outboard motors are believed, by older hunters, to have made dugongs more wary.

The parallel scars on the dugong's dorsal surface are considered to be from males fighting for females, males fighting to expel mature males from the herd, and from rubbing on rocks and reefs. The large white scar areas on some animals' backs are believed to be a sign of old age - akin to grey hair in people.

Again, as for Hopevale, no cause other than old age was proffered.

Herds of greater than 100 animals have been seen in times of very good seagrass, but herds usually comprise only ten to 20 animals. The herd structure is believed to be the same as described by Hopevale hunters: mostly females, calves and young males, with one or a few dominant males. The dominant males are said to be very strong, and difficult and dangerous to kill. They are described as being large with 'short tails'. The male is said to control the herd movements by 'whistling' at night. Single animals are usually males chased away by the dominant male.

The cow-calf bond is very strong, if one is caught, the other will remain close by until caught or chased away.

'Water-fat' dugongs (oedematous fat and meat) are also caught at Lockhart. Most were caught in the early 1940s during the war, near the old mission site. It was blamed on the seagrass being poor, and also on 'sick' dugongs coming down from Papua New Guinea 'because of the bombs'. The 'water-fat' animals appear healthy when first caught, but are identified when the first cut is made: the fat is oedematous and the meat smells bad. Some animals are still taken, although none have been taken for quite a few years. Chase (1980a:260) says that:

> "Very occasionally, if hunters are extremely hungry for fresh meat, a few ribs from such a carcass might be removed and eaten. The eating of "water-fat" animals is thought to make a person ill; it causes pains in the stomach and violent diarrhoea."

Life History: Males are identified by older hunters as having a thicker peduncle and larger head, while females have

thin peduncles and smaller heads. This contrasts with old Hopevale hunters who consider males to be more tapered posteriorly, and females fatter and rounder. No one at Lockhart could identify a pregnant female. Old animals are identified by the white scar area. Most believe there is a 1:1 sex ratio overall, but with more females in the herds.

No special area exists for breeding, nor is there a specific season, although they suspected there is a possibility of diffuse seasonality due to the occasional herd being seen with similar sized calves.

No one has seen mating occur, although one hunter said he may have seen it from a distance. He saw two or three males rolling a female.

The period of gestation is unknown by hunters, however the general opinion is that dugongs could give birth each year as cows are often seen with two calves, one larger than the other. One informant had seen a single case of twins in a pregnant female he caught about 40 to 50 years ago.

Dugongs are believed to give birth in the shallows away from sharks according to what the 'old people' told the elderly hunters when they were young. None of the informants have seen dugongs giving birth or heard of anyone else seeing it. One informant described finding a female dugong in murky water about 60cm deep, with a very small calf, just on dusk in mid-September 1985, while walking on a beach near the old mission site. The cow let the calf swim for ten to 20 minutes before rejoining other dugongs further off the beach.

No informant was willing to estimate how old individual dugongs caught were, or at what age the calves are weaned.

Pre-Mission Conservation Practices: There were no specific conservation measures aimed at preserving dugongs. The former cultural restrictions mentioned earlier (see also Chase, 1980a; Thomson, 1934) would have had an indirect affect. As would have the technological limitations, such as canoes. Informants said that 'before' (pre-mission?) no more dugongs were caught than could be eaten before the meat went off, and that nothing was wasted, as very strict rules applied with severe penalties. Gorges, in which men alone took part, often occurred when 'big meats' were caught after periods of food shortages (Thomson, 1934).

4.4.2 Turtles

(i) History

Thomson (1934) in his paper on the dugong hunters of Cape York also discussed turtles. They were hunted and harpooned in the same manner as dugongs.

> "Natives say that in former times, when only wooden harpoons...were used, turtle hunting was much more difficult than it is to-day, when iron and wire harpoons are in general use. It was necessary to harpoon the animal in a soft place, preferably in the region of the neck, for the wooden harpoon heads would not penetrate the hard carapace. They were sometimes captured by swimming, and were also taken when they visited islands and sandbanks to deposit their eggs, but turtle flesh was much less plentiful and was more highly valued than it is to-day." (Thomson, 1934:246)

Green turtles were the favoured species, but loggerhead and hawksbill turtles were also taken (Thomson, 1934). Mating turtles were easily approached, and the female with immature eggs preferred. Outside the mating season turtles were more wary (Thomson, 1934).

He also noted that after harpooning the turtle is taken aboard the canoe alive and the harpoon wound was plugged with material.

The method of butchering turtles described by Thomson (1934) is virtually identical to the current method.

In 1928, Thomson (1934) says that most of the restrictions applied to dugongs did not apply to eating green turtle meat, but severe restrictions were applied to eating hawksbill turtle meat. The hawksbill turtle was considered by those Aborigines to have:

> "...a poison gland in the neck, and unless this is removed they will not eat its flesh. Only a few of the old men profess to know how to do this, and I have seen a hawksbill turtle, taken when a group was really hungry, left to rot, because none of the men knew how to remove the poison gland. They believed that they would die if they ate it. How deeply rooted is this tradition of the poisonous nature of the hawksbill turtle was revealed to me by an old man of the Wutati tribe, which is now nearly extinct, who explained to me that his people had died off as a result of eating hawksbill turtle without having first removed the poison gland. I am unable at present to say whether or not there is any foundation in fact for the native tradition, and whether there is any gland in the neck of the hawksbill turtle that secretes a toxic

substance." [6] (Thomson, 1934:255)

Informants said that more turtles were taken while living at the old mission site then there are today. This was due to the scarcity of meat then. When working on the luggers, one informant remembers visiting Raine Island during the breeding season and 'filling up' the boat with green turtles.

(ii) Current Uses

The current uses of turtles by Lockhart people are identical to Hopevale. Green turtles are caught primarily for their meat. Their carapaces are often retained, cleaned, varnished and sold or traded to the white staff and other visitors. Their eggs are collected whenever a laying turtle or its nest are found.

Hawksbill turtles are occasionally taken for their carapaces. Some older men profess to know how to butcher the turtles and remove the poison, but very rarely do so now. Hawksbill turtle eggs are also collected opportunistically. Females have been reportedly taken, their eggs removed, and the animal discarded, but this is not a common occurrence.

Loggerhead and flatback turtles are considered just edible, but their flesh is 'strong' and smells.

(iii) Seasonality of Hunting

Green turtles are caught all year round, however, the peak season is November to January, when females are considered fattest (Fig. 4.2). This corresponds with Hopevale's turtle season. At Lockhart males are generally considered poor, although

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[6] See discussion on page 92.

occasionally young males are all right.

In order to collect eggs, the beaches are checked for turtle nests from November to early January. A few nests are also found from late August on, and a few in January.

(iv) Locations

Green turtles are caught along virtually the whole coastline. The favoured areas are off the Red Rocky Points, Stork Reef, between the Pascoe River and Temple Bay, and Eel Reef (Fig. 4.5). The last two areas are used only when the weather is calm or the wind is north-westerly. Eel Reef is considered the 'main place' for turtles. The mainland beaches from Cape Direction south are searched for turtle nests.

(v) Hunting Techniques

The major turtle catching method currently used at Lockhart is 'bulldogging' (Fig. 3.8). The technique is identical to that used at Hopevale. Harpooning of turtles is only used by older hunters or if the water is very turbid. The turtle harpoon head used is similar to Hopevale's - a single, thick, barbed prong. If a turtle is harpooned, the wound is stuffed with a rag, when it is brought into the boat. Turtle hunting is a male activity only. As at Hopevale, the use of the 'bulldogging' technique is becoming increasingly popular.

During hunting, large female turtles are selected for. All turtles with long tails (i.e. mature males) are ignored, and if turtles are plentiful during a hunt, only the largest are taken. This generally excludes immature males.

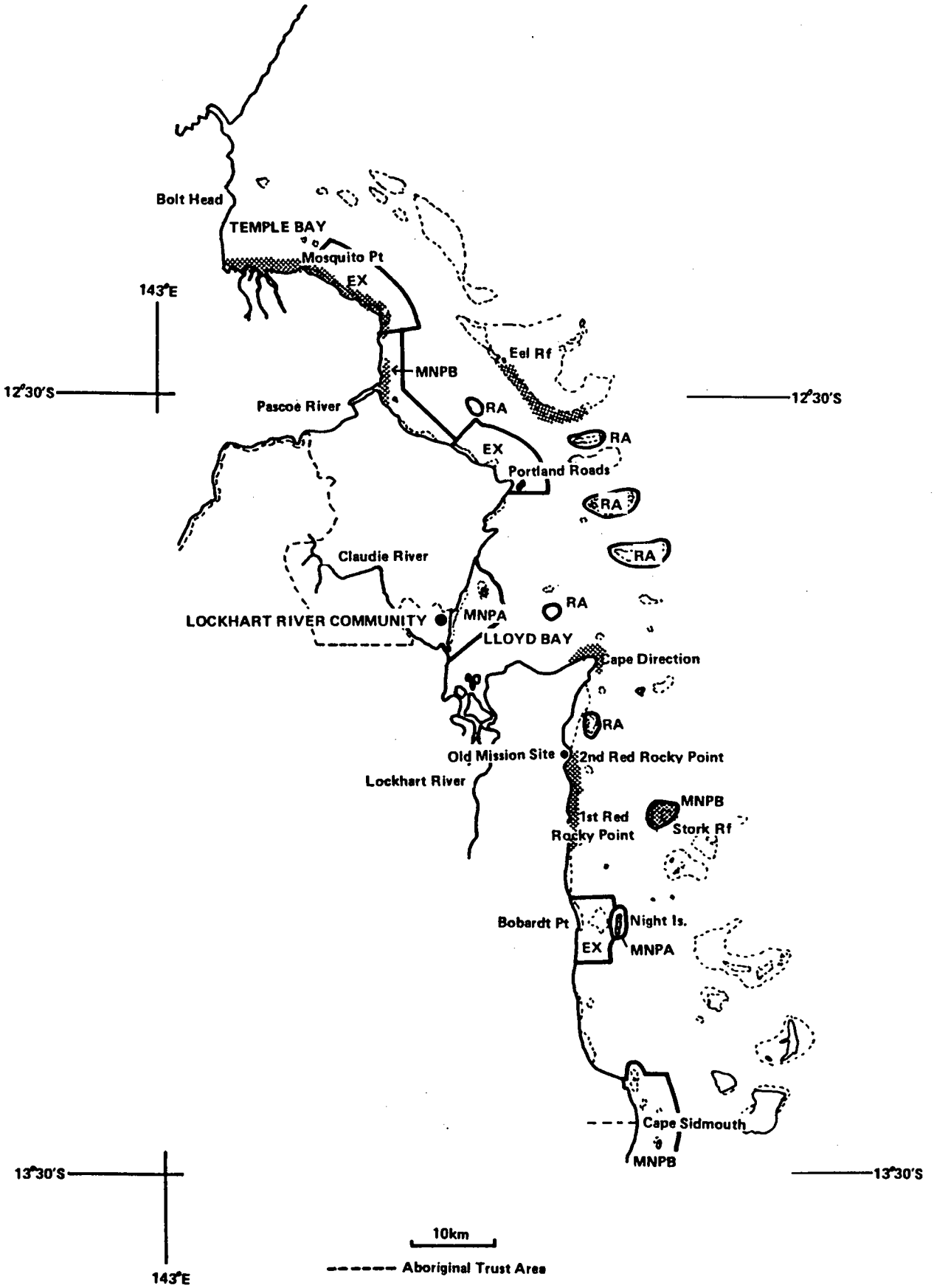

Figure 4.5: Areas used for turtle hunting by Lockhart River Aborigines (see Fig. 4.1 for key to GBRMP Zones)

The condition of the turtle is checked by the appearance of the skin around the neck and behind the hind flippers. It should appear yellowish and fat. Turtles with a fine covering of algae growing on their neck and carapace are known to be fat and easier to catch, as they are believed to remain in one area eating continuously.

Turtles are butchered ashore. They are flipped onto their backs and washed to remove sand. Then one of the following occurs: (1) an axe is used to knock the turtle unconscious, then the plastron is removed; (2) the fore flippers are cut off at the first joint, the plastron is then removed with the turtle alive; (3) the turtle is knocked unconscious, the carotid arteries cut, the fore flippers removed and then the plastron; (4) or the carotid arteries are cut, the fore flippers removed, then the plastron. The pectoral and abdominal muscles are removed along with the plastron (c.f. Hopevale: where the plastron is removed without any meat), exposing the viscera. At Lockhart the viscera are generally removed prior to the scapula, humerus and associated muscle. Otherwise the process is identical to that at Hopevale. The oesophagus and trachea are retained only occasionally. The heart, liver, intestine and eggs (if present) are kept. Turtle meat is cooked by boiling or frying, or the whole animal can be baked in a 'kapmari'.

There are two methods for collecting turtle eggs: if a turtle is found laying, a bag is placed under the ovipositor to catch the eggs; if the nest is found, the eggs are located by poking a stick in the ground, as occurs at Hopevale.

(vi) Catch Data

Measurements of the curved carapace length, tail length (from carapace), and reproductive and stomach samples were taken from 12 green turtles (11♀; 1♂). A summary of the results is shown in Table 4.3.

From late September to late December 1985, at least 30 green turtles (11♀; 3♂ ;16?) and one hawksbill turtle were caught. One green turtle nesting tag was given to me from a turtle caught in early September 1985. In a similar three month period (late September to late December 1984) at Hopevale, at least 27 green turtles (11♀; 0♂; 16?) were caught.

(vii) Biological Data

Assuming the minimum curved carapace length for an adult green turtle is 91cm (Limpus, *pers comm*; Limpus and Reed, 1985a), then four females and one male were immature adults. Of the turtles examined, two females were very immature, six were immature and three were mature adults (Table 4.3).

Of the three mature adult females, none was preparing to breed in the 1985 season. One was preparing to breed in the 1986 season, and had previously bred prior to 1983. Of the other two, one had previously bred in 1983 the other in 1984. One immature adult female had a carapace length greater than the largest immature female previously examined (98.5cm in Limpus and Reed, 1985a). It was possible that females breeding in the 1985 season had already migrated out of the region. More samples are required to understand the population structure and dynamics of turtles in this area.

DATE CAUGHT	SPECIMEN #	SEX	AGE* CLASS	CURVED CARAPACE LGTH(cm)	TAIL LGTH(cm)	BRED PREVIOUSLY	SEASON** FOR NEXT BREEDING	LOCATION CAUGHT
15/10/85	Q10028	F	J/SA	72.0	9.0	-	-	Stork Reef
15/10/85	Q10029	F	J/SA	75.0	4.0	-	-	Stork Reef
15/10/85	Q10026	F	SA	79.0	2.0	-	-	Stork Reef
15/10/85	Q10027	F	SA	84.0	4.0	-	-	Stork Reef
13/10/85	Q10025	F	SA	91.0	9.0	-	-	sth of Cape Direction
28/11/85	Q10035	F	SA	94.0	8.5	-	-	sth of Cape Direction
25/11/85	Q10034	F	A	101.0	12.0	<1983	1986	Mosquito Point
19/11/85	Q10033	F	SA	103.0	11.0	-	-	Stoney Point
11/10/85	Q10024	F	A	109.0	9.0	1983	>1985	sth of Cape Direction
27/10/85	Q10030	F	SA	112.0	11.0	-	-	nth of Pascoe R.
15/11/85	Q10032	F	A	112.0	14.0	1984	>1985	Bel Reef
15/11/85	Q10031	M	SA	94.0	16.0	-	-	Bel Reef

* Age Classes: J=juvenile; SA=sub-adult; A=adult
** >1985 = Preparing to breed in a future season, but not in the 1985 season.

Table 4.3: A summary of the results for green turtle specimens collected from those caught by Lockhart hunters. The turtles are listed according to sex and carapace length.

Hunting selection does occur in a similar manner to Hopevale. It is based on tail length, size and fatness. The selection for large, short-tailed turtles ensures that females predominate in the catch, but there is a chance of immature adult males being taken. No conclusions can be drawn from the sex ratio, due to the small sample size and selective hunting.

A large proportion of the turtles were caught on or close to the reefs. Limpus and Reed (1985a) found that 78.7% of a population sampled in a coral reef feeding ground consisted of immature turtles. This, coupled with females breeding that year possibly having left, would account for the large number of immature animals.

One green turtle tag return from Lockhart, indicated that at least some of the population nest at North West Island (Capricorn

Group; 20°18'S 151°42'E). This corresponds to other tag recoveries for the general region (Limpus and Parmenter, 1986). The tag returns from Hopevale were also from turtles nesting at North West Island.

(viii) Summary of the Ethnobiological Data

The following ethnobiological information will concentrate on a comparison with the data obtained at Hopevale. A brief comparison of the Hopevale and Lockhart River ethnobiological information on turtles with the biological literature is given in Section 4.5.

Ethnoclassification: The following are some of the ***Kuuku Ya'u*** terms recognised at Lockhart River. The list is not exhaustive.

tukulu - green turtle (***Chelonia mydas***)

yakurrun - hawksbill turtle (***Eretmochelys imbricata***)

wabun - loggerhead turtle (***Caretta caretta***)

i'ila - flatback turtle (***Natattor depressa***)

Other terms exist for:

- young female turtles
- old female turtles
- female turtle with eggs; laying
- young male turtles (2 terms depending on tail length)
- male turtle
- old male turtle, very large tail
- mating turtles

As for dugongs, there are more specialised lexical terms in

use at Lockhart than Hopevale. This may be a reflection of the greater continuity of turtle hunting and the importance of meat quality to Lockhart people. However, it would also be due to the discontinuities experienced by Hopevale Aborigines after 100 years of mission influence and the evacuation to Woorabinda for seven years. I will address this further in Chapter 5.

Life History: Male green turtles are recognised by Lockhart Aborigines by the long tail, larger head and flatter carapace. Females have short tails, small heads, rounder carapaces. Young turtles have lighter coloured carapaces, older animals are darker. Hopevale hunters relied on tail length only.

Mating is observed to commence about August and continue until December. Coupling pairs can be approached easily. The mating season is indicated by 'red tide' (*Oscillatoria sp*) blooms, as well as by a flowering shrub (unidentified). If, however, thunder and lightning occurs during the late mating season, then it will end earlier.

Females are known by hunters to lay eggs along the mainland beaches and on the islands. Some nesting occurs from August to November, but most occurs in November and December, with some in January. Green turtles are considered to lay about 80 to 100 eggs per nest, hawksbills' about 100 to 120 eggs per nest. Hawksbill eggs are smaller than green turtle eggs.

Hatchlings are believed to take about one month to emerge, depending on the amount of sun or clouds during that period: the cooler it is, the longer they take. Hatchlings are found on the reefs for a while, where they are seen being eaten by fish and sharks, and being caught in seaweed. The next sized turtles seen on the reefs inshore are in the 30cm to 40cm range.

No one had any idea of the maximum life span of turtles. Most believed adult females laid each year.

Movements: Information on movements is almost identical to that from Hopevale. Local movements depend on the tides, rather than a diurnal cycle. They come inshore and onto the reefs at high tides, and move off at low tides. High tides, especially spring high tides, are the best for hunting.

Turtle numbers tend to decrease, especially those of females, around August.

Seasonal Condition: The seasonal condition of turtles is virtually the same as for Hopevale. Females are considered fat all year, but especially during the breeding season. They are poorest immediately after breeding. Some young males can be fat, but old males are of poor quality and usually not caught or released if taken.

Behaviour/Ecology: Turtles do not live in groups, but do feed together on the high tides.

Hawksbill Turtle Poison:[7] Hawksbill turtles are considered extremely poisonous and must be butchered in a specific way to remove the poisonous sections. Only a few older men profess to know how to butcher these turtles correctly. The poison is believed to be in a gland in the neck of the turtle.

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[7] See discussion on page 92.

4.4.3 Elasmobranchs and Teleosts

These will not be discussed in detail. Only the major similarities or differences with species utilised by Hopevale fishermen will be considered.

(i) Current Uses

Fish are caught for food, with some smaller fish being used as bait. All edible fish caught are kept. Occasionally fish are sold, the basic unit of exchange being 'jug price' (price of a jug of beer at the canteen), which was equal to $6 (late 1985).

Sharks and stingrays are caught seasonally and prepared in the same manner as at Hopevale - the liver being cooked separately, and later mixed with the minced flesh.

(ii) Seasonality

The seasons for some of the most commonly sought species are shown in Figure 4.2. The major seasonal fish are: the schools of Cooktown salmon (***Eleutheronema tetradactylum***) which arrive in March to feed on prawns in the water fringing the beaches; and the blue-tailed mullet spawning migrations which enter the estuaries from August/September until December. Cooktown salmon do not constitute a major resource at Hopevale, as they do at Lockhart.

Floral and other indicators which are used at Lockhart to show the seasons are similar to Hopevale. The flowering of an ***Acacia sp*** indicates the blue-tailed mullet season. After the first wet-season thunder storm, shark livers are checked in the

same way as at Hopevale. The arrival of Torres Strait pigeons signals that stingrays are in season, oysters are 'fat', and some fish have eggs.

Most fish species are taken all year, although their quality may vary through the year. ***Lutjanus argentimaculatus*** (red bream), ***Lates calcarifer*** (barramundi), and ***Lethrinus spp*** (sweetlips) are the preferred species which are sought all year.

(iii) Locations

Quintell Beach, from the mouth of the Claudie River to past Quintell Creek, is regularly used for fishing, especially the rocks adjacent to the barge ramp (Fig. 4.6). These rocks are heavily used by women with hand lines. The Lockhart River is used mostly for spearing mullet, and some hand line fishing.

The numerous creeks south from Cape Direction are fished for barramundi, red bream and pikey bream (***Acanthopagrus berda***). The multitude of reefs in the same area are used for hand line fishing of reef species. Allen Reef (Replenishment Area) is used for line fishing. The beaches, creeks and estuaries are used for spearing stingrays.

(iv) Techniques of Appropriation

All of the techniques described for Hopevale are used, with some major differences.

Spearing: Spears are rarely used from the bows of boats to catch blue-tailed mullet, which is the technique used at Hopevale. Spearing occurs with fishermen wading in the upper

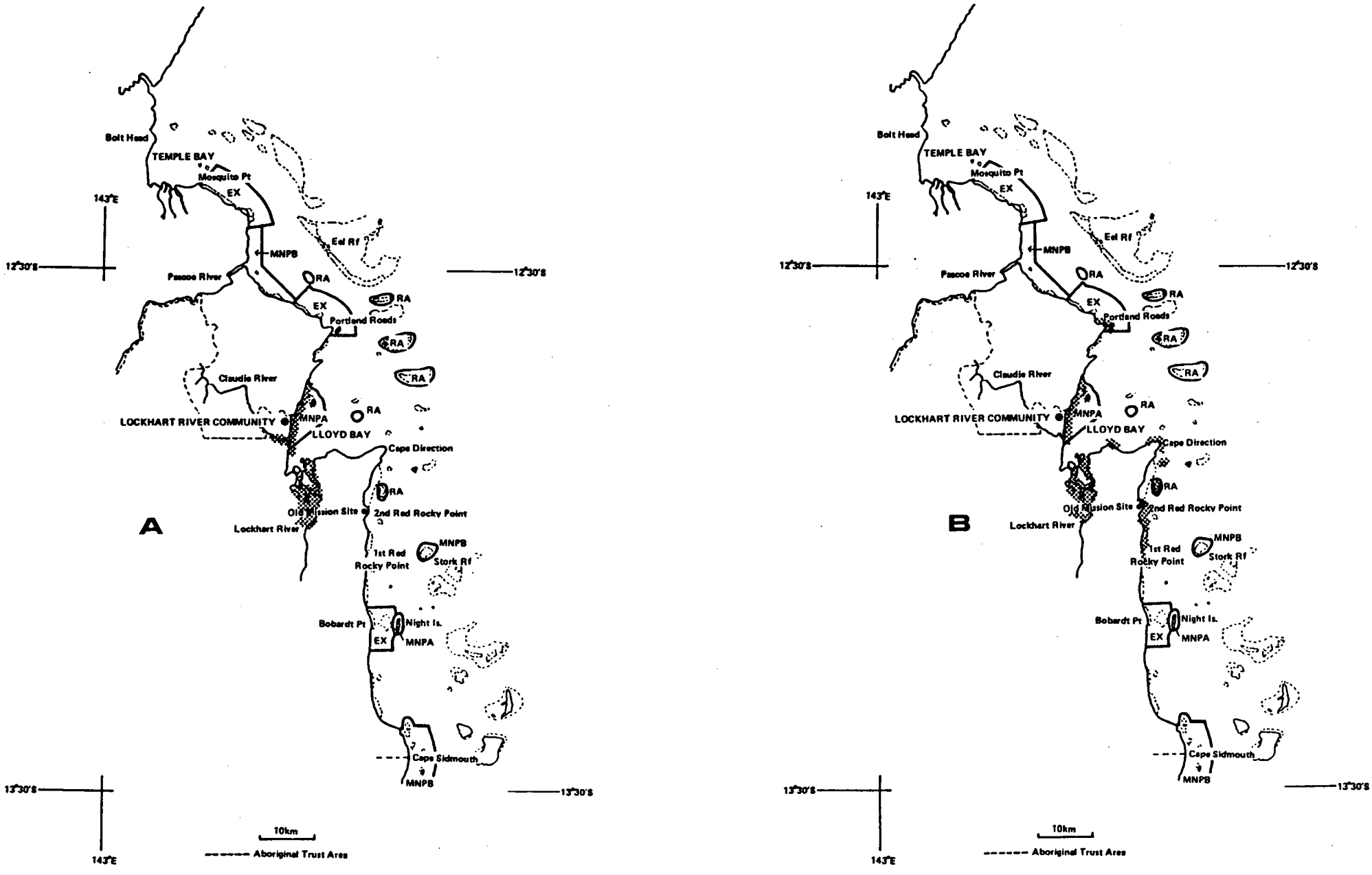

Figure 4.6: Areas used for spearing (A) and for line fishing (B) by Lockhart River Aborigines (see Fig. 4.1 for key to GBRMP Zones).

reaches of the river, or walking along the sand banks at the bends of the river, as the tide runs out (Fig. 3.14). The mullet run with the movement of the water, and are speared as they run. The fishermen also move down river, following the mullet as the water level drops.

Nets: Although at least one set net was in the community (impounded by the police due to illegal use by one of the white staff), no set nets were used by Lockhart Aborigines while I was there. Bait nets are dragged off beaches to catch small fish for use as bait, in 'soups' or for frying whole. Nets are used far less than at Hopevale. This is possibly due to the high cost of purchasing set nets and the difficulty of transporting them to fishing sites. In contrast, Hopevale has also had a long history of net usage, going back to 1898.

Fish-traps: There are the remains of two arrow-head fish traps in Lloyd Bay: one between Cape Direction and Orchid Point, and the other on the southern side of the Claudie River mouth (Fig. 4.1). Wooden stakes are all that are left. The one near Cape Direction was used while the people lived at the old mission site, and the Claudie River trap was used after the people were moved to the present site, but has not been used since the 1970s.

Line Fishing: Line fishing is by far the most common method. Most hand-lining by women occurs off rocks and rocky headlands, while men tend to fish from boats anchored on reefs. Hand lines with lures are commonly used by men in estuaries, creeks and lagoons. The most common baits are bivalves and small fish. During the salmon season the favourite baits are mullet and

garfish.

Boats for fishing are mostly used by men. When women are taken in boats they are usually dropped on shore to fish. Trolling occurs mostly from boats on their way to hunt dugongs or turtles.

Spearguns: Within the community there are hand spears and a few commercial spearguns (Fig. 3.4). They are nearly always used for spearing crayfish. They are generally used by the younger men, as at Hopevale.

(v) Summary of the Ethnobiological Information

Ethnoclassification: During my field work, I encountered ten terms for sharks; and ten for stingrays; two for shovelnosed rays; and one for sawfish. I encountered 75 terms for teleosts (compared with 97 for Hopevale). A number of these were generic terms (for example garfish: ***tyantyamu***), and some referred to the same species (for example, small barramundi: ***yalntatyi***; were distinguished lexically from large barramundi: ***athinyu***). ***Lethrinus fletus*** (grass sweetlip) and ***L.nebulosus*** (yellow sweetlip) have no currently known language names, they are referred to as 'snapper'.

General information: The same cure for stonefish and stingray venom as at Hopevale is used - ash and hot water. While working on the Japanese luggers, another method for relieving stonefish stings by using burnt rice in hot water was learnt.

Elasmobranchs: Elasmobranchs, especially stingrays, are

occasionally eaten out of season, but not often. The state of the liver is determined by the colour and size as described for Hopevale (Fig. 3.13). The common shovelnosed ray can be eaten all year, the liver is not eaten. However, the white-spotted shovelnosed ray is only eaten when its liver is 'full'.

Some stingrays may be in season as early as August, but most are in season between October and January, in February their condition declines (Fig. 4.2). It is believed that the more rain, the fatter the stingrays will be.

The preferred stingrays are the ***Urogymnus asperrimus*** (thorny ray), ***Dasyatis sephen*** (cowtail ray) and ***Himantura granulata*** (mangrove ray). Stingrays with two caudal spines are considered inedible, as are the Mobulidae (manta rays). The same species eaten at Hopevale are consumed at Lockhart. Sharks are less commonly eaten. Small sharks only are consumed.

Mugilidae: The behavioural trait of blue-tailed mullet exploited by Hopevale fishermen when spearing, is not used at Lockhart. On a number of occasions I observed groups of mullet sitting under mangrove overhangs on the high tide, and pointed it out to the fishermen with me on mullet trips. They merely acknowledged the fact and suggested I get the boat up the river before the tide begins to run out to spear the running mullet (Fig. 3.14). They said that is the way it has always been done. Catches are of a similar order of magnitude as for Hopevale. The turbid water produced by run-off after heavy wet-season rains can limit the mullet season, as the fish cannot be seen in the water and so are extremely difficult to spear.

Barramundi: ***Lates calcarifer*** is a preferred fish. They are

caught primarily by lures on hand lines in the creeks and lagoons. Nets are apparently set occasionally. Large barramundi (*athinyu*) are darker and can sometimes be found in the freshwater reaches of creeks. In times prior, women and children were restricted to eating the small barramundi (*yalntatyi*)(Chase, 1980a). This restriction does not apply now.

4.4.4 Invertebrates

(i) Current Uses

Marine invertebrates are presently used for food, fishing bait and in material culture activities. However, the former uses of a number of species not presently utilised are still known.

(ii) Seasonality

Most mollusc species are considered to be 'fat' from October to January. The season for some species extends either side of this period (Fig. 4.2). Oysters (*Saccostrea spp*) are considered 'fat' from the time of the arrival of the Torres Strait pigeon in October. The other main species of mollusc collected for food during this period is the saltwater mussel (*Polymesoda coaxans*), and the occasional small clam (*Tridacna spp*).

Mud crabs and sand crabs are considered to be in season around August to October, but are caught all year. At Hopevale they are taken all year round, but are considered fattest in the winter months. Coral crayfish, *Panulirus ornatus*, and occasionally *Panulirus penicillatus*, are believed to be in season from September/October on. They are also taken at other times of

the year, especially June/July. Prawns, ***Penaeus spp***, are caught during the wet season when they are more abundant near estuaries and foreshores.

Jellyfish, especially Cubomedusae (box jellyfish) and the blue-bottle, ***Physalia physalis***, are seasonally present from the first rains of the wet season, and from the change in wind direction from south-easterly, respectively.

(iii) Locations, Appropriation and Ethnobiological Information

I encountered 30 vernacular terms for molluscs, six for crustaceans, one for echinoderms, and two for coelenterates. These terms would probably not be exhaustive.

Large oysters, ***Saccostrea sp***, are collected from mangrove roots (***Rhizophora spp***) and cooked by placing them in the edge of a fire until they open. Those on the rocks are opened with a hammer and knife and the animal collected in a bucket (Fig. 3.15). Small oysters clustered on rocks are cooked by building a fire on them.

Small ***Tridacna spp*** are collected by diving. The adductor muscle is severed and all the flesh removed from the shell. The viscera are discarded and the muscle and mantle eaten by cooking in a 'kapmari' or by boiling.

The mussels, ***Polymesoda coaxans*** and ***Batissa violacea***, are collected and prepared in the same manner as at Hopevale.

The crabs, ***Scylla serrata*** and ***Portunus pelagicus***, are speared on mud flats, especially inside Cape Direction, and near the mouth of the Claudie River (Fig. 4.7). The tide is followed out and crabs speared in their burrows or as they move around. The incoming tide is also used. The sexes are distinguished by

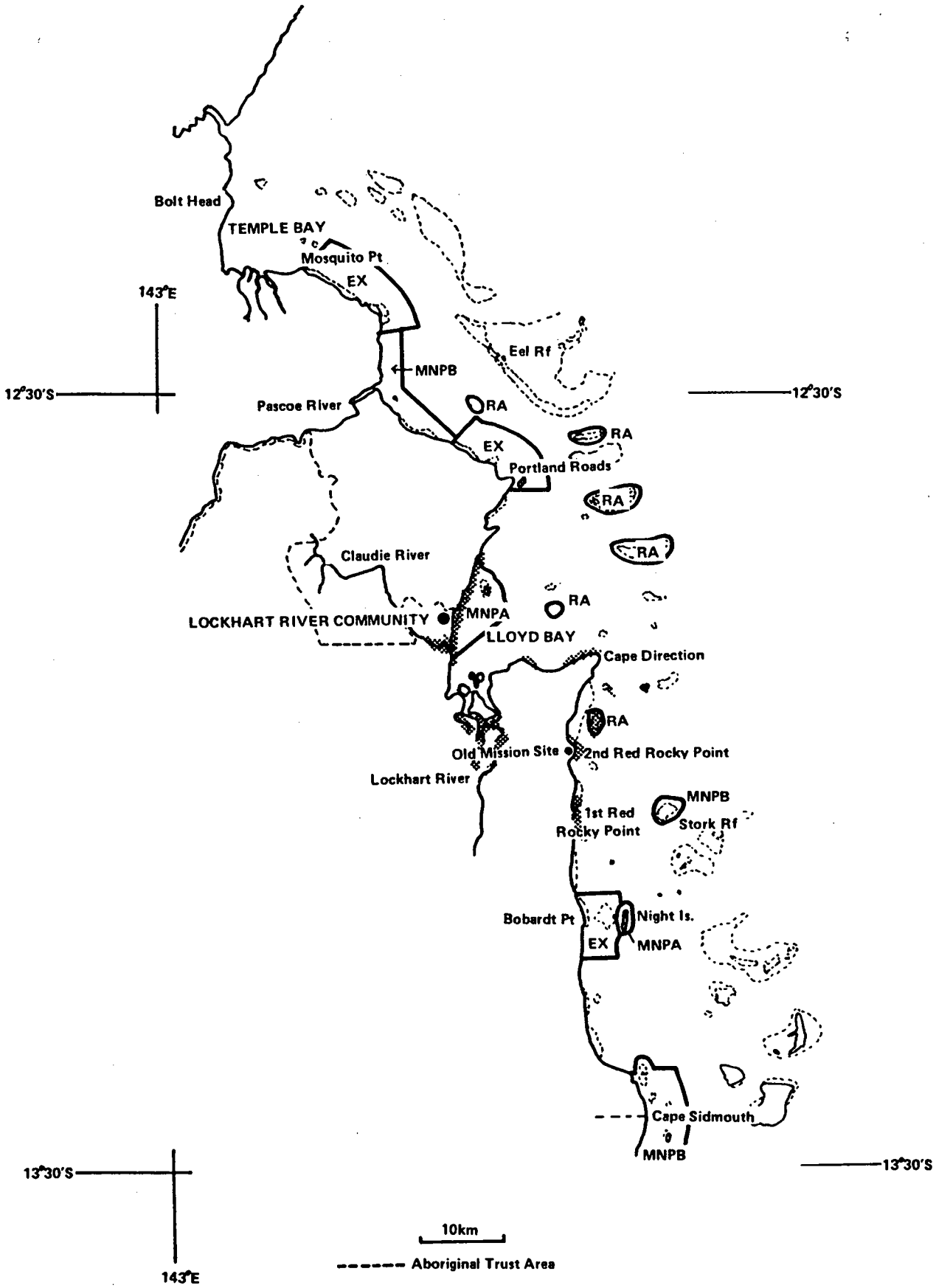

Figure 4.7: Areas used for collecting by Lockhart River Aborigines (includes crayfish) (see Fig. 4.1 for key to GBRMP Zones)

the shape of the abdomen flap. Females are considered to have more meat (especially sand crabs). Male mud crabs must be speared between the eyes, or water will enter the body; the meat is then considered ruined. Sometimes crabs are speared that are 'light' (i.e. recently moulted), these are not kept. Crabs are fattest, that is, have lots of 'red fat' inside, from about August to October (c.f. June/July at Hopevale). Mud crabs are preferred by most informants. Crabs are cooked by boiling in saltwater.

Two species of crayfish are speared. The majority are ***Panulirus ornatus***, but a few ***P. penicillatus*** are taken. The favourite sites are the reef off Quintell Beach and the numerous reefs south of Cape Direction near the old mission site (Fig. 4.7). In one low tide during my stay, 52 ***P. ornatus*** were taken off the reef at Quintell Beach by four boys. They are usually speared with a short hand spear. They can be easily taken at night with a torch as they leave their holes and move around. The period of calm weather coupled with the spring tides around October and November, are the favourite time for crayfish spearing. They are also taken by fishing spear when walking on the exposed edge of reefs during the extreme low tides in June and July. They are sometimes sold to the European staff for about $5 each: some are then re-sold to other staff or people outside the community. They are cooked by either boiling in saltwater or by roasting.

Prawns are dragged with bait nets. Some are eaten while others are used as bait. The beach near the Claudie River mouth is a major area where dragging occurs.

No sea urchins or sea anemones are eaten at Lockhart. The presence of ***Chironex fleckeri*** (box jellyfish) is indicated by ***Oscillatoria sp*** ('red tide') blooms in October, and the first big

wet season rains. One young boy was killed in January 1984 from a *C. fleckeri* sting while in the water next to the barge landing. The only traditional relief from stings is to use the roots and shoots of the 'cabbage tree' (not seen or identified; possibly *Livistona sp*) which are pulled out, chewed, and rubbed on the affected area. The ashes from the burnt leaves of the 'cabbage tree' may also be rubbed on. Bottles of vinegar are now also stored near the barge landing, but have not been used yet.

The older informants said that the 'old people' used to say that box jellyfish, *C. fleckeri*, were washed out of the mud in the creeks and rivers with the first big rain of the wet season, however, these informants were unsure whether to believe this or not. Blue-bottles, *Physalia physalis*, on the other hand, are considered to just 'drift in' during the early part of the wet season.

4.5 Summary of the Ethnobiological Data on Dugongs and Turtles for Hopevale and Lockhart River

This section briefly summarises and compares the ethnobiological information for dugongs (Table 4.4) and turtles (Table 4.5) obtained from Hopevale and Lockhart River with the biological literature for those species. This summary is limited to dugongs and turtles as it is these species which pose the major management problems.

It is evident from this comparison that where the Aboriginal marine ethnobiological knowledge is directly used to facilitate the capture of dugong or turtles, that knowledge tends to be of greater detail than western science. For example, Aboriginal hunters have a more detailed knowledge of the local movements of dugongs and the factors that induce those movements than do

biologists.

The factors which have influenced the knowledge used in marine hunting and the potential benefits of that marine knowledge to western science and resource management will be discussed in the following two chapters.

DUGONGS:	ETHNOBIOLOGICAL DATA		BIOLOGICAL DATA	SOURCES		
				HV	LR	BIOL. LITERATURE
TOPIC	HOPEVALE	LOCKHART		(pg#)*	(pg#)*	(major references)
Locations:						
local	+	+	+	74	146	Marsh, 1985; 1986a; 1986b
Movements:						
local	++	++	-	73	145	
causes	++	++	-	74	145	
Migrations:	-	-	-			
Life History:						
i.d. of sexes (in situ)	++?	++?	-	76	147	
sex ratio	+	+	+	77	148	Marsh, et al, 1984d; Marsh, 1986a
mating	+?	-?	-	77	148	
" season	+?	-	+	77		Marsh, et al, 1984d; Marsh, 1986a
gestation	-	-	+			" " " " " "
parturition	-	+?	+		148	" " " " " "
" season	-?	-?	+	77	148	" " " " " "
" area	+?	-	-	77		
litter size	+	+	+			" " " " " "
twins?	-	+	+?		148	" " " "
calving interval	-	+	++		148	" " " " " "
length lactation	+?	-?	++	77		" " " "
age of sexual maturity	-	-	+			" " " "
max. age	-	-	+			Marsh, 1980; Marsh, et al, 1984d
causes of death	+	+	+	76		Marsh, et al, 1984d; Thornback & Jenkins, 1982)
Behaviour/Ecology:						
feeding	+	+	+	74	146	Marsh, et al, 1982
fighting	+?	++	-	75	146	
source of scars	++?	++?	-	75	146	
groups (local):						
" size	+?	+?	++	76	147	Marsh, 1985; 1986a; 1986b
" composition	++	++	-	76	147	
" status	+?(less)	++(less)	-		146	
'waterfat'	++?	++?	+?	76	147	Marsh, 1980

* Page number of this thesis where the information is summarised.

Table 4.4: A comparison of the ethnobiological data obtained from Hopevale and Lockhart River with the biological literature on dugongs (key: ++ = more detailed knowledge; + = similar knowledge; - = no knowledge; ? = uncertain knowledge).

TURTLES:	ETHNOBIOLOGICAL DATA		BIOLOGICAL DATA	SOURCES		
TOPIC	HOPEVALE	LOCKHART		HV (pg#)*	LR (pg#)*	BIOL. LITERATURE (major references)
Locations:						
local	+	+	+?	81	152	Limpus, 1980
Movements:						
local	++	++	-	91	159	
causes	+	+	?	91	159	
Migrations:	-?	-?	+			Limpus, 1980; Limpus & Parmenter, 1986
Life History:						
i.d. of sexes (in situ)	+?	+?	+?	89	158	Limpus, 1980
sex ratio	+?	-	+?	91		Limpus, et al, 1983; Limpus & Reed, 1985a; Miller & Limpus, 1981
mating	+	+	+	91	158	Limpus, 1980
" season	+	+	+	91	159	" "
" frequency	-	-	+			" "
eggs						
clutch size	+	+	+	91	158	" "
devel. time	-	+	+		158	" "
hatchling to sub-adult	-	-	-			
age	-	-	-			
causes of death	+	+	+	91	158	Kowarsky, 1982; Limpus, 1980; Limpus & Pleay, 1983
Behaviour/Ecology:						
feeding	+	+	+	92		Limpus, 1980; Limpus & Reed, 1985a, 1985b
Local Population size	+?	+?	-			
" " status	+(same)	+(same)	-			
Seasonal Condition:	++	++	-	92	159	
Hawksbill Poison:	++?	++?	+?	92	159	Limpus, 1987

* numbers refer to the pages of this thesis where the information is summarised.

Table 4.5: A comparison of the ethnobiological data obtained from Hopevale and Lockhart River with the biological literature on sea turtles (key: ++ = more detailed knowledge; + = similar knowledge; - = no knowledge; ? - uncertain knowledge).

5.0 THE IMPORTANCE AND RELEVANCE OF THE MARINE ENVIRONMENT TO THE HOPEVALE AND LOCKHART RIVER COMMUNITIES

A knowledge of the way Aborigines perceive the marine environment and its resources is necessary for an adequate understanding of marine resource management problems; especially as management involves regulating the behaviour of those people.

This section will briefly consider Aboriginal perception of the marine environment, outline the factors which have influenced the knowledge used in marine hunting and fishing techniques, and the relevance of marine resources to Hopevale and Lockhart River.

5.1 Aboriginal Perception of the Marine Environment

The special relationship Aborigines have with the environment as hunter-gatherers has long been recognised. However, the complexity of their interrelationship with the environment, especially from an ecological viewpoint, has rarely been taken into account.

In discussing western conservation values, attitudes and Aborigines, Chase (1981a:68) says:

> "It is unrealistic and inappropriate to expect people embedded in dramatically different cultural traditions to think in terms of Western scientific values and attitudes. It is as difficult for Aborigines to understand our notion of conservation as for us to understand the dimensions of causality which link totemic forces, places and species appearance, none of which, I believe, anthropologists as yet fully understand."

This statement is also valid in relation to the Aboriginal perception of the environment. It cannot be assumed that Aborigines perceive the environment with the same values, attitudes and categories as Westerners do.

5.1.1 Lockhart River

As an example of the *traditional* perception and use of the marine environment I will refer to Chase's work at Lockhart River. A more detailed description and explanation can be found in Chase (1978, 1980a, 1980b).

The Aboriginal occupants of this region were closely identified, at various levels, with the environment. The initial division was between the 'sandbeach people' and the inland or 'on top people' (Fig. 5.1). The 'sandbeach people' occupied the coastal strip and were the legitimate exploiters of the marine resources and the plants and animals of the littoral zone. They possessed the special knowledge of dugongs and turtles, and the bush medicines required to facilitate their capture.

The 'sandbeach people' were further divided into four regions of coastal dialects. Each of these linguistic territories were said to 'own' a major ceremony.

Each linguistic territory was subdivided into precincts representing a cluster of local estates and estate groups. These shared a community site for camping, and operated as a single economic unit within the precinct range. This group typically consisted of 'close' kin between whom primary rights and obligations applied.

The precincts consisted of estates, inherited patrilineally. Estates extend into the marine environment to include coastal

islands, cays, sandbars and reefs. They were also the sites of myths and totems by which individuals were connected to the land, to the life forces of people and the environment, and to the past. At this level individuals had rights over particular

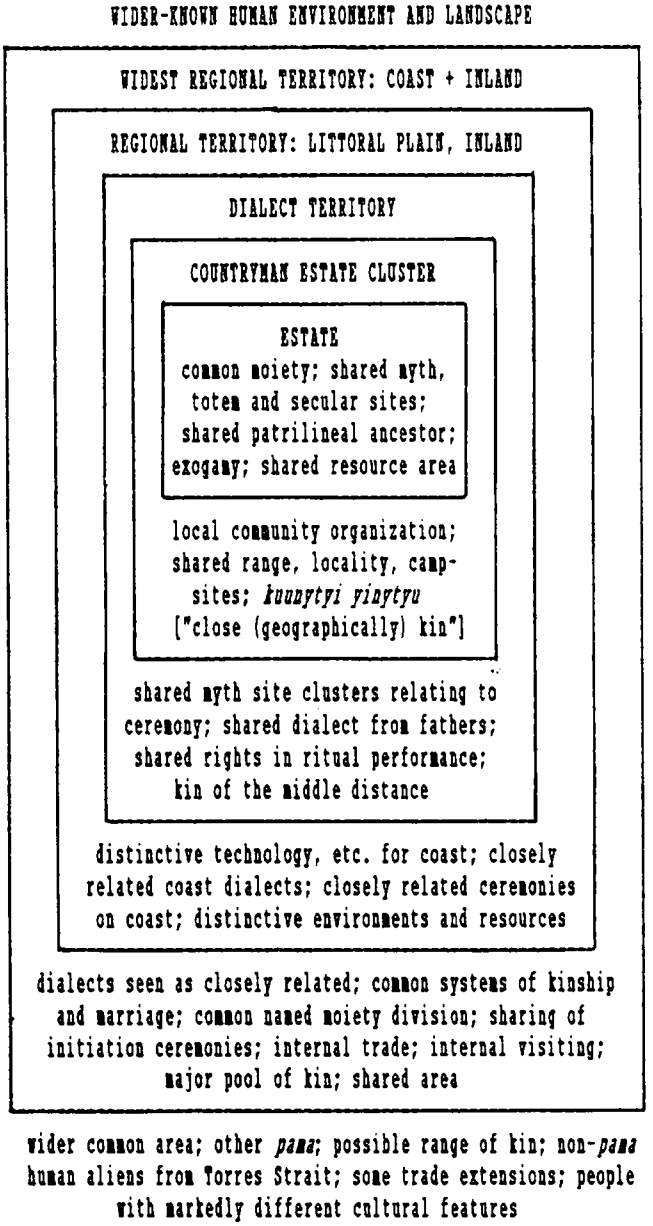

Figure 5.1: Features of identification and territorial recognition (After Chase, 1980a:202).

resources. Chase (1980a:137) says:

> "All islands and large coral reefs are named, as also

> are the many small features close to the beach which can be observed underwater. Generally, the seascape is allocated to the terrestrial estate which faces it on the mainland. In the case of the only large island in the area, Night Island, it is divided among the mainland estates which face it. The outer boundary of the marine area of estates is not fixed. The last recognized feature (usually 6-7 km out to sea) is taken as the outer limit. The main Barrier Reef, some 30km offshore, was unknown before lugger employment."

Estate boundaries were extremely precise on the beach, but the sharpness decreased out to sea. The greatest concentration of named sites occurs along the beachfront, river mouths and lower reaches of larger rivers.

The marine environment was divided into three main zones:

- 'deep saltwater place': the offshore area of deep water beyond the coastal shallows. It was considered dangerous and only crossed to visit islands.

- 'shallow saltwater place': the coastal area characterised by discoloured water and a substrate visible or touchable with a spear. This was the zone for the exploitation of major marine resources.

- 'beach place': the general littoral zone from the intertidal inland to the dry sclerophyll forests. Rivers are included in this zone as far as the limits of saltwater influence and the presence of mangroves.

There were also finer categories of minor marine environmental features, such as: the saltwater edge; intertidal beach zone; the zone where the water has deposited flotsam; the

raised sandy area above the tidal influence where camps were made; and the windsheared scrub of the foredune area. In addition, beach areas could also be referred to by other terms, for example, tide-rippled beach, windblown sand, dirty sand, etc.

The use of these zones and estate areas was influenced by the seasonality of resources. Six seasonal periods, the timing of which were tied to environmental conditions, were recognised by the 'sandbeach people':

- monsoon rains; northwest wind; February to April
- end monsoon rains; southeast wind; April to June
- early dry season; southeast wind; June to August
- middle and late dry season; August to November
- impending storms; cloud build-up; November to December
- main storm period presaging the monsoon; December to February.

Chase (1980a) considers that exploitation of a given resource could be viewed as either seasonal, or seasonally independent (although access may be seasonally affected). Blue-tailed mullet and Cooktown salmon were examples of highly seasonal resources. Reef produce was classed as generalised resources, as they were available throughout the year. If fringing reefs could not be exploited due to turbid water from storm runoff, then the offshore reefs were exploited.

A number of conclusions can be drawn concerning the traditional perception and use of the marine environment:

- The marine environment was inextricably linked to the overall social/cultural system.

- Marine resources not only provided sustenance and material needs, but were vital in forming a link with the mythological past, totemic forces and species appearance; they formed a

cognitive resource (Chase, 1978).

- Coastal Aboriginal groups throughout Australia were not only diverse in their cultural organisation, but also in their usage of the marine environment. They developed a range of exploitation strategies to maximise the diverse range of utilisable marine habitats (see Davis, 1985a; Taylor, 1984).

The major questions are: to what extent has the traditional system remained viable, and how relevant is that system to the contemporary situation?

In the mid-1970s Chase (1980b:85) found "...that this precontact system is still a conscious belief system among Lockhart's population, and still forms the basis for social grouping and action in the European-created settlements." He describes how there is a distinction between the two major kinds of resources: those which relate to the precontact past, and those of western origin. The former can consist of either material resources, or cognitive resources (Chase, 1980b). Chase (1980b) rejects the 'culture as whole' approach and refers instead to cultural continuities or discontinuities of beliefs within the community.

> "Aboriginal people, often with a history of long European contact and influence, can still retain an integrated set of beliefs (a 'model') which strongly links their perceived past to their present organisation and behaviour...Central to this 'model' are beliefs concerning the relationships which link individuals and social groups to certain areas of land, and as well, beliefs concerning resources and their distribution. In this way, dimensions that we call economic, social, political and ecological all become

intricately intermeshed." (Chase, 1980b:83).

Chase (1980b) reported that the Lockhart Aborigines still consider themselves as the cultural inheritors of their precontact ancestors, and as culturally distinct from other Cape York Aboriginal communities. It appeared to me that this was still the case during my field work.

5.1.2 Hopevale

The traditional perception of the marine environment of the ***Guugu Yimidhirr*** speaking Aborigines north of the Endeavour River is largely unknown. There was a distinction between 'with the sea' (***dhalun-dhirr***) and 'of the outside' (***waguurr-ga***) dialects. Haviland (1979b) has mapped 32 named locales for the ***Guugu Yimidhirr*** area. Terwiel-Powell (1976) carried out a study of continuity and change in the kinship system of Hopevale. The Aborigines of this area were exposed to considerably greater and more intense contact pressures than those at Lockhart. Of the native ***Guugu Yimidhirr*** speakers able to lay ancestral claim to the region, few survived to live under mission protection (Haviland, 1979b).

Haviland and Haviland (1980:119) argue that: "Social and genealogical continuities with the past are important for Hopevale people but modern life on the mission is also a product of ninety years of official administration." The cultural discontinuities experienced by Hopevale Aborigines have been considerable: the influx of gold miners in the late 1800s; the establishment of the mission which aimed to assimilate the Aboriginal population, and discourage traditional values; the Queensland Government's policy of displacing children of mixed

descent to missions such as Hopevale; the war-time removal of the mission occupants to Woorabinda; and the re-establishment of the community inland at its present site. Most of the old people who had previously experienced life in the bush did not survive the war-time evacuation (Haviland, 1979b). The effects of these discontinuities on marine knowledge are reflected in the type of information and techniques currently used for dugong hunting, especially when compared with Lockhart River.

5.2 Factors Which Have Influenced the Knowledge Used in Marine Hunting and Fishing Techniques

Ellen (1982) argues that for any given decision-making sequence the area of choice is circumscribed because social, cultural or environmental factors delineate the arena in which rules operate. The rules may alter through social changes, education and accumulated cultural experience of new knowledge (Ellen, 1982). He further points out that information is not a resource which is always present prior to action. The gathering of new information may occur simultaneously with action. Information is not homogeneous. Some information may be incorrect or imperfectly transferred from different sources (Ellen, 1982). Observed patterns often reflect a complex dialectical interrelationship between scheduling activities and environmental constraints accumulated over time (Ellen, 1982). People are therefore not passive interactors with their environment. Ellen's ideas may be seen to apply in the case of Hopevale and Lockhart River.

For Hopevale, the primary source of knowledge used in marine hunting and fishing techniques is that passed on from the 'old people', i.e. 'traditional knowledge'. This includes the seasonal

and behavioural traits of the various resources. This kind of knowledge is constantly in a state of revision and change.[1] As history shows (Chapter 3.0), the new information or techniques provided by mission life were adopted and readily incorporated.

This knowledge was augmented by new knowledge acquired by members of the community through their experiences during the period of the mission's marine industries in the early to mid-1900s. Also, community members who returned from living and working in southern centres brought new techniques and knowledge back with them.

For example, the dugong hunting technique currently used at Hopevale, is based on all these sources of knowledge. The behavioural knowledge used to determine where and when to look for dugongs would appear to be based primarily on information from the original inhabitants of the area. They provided this information for the mission exploitation of dugongs, and passed it on to those Aborigines brought to the mission from other areas. The men engaged in the oil industry acquired new techniques from the missionaries and their employees - especially related to using rowing boats, towing (e.g. the cut lip), butchering, and in the uses of the animal. These have influenced the current methods (e.g. intestine and skin not used; salting the meat; etc). This contrasts with turtles, where the current techniques appear to have undergone very little change (e.g. the intestine and other viscera are eaten; the meat is not salted; etc).

Given so many additions, it is difficult to determine what is 'traditional' knowledge of dugong behaviour. But when the knowledge that was obviously acquired through post-contact

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[1] See Section 6.1 for further discussion.

activities, such as the oil industry, is isolated, there is a residual, which is different from western knowledge. For the lack of evidence to the contrary, it can reasonably be assumed to be from pre-contact sources. However, even if that assumption cannot be ethnographically tested, at the very least this knowledge is an active, non-western interpretation of dugong behaviour.

At Lockhart, western technology and technical knowledge have also been incorporated into the existing Aboriginal value and conceptual systems. As Chase (1981a:68) says:

> "While tools and techniques may be borrowed from Europeans, it does not mean that they will be used as efficiently as in European cultures...[There are a number of] dimensions of cultural traditions which limited potential use through various restrictions and constraints upon both individuals and groups. While some cultural traditions may change (at Lockhart today, everyone can eat dugong meat) they nevertheless result in a dramatically different approach to resource exploitation from that which Europeans may see as "logical"."

In considering the transfer of marine resource knowledge between generations, it is primarily information that is relevant to the prevailing circumstances that is passed on. Information which is superfluous to the current activities remains stored in the minds of the older people. Unless a situation arises where that particular knowledge is required, then it may be lost when that generation dies. At the same time, however, new knowledge is continually being accumulated from various sources, and often assessed in terms of the traditional information. Informants frequently qualified pieces of information they supplied by

adding "...but them 'old people' tell us...". Two examples of this process at Hopevale are the lexical terms (see Sections 3.4.1 and 4.4.1) for dugongs, and the use of fishing nets. These are briefly discussed below.

Aboriginal and Torres Strait Islander communities that have historically exploited dugongs continuously, such as Lockhart River (Chase, 1980a), the Yanyuwa (Borroloola; Bradley, nd) and Mabuiag (Nietschmann and Nietschmann, 1981), tend to have detailed ethnoclassifications for dugongs. Lockhart River Aborigines have at least nine categories, the Yanyuwa have 13 (Bradley, nd), and Mabuiag Islanders have 27 (Nietschmann and Nietschmann, 1981). In contrast, at Hopevale, where ***Guugu Yimidhirr*** is still the main language, only six specialised terms exist for dugongs. If two assumptions are made, (1) that the number of lexical terms reflects the situation with ethnobiological knowledge, and (2) that ***Guugu Yimidhirr*** people would traditionally have also had a detailed ethnoclassification for dugong types, then it is possible to speculate that the sharp discontinuities described previously, and the influence of the commercial exploitation of dugongs, may have limited the knowledge being passed on.

Fishing nets have been used by ***Guugu Yimidhirr*** mission Aborigines since 1898 (see Section 3.4.3). The relative ease with which a large quantity of fish could be caught by netting, as opposed to spearing, would have allowed the finer ethnobiological knowledge of fish required for spearing to atrophy. For example, at Lockhart River where nets have not been used as much, there appears to be more ethnobiological knowledge of fish species than at Hopevale (see Section 4.4.3).

5.3 The Relevance of Marine Resources to the Communities

As I have previously argued, Aborigines perceive the marine environment and its resources in more than merely economic terms, i.e. providing food and resource materials. Marine resources are an integral part of their cultural system, for example, in satisfying kinship obligations (e.g. see Fig. 4.4: the distribution of dugong meat to countrymen). But their exploitation does more than simply maintain kin networks. For a community which has encountered numerous cultural discontinuities, the ability to use marine resources such as turtles and dugongs, provides an essential link to the past. Marine resource knowledge and experience does vary enormously between communities (e.g. Bradley, nd; Chase, 1980a; Davis, 1985a), but also shows how marine hunting and fishing remain important to many Aboriginal groups. Aboriginal hunting and fishing is seen by Aborigines as more than a recreational activity that allows them to enjoy a more varied diet.

The cultural significance of marine resources was clearly expressed by Noel Pearson, a Hopevale resident, in his paper presented at a recent ANZAAS Congress:[2]

> "The central argument of this paper concerns identity, black identity, and is directed towards the presumptions and ignorance about that identity prevailing in audiences wider than here... The basic premise of the argument is that fishing and hunting and the rights and responsibilities associated with it, is part of the black identity of the communities of Cape

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[2] Unpublished talk at the 57th Australian and New Zealand Association for the Advancement of Science Congress, Townsville, August 1987.

> York. Hunting and fishing of Cape York communities is an expression of that much maligned, much unrecognised, and very much misinterpreted thing called black identity. It is an expression of what some might call Aboriginality, or to use the language of my people, an expression of that which makes them ***bama***, blacks, Aboriginals... The rights to hunting, fishing and gathering for Hopevale people represent the most important connections with tradition that they have left for them; they should be recognised on their own terms."

This affirmation of cultural identity is demonstrated at Hopevale in a variety of ways:

(1) People visit their beach camps consistently. The location of Hopevale, 26km by track from the beach, separates most people from what they consider to be their proper place, by the coast. There are those families with direct ties to the coastal 'countries', and those who were brought to the mission at Cape Bedford as children, and grew up associated with marine activities. The fact that a large proportion of families spend virtually all their holiday periods at the beach camps, often investing in the construction of substantial beach houses, supports this. There are families with affiliations to the ***waguurr-ga*** ('of the outside') countries, but even they occasionally use beach camps.

(2) There is no economic advantage in dugong and turtle hunting. When the costs of hunting dugongs and turtles are considered[3], their use as mere food items would be inappropriate

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[3] In January 1984, a 4.3m dinghy with a 40hp outboard motor required approximately 80 litres of fuel (about $50 at Hopevale prices) for a dugong hunting trip to the Hummocks from the beach camps.

in household budget terms.[4]

(3) During my field work I was often told how dugongs and turtles were a 'proper [traditional] food'. Most informants also felt they had a right to use those resources.

(4) The significance of resources such as dugongs and turtles to these communities was demonstrated by the adverse reaction of the Aborigines to the possibility of a ban on hunting (e.g. see Marsh, *et al*, 1984e for Hopevale). The consequences of such a ban (which is currently unlikely to be imposed) would, I believe, result in the non-cooperation of those Aboriginal communities with the agency responsible, and the politicising of the issue.

At Hopevale, the need, in purely economic terms, for marine resources is low. Virtually all families can satisfy their subsistence requirements with store-bought food. Marine resources play a vital role in providing a means of affirming an Aboriginal identity.

At Lockhart the cultural link with the marine environment and its resources appears much stronger due largely to the cultural continuity of resource exploitation and the relatively smaller, and more recent, western influence due to the remoteness and isolation of the community.

On purely economic grounds, the Lockhart community is far less affluent than Hopevale due to the scarcity of employment opportunities. The use of 'bush' foods, especially marine resources, is therefore an important source of meat. But as Chase (1980a) notes, marine resources represent more than mere food sources. Chase (1981a:68-69) says:

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[4] This is, however, also the case with most recreational fishing in western society.

> "Today, Aborigines...are in a situation where there is great pressure to abandon old ways and to break continuity with the past in the raising of their children...There are people, however, who still attempt to make their traditions relevant to their own children's lives. The hunting and capture of dugongs in particular, is a major dimension in such attempts. To succeed in this activity is to gain a traditional status within a community. To hunt from the sea is for a man of the sandbeach the proper and manly thing to do, and it gives evidence of one's skill and knowledge and an independence from the village store with its introduced cash economy. While men go out hunting for dugongs, albeit in an aluminium boat with an outboard, there is some hope for the retention of indigenous cultural perspectives in a European dominated area."

The marine environment and its resources are an integral part of a continuing Aboriginal culture. It has been suggested (Dr Dermot Smyth, *pers comm*) that Aboriginal culture is, in a sense, itself part of the resource. He argues that conservation bodies have a role in encouraging the continuity of Aboriginal culture in order to properly conserve the totality (biological and cultural) of the marine resources (Smyth, *pers comm*). However, as Aboriginal culture is not a static entity, I consider that its continuity would best be served by the direct participation of Aborigines in the management processes. The incorporation of Aboriginal knowledge should therefore be an integral aspect of the development of management plans for marine resources exploited by Aboriginal groups.

6.0 ABORIGINAL MARINE ETHNOBIOLOGICAL KNOWLEDGE: ITS ACQUISITION AND POTENTIAL VALUE TO WESTERN SCIENCE, RESOURCE MANAGEMENT AND CONSERVATION

6.1 The concept of 'ethnobiology' was adopted in the 1950s to indicate that specialised knowledge was that of the observed rather than the observer. Ellen (1982) has outlined the range of environmental ethnoecological information obtainable. For flora and fauna he included the names and total numbers of categories known and recognised, the structure and classifications and types of cognitive devices employed, their uses, the knowledge of their biology and ecology, and the knowledge and techniques of domestication, propagation and appropriation. The majority of ethnobiological work has been concerned with eliciting ethnoclassifications. Their uses are, however, limited due to the greater emphasis and concern placed on the technical aspects of their elicitation, often neglecting the problems of variation, flexibility and social context of the classifications (i.e. the 'emic'[1] aspects)(Ellen, 1982).

Specific kinds of ethnoecological data have been of more use in conventional ecological analyses. Morril (1967) working in the Virgin Islands on the ethnoichthyology of the Cha-Cha, recorded their detailed ecological knowledge of reefs based on observations. Nietschmann (1973) related the importance of Miskito knowledge of animal behaviour in exploiting turtles.

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[1] From the linguists' 'phon*etics*' and 'phon*emics*': a description is an emic one if it is based on elements that are already components of that system; and an etic one if based on conceptual elements that are not components of that system (Goodenough, 1971). "Emics, then, refers to all that is involved methodologically and theoretically in making emic descriptions of socially meaningful behavioral systems, both linguistic and cultural. Etics refers to all that is involved in conceptualizing and describing the basic or primitive emic components of such behavioral systems." (Goodenough, 1971:7).

The most significant ethnobiological work has been by Johannes in Palau. He recorded information on traditional marine conservation methods (Johannes, 1978a); local hydrography (Johannes, 1981b); and considerable biological and ecological information on tropical fish (Johannes, 1978b, 1980, 1981b). One of his main informants, a Palauan master fisherman, was able to name and determine the feeding habits, movements and times and places of spawning of over 300 species of fish (Klee, 1980). That study also resulted in a doubling of the number of fish known by biologists to form lunar spawning aggregations (Johannes, 1978b, 1980). The results of that work has generated considerable interest in the benefits of ethnobiology and encouraged other biologists, such as myself, to study other indigenous groups.

In comparison to the biological information Johannes (1978b, 1980, 1981b) acquired in Palau, the information obtained from Hopevale and Lockhart River (see Sections 3 and 4; and Appendix 3) appears rather disappointing to a marine biologist. The lack of detailed marine ethnobiological knowledge at Hopevale and Lockhart River, compared with Palau, may be attributed to a number of factors. These are discussed in the following three sections.

6.1.1 In general, where marine resources constitute an important portion of the resource base, such as with island peoples, the specific knowledge of those resources should be considerable. With a greater reliance on marine products as a source of protein[2], especially on smaller islands with restricted

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[2] Johannes (1978a) notes that the inhabitants of Oceania [i.e. Polynesia (excluding New Zealand), Melanesia (excluding Papua New Guinea) and Micronesia] traditionally obtain most of the protein from the sea.

terrestrial fauna, islanders' knowledge of fish behaviour and biology, by necessity, would have to be extremely detailed and exact. This has been shown by Johannes (1978b; 1981a; 1981b) in Palau; Dye (1983) in Niuatoputapu; and Nietschmann (1977; 1982) in the Torres Strait. Johannes (1978a:350) notes that:

> "In some island groups extensive reef, mangrove, and seagrass communities produced more fish and shellfish than the population could use. But more often these islands...plunged steeply into abyssal depths, and productive shallow waters were limited to a narrow band of coral reef. Offshore waters were not only hazardous much of the time but also far less productive than the waters extending from the island to the outer reef slope. And although those who lived on the atolls had sheltered lagoons, these also were much less productive of food than the narrow strip of reef that encircled them.... Possessing a clearly limited fishery on which they depended for about 90% of their animal protein, these people viewed marine resources in a way different from that of continental peoples with abundant terrestrial food sources and wide continental shelves."

Mainland hunter-gatherer groups, such as coastal Aborigines, have a broader resource base to exploit. With the greater resource base, some aspects of Aboriginal resource knowledge would have been of greater importance than others. For example, the movement of Aboriginal camps tended to be based on the seasonal concentration of food sources, primarily plants. Aboriginal knowledge of plants was considerable: for example, 103 species of plants were identified last century by a Queensland Government botanist as being used in a variety of ways by the

Guugu Yimidhirr Aborigines at Cape Bedford (Webb, 1973). Aboriginal usage of marine resources tended to be more opportunistic, depending largely upon factors such as weather conditions. For the coastal Aborigines that occupied the Nesbit River region on eastern CYP:

> "The full resource schedule of some hundreds of plants as well as animals occurs across a wide range of both terrestrial and marine habitats with the mountains inland and the outer reef zone as its extremes. Constant camping on the immediate beachfront provides a strategic location at the centre of a complex environmental mosaic and allows rapid exploitation of general ocean and estuarine foods as <u>opportunities</u> arise. At the same time this location provides a central base for operating outward in either direction on land or on sea to harvest seasonally specific plants or animals." (Chase and Sutton, 1981:1833-1834. Emphasis added).

Therefore, I suggest that the greater the relative importance of a marine resource for subsistence, the greater the knowledge of that resource.

6.1.2 The availability of new information or techniques, and the degree to which the pre-mission knowledge and techniques were capable of revision, are extremely important. With the scheduling of behaviour as other food sources became available, such as mission supplied food, the new information or techniques may render previous marine knowledge redundant. Ellen (1982) believes the criterion of adequacy for a cognitive model is its functional and adaptive effectiveness, not its accuracy.

He further states that environmental information is culturally transmitted, both transgenerationally and laterally. This transmission includes the possibility of introducing errors, but more importantly, permits the pooling of knowledge and the comparison of information, in a sense acting as a clearing house for environmental information (Ellen, 1982).

This can be illustrated by Goodenough's (1971) concept of the 'culture pool'. He defines a society's culture pool as the sum of the contents of all the propriospects[3] of all the society's members, including every system of standards of which members happen to have knowledge (Goodenough, 1971). The term refers to culture as a reservoir of the knowledge and skills of a society. It consists of all the ideas, beliefs, values, recipes and traditions that are known to one or more members of the society (Goodenough, 1971).

Figure 6.1 illustrates Goodenough's model of a society's culture pool. Each individual (represented by numbers) has their own version of their society's culture (represented by *A*) and its several traditions (represented by *a, b, c, d,* etc). Individuals may be competent in the same traditions (e.g. *a, b*) such as their language or dress customs; as well as being differentially competent in other traditions (e.g. *c, d, e*), for example, as might occur with the division of labour between the sexes. The letters *K, L* and *M* represent the cultures of other societies in which some individuals have some competence. An individual's private views and understandings that he attributes to no one else, is represented by *x*. The number of traditions that

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[3] Propriospect: each individual's private, subjective view of the world and of its contents derived from personal experience. It embraces an individual's cognitive and affective orderings of their experience (Goodenough, 1971:36).

1. $p_1 = (A_1 : a_1, b_1, -, d_1, -, ...) + (K_1, -, -, ...) + x_1$
2. $p_2 = (A_2 : a_2, b_2, c_2, -, -, ...) + (-, -, -, ...) + x_2$
3. $p_3 = (A_3 : a_3, b_3, c_3, -, -, ...) + (-, L_3, -, ...) + x_3$
4. $p_4 = (A_4 : a_4, b_4, -, d_4, e_4, ...) + (K_4, L_4, -, ...) + x_4$
5. $p_5 = (A_5 : a_5, b_5, -, d_5, -, ...) + (-, -, M_5, ...) + x_5$
6. $p_6 = (A_6 : a_6, b_6, c_6, -, -, ...) + (-, -, -, ...) + x_6$
7. $p_7 = (A_7 : a_7, b_7, -, d_7, -, ...) + (K_7, -, -, ...) + x_7$
8. $p_8 = (A_8 : a_8, b_8, c_8, d_8, e_8, ...) + (K_8, -, -, ...) + x_8$
9. $p_9 = (A_9 : a_9, b_9, -, -, -, ...) + (-, -, -, ...) + x_9$

$n. \; p_n = (A_n : a_n, b_n, ...) + (.....) + x_n$

Figure 6.1: Model of a society's culture pool. The numbers *1*, *2*, etc, represent individuals in a society with a Culture *A*. After each number is a representation of the contents of that individual's propriospect (*p*). Within the first parentheses is the individual's version of Culture *A* and of the various traditions within Culture *A* of which they have knowledge (*a*, *b*, *c*, *d*, *e*). Within the second parentheses are the individual's versions of the Cultures of other societies (*K*, *L*, *M*) with which they happen to be familiar. It would be more accurate, if space permitted, to break down Cultures *K*, *L*, and *M* into their component traditions (K_a, K_b, K_c, etc). The letter *x* represents whatever there may be in the individual's propriospect gained from private experience apart from other people and that they attribute to no other persons. (After Goodenough, 1971:42).

individuals are competent in can vary, therefore, some people are potentially of greater importance than others to the society as culture-resource people (Goodenough, 1971).

The public culture is composed of the individual versions (e.g. a_1, a_2,...,a_n). They form a rich source of variation and innovations which could show up in the public culture as both the rates and kinds of interaction among individuals within the society change (Goodenough, 1971). The change with time of the modal point (i.e. the public culture) around which the individual variance clusters shift, has been described as 'cultural drift' (Goodenough, 1971). Cultural drift can be equated with linguistic drift but not the biological concept of genetic drift (Goodenough, 1971). Genetic drift is the theory that variation in gene frequencies in populations can occur by chance rather than

natural selection; and is thought to be important only in small and isolated populations. Cultural drift refers to the loss of a tradition, or variant form of a tradition, from the culture pool of a small population through the deaths of the few competent individuals before they have a chance, or reason, to pass on that knowledge (Goodenough, 1971). Goodenough (1971:44) further argues:

> "The process of cultural drift is alone sufficient to produce change in a society's Culture in the course of time, but clearly other processes within its culture pool affect its content. Whereas cultural drift is change without discontinuity of tradition, other processes result in change with clear discontinuity of some kind."

The culture pool and cultural drift concepts can be illustrated with dugong hunting by the people of Hopevale. Assuming that tradition *e* in Figure 6.1 is the detailed ethnobiological knowledge required for dugong hunting in pre-mission times, and tradition *d* the skills required for hunting, then should anything happen to individuals 4 and 8, for example if they died suddenly, then that detailed ethnobiological knowledge would be lost from the culture pool. Hunting would still continue through individuals 1, 5 and 7's knowledge of hunting skills and their individual propriospects (x_1, x_5, x_7) of hunting; or alternatively, individual 5's competence of culture M_5 may include some of that culture's ethnobiological knowledge of dugongs, which would now become important knowledge for culture *A*. Under ordinary circumstances individual 5's knowledge of culture *M* would have dropped out of the society's culture pool with his death. It would now, however, gain recognition as a

public tradition of culture *A*.

With the encroachment of Europeans, the establishment of the mission at Cape Bedford, and the removal of young Aborigines from other areas to the mission, it was possible that considerable cultural drift and other processes (due to discontinuities) would have occurred. Informants at Hopevale told me that when the dugong oil industry commenced in the 1920s, two of the 'old men' who knew where and how to hunt dugongs, had to teach the younger mission Aborigines. However, the different requirements in techniques and equipment (e.g. clinker-built rowing boats) needed to catch a large number of dugongs for commercial purposes, would have resulted in the former methods and traditions (e.g. taboos) associated with Aboriginal dugong hunting not being passed on; and therefore the modal point of *e* would have altered[4]. Goodenough (1971:43) argues that: "As the members of each new generation mature, they look increasingly to one another and less to their elders for confirmation of their competence."

The current resurgence of interest in dugong hunting at Hopevale has resulted in a further shift in the modal point around the hunters who were too young to be involved with the dugong oil industry. Techniques have been adopted and modified which partly overcome the need for detailed ethnobiological knowledge of, for example, individuals 4 and 8 who taught those starting the dugong oil industry. Only knowledge of the general locations and movements of dugongs at various tides are required now, as outboards permit a larger area to be covered during

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[4] At Lockhart River cultural drift, rather than discontinuities, appears to have had the greater influence on dugong hunting, as evidenced by the slower change in butchering methods; parts used; and restrictions associated with dugongs.

searching. As Goodenough (1971:44) says:

> "...people's evaluations of what they see as their own and as alien traditions change. Through their inventions and private discoveries, people are continually adding to the *x* component of the culture pool... From contacts with members of other societies they are also continually feeding new elements into the culture pool. These additions may consist of isolated concepts, propositions, value attitudes, skills, or recipes; or they may consist of whole systems of standards, entire traditions. These additions provide referents for reevaluating the ideas, beliefs, recipes, skills, and traditions already established in the societal Culture."

Culture pools and cultural drift, as illustrated in a simplified fashion by Hopevale dugong hunting, provide a conceptual model for assessing the processes of cultural change and evolution which ought to be considered in reviewing ethnobiological information, especially for management and conservation. Without some concept of how cultures may alter, the potential effects of management decisions upon those cultures may not be recognised.

6.1.3 The situation encountered by Johannes in Palau was, in ethnobiological terms, possibly at the other extreme of a complex continuum from places such as Hopevale, and to a lesser extent Lockhart River, where considerable information has been lost or affected due partly to the reasons discussed above. Johannes' prime informant had realised the need to record the considerable knowledge of fish he possessed, as it was in danger

of being lost from the Palauan culture pool. It would be unlikely that such a situation would be encountered very often in Aboriginal communities due to the individual ownership of different types of knowledge; although the collective knowledge of communities may be considerable. Aboriginal attitudes to knowledge can be complex. For example, for the Yolngu Aborigines of the N.T. there are inherited rights to knowledge, to 'know' is similar to saying 'having the right to know' (Harris, 1980).

The concept of a continuum of ethnobiological knowledge has a number of dimensions and it would be impossible to completely determine all the factors influencing the level or quality of marine ethnobiological knowledge.[5] It is useful in assessing such knowledge and also when applying it in management programmes, to have an understanding of some of the factors influencing this continuum. It must be acknowledged from the outset that any study of ethnobiology must largely relate to a body of knowledge at a single instant in time, including the present perceptions of traditional knowledge. This is because ethnobiological knowledge is a part of a society's culture, and is therefore also part of a dynamic system.

Figure 6.2 shows some of the other factors which influence the level and/or quality of marine ethnobiological information within a community. Briefly, they are: the continuity or discontinuity of the usage of the information and/or the resource; the influence of new technology and methods, both from within the culture and from other sources; the availability of alternative food sources, such as store bought food; changes in the population size; the type of resource base, whether broad or

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[5] This discussion could also relate to fishing/hunting methods; TURFs (Traditional Use Rights in Fisheries); traditional conservation methods; etc.

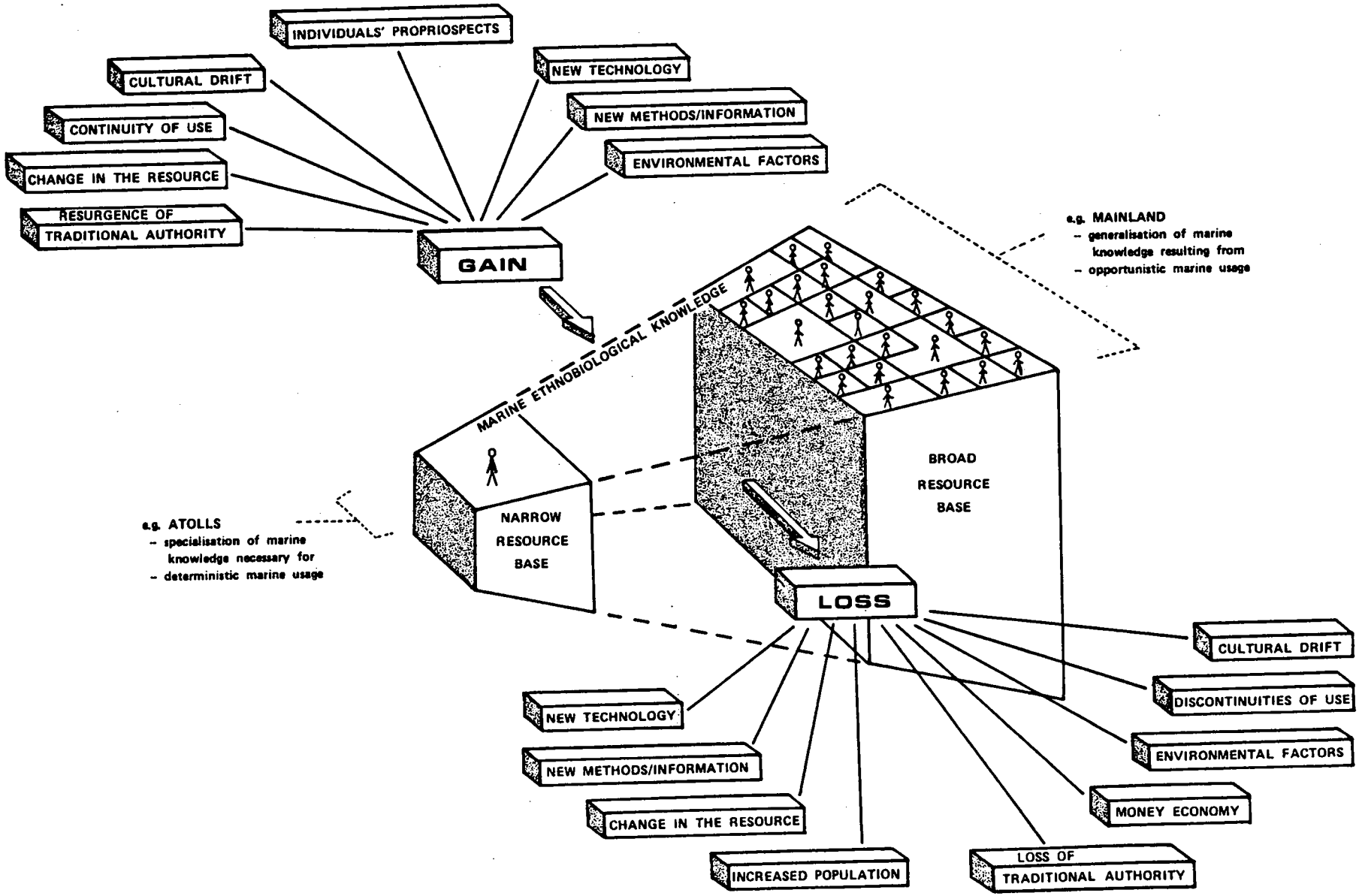

Figure 6.2: A diagramatic representation of the marine ethnobiological knowledge continuum and some of the factors which influence it.

narrow; the type of resource; and changes in environmental conditions which may affect resource availability in both the short and long term.

In addition, the majority of marine ethnobiological knowledge may be held by only a few people within a community, for example the master fishermen of Micronesia (Johannes, 1981b; Klee, 1980); or at the other extreme, by a large number of community members (Fig. 6.2). In the latter situation a large proportion of the information may be held by most community members who use marine resources, with some specialist knowledge held by certain individuals or groups (e.g. 'women's' and 'men's' information).

If this continuum is simplified and the extremes compared, then some generalisations can be drawn (Fig. 6.2). At one extreme would be areas with a narrow resource base, such as small islands, especially atolls, with small populations, dependent on the marine environment for a large proportion of their protein source. In that situation, marine ethnobiological knowledge would tend to be the province of specialists (e.g. master fishermen) who have considerable detail of the resources, and the usage of those resources would tend to be deterministic due to the considerable dependency on those resources. At the other extreme would be areas with a broad resource base, such as mainland or large islands, with larger populations, and with protein sources in addition to the sea. Here the distribution within a community of general marine ethnobiological information tends to be greater (i.e. more 'generalists'), and the marine resources would tend to be more opportunistically exploited. In the real world, however, there would still be elements of both extremes occurring in each situation, for example, the detailed knowledge required for

dugong hunting may be the province of only a few people in mainland communities; and island fishermen would still take advantage of opportunities should they arise.

Locating Palau, Hopevale and Lockhart River into this generalised continuum model is possible, although the inherent limitations of attempting to portray the real situation with its numerous dimensions must be accepted. The particular situation described by Johannes in Palau was an instant in time located towards the left in Figure 6.2 - characterised by specialisation, with the master fishermen maintaining considerable information (Klee, 1980; Johannes, 1981b); and a deterministic usage of the resources (Johannes, 1981b). However, Johannes (1978a; 1981b) also noted that in Palau, at the time of his research, the impact of Westernisation - especially the presence of the money economy, the breakdown of traditional authority, and the previous imposition of laws and practices by the former colonial powers - had assisted the decline of traditional values including ethnobiological knowledge and traditional marine conservation methods. Many of the 'loss' factors in Figure 6.2 were operating.

At the time of my field work at Hopevale and Lockhart, both communities would have been located somewhere towards the right of Figure 6.2. There were fewer 'specialists' and fishing and marine hunting were 'opportunistic' activities, having to fit in with work and other commitments, and environmental conditions. Hopevale and Lockhart can, however, be separated in the continuum by the degree to which the factors in Figure 6.2 had affected marine knowledge. For example, at Hopevale the discontinuities had been much greater (see Section 5); western methods and materials were introduced much earlier (e.g. fishing nets); and the commercial influence on traditional fishing and hunting

activities was greater (e.g. dugong hunting for oil). These have resulted in a greater loss of traditional marine resource knowledge than at Lockhart.

The above discussion has a practical application in marine ethnobiological studies. The obvious diversity of information levels and quality in different communities/societies, should greatly influence the way in which ethnobiological studies be carried out. The following Sections discuss research strategies and their advantages and disadvantages in different situations.

6.2 Strategies for Acquiring Ethnobiological Information:

The current literature on the use of traditional marine knowledge has largely concentrated on outlining the anticipated benefits of the documentation of such knowledge to management and science. The IUCN have recently developed a draft programme on traditional knowledge for conservation (Baines, 1985). This programme aims to provide a framework within which priority activities can be identified. The strategies required for documenting ethnobiological information have received little discussion.[6]

There would appear to be two basic strategies for acquiring marine ethnobiological knowledge: (a) short term studies focussing on specific species or topics in a number of communities; or (b) longer term, more generalised studies aimed at recording as much information as possible on numerous topics and species in a single community. Both of the strategies have advantages and disadvantages.

The advantages of a longer term, generalised approach have

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[6] This discussion refers to the overall strategy, not to the actual techniques and problems of acquiring data; they have been covered by Johannes (1981a, 1981b), and in texts on anthropological field work techniques.

been demonstrated and discussed by Johannes (1978a; 1980; 1981a; 1981b). As previously mentioned, he was able to record considerable information on traditional marine conservation methods; local hydrography; and considerable biological and ecological information on tropical fish. Dr R.E. Johannes (*pers comm*, 1987) argues that since the environmental knowledge of many groups has not been recorded and is being quickly lost, a high priority should be attached to recording all of it as soon as possible.

There are, however, a number of problems with this approach. As Johannes (1981a:678) points out, the researcher:

> "...should possess a good grounding in biology, ecology and oceanography in order to steer interviews in productive directions, taking full advantage of answers that open up new and potentially interesting areas of inquiry. Proof of this is implicit in the extensive literature on Pacific island anthropology, in which fascinating hints concerning native marine lore abound, but are almost never developed (Johannes, 1981). Traditional anthropologists have generally not had sufficient grounding in biological science to enable them to exploit effectively the valuable indigenous ecological knowledge that focussed inquiry could have yielded (Vayda and Rappaport, 1968)."

During my field work at Hopevale and Lockhart River, occasionally I found myself receiving information of uncertain value from informants. Without ready access to library facilities, I could not determine whether what I was noting was new information to biologists or not. As a result, it was probable that, despite having a grounding in biology and ecology,

some interesting data may have been missed simply because I lacked the specialist knowledge required to ask the correct questions, or to even recognise that the line of questioning should have been different. As a further example, Nash (1985) has carried out research on the biology of ***Trochus niloticus*** and its fishery in the Great Barrier Reef region. He recently visited Yorke Island in the Torres Strait in company with a former Fisheries Officer who has lived and worked with those Islanders for a number of years. In about ten hours of discussions with Islander ***Trochus*** fishermen, Nash was able to acquire considerable information on ***Trochus*** distribution and seasonality, and relate that information to reproduction, confirming his findings from other areas. This was information that the former Fisheries Officer had been unable to acquire as he lacked the specific knowledge to ask the right questions (Nash, *pers comm*).

A further problem with long term studies in single communities is that they may seek to document marine knowledge sets that are possibly not there, or may be incomplete. The cost of such long term studies in today's funding climate, and the uncertainty of the results, also argue against such a strategy being used.

The advantages of a research strategy involving working on specific topics or species in a number of communities, in conjunction with anthropologists, would I feel, be: (a) a more efficient use of field research time as it would utilise the expertise and hard won rapport of anthropologists; (b) more cost-effective as it would reduce field work time; (c) lead to the acquisition of more detailed data on specific topics by combining the respective areas of expertise of biologists and anthropologists; and (d) provide the opportunity to record other

ethnobiological information incidental to the main work. To be successful, this approach would require considerable cooperation between anthropologists and biologists, or alternatively, to have researchers trained in both biology and anthropology.[7]

The major disadvantages would be that other information may go unrecorded; and it may be more difficult to establish a good working relationship with informants.

As both research strategies have their advantages and disadvantages, it is apparent that the type of approach used should be based on: (a) the type of objectives, e.g. biological; management/conservation orientated; ethnographic/historical; or a combination of these; (b) what type of resource base is involved, e.g. narrow or broad; (c) the degree to which the marine knowledge has been altered or affected by westernisation, discontinuities, etc; and (d) whether the owners of the knowledge are Third or Fourth World groups. If the community is a member of the Fourth World - such as Aboriginal communities - there are added complications if the researcher is from the dominant culture. Generally speaking, informants will be more reticent to divulge knowledge to that researcher; therefore time is required to develop a rapport between researcher and fishermen. In addition, this reticence to divulge information will mean the researcher will have great difficulty eliciting the appropriate information, especially if he/she is not well grounded in the topics to be covered and be able to ask the necessary questions.

There can be no set formula applicable to all situations. Each of the above problems need to be assessed and the appropriate strategy, or compromise in strategy, applied. For

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[7] Biology students should be encouraged to undertake anthropological subjects in addition to their biological studies.

example, the longer term, more generalised study in Palau by Johannes was appropriate for that situation; however, I feel that a concentrated study would have been more appropriate for Hopevale and Lockhart to elicit biological information. In assessing each situation the effects of the strategies on the people who own the knowledge must be considered and their wishes incorporated.

6.2.1 Aboriginal Marine Knowledge and Biology: Despite the situation outlined for Hopevale and Lockhart (Section 6.1), Aboriginal marine knowledge can be of considerable value to western biology. I believe that researchers should focus on specific species or topics and acquire knowledge from a number of coastal Aboriginal communities. Biologists working on specific topics should also record any incidental ethnobiological information.

The following is an example of how a biologist could gain valuable information on specific topics by working in a number of Aboriginal communities, using ethnobiological as well as conventional research methods. For many years biologists argued over whether barramundi spawned in rivers or shallow coastal waters. Johannes (in press) pointed out how Aboriginal knowledge could have reconciled these conflicting views. The Yolngu of northern Arnhem Land have considerable knowledge of the seasonal feeding habits, migration and reproduction of barramundi (Davis, 1981a, 1981b, 1985b). Moore (1982) found that barramundi in the Fly River of Papua New Guinea migrated down the river and then along the coast to spawn. When informed of this, the Yolngu Aborigines insisted that the barramundi in their area spawned in rivers (Johannes, in press). T. Davis (1985) investigated the

spawning of barramundi in northern Arnhem Land and found that they did spawn upstream in rivers. The factor of importance for barramundi spawning was found to be salinity not topography.

Another specific topic where this approach would be of value would be the seasonality of 'fat' in tropical marine resources. This is a subject about which Aboriginal knowledge is considerable, and biological knowledge is lacking. Shul'man (1974) says that the accumulation of fat deposits that occur in fish may be used as indicators of the status of the fish population; as indexes of the food supply; of preparedness for migrations; of preparedness for spawning; of preparedness for wintering; and as indexes of racial and biological differences. Aborigines possess detailed knowledge of the timing and types of 'fat' for a diverse number of species (Davis, 1985a; Taylor, *pers comm*). For example, the knowledge of 'red fat' found in crabs at Hopevale around full moons and the winter months, is paralleled by the knowledge of the Anbara Aborigines in Arnhem Land. Meehan (1977b) found the Anbara were especially interested in the colour and quality of the 'fat' from inside crabs, discarding specimens they considered 'too thin'. The seasonal eating of sharks and stingrays based on their liver size and quality is also widespread amongst Aboriginal groups. The techniques of gauging liver quality and preparing stingrays at Hopevale and Lockhart is also found in northern Arnhem Land (see Davis, 1985a).

Further, acquiring information on dugongs and turtles from Aboriginal communities can be of considerable value to biologists. Bradley (nd) has described the Yanyuwa's knowledge of dugong migration paths in the Pellew Islands region. Currently, biologists know virtually nothing about dugong movements. Other

areas that require more information which may be available in Aboriginal communities, relate to dugong mating, feeding and general behaviour. A further benefit of working with Aborigines is the opportunity to collect reproductive and other specimens from otherwise protected species.

In my opinion the greatest value of Aboriginal marine knowledge to biologists would therefore not be through generalised studies in single communities, but by concentrating on particular topics, acquiring comparative ethnobiological information from a number of communities, and combining this with conventional biological research techniques. By collaborating with anthropologists[8] who have established relationships with communities, biologists with specialised knowledge would be able to acquire considerable data within a short time period (possibly two to four weeks). They would be able to recognise new information more readily. The reduced field time costs would help make the acquisition of funding more realistic. If the above research methodology was adopted, biologists would either have to acquire the necessary interview and communication skills, or work closely with anthropologists.

Where Aboriginal marine knowledge has been used, the source and ownership of that information must be acknowledged in the same manner as would be information acquired from other scientists.

6.2.2 Aboriginal Marine Knowledge, Management and Conservation: Where the acquisition of ethnobiological knowledge is primarily for management and conservation reasons, rather than

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[8] This collaboration would also enable anthropologists to more closely address marine cultural ecology questions (see Section 1.3.2).

for specifically biological purposes, then a different research approach may be required. Where both biological and management objectives have been set for a study, it would be beneficial to prioritise them before devising an appropriate research strategy.

The specific detail sought for biologically orientated work may not be needed for management purposes. Firstly, the management problem needs to be clearly defined. Does it involve a single community or a number of communities? Does it involve a single species, a number of species, or a whole ecosystem? Secondly, it should be determined if it is appropriate for a biologist to carry out the work. If, for example, Aboriginal traditional use rights in fisheries (TURFs) are to be recorded, these may be more appropriately documented and mapped by an anthropologist in consultation with a biologist, rather than just a biologist.

When management of an exploited resource is considered, it should be remembered that it is the exploiters who are being managed not the resource. Therefore, of prime importance in a management orientated ethnobiological study is the establishment and maintenance of a rapport with the informants and community involved. The brief focussed studies applicable to the acquisition of biological information would not be appropriate under these circumstances. The amount of time required would depend on the management problem to be addressed and the community or communities involved. At all stages the informants and community should be involved as much as possible.

Due to the dynamic nature of cultures, ethnobiological studies can only provide data relevant to the period in time when the study was carried out. For management purposes, it would not be appropriate to base contemporary management decisions on a

long term study carried out ten years ago. For example, there were considerable differences between Chase's (1980a) description of dugong hunting and butchering at Lockhart River in the 1970s and what I observed in 1985 (see Section 4.4.1). Therefore, short term ethnobiological studies tailored to contemporary management needs could be used to update any previous studies to avoid using out of date information.

When acquiring marine knowledge for conservation purposes, not all traditional knowledge is necessarily conservation oriented and of that which may be classed as conservationist, not all may be relevant to the current circumstances. Each situation needs to be evaluated upon its own merit. Johannes and MacFarlane (1986:34) believe there are three basic questions which need to be answered to determine the practical value of traditional fishing rights in the context of modern fisheries management:

1. Are they currently practised?
2. Will they contribute to the rational exploitation of the marine resource?
3. Will they contribute to the equitable allocation of these resources?

Even if the answers to some of these questions are negative, there may still be elements of the system which could be beneficially incorporated into modern management.

The problems associated with marine resource management in Aboriginal communities is discussed further in Section (7.0).

6.3 Summary: There are a number of factors relevant to the acquisition and use of Aboriginal marine knowledge which should be noted:

- Ethnobiological knowledge is not a static entity, but

changes with the parent culture. Therefore whatever is recorded represents that community's marine knowledge, both current and the present perception of traditional knowledge, at that point in time. This has important consequences for management programmes incorporating traditional knowledge.

- The complexity and the factors influencing marine ethnobiological knowledge in different communities need to be considered when assessing its potential value to western science, management and conservation.

- The research approach used should be based upon careful consideration of the objectives to be achieved, and the communities involved. The idea of acquiring general Aboriginal marine knowledge in the hope that some may prove of value to biologists or wildlife managers is not appropriate. Projects with a biological orientation should focus on topics in a number of communities. Those with specifically management orientated objectives will require careful consideration of the problems to be addressed prior to determining the appropriate research strategy.

- The source and ownership of the marine knowledge must be considered and acknowledged in its acquisition and use.

- In assessing the potential value of the TURFs to management, the three questions posed above need to be evaluated.

7.0 CONTEMPORARY MARINE RESOURCE MANAGEMENT INVOLVING ABORIGINAL KNOWLEDGE AND UNDERSTANDING: THE HUNTING OF DUGONGS AND TURTLES

7.1 Applied Ethnobiology and Policy Science

The problems experienced by anthropologists involved in 'applied' projects are particularly relevant to management orientated ethnobiological studies. This section outlines some of those problems and how they should be addressed in 'applied ethnobiology' studies.

'Policy science' has been defined by Weaver (1985) as the study of decision-making, the evaluation of available knowledge for solving particular problems, and assisting decision-makers in formulating, implementing, and evaluating policy. Weaver (1985:98) identifies the major tasks in policy science as:

1. Identify the problem focus
2. Learn about the values of the decision-maker
3. Study the decision-maker's organisation and decision process
4. Clarify the decision-maker's goals
5. Describe trends in the problem area
6. Analyse the underlying conditions to the problem
7. Project future developments
8. Select alternatives, and for each
    a. Establish a desired course of events
    b. Assess costs and budgetary limitations
    c. Appraise the expected results
    d. Determine the distribution of effects
    e. Ascertain the potential policy impact
    f. Rank order the suggested alternatives
9. Help select a course of action from the suggested

alternatives

10. Help write a policy statement about what is intended, how and why
11. Assist implementation of the plan
12. Evaluate its success or failure.

Weaver (1985) notes a failure of anthropologists to come to terms with anthropology as a policy science. He argues that anthropologists have been oriented primarily to theoretical rather than practical issues, and in their applied work they have been concerned mostly with change and development topics rather than public policy formulation. He concludes that in the American situation some of the:

> "...reasons for anthropology's ineffectiveness are an unfamiliarity with the politics, administration and the nature of policy formulation, ignoring contemporary social issues, poor communication about the value and application of anthropology, lack of experience in dealing with administrators and politicians, a desire to preserve Indian cultures, failure to understand inconsistencies in federal policy, having different models of society and social action from those of decision makers, and a misunderstanding of the place of research in policy science." (Weaver, 1985:103)

The problems involved with the field of 'applied anthropology' are discussed further in Goldschmidt (1979), Hinshaw (1980) and Hoben (1982).

The role of applied anthropology in policy, as it relates to Aborigines, is discussed in Coombs, *et al* (1983). They argue that applied anthropology is more than advising on priorities and how they can be made socially acceptable and administratively capable

of implementation (Coombs, *et al*, 1983). They believe it:

> "...involves crucial decisions being made by Aborigines and equally crucial commitments being undertaken by administrators...and other non-Aborigines with the anthropologist acting as a kind of translator, a cultural translator, for all parties." (Coombs, *et al*, 1983:19)

There has been considerable debate amongst Australian anthropologists concerning the uses of anthropology, especially in relation to policy matters (see Berndt, 1983/84a, 1983/84b; Coombs, *et al*, 1983; Cowlishaw, 1986; D. Rose, 1986; Sullivan, 1986; Vachon, 1983/84; Williams, 1986; Wilson, 1983/84). The main features of this debate which are relevant to 'applied' or 'practical' ethnobiology involving Aborigines are outlined below.

In general, with applied studies it is not enough that recommendations are provided; there needs to be a further commitment by assisting in the application of those recommendations. As there are currently a considerable number of people with diverse backgrounds involved with Aboriginal affairs, any recommendations that are made have to go through numerous intermediaries. Berndt (1983/84a:166) believes this raises a number of issues which are not easily resolved:

> "...for instance, the submission to a government department of recommendations which embody potential solutions framed in alternative-choice terms. These are (or may be) inspected and commented on by a range of persons who are quite likely to have had little practical experience and little real knowledge of Aborigines. It is therefore less likely that such recommendations will survive in the form in which they

have been submitted; and, consequently there is less likelihood that they will be implemented -- or, if they are implemented, less assurance that the stipulated conditions will be adhered to."

The involvement of Aborigines at all levels of applied ethnobiological research and its application is crucial. At all stages of research and the preparation of reports, communication should be maintained with the relevant Aboriginal community and its members. This should extend to the period after submission of the recommendations to government bodies, as many problems can arise during this period. Berndt (1983/84a:168) points out that:

> "...in any situation involving Aborigines, and where practical problems are present which require resolution, Aborigines themselves are only one ingredient. There are many other persons -- non-Aboriginal persons: government concerns, mining companies, for instance, advisors and so on, who also have interests, and those interests may override those of Aborigines."

Any recommendations made will usually directly affect the Aboriginal groups involved. Therefore, for a particular problem three basic questions need to be considered (after Berndt, 1983/84a:170): (a) What are the 'facts' based on careful research? (b) What kind of recommendations should and can be made? And (c) How should they be phrased? A further difficulty can arise when a particular problem, as viewed by the researcher, differs from the way it is perceived by the Aborigines who are intimately concerned with it (Berndt, 1983/84a).

Even when the 'facts' gained through research may appear straight forward, the resultant recommendations are not; they

depend upon the context in which the 'facts' were acquired, and are usually designed for a particular purpose (Berndt, 1983/84a).

The major points arising from the 'applied anthropology' debate which are of prime importance for 'applied ethnobiological' researchers are: (a) that it is unsatisfactory to merely provide results and recommendations and leave the responsibility of decision-making to others; and (b) it is essential that recommendations be followed through as far as possible, although the limitations of doing so need to be recognised.

7.2 Dugong Hunting: the Need for Management

7.2.1 General

The largest known populations of dugongs occur in northern Australia (Nishiwaki and Marsh, 1985). The seagrass beds of the east coast of Cape York Peninsula have been identified as a major region for dugongs, especially the Starcke River area (Nishiwaki and Marsh, 1985). As has been shown (Sections 3.4.1 and 4.4.1), dugongs form an important part of the culture and diet of eastern CYP coastal Aborigines.

Although dugongs are listed as vulnerable to extinction in the IUCN Red Data Book (Thornback and Jenkins, 1982), recent studies (Marsh and Saalfeld, manuscript) indicate that this is probably not the case within the northern Great Barrier Reef region[1].

Aboriginal hunting is not the only factor affecting dugong

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[1] Overharvesting is, however, apparently a problem in the nearby northern and western portions of the Torres Strait (Marsh, 1986a).

population levels in this region. There is anecdotal evidence that commercial and illegal gill-netting are also a cause of dugong mortality. Although there are no data on the incidental take of dugongs, this mortality is of great concern to Aborigines living in the region. However, there are currently only approximately 30 commercial fishermen operating north of Cooktown, and gill-netting is banned under Queensland law from November through January to protect barramundi stocks. Additionally, under the GBRMP Zoning Plans (GBRMPA, 1983, 1985) gill-netting has been banned from many important dugong habitat areas. Habitat destruction in this region is minimal. Prawn trawlers are currently zoned out of the coastal seagrass beds inhabited by dugongs (GBRMPA, 1983, 1985).

7.2.2 Legislation

The legal problems associated with Aboriginal marine hunting and the related legislation were reviewed by the Australian Law Reform Commission (LRC,1986:163-195).

The Commonwealth and State Governments share the constitutional authority over fisheries in Australian waters, including the GBRMP which is jointly managed by the Commonwealth and Queensland Governments (see Appendix 1). Under Commonwealth legislation, Aboriginal people engaging in traditional hunting, fishing and gathering are exempt from conservation and wildlife laws unless those laws are expressly stated to apply to them. Although the Great Barrier Reef Marine Park Act (1975) does not refer to traditional hunting and fishing interests or suggest that certain areas should be set aside for traditional use, the regulations incorporated in the GBRMP Zoning Plans

for the various Sections of the Park make provision for traditional hunting in all parts of the Park, except Presevation Zones, subject to a permit being granted.

Queensland legislation applies to waters above low water and those inshore waters excluded from the GBRMP. The State Government's Community Services (Aborigines) Act (1984) exempts members of an Aboriginal community residing on Trust Areas (formerly Reserves) from fisheries legislation provided the take is by traditional means for consumption by members of the community; a similar provision is contained in the Queensland Fisheries Act (1976).

The interrelationship of the Commonwealth and State Acts is complicated in the inshore (Queensland) waters of the GBRMP where most dugong hunting occurs. For example, an Aborigine could theoretically be given a permit to hunt dugongs within a specified Zone within the GBRMP, but be prevented from doing so in Queensland waters within a Zone because he was not a resident of a Trust Area (LRC, 1986).

7.2.3 The Establishment of the GBRMP: Causes for Concern

As part of the GBRMP zoning process, the GBRMPA invited the public to participate in the preparation of the draft zoning plan, and to comment on this plan when it was developed. Submissions received for the zoning of the Cairns Section of the Park expressed concern over the possible overexploitation of dugongs in the Hopevale region for the following reasons:

(a) The paucity of necessary biological and ecological information on dugongs: there was no indication of whether the population(s) of dugongs in the region was increasing, decreasing

or stable (Marsh and Heinsohn, 1982); how many populations were involved; detailed movement patterns; or what might be a safe level of exploitation;

(b) The significance of the Starcke River region for dugongs (more dugongs had been sighted here than anywhere else in the world), and the concern for their conservation (Marsh and Heinsohn, 1982);

(c) The ability of Hopevale residents to purchase larger speedboats and four-wheel-drive vehicles had increased during the preceeding five or so years, permitting easier access to the Starcke River region;

(d) The improved road access facilitated hunting during the dry season;

(e) There were verbal reports that the annual take of dugongs by the community had increased in recent years;

(f) A lack of knowledge among community members of the dugong's life history and vulnerable status. In addition, they believed that as large numbers of dugongs had been killed for oil between 1928 and 1932, this impact could be repeated without serious effect.

7.2.4 GBRMPA Actions Prior to the Implementation of the Zoning Plan

Zoning requirements: The information contained in the submissions stimulated the Marine Park Authority's concern about the status of dugongs within the Park for two reasons. Firstly, the GBRMP Act (1975) gives the Authority specific responsibility for endangered species and secondly, the large numbers of dugongs in the Park were listed as a reason for the region being given World Heritage Listing.

In allowing a zone within the Cairns Section of the GBRMP (GBRMPA, 1983:9) to be used for traditional fishing or hunting, the Authority is required to pay particular regard to:

(a) the need for conservation of endangered species;

(b) the means to be employed in traditional fishing or hunting;

(c) the number of animals to be taken.

Additionally, in permitting traditional hunting in the Far Northern Section (GBRMPA, 1985:7) the Authority has to consider:

(d) the particular purpose;

(e) whether the entry and use of the area will be in accordance with Aboriginal tradition;

(f) evidence that the person is a traditional inhabitant[2];

(g) the normal place of residence of the person.

In developing a management strategy the Authority needs to assess its likely impact on: (a) dugong numbers, (b) the relationship between the management agencies and the community, and (c) the socio-political situation within the community. It also requires information on the Aboriginal perception of dugongs, and the potential for over-harvesting through Aboriginal hunting.

Management decisions: Staff of the GBRMPA met with the Hopevale Aboriginal Council on a number of occasions between December 1982 and November 1983 when the Zoning Plan for the Cairns Section of the Park, with its requirements for permits for

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[2] A 'traditional inhabitant' is defined by GBRMPA (1985:2) as "...an Aboriginal or Islander who lives in an area or areas in accordance with Aboriginal tradition or Islander tradition, respectively."

traditional hunting, became operational. Despite a level of consultation over and above the general statutory requirements (and over and above that with many other user groups), there were a number of aspects relating to communicating with Aborigines/Aboriginal groups which mitigated against a successful permit system being negotiated. Some of these problems were: the general lack of communication between the Aboriginal Council and the community; the inherent problems of public meetings in Aboriginal communities[3]; a lack of understanding of the community dynamics; and the general 'acceptance' by Aborigines of authorities regulating their lives.

The dugong permit system which evolved from the meetings was implemented in December 1983. As a result, 20 individual permits were issued on a single day prior to a four-week open season in January 1984. The permit conditions were: one dugong per hunter (i.e. a quota of 20 for the community for the season); no females with calves to be taken; no firearms to be used; catch data sheets were to be completed and returned; the permits were to be available for inspection within the Park; the permits were valid north of the Endeavour River only. The permits were allocated on a 'first come, first served' basis.

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[3] Von Sturmer (1981) and Taylor (1981) suggest that public meetings in Aboriginal communities (a) should not be treated as information giving situations; (b) not be used to extract information, especially if it affects particular individuals; and (c) can be used to ratify a consensus, but are not the sole mechanism whereby consensus is established. Also, it should not be assumed that the sum of the individual expressions of opinion automatically reflect community consensus. Rather the sum of individual opinions represents the range of alternative expressions from which a consensus may ultimately emerge.

7.2.5 Reaction to the Permit System

The introduction of the dugong hunting permit system at Hopevale caused several problems as detailed by Marsh, *et al*, (1984d). Briefly, the major problems were:

(a) Widespread apprehension, confusion and misconception regarding the existence, function and regulation of the GBRMP;

(b) The Hopevale people felt victimised as GBRMP regulations on dugong hunting were applied to them but not to other east coast Aboriginal communities such as Lockhart River, Yarrabah or Wujal Wujal;

(c) There was confusion and discontent among Hopevale residents about the dugong hunting permit system and its operation; they regarded it as an infringement of their traditional hunting rights;

(d) There was dissatisfaction with the number of dugongs allowed per permit and the permit allocation arrangements. Some non-hunters received permits while known hunters missed out;

(e) There was general dissatisfaction with the manner in which management officers dealt with people.

The dugong permit system at Hopevale produced a negative community attitude towards the management agencies. The relatively sudden and selective[4] imposition of the restrictive dugong permit system resulted in an 'us and them', rather than a cooperative situation developing.

The dugong permit system also exacerbated existing socio-political tensions within the community, especially as some

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[4] As perceived by the Hopevale community: Yarrabah and Wujal Wujal were excluded due to their reported low dugong take; and Lockhart River was excluded as the Far Northern Section's Zoning was yet to begin. Yarrabah's hunting area is also outside the GBRMP.

members considered the 'right' to obtain a dugong permit more important than the actual 'need' for a permit.

Minor alterations were made in the method of distributing the permits for the 1985 and 1986 hunting seasons[5]. This helped reduce some of the ill-feeling but the general discontent remained.

Although these management developments raised the awareness of Hopevale residents to the Government's concern for the management and conservation of dugongs, they also resulted in a disproportionate amount of attention being focussed on dugong hunting, so that the quota became a target.

The policy governing Aboriginal dugong hunting in force during the period of my field work, was not only unsatisfactory to many Aboriginals, but gave rise to awkward management and enforcement problems. Similar problems and criticisms have been encountered with a permit system used in the Canadian Indian Fishery. The Pearse Report (1982) outlined these problems and criticisms. The major points raised against the system were: (a) the regulation of the people involved: the fishing times and the places were offensive to some; (b) the system was inconvenient due to the remoteness of areas involved; (c) certain administrative requirements of the permits were considered as unjustifiable or unnecessarily bothersome; (d) others objected to the whole system as an unwarranted interference in their fishing rights; (e) the permits were the Government's means of curtailing Indian fishing. The justifications for the permit system were: (a) that it enabled Indians to fish in ways and areas forbidden

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[5] A video was produced by GBRMPA in late 1984 to explain these changes and reasons for the permits, however, the video arrived after the permits had been issued. The majority of the people I asked did not understand the message the video attempted to portray.

to non-Indians; (b) it was an instrument to authorise these special exemptions for Indians; (c) it provided a means for managing stocks and obtaining statistical information. Overall, the permit system offered the Indians no security for their claim on the resource (Pearse, 1982). The report suggested that the permit system be abandoned.

The zoning plan for the Far Northern Section was not implemented until early 1986. As a result of the problems encountered with the dugong hunting permits at Hopevale, GBRMPA decided during the preparation of the Far Northern Section's draft zoning plan to delay applying restrictions on dugong hunting at Lockhart River until more biological information and catch data were obtained.

7.2.6 Management of Dugong Hunting

Catch data: Between January 1984 and February 1987, a total of 74 dugongs (38 females; 33 males; 3 of undetermined sex) were taken by Hopevale hunters (Table 3.3).

In a favourable three month period (late September to late December, 1985) 15 dugongs (4 females; 11 males) were caught by Lockhart River hunters (Table 3.2). In addition to this there was an unconfirmed report of two dugongs (one a pregnant female) being caught just prior to that period, and at least four dugongs being taken in the Pascoe River area by Aborigines visiting from the western side of Cape York Peninsula. Estimates of annual catches at Lockhart River cannot be extrapolated from these data due to the seasonal variability of hunting, and the unpredictability of the availability of boats for hunting.

The data indicate that dugongs of all ages including

reproductively-active females were hunted at both Hopevale and Lockhart River.

As mentioned previously (Section 3.4.1), from my observations I am confident that Hopevale hunters were not hunting selectively, except perhaps in very rare circumstances by older, more experienced hunters. Most hunting occurred in extremely turbid water, and since animals could not be followed and observed underwater, hunters opportunistically harpooned any available animal. At Lockhart River (Section 4.4.1), there was the potential for selection to occur during hunting as the clarity of the water allowed the animals to be observed for a few minutes before harpooning. However, from observations, and the catch data, it was apparent that an attempt was made to catch any dugong encountered.

Most trips to the Hopevale hunting area are by boat and involve a 90km voyage. As a result, the number of hunting trips is limited by fuel costs, tides and weather. The small number of dugongs caught per boat per trip is also limited by the small size of most boats used. Dugong hunting at Lockhart River is presently limited by weather and the low number of serviceable boats. In addition, Chase (1981a) considers the number of coastal Aborigines who exploit dugongs has declined dramatically since European settlement. He estimates that no more than 100 adults presently attempt to hunt dugongs along the Cape York Peninsula coast.

Estimated sustainable yield: On the basis of aerial surveys[6] in November 1985, the estimate of the dugong population of the

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[6] The aerial survey design, counting procedure, results and analysis are detailed in Marsh and Sinclair (manuscript) and Marsh and Saalfeld (manuscript).

Great Barrier Reef lagoon between Cape Bedford and Hunter Point is 8106 ± 1125(S.E.) animals (Marsh and Saalfeld, manuscript). The corresponding estimate for the Hopevale hunting area is 2540 ± 653(S.E.); and for Lockhart 611 ± 131(S.E.) (Marsh, 1986b; Marsh and Saalfeld, m/s). Dr H. Marsh (*pers comm* 1987) considers these estimates to be low, as very conservative correction factors were applied for the various survey biases. Comparison of the results of the two aerial surveys of Cape Bedford to Cape Melville in November 1984 and 1985, indicates that dugongs undergo local movements (Marsh and Saalfeld, manuscript). Therefore the populations from which the Aboriginal hunters are harvesting are unlikely to be restricted to the hunting areas *per se*.

Dugong life history data (Marsh, 1986a) suggests that a conservative estimate of the sustainable harvest of the dugong population of the whole region surveyed is of the order of two percent of females. Assuming a 1:1 sex ratio (as suggested by all the available data), a harvest of approximately 80 *females* per year for Hopevale and Lockhart River communities combined would be sustainable. Using the lower bounds of the confidence limits, the sustainable harvest level would be 70 *females* per year.

The catch statistics indicate that the combined annual dugong harvest by Aboriginal hunters from Hopevale and Lockhart River is substantially less than the estimated sustainable yield. Therefore, the present harvest by Aborigines is unlikely to be damaging the dugong population of the GBRMP in the eastern Cape York Peninsula region surveyed. However, as the number of dugongs drowned incidentally in gill-nets is unknown, it is possible, although unlikely, that the combined traditional and incidental man-induced mortality is reducing dugong stocks in this region.

The status of the dugong population: Dugongs are long-lived animals with a life-span of up to 70 years, a minimum pre-reproductive period of 9 to 10 years, and a mean calving interval which has been estimated as 3 to 7 years for various populations (Marsh, *et al*, 1984c; Marsh, 1986a). Marsh (1986a) has calculated that even with the most optimistic combination of these parameters, a low schedule of natural mortality and no anthropogenic causes of mortality, the maximum rate of increase is likely to be of the order of 5% per year. Under the present zoning and management regulations, the level of man-induced mortality in the northern sections of the GBRMP should be low. Thus, barring catastrophes, the annual rate of population change is also expected to be relatively low.

In a hypothetical example, Marsh and Saalfeld (manuscript) calculate that it would take 10 annual aerial surveys to detect a 5% per year decline in the population with 95% confidence. Alternatively, two surveys 10 years apart could establish with 95% confidence that a population decreasing at 5% per year is declining. As a compromise between information and cost, Marsh and Saalfeld (manuscript) suggest large-scale surveys be conducted every 5 years in the northern sections of the GBRMP, so as to coincide with the required revision of the zoning plans. Thus it will probably be at least a decade before the status of the dugong population is confirmed in this region. Meanwhile a conservative management policy needs to be adopted.

Proposed management system: The range of management options for dugong hunting include:

(i) Do nothing: this is not legally possible due to the GBRMP Act (1975);

(ii) A total ban on dugong hunting: this would not be justifiable on biological or social grounds; it would be impossible to police; and it is against current government policy;

(iii) Government control: this is the current situation;

(iv) Aboriginal control: this is not possible due to the GBRMPA Act (1975) giving the Authority responsibility for endangered species within the GBRMP (see 7.2.4);

(v) Combined Aboriginal and Government control: with the majority of control in Aboriginal hands - this would be the preferred option.

Based on the population estimates and Aboriginal catch data, a modified system to manage Aboriginal hunting of dugongs was recommended to GBRMPA (Marsh, 1986b; Smith, 1987), and is currently being trialled. This management system involves a hierarchical list of management options. They are, in increasing severity:

(a) community dugong hunting permits;

(b) declaring current dugong hunting areas as 'official' hunting areas;

(c) closed seasons;

(d) quotas.

This broad management system allows each community to be covered by the same scheme, but permits flexibility to cater for the unique situation experienced at each community. It also allows for applying different options as circumstances change.

The dugong hunting permit system currently being trialled at Hopevale and Lockhart River is:

(a) Dugong hunting is permitted via a dugong hunting permit issued to the Aboriginal Councils for the whole community. The

permit stresses that the whole carcass should be used, and that hunting should not utilise commercial freezer boats.

(b) The areas presently used for dugong hunting by each community have been declared 'hunting areas'. This declaration serves two functions: (1) the recognition of Aboriginal dugong hunting rights for the area, and (2) prevention of expansion of hunting into other areas should the means become available, until the status of the dugong population is determined.

(c) There is no quota applied to the communities.

(d) The closed season at Hopevale has been retained because of the potential for overharvesting provided by the easy road access to the hunting grounds in the dry season. The details of its duration and timing are determined through discussions with the Council. There is provision for the Council to apply for a special permit(s) to take dugong(s) for special *community* occasions (e.g. dance festivals). There is no closed season at Lockhart River because dugong hunting is not as seasonal an activity as at Hopevale and there is not the same potential for overharvesting, primarily due to the current lack of serviceable boats.

(e) The management agency is responsible for maintaining catch records for the communities.

(f) Provision has been made for the collection of dugong skulls, or at least the tusks, and any available capture information.

(g) The management plan for dugong hunting will be reassessed at the time of the reviews of the Cairns and Far Northern Zoning Plans.

The response of the communities to the management system currently being trialled has not yet been formally stated.

However, the response of the Hopevale community was foreshadowed in talks presented at the 57th Australian and New Zealand Association for the Advancement of Science Congress in Townsville in August 1987. The Hopevale representatives expressed the strong feeling that the community should play an important role in determining management structures and in administering those structures and suggested the use of Community By-laws (Pearson, 1987) as a way of controlling local hunting practices. In principle, this approach was welcomed by the staff of the GBRMPA at the meeting.

As outlined above, it will probably be at least a decade before the status of any dugong population is confirmed. In the meantime management needs to be conservative while acknowledging the rights of traditional hunters.

7.3 Turtle Hunting: a Potential Problem

With restrictions applied to dugong hunting, there is the potential for greater utilisation of green turtles as an alternative. Whether or not this has been the case since the introduction of restrictions at Hopevale, cannot be determined, since there are no records of turtle catches in previous years. On occasions where both dugongs and turtles would have been used, such as weddings and dance festivals, it was possible that more turtles were caught to compensate for the lack of dugongs. For example, in September 1984, the Hopevale Council was planning to offer two dugongs and a 'few' turtles for the Cape York Dance Festival participants. However, due to the quota restrictions on dugong hunting, they caught a total of ten turtles instead (four were used for the actual festival, the rest for various

activities on the same weekend).

The ease (relative to dugong hunting) with which turtles can be caught, the greater number of hunting locations, and the apparent abundance of turtles within the area, combine to make management potentially more complex than for dugongs.

Limpus and Parmenter (1986) say that turtle management on a sustained yield basis is particularly difficult as their biology is so poorly understood. For example, turtles:

> "...are migratory. The post hatching dispersal phase has never been adequately investigated. The relationship between rookeries and feeding grounds is poorly known. They are long lived... Recruitment rates to the adult population are probably very low with an associated low adult population mortality rate. The individual adult females do not breed annually. The relationship between the nesting numbers and the actual population is unknown. Sex of sea turtles is determined during incubation by the temperature of the nest and cannot be assumed to be 1:1. Sex ratio may be variable between populations and indeed between different segments of the same population if different size classes and/or maturity status turtles segregate into different feeding grounds during their development migration." (Limpus and Parmenter, 1986:101)

An added complication for turtle management is that the breeding and feeding grounds of the green turtles of the Great Barrier Reef are a shared international resource. To be effective, any management programme implemented in Australian waters would need to be complemented by programmes in neighbouring countries; an extremely difficult proposition. In

addition, turtle management, if it is to be attempted at all, needs to be planned on a long-term basis.

Limpus and Fleay (1983) have briefly outlined some of the turtle management options: (1) species protection; (2) habitat protection (of courtship; nesting; and feeding areas); (3) predator control (of nests); (4) control of the incidental trawl catch; (5) management of the Australian indigenous harvest (of turtles and eggs); (6) international harvest; and (7) management orientated research. It must be realised that Aboriginal hunting is only one of the turtle management options. It is also the issue over which resource managers have the greatest potential control, and as such is likely to receive the brunt of any management initiatives.

From my experiences during field work at Hopevale and Lockhart River, it is evident that the Aborigines in both communities would not be able to comprehend restrictions being placed on turtle hunting, as to them turtle numbers have not altered as long as they can remember. Should management of Aboriginal turtle hunting be considered, substantial work will be required in education and extension programmes. The potential for culturally and socially orientated management problems is considerable, due to the complexity of the situation. The management problems experienced with dugong hunting outlined in the previous section can be used to highlight and address the potential problems with managing Aboriginal turtle hunting.

The anecdotal and qualitative information on which the original planning and management decisions for dugong hunting were based was obviously inadequate for effective management. To be able to ascertain a sustainable harvest level for turtle hunting, the minimum population data required would be: the

current population size; sex and age distribution within populations; age-specific natality and mortality rates; causes of mortality; and migration and recruitment patterns. As mentioned above, turtle biology is poorly understood (Limpus and Parmenter, 1986). Although technically difficult, expensive and time-consuming to acquire, these data are, however, basic to effective management.

The first problem managers must address, is to determine the levels of the Aboriginal harvest and incidental take of turtles. Anecdotal estimates of Aboriginal dugong take proved to be considerably greater than the actual situation at Hopevale and Lockhart. Based upon the meagre biological information available and actual catch statistics, management authorities should then decide whether or not it is possible to postpone management initiatives until further research is carried out. If it is felt that based upon the available data, restrictions on turtle hunting need to be imposed, then management regulations must have the capacity to be flexible in order to incorporate new research findings. In such situations, the initial attempts at management must be accompanied by culturally appropriate education and extension programmes. Additionally, there needs to be constant feedback, perhaps through Aboriginal monitoring, of the current situation. The relevant management agency also needs to have the capacity to respond to increasing demands from Aboriginal hunters who want to assume a more active role in both developing and administering management policies.

7.4 Aborigines and Marine Resource Management: the Need for a Strategy

7.4.1 Aborigines and the GBRMP

As part of the GBRMP zoning process, the GBRMPA invited the public to participate in the preparation of the draft zoning plans, and to comment on the draft plan when it was developed. Aboriginal user groups, especially Hopevale, received a level of consultation over and above the general statutory requirements, although no special provisions were made to take account of their cultural differences. Despite extension programmes, the Aboriginal perception of the Marine Park has not been determined.

During the three Christmas fishing/hunting seasons of my field work, I was frequently asked questions concerning where the Park boundaries were, what they were allowed to do within the various areas, what would happen if they ignored them. Many of the questions which were asked during the initial dugong hunting season (1984) (see Marsh, *et al*, 1984e), were repeatedly asked in later seasons. Some of these questions would have been asked in order to confirm what had been heard elsewhere; on the other hand some people were genuinely confused. This study was not designed to determine how the Aboriginal people in the two communities perceived the Marine Park. However, for the benefit of the GBRMPA I did record my opinions and impressions of the communities towards the GBRMP. These were gathered as a participant observer interacting with a core of informants.

My field work at Lockhart occurred immediately prior to the implementation of the Far Northern Section Zoning Plan (February, 1985). At that time, few people had any notion of what the Marine Park's purposes were or what the zoning was about. All that most

Aborigines (apart from some Council members) knew about the Marine Park, were rumours about restrictions on dugong hunting at Hopevale. Whenever that topic came up in conversation, they usually said such controls would be ignored at Lockhart River, because dugong is their 'proper' food (i.e. traditional).

There are basically three areas which still appeared to require elaboration in these communities: (a) the need for the Marine Park; (b) its purposes and uses; and (c) its relevance to the communities.

Management authorities must realise that specific management problems within an Aboriginal community, such as dugong hunting, cannot be considered in isolation from other management problems that directly or indirectly affect that community. For example, the problem of prawn trawlers working at night within the area closed to trawling between Cape Bedford and Murray Point (Marine National Park 'A' Zone - see Fig. 3.1) has caused a certain amount of resentment within the Hopevale community. It appears to the Hopevale people that the GBRMPA/QNPWS were imposing restrictions on their activities (e.g. dugong permits) and enforcing them (e.g. ranger presence January 1984; aerial surveillance; follow-up visits by GBRMPA/QNPWS staff), whilst the trawlers continued to illegally work undisturbed. The people of Hopevale saw this as a double-standard being applied.

Lockhart Aborigines blame the trawlers[7] for any perceived (real or otherwise) decrease in marine resources. The restrictions on Queensland east coast prawn trawling during the wet seasons since late 1984, have helped reduce the complaints against trawlers to some extent due to the noticable absence of

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[7] At Lockhart, the term 'trawler' often encompassed both trawlers and gill-net fishermen.

trawlers during those months.

Management must be accompanied by culturally appropriate education and extension programmes, especially when the initiatives are complex, such as in the GBRMP zoning. For example, there were problems resulting from the Marine Park boundaries not following the shore line, nor coinciding with the Aboriginal division of the seascape (see 5.1). I had difficulty answering questions from Hopevale dugong hunters as to why they could catch dugongs without permit restrictions in one area (as happened in two cases in 1985), when a short distance away a restrictive permit was required to do exactly the same thing.

Also, the difference in jurisdiction between GBRMPA/QNPWS and Queensland Fisheries[8] caused confusion. At times GBRMPA/QNPWS has been blamed for not controlling illegal netting activities in rivers such as the McIvor and the Starcke, which are not within the GBRMP.[9]

It is inappropriate to go to considerable effort to make management systems culturally acceptable if they are not adequately explained to the user groups.

7.4.2 The Need for a Management Strategy

It was evident from the problems I encountered at Hopevale, which were not repeated at Lockhart River, that a strategy needs to be developed to avoid similar situations from occurring in other communities. It is important to note that each Aboriginal

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[8] Responsible for enforcement of fisheries regulations.
[9] GBRMP boundaries reach only to the low water mark and across river and creek mouths; therefore estuaries are not within the GBRMP; although they will be in the proposed State Marine Park.

community is unique in its knowledge, history of interaction with Europeans, and the role of marine resources, both economically and culturally. Therefore, what works in one community may not be transferable to another. For example, both Hopevale and Lockhart River are adjacent to similar marine habitats, but the knowledge and methods of utilisation by the two communities vary.

The major source of problems at Hopevale was not the restrictions *per se*, but the way in which they were implemented. This stemmed largely from communication problems between the GBRMPA and the Aboriginal Council (and also between the Council and the community), despite the Authority adopting a greater than normal level of consultation.

Ideally, the best way to mitigate this type of communication problem in Aboriginal communities, would be to use 'cultural brokers' living within the community for an extended period. Goodenough (1976:18) argues that:

> "If planners want information on the aspects of a culture that are relevant to their planning, either they must consult anthropologists who have already acquired expertise in the culture in question or they must turn to bicultural nonanthropologists, to persons who can deal with the planners in the planners' terms and who, at the same time, are competent in the other culture. Most of these persons grow up with that other culture and, through later, formal education and job experience, acquire competence in the planners' culture....In practice, however, planners are hesitant to use this resource for serious, as distinct from token, consultation, especially at the policy-making level. They are more likely to use them to help

implement policies and plans already decided upon..."

What would be required is a skilled liaison person, preferably Aboriginal[10], able to translate the requirements of the Authority to Aboriginal communities, and explain and interpret the feelings of the community to the Authority. He/she would need to be familiar with living, working and communicating with Aborigines. Maximum use should also be made of researchers, such as anthropologists and linguists, who have previously worked in those communities, although work commitments may prevent them from doing the work themselves.

As there is rarely enough time nor money for extended research, briefer periods of two to three months can still provide considerable information of benefit to management authorities. One briefer stay may prevent problems developing which could take months or years to overcome, such as occurred with Hopevale's dugong permits.

It would be inappropriate here to recommend specific management procedures within the general framework I have suggested, due to the diversity of resources and the variation between communities. In summary, however, I would suggest the following general procedures be considered by management authorities when preparing proposals for management or education/extension programmes in Aboriginal communities[11]:

- Prior to implementing new management strategies which directly affect Aboriginal communities, I suggest that an appropriately trained person spend as much time as feasible in

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[10] As most Aboriginal fishing and hunting that occurs within the GBRMP are male activities, the liaison person would need to be male; however, it may be necessary to employ a female liaison person as well in some situations.

[11] The specific recommendations for the GBRMPA directed at the management of marine resources used by Aborigines in areas of the GBRMP adjacent to the Trust Areas are included in Appendix 3.

that community to discuss and assess any potential problems. This could have alleviated a number of the problems which occurred at Hopevale (see 7.2.5). Brief meetings are insufficient and inappropriate to gain a basic understanding of potential problems, as was demonstrated with Hopevale;

- Researchers working on non-management related projects, or indirectly on management projects, need to be able to disassociate themselves from management authorities to alleviate one possible cause of communication problems. Misidentification and association with enforcement agencies can hinder the development of a rapport with potential informants (see 2.5);

- The use of Aborigines, for example as Rangers and Liaison Officers, may alleviate a number of communication problems. The training of Aboriginal rangers has been discussed in detail in Smyth, *et al* (1986);

- When consulting with Aboriginal communities, continuity of personnel is essential for a rapport to develop and be maintained;

- Aborigines from the community concerned need to be encouraged to participate in the development of any public education or management programmes. In addition, the management authorities need to have the capacity to respond to demands by Aborigines who want to assume a greater role in developing and administering management policies;

- If western-style management systems need to be imposed on Aboriginal hunters and fishermen, then education/extension programmes need to be tailored to suit each community situation;

- Inappropriate management restrictions need to be avoided. For example, restrictions on the taking of female dugongs with calves, although biologically desirable, would be totally

unenforceable. What is or is not achievable should be ascertained prior to implementation. If unpopular restrictions have to be applied, the management authorities must have the means and will to enforce those restrictions.

Where marine resource management involves Aboriginal communities, the normal Western bureaucratic methods of consultation may not be enough. There needs to be a philosophy or concept of 'appropriate management', used in the sense that the term 'appropriate technology'[12] is. An overall management system is required, capable of covering all eventualities, and yet flexible enough to be adaptable to each community concerned. If this can be done within a common framework as in the GBRMP, it is likely to be more acceptable to the communities concerned as well as being administratively easier. The management of a resource exploited by people with a different cultural perception of that resource, can successfully occur (as appears to be currently happening at Hopevale) when the authorities concerned are willing to demonstrate flexibility and adaptability in their management programmes.

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[12] 'Appropriate technology': "...any technology that makes the most economical use of a country's natural resources and its relative proportions of capital, labour and skills, and that furthers national and social goals... [It] must be technically sound, economical to users and customers in comparison with the available alternatives, and socially acceptable in the light of local culture and traditions." (Harrison, 1983:140-141).

8.0 CONCLUSIONS

This thesis has considered the role of contemporary Aboriginal marine ethnobiological knowledge and practices in Western biology and resource management. In determining to what extent marine ethnobiological studies, like that carried out in Palau by Johannes, are applicable to Australian coastal Aborigines, I found that there needs to be a distinction made between ethnobiological studies aimed at furthering biological knowledge, and those orientated towards resource management.

This division has many similarities with that between 'classical' and 'applied' anthropology, especially in relation to policy and management decisions. The major need for this distinction arises in deciding the research strategy to be used. In my work at Hopevale and Lockhart River I attempted to cover both areas: acquire general marine biological information, as well as consider the specific objective of determining management strategies for Aboriginal hunting of dugongs and turtles within the GBRMP.

In acquiring biological information, I feel the greatest value of Aboriginal marine knowledge to biologists would not be through generalised studies in single communities, but by concentrating on particular topics, acquiring comparative ethnobiological information, in collaboration with anthropologists, from a number of communities, and combining this with conventional biological research techniques. However, there can be no set formula applicable to all situations. The objectives of the study, and the nature of the Aboriginal communities, need to be assessed and the appropriate strategy, or compromise in strategy, applied. In assessing each situation the

effects of the research strategies on the people who own the knowledge must be considered and their wishes incorporated.

In comparison to the marine biological information Johannes acquired in Palau, the information obtained from Hopevale and Lockhart River lacked detail. To account for these differences I have employed Goodenough's notion of the culture pool and identified factors influencing Aboriginal marine environmental knowledge. In considering these factors I have developed the concept of a continuum of ethnobiological knowledge. If this continuum is simplified and the extremes compared, then some generalisations can be drawn. At one extreme would be areas with a narrow resource base, such as atolls, with small populations, dependent on the marine environment for a large proportion of their protein source. In that situation, marine ethnobiological knowledge would tend to be the province of specialists, and the usage of those resources would tend to be deterministic due to the considerable dependency on those resources. At the other extreme would be areas with a broad resource base, such as mainland areas, with larger populations, and alternative protein sources to the sea. Here the distribution of marine ethnobiological knowledge within a community tends to be more general, and those resources more opportunistically exploited.

This concept has a practical application in marine ethnobiological studies. The obvious diversity of information levels and quality in different communities/societies, and the factors influencing that knowledge, should greatly influence the way in which ethnobiological studies be carried out. Careful consideration of the objectives of management orientated ethnobiological studies is required prior to deciding upon the appropriate research strategy. Ethnobiological knowledge is not a

static entity, therefore, whatever is recorded represents that community's marine knowledge at that point in time. This has important consequences for management programmes attempting to incorporate traditional Aboriginal knowledge.

With applied ethnobiological studies it is unsatisfactory to merely provide results and recommendations and leave the responsibility of decision-making to others. It is essential that recommendations be followed through as far as possible.

From the problems experienced by the GBRMPA with the management of Aboriginal dugong hunting at Hopevale, it was obvious that the anecdotal and qualitative information on which the original planning and management decisions were based was inadequate for effective management. When faced with the problem of management of traditionally exploited resources based on meagre biological information and no actual catch statistics, management authorities need to decide whether or not it is possible to postpone management initiatives until further research is carried out. If it is felt that based upon the available data, restrictions need to be imposed, then management regulations must have the capacity to be flexible in order to incorporate new research findings. In such situations, the initial attempts at management must be accompanied by culturally appropriate education and extension programmes. Additionally, there needs to be constant feedback, preferably through Aboriginal monitoring, of the current situation. The relevant management agency also needs to have the capacity to respond to increasing demands from Aboriginal hunters or fishermen who want to assume a more active role in both developing and administering management policies.

The management of a resource exploited by people with a

different cultural perception of that resource, can successfully occur (as appears to be currently happening at Hopevale and Lockhart River) when the authorities concerned are willing to demonstrate flexibility and adaptability in their management programmes.

9.0 APPENDICES

9.1 Appendix 1

Great Barrier Reef Marine Park Authority: Goal, Aims, Functions and Park Management. (From GBRMPA Annual Report, 1984-85)

The Great Barrier Reef Marine Park Authority, which was established under the Great Barrier Reef Marine Park Act 1975, is a Commonwealth statutory body consisting of a full-time chairman and two part-time members, one of whom is nominated by the Queensland Government.

The Authority has adopted a statement of its goal and aims which has been derived from and is consistent with the objects, functions and powers specified in the Act.

1. GOAL
   To provide for the protection, wise use, appreciation and enjoyment of the Great Barrier Reef in perpetuity through the development and care of the Great Barrier Reef Marine Park.

2. AIMS
   These aims are subordinate to the primary goal and must be read in conjunction with it and with each other.

   2.1 Social
   - To involve the community meaningfully in the establishment and management of the Marine Park.
   - To minimise regulation of, and interference in, human activities, consistent with meeting the goal and other aims of the Authority.
   - To achieve management of the Marine Park primarily through the community's understanding and acceptance of the provisions of zoning, regulations and management practices.
   - To achieve competence and fairness in the development and care of the Marine Park through the deliberate acquisition and use of relevant scientific and non-scientific information and techniques in decision-making and other activities.

   2.2 Environmental
   - To provide for the protection of the natural features of the Reef, whilst providing for multiple use of the Reef's resources.

   2.3 Economic
   - To minimise costs of developing and caring for the Marine Park consistent with meeting the goal and other aims of the Authority.
   - To provide for development compatible with the conservation of the Reef's natural resources.
   - To minimise inhibitions on economic activities consistent with meeting the goal and other aims of the Authority.

2.4 General
- To adapt the Marine Park and the operations of the Authority to changing circumstances.

The functions of the Authority, defined in Section 7 of the Act as amended in November 1983, are as follows:

"(a) to make recommendations to the Minister in relation to the care and development of the Marine Park including recommendations, from time to time, as to -
(i) the areas that should be declared to be parts of the Marine Park; and
(ii) the regulations that should be made under this Act;

(b) to carry out, by itself or in co-operation with other institutions and persons, and to arrange for any other institutions or persons to carry out, research and investigations relevant to the Marine Park;

(c) to prepare zoning plans for the Marine Park in accordance with Part V;

(ca) to furnish information and advice to the Minister in respect of matters relating to the Marine Park, including -
(i) information and advice in relation to any agreement (including any proposed agreement) between the Commonwealth and Queensland on such matters;
(ii) information and advice on the following matters:
(A) whether the Commonwealth should grant financial assistance to Queensland in respect of a matter relating to the Marine Park;
(B) the amount and allocation of such assistance;
(C) the terms and conditions (if any) on which such assistance should be granted; and
(iii) information and advice on the following matters:
(A) whether it is desirable that Queensland should make payment to the Authority in respect of a matter relating to the Marine Park;
(B) the amount and allocation of such payment;
(C) the terms and conditions (if any) on which such payment should be given;

(cb) to receive and disburse moneys appropriated by Parliament for payment to the Authority for the purpose of payment of the moneys to Queensland by way of financial assistance to Queensland in respect of matters that relate to the Marine Park;

(cc) to receive and disburse moneys paid to the Authority by Queensland under an agreement between -
(i) the Commonwealth and Queensland;
(ii) Queensland and the Authority; or
(iii) the Commonwealth, Queensland and the Authority;

(d) such functions relating to the Marine Park as are provided for by the regulations; and

(e) to do anything incidental or conducive to the performance of any of the foregoing functions."

Amendments to the Act in June 1985 include changes to Section 7:

"(cd) to provide, and arrange for the provision of, educational, advisory and informational services relating to the Marine Park;

(1B) The Authority is responsible for the management of the Marine Park."

Park Management:

The Great Barrier Reef Marine Park Authority has ultimate responsibility for all aspects of the Marine Park. The Authority is responsible for the development of management planning, policy and guidelines, and general oversight of Marine Park management.

The Queensland National Parks and Wildlife Service (QNPWS) is the principal agency responsible to the Authority for day-to-day management of the Marine Park. Other agencies with ancillary responsibilities for day-to-day management are the Queensland Boating and Fisheries Patrol, the Federal Police and the Federal Sea Safety and Surveillance Centre.

Zones:

For the purposes of the Act, the Marine Park is divided into the following zones:

- General Use 'A' Zone;
- General Use 'B' Zone;
- Marine National Park 'A' Zone;
- Marine National Park Buffer Zone;
- Marine National Park 'B' Zone;
- Scientific Research Zone;
- Preservation Zone.

The objectives of each zone are outlined below:

(i) General Use 'A' Zone:
(a) to provide opportunities for reasonable use consistent with the conservation of the Great Barrier Reef; and
(b) to provide for Replenishment Areas where collecting and fishing other than trolling are prohibited for limited periods to enable resource stocks to regenerate.

(ii) General Use 'B' Zone:
(a) to provide opportunities for reasonable use consistent with the conservation of the Great Barrier Reef free from the effects of trawling;
(b) to provide for Replenishment Areas as in (i-b) above;
(c) to provide Seasonal Closure Areas to protect from human intrusion some areas of importance to the breeding of some animals in the Marine Park; and
(d) to provide for Shipping Areas through which ships may pass.

(iii) Marine National Park 'A' Zone:
(a) to provide for the protection of the natural resources of the area while allowing the following uses:
- recreational activities;
- limited fishing and permitted traditional fishing, hunting and gathering; and
- permitted research; and
(b) to provide for Shipping Areas through which ships may pass.

(iv) Marine National Park Buffer Zone:
(a) to provide for the protection of the natural resources of some reefs while allowing the public to appreciate and enjoy the relatively undisturbed nature of those reefs;
(b) to provide for trolling for pelagic species; and
(c) to provide for Shipping Areas through which ships may pass.

(v) Marine National Park 'B' Zone:
(a) to provide for the protection of the natural resources of the area while allowing the public to appreciate and enjoy the relatively undisturbed nature of the area;
(b) to provide for Shipping Areas through which ships may pass; and
(c) to provide for Seasonal Closure Areas to protect from human intrusion some areas of importance to the breeding of some animals in the Marine Park.

(vi) Scientific Research Zone:
(a) to provide an area where permitted research can be carried out free from the influences of recreational activities, fishing (other than permitted traditional fishing, hunting and gathering) and collecting.

(vii) Preservation Zone:
(a) to preserve areas of the Great Barrier Reef in their natural state undisturbed by man except for the purposes of scientific research.

9.2 Appendix 2

Phonology Used for *Guugu Yimidhirr* in this Thesis.

The following excerpt from Haviland (1979b:171) briefly outlines the phonology used in this report: ***Guugu Yimidhirr*** "...has only three vowels, ***a***, ***i***, and ***u***, although long vowels (here written doubled) differ from short ones...[It] also uses a number of sounds, called "laminals", produced with the blade of the tongue; the sounds represented as ***dh*** and ***nh*** are produced by pushing the tongue against the back of the front teeth so that it almost protrudes (***dh*** sounds a bit like the ***th*** in ***there***; ***nh*** sounds like an ***n*** pronounced with the tongue in the same position). The sounds ***dy*** and ***ny*** result from putting the tongue against the roof of the mouth and sounds something like the ***j*** of ***judge*** or the ***ny*** of ***canyon***. There is also a difference between the "flap" or "trilled" ***rr*** and the single ***r*** which resembles the ***r*** of ***rat***, with the tongue curled...The ***ng*** sound of ***Guugu Yimidhirr*** is like the ***ng***'s of ***singing*** (and not like the ***ng*** of ***finger***, which would be written...with two ***g***'s, as ***ngg***)...There are no "fricative" sounds like English ***s***, ***z***, ***f***, or ***v***, and, finally, that there is no contrast...between voiced and unvoiced consonants: ***b*** sometimes sounds like ***p***, or ***d*** like ***t***."

9.3 Appendix 3

A summary of the species recognised by Hopevale people: their uses, means of capture, and basic ethnobiologicl information

SCIENTIFIC NAME	COMMON NAME	GUUGU YIMIDHIRR NAME	ID	GENERIC	USAGE	PREFER. *	POISON.	HIST. USED	CURR. USED	CAPTURE METHOD *	OCCUR.	HABITAT *
** Coelenterates												
Cryptodendrum adhaesivum	sea anemone	gudyaawu	Y		food	1		yes	yes	c	present	b
Alcyonacea	soft corals	milga-gudyaawunganh	Y	generic								rf
Hydrozoa	stinging hydroid	midyi-midyi / ngan.ga-burriwi	N	generic								rf
Medusozoa	jellyfish	guliil	Y	generic			yes					
Scleractinia	coral	dagarranggal	Y	generic								rf
Scleractinia	reef / coral reef	dhagaar / gaabu	Y	generic								rf
Scleratinia	coral reef	muulaarr	Y	generic								rf
** Crustaceans												
	"rock crab"	muguburrburr	N		bait	1		yes	yes	s	present	rk
Clibanarius spp	hermit crab	ngaarrunh	Y	generic	bait	h		yes	yes	c	common	m
Natantia	prawns / shrimps	yulnggurr	Y	generic	food / bait	h		?	yes	n	common	b
Ocypode ceratophthalmus	ghost crab	wandun	Y		bait	1		yes	yes	s	common	b
Panulirus ornatus	coral crayfish	yilnggurr	Y	generic	food	h		yes	yes	s	present	rf
Portunus pelagicus	sand crab	dyiibi / yiibi	Y		food	h		yes	yes	s	present	b
Scylla serrata	mud crab	waan	Y		food	h		yes	yes	s	present	m,b
** Echinoderms												
Asterozoa	starfish	dawaar	Y	generic								
Echinoidea	sea urchin	binga-binga	N		food	1		yes	yes	d	present	b,rk
Echinoidea	sea urchin	gami-guuluumun	N									rk
Holothurioidea	beche-de-mer -("roughback")	dhanga-dhanga	N		other			yes	no	d	present	b,c
Holothurioidea	beche-de-mer	dyaanydyi	Y	generic	other			yes	no	c,d	common	b,c,rf
Bohadschia argus	beche-de-mer - (tiger fish)	gudaa-gulidhirr	N		other			yes	no	c,d	present	
Stomopneustes variolaris	sea urchin	guuluu	Y		food	m		yes	yes	c	common	rk
Temnopleurus toreumaticus	sea urchin	binga-binga-ngalan	Y								present	b
** Elasmobranchs												
Carcharhinus spallanzani	black-tip shark	guliman	Y		food	m		yes	yes	n,l	present	c,rf
Chondrichthys	sharks - large	ngamu	Y	generic				?	no		present	c,rf,r
Chondrichthys	shark sp	nhumba	N					?	no		present	c
Chondrichthys	shark sp - small	yawu	N		?food			?	yes	n,l	rare	c
Chondrichthys	sharks - small	yugnan	Y	generic	food	m		yes	yes	n,l	common	c,r
Lamniformes?	"estuary shark"	burruunh-burruunh	N					?	no		present	r
Orectolobus spp	wobbegong	galga-nambarr	Y	generic				?	no		rare	rf
Pristis zijsron	green sawfish	yubadhi	Y		?food / other	1		?	yes	n	present	c
Scyliorhinidae?	catshark?	biriyubadyi	N					?	no		rare	c
Sphyrna lewini?	hammerhead shark?	walaaynggurr	N					no	no		present	c
Aetobatus narinari	spotted eagle-ray	walbuulbul	Y		food	m		yes	yes	s	present	c
Amphotistius kuhlii	blue-spotted stingray	milmiinh	Y		bait	1		?	yes	s	common	b,rf
Dasyatis sephen	cowtail ray	gundurru	Y		food	h		yes	yes	s	common	b
Himantura granulata	mangrove ray	yalnganydyi	Y		food	h		yes	yes	s	common	b
Himantura uarnak	long-tailed ray	yidi	Y		food	h		yes	yes	s	present	b
Manta spp / Mobula spp	manta / devil rays	walmbaar	Y	generic				?	no		rare	c
Rajiformes	stingray sp	baldhaarru	N		?			?	no		rare	?
Rajiformes	stingray sp	dhulmbadhi / dhulmbadyi	N		food	m		yes	yes	s	rare	b
Rajiformes	stingray sp	gurraana	N					?	no		rare	?
Rajiformes	stingray sp	gurraynydyi	N		food	m		yes	yes	s	?	?

SCIENTIFIC NAME	COMMON NAME	GUUGU YIMIDHIRR NAME	ID	GENERIC	USAGE	PREFER.	POISON.	HIST. USED	CURR. USED	CAPTURE METHOD	OCCUR.	HABITAT
Rhinobatos batillum	common shovelnosed ray	waramarradhirr	Y		bait / food	1		yes	yes	s	common	b
Rhynchobatus djiddensis	white-spotted shovelnoseray	mirbuy	Y		bait / food	1		yes	yes	s	present	b
Taeniura lymma	blue-spotted fantail ray	yilinggan	Y					no	no		present	b,rf
Urogymnus asperrimus	thorny ray	nhiirriil	Y		food	h		yes	yes	s	present	b
** Flora												
?	seagrass	ngan.ga	N		food	1		yes	yes	c	present	b
Algae	seaweed	gaarruul	Y	generic	other			yes	yes	c	present	rk
Enhalus acoroides	seagrass	waban	Y		food	1		yes	yes	c	present	b
Oscillatoria sp	blue-green algal bloom	yumu	Y	generic								
** Mammals												
Cetacea	dolphins	wurruuyga	Y	generic				no	no		present	c
Cetacea	whales	yalmbunydya	Y	generic				no	no		v.rare	c
Dugong dugon	dugong	girrbadhi	Y		food / other	h		yes	yes	h	present	c
** Molluscs												
?	shell sp	baabaa	N								?	?
?	shell sp	dhun.gala	N								?	?
?	shell sp	diirril	N								?	?
?	shell	girbu	N								?	?
?	"punch shell"	gumuy	N								?	?
(Thersites bipartita?)	shell	guna	N		?			?			?	?
Anadara secticostata	mussel	wugu	Y								?	?
Asaphis violascens	shell	gayiil-ngarraa	Y		bait	h		yes	yes	c	present	rk
Batissa violacea	mussel	dhuwan-ga	Y		food	h		yes	yes	c	present	ck
Bivalvia	mussel	dyulgay	N								?	?
Bivalvia	mussel	gunmun	N									
Bivalvia	mussel	madun	N									rk
Bivalvia	shell	midhuur / midyuur	N									
Bivalvia	"hairy mussel"	nganhdhaar	N									
Cassidae	helmet shell	gayimugu	N									
Cellana conciliata +	limpets	wadhulnggan	Y	generic							c	rk
Coleoidea	squid / cuttlefish	yirni / yini	Y	generic							present	c
Fimbria fimbriata?	basket shell	dhinburr	N		other			yes	no	c	rare	rf
Gastropoda	shell sp	dhabiguy	N					?				
Haliotis ovina	sheep's ear shell	ganawun.gan	Y					yes	no	c	present	rk
Lambis spp	spider shells	manigay	Y	generic								
Liolopleura queenslandica	chiton	wurrul	Y	generic	food			yes	no	c	common	rk
Melo amphora	baler shell	dhigay	Y		food / other			yes	no	c	present	b
Monodonta labio	top shell	baaydyin	Y					?				
Nautilus pompilius	nautilus	dhilngaarr	Y		other	m		yes	yes	c	present	b
Nerita costata	ribbed nerite	mugu-bina	Y		bait	1		yes	yes	c	common	rk
Octopoda	octopus	gurriidha	Y	generic								
Ostreidae	oyster	margu	Y	generic	food	h		yes	yes	c	present	rk,m
Pinctada margaritifera +	pearl shell	walubuy	Y	generic	other			yes	no	d		
Pinnidae	razor shell	gungimbarr	N									
Polymesoda coaxans	saltwater mussel	ngulumugu	Y		food	m		yes	yes	c	present	m
Pteriidae	pearl shell	biida	N		other			yes	?	c	present	b

SCIENTIFIC NAME	COMMON NAME	GUUGU YIMIDHIRR NAME	ID	GENERIC	USAGE	PREFER.	POISON.	HIST. USED	CURR. USED	CAPTURE METHOD	OCCUR.	HABITAT
Pteriidae	pearl shell	bugaarr	N					?			present	b
Saccostrea commercialis	oyster - large	baaman	Y		food	h		yes	yes	c	present	rk,m
Saccostrea spp	oyster - small	dhunhi / dyunhi	Y	generic	food	l		yes	yes	c	common	rk
Syrinx aruanus?	false trumpet shell	dhunydyuun	N		food / other			yes	no	c,d	present	b,c,rf
Telescopium telescopium	telescope mud creeper	waadhul	Y		food / other	l		yes	no	c	common	m
Terebralia sp		miirra / waadhul	N					?			present	m
Terebralia sulcata		dhagalgal	Y		?			yes	no	c	common	m
Thais luteostoma	muddy thaid	wandii(garr)	Y		food / bait			yes	no	c	common	rk
Tridacna gigas	giant clam	gaadhaarrbi	Y		food			yes	no	c,d	present	rf
Tridacna spp	clams - small	munhdhi	Y	generic	food	l		yes	no	c,d	present	rf
Trochus niloticus	trochus	dhubi / dyubi	Y		other			yes	no	c,d	present	rf
Turbo cinereus	squat turban	dharaa	Y		food			yes	no	c	common	rk
Turbo sp		dhuyuguy	N								?	
** Reptiles												
Caretta caretta	loggerhead turtle	gaarraadhal	Y		?food	l		yes	no	h	present	c
Chelonia mydas	green turtle	ngawiya	Y		food / other	h		yes	yes	h,b	common	c,rf
Eretmochelys imbricata	hawksbill turtle	yalnga	Y		other / food	m	yes	yes	yes	h,b	present	rf
Lepidochelys olivacea?	Pacific Ridley turtle?	gumbuudhaga	N					no	no		v.rare	c
Natattor depressa	flat-back turtle	dagu-balay	Y					no	no		rare	c
Crocodylus johnstoni	freshwater crocodile	dhanhdhidhirr	Y					?	no		rare	r
Crocodylus porosus	saltwater crocodile	ganhaarr	Y		other			yes	no	s	present	r,cr,m
Hydrophiidae	seasnakes	yuuraay	Y	generic			yes	no	no		present	c,rf
** Teleosts												
Acanthopagrus berda	pikey bream	barrbal	Y		food / bait	h		yes	yes	l,s,n	common	r,ck
Acanthurus spp	surgeon-fish	yarragul / yarrguldyi	Y	generic	?food			?	?		present	rf
Agrioposphyraena barracuda	barracuda	gulgaan(h)	Y		?food			?	yes	s,n	present	b,c
Amniataba caudavittatus	yellow-tailed perch	marrul	Y		food / bait	m		?	yes	l	present	r,ck
Anguilla sp	freshwater eel	biganh	N		?food / ?bait			?	yes	l	present	ck,r
Anguillidae	saltwater eel	dindurr	N					?	yes	l	present	r,ck
Anguillidae	freshwater eel sp	wanguyngga	N									ck
Ariidae	catfish	dambiilnggan / dhamiilnggarr	Y	generic								
Arothron hispidus	stars & stripes toadfish	ganadyi	Y				yes				present	g
Arothron immaculatus	narrow-lined toadfish	wuyumbi	Y				yes				common	b,rk
Belonidae	long-toms	budhiil-galbay	Y	generic	bait			?	yes	n,s	present	b,c
Carangidae	trevally sp	dhaawugadhi	N		food	m		?	yes	n,s,l	present	b,c
Carangidae	trevally / dart	dhamalga	N		?						rare	c
Caranx sansun	papuan trevally	wadhan	Y		food	m		?	yes	l,s,n	present	b,c
Caranx sexfasciatus	great trevally	bila-bila	N		food / bait	m		yes	yes	s,l	present	c
Chanos chanos	milkfish	buulga	Y		food	l		?	yes	s	present	b,c,rf
Choerodon albigena	blue tusk-fish	buudhuu	Y		food / bait	h		yes	yes	l	common	rk
Choerodon schoenleinii	black-spot tusk-fish	mugadyi	Y		food / bait	h		yes	yes	l	common	rk
Cromileptes altivelis	barramundi cod	dhagay	Y		food	h		?	yes	l	rare	rf
Dicotylichthys punctulatus	three-bar porcupine-fish	dingunh	Y				yes		no		present	b
Drepane punctata	sickle-fish	buunarr	N								?	?
Eleutheronema tetradactylum	Cooktown salmon	dhalbadyi	Y		food / bait	m		?	yes	l,n,s	present	b,c,r
Epinephelus lanceolatus	groper	nhinhinhi	Y		food / bait	m		yes	yes	l,s	present	r,ck
Epinephelus spp	cods	marrbaarrga	Y	generic	food / bait	m		yes	yes	l,s	common	rf,rk,r,ck

SCIENTIFIC NAME	COMMON NAME	GUUGU YIMIDHIRR NAME	ID	GENERIC	USAGE	PREFER.	POISON.	HIST. USED	CURR. USED	CAPTURE METHOD	OCCUR.	HABITAT
Epinephelus tauvina	estuary cod	marrbaarrga	Y		food / bait	m		yes	yes	l,s	present	r,ck
Eutherapon theraps	banded trumpeter	gundunrr-gundunrr	Y		food / bait	m		yes	yes	l	common	b,rk,ck
Euxiphipops sexstriatus	six banded angelfish	baban	Y					?	no		present	rf
Exocoetidae	garfish	yangandal	Y	generic	bait	m		?	yes	n	present	b,r
Gerres argyreus	Darnley Is. silverbelly	gaalbun	N		?food / bait			?	yes	n	present	b
Glossamia aprion aprion	mouth almighty	barrgaar-waalaal / dharral	Y					?			rare	r,ck
Gnathanodon speciosus	golden trevally	bunbaal	Y		food	h		yes	yes	s,n,l	present	b,c
Lates calcarifer	barramundi	murrabal	Y		food	h		yes	yes	n,l,s	present	b,ck,r
Leiopotherapon unicolor?	spangled perch?	wuyumadharr	N									ck
Lethrinus fletus	grass sweetlip	-	Y		food / bait	h		?	yes	l	present	b
Liza strongylocephalus	long-finned mullet	dhuraay-dhuraay	Y		bait			yes	yes	s	present	b,r
Liza vaigiensis	diamond-scaled mullet	nganhdha	Y		food / bait	h		yes	yes	s,n	common	b,r,ck
Liza vaigiensis	diamond-scaled mullet - juv	nhumba-nhumba	N		bait			?	yes	s,n	present	r,ck,b
Lutjanus argentimaculatus	red bream	dhalbu	Y		food / bait	h		yes	yes	l,s	common	m,b,ck
Lutjanus carponotatus	stripey	dhawiirrga / gawiirrga	Y		food / bait	m		yes	yes	l,s	common	rf,rk
Lutjanus russelli	moses perch	-	Y		food / bait	m		?	yes	l	present	rf,rk
Monodactylus argenteus	diamond fish	birra	Y		food / other	l		?	yes	l,n	present	cr,r
Mugil cephalus	sea mullet	miil-budhi-dhirr	Y		bait			?	yes	s,n	present	r,ck
Muraenesox cinereus	pike eel	yaalgaadyi	Y					yes	yes	l	present	ck,r
Muraenidae	reef eels	nhiwa	Y	generic				?	?		present	rf
Myxus elongatus?	sand mullet?	gadhabarra	N		bait			yes	yes	s,n	present	b,r
Naso unicornis	brown unicorn fish	baabundyi	Y					?	no		present	rf
Nematolosa come	bony bream	baydyiil	Y		bait			?	yes	n,s	common	b,c
Netuma thalassina	blue catfish	buumuruu	Y		food/bait/other	l		yes	yes	s,l	present	b,r,ck
Osteichthys	fish - small	birri	Y	generic	food / bait	m		yes	yes	n,l,s	common	g
Osteichthys	fish sp	dhalaba	N								?	?
Osteichthys	fish - small	dhilin	Y	generic	food / bait	m		?	yes	n	common	g
Osteichthys	fish sp	dhugabina	N								?	?
Osteichthys	reef fish sp	garriirrga	N		?food						present	rf
Osteichthys	fish	guudyu	Y	generic	food/bait/other							
Osteichthys	fish - [rare name]	guyu	Y	generic	food/bait/other							
Osteichthys	fish sp	mulan	N								?	?
Ostraciontidae spp	boxfish / cowfish	murran	Y	generic	food / ?bait	l		yes	?	s	present	rf,rk
Pelates quadrilineatus	trumpeter	muman	Y		food / bait	m		yes	yes	l	common	b,ck,m
Periophthalmus koelreuteri	mud-hopper	dhalil-dhalil	Y								common	m
Platycephalus spp	flatheads	nambaa	Y	generic	food / bait	m		?	yes	s,l	present	b,ck
Plectorhynchus schotaf	sombre sweetlip	gumundhirr	Y		food / bait	m			yes	l	present	rk
Plectropomus spp	coral trouts	dhawii	Y	generic	food	h		?	yes	l	present	rf
Plotosidae	freshwater catfish	galbi	N								p	ck
Plotosidae	catfish eels	madyigi	Y	generic	?food		yes				present	ck,r,b
Pomadasys spp	javelin-fish	guugu-dhirr	Y	generic	food / bait	h		yes	yes	l,s,n	common	ck,r
Psammoperca waigiensis	sand bass	gudiirrga	Y		food / bait	h		yes	yes	s,l,n	present	cr,r
Pseudobalistes flavimaginatus	green triggerfish	gambarr	N		food	l		?	yes	l,s	rare	rk
Pseudorhombus arsius	large-toothed flounder	naburr	Y		?food / bait	l		?	yes	s	present	b,ck
Pterois volitans	red firefish	mirrginbina	N				yes				present	rf,rk,r
Remora remora	sucker fish	yurin.gin	Y		?food			?	?		present	g
Scaridae	parrot fish	yugudyi	Y	generic							present	rf
Scatophagus argus	spotted butterfish	baladhan / buurrun /buurrunbul	Y		food / bait	m	yes	?	yes	s,l	present	b,c,r
Scomberoides commersonianus	queenfish	wananh	Y		food / bait	h		?	yes	n	present	b

SCIENTIFIC NAME	COMMON NAME	GUUGU YIMIDHIRR NAME	ID	GENERIC	USAGE	PREFER.	POISON.	HIST. USED	CURR. USED	CAPTURE METHOD	OCCUR.	HABITAT
Scombridae	mackerels	dhurrgubila	Y	generic	food	m		?	yes	l,s,n	present	c
Scombridae	tuna	gidyiga	Y	generic	food	l		?	?	l	present	c
Scorpaenidae	scorpion fish	dhungung	Y	generic			yes				present	rf,rk,r
Selenotoca multifasciata	butterfish	bangunhdhirr	Y		food / ?bait	m	yes	?	yes	s,l,n	present	c,b
Serranidae	cod sp	ganyarr	N		?food				yes	l	rare	rf,rk
Sillago spp	whiting	dyuugaarbina	Y	generic	food / bait	m		yes	yes	l,n,s	common	b
Siluriformes	catfish sp	muurraar	N		?food						rare	ck
Spheroides hamiltoni	toadfish	bulal	Y				yes	?	no		common	rf,b
Spheroides pleurostictus	banded toado	banhdhadyi	Y				yes	no	no		present	g
Sphyraena jello	slender barracuda	gaangga	Y		?food			yes	yes	n,s	present	c
Synanceia horrida	estuarine stonefish	dunun	Y				yes				present	b,m,r,ck,rk
Syngnathidae	pipe-fish	dhabulin	N								present	b
Tandanus tandanus	freshwater catfish	bigudhirr	Y		food	h		yes	yes	l	common	r,ck
Tetraodontidae	"toadfish"	mulaadyi	N		food	l		yes	?	l,s	v.rare	rk
Toxotes chatareus	archer fish	balngguga	Y		food / bait	m		yes	yes	s	common	r,ck
Trachinotus bailloni	black-spot dart	yurbina	N		?food				?		rare	c,b
Trachinotus russelli	dart	gulgi-maladhirr	Y		food / bait	m		?	yes	s,l,n	present	b,c
Trachinotus sp	dart	waalaal-waalaal	N		?food						?	?
Tripodichthys angustifrons	tripod fish	dhiimal	Y					?	yes	n	common	b
Valamugil seheli	blue-tailed mullet	gaalnggaan	Y		food / bait	h		yes	yes	s,n	common	r,b

Key

PREFER = PREFERENCE: l = low; m = medium; h = high

CAPTURE METHOD: h = harpoon; s = spear; n = net; c = collecting; l = line fishing; d = diving; b = "bull dogging" from boat; g = gun; sg = spear-gun

HABITAT = AREAS WHERE FISHERMEN SAY THEY ARE FOUND: r = river; rf = reef; rk = rocks; cr = creeks; c = coast/open water; b = beach/intertidal flats; m = mangroves; g = general distribution

9.4 Appendix 4

The following recommendations, submitted to the GBRMPA (Smith, 1987), are directed at the management of marine resources used by Aborigines in areas of the GBRMP adjacent to the Trust Areas.

1. ***The Authority should set up a formal consultative or coordinating committee for the consultation and direct participation of Hopevale and Lockhart River communities in the management of their marine resources, primarily dugongs, but with potential to include other species***

The committee should be set up to work within the already existent Aboriginal Community Council system, which is the major official Aboriginal decision-making body within the community. I suggest a possible Aboriginal marine resources management committee structure and method of functioning:

(a) The committee should consist of at *least* one current Aboriginal Council member, at *least* two other elected members from the community, plus one representative from GBRMPA/QNPWS.

(b) Selection of members could coincide with the present three-yearly council elections.

(c) The committee should meet at least twice a year. Official records of the discussions and decisions should be kept and made available to any community member.

(d) The committee's decisions should be subject to the principle of conservation.

(e) The committee, with as much assistance as they request (e.g. from Government Authorities, legal services, biologists, anthropologists, etc), should be responsible for reviewing the current management options, and make recommendations on possible adjustments.

(f) Any regulations or decisions relating directly to marine hunting proposed by GBRMPA/QNPWS should be submitted to the committee for advice before enactment.

(g) The committee should submit recommendations to the Chairman of the Authority, who should have ultimate discretion to act upon such recommendations. The committee should consider:

(i) regulations, guidelines and other measures relating to hunting;

(ii) conservation, including management procedures;

(iii) the levels of resource exploitation;

(iv) methods of acquisition;

(v) the uses of the resource;

(vi) research projects related to the resource;

(vii) enforcement of the regulations;

(viii) receiving, maintaining and distributing information necessary for proper management and education programmes;

(ix) receiving and reviewing information relating to research, studies, surveys and the data obtained from them.

(h) The committee should, in its operation, recognise and give consideration to:

(i) the exclusive rights of Aborigines in Trust Areas to hunt dugongs;

(ii) the principle of conservation;

(iii) the importance of the exchange of information between the parties;

(iv) the economic and social implications of its decisions and actions.

(i) The QNPWS should be responsible for the enforcement of breeches of any regulations.

The establishment of such a committee should be discussed with Community Councils, to assess its feasibility.

Aboriginal communities are currently not represented on the Great Barrier Reef Consultative Committee, and due to their isolation are not readily accessible to the normal public participation programmes such as television and newspapers. The proposed committee would allow Aboriginal users of the GBRMP greater input to the development and management of the Park.

The committee, if established, should not be a token gesture, it should have a key role in management of the resources they use.

It may take a number of years for the committee to become properly functional, however, by working within the familiar structure already established for Aboriginal Community Councils, a number of problems should be pre-empted.

This approach is in line with the Queensland State Government's policy for increasing the level of Aboriginal participation in matters affecting Aboriginal communities.

As other management problems arise, e.g. green turtles, then the committee should be designed to be able to address those problems. If necessary, it could also be extended to include fisheries problems, in which case an observer from Queensland Fisheries (DPI) may be invited to join.

If properly established, such a committee system would permit each community to be treated on an equal level, yet maintaining the ability to adapt to the often markedly different

management problems in each community.

2. *A representative from the east coast Cape York Peninsula Aboriginal communities should be appointed to the Great Barrier Reef Consultative Committee*

Aboriginal interests are currently not represented on the Great Barrier Reef Consultative Committee. The functions of the Committee, defined in Section 21 of the Great Barrier Reef Marine Park Act (1975) are as follows:

(a) to furnish advice to the Minister, either of its own motion or upon request made to it by the Minister, in respect of matters relating to the operation of this Act; and

(b) to furnish advice to the Authority in respect of matters relating to the Marine Park, including advice as to the areas that should be parts of the Marine Park, referred to it by the Authority.

The Committee membership is intended to represent a wide and varied cross-section of interests in the Great Barrier Reef. The Committee is at present the only major means by which user groups have a say in the management of the GBRMP. This Report has shown that Aborigines constitute a major user group of both the Cairns and Far Northern Sections of the GBRMP. Aborigines should therefore be represented on the Great Barrier Reef Consultative Committee and allowed to contribute to its stated functions.

3. *The imposition of any inappropriate or unenforceable restrictions should be avoided*

For example, restrictions on the taking of female dugongs with calves, although biologically desirable, would be totally unenforceable. The main result of such a restriction would not be a reduction in the take of females with calves, but the lack of any information on their take being accessible, i.e. the non-recording of these animals being taken. They would still be taken, both deliberately and accidentally, as they are a preferred target.

4. *GBRMPA/QNPWS should continue and expand their extension/education programmes in Aboriginal communities explaining the need for, purposes of, and effects of the Marine Park*

5. *The GBRMPA/QNPWS should take immediate steps to control illegal trawling activities in the Marine National Park 'A' Zone immediately north of Cape Bedford*

The trawlers, their perceived damage, and apparent immunity from restrictions are a sore point with Hopevale residents.

6. *That serious consideration be given to the potential problems of implementing management of turtle hunting*

7. *Aborigines should be employed as Liaison Officers and Rangers by GBRMPA/QNPWS to work in the Cairns and Far Northern Sections of the Park*

Preferably these people should be full-time employees (e.g. as QNPWS Rangers) selected from any of the east coast Cape York Peninsula Aboriginal communities. GBRMPA could also employ Aborigines on a contract basis as Liaison Officers to work with QNPWS Rangers and Officers in Aboriginal communities. Their roles and responsibilities could involve working with the committee (10.1) as an observer/adviser. Their presence could alleviate potential cultural misunderstandings. The training of Aboriginal Rangers has been discussed in detail in Smyth, *et al* (1986).

8. *Continuity of QNPWS Officers and Rangers should be maintained when working with an Aboriginal community*

Current QNPWS Officers and Rangers working with Aboriginal communities should be allowed to develop a working relationship with communities through continuity of personnel, and by adjusting their work committments to permit an extended stay in the community to allow them to become 'known'. One longer stay would allow better rapport to develop than a number of brief stays, although the total time in the community may be the same.

9. *The GBRMPA should undertake to support an anthropological study, or studies, in all the Aboriginal communities adjacent to the Marine Park, aimed at determining how the Aboriginal communities perceive the GBRMP; and to provide guidelines on how best the GBRMPA/QNPWS can present their aims and aspirations to those communities, so as to prevent confrontationist situations from developing*

This study's objectives and research design were not aimed at determining how the two Aboriginal communities perceive the GBRMP. Such a study, or studies, would be especially valuable in the other Aboriginal communities such as Palm Island and Yarrabah to avoid the problems that occurred at Hopevale. Such research could form the basis of a policy for interaction between the Authority and Aboriginal user groups of the GBRMP.

10. *The dugong hunting permit system be modified*[1] *as follows*

10.1 Hopevale:

- The areas presently used for hunting dugongs should be

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[1] This recommendation by Marsh and myself, has already been accepted and was trialled in January 1987.

declared as 'hunting areas'. These areas should not be a 'Zone', but could be declared through the 'Areas of Periodic Restricted Use' provisions or the community permit. This declaration would serve two functions: (i) the recognition of Aboriginal dugong hunting rights for the area, and (ii) prevention of expansion of hunting into other areas, should the means become available, until the status of the dugong population is determined.

The area for Hopevale hunters should be from Nob Point in the south to Murdoch Point in the north, and east to the 10m depth contour.

- Dugong hunting should be permitted via a dugong hunting permit issued to the Council for the whole community. The permit should stress that the whole carcass should be used, and that hunting should not utilise commercial freezer boats.

- There should be no quota applied to the community.

- The closed season should be retained, however, details of its duration and timing should be discussed with the Council. There should also be provision for the Council to apply for a special permit(s) to take dugong(s) for special *community* occasions (e.g. dance festivals).

- The QNPWS should attempt to maintain catch records for the community, perhaps via the Council.

- Provision should be made for the collection of dugong skulls, or at least the tusks, with any available capture information, by QNPWS and then forwarded to appropriate scientists for analysis. A pamphlet explaining the reasons for collecting skulls or tusks, including diagrams emphasising that female as well as male tusks need to be collected, should be given to all dugong hunters in the community.

- The management plan for dugong hunting at Hopevale should be reassessed at the time of the Cairns Section Zoning Plan review.

10.2 Lockhart River:

- The areas presently used for hunting dugong should be declared 'hunting areas'.

The area for Lockhart River hunters should be from First Red Rocky Point in the south to Bolt Head in the north, and east to the 10m depth contour.[2]

- Dugong hunting should be permitted via a dugong hunting permit issued to the Council for the whole community.

- No quotas should be applied to dugong hunting.

- No closed season should be applied at present, however

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[2] QNPWS Officers, after consultation with Lockhart Council, have suggested Bobart Point to Mosquito Point (Fig. 4.1); a slightly larger area than suggested above.

this should be the first restrictive option considered if required in the future.

- The QNPWS should attempt to maintain catch records for the community, perhaps via the Council.

- Provision should be made for the collection of dugong skulls, or at least the tusks, with any available capture information, by QNPWS and then forwarded to appropriate scientists for analysis.

- The outside take of dugong by Weipa/Bamaga Aborigines and Islanders in the Lockhart River area should also be controlled perhaps through the community permit. The hunting of dugongs by non-Lockhart Aborigines was not covered in this study. The situation may involve questions of resource ownership and the legal status to hunt (i.e. if not residents of Trust Areas).

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Table 3.2: A summary of the results for dugongs caught by Hopevale hunters (1984 - 1987) and Lockhart River hunters (Sept.-Dec. 1985).

DATE CAUGHT	SPEC. #	LOCATION CAUGHT	PERMIT	SEX	LGTH (m)	AGE EST. (yrs)	TUSK*	# PLACEN. SCARS	REPRODUCTIVE STATUS	COMMENTS
Hopevale:										
4/01/83	H013	nth of Starcke R.	N/A	M		33+	E*		adult	pre-GBRMP; voluntary data collection.
?	H014	found at Hunnocks	N/A	M		23+	E		adult	skull found 1/84; assumed taken 1/83.
?	H015	" " "	N/A	F?		18.5+	U		adult	as for H014.
?	H016	" " "	N/A	F?		18+	U		adult	" " "
7/01/84	H022	Murdoch Pt	Y	F	2.50	21	U		adult; parous; preg- with sml foetus; not lactating.	viscera samples for heavy metal analysis.
7/01/84	H021	Murdoch Pt	Y	M	2.65	21+	E		adult; active	" " "
10/01/84		Murdoch Pt	Y?	M						
10/01/84		Murdoch Pt	Y?	M						
13/01/84	H023	Hunnocks	Y	M		23+	E		adult	skull brought by hunter
15/01/84	H020	Murdoch Is	Y	F		36	U		adult	" " " "
15/01/84	H019	Murdoch Is	Y	M		24+	E		adult	" " " "
15/01/84		Murdoch Is	Y	M						
17/01/84	H017	Murdoch Is	?	M		15	U			" " " "
17/01/84	H018	Murdoch Is	Y?	F		46+	E		adult	" " " "
17/01/84		sth of Starcke R	Y	M						
21/01/84		Hunnocks	Y	M						
21/01/84		Hunnocks	?	M						
?/01/84			Y							caught, went bad due to motor breakdown
27/10/84		Starcke R. area	M							taken out of season
4/01/85	H008	sth of Hunnocks	Y	F	2.77	43	U	2	adult; recent birth; lactating	
4/01/85	H009	sth of Hunnocks	Y	F	2.42	19	U	2	adult; oestrus	
4/01/85	H010	sth of Hunnocks	Y	F	2.73	30	U	5	adult; lactating	
4/01/85	H011	sth of Hunnocks	Y	F	2.40	17	U	1	adult; resting	shark bite scar on head
4/01/85		sth of Hunnocks	Y	M						taken & tied to mangroves to be butchered in morning; 'lost'; seen dead few days later.
5/01/85	H004	sth of Hunnocks	Y	F		30			adult	head brought by hunter
5/01/85	H005	sth of Hunnocks	Y	F	2.37	18	U	1	adult; oestrus	
5/01/85	H006	sth of Hunnocks	Y	F	~2.72	23	U		adult; oestrus	body cut into 3: lgth est
5/01/85	H007	sth of Hunnocks	Y	F	~1.19	3.5	U		immature	body cut into 2: lgth est
12/01/85	H001	sth of Hunnocks	Y	F		18	U		adult	
12/01/85	H002	nth of Jeannie R	Y	F		64			adult	head brought by hunter
12/01/85	H003	sth of Hunnocks	Y	F		24	U		adult	" " " "
12/01/85	H026	North Sandhill	Y	M						
12/01/85	H027	Blackwater Ck	N/A	M		30+	E		adult	taken outside GBRMP area
19/01/85	H028	sth of Hunnocks	Y	F		46			adult	
19/01/85	H029	Hunnocks	Y	F		3.5	U		immature	
19/01/85	H030	Hunnocks	Y	F		36			adult	
19/01/85	H031	sth of Hunnocks	Y	M						
25/01/85	H032	nth of C.Flattery	N/A	M						taken outside GBRMP area

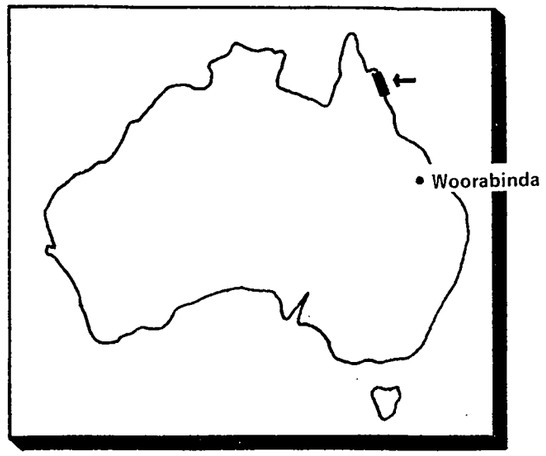
* E=erupted tusk; U=unerupted tusk

Table 2 (cont.):

DATE CAUGHT	SPEC. #	LOCATION CAUGHT	PERMIT	SEX	LGTH (m)	AGE EST. (yrs)	# PLACEN. TUSK SCARS	REPRODUCTIVE STATUS	COMMENTS
Hopevale (cont.):									
3/01/86	H050	sth of Hunnocks	Y	M	2.15	4.5	U	immature	
4/01/86	H051	Hunnocks	Y	M		5	U	immature	
5/01/86	H052	Hunnocks	Y	?					
5/01/86	H053	sth of Hunnocks	Y	F					
5/01/86	H054	sth of Hunnocks	Y	M					
10/01/86	H055	sth of Hunnocks	Y	F	2.57	25	U	adult	
10/01/86	H056	sth of Hunnocks	Y	F	2.45	24	U	adult	
10/01/86	H057	sth of Hunnocks	Y	F		63		adult	
10/01/86	H058	sth of Hunnocks	Y	M		17+	E	adult	
11/01/86	H059	Hunnocks	Y	F		43		adult	
18/01/86	H060	sth of Hunnocks	Y?	M					"small"
18/01/86	H062	sth of Hunnocks	Y	M					"young"
21/01/86	H061	Hunnocks	Y	F					"white scar on back"
29/12/86		Starcke R	Y	F					
31/12/86	L1	nth Lookout Pt	Y	F					tusk collected
31/12/86		Dead Dog Ck	Y	F					
2/01/87	H2	Hunnocks	Y	M					tusk collected
2/01/87		Hunnocks	Y	M					
3/01/87		nth Lookout Pt	Y	F					
3/01/87		Hunnocks	Y	M					
6/01/87	H1	Hunnocks	Y	M					tusk collected
6/01/87	S1	sth of Starcke R	Y	M					tusk collected
10/01/87	S3	sth of Starcke R	Y	M					tusk collected
10/01/87		sth of Starcke R	Y	M					
10/01/87		sth of Starcke R	Y	F					
10/01/87		Lookout Pt	Y	F					
10/01/87		Hunnocks	Y	M					
11/01/87	S4	sth of Starcke R	Y	M					tusk collected
11/01/87		sth of Starcke R	Y	F					
11/01/87		sth of Starcke R	Y	F					
11/01/87		sth of Starcke R	Y	F					
12/01/87		Starcke R	Y	F					
13/01/87		Starcke R	Y	M					
14/01/87	S2	sth of Starcke R	Y	M					tusk collected
14/01/87		Dead Dog Ck	Y	F					
14/01/87		Murdoch Is	Y	M					dugong in Coastwatch photo
14/01/87		Starcke R	Y	F					
14/01/87		Starcke R	Y	F					
14/01/87		Starcke R	Y	F					
17/01/87		sth of Starcke R	Y	F					

Table 2 (cont.):

DATE CAUGHT	SPEC. #	LOCATION CAUGHT	PERMIT	SEX	LGTH (m)	AGE EST. (yrs)	TUSK	# PLACEN. SCARS	REPRODUCTIVE STATUS	COMMENTS
Lockhart River:										
?	L040			F		22				skull only, "5 yrs old"
22/09/85			N/A	F					pregnant	taken prior to my arrival
22/09/85			"	?						" " " " "
27/09/85	L034	Red Rocky Pt	"	M		22+	E		adult	
8/10/85	L035	Cape Direction	"	M		5.5	U		immature	
8/10/85	L038	Cape Direction	"	F		19	U		adult	
11/10/85	L036	Cape Direction	"	F	2.60	23	U		adult; lactating	
15/10/85	L037	Red Rocky Pt	"	M	2.46	17+	E		adult	
20/10/85	L041	Cape Direction?	"	M		19+	E			rotting head only
26/10/85	L039	nth of Pascoe R	"	M						
26/10/85		nth of Pascoe R	"	?						caught by Weipa/Bamaga
26/10/85		nth of Pascoe R	"	?						Aborigines; 4-7 taken
26/10/85		nth of Pascoe R	"	?						" " "
26/10/85		nth of Pascoe R	"	?						" " "
19/11/85	L042	Mosquito Pt	"	F	2.77	46			adult; lactating	had small calf with it
30/11/85	L043	Red Rocky Pt	"	M						"young"
2/12/85	L044	Red Rocky Pt	"	F		44			adult	"had large calf with it"
3/12/85	L045	Red Rocky Pt	"	M	2.40	23+	E		adult	
3/12/85	L046	Red Rocky Pt	"	M	2.08					
4/12/85	L047	Red Rocky Pt	"	M		6.5	U		immature	
15/12/85	L048	Red Rocky Pt	"	M						
16/12/85	L049	mouth Claudie R	"	M		21+	E		adult	



	GENERAL USE		MARINE NATIONAL PARK			SCIENTIFIC RESEARCH ZONE (SRZ)	PRESERVATION ZONE (PZ)
	'A' Zone	'B' Zone	'A' Zone (MNPA)	Buffer Zone (BZ)	'B' Zone (MNPB)		
BOATING DIVING	YES	YES	YES	YES	YES	NO	NO
COLLECTING	PERMIT	PERMIT	NO	NO	NO	NO	NO
LINE FISHING	YES	YES	YES	NO	NO	NO	NO
BAIT NETTING	YES	YES	YES	NO	NO	NO	NO
TROLLING for pelagic spp.	YES	YES	YES	YES	NO	NO	NO
SPEARFISHING (no SCUBA)	YES	YES	NO	NO	NO	NO	NO
POLE & LINE TUNA FISHING	PERMIT	PERMIT	NO	NO	NO	NO	NO
TRAWLING	YES	NO	NO	NO	NO	NO	NO
CRUISE SHIPS	YES	PERMIT	PERMIT	PERMIT	PERMIT	NO	NO
GENERAL SHIPPING	YES	NO	NO	NO	NO	NO	NO
TRADITIONAL HUNTING	PERMIT	PERMIT	PERMIT	PERMIT	PERMIT	PERMIT	NO
TRADITIONAL FISHING	YES	YES	PERMIT	PERMIT	PERMIT	PERMIT	NO

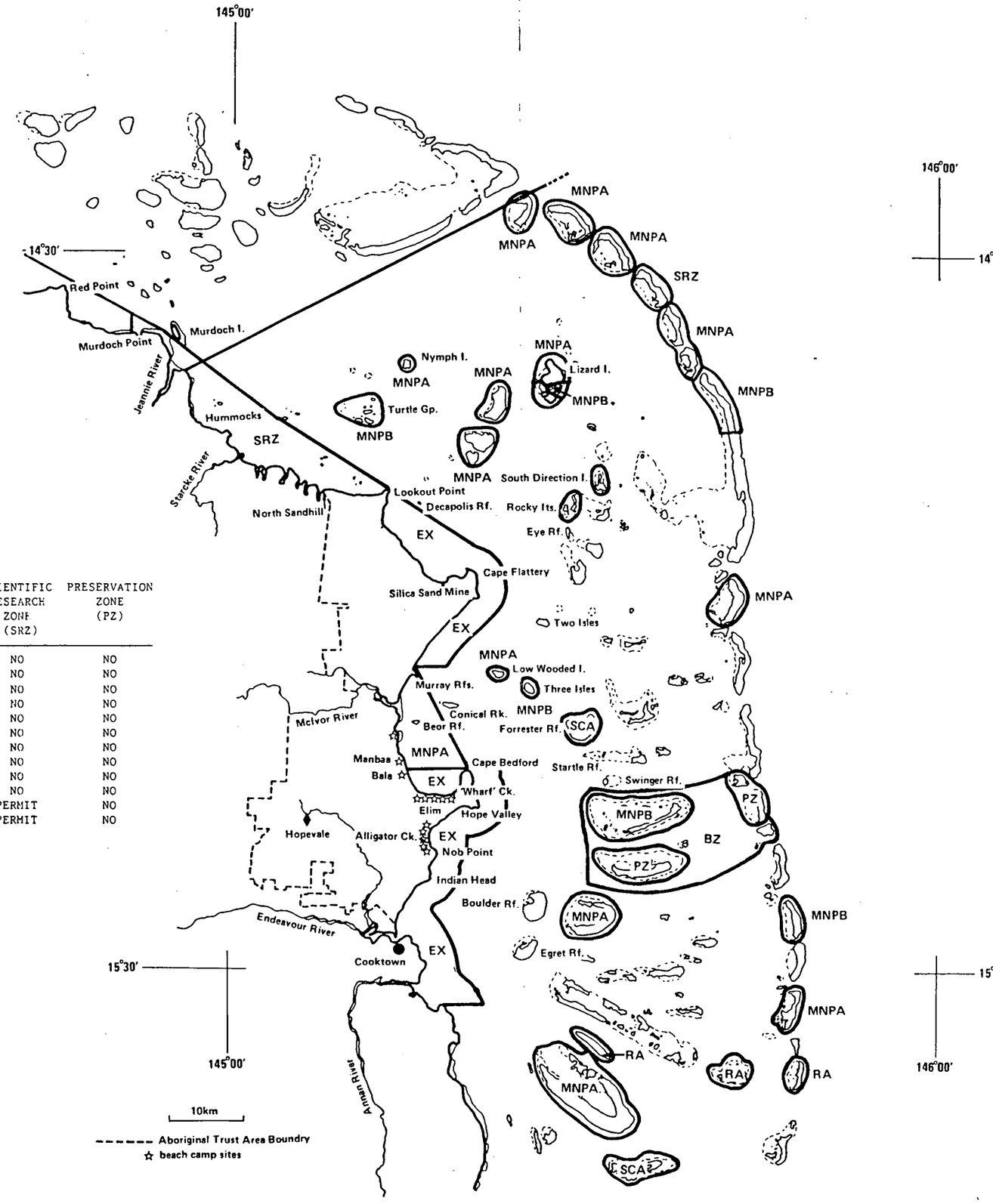
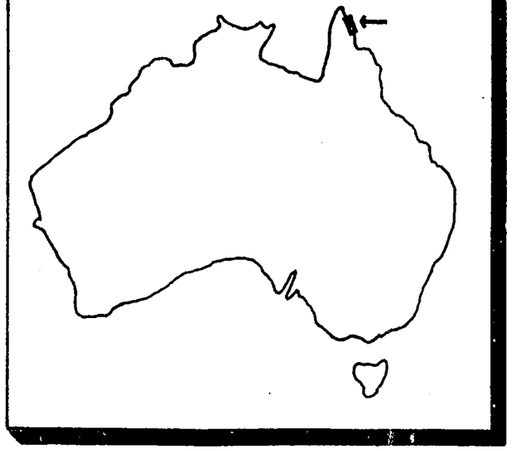


Figure 3.1: Map of the Hopevale area including the GBRMPA Zones (nb General Use 'A' and 'B' Zones not shown)

EX = excluded from GBRMPA;
SCA = seasonal closure area;
RA = replenishment area

	GENERAL USE		MARINE NATIONAL PARK			SCIENTIFIC RESEARCH ZONE (SRZ)	PRESERVATION ZONE (PZ)
	'A' Zone	'B' Zone	'A' Zone (MNPA)	Buffer Zone (BZ)	'B' Zone (MNPB)		
BOATING DIVING	YES	YES	YES	YES	YES	NO	NO
COLLECTING	PERMIT	PERMIT	NO	NO	NO	NO	NO
LINE FISHING	YES	YES	YES	NO	NO	NO	NO
BAIT NETTING	YES	YES	YES	NO	NO	NO	NO
TROLLING for pelagic spp.	YES	YES	YES	YES	NO	NO	NO
SPEARFISHING (no SCUBA)	YES	YES	NO	NO	NO	NO	NO
POLE & LINE TUNA FISHING	PERMIT	PERMIT	NO	NO	NO	NO	NO
TRAWLING	YES	NO	NO	NO	NO	NO	NO
CRUISE SHIPS	YES	PERMIT	PERMIT	PERMIT	PERMIT	NO	NO
GENERAL SHIPPING	YES	NO	NO	NO	NO	NO	NO
TRADITIONAL HUNTING	PERMIT	PERMIT	PERMIT	PERMIT	PERMIT	PERMIT	NO
TRADITIONAL FISHING	YES	YES	PERMIT	PERMIT	PERMIT	PERMIT	NO



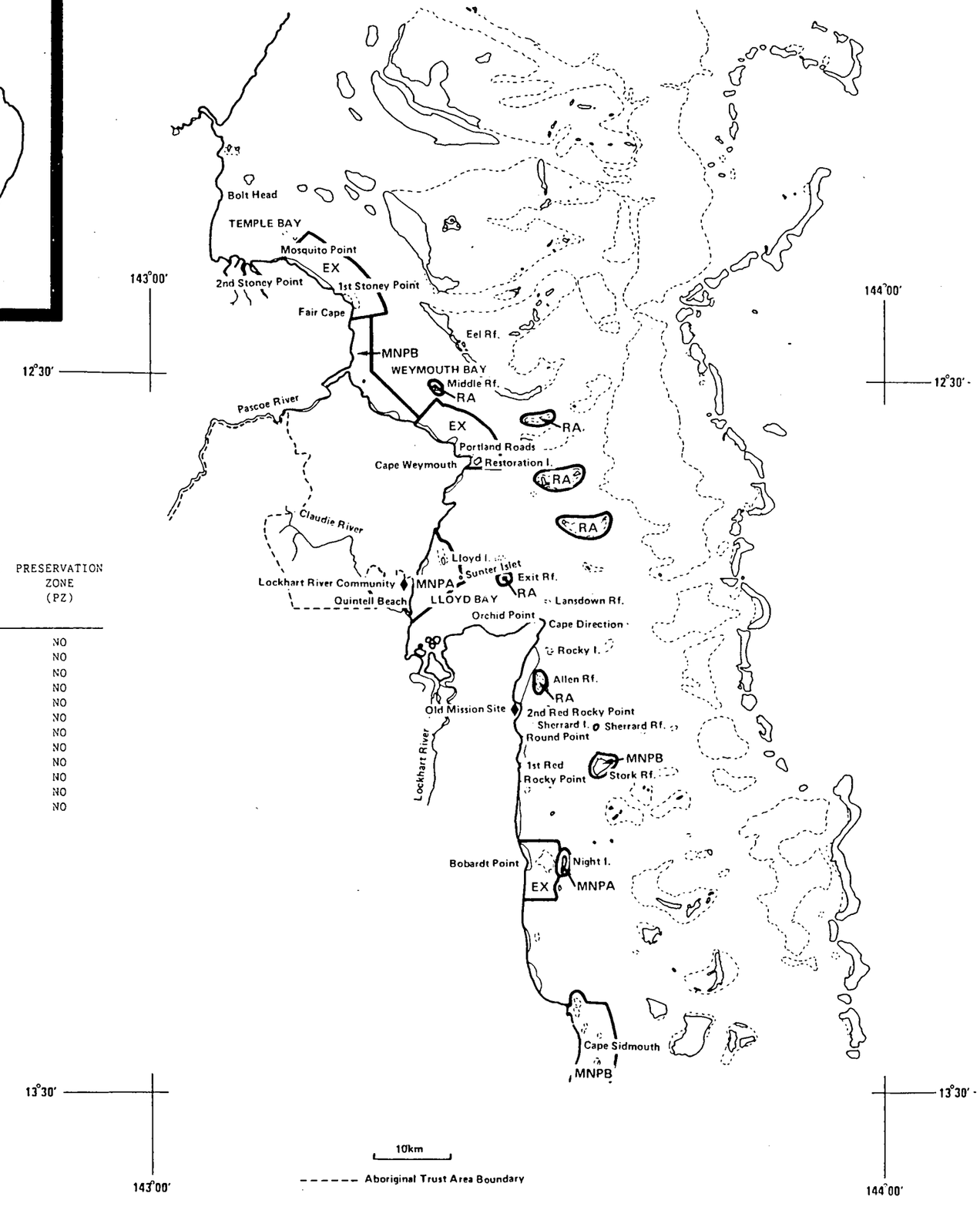


Figure 4.1: Map of the Lockhart River area including the GBRMPA Zones (nb General Use 'A' and 'B' Zones not shown)

EX = excluded from GBRMP; SCA = seasonal closure area; RA = replenishment area