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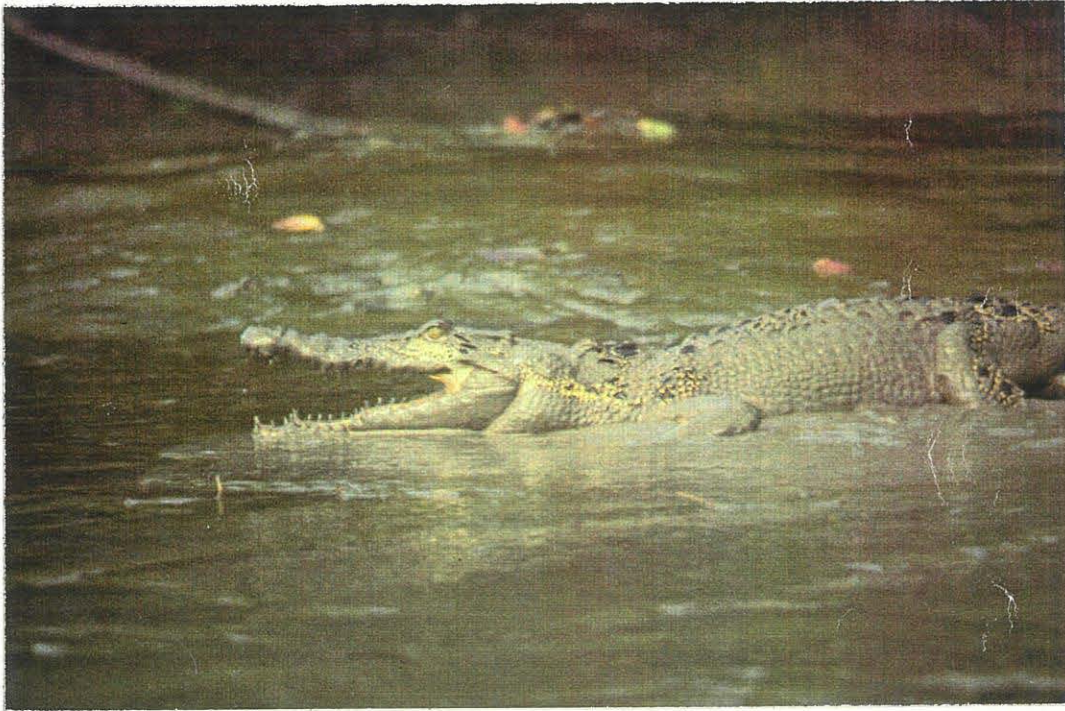


Photo: Dominique Benzaken

" Never smile at a crocodile..."

**COMMUNITY ATTITUDES TOWARDS CROCODILES IN NORTHERN
QUEENSLAND: A CASE STUDY OF THE ROLE OF SOCIO-CULTURAL
FACTORS IN THE MANAGEMENT OF DANGEROUS WILDLIFE**

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August 1992

in Partial fulfilment of the requirements for the research degree of
Master of Science
in the Faculty of Sciences
James Cook University of North Queensland.

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Dominique Benzaken (BSc) (Q/d)

August 1992

ACKNOWLEDGMENTS

This project could not have been completed without the participation and support of a number of people: Dr J. Taylor (Division of Anthropology, James Cook University) who introduced me to Aboriginal communities and research methods in anthropology; Toni Craig, Jamie O'Keefe, Debbie Van Veltzen, Wendy Gunthorpe, Carol Finlay, Sushil Singh, Kate Dempsey, Andrea Porter, Christine Cutts, who conducted interviews; Mark Wayne; Katherine Perrot, Lyn Wallace and Kylie McDonald for typing assistance; fellow post graduate student Liz Bragg who participated in the interviewing and coding and provided stimulating discussion; the people of Napranum, (particularly Mrs I. Hall), Weipa, Daintree, Cape Tribulation, Hopevale (particularly Mr E. Deeral), and Townsville who supported my project; the participants of the survey for their contribution; my supervisor Mr P. Valentine (Department of Geography, James Cook University) for useful discussions and his reading and comments of numerous drafts and finally Thierry and Leigh Auriac for their support and patience at home.

This research was jointly funded by Queensland National Parks and Wildlife Service (Far Northern Region), 1990-1 and a Merit Research Grant from James Cook University, 1990.

This thesis is dedicated to Thierry Auriac and my son Leigh Auriac.

ABSTRACT

A survey of attitudes towards the Estuarine crocodile (*Crocodylus porosus*) was conducted in Northern Queensland (Australia) in communities chosen for their distinct cultural background (Aboriginal / non Aboriginal), community structure (mining town, farming community, tourist destination and urban centre), residence status (local resident/visitor), proximity to crocodile habitats, and remoteness. Attitudes were a mix of emotional response (empathy and/or fear of crocodiles primarily) and crocodile management expectations (various levels of crocodile population control), with a dominance of risk management expectations in resident communities as opposed to the visitors in those communities. Empathy towards crocodiles and risk perception were investigated in relation to knowledge, experience, communication networks, social background and gender. The distribution of knowledge and experience was closely related to residence near crocodile habitats, predominantly vicarious and lacking in ecological understanding. Risk perception was primarily affected by residence near crocodile habitats and the cultural background of residents (Aboriginal / non Aboriginal) while the distribution of empathy was indicative of broader cultural values. They were interpreted in relation to attitudes towards the non-human world (discriminating between Aboriginal and non Aboriginal attitudes) and the regional historical and cultural context of the Frontier and its importance in the construction of the national identity (discriminating between northern Queensland residents and visitors). A brief discussion of management implications is presented focusing on the importance of equitable distribution of social benefits and costs of management policies, the relevance of public participation and management issues arising from a diverse social and cultural environment.

INTRODUCTION

The importance of managing people's uses of resources as well as resources themselves in order to fulfil social goals of economic and cultural well being and to maintain resource availability for future use has been presented by various advocates of Ecologically Sustainable Development. The failure of management policies based primarily on scientific expertise and a centralised decision making process have lead to a reconsideration of the importance of the cultural, social and political context of resource management.

The approach taken by the present study is based upon related but separate management contexts - that of biophysical resources management and of management of risks. Although there is no intrinsic difference between the two in terms of the social processes involved (economic, social, political and cultural), the former has concentrated on positive impacts and the promotion of environmental awareness while the latter has been primarily concerned with managing the negative impacts of technology and the promotion of socially acceptable risk.

The choice of the management of crocodilians as an object of study combined this double perspective. On the one hand a number of crocodilians are endangered and vulnerable species and their management is often faced with conflicts between conservation and development. On the other hand, crocodilians are perceived as a risk and a personal threat, a situation which may be in conflict with protective legislation. The cultural importance of this group of animals also makes it very attractive for a study of cross cultural aspects of resource management.

Most management programmes of crocodilians worldwide acknowledge the necessity of understanding social and cultural factors - as conflict situations arose - but too often the trust in expert biological assessment and implicit cultural values have been dominant factors in the decision making process and social aspects have been overlooked or poorly addressed, resulting in the alienation of sections of the community and a lack of support for conservation policies.

The study of community attitudes towards the Estuarine crocodile (*Crocodylus porosus*) in northern Queensland (Australia) provides a case study whereby the socio-cultural factors become predominant and overshadow biological considerations. The management of crocodiles (and of protected species) in northern

Australia provides an interesting situation by which contrasting world views and belief systems coexist. Historical factors such as colonialism and frontier expansion into the tropics have left a situation by which a economically dominant European based culture coexists with a contrasting indigenous Aboriginal culture.

The management response to the range of social concerns and attitudes towards crocodiles taken in each state of northern Australia accounts for differences in the status of the crocodile resource and the political, social and economic context of decision making processes. As a result of changes in land tenure, the understanding of Aboriginal views is essential as they become increasingly involved in joint management of natural areas such as national parks (Kakadu National Park and Uluru National Park, Northern Territory). In Queensland, recently passed legislation, the *Nature Conservation (Qld) Act (1992)* and the *Aboriginal and Torres Strait Islander Land (Qld) Acts (1991)* include provision for the joint management of National Parks owned by Aborigines as well as provisions for hunting and fishing rights.

The lack of systematic investigation of human perception of animals is surprising, given its theoretical and practical significance for wildlife management. Few studies have investigated attitudes towards animals and/or wildlife related issues in the applied context of wildlife management. Most studies have looked at public perception, knowledge of animals and animal preferences (Kellert 1980c, 1983, 1984b, 1988, 1989; Fenton & Hills 1988; Paterson 1990), in an attempt to identify user groups and describe wildlife experiences in order to assess the desirability of specific management options among user groups of a particular wildlife resource (Hines & Schaeffer 1977; Shaw & Zube 1980; Delany, Hines & Abercrombie 1986). The study of environmental awareness and its determinants for instance proposed a number of hypotheses which identify demographic parameters such as age, sex, social status, income and background as social indicators of support for environmental awareness. Few studies have looked specifically at the perception of dangerous animals: alligators (*Alligator mississippiensis*) in Florida (Hines & Schaeffer 1977), the wolf and the coyote in the United States (Kellert 1985b), and the grizzly bear in the USA (Schullery 1980). The information on attitudes towards wildlife and wildlife issues have been primarily used to determine wildlife values and have provided the support for environmental decision making and planning (Kellert 1980b, 1983, Shaw & Zube 1980; Caughley 1985). Wildlife managers recognise the need to expand from the basic benefit cost analysis approach to decision making and promote research in the

social and political processes at play (Caughley 1985; Witter & Sheriff 1988; Kellert 1988). Few studies have addressed the socio-cultural basis of endangered species legislation (Shepard 1978; Kellert 1985c). The current challenge of the management of endangered wildlife in particular dangerous wildlife reside in the understanding of the factors affecting policy acceptability and its connections with social systems.

The area of risk studies provide a useful conceptual framework and methodology for an investigation of attitudes towards dangerous wildlife. The study of risk is a fairly new field of research which arose from the controversy about the desirability of new technologies, in the wake the ecological crisis in the 1970's (White 1973). The need to question the dominant view of nature and to appraise the impact of technology on the quality of the environment emerged as the most significant social phenomenon for the next two decades. Although the study of environmental threats have been mainly concerned with natural disasters and technological risks, the validity of the approach for personal physical dangers may be relevant, as recreation and tourism create opportunities for wildlife encounters; such encounters are out of the range of daily experience and as such are rare events, but in the case of fatal accidents, the concerns expressed in the community are similar in many ways to those expressed during salient events associated with technological risks; similar social factors and processes may affect the level of acceptability of such risks. While the interest and empathy towards crocodiles and the perception of crocodiles as a threat both are dependent on socio-cultural factors, the balance between the two will be affected by the geography of interactions between humans and crocodiles, the social cultural context and distribution of liabilities and benefits of conservation policies. In many ways, the crocodile is a symbol of the conflicts affecting the development of wetlands areas in northern Australia.

This study can be seen as a form of social impact assessment of the current protective legislation and is concerned with the collection of information on public attitudes. It consists of three parts:

- (1) A critical account of the cultural aspects and socio-historical factors in which attitudes towards crocodiles are imbedded and the development of a conceptual framework based on a review of existing studies on the perception of animals and animal related issues, risk studies and communications studies (Chapter 1).

- (2) A cross cultural survey of attitudes towards crocodiles in northern Queensland and Cape York Peninsula which investigates the knowledge of crocodiles, crocodiles as an threat, the empathy towards crocodiles within the context of existing crocodile management regime. The collection of a range of qualitative information combined with the results of the attitude survey provide a social profile of the communities affected by crocodile management (chapters 2 to 6).
- (3) A conclusion which summarises the major features of the study, its achievements and shortcomings, presents options for future research and provides a set of recommendations for management.

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CHAPTER 1

HUMAN NATURE INTERACTIONS AND THE MANAGEMENT OF WILDLIFE: TOWARDS A CONCEPTUAL AND THEORETICAL FRAMEWORK

This chapter aims at placing the present study in the broader context of the existing literature, bringing together a number of disciplines and areas of studies. It is divided into three parts: the first part presents an overview of the management of crocodilians and other dangerous wildlife and identifies relevant management issues; the second part is an account of historical and cultural themes necessary to the understanding of the pattern of attitudes towards nature and wildlife in northern Australia; the third part develops a theoretical framework using the existing literature on social research in wildlife management and risk studies. The importance of social and cultural factors in the understanding of individual responses is presented and examined in the broader framework of decision making processes in environmental management.

PART ONE: THE MANAGEMENT OF CROCODILIANS IN NORTHERN AUSTRALIA

1.1 - Introduction

Crocodiles occur in waterways and coastal wetlands of Northern Australia. Two species are found, *Crocodylus porosus* and *Crocodylus johnstoni*. The latter is endemic to northern Australia, the former ranges from South-East Asia and Papua New Guinea to northern Australia. The distribution of these two species overlap, although *C. johnstoni* is mostly confined to upper rivers and fresh water swamps, whilst *C. porosus* is found in Estuarine waters, freshwater lagoons and billabongs and even at sea (Appendix 1).

The extensive network of waterways which provides a habitat to crocodiles covers a range of land tenure and land use and is administered by a number of institutions with different mandates. The domain of the management of crocodiles does not just include protected areas such as national parks where recreational use is predominant and actively managed. The once remoteness of northern Australia is no longer a guarantee of low level of interaction with crocodiles. The influx of visitors

to northern Queensland (1 1163000 domestic visits and 368 000 international visits to the Cairns region only, Domestic Monitor Bureau 1991) and associated regional expansion have changed this situation. Visitors, often unfamiliar with tropical hazards and residents communities are affected by management policies aimed at the conservation of species responsible for fatal attacks on humans.

The management regime of crocodilian populations in the different states follows international conventions, federal and state legislation. *C. porosus* is classified as an endangered species and *C. johnstoni* as vulnerable by the International Union for Conservation of Nature and Natural Resources (IUCN). Both species are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Those conventions ensure a high degree of protection and restricts the use of crocodiles as a commercial resource. Crocodiles are also the object of Australian federal legislation, (Schedule 2 of the *Wildlife Protection (regulation of Exports and Imports) Act 1982*, and state legislation *Nature conservation Act 1992* in Queensland and *Territory Parks and Wildlife Conservation Act 1988* in the Northern Territory.

1.2 - The Northern Territory of Australia

The Management of crocodilians is the responsibility of the Northern Territory Conservation Commission (management programme for *C. porosus* & *C. johnstoni* in the Northern Territory of Australia 1989). The long term objective of the management is to establish the commercial value of crocodiles as a direct incentive for crocodile conservation, in that following the American model of value added conservation (Hines & Abercrombie 1987; Hines & Percival 1987; Joanen & McNease 1987). Current objectives include maintaining viable wild populations and conserve their wetland habitats, enhance safety by maintaining an active awareness campaign and by removing problem crocodiles, develop strategies for the sustainable utilisation of crocodiles and expand the farming industry to commensurate with the capacity of the wild populations to sustain harvest.

A unique feature of the Northern Territory is the large area of protected wetlands under National Parks legislation, sanctuaries and Aboriginal land tenure which provide a secure habitat for crocodiles. Sixty per cent of *C. porosus* habitat is under Aboriginal land tenure (Northern Territory Conservation Commission 1989), following land rights legislation (*Aboriginal Land Rights Act 1976, NT*). Aboriginal lands are equated with Category VII of the IUCN List of National Parks and Protected

Areas (Webb, Manolis, Whitehead & Letts 1984). Some of those areas are being leased back to the Australian National Parks and Wildlife Service (ANPWS) and jointly managed (Kakadu National Park, Uluru National Park). Management on private land involves the harvest of wild crocodiles in harvest areas chosen on the basis of the interest and commitment of individual land owners by providing them with financial incentives, in order to gain their support for long term conservation of the species.

The management of problem crocodiles focuses on individual animals found near settled areas, areas subject to high intensity recreation and areas where their presence may threaten a desirable land use. The Darwin harbour and Gove recreational beaches are "crocodiles free areas" ie the removal of all individual animals is systematic and well publicised. Those animals are relocated to crocodile farms and used in the determination of the next year harvest. Associated with the removal programme is an public awareness and educational campaign outlining the potential hazard of crocodiles and the promoting crocodiles as an "asset, not a liability" (Webb & Manolis 1989).

1.3 - The management of crocodiles in Queensland

The goals of the current management are to ensure adequate protection of crocodiles and crocodile habitats in Queensland, to develop a farming industry as appropriate, and to promote positive attitudes towards crocodiles and crocodile management through public education (Queensland National Park and Wildlife Service Management Plan 1989).

Management has been concerned with the determination of baseline information on population dynamics and the establishment of areas of priorities for conservation based on the status of the populations, habitat quality and the constraints of human settlements (Q.NPWS 1989). Unlike other states in northern Australia, ranching is not permitted and the stocking of crocodile farms is of captive origin (Edward River Crocodile Farm) or from removed "problem" crocodiles. The conservative approach to management in Queensland was justified on the basis of the relatively low crocodile population densities following the extensive expansion of agriculture and urbanisation into coastal lowlands reducing significantly areas of prime crocodile habitats and the ecological marginality of the remaining habitat (Taplin 1987).

The recovery of crocodile populations associated with the increase in human populations in northern Queensland have resulted in a greater awareness of their presence in tropical waterways. The perceived impacts of large(r) crocodile populations near urban areas on recreation and regional industries such as tourism, cattle farming and commercial fishing are currently debated and are affecting crocodile management in the region, particularly in the populated areas of the east coast of far northern Queensland.

The management response regarding the issue of public safety has been initially reactive under public pressure, following a fatal accident where a woman was taken in Daintree (December 1985). It has had the unfortunate effect of putting crocodiles in the public eye and the accident was followed by major killings of *C. porosus* in retaliation. The management of "problem" crocodile in northern Queensland has consequently focussed on the populated east coast between Ingham and Cooktown. A programme aimed at the removal of "problem" crocodiles (a majority being *C. porosus*) was organised following a zonation scheme according to river system, human population pressure and size class of individual crocodiles; animals were to be removed by licensed crocodile farmers (QNPWS 1989). After appropriate consideration, the animals caught were relocated to farms as breeding stock, or as zoo display animals. This strategy has had the effect of decreasing significantly the number of reported sightings (see Appendix 4).

An educational programme based on the ecology of crocodiles and public safety is actively promoted; signs have been placed at major rivers and water bodies to warn people of the dangers of swimming. Pamphlets are also available which reinforce graphically the importance of safety and inform the public of the basic facts of the conservation and biology of both the Estuarine and the Johnstone crocodiles and of their international significance (see Appendix 7).

The current situation in Queensland regarding habitat protection is quite unlike the Northern Territory. Wetlands are under a number of legislation and administrations, each providing a different degree of protection (national parks, sanctuaries, refuges and reserves, environmental parks, State forests, fisheries habitats reserves, wetland reserves, fish sanctuaries and marine parks), with most of the inland and ephemeral wetlands totally unprotected and vulnerable to a range of land use practices or ecologically inadequately delineated (e.g. Edmund National park). A notable exception is the Wet tropical Rainforest of north-eastern Queensland which includes 37 wetlands reserves (Arthington & Hegert 1989). The multiplicity of legislation and administrative arrangements complicates the

management of wetlands and diffuse the responsibility between departments all to the detriment of appropriate wetland management. Furthermore, procedures for environmental impact assessment (EIA) of proposed developments in wetlands is given moderate emphasis (*Local Government (Planning and Environment) Act 1990*) and the provision for public participation in EIA is limited. Only general provisions are provided in the *Impact Assessment in Queensland: Policies and Administrative Arrangements (Jan 1987)* (Martyn, Morris & Downing 1990). Given this context of habitat protection, the management of *crocodiles habitats* in Queensland by QNPWS was in effect limited to national parks.

Recent legislation has changed this situation. Aboriginal land tenure in Queensland is undergoing changes as a number of existing reserves (Deed Of Grant In Trust) are being transferred to Aboriginal control under the *Aboriginal Land Act 1991 (QLD)*. The newly enacted *Nature Conservation (QLD) Act (1992)* which combines a number of statutes under the same umbrella (*National Parks and Wildlife Act 1975*, *the Fauna Conservation Act (1974)*, *the Native plants Protection Act (1930)* and *the land Act (1962)*) acknowledges the ecological concept of a direct link between the maintenance of habitat and the survival of species; it provides a regional framework for environmental planning by establishing legal and administrative structures and procedures for the prevention or management of threatening processes, following existing procedures of EIA of the *Local Government (Planning and Environment) Act (1990)* and *the State Developments and Public Works Organisation 1971*, procedures for the management of national parks and other reserves, provision for Aborigines and Torres Strait Islanders to be involved in the protection and management of land and public participation in nature conservation planning by the wider community (advisory committees and boards of management). The legislation allows for the protection of wildlife on declared lands, reserves other than crown lands and private lands. The impact of this legislation, despite its shortcomings is an important change for wildlife management in Queensland.

1.4- Management of crocodilians: major issues

The most recent international publication on the management of crocodiles and alligators (Webb, Manolis & Whitehead 1987) shows that agencies responsible for the management of crocodilians worldwide acknowledge the importance of social and cultural factors in the successful implementation of management; few actually show that they have investigated the matter further than through descriptive studies on the desirability of certain management options when a threshold of tolerable

crocodilians numbers is reached and public safety is perceived to be at stake. Management responses to the issue of public safety vary with the legislation in force in each country where crocodilians occur. It is a combination of the status of local crocodilian populations and historical, political, economical, social factors (see Appendix 3 for a review of existing management regimes).

The negative perception of crocodilians and the issue of public safety is a common management problem with local populations. It is compounded by the acceptability of conservation as an appropriate land use. Conflicts usually arise from different perceptions of desirable land uses and values of both wildlife and wildlife habitats. This is particularly well illustrated by the experience of developing countries where the management of crocodilians (and other threatening wildlife) is a long story of conflicts of interest between local residents values and lifestyle and internationally set conservation policies. The justification of those programmes is made even more difficult in the light of the North South socio-economic inequity, as the development of effective programmes is greatly impaired by the depressed economic situation of those countries, and often by the lack of adequate administrative and financial arrangements. Traditional land practices and regional economic development are rarely congruent with conservation policies implemented with little community participation in decision making processes. The intensity of conflicts is increasingly encouraging management solutions based on a close involvement of local populations (Child 1987).

Most programmes are associated with public education campaigns to obtain support for management decisions. They are based on the assumption that knowing more about wildlife will promote positive attitudes towards conservation and risk acceptability, although there is no evidence that public education alone will suffice. Programmes often ignore the value of local knowledge (both customary and indigenous) and local networks in their implementation and effectiveness (Graham & Payne 1990). The scientific base of educational programmes also tends to isolate the animal from the wider context of interaction of people with wildlife and to focus on ecology and biology which may limit the relevance and value of the information conveyed (Watson & Chambers 1989).

The provision of economic incentives has proven so far the best way to ensure the acceptability of crocodile conservation management policies. The concept of value added conservation has been successful in promoting a sustainable industry by providing local economic incentives while ensuring international conservation goals.

Commercial exploitation (farming, ranching, hunting) must be within limits set by the constant monitoring of wild populations. Such an approach has been made necessary given the multiple tenure of wetlands (mostly private) and ownership of crocodiles as a resource. Public ownership of crocodiles is the norm in developed countries (as in Australia) regardless of the tenure of wetlands (public or private) and management of crocodiles rest with government agencies at all levels; crocodiles are often traditionally owned in developed countries (Papua New Guinea for example), unless reserves are set aside for their protection. Management then concentrates on the regulation of commercial outputs and therefore non commercial use of the resource is left to the owners (Hollands 1987).

This brief review of the management of crocodilians both worldwide and in Australia suggests that cultural values as much as local economic interests strongly influence the acceptability of management policies. Given the cultural context of northern Australia, it is important to understand the social and cultural processes involved in attitudes towards crocodiles.

PART 2 : CULTURAL AND HISTORICAL CONSIDERATIONS

1.1 - Definitions

Central to the management of natural resources is the relationship between humans and nature. Throughout history, the concept of nature has been invested with a rich layer of meanings, symbolic elaborations and transformations (Wolhwill 1983). The way in which people see their environment is constructed and maintained through cultural systems.

A useful definition of culture can be the beliefs, values systems, art and technology shared by a group of people (Young 1990). Culture can be seen as the mediating relationship between a society and its environment:

"Worlds of individuals and cultures are perceived elements of nature, and man in all his cultural forms symbolises natural phenomena so to cope with his world and come to terms with it " (Tuan 1971, p 4).

Coping includes coping with environmental constraints but also social constraints, so that environmental disruption may be seen as the inadvertent outcome of

imperfect collective institutions which fail to counteract the harmful side effects of human's inconsistent behaviour (O' Riordan 1976).

Cultural selection of particular parts of the environment operates to select and classify a set of resources and ways to use them. Classifications are culture specific and therefore the same environment may provide a different set of resources according to different modes of cultural selection. Culture shapes a society's conception of the natural world and provides the means to solve problems of resource management. Culture itself can be seen as a resource as it is a mean of identifying, managing and passing on the knowledge of resources. The resources which a group of people live on may be perceived as uncertain, unpredictable and problematic by outsiders but not by that group whose environmental knowledge has accumulated through generations (Nietschmann 1984).

A conceptual framework for relating the cultural, socio-economic and political aspects of wildlife resources into management and development programmes is provided by Firey's resource paradigm (1980). Resources are the product of social processes that initially define potentially useful things to convert for social purposes. Resource systems are then a hierarchy of interactions comprising a set of resource processes, structured to achieve a particular objective. Different social groups will have a different perception of the resource system within their own frame of references, not necessarily connected to the assumptions of others. The preservation of wildlife habitats is a major area of conflict with different resource systems. Most rural societies particularly tribal people, living in the vicinity of those habitats have a resource system based on subsistence economy. The impact of conservation policies is only accepted if there is as part of the management strategy allocation for an alternative or modified resource system which is suitable to people expectations (Saharia 1984).

In this study, an Aboriginal and non Aboriginal cultural traditions coexist; it is therefore important to present the distinctive cultural features of those two traditions in order to identify the cultural bias of this investigation since it has been shown that implicit cultural assumptions are common place in resource management (Caughley 1985; Kellert & Berry 1987).

1.2 - Aboriginal perspective

1.2.1 - The basis of Aboriginal worldview

In Aboriginal thought, there is "a oneness of thought, belief and expression through time and space" (Yengoyan 1987). The isomorphic fit between the natural and the supernatural means that nature is coded and charged by the sacred, while the sacred is everywhere within the physical landscape. All behaviour is an expression of a well developed sense of moral conduct which provides the basis for all human obligations and is inherited by each individual. (Berndt 1982; Rose 1984, 1987, 1988; Stanner 1966; Yengoyan 1987).

Aboriginal land is a humanised landscape. For example, a crocodile story explains the landscape of the Breakfast Creek/Mookan area of the Wik region (Cape York Peninsula): a set of topographic features, named anabranches (*Kugu-Nganychara*) are supposed to have been formed by a Saltwater Crocodile (*Minha pinchyi*) who was injured while travelling down stream; by thrashing his tail, he created these particular features (Von Sturmer 1978). Another example, recorded by Thomson (1933), tells the story of the mythical canoe trip of *Liway* the Crocodile and *Yawa* the Diamond Stingray from the Pascoe river to the Torres strait Islands leaving on their path a number of sites such as White Point sand dune in Shelburne Bay (Cape York peninsula) (Chase in Benzaken 1988).

In Aboriginal land management system, the environment is managed physically, spiritually and politically and these operate instructively. Culturally appropriate land management will ensure a continuous supply of food for the custodians of the land (Department of Aboriginal and Torres Strait Islanders Affairs 1989). Rose (1988) describes the principles of Aboriginal Law for the Yarralin community of the Northern Territory as follows: the "dreaming law" was established during the "Dreaming time", the heroic time when the Ancestral Beings (Dreamings) travelled along particular tracks of land creating the landscape and setting specific laws by which all life forms should live. Yarralin people believe that human life exists within a wider context of a living and conscious cosmos and that:

"Human responsibility lies in actions that nurture and enhance human life, the life of other species (plants and animals) and the relationship between humans and others" (Rose 1988, p. 19).

Moral rules concern the relationship between parts of the system and are based upon the four principles of balance, response, symmetry and autonomy (Rose 1987). These rules apply to any part of the system including plants and animals. The social system and the natural system are matched and have their legitimacy in the Dreaming. The totemic association of humans and non humans through common ancestry maintains the social structure and regulates the use of the land both for spiritual and physical needs in time and space.

Failing to comply to human responsibility of enhancing life processes result in the *deterioration* of the environmental *status quo*, as it is believed that other species depend on humans for their survival. This is in contrast with western thinking which advocates non intervention to ensure the *preservation* and survival of other species (Flose 1988). This cultural difference is well illustrated in the notion of wilderness. Wilderness, defined as an area of minimal human intervention in a Western sense, is in contradiction with Aboriginal moral duty of management. Unspoiled and pristine landscapes in western terms are in fact degraded lands in Aboriginal terms.

1.2.2 - Aboriginal resource management: a contemporary perspective

There is an extensive literature on Aboriginal resource management of Northern Australia where Aborigines are presented as active resource managers (Thomson 1939; Von Sturmer 1978; Jones 1980; Gould 1982; Hynes & Chase 1982; Meehan 1982; Sutton & Rigsby 1982; Williams 1982; Davies 1984; Chase 1984; Haynes 1985; Stevenson 1985; Peterson & Long 1986; Chase & Sutton 1987; Myers 1987).

An intimate knowledge of the environment and extensive resource manipulation were important aspects of a subsistence lifestyle. Resource manipulation included the use of a range strategies such as fishing techniques (Thomson 1939), domiculture (Hynes & Chase 1984), fire management (Stevenson 1985) and the knowledge of seasonal cycles of resource availability. For example, the Wik-Ngathan of Cape Keerweer (Cape York Peninsula), when the migratory Magpie geese first come, do not consume the first batch of eggs but bury them because "the geese will fail to lay more eggs if they are consumed by people" indicating the importance of cultural factors as determinants of harvest (Sutton & Chase 1987). The seasonal cycle of resource use, first described by Thomson (1939) at Cape Keerweer rests on a detailed knowledge of interactions between biophysical features of the

environment and plants and animals as well as on changes affecting plant and animal distributions. Yoignu calendar (Arnhem land, Northern Territory) has 6 seasons and uses a number of environmental features (climate, seasonal movements of animals and growth of plants) to determine the right time (or "degree of fatness") to harvest a particular resource (Davies 1984). Rituals are performed which ensure the continuity of Aboriginal lifestyle both material and spiritual. For example, mortuary songs of the Yirritja (Northern Territory) emphasising the cycle of songs and dances and resource availability include the crocodile,

"The crocodile sings lightning when it comes in the east and that's when the crocodile lay his eggs and that's when the sting ray gets fat and good to eat. When the lightning comes and the rain comes that makes the sting ray fat, that makes the crocodiles lay his eggs. Before that time, the sting ray has no fat and he is not worth eating,"

12th song of the eastern cycle of songs sung by members of the group of the deceased (Warner 1964, p. 409).

The system of land tenure and access to material and spiritual resources is based on the concept of "country" and "one countryman" (Myers 1987). Ownership of "country" is based on the ownership of specific tracks of land and inherited rituals associated with it. The concept of "One countryman", based on the sharing of physical resources does not imply spiritual ownership of land, but a right of access to resources that has to be negotiated with spiritual owners. A system of ritual obligations regulates the size and composition of social groupings and their access to resources (Hiatt 1984).

Most Aboriginal people in northern Australia today have maintained their cultural identity within contemporary Australia despite their loss of control of tribal lands, social marginalisation, institutionalisation, and economic dependence, primarily because of the remoteness of that region from mainstream Australia. Indigenous management systems worldwide have suffered from a number of factors operating simultaneously: the loss of land leading to intensification of use and land degradation of the remaining, cultural disruption as the repository of primary environmental controls (sacred knowledge, traditional land ownership and population control), market integration creating external dependency, changes in social relations and delocalisation of factors of production, introduced technology and energy subsidised activities instead of self sustained activities based on solar and human energy (Anon 1992 United Nation Conference on Environment and Development). However, not all

the above factors have affected Aboriginal management systems. Land dispossession was widespread following European invasion. As a result, the economic base and social life of Aborigines were dramatically affected by successive religious and governmental administrations which created marginalised and institutionalised communities. The knowledge of their environment once appropriate to a subsistence lifestyle has become for most part inadequate in contemporary economy, however, the spiritual relationship to the land remains the most important feature of Aboriginal identity and social structure and is the basis of their political struggle for autonomy and self determination. The outstation movement which originated in the Northern Territory in the 1970's, showed the adaptability of Aboriginal social systems to new circumstances. It was instrumental in the granting of land rights in the northern Territory (1976) and recently in Queensland (1991). A number of studies have looked at social change and how market economy, welfare and subsistence have been integrated in contemporary Aboriginal life including the outstation movement (Meehan & Jones 1980; Meehan 1982; Altman 1987; Law Reform Commission 1986). Altman (1987) has shown how the introduction of European food stuffs, cash economy and technology has been integrated to the seasonal cycle of subsistence activities of outstations, while the ownership of the land and the acquisition of ritual knowledge has remained unchanged and are still at the basis of the system of resource allocation for the Gunwinggu (Arnhem Land, Northern territory). Changes have occurred in the focus of resource getting and division of labour and have been associated with a shift of emphasis of ritual patterns. The involvement of Aborigines in joint ventures with National Parks (Altman 1988) and industry following land rights legislation outline the political nature of conflicts and the general issue of the desirability of particular land uses (Anderson 1986).

1.2.3 - Aboriginal view on conservation

The false choice presented in western thought between disrespectful use of non human world and respectful non use of resources is linked to concept of instrumental value of non humans as essentially anthropocentric (Routley & Routley in Bennett 1983, p.19). Instrumental and intrinsic categories are made mutually exclusive because the ability to destroy makes mandatory the desire to protect. This false choice actually leaves out the alternative of limited and respectful use as it has been practiced in Indigenous traditions.

in Aboriginal tradition, concern for other species is ensured through the essentially common ancestry of non humans and humans. Newsome (1980) showed that in *Arunta* mythology, the major totemic sites coincide with the most favourable habitat for animal species. The conservation principle is built into the moral system. The recognition of unity and mutual interdependence which bond humans and non humans is not however equality and the extension of moral rights to non human do not necessarily mean that non humans have intrinsic values in the western sense nor that they must be treated identically to humans. Extending moral rights do not preclude the use of other species as a resource (Bennett 1983). With the Wik-Mungkan of Cape Kerweer (Cape York Peninsula), the Crocodile Man can send his son (the crocodile) to carry away women, to drive fish into his net and to take vengeance on his enemies (Bennett 1983, 1991). While it is accepted that non humans and humans share equal rights to resources and are necessary to the well being of Country, non humans are also the foundation of human subsistence, hence their valuable place in the moral system, although without intrinsic value *per se*, but instrumental values (Bennett 1983, 1991).

It has been argued that limited technology determined the rate of utilisation of resources rather than social choices. Palmer (1991) argues that the relationship between Aborigines and the environment involving intrinsic values of conservation may be erroneous. Instead he advocates environmental constraints as the major aspect of the development of the strong association with the land as it is expressed in the cultural system. He further argues that because traditional Aboriginal economy did not generate surplus production, an elaborate system of spiritual values developed instead, which was used as a commodity in social exchanges. The perpetuation of those values in vastly changed circumstances is then seen as a mean whereby cultural integrity may be maintained and land ownership asserted.

In a number of instances, conservation and Aboriginal interests have clashed over the desirability of a proposed development, leading to an reevaluation by environmentalists of the notion that Aborigines lived "in harmony" with nature (Anderson 1989). In 1983, the Kulu-Yalanji of Wujul-Wujul south of Cooktown (Far North Queensland) supported the construction of a road through their community and land, an ecologically important area of lowland rainforest near Cape Tribulation (Appendix 1). This conflict of interests illustrated the misconception that Aborigines were "natural" conservationists and emphasised the local Aboriginal political economy and the realisation that consultation with Aboriginal owners was mandatory (Anderson 1989).

In conclusion, are Aboriginal skilled management strategies the result of moral and ontological systems or are their environmental ethics developed from their economic activities? It may be said that both may operate simultaneously. Pre-contact lifestyles and knowledge embodied in Aboriginal law in fact may form today the legitimate basis for political action towards achieving Aboriginal goals in contemporary Australian society. As a result, the social construction of Aboriginality by the wider Australian community through its anthropologists cannot be sustained any longer in the light of contemporary environmental politics. Aboriginal culture is not "traditional" as fixed in time and space but may be seen as an ongoing dynamic process of changing expectations in the face of changing circumstances.

As Cowlshaw (1986) wrote:

"If culture is a creation and expression of a human group's responses to their social existence, then the changing conditions of that existence does not mean a loss of culture"... "Aboriginal responses to change is cultural by definition. While Aborigines have not chosen the weapons or the arena on which the struggle is played out, nonetheless they have, consciously or unconsciously, continually responded to and resisted the hegemony of white society" (Cowlshaw 1986 p. 10).

1.2.4 - Aborigines and crocodiles

Crocodiles are a conspicuous species of Northern Australia. They are a source of food, a major hazard and also an important totem. Crocodiles were used for their eggs (Puxley 1923; Taylor MS; Webb & Manolis 1989), or their meat (Flood 1983). Hunting techniques included spearing, harpooning and the use of a slip noose or screens (Roth 1984; Warner 1964). Freshwater crocodiles were caught by hand. At Cape Bedford (Hopevale), old men were known to dive and tackle salt water crocodiles (Field notes 1990). There has been stories of old men whose totem is the crocodile using them to drive fish into their nets (Bennett 1983; Roth 1984).

Crocodiles are considered a threat and are feared even though people may be skilled at recognising crocodiles signs and have techniques to defend themselves; for example, the poking of the eyes which is still used to this day: a recent attack on an Aboriginal man (1990) in the Northern Territory was unsuccessful thanks to that method (see code book Appendix 2). Northern Territory Aborigines make a

distinction between those billabongs where Saltwater crocodiles are unlikely to attack, where they collect water lilies, file snakes and turtles, and others where they believe crocodiles may attack (Webb & Manolis 1989). Crocodiles were a major hazard in Aboriginal life. James Morrill while he lived with the Aborigines of Cape Cleveland for seventeen years said that many were taken by crocodiles (1898). Thomson (1983) also mentioned fatalities. Sorcery has traditionally explained accidental death in Aboriginal society and continue to do so (see an early account of the importance of sorcery for Queensland Aborigines in Roth 1984). The use of crocodiles as agent of death by their totemites is still common (Bennett 1983). Sorcery is instrumental in the attribution of blame as deaths are always attributed to an identified cause. In the past, diseases and accidents were thought to be produced by an enemy dooming the victim using supernatural powers and/or a number of objects or they could be the result of the victim failing to follow social rules (Roth 1984).

Crocodiles featured prominently in Aboriginal mythology and ritual life of Northern Australia. For example, the Wutati of Shelburne Bay (eastern Cape York Peninsula), as part of a hero cult of Papuan origin, performed dances where dancers wore painted masks and crocodile headdresses. The cult of masked dancers played an important part in initiation and the crocodile was a chief figure among the culture heroes (Thomson 1933). The Mallampara of Pennifeather River (western Cape York Peninsula) also performed crocodile dances as part of initiation rituals (Roth 1984). In today's Arnhem land region, nineteen clans have the crocodile as a totem. The initiation of boys into manhood requires learning from the elders about crocodiles and developing a respect for them (Lanhupuy 1987).

Crocodiles stories are numerous (A selection of Aboriginal crocodile myths and stories are presented in Appendix 6). They often portray the crocodiles as a stealer women and a unpleasant character except for their totemites as explained by Gularrwuy Yununpinu of the Gumatj people:

"I see a crocodile as an animal that is part of me and I belong to him. he belongs to me. It's commonness of and ownership"....We consider ourselves, even name ourselves, as crocodile and we come back as crocodiles" (*Living with crocodiles*, ABC video transcript, Cross & Atkinson 1986)

1.3 - The western perspective

From his exhaustive review of attitudes of "civilised *Man*" (italics my emphasis), Glacken (1967) concludes that three contradictory beliefs have dominated in the desire of *Man* to design his surroundings with so much symbolism, a recognition that *Man's* actions are determined to some extent by *his* physical surroundings, a knowledge that *Man* is capable of causing ecological damage, a feeling that the earth was designed for *Him* to use so to improve *His* mind as well as *His* economic and social conditions. The symbolic and conceptual as well technological mastery of nature are a driving force of environmental construing as it is the essence of civilisation (Glacken in O'Riordan 1976, p.201).

1.3.1 - The dominion of *Man*: the basis for the utilitarian view

The anthropocentric basis of Christianity may be seen as a fusion of Hebrew thought and Greek stoics' argument of design which emphasises the view of *Man's* ability to subdue nature as evidence of *His* creation for that purpose.

"And God said, let us make man in our image, after our likeness: and let him have dominion over the fish of the sea and over the fowl of the air and over the cattle and over all the earth and over every creeping thing that creepeth upon the earth. So God created man in his own image, in the image of God he created him: male and female created he them. And God blessed them and God said unto them, be fruitful and multiply, and replenish the earth and subdue it: and have dominion over the fish of the sea, and over the fowl of the air and over every thing that moveth upon the earth". Genesis Chapter 1 (in O'Riordan 1976, p. 203).

Christianity accentuated the dichotomy between the human and the non human world by presenting contrasting modes of thoughts: spiritual/ material, human/nature, sacred/profane. The duality inherent to western thought has allowed secularism and individualism to develop, as nature no longer was invested of moral status. The early development of Europe under Christian ideology is one of technological changes stimulated by scientific enquiry, economic growth, intense use and manipulation of natural resources and social reorganisation. By the 18th century, the concept of progress of the human mind was the decisive condition for material and social progress and involved the mastery and possession of nature (Fitzgerald 1986). The application of this concept to past human history "demonstrated" that people from

the past were inferiors to their descendants. The representation of economies and societies as a step ladder from hunting through pastoral and agricultural societies to market oriented societies lead to the belief of superiority of western culture and technology. This ideology was instrumental in colonial expansion and allowed the rise of modern capitalist economies.

1.3.2 - Environmentalism

Environmental global concern as a social issue arose in the last decades as the welfare of the planet and of the human race were perceived as intimately linked, following the realisation of the interconnections between human actions and environmental quality. The Christian view of nature as the dominion of *Man* was claimed to be the source of the environmental crisis (White 1973). However tracing the origin of the ecological crisis to Judeo - Christian beliefs has been widely challenged. Western tradition which advocated the domestication of nature and ultimately the alienation of the natural environment also advocated human stewardship (Attfield 1983). The myth of Genesis Chapter 1 did not only command to subdue but to replenish. The concept of stewardship also arose from biblical texts:

"and the lord God took the man and put him into the garden to dress it and to keep it" (Genesis 2;5: in Young 1990, p. 64).

Stewardship meant that while managing the estate, long term viability had to be ensured. The desire to maximise short term profits had to be tempered by the drive to ensure permanency of tenure. It also meant moral responsibility in the care of the garden (Black in O' Riordan 1976, p. 204). The notion of human stewardship is at the basis of the early conservation movement (Glacken 1967). The construction of nature as a refuge and the concept of wilderness have their origin in bioethics as professed by the transcendentalists in the USA 150 years ago (O'Riordan & Turner 1983). However, attempts to carve out a domain of nature set apart from human activity and influence is to reinforce the dichotomy between nature and culture, natural and artificial (Wohwill 1983). The concept of natural reserves in fact separates in space different uses, nature as place to protect or as a resource to exploit. Lowenthal (in O'Riordan 1976) has shown how the concept of landscape evoked different images in the minds of Americans and Europeans at different periods of their cultural history. To the American, the landscape is wild and non human, while to the European, it is gentle and secure, reflecting the longer period of

integration between cultural and biophysical environments. In early America, the wilderness was feared and hence had to be overcome and destroyed, but today the vanishing wilderness is cherished and protected partly for its scientific and recreational value, but equally for its role in American heritage (O'Riordan 1976). This is also very much the case of Australian wilderness. In both cases however, wilderness was in fact managed indigenous lands existing prior to invasion.

Environmental concern originated in the humanist movement which stated that cruelty to animals and non human slaves may be followed by cruelty to people. The concept of moral rights of non human slaves and animals came with the realisation that *Man* had lost the right to do as *He* pleased with the rest of the creation (Young 1990). The historical evolution of ethics and the concept of expanding moral rights to include the rights of the environment are at the basis of ecocentrism (Nash 1990).

The question of moral rights of non humans involves the discussion of instrumental and intrinsic values of non humans. While the first proposition may be seen as anthropocentric, the second proposition may be seen as ecocentric. A new environmental ethic may require an eccentric approach, however, the difficulty of ascertaining the interests of non humans may be problematic and irrelevant. It may be more appropriate to talk in terms of identification by humans with the natural environment rather than in terms of the recognition of inherent values (Boer 1984). Furthermore, extending moral rights to non humans does not necessarily imply that non humans be also moral agents. Bookchin (in Boer 1984, p. 245) argues that the domination of nature will go on as long as the domination of humans by other humans continues. The incorporation of an ecological ethic into environmental policies therefore will require major changes in the current system of distribution and exercise of power including a change towards a more participatory model of democracy as well as changes in citizens' attitudes towards a co-existence conception of nature (Boer 1984).

1.4 - The Australian tropics: the last frontier

The dominant Australian culture is originally a displaced fragment of European culture, as are American and Canadian cultures. The confrontation of idealised visions with the reality of the tropics in the course of colonisation of tropical Australia is very interesting from a cultural view point. The centrality of the taming of those new and alien lands and their inhabitants, the sense of cultural

superiority and the belief in social progress provided a basis for the construction of a national identity, quite distinct from their country of origin, for the European residents of colonial lands. The construction of the Australian identity rests on the concept of the frontier, the frontier being both the geographic margin of European expansion and a set of beliefs held by the settlers of those areas (Frawley 1991a). Politically rival colonies developed independent colonial identities in which Queensland was the new frontier (White 1981).

Up until the 19th century, Australians defined themselves with wider loyalties, considering themselves as British. The *coming man* arising from colonial frontiers of the British empire had a number of characteristics: "independence, manliness, fondliness of sport, egalitarianism, a dislike of mental effort, self confidence and a certain disrespect for authority" (White, 1981 p. 77). This image of the typical Australian was shaped out of a background of racism and sexism and was presented in the context of imperial England. It emphasised the value of the common man at the margin of the empire, the settler civilising its fringe (White 1981). The Australian nomadic bush workers (shearers, drovers) of the outback came to personify the vanguard of white settlement of new frontiers by turning an alien landscape into a profitable venture (White 1981). The "noble frontiersman", came to be a symbol of escape from urban industrial civilisation, a romanticising of imperial expansion, a focus for patriotic and nationalistic sentiments, typical of new societies (Ward 1978). While the frontier fostered nationalism and individualism in the United States of America (Turner in Ward 1978), it produced a strong focus for nationalism and an egalitarian sentiment in Australia (Ward 1978). The harshness of the Australian landscape could never support the dream of the family on the small plot of land as it happened for American settlers, thus fostering a class of unskilled nomadic male workers in the Australian outback. The influence of the frontiersman as a national symbol though may in fact ignore the most important aspect of Australian society, that is the urban development of Australia (Roe in Allington 1988).

The reality of the frontier in Queensland is a succession of European expansions (pastoralism, mining and agriculture) into the wilderness (Aboriginal lands), closely following exploration, strong with the conviction that progress was inevitable and could only be beneficial. The misreading of the country and the annihilation of its indigenous inhabitants (and their knowledge of the land) associated with land resource based policies, reliance on external capital and political marginality, yet regionalism, resulted in an overall slow development of

the region, both from an economic and social point of view (Fitzgerald 1986; Frawley 1991a, 1991b). The reliance on primary industries is still today a major part of Queensland economy and the values of the frontier of development and progress are still very much associated with the exploitation of the land. Numerous examples of mismanagement are presented in Fitzgerald's history of Queensland (1986). The great drought of 1894 to 1901 demonstrated "how little the Europeans, as distinct from the Aborigines, had so far learned about the erratic climate (Blainey 1980). Throughout the drought, the land was stripped of vegetation in order to feed the sheep, and the Mulga was near extinction. Economic hardship of the small farmers bred in turn a ruthless attitude to nature. Native fauna was exterminated as rural pests so were trees because they were obstacle to agriculture. The timber boom of the 1880's made possible the destruction of forests by large timber companies. The famous episode of the floating of several million cubic feet of red cedar by the North Queensland Timber Company in 1883 over the flooded Barron Falls resulted in an incredible waste as the logs were smashed to pulp, while the rest was left to rot, contributing to the extinction of the species in northern Queensland. Hard lessons were learnt by new immigrants; quantity of pasture did not mean quality. The lush coastal marshes proved unsuited to sheep rearing; sheep died of poison grass, thirst, drowning during the wet season or of predation by dingoes. Once the Aborigines were driven away from their lands, their practices of burning the land stopped and hunting decreased, dingoes were systematically destroyed by pastoralists and as a result, native fauna increased dramatically to plague proportions (kangaroos, wallabies and possums) leading to a mass slaughter between 1876-1878. The ruthless attitude towards the land also applied to its original inhabitants, as Aborigines were perceived as an obstacle to progress and systematically eliminated as "rural pest" (Woolmington in Bolton 1982). The centrality of land ownership, racial ideology and conflict shaped the race relations of the frontier despite the role of Aborigines from the earliest years of settlement as guides, trackers, police troopers and stockmen (Reynolds 1987). Assimilation and segregation were the policies which incorporated Aborigines into the European economy.

European land use practices applied to an unfamiliar environment, in an effort to recreate a familiar landscape suitable to their concept of an designed nature failed to fulfil settlers' expectations. The divorce between the image of the tropics and their reality was and still is a obstacle to a sustainable development in northern Queensland. Current land uses practices in agriculture, cattle grazing and forestry by and large still ignore the fundamental aspects of the ecology of Australian

tropical landscapes. The recent development of tourism follows the tradition of myth about the tropics (Valentine 1984, 1985). Tropical environments and their wildlife once meant to be tamed and subdued now are considered worth saving for their unique conservation values and are a tourist asset since they evoke powerful images of exotism in the mind of visitors (Valentine 1982).

Although European expansion is now over, the frontier of today is associated with mining and tourism. Frontier images are still strongly held by those people living in the most recently "developed" regions such as northern Queensland. Frontier images are characterised "by the belief on the part of people that they are still pioneers, by a faith in individual action, resentment of government, bureaucracy and red tape, a scope for willingness to experiment in empirical testing, especially with the environment; an emphasis on subduing nature, believing in and making the most of limitless opportunities" (Frawley 1991a, p. 222). The impact of frontier attitudes in the conservation of the Saltwater crocodile has been highlighted by Tighe (1986) following a fatal crocodile attack in northern Queensland whereby the myth of large population of Saltwater crocodiles in the region prompted a National Party state minister to advocate the eradication of the species.

For many Australians, northern Australia remains a frontier, a land of adventure and new opportunities. Here the landscape is used to construe images of Australianness. The Australian landscape and particularly the tropics have attracted a wealth of images well represented in the art and literature (Ritchie 1989; Searle 1991). From the strangeness came the fascination and the fear of exotic places. While most Australians today live in suburbia, the use of the landscape and wildlife in Australian representations is remarkable if one considers the plethora of Australiana available. Interestingly enough Aboriginal motifs are used to package Australia for the tourist industry yet the typical Australian occupies a landscape devoid of Aboriginal cultural evidence (Hodge & Mishra 1990). In many ways, Paul Hogan's *Crocodile Dundee* reconciles this two kinds of representations, possibly by appropriation of Aboriginal attributes as suggested by Clark (M.S.) and Morton (1991). This contradiction may function as to legitimate the illegitimate (Aboriginal dispossession) by knowing and loving the landscape. For contemporary Australians, tourism and leisure provide many opportunities to recreate a national identity (Hodge & Mishra 1990, p. 144).

1.5 - Settlement and crocodiles

During the course of exploration and settlement, encounters with Saltwater crocodiles often occurred with dramatic outcomes. It is however interesting to notice how little mention they got in explorers' accounts (Shield *pers. comm.*, Webb & Manolis 1989). It may be because early expeditions always involved Aboriginal trackers who were more able to take adequate precautions. Early surveyors in the Northern Territory rivers occasionally made mention of them and gave the impression of local variations in crocodile abundance (Webb & Manolis 1989).

Early accounts of crocodile encounters showed how much of a hazard they were to new settlers; crocodiles were treated as vermin and shot on sight. Recorded attacks since European expansion into northern Queensland alone are about one hundred (Shield *pers. comm.*). The Barron River system (near Cairns, Far North Queensland) alone claimed eight reported attacks between 1877 and 1906 (Shields & Wilkes 1988). Early records of attacks on Europeans to the 1900's occurred in the Darwin harbour (1873), the Roper River (1870) and the Katherine River (1886) in the Northern Territory. Attacks were on both Aborigines and settlers alike although those on Aborigines were less likely to be reported (Webb & Manolis 1989).

Caution had to be exercised as recalled British visitor Lavallin Puxley while travelling in northern Queensland (1923):

" In wading or walking beside rivers in the North one has to keep a sharp look out for crocodiles, for these lie in the ooze ready to snap up any unwary walker, and so closely do they resemble the logs which lie about everywhere on the banks of rivers in Queensland that they are easily mistaken for one."

" Though the crocodiles is supposed to be a slow mover, one was seen to turn a complete somersault in order to catch a native who was standing behind him. These natives are said to make for the eyes of a crocodiles which has caught them and to try to poke them out..."

Thomson in his expedition to Arnhem land down the Roper river (Northern Territory) frequently mentioned crocodiles and acknowledged the long experience of Aborigines and their vigilance; however the crossing of rivers and creeks was inevitable and caution had to be exercised (Thomson 1983, p. 29). Artist Ellis

Rowan on her expedition to northern Queensland to paint wild tropical flowers (1898) was nearly taken by a crocodile in the Bloomfield river area, while crossing a creek. She painted the incident. Artist and explorer Thomas Baines pictured himself with an alligator of extraordinary size and improbable appearance during a visit to northern Australia in 1856 (Trompf 1989). The fascination for crocodiles even then attracted southern journalists (Ashton 1941). Crocodiles also provided scope for sport hunting in the tradition of trophy hunting and adventure travels of British colonials. Adventure travelling and early anthropological expeditions in fact provide apart from a record of crocodile encounters, an estimation of abundance of crocodiles at the time in the rivers of Northern Australia (Webb & Manolis 1989). James Morrill who was shipwrecked in 1846 and then lived with the Aborigines of Cape Cleveland (Mount Elliot) near Townsville for seventeen years said:

"There [near Mount Elliot] are a great many alligators in both the fresh and salt water creeks, and particularly in one large fresh water lagoon. I have seen dozens of natives dragged down and killed by them."

Similarly, J.H. Black (1896) described the new port of Townsville as:

"situated a hundred miles to the north west on an alligator infested creek in a mangrove swamp shut in by heated granite rocks." (in Fitzgerald 1986, p. 144).

A Danish emigrant travelling through Queensland noted lots of "alligators" in the Ross creek while he was in Townsville and the Herbert river " was swarming with the reptiles" while he went through in Cardwell (Dreyer 1892, pp. 102 & 133).

It was not until after the second World War that commercial hunting of Saltwater crocodiles developed in northern Australia. The crocodile hunters of 1945-1950 period in fact were some of the first people to explore coastal creeks and inland swamps. Those areas were difficult to access and the cooperation with local Aboriginal groups was mandatory since they provided the specialist knowledge of crocodiles and their habitats and the labour necessary to the success of hunting expeditions. It may also have been a way for Aborigines to control the white man access consistent with their beliefs about the land. Many of those hunters are still alive and the accounts of those days are of hardship, adventure and learning of Aboriginal ways for some (Mulner *por. comm*).

The importance of that industry can be estimated from the trade in skins at the time. It is estimated at 113 000 skins in the Northern Territory alone between 1945 and 1971. Most of the harvest took place between 1945 and 1958 with 87 000 skins traded which may have indicated a decline in crocodile populations and the shift of Freshwater crocodile. About 270 000 Saltwater crocodile skins and 200 000 to 300 000 freshwater crocodile skins were exported from Australia in total. As the populations started to decline and returns to the hunters decreased, the decision was made to protect the crocodiles in 1969 in Western Australia, 1971 in Northern Territory and 1974 in Queensland (Webb, Whitehead & Manolis 1987).

From being a vermin to destroy, then a resource to exploit to a threatened species showed an evolution in attitudes towards crocodiles as it was realised that populations were declining. It was followed by international, federal and state protective legislation, the start of intensive research into the status of remaining populations and the establishment of management programmes based on scientific information. The days of uncontrolled exploitation had come to an end.

PART 3: TOWARDS A THEORETICAL FRAMEWORK FOR WILDLIFE MANAGEMENT

1.1 - Definitions

Attitudes towards an issue or an object can be seen as having three major components: the *knowledge* and *beliefs* of, the *evaluation* of and the *behaviour* towards such object or issue. Attitudes provide mental representations used to explain and organise the world. They develop through experience both direct (personal) and indirect (information, media, education) with the object or issue. They are connected to other attitudes in complex relationships. Attitudes and behaviour towards an issue or an object also express the values of an individual. Attitudes to familiar issues or objects are more resistant to change than those to new, unexpected and unfamiliar ones. (Pearce & Moscardo 1988). Socially acceptable behaviour is guided by three determinants, the knowledge component (a function of experience, education and cognitive process), the culpability component (attribution of blame for one's actions and least socially detrimental option) and the normative component (social compliance) (Heberlein in O'Riordan 1976, p. 213). The Reasoned Action or Expectancy model provides a theoretical support for understanding the relationship between attitudes and behaviour (Figure 1.1).

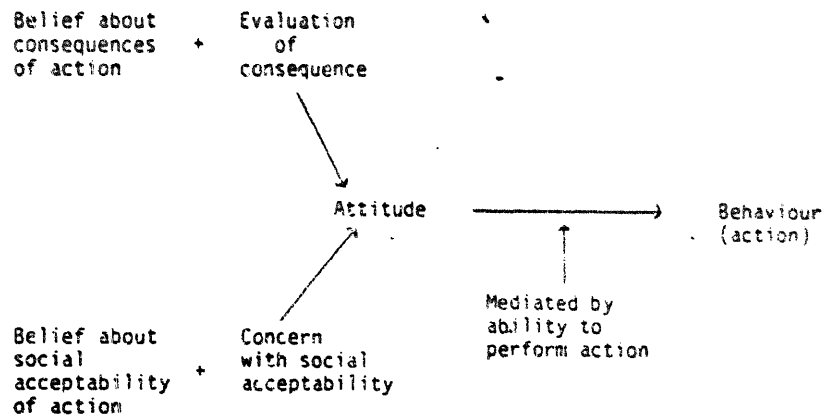


Figure 1.1 - *Reasoned Action Models*. (Source: Pearce & Moscardo 1988).

It emphasises that attitudes are the product of two sorts of beliefs, beliefs about the consequences of a certain behaviour, and their evaluation, and the belief about the social acceptability of the consequences and concern about their social desirability. How attitude change translates into behaviour change depends on the mindful processing of new information as well as a change in the knowledge and desirability of appropriate behaviour (Pearce & Moscardo 1988). Environmental construing is as much a social process as it is a product of individual psychology. A matrix of behaviour, personal values and perceived social norms provides a convenient categorisation for the interpretation of individual behaviour (Figure 1.2).

| | | Relationship between behaviour and personal values | |
|---|--------------|--|------------|
| | | Consonance | Dissonance |
| Relationship between behaviour and perceived social norms | Congruent | A | B |
| | Noncongruent | C | D |

Figure 1.2 - *Individual and Social Sanctions on Environmental Behaviour*.

(Source: Eckardt & Hendeshot in O'Riordan 1976, p. 214).

1.2 - The scope of attitude studies in wildlife management

Systematic investigation of human perception of animals is surprisingly lacking, given the theoretical and practical significance of the topic to wildlife management. The importance of understanding the perception of animals has been stressed many times, as the real issue is not just how to manage animal species and their habitat, but also managing humans (Leopold in Kellert 1983, p. 242). Norris (in Kellert 1983, p. 242) argues that:

"how we behave in relation to natural populations is largely a human affair tightly interwoven with the needs, competitions and frivolities of humans and the social institutions they build."

Available studies provide quantitative measurements of attitudes which allow comparative assessments between socio-demographic groups of a representative sample of population (for a review of measurements of wildlife values, see Steinhoff 1980). Those measurements provide a basis for the valuation of wildlife in Benefit Cost Analysis (CBA) of conservation policies (Shaw & Zube 1980). Heberlein (1969, p.37) argues that:

"Attitude studies are useful for environmental managers because they provide information about public support and beliefs, information about goals necessary to set standards and information about the current and future behaviour of relevant parties"

The difficulty experienced by wildlife managers is to account for the range of values attributed to wildlife. Depending on authors, the values considered are economic psychological/social and ecological (Figure 1.3). The relationship between those different approaches shows areas of overlap, yet leaving out unmeasured values (Shaw & Zube 1980).

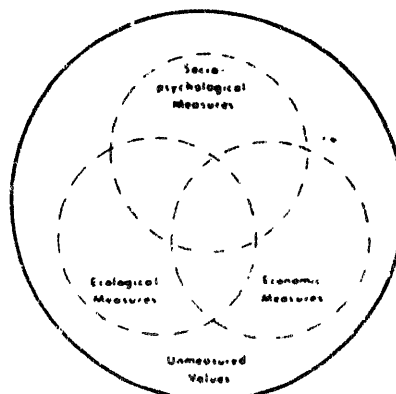


Figure 1.3 - The measurement of wildlife values (Source: Shaw & Zube 1980, p.6).

1.3 - Attitudes towards animals

Research on attitudes towards animals have focussed on animal preferences and symbolic perception, knowledge of animals, fear of animals, attitude typologies and attitudes to critical wildlife issues among relevant target groups.

1.3.1 - A typology of attitudes towards animals

A major piece of research on attitudes towards animals in the context of wildlife management was conducted in the USA by the School of Forestry and Environmental Studies (Yale university, USA) under the leadership of Professor Kellert (Kellert 1978, 1980a, 1980b, 1980c, 1983, 1984a, 1984b, 1985a, 1985b, 1985c, 1987, 1988). The study, conducted over several years, generated a basic typology of attitudes towards animals. In considering attitudes, three components were described, affective, evaluative and cognitive. The relationship between the perception of animals and those components of human perception is shown on Table 1.2.

| Perception of animals | Primary, secondary and tertiary components of human perception | | |
|-----------------------|--|-----------|-----------|
| | Evaluative | Affective | Cognitive |
| Attitudes | 1 | 3 | 2 |
| Knowledge | 2 | 3 | 1 |
| Symbolic | 2 | 1 | 3 |

Table 1.1 - Relation of perception of animals to components of human perception
(Source: Kellert 1983, Table 1, p.243).

Ten attitudes types were identified: *naturalistic, ecological, humanistic, moralistic, scientific, aesthetic, utilitarian, dominionistic, negativistic, and neutralistic* (Table 1.2).

| Attitude towards animals | |
|--------------------------|---|
| Naturalistic | Primary interest in affection for wildlife and the outdoors. |
| Ecological | Primary concern for the environment as a system. |
| Humanistic | Primary interest and strong affection for individual animals (pets) and opposition to cruelty to animals. |
| Moralistic | Primary concern for the right and wrong treatment of animals. |
| Scientific | Primary interest in the physical attributes and biology of animals. |
| Aesthetic | Primary interest in the symbolic characteristics of the animals. |
| Utilitarian | Primary concern for the practical and material value of animals and their habitats. |
| Dominionistic | Primary satisfaction derived from mastery and control over animals. |
| Negativistic | Primary orientation in passive avoidance of animals due to indifference, dislike, and fear. |

Table 1.2 - Wildlife values (Source: Kellert 1983, p. 249).

The distribution of those attitudes in a national survey of the American public (3107 randomly selected respondents), among selected animal activity groups and various demographic groups was conducted in 1977. Attitudes towards critical wildlife and habitat issues, knowledge of animals and species preferences, historical trends in uses and perception of animals in the 20th century, and children's knowledge of attitudes and behaviour towards animals were investigated (Kellert 1980c). Attitudes were roughly distinguishable into two broad and relatively antagonistic pairs suggesting some reason for the considerable tension and conflict in attitudes towards animals in contemporary American society. The *humanistic* and *negativistic* diverged in their affective response to animals, the *moralistic* and *utilitarian* in their perspectives on the exploitation of animals (Kellert 1983).

There was a distinct difference of affective, cognitive and evaluative responses with age, sex, education, socio-economic status and ethnicity. It was found that age affected the *utilitarian* scale (it was high among older respondents), the *naturalistic* and *ecological* scales (they were higher among respondents under 30 years old). High *negativistic*, low *naturalistic*, *ecological* and *moralistic* scales were found among Black Americans, expressing an overall lack of interest in animals and wildlife particularly; however those results may have been a combination of socio-economic and cultural factors rather than strictly ethnic differences (Dwyer & Hutchison 1990; Taylor 1989). Education affected the *negativistic* scale (it was high among poorly educated respondents) and the *ecological* scale (it was high with college educated respondents). The degree of utilisation, concern and negative feelings towards animals varied with occupational groups. While professionals and college graduates had high *naturalistic* scale, farmers had the highest *negativistic* and *utilitarian* scales. However, it was associated with high *ecological* scale (Kellert 1983, 1988).

It was found that gender affected attitudes significantly. Females had a high score for the *humanistic* scale, indicating attraction for pets and aesthetically appealing species, and a high score for *moralistic* scale indicating opposition to cruelty to animals. Males in contrast had high scores for the *utilitarian* and *dominionistic* scales, indicating that gender may be the most important demographic variable to account for influences on attitudes towards animals. Males were more knowledgeable about animals than females. They were more involved in consumptive-use activities such as hunting, fishing and trapping than in non consumptive activities such as bird watching nature photography and zoo visits. The difference in participation in non consumptive activities were far less divergent (Kellert & Berry 1987).

1.3.2 - Animal preferences

The factors affecting the perception of animals have been identified as size, intelligence, aesthetics, dangerousness, damage to property, phylogenetic relatedness, domestic or wild, social structure, texture, cultural and historical relationship (Kellert 1985b). The most disliked animal category according to Kellert (1985b) were biting and stinging invertebrates (cockroach, mosquito, wasp) followed by unattractive animals and animals associated with human injury (snake, bat, vulture, shark). The most liked animals were the dog and the horse followed by familiar and aesthetically appealing species (robin, swan, butterfly trout eagle). Fenton and Hills (1988) investigated the perception of animals among animal liberationists and hunters using multidimensional scaling techniques. Five dimensions were identified: domestic versus wild, mammals versus non mammals, relatedness to humans, useful versus pest, builders/gatherers versus hunters. It was found that animal liberationists attached more importance to the domesticity dimension, while hunters attached more importance to the mammals and the builder dimensions. A similar technique was used to investigate animal names (Henley 1969; Howard & Howard 1977). Three dimensions were identified which coincided with the previous study : wild/domestic, relatedness to human, builders, gatherers/hunters.

A review of animal preferences among children by Paterson (1990) incorporating three studies, two in England (Paterson 1981-86 and a BBC survey 1988), and one in the United States (United States Fish and Wildlife Service 1982 onwards), showed that the dog and the horse were the most popular animals in two of the surveys, and the dolphin and the dog in the third one. (Table 1.3).

| | | Animal preferences | |
|---------------|--------------------------------------|---------------------------------------|------------------------------|
| | Paterson 1981-1986 | US fish and Wildlife Service 1982- | BBC survey 1988 |
| Most popular | Dog/Horse Cat Panda/Chimpanzee | Dog Horse Cat | Dolphin Dog Cat/Rabbit |
| Least popular | Crocodile Rat Spider | Rat Wasp/Mosquito Cockroach | Wolf Spider Rat |

Table 1.3 - Animal preferences among children (Source: Paterson 1990, p. 39).

The Crocodile was mentioned as one the least popular animal (Paterson 1990). Kellert (1985a) showed that there was no emotional identification with animals in young children and that their attitude was mostly exploitative. As the children developed, the ethical concern for the welfare of animals and the ecological

appreciation of animals increased dramatically, as well as the knowledge of animals. The amount of anthropomorphic characteristics of animals affected attitudes quite significantly. Most children would prefer pets to wild animals, although older age groups were not so sentimental about animals (Paterson 1990). The least popular animals lacked anthropomorphic features and were dangerous (crocodile), unattractive or associated with disease (rat). The amount of exposure to wildlife documentaries and books was found to be correlated to knowledge of animals and positive attitudes towards animals (Paterson 1990). Finally, the background of the respondents showed that rural children were more likely to be better disposed towards wild animals than urban children, and that males were more knowledgeable while females were more sensitive about animals. It was also shown that knowledge was higher in white children than black children (Kellert 1985a). The study of fear of animals during middle childhood conducted by Bowd (1983, 1984) showed that there was a decline in the number of species feared with age, and an increase in the realism of fears with age. Fear of animals were considered learned, dependent on intellectual and maturational levels, and a consequence of experience or instruction, but empirical evidence on the role of specific environmental variables is lacking. Positive attitudes towards animals in middle childhood was found to relate to pet ownership with reduced reported fears. Fears were more readily reported by female than males children. Reported fears correlated with expressed dislike of several species including some perceived as non threatening: highest correlation were found with snake, rat, lion cow and sheep. A study conducted among biology and non biology college students (Bowd & Boylan 1984) showed that the most frequently cited feared species to be the snake, the spider and the dog in both groups with no significant difference as previously expected.

The unpopularity and fear of crocodiles is very deeply rooted may be seen as a combination of poor aesthetic characteristics (scales, rough skin, large jaws), potential predation on humans and reptilian attributes such as cold bloodedness, immobility and amphibious habits. Those very attributes have been invested with anthropomorphic meaning of evilness. Feared predators or phylogenetically distant animals such a snakes, insects, fish and crocodiles have provided the visual and symbolic material for the representation of the demon, in fact indicating the symbolic connection between evil beast and human irrationality (Midgley in Benson 1983, p. 87). The slaying of the dragon, found in the Judeo-Christian myth of creation symbolises the emergence of humanity out of a primeval chaos (Hogarht & Clery 1979). Crocodiles may be seen as the sentinels of evil and the legitimate fear of crocodile attack may in fact be seen as an expression of the powerful taboo of

cannibalism, where being eaten by a crocodile carries evilness to its victim (Graham & Beard 1990).

Animals preferences however, are culture specific and the above classification may not be readily applicable to other cultural contexts. Caughley (1985) classified animals as *nasties* (pests and fearful animals), *lovelies* (aesthetically attractive animals), *commodities* (domesticated and harvested animals) and *irrelevencies* (non impacting animals). He found that different species occupied the same category according to the cultural background, economies and social environments of respondents (Table 1.4).

| | Nasties | Lovelies | Commodities | Irrelevencies |
|-------------|----------|----------|-------------|---------------|
| Australians | Wild pig | Dog | Cattle | Lizard |
| Indians | Lizard | Cattle | Wild pig | Dog |

Table 1.4 - Cross cultural factors in the perception of animals (Source: Caughley 1985, table 13.1, p 129).

1.3.3 - Knowledge of animals and animal related issues

Factual knowledge and awareness of management issues (Kellert & Berry 1980) showed that Americans were more knowledgeable about animals known to inflict injury and disease and about domestic animals. Little was known of endangered wildlife, invertebrates and animals commonly associated with superstition and myth (Table 1.5).

| Mean correct score for types of knowledge questions (score from 0 to 100) | |
|---|------|
| Human injury | 63.4 |
| Biological characteristics | 55.3 |
| Domestic animals | 53.4 |
| Predators | 47.1 |
| Wildlife management/history | 43.6 |
| Taxonomic characteristics | 38.5 |
| Invertebrates | 34.7 |
| Superstition/myths | 33.2 |
| Endangered species | 27.4 |

Table 1.5 - Knowledge of animals (Source: Kellert 1983, table 4, p.254).

The knowledge of animals was found high among college educated, high socio-economic groups and among animal activity groups compared to the general public (Kellert 1983). The knowledge of animals has mostly been studied with children. It was found the highest knowledge scores were found among white children with secondary education as opposed to blacks children (Giles in Kellert 1985a) and among rural students especially those involved in recreational fishing and hunting

(Pomerantz in Kellert 1985a). It was also found that knowledge was higher among males than females and differences concerned endangered species, invertebrates and awareness of wildlife issues (Kellert & Berry 1987).

The knowledge of animals related issues showed that issues of great familiarity were either highly emotional (the baby seal controversy) or associated with a human health hazard. The issue of impacts on wildlife, such as habitat loss were not well recognised. Attitudes towards animal related issues and problems have for most part been descriptive and unrelated to any theoretical perspective of human animal relations. Kellert (1983) identified four types of issues:

- human socio economic development versus animal and habitat protection;
- animals rights and welfare issues;
- consumptive and extractive use of animals;
- wildlife practices and procedures.

The "willingness to pay" for the protection of wildlife has often been overlooked by policy makers. However, the modification of human activities in order to protect wildlife is influenced by the aesthetic value of the species, the degree of socio-economic impact involved in protecting the species, the phylogenetic relation of the species to humans, the presumed threat of the species to human health and productivity, the cultural and historical importance of the species and the potential and actual economic value of the species. Kellert (1985c) showed how influential animals values are in the evaluation of the costs of protection in energy development programmes in the American public. The costs of protecting certain species rather than others were more readily accepted for large, aesthetic and human related animals such as the Eastern Mountain lion, the Bald eagle, the Agassiz trout and the American crocodile and even the Silverspot butterfly than the Eastern Indigo snake, the Kauai wolf Spider and a plant the Furbish lousewort. The reasons for conservation may not be economical, ethical nor ecological, but related to human development. Important animals to humans are not necessarily important to ecosystems but may see them as desirable (Shepard 1978).

1.3.4 - Wildlife/human conflicts

Investigations of wildlife practices and procedures have been a descriptive determination of support for or against a particular management procedure, often in response to situations of open or potential conflicts. Examples of such research have

been wildlife law enforcement, controlling bear-people conflicts in National parks, habitat manipulation, perceptions of wildlife management agencies, predator reintroduction programmes and funding for public wildlife management.

The valuation of wildlife become crucial for dangerous wildlife (bears, crocodiles, alligators, elephants, rhinoceros, wolves and coyotes). The control of dangerous wildlife may raise important issues of public safety but also protection of property. This is made even more difficult if the species is being protected. Attitudes to predators are shrouded with myths (see the factors affecting animals preferences) which affect the acceptability of management policies. For example, the negative perception of the Timber wolf in Minnesota (USA) has historical and cultural roots. To the pioneer American, the wolf symbolised the wilderness and was an obstruction to progress and civilisation and as such was considered as vermin (Lopez in Kellert 1985b, p. 175). The closeness of the Indian and the wolf in the settler's perception only reinforced the desire to push into the unknown wilderness, land of the wolf and the Indian. A similar attitude to wilderness, crocodiles and to Aborigines also prevailed in the Australian frontier. There has been contradictory evidence regarding regional differences in attitudes to the timber wolf among demographic groups. While early studies showed negative perception with persons living in closest proximity to the animal (Llewellyn in Kellert 1985b), the reverse was found in Kellert's study. He found that livestock producers expressed negative attitudes towards the wolf despite the low incidence of livestock predation. The ecological value of predator species (Grizzly bear, coyote) was found low but high for other wildlife such as the Pronghorn antelope and White tailed deer (both being herbivores) among those respondents. However, knowledge of predators was greater among livestock producers. Anti-hunters and zoo enthusiasts had low knowledge scores despite their strong affection and support for protecting wolves and coyotes. The greatest knowledge was found among nature hunters, birdwatchers and environmental protection groups. It was found that positive attitudes towards predators were associated with appreciative attitude towards wildlife and the outdoor (high *naturalistic* scale), a disposition towards wildlife and habitat protection (high *ecological* scale), opposition to the cruel treatment (high *moralistic* scale) and exploitation of animals (low *utilitarian* scale). Negative attitudes were primarily associated with fear and lack of interest in animals (*negativistic* scale).

Wildlife related conflicts in outdoor recreation have been documented in the United States with Grizzly bears at Yellowstone, Glacier and Banff National Parks

(Schullery 1980). A history of the management of Grizzly bear populations at Yellowstone National Park showed the changes in attitudes towards Grizzly bears and the management direction over the last decades: as a result of public demand, bears were first used as a tourist attraction, and to that effect, were encouraged to scavenge on the parks' waste, despite the danger they represented. A few dramatic encounters changed that attitude and today, the emphasis is on the minimisation of interaction between bears and people. The public is not to interfere with bear habitats and bear shows have long gone; a strong emphasis is placed on safety in bear territory by the management. In many ways, the situation with crocodiles in northern Queensland is similar (Valentine 1985). The crocodile though never got the popular image of the bear, despite the fact that its exotic nature attracts the curiosity and fascination of many.

Three published studies of attitudes towards crocodilians were found, and I suspect that the remainder of available material would be in grey literature. The first two are studies of public opinion of alligators (*Alligator mississippiensis*) in Florida (Hines & Scheaffer 1977; Delany, Hines & Abercrombie 1986), following the development of conflicts between increasing populations of both human and alligators. The Game and Fresh Water Fish Commission was requested by public demand to remove problem animals in such numbers (5000 in 1976) that an investigation of public support for certain management options regarding alligator populations became imperative. Danger, values and management options were surveyed in both rural and urban areas. The results showed that the residents of Florida regarded the alligator as an important part of the Florida scene and that the species was of value. People with contact with alligators were less likely to perceive them as dangerous (particularly males). There was a range of responses to management options; the option with greater support was for regulated commercial harvest, mostly in rural areas compared to urban areas. Further research on the acceptability of harvest among fishermen showed general approval of harvest programmes, however with some confusion between harvest and nuisance alligator programmes (Delany, Hines & Abercrombie 1986).

The third is a study of anxiety associated with the Estuarine crocodile in a resident community of far northern Queensland (Ross 1989). The study showed that high levels of knowledge were associated with high level of anxiety. Anxiety was more readily admitted by females than by males and knowledge was higher among males than females. The level of anxiety did not seem to affect the recreational activities of respondents.

1.3.5 - Limitations of the study of attitudes

The above studies have focus on the individual cognitive maps of attitudes and values in relation to nature and animals. The determinants of environmental concern and attitudes towards animals have focussed on socio-demographic variables. Unfortunately, it has been fairly difficult to establish strong links between any factor (or group of factors) which could explain satisfactorily observed patterns of environmental concern. Factors such as age, sex, income, ethnicity, occupation, political ideology, religion, and background were the major variables investigated in the extensive review of existing studies of the determinants of environmental concern (Van Liere & Dunlap 1980; 1981).

A common myth has been that environmental concern was a middle class issue. The basis for this early argument was the theory of needs which stated that only once basic needs are provided, one can be concerned about other needs such as environmental quality (Maslow in Van Liere & Dunlap 1980, p. 183). Research has shown that there was confusion between environmental concern and environmental activism. The former being widely spread in the community, while the latter being related to a middle class background. A model was derived which showed how attitude strength, personal efficacy and resource availability actually differentially interacted in participation and non participation of low and middle class groups in environmental activism (Mohai 1985). Likewise, it was found that urban residents were overall more concerned about the natural environment than rural residents, but the more utilitarian concept of nature and the degree of association with extractive activities of rural residents were found more significant than residence *per se* (Van Liere & Dunlap 1980).

The overall poor level of environmental concern among Black Americans has been associated both with low socio-economic and cultural variables (Kellert & Westerfelt 1982; Kellert 1984a). Those groups were found to have low knowledge scores and a primarily negative attitude towards animals, a generally lower interest in environmental issues as well as being unlikely to engage in environmental action (Taylor 1982). Taylor (1989) identified three streams of interpretation to account for racial differences presented in a number of studies, the first one is economic constraints and marginalisation, hierarchy of needs, the second one is cultural and relates to mythology, history and ethnicity, both are explanations of the concern gap, the third being political efficacy and subcultural socialisation and is an explanation of the action gap. Taylor (1989) explained the non participation of

Blacks American in environmental groups, chiefly by low social matching and social marginalisation rather than lack of environmental concern, despite their high level of affiliation to voluntary groups. Dwyer and Hutchison (1990) have shown that recreation behaviour and preferences among Black American households had an urban orientation. One problem with the ethnicity approach is the assumption of homogeneity within the black community and its assertion that Blacks represent a distinct ethnic group.

Gender has not been extensively used as a determinant of environmental concern and the few studies available provided conflicting evidence (Van Liere & Dunlap 1980). Gender differences in attitudes may develop from social and cultural contexts where the socialisation process and the "factors of social status and power combine with reproductive biology to shape the experience of males and females and the relation between the sexes" (Chodorow 1987; Gilligan in Blocker & Eckberg 1989, p. 2). In Western society, female socialisation develops around motherhood and nurturing and a worldview based upon concern for the maintaining of life and relationships, while male socialisation develops around rationality, competition, accumulation, assertiveness and a worldview of nature as a commodity (McStay & Dunlap 1983). In their study of attitudes towards animals, Kellert & Berry (1987) found that gender was a major variable to account for differences in knowledge, attitudes and behaviour towards animals. Local environmental issues also seemed to be greatly affected by gender, females being more concerned about local issues than males while there was no difference for broader environmental issues (Blocker & Eckberg 1989). A change in management agencies' culture may be required to address those issues, since existing policies may in fact reflect white, middle class, male dominated cultural values (Kellert & Berry 1987).

In conclusion, the failure of socio-demographic variables to account for variations in environmental concern points to the widespread distribution of such concern in society and argues that a more relevant approach to policy making would be to focus attention on specific environmental issues and policies since it is unlikely that concern would be similar for a wide range of issues. Furthermore, the trade offs between environmental quality and other widely valued ends such as low taxes, economic growth, free enterprise and private property rights suggest the fruitfulness of examining differential commitments as determinants of support for environmental protection (Van Liere & Dunlap 1980). From a methodological point of view, it means that the use of the range of dimensions in the measurement of environmental concern should be more focussed on single issues rather than

encompassing a range of substantive issues in order to avoid the "masking effect" of the true relationship between the dimensions used in scales and selected independent variables (demographic variables for example, Van Liere & Dunlap 1981). Samdhal and Robertson (1989) further argue that the interaction between dimensions among socio-demographic variables may render correlational analysis inconclusive and difficult to interpret. They demonstrate that socio-demographic variables are ineffective in explaining differences in the perception of environmental problems or ecological behaviour. The "dominant social paradigm" (support for laissez faire government, support for private property rights, and a belief in economic growth and material abundance) has been found to be strongly (negatively) correlated to environmental concern indicating liberalism as a broader ideological system from which environmental attitudes are drawn.

1.4 - The contribution of risk studies to the management of dangerous wildlife

1.4.1 - Definitions

An alternative approach to the study environmental attitudes can be found in risk studies. The justification of such an approach with regards to crocodile management is that crocodiles are a potential threat to humans and as such risk studies may be relevant. The study of risk has been mainly concerned with technological risks, as threats from the physical world have largely been eliminated through science and technology; indeed, very few natural threats remain, diseases are for the most part controlled, wildlife is unfamiliar to most people as modified environments dominate the humanscape, natural disasters are infrequent. The social intensity of conflict situations associated with technological risks has triggered a large volume of research and management applications not matched in other situations such as wildlife hazards.

Hazard can be defined as a *potential* harmful event. What constitute a natural hazard is problematic because natural hazards only exist in relation to a *vulnerable* community (Hewitt 1983). Risk can be defined as the *probability* of an harmful event multiplied by the *severity* of the harm (Campbell in Douglas 1986, p. 20). The definition of hazard as "the inability to cope with physical causes and physical consequences is perhaps the best, because expectations about coping create the quality of hazardousness, and a theory of perception is necessary for thinking about risk acceptability" (Douglas 1986, p 27).

1.4.2 - Conceptual approach

The approach to the study of environmental threats was originally developed in anthropological studies (Douglas 1966; Douglas & Wildavsky 1982). Concepts such as cultural bias, risk selection, social accountability and risk acceptability were introduced. Culture is presented as a coding principle by which hazards are recognised; cultural bias, which states that individuals structure their world in ways consistent with their shared daily experience, is the basis of the social construction of risk. Risk encompasses societal concerns about equity as well as concerns about the probability and magnitude of adverse consequences. The community sets up the individual's model of the world and the scale of values by which different consequences are identified as grave or trivial. Risk acceptability is presented in social terms as a function of the procedures of consent and allocation of responsibility according to social norms of fairness (Rayner 1985; Thompson & James 1989). Environmental problems are socially constructed and as such their perception may change in time and space (Thompson 1982). For instance, the threat to the environment is perceived when certain social indicators of social climate are at play such as an erosion of trust in institutions, intense media attention and politisation of environmental issues (Brown 1989). Social analysis used in the study of technological threats stresses the importance of understanding of social meanings of risk as a necessary dimension to establish a useful dialogue between risk creators and risk bearers.

There is no unified social theory of risk, rather a number of approaches and methodological tools used to identify the social processes underpinning definitions, responses to, and ways of managing risks. Those studies can be considered in terms of their level of analysis (institutions, communities, groups and individuals) and methodologies. Early methodologies were concerned with physical safety then extending to environmental concerns and now including social and political consequences (Brown 1989). The institutional approach considers the institutionalisation of matters of safety to regulatory and policy making bodies, and assesses the political nature of risk management (O'Riordan in Brown 1989 p. 9). The study of community responses to environmental threats considers the social networks and interface with institutions at local level. Risk perception considers individual judgments about threats and the attributes of risk perception.

The Grid and Group model, based on the assumption that individual behaviour and thoughts are shaped by primarily social influences rather than by individual

volition (Douglas & Wildavsky 1982), provides a conceptual framework for the social analysis of attitudes towards nature. It identifies four rationalities (or social organisations and worldviews), "atomised individualism", "hierarchy", "network individualism", and "egalitarianism" (James & Thompson 1989) (Figure 1.4). "Group" is defined as the range of social interactions and "grid" as the amount of constraints imposed on individual interactions.

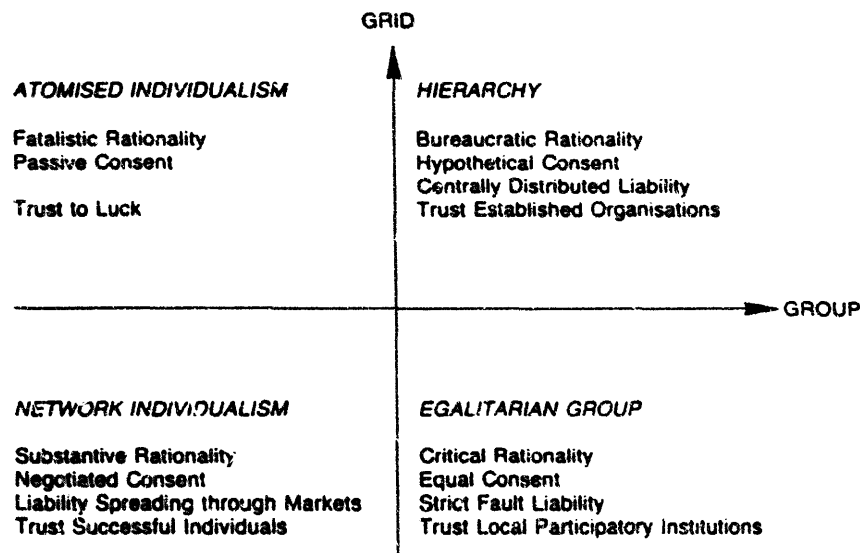


Figure 1.4 - The grid and group model of cultural diversity
(Source: James & Thompson 1989, p. 88).

These four ideal categories are dynamic and individuals have the ability to move from one to another. They are also modified by other forms of social classification such as class, gender and ethnicity for instance.

1.4.3 - Risk selection and accountability

Why are certain risk are chosen for social attention is a complex issue. Different types of societies develop different types of accountability and are concerned with different dangers (Douglas 1986; Douglas & Wildavsky 1982). For instance, in holistic societies, there is no concept of death by natural causes; death is attributed to a member of the community or blamed on the victim and has moral and social implications. The Lele ranking of risks, for example, does not include the numerous tropical diseases that affect them but lightning, barrenness and bronchitis. These troubles are related to immorality and blamed on village elders (Douglas &

Wildavsky 1982). In other groups the victim is to blame and guilty of wrong moral conduct. For instance, The Turkana of lake Rudolf in East Africa believe that a man with a clear conscience has nothing to fear from crocodiles. If an individual is taken, then it means that the person in fact may have done something wrong, and it is only legitimate that the crocodile took the person. This can be extended to the point of giving the animal the decision of morality (Graham & Beard 1990). Those who respect crocodiles enjoy a special immunity from their attacks. In the Island of Ceram in the Indonesian Moluccas, the feeling of veneration and awe towards crocodiles are expressed through ritual sacrifice of virgins to secure protection from attacks. In other part of Indonesia, human predation by crocodiles is made unlawful and skilled hunters in magic and crocodile knowledge will destroy the offender crocodile (McNeely & Watchel 1990). In Nuer tradition, crocodiles are seen as ferocious and savage by individuals outside the totemic association (Willis 1974, p. 19). Crocodiles as a risk in those cultures has been included into belief systems and they are considered moral agents, therefore crocodile predation, although frequent and feared is accounted for through social mechanisms based on totemic association and extension of moral rights. This is also the case with Australian Aborigines (see Section 1.2).

With the advent of science and the ability to explain previously inexplicable phenomena, western societies could discriminate between natural causes of death and were freed of the tyranny of moral behaviour in all aspect of social interactions. However, the tendency to blame fate rather than society or the victim is not nowadays so clear because more and more, the responsibility is transferred to the society. With the complexity of industrial societies, the centralisation of decision making rests on the procedures of consent by individuals and the management of risk and distribution of liabilities is increasingly attributed to institutions rather than to individuals themselves (Douglas & Wildavsky 1982). In the case of personal threats, which include wildlife threats, the management of risk is still left to the individual as the blame for accident most often rest on the individual. However, increasingly the balance between personal control and social control becomes fuzzy and the locus of control is not so clearly defined with regards to personal dangers.

1.4.4 - Risk perception and public concern

The focus of this approach is in the individual coping with alternative situations and making judgement based on perceptions and values. People are asked to make judgements about the existing and the desired riskiness of different hazards and the

desirable level of regulation for each. These judgements are related to attributes of the hazard (unpredictability, dread and knowledge), benefits accompanying the hazard, number of deaths caused by the hazard and the seriousness of each death from a particular hazard relative to death from other cause (Slovic, Fischhoff & Lichtenstein 1986).

A number of factors have been seen to affect risk perception and public concern. Natural unpredictable hazards are more readily accepted than human induced predictable risks and can be explained in the context of the attribution of blame. People also tend to overestimate the dangers of rare and memorable events and underestimate those of common events. At the same time, most individuals have a strong but unjustified sense of subjective immunity with regards to low probability dangers: people underestimate the risks that are under their control and the risk of events which are rarely expected to happen (Douglas 1986). Finally, risks that are dreaded seem less acceptable than those which carry less dread (Sandman 1987; Wynne in Brown p. 118).

It has been shown that dread and familiarity were the two significant independent orthogonal dimensions of risk perception to which all attributes could be reduced, dread representing the emotional and familiarity the cognitive dimensions (Slovic *et al.* in Wynne 1989, p.124). Those dimensions are considered as attributes of risk and are associated with objective physical properties of the technology or threat concerned. However there are two problems with this approach; first the symbolic (cultural) factor has been ignored and second there is an understanding of an objective assessment of the risk (Wynne 1989).

It is important to acknowledge the biases inherent to public perception. Not only lay people use qualitative criteria to judge hazards but are also influenced by memorable instances leading to erroneous beliefs about the likelihood of accidents. Judgements about risk are different depending on the perception of the risk affecting the individual or society as a whole. In the case of personal risk (under individual control), self interest is more prevalent, while in the latter, moral values are more important. Following theories of attitudes developed by Fishbein and Ajzen (1975), it was found that people made judgments about risks using a number of factors including economic factors, environmental consequences, socio-political implications, psychological risk and local impacts (Brown 1989).

Peter Sandman (1987) defines the perception of risk by the lay person as "outrage" (public concern) and the expert risk assessment as "hazard". Factors that contribute to public "outrage" can function independently from the severity of the hazard because they are social in origin. For instance, environmental lobbying, media attention, political pressures can affect "outrage" about low "hazard" situations. Conversely, low "outrage" can occur for high "hazard" situations.

1.4.5 - Risk communication processes

The management of risk involves people, as they have to be warned, or protected against adverse consequences and also persuaded of the efficacy of expert risk assessment and solutions to minimise risks. The relationship between the public and risk managers is based on trust and confidence. Appropriate risk communication is based on appropriate risk assessment, trust in the institution delivering the message, quality of the message, and relevance to the target groups. The communication process includes the source, the message and the receivers. The source's main attribute is credibility; message's attributes include emotional versus logical presentation, fear appeals, message style (implicit versus explicit conclusions). Receivers are the risk bearer, the risk manager, the general public (Kasperson & Palmlund 1987). Receivers' attributes are prior experience of the risk, group membership, education, and personality. The understanding of the importance of risk communication in order to reduce risk taking behaviour is paramount.

1.5 - Risk assessment and probabilistic thinking

The difficulty of making quantitative judgments under uncertainties has been the subject of extensive literature in decision analysis and management sciences (Hattis 1987). Certain cognitive heuristic processes resulting in biases in the perception of probabilities have been identified and methods to reduce those biases proposed. Two specific biases are common: overconfidence in the reliability of subjective predictions, assignments of too narrow confidence limits to uncertain quantities, and neglect of distributional information on the "prior" probabilities of various outcomes in favour of weak information with little bearing on the likelihood of those outcomes (Hattis 1987).

The problem of the discrepancy between the public and the expert perspectives is a common problem of public education programmes in environmental and risk

management management alike. Public and expert risk assessments are usually different and the amount of difference is a reflection of the level of public concern (Sandman 1987). The faith in education is a logical step towards the reduction of public concern and is based on the notion that the problem lays with the public's misconceptions about the risk. However, as early as 1974, Slovic, Lichenstein and Fischhoff (in Douglas 1986, p.31) stated that:

" our own view is that educational attempts to reduce the perception gap are probably doomed to failure" .

Fischhoff (in Covello, McCallum & Pavlova 1987, p. 149) describes characteristics of the information on risk as perceived by the public:

"people simplify information,
people remember what they see or hear in the media and what they observe first hand,
people cannot detect omissions in the information they get, therefore they can be manipulated,
people worry about *what* risk, rather than *how large* (difference between lay people and experts definitions of risks)
people have difficulty evaluating expertise,
people have problems detecting inconsistencies and must be provided with alternatives".

1.5.1 - The social basis of the credibility of sources

Reducing the perception gap to public misconception ignores both the social and cultural dimensions of risk perception (Douglas & Wildavsky 1982; Ostrander 1982, Thompson 1982; Rayner 1985; James & Thompson 1989). Effective risk communication can be seen as a joint product of knowledge and consent about most desired outcomes (Figure 1.5).

Uncertain knowledge and consent contest are the problems faced by risk management. Risk communication is about increasing personal control as well as providing information. The public evaluation of a message will largely depend on the past performance of institutions delivering the message, the amount of information disclosure and opportunities for public involvement, and the availability of educational programmes (Renn & Levine 1990).

| | | <i>Knowledge</i> | |
|----------------|-----------|---|--|
| | | Certain | Uncertain |
| <i>Consent</i> | Complete | Problem: <i>Technical</i> Solution: <i>Calculation</i> | Problem: <i>Information</i> Solution: <i>Research</i> |
| | Contested | Problem: <i>(dis)Agreement</i> Solution: <i>Coercion or Discussion</i> | Problem: <i>Knowledge and Consent</i> Solution: ? |

Figure 1.5 - *The Relationship Between Knowledge and Consent*
(Source: Douglas & Wildavsky 1982, p. 5).

1.5.2 - The role of the media in the communication process.

Do the media reflect or initiate public concern is a contentious issue. Studies have shown that media coverage have been followed by changes in attitude towards hazards (Lee in Brown 1989 p. 5). It is more likely that the media consolidate the public's views rather than changing them (Tichenor, Donohue & Olien 1980). Furthermore, the media cannot be seen as monolithic in their coverage of news. They should be seen as biased in their reporting because of the necessity to come up with good stories which will attract public attention. The media give salience to certain events for certain qualities which happen to coincide with attributes of risk such as catastrophic potential, unfamiliarity and dread (Peltu 1991). This only reflects the ambiguous role of the media as biased source of information, a place for public debate and a mean of setting social and political agendas (O'Riordan 1985). Graumann and Kruse (1990) argue that the most important impact of the media is in the interaction between the players involved in environmental controversies where the "facts" are publicly debated and in many ways take precedence over direct individual experience, contributing to the social construction of environmental issues. In such situations, experts become increasingly exposed; reported incompetence, negligence, error and misdeeds are the subject of attention which have led to public loss of faith in institutions (Brown 1989; Magill 1989). The media coverage of a risk controversy for instance, has been found to increase public opposition, regardless of the content of news coverage and exposure to expert disagreement contributing to the perception that a technology may be more

dangerous (Mazur in Lichtenberg & McLean 1990, p. 162). The media in fact present a certain political reality and must be seen as part of the social and political process as much as the risk issues they cover; as such, it would be unreasonable to expect a social consensus on those issues (Lichtenberg & McLean 1990).

Deaths which make their ways into the news are those of particular, bizarre, surprising and or rare events. The type of death least likely to occur will make the news. Disaster stories, air crashes, and earthquakes have more priority than famine in a developing country. Stories about monsters killing people are the most prized. Any attack from those animals (funnel web spider, sharks) fatal or otherwise will make the news. For example, every year, at the start of summer, the same two shark attacks stories are reproduced indicating that experts warned that the beaches are swarming with sharks (Windschuttle 1984). However, the probability of a shark attack was estimated as as low as one in ten million (Owen Ingles, Sydney Morning Herald 15 Feb 1979). An explanation for the unusual treatment of death in the news may be related to a death denying society. Death in the media is the one unlikely to happen to the majority of people.

A study of the role of the media in a community response to earthquake threat in California, using the monitoring of local media coverage in 1976, 1977, 1978 (Turner & Paz 1986), showed that the sources of information about the threat were primarily television news, newspapers and radio followed by fiction, documentaries and magazines. Personal networks had a minimal impact. However, in term of their importance to respondents, it was found that the primary sources were attributed quite different value: television was considered the most important compared to the other two media sources and a significant importance was attributed to other people. In terms of their credibility, it was found that books and magazines were by far the most credible, while people were the least credible source. As the warning went on, respondents would switch sources and many would complement the initial media exposure by interpersonal discussion of media messages. The disproportionate reliance on interpersonal discussion was negatively related to the amount of prior experience of earthquakes suggesting susceptibility to rumour. Rumour seemed to flourish when there was a need to fill a void in more authoritative source of information. However, the effect of personal rather than vicarious experience of earthquake damage supplemented media information and decreased sole reliance on media sources. Personal experience was associated with greater social awareness of hazard and greater fear and concern about the prospect of an earthquake than in the case of vicarious experience. Personal experience could override expert advice. It

indicated that people judge risk in the context of their whole environment (Peltu 1991). A study of community perception of health hazard as a result of groundwater contamination by Fichen Heath and Fessenden-Raden (1987) found that risk perception was a dynamic and interactive process and was influenced by the way in which the risk was being addressed by institutions, the prior experience of people, the visibility of adverse effect of the risk, the origin of the risk in the community or outside the community, and the trust in local authorities. Community responses to risk have shown that people use their own social networks and then turn to institutional networks whose mandate it is to deal with the situation. In the case of failure, new networks are formed to counteract adverse consequences. There is often a sense of uncertainty, loss of control and powerlessness in the affected community (Edelstein & Wan Dersman in Brown 1989, p. 10).

1.6 - The relevance of risk studies to the management of dangerous wildlife

The range of approaches and methodologies presented in risk studies illustrate the complexity of risk management. Many of processes and concepts discussed are directly relevant to contemporary wildlife management. The current threats to wildlife conservation require a wildlife policy paradigm to correctly make the societal decisions affecting the well being of wildlife. Natural resource managers must consider the full range of resource values in formulating management policies. Typically, the focus of evaluation has been on the measurement of one or more attributes, usually biological and ecological assessment, (as a result of the training of wildlife managers) and economic assessments. The use of attitude surveys has been the most common approach to the study of social factors: categories of responses based on demographic variables and their relationships were used with limited systematic investigation of the social processes. Studies of attitudes towards animals and related issues were aimed at establishing quantitative measurements of wildlife values to be used in Benefit Cost Analysis (BCA) in support for alternative management options. However, in BCA (Benefit Cost Analysis) and MAUA (Multiattribute Utility analysis), decisions are treated as discrete occasions with a given decision problem (Wynne 1989). Collective values are considered as an aggregate of separate individual values and ignore the social context they originate from and the broad influences which in fact are affecting public perception. Public perceptions are socially defined; the boundary of problems are ambiguous reflecting in that the social relationship and time-space context in which assessment is framed. Those social influences have a historical dimension which is not necessarily

recognised by the holders of certain perception but nonetheless affect their judgment. There is a need to recognise those larger influences and incorporate them into enlarged institutional processes which encourage their constructive expression and mature negotiation (Wynne 1989). Simple user attitude surveys are not enough to influence decision making processes, as political interference often overrides those decisions (Heberlein 1989).

The political dimension of wildlife management decisions is recognised by managers (Clark & Kellert 1988; Witter & Sheriff in Clark & Kellert 1988) including the effect of managers' values on the decision making process (Caughley 1985; Kellert & Berry 1987). The role of a wildlife policy paradigm would be to allow socially and politically desired outcomes to emerge, and in a sense would determine what values and goals are important in defining the nature of public good. Policy formulation can assist the democratic process of identification of basic values and outcomes through the dynamic interactions of societal constituencies. The unfolding policy process provides ideally sufficient opportunities for all interests to express themselves fairly and equitably. It should be recognised that the process itself includes a considerable degree of political lobbying and its outcomes are often a consequence of competition and conflict (Clark & Kellert 1988). "The incorporation of public values into wildlife policies is a never ending process of monitoring public participation and expectations and then blending them with biological data, fiscal constraints, legislative climate, legal limits of agency's governing board" (Witter & Sheriff in Clark & Kellert 1988). The acceptability of a policy or management strategy is eventually a political decision, a choice between alternatives, values, and beliefs, each alternative representing particular interests and recommending particular solutions. Using this approach, The critical factor in acceptance is the extent to which the procedures of consent (trust in institutions and experts) and the distributions of liabilities conform to community norms of fairness (James & Thompson 1989). Acceptance is rooted in the political culture, in views about fairness and justice, and in feelings about exploitation (O'Riordan 1976). Public participation is a process by which equitable management decisions can be made. Cassells and Valentine (1983) present a framework of decision making in the context of wildland management which separates the administrative process from the political process of decision making by leaving the weighting of values to be located in the political rather than administrative area, as an institutional solution to the resolution of conflict situations.

CONCLUSION

The wide sweep of this review indicates the range and complexity of issues relating to wildlife management. The underlying thread though remains that the management of wildlife as the management of risk (as negative utility) is firmly anchored in the management of people and in broader sense a reflection of social goals. The study of attitudes can be seen as way of documenting the issues management should be considering. In the following chapters, the study of attitudes towards crocodiles in northern Queensland is presented as a case study to illustrate the essential role of social and cultural factors in environmental management.

CHAPTER 2

RESEARCH DESIGN AND METHODOLOGY

In chapter one, the relevance of historical, social and cultural factors to resource management was introduced; a number of theoretical approaches and methodologies, which investigated the relationship between humans and nature, were used to examine the social impacts of the existing management of crocodiles in northern Queensland. The main body of this study consists of a survey of attitudes towards the Estuarine crocodile conducted in northern Queensland; communities were chosen for their proximity to crocodile habitats, remoteness, their distinct social structure, cultural background, residence status and economic base. Visitors as well as residents to the region were interviewed. The survey was conducted in Weipa, Napranum (Weipa South), Hopevale, the Daintree - Cape Tribulation area, and Townsville (see locational map, Appendix 1). The survey area provided a double transect of increased remoteness and increased crocodile populations, combined with a cross cultural element, as both Aboriginal and non Aboriginal respondents were interviewed at each location; unfortunately a sample of urban Aborigines could not be included in the survey for comparison purposes. The visitors to the region provided the national perspective to the study although it was admittedly a biased group.

2.1 - Choice and relevance of study sites to the management of crocodiles

The mining town of Weipa, the largest settlement in Cape York Peninsula, is next to a major nesting area of the Estuarine Crocodile (see location map, Appendix 1). Baseline research in community attitudes towards crocodiles is needed to understand public opinion for future management planning, given the conservation significance of the area (Q. NPWS 1989).

Major wetlands of Cape York Peninsula are under Aboriginal land tenure and provide some level of protection for those wetlands otherwise poorly represented in the National Park estate (see Chapter 1); given Aborigines' distinct cultural background and control of coastal lands, it is important to document their views on crocodiles and crocodile management. The communities surveyed were Napranum (Weipa South) and Hopevale on Cape York Peninsula.

Conflicts in land use between agriculture, urbanisation, tourist development and crocodile conservation policies have occurred in the heavily settled eastern coast of Far North Queensland. This situation has focused community attention on crocodiles as a potential threat to individuals and to local economies. The survey was conducted in the Daintree/Cape Tribulation area.

Townsville, the largest regional centre of northern Queensland, although well within the range of the Estuarine crocodile, has not faced any conflict situation.

There is an increasing number of visitors to northern Queensland who have little knowledge of the tropics and its hazards. Visitors were surveyed both in Weipa and in the Daintree-Cape Tribulation area.

2.2 - Aims and objectives of the study

The primary goal of this research was to develop an understanding of attitudes towards crocodiles within different communities and to provide an interpretation of those attitudes within a socio-cultural framework.

The objectives of the survey were:

- (1) To evaluate the knowledge of and beliefs about crocodiles, as well as the existing communication channels and their perceived value.
- (2) To investigate the perception of crocodiles as environmental threat relative to patterns of activities in wetlands and experience of crocodiles and to describe the perceived nature of the threat.
- (3) To assess the importance of social and cultural factors in risk perception and risk acceptability and to identify cultural themes in which they are embedded.
- (4) To identify the level of environmental awareness and its social and cultural basis and to assess avenues for the promotion of positive attitudes towards crocodiles and crocodile conservation.
- (5) To present a brief outline of implications for management, including risk communication and interpretation, risk assessment and management of natural resources in cross cultural situation.

2.3 - Methodology

The project was conducted in two phases:

- (1) A preliminary phase when initial investigations and methodological issues were defined. It included a review of social and cultural aspects of resources management (presented in Chapter 1) and the practical aspects of survey design and planning, including choice of sites, questionnaire development and pilot.
- (2) The second part of the project consisted of the collection, analysis and interpretation of the data. A report was prepared for Queensland National Parks and Wildlife Service which included guidelines for an interpretive programme; the present thesis provides a comprehensive account of the study.

2.3.1 - Preliminary Investigations

The aims of the preliminary investigations, conducted in Weipa and Napranum (July 1989) and Daintree (January 1990), were primarily to assess those localities for subsequent survey. Informal interview techniques and participant observation (Spradley 1979) were used to collect information on general attitudes towards crocodiles, community networks, and any information of relevance on these communities. Local authorities were contacted when appropriate, Aboriginal Community Councils in Hopevale and Napranum, Comalco management in Weipa, to secure approval for the research. All visits were advertised in the local newspapers, and leaflets were available to residents (Appendix 7). They provided background information on the study and emphasised the importance of community participation for the its success. The information collected and the time spent there proved invaluable in several ways:

- (1) The confidence of the residents and their support of the project were secured and subsequently, the survey team was welcomed. This was particularly important in Aboriginal communities, for the fishing community in Weipa and the farming community of Daintree.
- (2) Relevant information could be incorporated into the design of the questionnaire.

- (3) The interpretation of the results was facilitated by these early field notes on the communities.

In return for their cooperation, preliminary results were provided to the communities using the local press (Weipa) and community notice boards. A copy of the final thesis will be made available at the local libraries when completed.

2.3.2 - Questionnaire design and pilot study

Questionnaire development

The questionnaire was developed using existing literature on attitudes towards animals, ecology and biology of crocodiles (Webb, Manolis & Whitehead 1987) and risk (see Chapter 1), existing questionnaire designs (Kellert *pers. comm.*; Ross *pers. comm.*), expert advice from wildlife professionals (Q. NPWS) and field notes.

The questionnaire consisted of a 31 item knowledge scale (see Chapter 4 for details) and nine sections (see Questionnaire, Appendix 2):

- (1) Section one investigated attitudes towards crocodiles as an environmental threat; it included its salience and its attributes; the respondents' personal experience of crocodiles as a threat including circumstances (with wild or captive animals), the type of responses to and its influence on their attitudes towards crocodiles as well as the appraisal of the attributes of fear. The recollection of crocodile attacks was also investigated in order to get an idea of the impact of the media on attitudes (Questions 1 to 23).
- (2) Section two investigated the pattern of activities in wetlands (recreation and working activities) and the safety behaviour of respondents (Questions 24 to 32).
- (3) Section three investigated the respondents' perception of change in risk in the last five years and the reasons attributed to that change (Questions 33 to 41).
- (4) Section four investigated the channels of communication and social networks of respondents and their respective value as a source of information (Questions 42 to 50).

- (5) Section five investigated the empathy towards and the perceived values of crocodiles including an appraisal of their ecological, recreational and utilitarian values and respondents' commitment to change in support for their answers.
- (6) Section six investigated the symbolic value of crocodiles including an appraisal of the fascination they generated in respondents as well as the perception of crocodile representations in popular culture.
- (7) Sections seven and eight investigated respondents' perception of management issues, including respondents' perception of their agreement with current management and their perception of a desired level of management.
- (8) Section nine investigated the socio-demographic characteristics of the respondents, including age, sex, social background (education, occupation, rural/ urban) and cultural background (Aboriginal/non Aboriginal).

Questionnaire design

The questionnaire consisted of a combination of several types of measurements: Likert scales, categories, open ended questions and rank ordering questions following experimental field techniques (Bernard 1988; Whyte 1977), which provided a combination of ordinal, nominal and interval data (see questionnaire, Appendix 2).

(1) *Types of Likert scales used:*

☐ ☐ [Statement] ☐ ☐ ☐
not at all a little moderately a lot don't know

☐ ☐ [Statement] ☐ ☐ ☐ ☐

never rarely sometimes most times all the time don't know

☐ ☐ [Statement] ☐ ☐ ☐

agree moderately undecided moderately disagree don't know
agree disagree

[Statement]

Low 1 2 3 4 5 high, don't know

[Adjective]

Not at all 1 2 3 4 5 very, don't know

(2) Rank ordering questions used:

Respondents were asked to rank a set of cards in two instances, (ranking of threats and animal preferences); the rank order was then entered into the questionnaire by the interviewer.

(3) Categories

Knowledge scale items:

[statement],
☐ untrue ☐ unsure ☐ true

Multiple choice questions:

[Question]
☐ Alternative 1
☐ Alternative 2
☐ Alternative 3

(4) Open ended questions

Semi structured open ended questions were used. Prompts were available to interviewers.

The use of "don't know" option provided more reliable answers by reducing the number of guess answers.

Pilot study

The questionnaire was piloted in April 1990; twenty questionnaires were administered between Cairns and Townsville to a range of respondents, both residents and tourists. The data were analysed for validity and appropriate modification was done. The modified version was used in the final survey.

2.4 - Survey design

The survey was conducted in Weipa and Napranum (Weipa South) in June-July, 1990, in Townsville in July-August 1990 and in Daintree and Hopevale in September-October 1990.

2.4.1 - Weipa

Weipa consisted of three major social groups, the Comalco employees, the residents associated with the wharf and the harbour and the visitors.

The survey of the Comalco employees was designed using information provided by the Comalco Town clerk; a stratified random sample was drawn based on the lay out of the town which reflected the social structure of the community (based on marital status and length of residence). The town was divided into sections and random numbers were used to designate in each section the households where questionnaires would be administered.

The survey of the "wharf community" was designed using information on the number of resident and visiting fishing boats provided by the British Petroleum depot manager. Interviews were conducted as fishermen came into port; other residents associated with the harbour were interviewed in relation to their availability.

An estimate of the number of visitors at the only caravan park was obtained from the Comalco Town Clerk and was used to determine the sample size. The survey of visitors was conducted over several days to increase the representativeness of the sample.

2.4.2 - Hopevale and Napranum

Population censuses (Hopevale, 1988; Napranum, 1989) were obtained from Dr J. Taylor (Division of Anthropology, James Cook University) and used to draw a random sample. A research assistant (Mrs Ina Hall) was hired from community to help with the survey in Napranum. Community rangers provided casual assistance in Hopevale.

2.4.3 - The Daintree/Cape Tribulation area

No data, which discriminated between Daintree and Cape Tribulation populations and the whole Douglas shire population were available (ABS 1986). The Douglas Shire Council was approached but could not give further information. I estimated 100 residents in the Daintree village, but it was impossible to do so for the residents in Cape Tribulation. Stratified random sampling was conducted using the road network for the Daintree farming community and Cape Tribulation residents, the Daintree township street map for other Daintree residents; tourist operators were surveyed at their work place.

The absence of visitor statistics again was a constraint, and stratified sampling was used which emphasised the type of tourist coming to the region, (domestic tourists versus international tourists) and by accommodation type (camping, resort, units or caravans and backpacking). Visitors were interviewed at the Daintree Caravan Park (Daintree), Wonga Beach Caravan Park (Wonga Beach) Pilgrim Sands camping grounds (Cape Tribulation), Port Douglas Marina and township, Daintree Cafes, the Jungle Lodge and the Village backpackers' accommodation (Cape Tribulation).

2.4.4 - Townsville

The North Queensland Electricity Board list of households was used to draw a random sample of 156 households. This sample unfortunately did not account for the army population, a factor overlooked at the time.

2.5 - Response rate, refusals and sample size

There was generally a good response to the survey (Table 2.1) despite the length of the questionnaire itself, a reflection of the amount of interest crocodiles could generate. Sample size could not be estimated when total populations were not known or open ended as it was the case for visitors. The representativeness of the sample was affected by the sample size at each location and the sampling procedure (random sampling or convenient sampling).

| Communities | Sample size no (%) | Populations estimates (no) | Refusals | Response rate (%) |
|------------------------|-----------------------|--|-----------|----------------------|
| Hopevale | 19 (2.5%) | 817 (Taylor 1988) | 2 | 90.4% |
| Napranum | 20 (3.1%) | 723 (Taylor 1989) | 3 | 86.9% |
| Weipa residents | 80 (3.2%) | 3102 (Comalco 1990) | 25 | 76.1% |
| Weipa visitors | 18 (---) | 580/month/July (Comalco 1990) | 1 | 94.4 % |
| Daintree* residents | 31(---) | 7385 (Douglas shire, ABS 1988) | 2 | 93.9% |
| Daintree** visitors | 63 (---) | 9628 (visitors to Cairns, ABS 1986) | 30 | 67.7% |
| Townsville | 125 | 112 013 (ABS 1986) | 31 | 80.1% |
| Total sample | 356 (100%) | | 94 | 73.6% |

Table 2.1- *Sample description.** *Daintree= Daintree/Wonga/Cape Tribulation area,*** *Daintree= Daintree/Port Douglas/Cape Tribulation.*

The number of refusals and resulting response rate depended on time availability, particularly for women with young children, on language barriers and/or tight schedules for visitors. Lack of interest or not knowing about crocodiles were also mentioned. The majority of refusals came from women.

2.6 - Interviewing procedures and biases

Interviews were individually administered by volunteers, all female undergraduate and post graduate students in the School of Behavioural Sciences at James Cook University (Townsville). The number of interviewers varied from 2 to 5 depending on the sample size at a particular location (see Table 2.2).

| | Weipa | Daintree | Hopevale/Napranum | Townsville |
|---------------------|-------|----------|-------------------|------------|
| No. of interviewers | 3 | 4 | 2/2 | 5 |

Table 2.2 - *Number of interviewers per location.*

It was not possible to test interviewers' bias because they could not be all checked on the same group of respondents, due to logistics constraints. The female bias was kept constant throughout. Each interview took about 30mn to 1 hour to be completed depending on the respondents and the interviewers. In the case of Aboriginal respondents, interviewing procedures had to be adapted to individuals and usually took longer and required careful double checking of the responses given. As a result, those were conducted only by experienced interviewers and myself.

Because of logistic constraints, a strictly random sample was not always feasible. When random sampling was possible, if there was no one in one household, the interviewer would go to the adjacent household; in the case of a refusal, the interviewer would go the next household on the random list. When convenient sampling was conducted, attention was given to maintain the optimum possible representativeness with regards to age, sex ratio and categories of respondents; using a range of places of interview and different time of the day (work hours/after hours), the spreading of interviewing over several days and keeping the number of respondents low at any one place were employed to optimise representativeness.

2.6.1 - Cultural bias

The format and content of the questionnaire posed a number of problems in a cross-cultural context. In the case of overseas visitors, fluency with the English language was an assumption of the survey and a section of overseas visitors were excluded from the survey (Japanese tourists in particular). If this group was to be specifically studied in future, a translation of the questionnaire should be prepared.

In Aboriginal communities, where English literacy varied considerably with age groups and where the social protocol was different, the questionnaire did not perform as well as in non Aboriginal communities: the sequencing, wording and content of questions were not always suited to Aboriginal people and did not always present Aboriginal concerns adequately. Furthermore, interviewers would be directed to the elders, the traditional recipient of collective knowledge and it was difficult to get the cooperation of young respondents. This affected the representativeness of the sample in those communities. The most valuable information was in fact recorded during the preliminary stages of the research, as well as in the open ended questions and in the interviewers' notes on the margin of the questionnaire. This information was used for the interpretation of the results in conjunction with the supporting literature on Aboriginal worldview and environmental management. These considerations outlined the methodological difficulties encountered in cross-cultural comparisons and supports the notion of using an alternative methodology, such as culturally appropriate informal interviews over a longer period of time and the use of qualitative analysis, if further investigations were to be conducted.

2.7 - Complementary Information

A diary was kept during field work. It included a range of anecdotal information relevant to the communities visited (social, cultural and environmental) as well as informal knowledge of crocodiles. At each location, participant observation was used to assess a number of tourists attractions based on crocodiles, tourist cruises on the Daintree River and in the Mission River delta in Weipa, zoos and parks between Townsville and Cairns. Attention was given to the type of experience offered and the information conveyed, as well as to visitors' reactions. It was by no mean a systematic process, but more a qualitative approach to assess the range of available interpretive possibilities. Interpretive material was also collected..

During the whole period of the project, newspaper clippings, articles, television documentaries, books, comics, advertisements and any item relevant to popular representations of crocodiles were collected. It provided useful material for the understanding of cultural issues in which the perception of crocodiles is embedded.

2.8 - Data coding and entry

The coding was done by two coders (including the author), checked and entered by myself to ensure coding consistency. The coding of open ended questions was done by one coder using a set schedule of categories developed using content analysis techniques. Coding procedures, code books and questionnaire are presented in detail in Appendix 2.

2.9 - Analytical procedures

The sample was divided into subgroups which took into account the cultural difference between Aboriginal and non Aboriginal respondents, the residential status of respondents (residents and visitors), the distribution of crocodile populations in each area: Weipa, the Daintree area and Townsville and the remoteness and isolation of Cape York communities.

6 community groups were identified:

| | | |
|---------------------------------|---|--------|
| - Hopevale/Napranum residents*: | Hopevale residents Napranum residents | 1 |
| - Residents | The Weipa residents | 2 |
| - The Daintree residents** | | 3 |
| - Visitors | Visitors to Weipa*** Visitors to the Daintree area | 4 5 |
| - Townsville residents | | 6 |

Note:

*Respondents from those two Aboriginal communities were grouped because there was enough similarity of response and also because the combined sample of respondents was larger.

** the Daintree area sample included residents and visitors of Daintree, Wonga Beach, Cape Tribulation, and Port Douglas (see Appendix 1).

***Although the number of Weipa visitors was low, it was felt that they still represented a distinct group in relation to location and characteristics.

Initially, descriptive statistics (frequency distributions) were applied to the data and included missing values ("don't know", "no answer"). Major trends in the results were then identified from which a number of broad hypotheses could be explored:

- (1) The term "crocodile" was interpreted by respondents as being the Estuarine crocodile.
- (2) Crocodile as a safety issue dominated attitudes towards the species and its management in the region while the interest in crocodiles as a unique wildlife species may have been more important to respondents outside the region. Crocodiles were seen as a low probability but high salience risk.
- (3) The salience of crocodiles as a threat depended on location, residence status, and cultural background of respondents. The present level of concern about safety should be a function of respondents' familiarity, exposure, personal experience and safe behaviour in wetlands; social factors such as media attention (impact of past attacks), social accountability and perception of benefits associated with the risk may affect risk acceptability.

- (4) The perception of crocodiles as a valuable wildlife species (environmental awareness) should be affected by cultural background and social factors rather than strictly geographic location and residence status and a function of general attitudes towards animals and wildlife: utilitarian (crocodile as a resource or/and a threat to human property), aesthetic (fascination for crocodiles, crocodile symbolism), negativistic (fear of crocodiles, danger), naturalistic (interest in the outdoors) and ecological (interest on the preservation of natural processes). Attitudes towards crocodiles and animal preferences can be interpreted in the light of the cultural themes identified in the region.
- (5) Knowledge of crocodiles was the result of vicarious sources rather than personal experience and subject to fallacies. Knowledge was not necessarily accompanied with positive attitudes toward crocodiles neither less fear nor safety behaviour.

The scope of the research was exploratory and as such, much of the analysis was based on descriptive statistics. Relationships between dependents variables (single and composite variables) and independent variables (location, residence status, length of residence and cultural background as well as demographic variables (i.e. age, sex, education, background, occupation) were investigated using Chi-square test, and analysis of variance when appropriate. These results could not account for missing values as the initial descriptive statistics did; the sample size is therefore always indicated; however, given the high response rate, it did not affect the results to a great extent. In the case of open ended questions, it was not possible to apply a Chi-square test because categories were not mutually exclusive. Those results include missing values and are presented graphically rather than as tables. Open ended questions were analysed using content analysis techniques (Weber 1990). Spearman rank correlation was used to test the relationship between dependent variables. The statistical analysis was done using StatView SE + Graphics TM version 1.03 and Cricket Graph version 1.3.1.

2.9.1 - Investigator subjectivity

An important consideration in the design, analysis and interpretation of this survey was the subjectivity of the investigator which acted as a major socio-cultural filter. This intrinsic bias was acknowledged and stressed as appropriate in the interpretation and discussion of the results.

In the next chapters, results of the survey are presented and discussed. Chapter three presents an overview of attitudes towards crocodiles and crocodile management. Chapter four presents an assessment of respondents' knowledge, channels of communication and trust in sources of information. Chapter five presents respondents' perception of crocodiles as an environmental threat. Chapter six presents an evaluation of respondents' awareness of crocodiles as wildlife and a cultural artefact.

CHAPTER 3

ATTITUDES TOWARDS CROCODILES AND CROCODILE MANAGEMENT: AN OVERVIEW

The increased interaction between crocodiles and people in the last few years and the greater awareness of their presence near populated areas have lead to public concern for safety and the notion of a "crocodile issue", as more Estuarine crocodiles were sighted by residents and referred to the management authority for attention and removal (Q.NPWS 1989). How did respondents perceived crocodiles and crocodile management including their perception of the local aspects of management are presented below.

3.1 - Attitudes towards crocodiles

The first question respondents were asked was about their feelings towards crocodiles generally and what they thought ought to be done about them (Question 1 see questionnaire, Appendix 2). This was a deliberate attempt to avoid respondents being influenced by the questionnaire itself and to get a spontaneous answer. The semi-structured open ended format of the question left the respondent with some liberty as to what to say. Respondents' answers came under two broad items, feelings towards the animal itself and the management options they favoured, either in conjunction or separately.

Management oriented responses were coded under three categories: "No management" (M1) i.e. "leave them alone" , "Management" of various levels (M2) i.e. "they should be controlled", meaning any mention of human control including removal from populated areas, culling, farming; and "Public education" (M3) ie "the public should be educated", which included mention of "living with crocodiles" (see code book, Appendix 2).

Emotional responses were coded under four categories: "Positive feelings" (E1), including feelings such as interest, fascination, respect, awareness of a unique wild animal with a place in nature, and opposition to cruelty to crocodiles; "Negative feelings" (E2), including every mention of fear and dislike of crocodiles as a result of their threatening aspects: Danger, cruelty, unpredictability and their unpleasant nature; "Neutral feelings" (E3), including absence of concern about them, "they don't worry me, they're OK", and indifference to them; "Cautious feelings" (E4)

including wariness and respect because of the danger. There were major differences between community groups regarding the type and magnitude of responses (Figure 3.1).

3.1.1 - Residents of Hopevale and Napranum

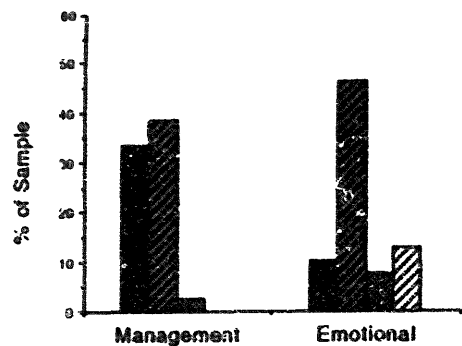
Aboriginal responses presented quite a distinct pattern, with one very high single emotional response "Negative feelings" (E2), associated with an almost equal level of "No management option" (M1), and "Management option" (M2). The "Negative feelings" response (E2) was the highest of all groups and reflected the high awareness of the danger crocodiles present to humans (Figure 3.1). These feelings however may not have been associated with a negative perception of crocodiles *per se*, but rather an ethnocentric classification of fear and awareness of danger as a negative emotional response.

3.1.2 - Residents of Weipa and the Daintree area

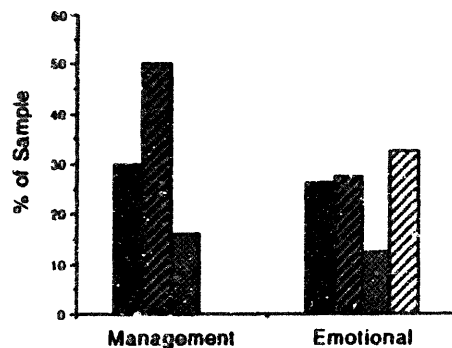
Management oriented responses were more important than emotional responses in residents of Weipa and the Daintree area. There was some consensus among Weipa residents about the "need for management" (M2), whereas the residents of the Daintree area were quite divided about the issue of "management" (M1, M2) (Figure 3.1). It was a reflection, in my view, of the socio-demographic changes in the Daintree area following the expansion of the tourism industry and the influx of new residents in a well established farming community (Figure 3.1). Emotional responses among residents of Weipa showed higher "Cautious feelings" (E4) and "Negative feelings" (E2) than among the residents of the Daintree area; "Public education" (M3) was mentioned by a few respondents in both communities.

3.1.3 - Visitors to Weipa and the Daintree area

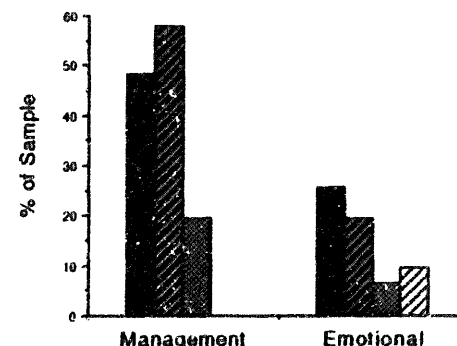
By contrast, emotional responses were higher than management responses among visitors to both Weipa and the Daintree area, showing high level of "Positive feelings" towards crocodiles (E1), with a high level of the "No management" option (M1). An interesting feature of the visitors to Weipa was a higher level of "Management" (M2) and high level of "Cautious feelings" (E4), compared to the visitors of the Daintree area (Figure 3.1).



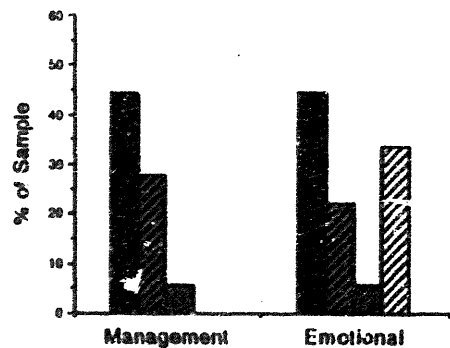
Residents of Hopevale and Napranum (n=39)



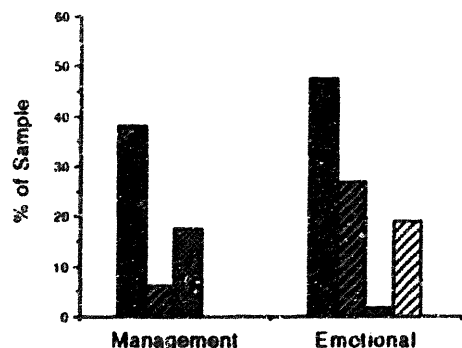
Residents of Weipa (n=80)



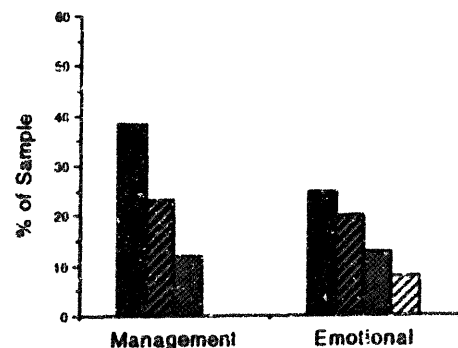
Residents of Daintree/Cape Tribulation area (n=31)



Visitors to Weipa (n=18)



Visitors to Daintree/Cape Tribulation area (n=63)



Residents of Townsville (n=125)

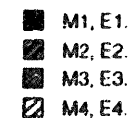


Figure 3.1 - Attitudes towards crocodiles among community groups: emotional and management responses (n=356).

Note: refer to text for legend.

3.1.4 - Townsville residents

Overall, the Townsville residents displayed a lower level of response, both for management and emotional responses, with a trend towards "Positive feelings" (E1) and "No management" option (M1). Crocodiles were obviously not perceived as an issue in the area (Figure 3.1).

3.2 - Perception of crocodile management

3.2.1 - The resident perspective

Residents' expectations of management in areas near crocodile habitats were distinct from those of visitors and Townsville residents (Figure 3.1). The perception of the management of crocodiles among residents was measured by how local the issue of crocodiles was, how important it was to raise public awareness of local implications of management decisions, and by the perceived level of congruence between the residents' and management view (Questions 89, 90 & 91 see questionnaire, Appendix 2).

Perceived locus of crocodile management

Most residents thought that crocodile management was more than just a local issue (49.61%). However, there was a significant distinction between the residents of Cape York Peninsula and other residents ($p=0.0001$, $n=254$) (Table 3.1).

| Community groups | Are crocodiles a local issue only? | | | | N values |
|-------------------------|------------------------------------|----------|------------|---------|----------|
| | Not at all | A little | Moderately | Greatly | |
| Hopevale/ Napranum | 43.25% | 2.7% | 21.62% | 32.43% | 37 |
| Weipa residents | 26.32% | 23.68% | 26.32% | 23.68% | 76 |
| Daintree residents | 62.07% | 6.9% | 20.69% | 10.34% | 29 |
| Townsville residents | 64.29% | 12.5% | 16.96% | 6.25% | 112 |
| Total | 49.61% | 13.78% | 20.87% | 15.75% | 254 |

Table 3.1 - Perception of crocodile management as a local issue among resident community groups ($p=0.0001$, $n=254$).

While Daintree residents (62.07%) and Townsville residents (64.29%) did see crocodile management as a wider issue, only a few Weipa residents (26.32%) did. Aboriginal respondents were divided however, more inclined to consider the crocodile issue as a wider issue (43.24%) than just a local issue (32.43%). The

tendency to value the local perspective may have been the reflection of the isolation of those latter communities from the wider community and the locus of decision making.

Residents were "moderately" (36.47%) to "greatly" concerned (53.33%) about the necessity of focussing public attention on the local implications of crocodile management (Table 3.2). This was particularly true of Aboriginal respondents (67.57%) and Daintree residents (62.07%). However, there was no significance difference regarding this question between community groups ($p = 0.2401$, $n=255$). This pattern was consistent with in the pattern of attitudes of residents near crocodile habitats, where there was a dominance of management expectations (Figure 3.1).

| | Perceived need for increased public concern of local implications of management | | | | N values |
|-------------------------|---|----------|------------|---------------|----------|
| | Not at all | A little | Moderately | Greatly | |
| Hopevale/ Napranum | 0% | 2.7% | 29.73% | <u>67.57%</u> | 37 |
| Weipa residents | 1.32% | 9.21% | 35.53% | <u>53.95%</u> | 76 |
| Daintree residents | 3.45% | 0% | 34.48% | <u>62.07%</u> | 29 |
| Townsville residents | 5.31% | 8.95% | 39.82% | <u>46.02%</u> | 113 |
| Totals | 3.14% | 7.06% | 36.47% | <u>53.33%</u> | 255 |

Table 3.2 - *Perceived need for increased public concern for the local implications of crocodile management decisions among resident community groups ($p = 0.2401$, $n = 255$).*

Perceived representation of residents views in management decisions.

Most residents felt their views were "very poorly" (28%) to "moderately" (32.4%) represented by the current management regime and represented the dominant view in Weipa and Townsville (Table 3.3).

| | Perceived representation of residents' views in management's decisions | | | | | | N values |
|-------------------------|--|---------------|--------|---------------|---------------|---------------|----------|
| | No wish to participate | Very poor | Poor | Moderate | good | Very good | |
| Hopevale/ Napranum | 17.95% | <u>25.21%</u> | 5.13% | 15.38% | <u>23.08%</u> | 10.26% | 39 |
| Weipa residents | 0% | <u>31.43%</u> | 20% | <u>40%</u> | 7.14% | 1.43% | 70 |
| Daintree residents | 0% | <u>28.57%</u> | 21.43% | 21.43% | 17.86% | <u>10.71%</u> | 28 |
| Townsville residents | 0% | 25.66% | 30.09% | <u>36.28%</u> | 7.08% | 0.88% | 113 |
| Totals | 2.8% | 28% | 22.4% | <u>32.4%</u> | 10.8% | 3.6% | 250 |

Table 3.3 - *Perceived representation of residents' view in management's decisions among resident community groups ($p = 0.0001$, $n = 250$).*

Only 14.4% of residents thought their views were "well" to "very well" represented. It included Hopevale/Napranum residents (10.26% "Very good") and Daintree residents (10.71% "Very good") primarily.

There was a pattern of contradictory views in both Hopevale/ Napranum and the Daintree area. Although there was 28.57% of Daintree residents who felt their views were "very poorly" represented, following in that the trend with others residents, there was a significant amount of respondents agreeing with the current management (28.57% of "good" to "very good" representation of their views) (Table 3.3). It may be that the conservation of crocodiles generally appealed to more residents in the Daintree area because of the value of crocodiles as an tourist attraction. There was, however, distinct demographic differences between that community and the other two resident communities investigated (see demographic profile, Appendix 5), which were also reflected in their greater empathy towards crocodiles (see Chapter 6).

A number of respondents in Hopevale and Napranum (Weipa South) expressed "very poor" representation of their view (28.21%); some in Napranum even expressed dissatisfaction with the fact that they were not consulted at all, when they felt they had a lot to contribute (Mrs Joyce Hall, *pers. comm.*). However, 33.34% felt their views were "well" to "very well" represented in the decisions made about crocodiles, quite a high proportion compared to non Aboriginal respondents who basically expressed dissatisfaction and little congruence between their view and the management view (Table 3.3).

It was found that respondents with status in the community and knowledge of crocodiles, such as older people, were more likely to see their views well represented. The demographic profile of the sample actually showed a bias towards older respondents (see demographic profile, Appendix 5). Furthermore, the appointment of trainee rangers in both communities may have raised the perceived level of participation in the management of crocodiles, perhaps contributing to the perception of adequate representation in management decisions.

Other Aboriginal respondents (younger respondents particularly) would either not express their views or would feel their views were "very poorly" represented, because of their ignorance of crocodiles and/or their marginality in decision making at community level and/or in the wider context. This may have explained why

17.95% of Aboriginal respondents would not want to have their view represented in that expressing some rebellion against existing social controls (Table 3.3).

3.2.2 - The visitors' perspective

It was found that visitors did not particularly emphasise management issues in their attitudes towards crocodiles but rather had more emotional responses (Figure 3.1). Visitors' concern about crocodiles as a local issue, and the importance of their views as opposed to residents' views were investigated (Questions 84 & 86, see questionnaire, Appendix 2).

Visitors overall felt "moderately" concerned (35.06%), which was quite expected, as crocodiles were not part of their everyday life and therefore not a priority (Table 3.4). However, 25% of Daintree visitors expressed high concern about the local aspect of the crocodile management. It may be seen in the light of the importance given to crocodiles in this area by management, given the high resident population density and the number of visitors, compared to the sparsely populated Cape York Peninsula. It may also have reflected differences in the interest in crocodiles between these two groups (see Chapter 6).

| Visitors' concern about local issues such as crocodiles | | | | | |
|---|------------|----------|---------------|--------|----------|
| | Not at all | A little | Moderately | A lot | N values |
| Weipa visitors | 23.53% | 11.76% | <u>58.82%</u> | 5.88% | 17 |
| Daintree visitors | 16.67% | 30% | 28.33% | 25% | 60 |
| Totals | 18.18% | 25.97% | <u>35.06%</u> | 20.78% | 77 |

Table 3.4 - Visitors' concern about local issues ($p=0.0485$, $n=77$).

When asked if they agreed that visitors' views were as important as those of the local residents, it was found that 33.78% of visitors "moderately disagreed" and 28.38% "moderately agreed" which was quite inconclusive, perhaps the result of unclear wording but also because of their lack of association with the region and genuine concern about the issue (Not In My BackYard, NIMBY syndrome) (Table 3.5).

| Visitors' opinions on crocodile issues are equally important as residents' | | | | | |
|--|----------------|------------------|-----------|---------------------|-------------------|
| | Strongly agree | Moderately agree | Undecided | Moderately disagree | Strongly disagree |
| Weipa/ Daintree visitors | 18.92% | 33.78% | 0% | 28.38% | 18.925 |
| | | | | | 74 |

Table 3.5 - Visitors' evaluation of their opinions on crocodile management compared to residents'.

3.3 - Summary and discussion

From those initial results, attitudes towards crocodiles can be seen as a mix of emotional responses (positive and negative feelings) and crocodile management expectations (various level of crocodile population control) with a dominance of management expectations in residents communities near crocodile habitats (as opposed to the visitors to those communities and Townsville residents).

The overall pattern of response to the above questions indicated a certain amount of dissatisfaction with crocodile management decisions and a need for increasing public awareness of local problems associated with living near crocodile habitats. In remote areas such as Weipa, where the locus of decision making may have been perceived as fairly distant, the perception of crocodile management as a local issue was greater. However, Townsville respondents gave similar answers. These two groups were found demographically similar (see demographic profile, Appendix 5). Those results may be interpreted as the expression of the historical regionalism of northern Queensland and frontier attitudes which emphasised among other things, an opposition to central Authority and a sense of individualism (Frawley 1991a, 1991b). Daintree residents and Hopevale/Napranum were more positive towards current management decisions perhaps because both communities have attracted more management consideration than remote areas but also because of a different attitudes towards conservation in the case Daintree residents (see Chapter 6) and cultural factors in the case of Aboriginal respondents. Visitors were not that concerned about crocodile issues as one would expect, however, visitors to the Daintree area were more interested in those issues.

Obvious questions in the light of this analysis of initial responses included what factors promote positive (or negative) feelings towards crocodiles and the choice of particular options for crocodile management. Four major areas were investigated to address these: the knowledge of crocodiles and crocodile management issues and communication channels; the perception of crocodiles as environmental threat and the issue of public safety ("Negative feelings"), and the empathy for crocodiles ("Positive feelings") including a consideration of their perceived value.

CHAPTER 4

THE KNOWLEDGE OF CROCODILES AND SOURCES OF INFORMATION

In chapter 3, it was shown that attitudes towards crocodiles involved references to personal beliefs as well as statements about crocodile management. In this chapter, the knowledge of crocodiles and crocodile issues as well as sources of information are investigated. The aims are to evaluate the level of knowledge of crocodiles, to determine its main attributes and to ascertain the relative importance of sources of information in the acquisition of that knowledge.

A knowledge scale of 31 items was constructed which investigated the knowledge of crocodile conservation, status, ecology, biology and safety behaviour. Items included were species range (Items 1 & 2), conservation status (Items 3 & 4), habitat (Items 5, 6 & 8), movements (Items 7 & 28), safety (Items 9, 10, 11, 12, 13, & 14), hunting (Items 15, 17, 22, 24, 25, & 26), crocodile attacks (Items 16, 18, 20 & 21), other behaviour (Items 19, 23, 29 & 31) and ecology (Items 27 & 30) (see questionnaire, Appendix 2). The questions and their correct answers were based on factual evidence (source: Wildlife management of Crocodiles and Alligators, Webb, Manolis & Whitehead 1987), expert advice, reports, publications, Queensland National Parks and Wildlife Service, personal knowledge and field notes gathered during preliminary investigations.

Most of the questions related to the knowledge of safety behaviour followed Queensland National Parks and Wildlife Service current information available to the general public (see Appendix 7). Generally, a conservative approach was taken in the determination of "correct answers". For example, when asked whether crocodiles were slow on land (Item 21), the expected response was "untrue" because crocodiles *can* be very fast during attacks, even though it is not true at all times (see code book, Appendix 2).

4.1 - Mean knowledge score and analysis of variance

Mean knowledge score was found highest among residents near crocodile habitats, Weipa (21.612) and the Daintree area (21.613), which was expected, and lowest among Townsville residents (16.616), indicating the low awareness of crocodiles in

that area despite the fact that Townsville was well within the range of both species of crocodiles. The mean knowledge score for Hopevale and Napranum residents was lower than other residents near crocodile habitats (18.795); it was explained in the itemised knowledge scale which identified a much lower score for safety behaviour and ecology (Figure 4.1; Table 4.7a). The knowledge of visitors seemed to increase as they travelled north (Daintree visitors, 17.694 and Weipa visitors, 21.612), the result of the relevance of the information and the exposure to tourism promotion of northern Australia as "crocodile country". Crocodiles featured prominently as an icon of wild and unfamiliar experiences (see Chapters 1 & 6 on crocodile symbolism).

| Community groups | N values | Mean knowledge score | Standard deviation | Standard error |
|-------------------------|----------|----------------------|--------------------|----------------|
| Hopevale/ Napranum | 39 | 18.795 | 3.238 | 0.518 |
| Weipa residents | 80 | 21.612 | 3.071 | 0.343 |
| Weipa visitors | 18 | 20.389 | 2.789 | 0.657 |
| Daintree residents | 31 | 21.613 | 4.072 | 0.731 |
| Daintree visitors | 62 | 17.694 | 4.26 | 0.541 |
| Townsville residents | 125 | 16.616 | 5.659 | 0.506 |

Table 4.1 - Mean knowledge scores, standard deviation and standard error for community groups.

The analysis of variance conducted on the knowledge scale was found significant between groups (Table 4.2). Post-hoc Scheffe F-test showed significant differences between 5 pairs ($p < 0.05$). The most significant difference was between Weipa residents and Townsville residents (Scheffe $F = 12.406$), followed by Daintree residents and Townsville (Scheffe F test = 6.318), Weipa residents and Daintree visitors (Scheffe $F = 5.465$), Daintree residents and Daintree visitors (Scheffe F test = 3.234). The least significant result was between Weipa visitors and Townsville residents (Scheffe F test = 2.282).

| Source | DF | Sum Squares | Mean squares | F-Test |
|----------------|-----|-------------|--------------|--------------|
| Between groups | 5 | 1595.673 | 319.135 | 16.255 |
| Within groups | 349 | 6851.725 | 19.632 | $p = 0.0001$ |
| Total | 354 | 8447.397 | | |

Table 4.2 - Knowledge of crocodiles: analysis of variance of knowledge scores ($n = 354$, $F = 16.255$).

4.2 - Recoded knowledge scores

The knowledge scores were recoded into a lower and a higher score categories, using the median score value of 20. Chi-square test and level of significance for recoded knowledge scores between groups was found significant ($p = 0.0001$, $n = 356$) as indicated in Table 4.3.

| Communities | Lower score (1-19) | Higher score (20-31) | No of respondents |
|----------------------|--------------------|----------------------|-------------------|
| Hopevale/Napranum | <u>47.72%</u> | <u>51.28%</u> | 39 |
| Weipa residents | 21.25% | <u>78.75%</u> | 80 |
| Weipa visitors | 38.89 % | <u>61.11%</u> | 18 |
| Daintree residents | 22.58% | <u>77.42</u> | 31 |
| Daintree visitors | <u>64.52%</u> | 35.48% | 62 |
| Townsville residents | <u>65.6%</u> | 34.4% | 125 |

Table 4.3 - *Recoded knowledge scores among community groups, expressed as % of respondents*
($p=0.0001$, $n=355$).

Most residents were well above the median value, while visitors to Daintree and Townsville residents were well below. Weipa visitors appeared to be a knowledgeable group despite their relatively short stay in the area (up to a month at the most, see demographic profile, Appendix 5) which indicated other factors for this interest in crocodiles such as the search for adventure into the wild Australian frontier of Cape York Peninsula. The surprising lower score of Aborigines shown by the analysis of variance and the Chi-square test on recoded knowledge scores have to be explained in relation to the cultural bias of the survey which assumed certain responses and behaviour patterns from a dominant cultural perspective. This was particularly relevant in the "safety" items because of differences in risk assessment (see Section 4.4.3). Aboriginal respondents had a lower score for the "ecology" primarily because they were unsure about the answers, indicating the difficulty with the format and logic of the questionnaire rather than its content (see Figure 4.1 & Table 4.7a). It was also the case for the questions on the role of crocodiles in nature (see Section 4.5). It should also be noted that good knowledge of crocodiles was not shared by all members of Aboriginal communities. The younger generation was not particularly knowledgeable about crocodiles and crocodile habitats compared to the older generation (Field notes 1990). It may be a combination of changed circumstances (settled life of the community and limited interaction with crocodile habitats), different expectations on the part of younger generation combined with limited participation in community life, but also reliance on elders' expert knowledge for emergency.

4.3 - Demographic variables and knowledge scores

What were the demographic factors which may have influenced those results? A Chi-square test between independent demographic variables and recoded knowledge scores showed no significant difference for age ($p=0.5875$, $n=355$), and length of residence near crocodile habitats ($p=0.7559$, $n=156$) but significant difference for sex ($p=0.0001$, $n=355$) background ($p=0.0001$, $n=354$), education

($p=0.0353$, $n=348$), and occupation ($p=0.0112$, $n=323$) as shown on Tables 4.4, 4.5, 4.6, 4.7 and 4.8.

| Sex | Knowledge score | | N values |
|--------|-----------------------|-------------------------|----------|
| | Lower score (1-19) | Higher score (20-31) | |
| Female | 61.35% | 38.65% | 163 |
| Male | 37.5% | 62.5% | 192 |

Table 4.4 - Knowledge scores and gender, expressed as% of respondents ($n=355$, $p=0.0001$, $\phi=0.238$).

The higher scores of males may be explained both by the activity pattern of male respondents (see section 5.10) and by the different feelings crocodiles may arise in male and female respondents. The "wild" attribute attached to crocodiles was popular with males particularly in northern Queensland and was considered an attraction to northern Australia (Field notes 1990). Studies elsewhere have shown that the knowledge of animals was higher among males than females and the greatest difference concerned questions about rare and endangered species with males having greater knowledge than female (Kellert & Berry 1987; Paterson 1990).

4.3.1 - Gender and cultural background

The effect of sex on recoded knowledge scores was investigated for Aboriginal and non Aboriginal respondents to assess possible cultural differences.

| Sex | Aboriginal respondents ($n=39$) | | Non Aboriginal respondents ($n=316$) | |
|----------|--------------------------------------|---------------------|---|---------------------|
| | Knowledge score | | Knowledge score | |
| | Low (1-19) (%) | High (20-31) (%) | Low (1-19) (%) | High (20-31) (%) |
| Female | 55.56 | 44.44 | 62.07 | 37.93 |
| Male | 42.86 | 57.28 | 34.84 | 61.16 |
| p values | 0.429 | | 0.0001 | |

Table 4.5 - Knowledge scores, cultural background and gender ($p<0.005$ shows significant differences).

There was no significant difference between the knowledge of males and females among Aboriginal respondents, as there was for the rest of the sample (Table 4.5). The effect of gender on knowledge in non Aboriginal respondents was therefore culturally constructed, and reflected both the historical and social context on which the Australian identity developed (see Chapter 1). Because of the cultural nature of the effect of sex, it is referred as gender in the study, a social category rather than sex which is a biological category.

4.3.2 - Background

"Rural" background included rural areas and small country towns, "urban" background included urban centres (Townsville and Cairns were coded as "urban"), "rural/urban" background both of the above (see code book, Appendix 2). The effect of background on the recoded knowledge score showed that respondents with a "rural" background were likely to be more knowledgeable about crocodiles than respondents with an "urban" background (Table 4.6).

| Background | Knowledge score | | No of respondents |
|-------------|-----------------------|-------------------------|-------------------|
| | Lower score (1-19) | Higher score (20-31) | |
| Rural | 35.5 % | <u>64.41%</u> | 118 |
| Urban | <u>63.76%</u> | 36.24% | 149 |
| Rural/Urban | 39.1% | <u>60.61%</u> | 66 |
| Other | 38.1% | <u>61.9%</u> | 21 |

Table 4 6- *Knowledge scores and background, expressed as a % of respondents*
(*n=354, p=0.0001*).

This result showed the importance of local experience of crocodiles and crocodile habitats in the knowledge of crocodiles rather than general knowledge which was only useful as long as there was an immediate interest in - as it was the case for the visitors to the Daintree area - or concern about the species - as it may have been the case for Weipa or Daintree residents. It also may be explained by the fact that respondents with that type of background were more likely to have interest in animals.

4.3.3 - Education

Respondents with primary (70%) and technical (60.66%) education had the highest knowledge scores. Those respondents were also mostly found in rural areas and near crocodile habitats (Hopevale, Napranum, Weipa, see demographic profile Appendix 5). Respondents with tertiary education had comparatively lower knowledge scores, indicating that residence near crocodile habitats and experience of crocodiles may have been more relevant than formal education in the knowledge of crocodiles (Table 4.7).

| Education | Knowledge score | | N values |
|-----------|-----------------------|-------------------------|----------|
| | Lower score (1-19) | Higher score (20-31) | |
| Primary | 30% | 70% | 30 |
| Secondary | 53.85% | 46.15% | 182 |
| Tertiary | 52% | 48% | 75 |
| Techn./ | 39.34% | 60.66% | 61 |
| Total | 48.85% | 51.15% | 348 |

Table 4.7 - Knowledge scores and education, expressed as % of sample
($p=0.0353$, $n= 348$).

4.3.4 - Occupation

Primary producers had significantly higher knowledge scores (83.33%), while home keepers had significantly lower knowledge scores (65.85%) (Table 4.8). The former group consisted of the respondents of rural background (Table 4.6), fisherman of Weipa and graziers of Daintree primarily (Field notes 1990) and had personal experience of crocodiles (see chapter 5). Home keepers were mostly females (Field notes 1990) and response pattern was consistent with that of gender and knowledge score (Table 4.4).

| Occupation | Knowledge score | | N values |
|-----------------------|-----------------|--------------|----------|
| | Lower score | Higher score | |
| Labour | 42.86% | 57.14% | 70 |
| Trade/Techn./ | 47.9% | 52.1% | 119 |
| Paraprofess./clerical | | | |
| Professional | 46.67% | 53.33% | 75 |
| Home keepers | 65.85% | 34.15% | 41 |
| Primary producers | 16.67% | 83.33% | 18 |
| Totals | 47.06% | 52.94% | 323 |

Table 4.8 - Knowledge scores and occupation, expressed as % of sample
($p=0.0112$, $n=323$).

4.4- Detailed study of the knowledge scale

A detailed study of the knowledge scale shed some light on the above results. Each topic (including a group of related items) was studied separately. For each community group, the mean topic score, expressed as the percentage of "correct answer" and the mean "unsure" answers were recorded (Table 4.7a & Figure 4.1).

| | Range | Status | Habitat | Movements | Safety | Hunting | Attacks | Behaviour | Ecology |
|------------------------------------|-------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|------------------|------------------|
| Hopevale/Napranum residents (n=39) | 51.2% (11.2%)* | 92.3% (3.8%) | 59.8% (6.8%) | 89.7% (5.1%) | 68.8% (3.8%) | 40.6% (11.9%) | 58.5% (8.9%) | 67.8% (19.8%) | 33.3% (37.2%) |
| Weipa/Daintree residents (n=111) | 56.7% (15.6%) | 98.1% (1.3%) | 71.4% (7.5%) | 92.6% (3.6%) | 82.1% (4.2%) | 46.8% (14.5%) | 75% (8.7%) | 64% (24.9%) | 65.9% (23.5%) |
| Weipa/Daintree visitors (n=81) | 46.7% (15%) | 83.3% (1.4%) | 54.7% (19.7%) | 68.4% (17.6%) | 77.9% (8.6%) | 40.2% (18.1%) | 69.5% (13.9%) | 51.1% (38.4%) | 64% (28.1%) |
| Townsville residents (n=125) | 50.8% (20.8%) | 74.4% (18%) | 46.4% (23.2%) | 60.4% (30%) | 69.3% (14%) | 36.7% (29.5%) | 61.6% (21.4%) | 58.2% (49%) | 57.2% (30.8%) |

Table 4.7a - Knowledge of crocodiles by items among respondents in relation to residence status, location near crocodile habitats and cultural background (* % of "unsure "answers).

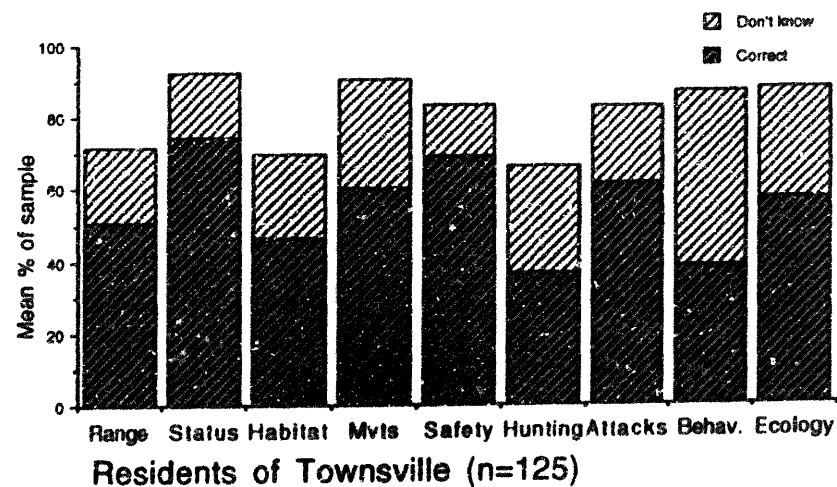
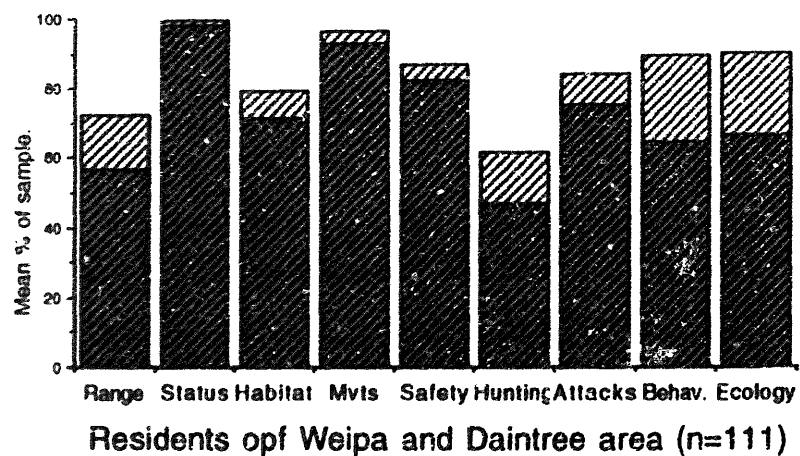
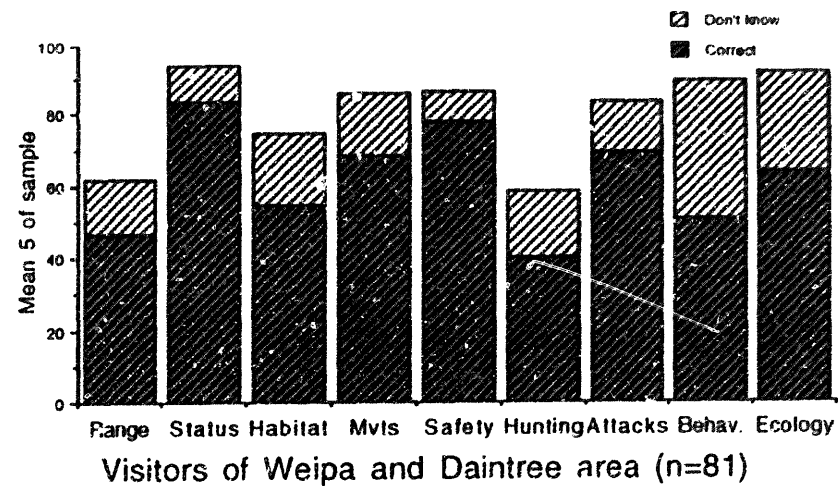
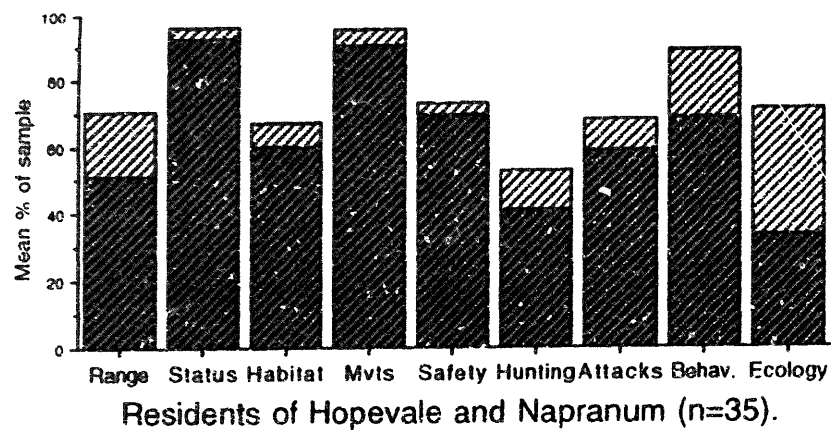


Figure 4.1 - Knowledge of and beliefs about crocodiles among community groups.

4.4.1 - The "unsure" answers

Topics with the highest proportion of "unsure" answers were "other behaviour" and "ecology" across all groups. These topics referred to mating behaviour (Item 19) and parental care (Item 29), energetics (Items 23 & 31), locomotion (Item 21), mortality rates (Item 30) and ecological role (Item 27). Topics with the lowest proportion of "unsure" answers were "safety" (Items 9 to 14), "movements" (Items 7 & 27), "habitat" (Items 5, 6 & 8) and "status" (Items 1 & 2)

There was a high proportion of "unsure" answers for Townsville residents across all topics. The pattern was very similar for the visitors to Weipa and the Daintree area. There was no major difference for all topics in the proportion of "unsure" answers between Aboriginal and non Aboriginal residents, except for "ecology", where Aboriginal respondents showed a high proportion of "unsure" answers (37.2% compared to 23.5%) (Figure 4.1 & Table 4.7a).

4.4.2 - The "correct answers"

There was again similarities in the responses of residents of Hopevale/Napranum, Weipa and the Daintree area for "correct answers" (Figure 4.1 & Table 4.7a). Noticeable differences concerned "ecology", where the percentage of "correct answer" for Aborigines was much lower than for other residents near crocodile habitats (33.3% versus 65.9%), "safety" (68.8% versus 82.1%) and "habitat" (59.8% versus 71.4%).

Visitors in Weipa and the Daintree area generally displayed a slightly higher mean percentage of "correct answer" than the Townsville residents (Figure 4.1 & Table 4.7a), particularly in relation to "safety" (77.9% versus 69.3%), "movements" (68.4% versus 60.4%), "habitat" (54.7% versus 46.4%), "status" (83.3% versus 74.4%). It was, in my view, the result of an increased exposure to crocodile information and their temporary presence in the vicinity of crocodile habitats (Field notes 1990).

4.4.3 - Knowledge of safety behaviour

Safety

Safety was investigated through a series of items which looked at the behaviour of respondents and their awareness of dangerous situations. Most of those items were in fact based on the pamphlet put out by Queensland National Parks and Wildlife Service (see Appendix 7).

Most items relative to safe swimming were overall answered correctly by a high percentage of respondents. Swimming in shallow rapids was considered safe by residents only, but was uncertain for visitors to the Daintree area (31% of "unsure" answers) and the residents of Townsville (34% of respondents only gave a "correct answer"). Only 53.4% of visitors to the Daintree area would not swim in waters where crocodiles were never seen before, a sign that it was important to inform them about the possibility of an encounter. Specific behaviours such as camping away from the water, not fishing with the feet in the water, and not leaving food scraps (including fish frames) were well known by a high percentage of respondents in all the groups.

Aboriginal knowledge of safety was lower than other respondents. They were more likely to engage in "risky" behaviour from the conservative point of view of the questionnaire - for example swimming, (or rather fishing and hunting) in circumstances not recommended by Queensland National Parks and Wildlife Service - because from an Aboriginal perspective, there may not have been any risk involved. Aboriginal risk assessment was based on the practical knowledge of crocodile habits, as demonstrated by the amount of safety precautions in crocodile habitats (Section 5.12) and on an intimate knowledge of where and when crocodiles were likely to be found (Webb & Manolis 1989). However, Aborigines would take risks as other respondents would for practical reasons but also out of the belief that there is no accidental death so that if someone was taken or attacked by a crocodile, the responsibility laid within the social network of the victim or with the victim's social misconduct, not necessarily in the victim's actual action at the time (Douglas & Wildavsky 1982; Graham & Beard 1990). Aboriginal respondents may have had an unwarranted sense of personal immunity not reflecting the reality of fatal encounters (see Section 5.13.3).

Attacks

Most people seemed to think that crocodiles avoided people (Item 16, an average of 60% to 70% of residents and visitors). It was not so clear for Townsville residents, as expected. Most respondents also realised that the reason for attacks was threat (Item 18, 63% in Hopevale/Napranum, 65.5% in Townsville, 72% to 76% in visitors to Weipa and Daintree and Daintree residents). A number of respondents also mentioned hunger (Field notes 1990). The outcome of attacks was an interesting point because people were confused about the chance of escape (Item 20). The question was coded conservatively as "no escape" (see code book, Appendix 2). "Unsure" answers were high among the residents of Townsville (25%), Hopevale and Napranum (20.5%), the visitors to the Daintree area (25.3%). The "no escape" answers were higher, as expected, in residents of Weipa (70%) and the Daintree area (61%). Aboriginal respondents showed an even spread of answer of "no escape" (41%) and "escape" (38.4%), which showed that they may have known ways to escape successfully. This was supported by successful escapes in the last two attacks on Aborigines in the Daly River (Northern Territory) in 1989 and 1990 (see section 5.13). The high level of "unsure" answers could be attributed, in my view, to younger respondents who did not have the confidence and the knowledge of the older generation. A study of past attacks might provide useful evidence on when and why people are able to escape (see Section 5.13).

4.4.4 - Knowledge of the conservation biology and ecology of crocodiles

Status

It was well known to all respondents that crocodiles are a protected species although there were many comments particularly in Weipa which questioned whether they were actually endangered (Field notes).

Range

How far inland crocodiles were found was not all that clear, the result of both the wording of the question (it did not say what type of crocodile or how far inland precisely) and confusion about crocodile habitats generally (see questionnaire, Appendix 2).

Habitat

There was a higher level of awareness of the presence of Estuarine crocodiles in fresh water among all residents near crocodile habitats (74.3%, 87%, 91.2%), than among visitors and Townsville residents (around 50%). It showed the importance of local knowledge and/or personal experience (see Sections 4.5 & 4.9) in the acquisition of specific information. In contrast, there was much less awareness of the occurrence of the Johnstone crocodile in salt water as well as fresh water (less than 30% for all groups). It was known that crocodiles could be found on the beach, except to the Townsville residents (28% of "unsure", 50% of "correct answer") and the Daintree visitors (25.3% of "unsure", 71.4% of "correct answer"). It was quite likely, however, that the proportion of "unsure" answers reflected the responses of the visitors interviewed in Port Douglas, a group less likely to be exposed to local information because of the type of holiday they chose. However, once they reached the northern beaches, most visitors would learn about crocodiles, as the percentage of "correct answer" showed. The visitors to Weipa displayed an even higher percentage of "correct answer" for that question (94.4%), possibly an artefact of the small sample size (n=18), but perhaps the result of the "trip to the top" mystique of which "croc" are a major topic of conversation around the camp sites (Field notes). One should also be aware of the fact that all respondents were interviewed at the only caravan park in Weipa; at the office, ample information on crocodiles was available for interested visitors (Field notes 1990).

Movements, territoriality and dispersal

These were quite well known particularly among residents near crocodile habitats, not so much among Townsville residents (24% of "unsure" answers) and visitors to the Daintree area (31.7% of "unsure" answers). It would be appropriate to relate these two aspects of crocodile ecology (Habitat and movements) to stages in the life cycle of crocodiles and to seasonal factors such as flooding. Where are crocodiles, at what time of the year? The flooding of major waterways during the wet season and the need to establish new territories expands the area in which crocodiles would be found and this should be available information.

4.4.5 - Knowledge of the hunting and feeding behaviour of crocodiles

Residents were well aware that crocodiles were hunting at night as well as during the day, while the visitors to the Daintree area (30.1 % of "unsure" answers), and the residents of Townsville (36.6% of "unsure" answers) were unsure. There was some confusion about the fact that crocodiles may not necessarily hunt from the water, with a 50/50 response pattern in most cases, except for the residents of Townsville (28% of "unsure" answers). There was no major difference between residents and visitors for this question, which may be an indication that there was an uncertainty about this aspect of crocodile behaviour despite the information available to respondents.

Hunting techniques and energetics

The question of whether crocodiles stalked their prey or not was interesting. The "correct answer" for that question was "no", mainly because of the comments people made reflected more anthropomorphism than a real assessment of crocodiles' largely opportunist hunting behaviour (see discussion this chapter).

The majority of residents in Weipa and Napranum agreed (80%, 92% respectively), while residents in the Daintree area were unsure (22% of "unsure" and 58% of "correct answer"). Visitors to the Daintree area and Weipa and residents of Townsville either agreed (55.5%, 77.7%, 48.2% respectively) or were unsure (34.9%, 16.6%, 38.4% respectively).

Diet

The range of crocodiles' prey items (not just fish but also mammals) was known to an average of 50 to 60 % of respondents of all groups, and to 82% of Aboriginal respondents of Hopevale and Napranum. The storage of food for future feeds by crocodiles was still wrongly believed, with less than 20% of respondents giving the correct response. The comment that crocodiles left their food to rot before eating it (Field notes 1990) is in contradiction with an opportunist feeding behaviour (Taplin, *pers comm.*). It would be useful to inform people on the relationship between prey size and predator size and energy requirements of reptilians to dispel the myth that all crocodiles have formidable appetites and are all potential "man eaters".

Other behaviour

Aspects of crocodile behaviour relevant to safety such as speed on land (item 21), aggressive behaviour during the mating season (item 19), the ability to stay under water (item 23), parental care (item 29) and energetics (item 31) were not well understood. The "unsure" answers represented around 30% of respondents across all groups, except for item 21 on crocodile speed on land for which most respondents gave the expected response. This spectacular aspect of crocodiles' behaviour usually attracts a lot of media attention. Aboriginal respondents knew about parental care (76.9%), and about crocodiles' ability to stay submerged for long periods of time (74.3%). This was, in my view, the reflection of a tradition of living with crocodiles and of a long history of collective observation of the behaviour of the animal.

Ecology

There were only two items in that topic, the role of crocodiles in the environment (item 27) and the mortality rate of crocodiles (item 30). These aspects of the knowledge of crocodiles were definitively poorly understood for all groups.

4.5 - The role of crocodiles in nature

The role of crocodiles in wetland ecosystems was further investigated in the questionnaire in a separate section (Questions 55, 56, 57 & 58 questionnaire Appendix 2) which assessed the understanding of the links between habitat, species ecology and biology and human impacts. Respondents thought crocodiles were "very important" (31.15%) or "essential" (21.81%), particularly residents in the Daintree area (31.03% said "essential") while a number of residents in Weipa thought there were only "moderately important" (29.17%). However, there was no significant difference between groups ($p=0.062$, $n=321$).

There was a spread of answers about the role of crocodiles: "don't know", "ecological" (i.e. predator), "not defined" (i.e. have a place in nature) were the most mentioned (see code book, Appendix 2). Many respondents were unsure about what the role of crocodiles (if any) actually was, particularly Townsville residents, Daintree visitors and Aboriginal respondents. The "predator" role of crocodiles was mentioned by a majority of visitors and residents in Weipa, while their "place in nature" was mentioned equally by Daintree residents, visitors and Townsville

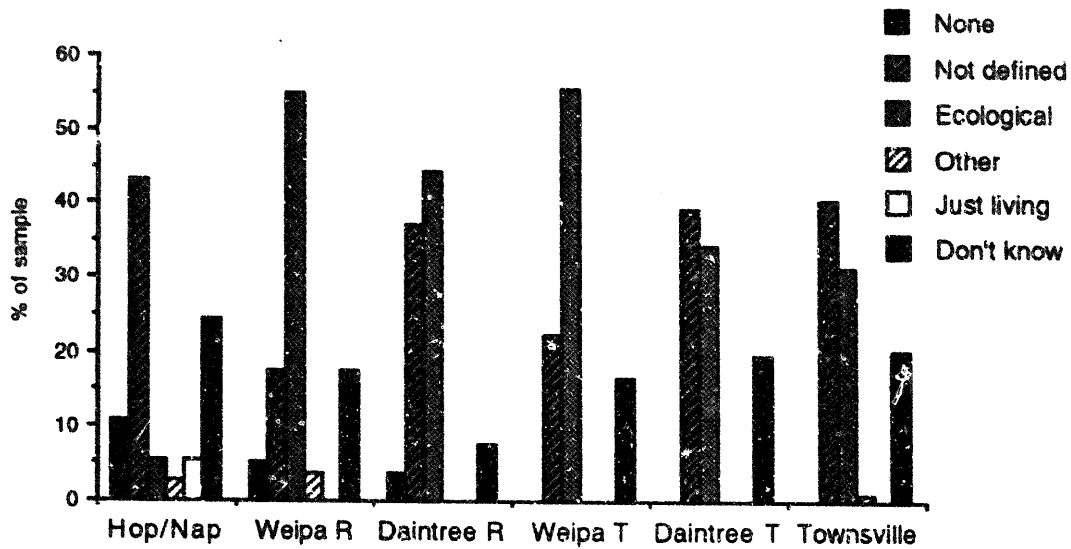


Figure 4.2 - Perceived role of crocodiles, expressed as % of sample.
(n=37/39, n=80, n=17/18, n=61/63, n=124/125 respectively)

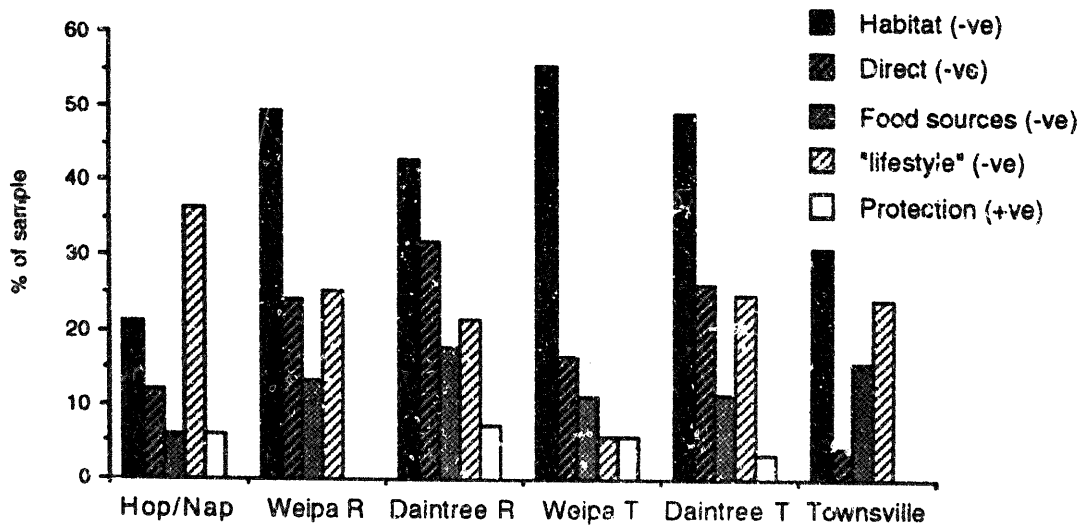


Figure 4.3 - Perceived human impact on crocodiles, expressed as % of sample.
(n=29/39, n=75/80, n=28/31, n=18, n=61/63, n=121/125 respectively)

residents; Aboriginal residents did not define the role of crocodiles in ecological terms at all but rather as part of nature "just living their crocodile life" (Figure 4.2).

Human impacts on crocodiles and crocodile habitats were considered "moderate" (38.89%) to "high" (41.36%) by most respondents. The highest percentage of "high" was found among Daintree residents (60.71%), and lowest among Aboriginal respondents (34.29%) (Table 4.9).

| | Perceived human impacts on crocodiles | | | | N values |
|-------------------------|---------------------------------------|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | 28.57% | 8.57% | 28.57% | <u>34.29%</u> | 35 |
| Weipa residents | 6.58% | 17.11% | 35.53% | <u>40.79%</u> | 76 |
| Weipa visitors | 0% | 17.65% | <u>41.18%</u> | <u>41.18%</u> | 17 |
| Daintree residents | 10.71% | 0% | 28.57% | <u>60.71%</u> | 28 |
| Daintree visitors | 3.39% | 20.34% | 30.51% | <u>45.76%</u> | 59 |
| Townsville residents | 3.67% | 8.26% | <u>51.38%</u> | 36.7% | 109 |
| Totals | 7.41% | 12.35% | <u>51.38%</u> | 36.7% | 324 |

Table 4.9 - Perceived human impacts on crocodiles among community groups ($p=0.0001$, $n=324$).

This impact was perceived as "negative", through the loss of habitat or through direct effects on crocodiles themselves by most respondents (Figure 4.3). The "positive" effect of management such as conservation policies or habitat rehabilitation, was the least perceived human impact in all groups. These results showed the impact of the current environmental discourse on public opinion where humans are perceived as the destroyers of a fragile nature not as potential managers (see Chapter 1).

4.6 - Respondents' perception of their own knowledge

Respondents' perception of their own knowledge and availability of information were investigated (Questions 42 & 43, see questionnaire Appendix 2). Overall, respondents' perception of their own knowledge showed that most respondents thought it was reasonable (58.75%). There was significant differences between community groups regarding the evaluation of their knowledge ($p=0.0005$, $n=337$) (Table 4.10).

| Community groups | Respondents' perception of their own knowledge | | | | N values |
|-----------------------|--|--------|---------------|------------------|----------|
| | Nil | Poor | Reasonable | Good / Very good | |
| Hopevale/ Napranum | 0% | 25% | <u>62.5%</u> | 12.5% | 32 |
| Weipa residents | 1.28% | 14.1% | <u>55.13%</u> | 29.49% | 78 |
| Weipa visitors | 0% | 33.33% | <u>66.67%</u> | 0% | 18 |
| Daintree residents | 0% | 7.69% | <u>65.38%</u> | 26.92% | 26 |
| Daintree visitors | 1.61% | 40.32% | <u>51.61%</u> | 6.45% | 62 |
| Townsville residents | 1.65% | 28.93% | 61.16% | 8.25% | 121 |
| Totals | 1.19% | 25.82% | <u>58.75%</u> | 14.24% | 337 |

Table 4.10 - Respondents' perception of their knowledge ($p=0.0005$, $n=337$).

Residents in Townsville (28.93%), Aboriginal respondents (25%) and quite a number of respondents among visitors (30 to 40%) admitted to "poor" knowledge. "Good" to "very good" knowledge evaluation was found in a small percentage of respondents among residents of Weipa and Daintree (25% to 30%). Knowledge scores and respondents' evaluation of their knowledge were positively correlated (Spearman $Rho=0.38$, $p=0.0001$, $n=337$). A Chi-square test was applied to lower and higher knowledge score categories (see Section 4.2) as independent variables and the knowledge perception as the dependent variable, in order to evaluate the correctness of respondents' evaluation for both these groups (Table 4.11).

| Knowledge score | Knowledge perception | | | |
|-----------------|----------------------|--------|---------------|----------------|
| | Nil | Poor | Reasonable | good/very good |
| low (1-19) | 1.2% | 40.36% | <u>54.22%</u> | 4.22% |
| high (20-31) | 1.17% | 11.7% | <u>63.16%</u> | 23.98% |
| Totals | 1.19% | 25.82% | <u>58.75%</u> | 14.24% |

Table 4.11 - Relationship between knowledge perception and knowledge scores ($p=0.0001$, $n=337$).

While 40.36% of respondents with a lower knowledge score acknowledged rightly their ignorance, 54.22% thought it was "reasonable" and probably overestimated their knowledge. A Chi-square test was conducted on the lower knowledge category showed that there was no difference in community groups with regards to their knowledge evaluation ($p=0.704$, $n=166$). In contrast, 63.16% of respondents with a higher knowledge score thought of their knowledge as "reasonable" and perhaps underestimated theirs. Respondents with higher score (23.98%) thought their knowledge was "good to very good" which might have been overestimated. Using the high score respondents as a single group, a Chi-square test was used to identify the differences between groups. It was only significant at 90% confidence intervals ($p=0.0586$, $n=171$) but showed that residents in Weipa (36.07%) and Daintree (30%) estimated their knowledge as "good to very good" which was confirmed by

their knowledge scores while Aboriginal respondents estimated their knowledge as "reasonable" (62.5%) (Table 4.12). This information may in fact have reflected the confidence people placed on their judgment rather than the evaluation of their knowledge.

| Community groups | Knowledge evaluation (high knowledge score group only) | |
|----------------------|--|----------------|
| | Reasonable | Good/very good |
| Hopevale/Napranum | 62.5% | 12.5% |
| Weipa residents | 55.74% | <u>36.07%</u> |
| Weipa visitors | 81.82% | 8% |
| Daintree residents | 65% | <u>30%</u> |
| Daintree visitors | 54.55% | 13.64% |
| Townsville residents | 74.17% | 19.51% |
| Totals | <u>63.16%</u> | <u>23.98%</u> |

Table 4.12 - Higher knowledge score group, perception of their own knowledge ($p=0.0585$, $n=171$).

4.7 - Sources of information

4.7.1 - Information availability

Generally, access to information was considered "moderately" (54.25%) to "very easy" (31.37%) by all respondents (Table 4.13). However there was a significant difference between community groups ($p=0.0226$, $n=306$). Overall, the information on crocodiles was perceived as "moderately easy" to obtain (54.25%), particularly for the Daintree visitors (68.85%), Weipa residents (62.86%) and visitors (58.82%). A perceived "easy" access to information was only found in 31.37% of respondents, most of those being Aboriginal respondents (54.05%) and Daintree residents (42.86%). The differences observed may be a function both of the type of knowledge (practical or general) and the source of knowledge (experience, local networks or vicarious sources).

| Community groups | Access to information | | | | N values |
|----------------------|-----------------------|----------------------|-----------------|---------------|----------|
| | Very difficult | Moderately difficult | Moderately easy | Very easy | |
| Hopevale/Napranum | 2.7% | 16.22% | 27.03% | <u>54.05%</u> | 37 |
| Weipa residents | 5.71% | 8.57% | <u>62.86%</u> | 22.86% | 70 |
| Weipa visitors | 5.88% | 17.65% | <u>58.82%</u> | 17.65% | 17 |
| Daintree residents | 7.14% | 10.71% | <u>39.29%</u> | <u>42.86%</u> | 28 |
| Daintree visitors | 1.64% | 9.84% | <u>68.85%</u> | 19.67% | 61 |
| Townsville residents | 3.23% | 8.6% | 52.69% | 35.48% | 93 |
| Totals | 3.92% | 10.46% | <u>54.25%</u> | 31.37% | 306 |

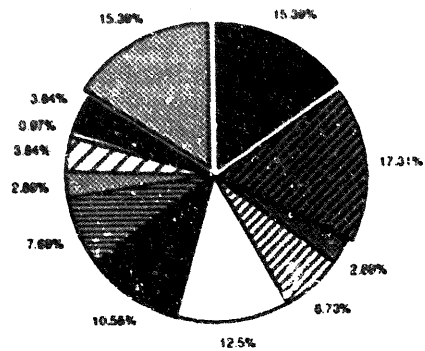
Table 4.13 - Perceived access to information on crocodiles among community groups ($p=0.0226$, $n=306$).

4.7.2 - Sources of Information

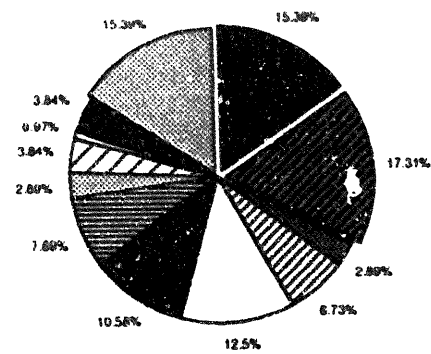
Respondents were asked to name out of thirteen possible sources of information the ones they used and to assign them with a index of credibility (1 as lowest to 5 as highest score) (Questions 44 & 47 see questionnaire Appendix 2). The range of sources and % of sample of community groups is given in Figure 4.4. The first five sources (representing more than 9% of total sample) given by respondents in each community group are presented in Table 4.14. These results showed that residents relied on personal experience and local networks primarily. This was particularly obvious for Aboriginal communities and Weipa residents because of their geographical isolation but also, in the case of Aboriginal communities because of the valuation of their own culture as a source of information. This was in contrast with Daintree residents who used a greater range of sources. Visitors and Townsville residents relied on tourist and wildlife personnel and natural history accounts as well as national media. Crocodile signs were acknowledged by all respondents as useful information.

| Community groups | Sources of information | | | | |
|------------------------------|------------------------------------|-----------------------------------|-----------------------------------|-------------------------------|----------------------------------|
| | 1st source (%) | 2nd source (%) | 3rd source (%) | 4th source (%) | 5th source (%) |
| Hopevale Residents (n=19) | Locals, family friends (17.31) | Personal experience (15.39) | Crocodile signs (15.39) | Local news (12.5) | National news (10.58) |
| Daintree Residents (n=31) | Personal experience (12.43) | Local, family, friends (11.45) | Nat. history books/TV (11.45) | Crocodile signs (9.95) | |
| Daintree Visitors (n=63) | Tourism personnel (14.14) | Crocodile signs (12.08) | Nat. history books/TV (12.08) | Wildlife personnel (11.82) | Tourist brochures (9.25) |
| Napranum Residents (n=20) | Locals, family, friends (20.21) | Personal experience (20.21) | Crocodile signs (12.77) | Local news (9.57) | |
| Weipa Residents (n=80) | Locals, family, friends (12.91) | Personal experience (12.77) | Crocodile signs (13.30) | Local news (11.72) | Nat. history books/TV (11.20) |
| Weipa Visitors (n=18) | Nat. history Books/TV (12.59) | Crocodile signs (11.11) | National news (11.11) | Tourism personnel (10.38) | Wildlife personnel (9.63) |
| Townsville Residents (n=125) | Local news (14.72) | National news (11.96) | Nat. history books /TV (11.91) | Crocodile signs (11.59) | |

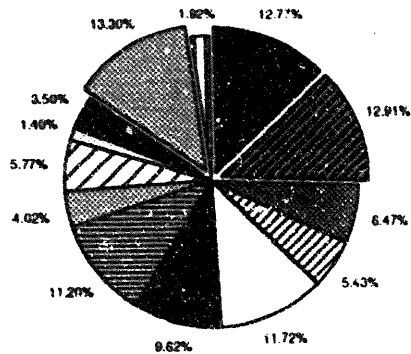
Table 4.14 - Five major sources of information used by community groups, expressed as % of sample (note: only sources representing more than 9% of total sample are used).



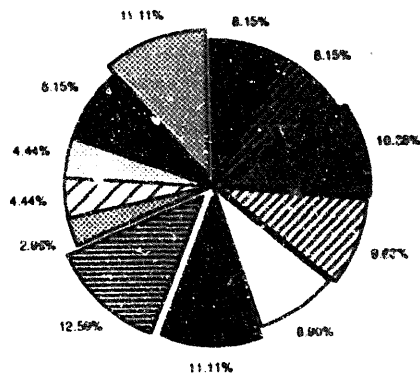
Residents of Hopevale (n=19).



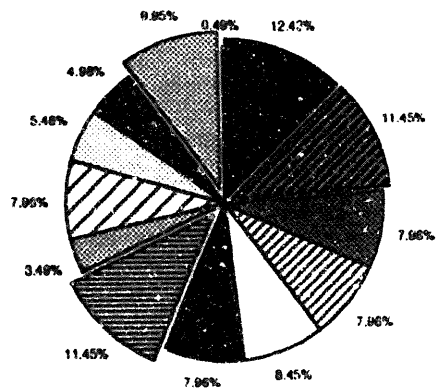
Residents of Napranum (n=20).



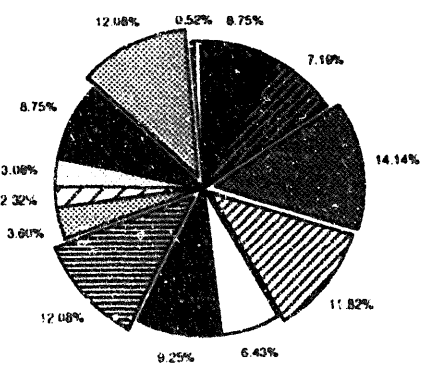
Residents of Weipa (n=80).



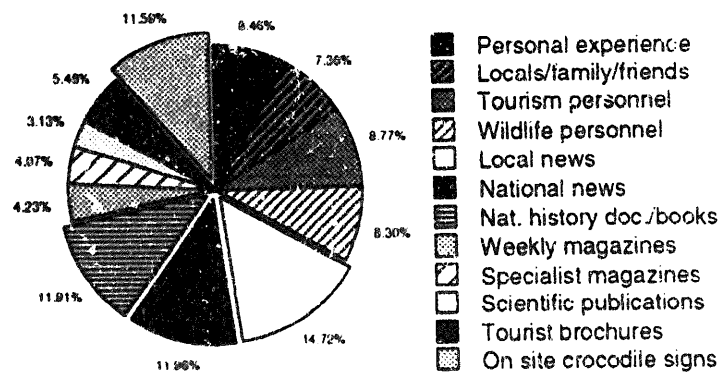
Visitors to Weipa (n=18).



Residents of the Daintree area (n=31).



Visitors to the Daintree area (n=63)



Residents of Townsville (n=125).

Figure 4.4 - Information sources used by respondents (n=354).

4.9 - Credibility of sources of information

4.9.1 - Credibility of all sources

Each of the above sources, when mentioned by respondents, was assigned a credibility value. A Chi-square test was applied to each source (dependent variable) in relation to community groups (independent variable) (Table 4.15).

| Sources | Credibility scale | | | | | p values | N values |
|-----------------------|-------------------|--------|---------------|--------------|---------------|---------------|----------|
| | 1 (low) | 2 | 3 | 4 | 5 (high) | | |
| Personal experience | 2.33% | 10.23% | 19.53% | 26.51% | <u>41.4%</u> | <u>0.0001</u> | 215 |
| Locals/friends/Family | 2.86% | 6.19% | 18.1% | 25.24% | <u>47.62%</u> | <u>0.0001</u> | 210 |
| Tourism personnel | 3.37% | 7.3% | 20.79% | <u>42.7%</u> | 25.84% | 0.1963 | 178 |
| Wildlife personnel | 2.42% | 1.21% | 6.67% | 23.03% | <u>66.67%</u> | 0.6392 | 165 |
| Local news | 9.78% | 16.89% | <u>32.44%</u> | 28% | 12.89% | <u>0.0188</u> | 225 |
| National news | 9.22% | 16.02% | <u>34.47%</u> | 24.76% | 15.53% | <u>0.0003</u> | 206 |
| Natural history | 1.74% | 2.61% | 11.74% | 38.7% | <u>45.22%</u> | 0.5815 | 230 |
| Tourist brochures | 9.62% | 23.08% | <u>34.62%</u> | 21.15% | 11.54% | 0.4469 | 104 |
| Crocodile signs | 1.62% | 4.45% | 8.91% | 14.98% | <u>70.04%</u> | 0.1754 | 247 |

Table 4.15 - Credibility of sources most mentioned by all respondents. ($p < 0.005$ indicates significant differences between community groups for each source and N values indicate the number of respondents using a given source (Total sample size=356).

Overall, respondents agreed on the high credibility of wildlife personnel (66.67%) and crocodile signs (70.04%), ahead of natural history books and documentaries (45.22%) local networks (47.62%) and personal experience (41.4%). There was a spread of opinions regarding the credibility of news, generally with no difference between local and national news, likewise for the credibility of the information from tourism (personnel and brochures). It showed that the status of sources is major factor in the credibility of the information provided. It was interesting to note though that natural history books and documentaries were considered credible by most respondents despite the fact that they belonged to the media (as the news did) and therefore were subject to vested interests. In the case of personal experience, the majority of respondents valued their own experience despite the fact they may have been inexperienced or ill informed as it was the case for visitors. This only reflected the importance of processing information through personal experience as a mean of acquiring knowledge and formulating judgments. Chi-square tests showed significant difference between community groups for

"personal experience" ($p=0.0001$, $n=215$), "locals/friends/family" ($p=0.0001$, $n=210$) and "national news" ($p=0.0003$, $n=206$) .

4.9.2 - Credibility of personal experience

The credibility of personal experience was, as expected, mostly prevalent among resident communities near crocodile habitats and was found highest with Aboriginal communities (86.21% "5") and should be seen in conjunction with local networks (Table 4.16).

| Communities | Credibility of personal experience | | | | |
|--------------------|------------------------------------|---------------|--------|---------------|---------------|
| | 1 (not at all) | 2 | 3 | 4 | 5 (highly) |
| Hopevale/ Napranum | 0% | 3.45% | 3.45% | 6.9% | <u>86.21%</u> |
| Weipa Residents | 1.52% | 4.55% | 24.24% | <u>34.85%</u> | <u>34.85%</u> |
| Weipa visitors | 0% | 11.11% | 11.11% | <u>33.33%</u> | <u>44.44%</u> |
| Daintree residents | 0% | 4.17% | 16.67% | 29.17% | <u>50%</u> |
| Daintree visitors | 5.71% | <u>31.43%</u> | 22.86% | 5.71% | <u>34.29%</u> |
| Townsville | 3.85% | 9.62% | 25.08% | <u>38.46%</u> | 25% |

Table 4.16 - *Credibility of personal experience among community groups ($p=0.0001$, $n=215$).*

It was important to note the differences between Aboriginal communities and Weipa residents whose geographical isolation was similar. While the former relied largely on personal experience and local networks, the latter did to a lesser extent. Cultural identity rather than geographical isolation explained Aboriginal networks and processes of transmission of information and their intrinsic value. Geographical isolation and displacement, loose community identity may have explained the lesser level of trust in local networks and personal experience in the case of Weipa residents. Weipa is a mining town with a suburban design and lifestyle; unless people used wetlands for recreational purposes, there was little chance to have personal experience of crocodiles (see Sections 5.9 & 5.10). It was interesting to note that visitors to Weipa were confident about their personal experience which was primarily based on vicarious knowledge (Figure 4.4) and not on their actual personal experience of crocodiles (see Section 5.10). It was not the case of Daintree visitors who were quite happy to acknowledge their limited personal experience and its unreliability. It was important because visitors to Cape York Peninsula may have mistaken fiction for reality and overestimate their own understanding of the region and certainly of its hazards.

4.9.3 - Credibility of local networks

Local networks were found most important with residents generally, particularly with Aboriginal respondents (94.12% "high"), compared with Weipa residents (37.68% "high") (Table 4.17). As for personal experience, the same distinction between Aboriginal communities and Weipa residents existed for the credibility of local networks.

| Communities | Credibility of local networks | | | | |
|--------------------|-------------------------------|--------|--------|---------------|---------------|
| | 1 (low) | 2 | 3 | 4 | 5 (High) |
| Hopevale/ Napranum | 0% | 2.94% | 2.94% | 0% | <u>94.12%</u> |
| Weipa residents | 1.45% | 5.7% | 24.64% | 30.43% | <u>37.68%</u> |
| Weipa tourists | 0% | 0% | 10% | 30% | <u>60%</u> |
| Daintree residents | 0% | 4.35% | 26.09% | 17.39% | <u>52.17%</u> |
| Daintree visitors | 3.7% | 14.81% | 25.93% | <u>40.74%</u> | 14.81% |
| Townsville | 8.51% | 6.38% | 12.77% | 29.79% | <u>42.55%</u> |

Table 4.17 - *Credibility of locals, family and friends among community groups, expressed as % of sample*
($p=0.0001$, $n=210$).

Although local networks were a predominant source of information in Weipa, their reliability was appreciated differently by residents, an indication of the level of community cohesion. Many residents were transients (1 to 5 years residence), therefore there was not enough time to develop a community spirit despite the isolation (see demographic profile Appendix 5). It was in contrast with Daintree residents where local networks were overall more important. There was however a section of that community which was uncertain about local information and it may have been a reflection of recent social changes in the area: in the last 15 years there has been an influx of new residents quite unlike the original farming community (Field notes 1990). Visitors to Weipa were more likely to trust local information than visitors to the Daintree, perhaps because of the geographic isolation but also because of the social similarity between those respondents with residents of those areas (see demographic profile, Appendix 5).

4.9.4 - Credibility of national news and current affair programmes

The credibility of National media and current affairs programmes was average (32% "3") to high (25.33% "4", 22.67% "high") (Table 4.18). The low credibility score among Daintree residents could be attributed to their poor experience with the national media coverage of the death of Beryl Wruck in 1985 in *Jaws the sequel*, a "60 Minutes" TV segment (Penlington 1986) (Field notes 1990). Daintree visitors also expressed some reserve about the credibility of national media compared to Queensland residents which may be related to the middle

class background of those respondents (see demographic profile Appendix 5), but also to their greater exposure to media generally.

| Communities | Credibility of national media | | | | |
|-----------------------|-------------------------------|--------|---------------|------------|---------------|
| | 1 (low) | 2 | 3 | 4 | 5 (High) |
| Hopevale/ Napranum | 12.5% | 6.25% | 25% | 25% | <u>31.25%</u> |
| Weipa residents | 12.5% | 6.25% | 25% | 25% | <u>31.25%</u> |
| Weipa visitors | 0% | 14.29% | 14.29% | <u>50%</u> | 21.43% |
| Daintree residents | <u>37.5%</u> | 31.25% | 18.75% | 12.5% | 0% |
| Daintree visitors | 8.57% | 28.57% | <u>34.29%</u> | 22.86% | 5.71% |
| Townsville | 5.33% | 14.67% | <u>32%</u> | 25.33% | 22.67% |

Table 4.18- Credibility of national news and current affairs TV programmes among community groups expressed as % of sample (n= 206).

4.10 - Information priorities

Respondents were asked to name and rank a number of information items ("safety", "ecology and biology", "farming", "management practices" and "crocodile attacks"). Only first and second ranks were considered in this analysis as the most indicative of respondents' interest (Question 46, see questionnaire Appendix 2). "Safety" by far was the most mentioned information wanted by respondents (41.2% "1st rank", 13.2% "2nd rank") followed by "ecology and biology" (22.8% "1st rank", 18.4% "2nd rank"), "crocodile attacks" (13.9% "1st rank", 17% "2nd rank"), "farming" (10.8% "1st rank", 9.4% "2nd rank") and "management practices" (10.2% "1st rank", 17.1% "2nd rank") (Table 4.19).

| | 1st rank | | 2nd rank | | Correction factor for sample size |
|-------------------|------------------------|-------------------------|------------------------|-------------------------|--------------------------------------|
| | Observed values (%) | Corrected values (%) | Observed values (%) | Corrected values (%) | |
| Ecology/biology | 38.14 | <u>22.8</u> | <u>30.77</u> | 18.4 | 0.60 |
| Management | 21.26 | 10.2 | <u>35.63</u> | 17.1 | 0.48 |
| Crocodile attacks | 24.88 | 13.9 | <u>30.35</u> | 17 | 0.56 |
| Farming | 30 | 10.8 | 26.1 | 9.4 | 0.36 |
| Safety | 59.76 | <u>42.2</u> | 19.11 | 13.2 | 0.69 |

Table 4.19 - Respondents' information priorities expressed as corrected % of sample.

It was interesting to note that although people were wanting information on safety, they did not however want it in the form of information on crocodile attacks (a reflection of low credibility of the media) but more as information on ecology and biology which reflected both a concern about safety and an interest in crocodiles; this was not matched, however, by wanting to know more about the management of the species.

There were no significant differences between community groups for "Ecology/biology" ($p=0.1268$, $n=215$); however, there was significant differences in ranking among groups for "crocodile attacks" ($p=0.0001$, $n=201$, "management practices" ($p=0.0011$, $n=174$) "farming" ($p=0.0127$, $n=130$) and "safety" ($p=0.0434$, $n=246$) (Tables 4.20 & 4.21).

4.10.1 - Management practices and crocodile attacks

| Communities | Management | | Crocodile attacks | |
|--------------------------------------|----------------|---------------|-------------------|---------------|
| | 1st rank (%) | 2nd rank (%) | 1st rank (%) | 2nd rank (%) |
| Hopevale/Napranum ($n=18, 17$) | 11.11% | 27.78% | 11.76 % | <u>47.06%</u> |
| Weipa residents ($n=35, 33$) | <u>42.86%</u> | <u>37.14%</u> | <u>33.33%</u> | <u>36.36%</u> |
| Weipa visitors ($n=9, 10$) | 44.44% | 33.33% | <u>30 %</u> | 10 % |
| Daintree residents ($n=18, 17$) | <u>22.22 %</u> | <u>44.44%</u> | 5.88% | 29.41 % |
| Daintree visitors ($n=37, 40$) | 8.11% | 29.73% | 22.5% | 20% |
| Townsville ($n=57, 84$) | 15.79% | 38.6% | 28.57% | 32.14% |
| Total($n=174, 201$) | 21.26% | 35.63% | 24.88% | 30.35% |

Table 4.20 - Ranking of management practices and crocodile attacks among community groups, expressed as % of respondents ($p=0.0011$, $n=174$, $p=0.0001$, $n=201$ respectively).

Management practices

The effect of location was significant for management practices and probably due to remoteness, as 42.86% of Weipa residents felt they wanted to have more information on management practices compared to 22.22% of Daintree residents. This may be explained by both the low level of management presence in the Weipa area but also by the fact of a large proportion of transient respondents being uncertain about the information they had about crocodiles (primarily from local networks) as well as a feeling of being away from "civilisation" and right in the middle of crocodile country. The need for management was expressed by those respondents early in the questionnaire as a major aspect of their attitudes towards crocodiles (Figure 3.1). Daintree residents did not wish to know more about management practices, perhaps the fact that they were better catered for by wildlife agencies and politicians, but also because the community was divided about the necessity of management (see Figure 3.1).

Visitors generally did not care to know about management which was in agreement with their pattern of responses in the opening question and reflected the fact that

they did not live in the region, so such knowledge was not seen as relevant (see Figure 3.1).

Crocodile attacks

The need for information on crocodile attacks was also significantly different between community groups. Daintree residents did not wish to know more about crocodile attacks (5.88% "1st rank"). It may be the consequence of the death of Beryl Wruck in 1985 (see Section 5.13.); that same attack has changed the focus of attraction from the rainforest to crocodiles and crocodile cruises are now the main tourist attraction and source of income for a significant proportion of the Daintree residents (see demographic profile, Appendix 5). In contrast, Weipa residents wanted to know more about crocodiles attacks (33.33% "1st rank"). It was in my view the result of the isolation of that community and the amount of rumour and crocodile stories that went around; every resident had a crocodile story to tell (Field notes 1990). It has been shown that rumour usually occur when trustworthy sources of information are missing (Chapter 1).

4.10.2 - Safety and farming

Farming

The need for information on farming, although of interest to a small number of respondents (n=130/356), provided an insight into an important aspect of crocodile management as well as into respondents' perception of employment opportunities. It was also indicative of the utilitarian value respondents placed on wildlife generally.

| Communities | Safety | | Farming | |
|-------------------------------------|---------------|--------------|---------------|--------------|
| | 1st rank (%) | 2nd rank (%) | 1st rank (%) | 2nd rank (%) |
| Hopevale/Napranum (n=21, 16) | <u>85.71%</u> | 4.76% | <u>50%</u> | 31.25% |
| Weipa residents (n=45,22) | <u>71.11%</u> | 17.78% | <u>36.36%</u> | 31.82% |
| Weipa visitors (n=15,7) | <u>46.67%</u> | 26.67% | <u>42.86%</u> | 0% |
| Daintree residents (n=16,9) | <u>50%</u> | 25% | 0% | 11.11% |
| Daintree visitors (n=49, 23) | 38.78% | 22.45% | 26.09% | 21.74% |
| Townsville residents (n=100, 53) | <u>63%</u> | 19% | 26.42% | 30.19% |
| Total (n=246,130) | 59.76% | 19.11% | 30% | 26.15% |

Table 4.21 - Ranking of safety and farming among community groups, expressed as % of respondents
($p=0.0434$, $n=246$; $p=0.0127$, $n=130$).

Information on farming interested residents in Hopevale/Napranum (50% "1st rank", 31.25% "2nd rank", and Weipa (36.36% "1st rank", 31.82% "2nd rank") visitors to Weipa (42.86% "1st rank") primarily followed by Townsville residents (26.42 % "1st rank", 30.19% "2nd rank") and visitors to the Daintree (26.09% 1st rank, 21.74% "2nd rank"); it was of no interest to the Daintree residents. (0% "1st rank", n=9/31) (Table 4.21). The need for employment opportunities associated with a rather utilitarian view of crocodiles explained those results. Those are discussed in Chapter 6.

Safety

Safety was a major concern of all residents (59.76% "1st rank"), particularly of Aboriginal respondents (85.71% "1st rank") and Weipa residents (71.11% "1st rank") despite their high knowledge scores (Section 4.3). Visitors to the Daintree area in contrast were not so interested in more information on safety despite their low knowledge score (see Section 4.3) and absence of personal experience. Those results were reflected in the distribution of expressed concern about safety in those locations (see Chapter 5).

4.11 - Summary and discussion.

Studies on the knowledge of animals and animal related issues in the American public have shown that knowledge was highest for domestic species and species that could inflict harm to humans and that animal related issues were either highly emotional or associated with human health hazards. Little was known of endangered species, invertebrates and animals associated with superstition and myths (Kellert 1985b). In this study the knowledge of crocodiles was overall high and respondents were well aware of the conservation status of the species. It is argued here that the knowledge of crocodiles was closely linked to its relevance to respondents and to cultural factors.

The common assumption that environmental awareness is highest among educated people has been questioned (Van Liere & Dunlap 1980,1981) and was found to be the result of a confusion between environmental awareness and activism which is class related (Mohai 1985). In this study, Daintree residents who had a high proportion of tertiary educated respondents and the only group with respondents belonging to environmental groups (see demographic profile, Appendix 5), did not differ from Weipa residents in their knowledge scores. Daintree visitors, who had

the highest proportion of tertiary educated respondents had a poor knowledge of crocodiles. Relevance rather than education was most important in the knowledge of respondents. Knowledge scores were highest among residents near crocodile habitats and lowest among respondents not living in those areas but as visitors came into those regions their knowledge would increase as a result exposure to on site information. The amount of retention of such information however was not investigated.

The knowledge of crocodiles was significantly affected by gender and background. It was found more prevalent among people of rural background and among males respondents. Why it was important to know about crocodiles in rural areas studied may be easy to understand in terms of the relevance of such information in northern Australia, but why more so for male respondents? The distinction between Aboriginal and non Aboriginal male respondents clearly indicated the cultural basis of that relationship and pointed out to historical and cultural construction of the Australian identity (White 1981; Hodge & Mishra 1990). Examples of the association of crocodiles and masculinity can be seen in popular culture artefacts. Recently produced documentary *Crocodile Man* (Ireland 1991) and an television advertisement for Queensland beer "Power" (1992) are examples of this phenomenon. The symbolic association of crocodiles with wild nature and the desire to control and tame may be seen as an explanation for the interest of non Aboriginal male respondents in crocodiles. Male respondents were found to be more likely to engage in outdoors activities and used wetland significantly more than females (see Section 5.10), both through work and recreation, in that continuing a tradition originated in the colonial expansion of the last century (Hodge & Mishra 1990).

The knowledge of crocodiles was overall high, but patchy, sometimes misleading, with a predominance of knowledge relating to safety and and a poor understanding of ecological relationships and crocodile related issues. The knowledge of crocodiles was associated with anthropomorphism as reflected in the misconceptions about their behaviour and ecology. They originated, in my view, from the fact that people did not understand the implications of reptilian energetics. The ectothermy and low metabolism of crocodiles are reflected in all aspects of their behaviour: active and resting behaviour, feeding and hunting patterns and amphibious behaviour. The energy requirements of crocodiles for maintenance, growth and reproduction are low and energy only needs to be expended at irregular intervals (Lang 1987). The unpredictability of their behaviour and their cryptic habits have called for a range of comments from respondents such as "they watch you" when they are at rest either

on the banks or in the water, "they are cunning and sneaky" or "you can't trust them" when they hunt their prey. These are human motives attributed to the crocodile behaviour and represent a basic human trait of coping with the uncertainty and the unpredictability of unfamiliar situations and surroundings. Although not investigated formally, anecdotal evidence from informal interviews suggested that the connection between habitat and population size were not always understood. Most people failed to realise that crocodile population size depended upon the availability of suitable habitat. As a result, it was assumed that human control, not environmental constraints, was the most important way to regulate population numbers. The present crocodile population in Weipa was perceived by residents as large and as constituting a threat, because crocodiles "had been protected for too long" (Field notes 1990). The protective legislation was not well understood by the general public, and the concept of the crocodile as an endangered species was often challenged by respondents. It would be desirable to give an overall picture of the status of Estuarine crocodiles at different scales (international, national, regional) and to emphasise the conservation value of northern Australia within that context. It is important, in my view, to raise people's awareness of basic ecological principles and relate those principles to regional wildlife issues such as crocodiles, and to demonstrate that management practices can have a positive influence on the environment (conservation policies, rehabilitation of degraded habitats for example), in that being a benefit to people.

Relevance was most important to understand the type of information people wanted to acquire and how much that information was needed. Safety was the overwhelming area of interest for all respondents followed by ecology and biology. It reflected respondents' perception of their poor understanding of crocodile ecology and biology but also their concern that what they knew of safety was not adequate or sufficient. It may also have reflected a failure of current risk management. For instance, risk information in the form of crocodile signs were perceived as a major source of practical on site safety information by most respondents, suggesting that it would be desirable for management to provide a greater range of safety information aimed at identified user groups, specific locations and activities informing on practical aspects of crocodile behaviour and appropriate behaviours. In Chapter 5, safe behaviour and its relationship to knowledge of safety is further investigated. It should also be pointed out that society today aims at reducing risks by widely informing about risks. This social trend may in fact have influenced respondents' interest in more information on safety.

The need for more information on management practices, and crocodile attacks discriminated between residents in the West coast of Cape York Peninsula and the populated east coast of Far North Queensland. The need for better risk management expressed by Weipa residents may be seen as an expression of their political and geographical remoteness from decision making processes combined with an acute sense of urgency for visible management actions regarding public safety and a perceived large crocodile population (see Chapter 5 for a discussion of risk assessment).

The knowledge of crocodiles was found to be experiential and/or vicarious and closely related to respondents social and communication networks. Knowledge of crocodiles was acquired through personal experience, local networks as well as through vicarious sources and wildlife personnel. It was important to note that personal experience and local networks were important channels used by residents and could be associated with poor factual knowledge with serious implications with regards to safety management particularly public education (Benzaken 1991). Vicarious information came mostly through the media (print media, current affairs programmes, television documentaries and books) and was widely used although not always considered a good source of information (print media particularly). The media are important in the attitudes towards crocodiles because they shape people's expectations where no first hand experience is available. The type of medium used to convey information carries preconceptions about its content. For example, the style (entertainment and/or educational) and content (scientific information) presented by documentaries may be seen as factual, "real" and authentic, (it is well known though that wildlife sequences are highly staged, see Attenborough nature documentaries). They may present however a highly subjective and anthropomorphic or distant and scientific view of animals; in the case of crocodiles, emphasis on physical features (open mouth, jaws, teeth), the ferocity of their predatory behaviour, using sound track effect (suspense music), low camera angles have been reinforced the symbolic status of crocodiles. The intimacy and closeness with wildlife in those programmes establish a sense of otherness because it is unlikely that those conditions will occur in real life experience of wild animals reinforcing the boundary between humans and non humans. The narrative also brings together events unrelated in time and space for the purpose of the argument (Medhurst 1989). The effect of the news, no matter how sensational it may be, is after all short lived and as a result may not have such a profound and lasting effect on attitudes towards crocodiles. The worse crocodile attack report will be quickly displaced by other equally disastrous news. The major impact of sensational

crocodiles attacks reports is to focus the imagination of readers on the horror and bestiality of attacks and to reinforce the moral differentiation between humans and non humans.

The cultural differences between Aboriginal and non Aboriginal respondents affected knowledge in a number of ways. Although the knowledge of crocodile behaviour was in fact higher with Aboriginal respondents, the knowledge of safety was lower and may be seen as a reflection of differences in risk assessment (see Chapter 5); the apparent low level of understanding of ecological relationships compared to other groups is in contrast with Aboriginal worldview of interrelationships between human and non humans (Rose 1987, 1988; Yengoyan 1987; Stanner 1966) and may be explained by the short coming of the instrument with those respondents. It has been argued that it would be wrong to assume that Aborigines are natural conservationists (Bennett 1983, 1991). One could argue that empirically (culturally) developed sustainable management practices have been disrupted and may need reappraisal given the new circumstances of a limited and fragmented original landscape. This may be a test of cultural strength for contemporary Aborigines in a period of recognition of traditional rights and land rights acquisition. The overwhelming use of personal experience and local networks compared to other groups were evidence of cultural isolation from the wider community but primarily an expression of the cultural importance of intrinsic communication networks and knowledge transmission. It was a common comment among Aboriginal respondents to say that if you wanted to know, you just have to ask the elders, they have the knowledge (Field notes 1990). It is likely that this type of beliefs still prevails. The interest Aboriginal respondents had in farming and crocodiles attacks requires some contextual information. Farming was seen as employment opportunity for those remote communities which was consistent with life on tribal lands (as was crocodile shooting in the old days). The existing Edward River Crocodile Farm (Pormpuraaw, Cape York Peninsula) may have provided a focus for that interest. The interest in crocodile attacks may be explained by the fact that the more exposed to such incidents the more one should be aware of its eventuality in a given location. It was not the fact of morbid attraction but rather useful information on a particular animal (Field notes 1990).

The implications for crocodile management of the current status of knowledge and the existing channels of communication in relation to the design of a public education strategy have been discussed elsewhere (Benzaken 1991). The importance of risk communication is emphasised and the strategies proposed use the findings of this

research to identify of target groups, design message content and style and to choose the appropriate channel. Recommendations regarding the implementation of an educational programme proposed training of specialist staff and community groups, specialists workshops, and the provision of integrated interpretive facilities focused on the tropical ecosystems and wildlife in the Daintree area for visitors, including an upgrading (and accreditation) of existing river cruises as a mean of providing visitors with the required level of personal experience necessary for mindful processing of information about crocodiles and safety in crocodile habitats (see Chapter 5 for a discussion of the value of personal experience in promoting safety behaviour).

CHAPTER 5

THE PERCEPTION OF CROCODILES AS DANGEROUS WILDLIFE

In the previous chapter, it became apparent that safety was a major aspect of the knowledge of crocodiles respondents wanted more information about. It was also obvious that most people were not aware of important information on crocodile biology and ecology that could help them make a better evaluation of the risk involved. How respondents saw the danger crocodiles represented and what may have affected their perception are presented in this chapter. It followed the framework presented in risk studies and included the relevance of crocodiles to respondents' daily life (risk selection), the evaluation of risk perception (in this study *expressed concern* about safety), the understanding of the nature of the danger (fatal outcome, unpredictability of attacks, helplessness and amount of harm), the assessment and relevance of personal experience (as different from factual knowledge) and perceived exposure, the documentation of safety behaviour and pattern of activities of respondents in crocodile habitats, and finally the assessment and relevance of social factors (media attention and social/personal responsibility).

5.1- Perceived environmental threats

Why certain risks are selected for social attention is a cultural process and different societies are concerned with different dangers (Douglas & Wildavsky 1982; Douglas 1986). Because risk combines both a probability of an event and the severity of harm associated with that event (Campbell 1980), it is unrealistic to compare different risks (Covello, McCallum & Pavlova 1987). However, it was possible to ask respondents to rank a number of concerns of relevance to them, in that reflecting more social attention than an objective comparative scale of risks.

The level of concern about crocodiles as a threat for all respondents was explored relative to specific aspects of living in the tropics and to more general concerns about health and technology (Question 8, see questionnaire, Appendix 2).

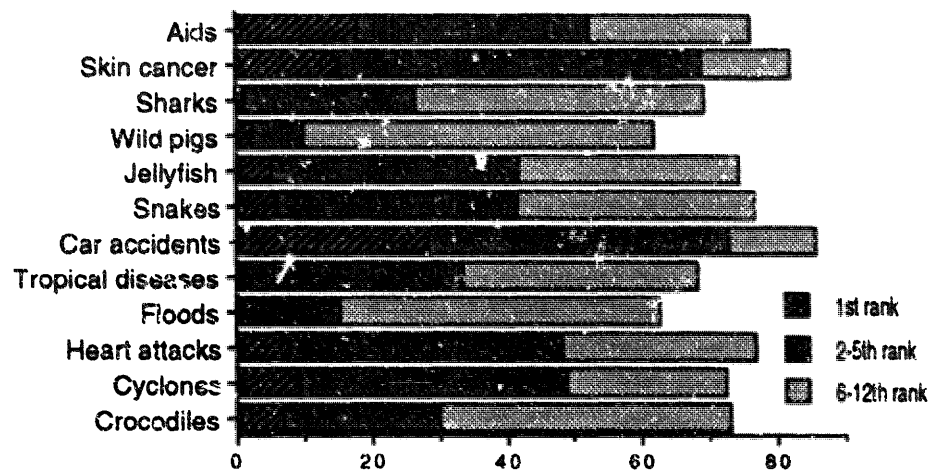


Figure 5.1- Perceived threats among all respondents expressed as cumulative % of sample (n=356)

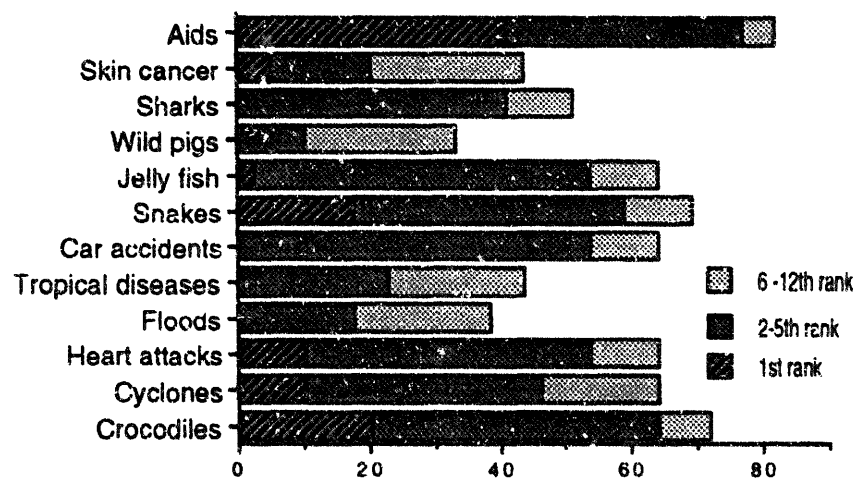


Figure 5.2 - Perceived threats among Aborigines expressed as cumulative % of sample (n=39)

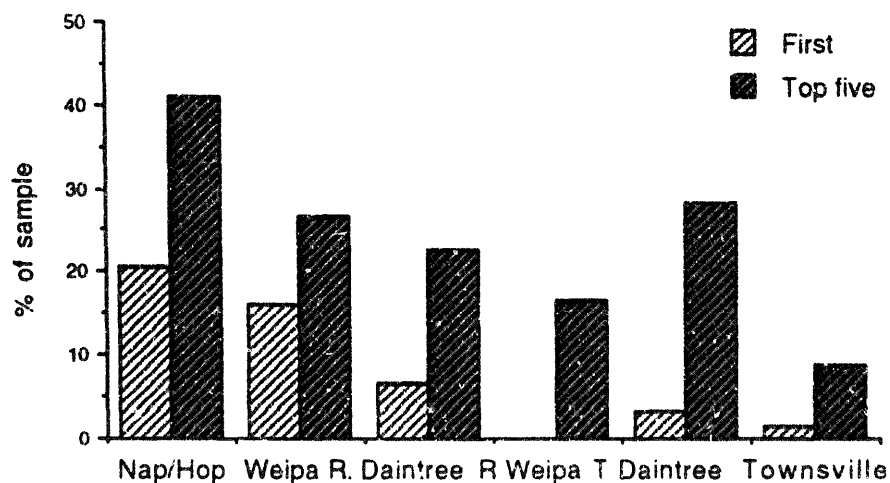


Figure 5.3 - Crocodiles as an environmental threat, expressed as a rank and % of sample.
(n=39, n=80, n=31, n=18, n=63, n=125 respectively)

The order of perceived threats showed that car accidents, Aids, skin cancer, cyclones and heart attacks were the most perceived threats, far ahead of any wildlife related threats. Snakes, jellyfish, tropical diseases and crocodiles were the most commonly mentioned wildlife threats (Figure 5.1 & Table 5.1).

| Threats | 1st rank only (%) | 2nd to 5th rank (%) | 6th to 12th rank (%) |
|-------------------|-------------------|---------------------|----------------------|
| Car accidents | 28.65 | 44.38 | 12.92 |
| Skin cancer | 15.45 | 53.93 | 13.20 |
| Aids | 18.26 | 34.27 | 23.88 |
| Cyclones | 9.27 | 39.61 | 23.60 |
| Heart attacks | 7.87 | 40.45 | 28.37 |
| Jellyfish | 5.34 | 36.80 | 32.58 |
| Snakes | 5.90 | 35.96 | 34.33 |
| Tropical diseases | 1.12 | 32.58 | 34.55 |
| Crocodiles | 7.02 | 23.03 | 42.92 |
| Sharks | 1.12 | 35.96 | 34.83 |
| Floods | 0.56 | 14.89 | 47.19 |
| Wild pigs | 2.53 | 7.58 | 51.97 |

Table 5.1 - Ranking of perceived environmental threats for all respondents (n=356).

Following the assumption that risk was culturally selected for social attention, a study of environmental threats with Aboriginal respondents was conducted separately (Figure 5.2 & Table 5.2).

The ranking of perceived threats by Aboriginal respondents was strikingly different in several ways; first, the range of threats perceived as important was less and second the salience of threats was different. Aids came overwhelmingly first, followed by crocodiles and snakes, and then cyclones and heart attacks. It indicated a pattern of inclusion of post-contact health hazards (Aids and heart attacks), associated with a change in lifestyle, with pre-contact hazards (snakes, crocodiles, cyclones). It could be said that Aids was an exogenous hazard for which there was no standard coping strategy unlike wildlife threats. Recent Aboriginal health programmes have alerted communities of the dangers of Aids, as indicated by a number of health workers (Napranum, Field notes 1990) and it may have influenced respondents' ranking.

5.2 - The salience of crocodiles as a threat

The ranking position of crocodiles was examined at the different locations and was found to be affected by residence near crocodile habitats and cultural background (Aboriginal/non Aboriginal) quite significantly (Table 5.2 & Figure 5.3).

| Groups | 1st rank | 2nd to 5th rank | 6th to 12 h | N values |
|--------------------|----------|-----------------|-------------|-----------|
| Hopevale/Napranum | 28.57% | 60.71% | 10.71% | 28 (39)* |
| Weipa residents | 17.46% | 38.10% | 44.44% | 63 (80) |
| Weipa visitors | 0.00% | 18.75% | 81.25% | 16 (18) |
| Daintree residents | 13.33% | 53.33% | 33.33% | 15 (31) |
| Daintree visitors | 8.70% | 82.61% | 8.70% | 23 (63) |
| Townsville | 1.74% | 9.57% | 88.70% | 115 (125) |
| Totals | 9.62% | 31.54% | 58.65% | 260 (356) |

Table 5.2 - Ranking of crocodiles as a personal threat, expressed as % of sample, among community groups.
Note: * Total sample size.

Crocodiles were perceived as an important threat by all residents, particularly by Aboriginal respondents ("1st rank", 28.57%; "2nd-5th rank" 60.71%) followed by Daintree residents ("1st rank", 13.33%; "2nd-5th rank", 53.33%) and Weipa residents ("1st rank", 17.46%; "2nd-5th rank", 38.10%). They were not so for Townsville residents ("6th to 12th rank", 88.7%) despite the fact that they could occur, admittedly in small numbers, in that region, nor for the visitors to Weipa ("6th to 12th rank", 81.25%), which was surprising since they were in the middle of "crocodile country" when interviewed. Only 23 out of 63 of the Daintree visitors ranked crocodiles at all, an indication that the threat was largely ignored; however, those who included crocodiles were more aware of them as a threat ("2nd to 5th rank", 82.61%). This may be due to their presence in an area where crocodiles were known to occur and could readily be seen on tourists cruises and in zoos, compared to the visitors to Cape York Peninsula where crocodiles would have been more difficult to see.

Residence in the vicinity of crocodile habitats certainly was an important factor in the high ranking of crocodiles as a threat, and permanent residents were more likely to give a high rank to crocodiles. However, temporary residence near crocodile habitats could also increase the ranking of crocodiles (Daintree visitors). The low ranking of crocodiles by Townsville residents could be attributed to the predominantly urban lifestyle of its residents and to the fact that crocodiles were not perceived as an issue. The particularly high ranking of crocodiles with Aboriginal respondents compared to other groups may have indicated that more than residence may have been responsible for this concern and could be culturally based (Table 5.3 & 5.4).

5.3 - The concern about safety

The way in which the threat was perceived (*risk perception*) by respondents was expressed by their *concern about safety* at the place where they were interviewed

(Questions 5 & 6, see questionnaire, Appendix 2). It was presented as affecting personal safety and safety in general.

It was found that the concern about safety was variable. A significant number of respondents were not very concerned for both personal (40.79%) and public (32.37%) safety (Table 5.3). Personal safety was an even lower area of concern, perhaps the reflection of the primarily vicarious experience of crocodiles and subsequent underestimation of crocodiles as a potential danger. The discrepancy between both measures of concern was interesting as it discriminated between social concerns and personal concerns.

| Concern about safety | | Hopevale/ Napranum | Weipa residents | Weipa visitors | Daintree residents | Daintree visitors | Townsville residents |
|----------------------|------------|-----------------------|--------------------|-------------------|-----------------------|----------------------|-------------------------|
| General safety | Not at all | 7.69% | 21.25% | <u>44.44%</u> | <u>40.00%</u> | <u>39.68%</u> | <u>40.52%</u> |
| | A little | 10.26% | 15.00% | 22.22% | 20.00% | 25.40% | 29.31% |
| | Moderately | 15.38% | 26.25% | 33.33% | 10.00% | 31.75% | 19.83% |
| | A lot | <u>66.67%</u> | <u>37.50%</u> | 0.00% | 30.00% | 31.70% | 10.34% |
| Personal safety | Not at all | 17.95% | 17.50% | <u>27.78%</u> | <u>58.06%</u> | <u>46.03%</u> | <u>58.20%</u> |
| | A little | 10.26% | 12.50% | <u>27.78%</u> | 16.13% | 22.22% | 18.03% |
| | Moderately | 10.26% | 37.50% | <u>27.78%</u> | 3.23% | 19.05% | 9.84% |
| | A lot | <u>56.41%</u> | <u>33.50%</u> | 16.67% | 22.58% | 12.70% | 13.93% |

Table 5.3 - Concern about safety (personal and general), expressed as % of sample, among all respondents ($p=0.0001$, $n=353$, $p=0.0001$, $n=346$ respectively).

There was a significant difference for both measures of concern between community groups (Personal safety, $p=0.0001$, $n=346$; public safety, $p=0.0001$, $n=353$).

5.3.1 - Non Aboriginal respondents

For non Aboriginal respondents, a low level of concern for both measures was found in all groups except among Weipa residents and some Daintree residents. There was a "moderate" to "high" concern about public safety (63.75%) and personal safety (70%) among Weipa residents which reflected a genuine concern about the risk of crocodile attack in the area. Most of the residents in Daintree were "not at all" concerned about their own safety (58.06%), but a significant number of respondents were concerned about public safety (40% "moderately" to "a lot"), which probably related to the safety of the visitors to the area (Field notes 1390).

Visitors to Daintree were far more concerned about public safety (63.45% "moderately" to a "lot") than about their own safety (46.03% "not at all"), perhaps because of their ignorance about the risk incurred and their little experience of

crocodiles. In contrast, 44.44% of the visitors to Weipa were "not at all" concerned about public safety and "little" concerned about personal safety (the percentages were evenly distributed towards more concern) which was quite interesting despite the small sample size ($n=18$). It may have reflected the fact that although those visitors had been travelling in Cape York Peninsula, an area with the reputation of hosting a large number of crocodiles, they did not feel at risk. The low level of concern for public safety may also have reflected an individualistic attitude to risk.

5.3.2 - Aboriginal respondents

The most significant difference was cross cultural, as Aboriginal respondents departed significantly from the above trends (Table 5.3). While the wider community did not worry very much about safety overall, Aboriginal respondents did so to a much greater extent both for public safety (66.67%, "a lot") and personal safety (56.41%, "a lot"). This difference may be an indication of the differences in risk assessment and/or social concerns and accountability combined with greater exposure and use of wetlands. Anecdotal evidence also suggested that many Aboriginal respondents were quite concerned about the safety of visitors in their region (specifically in Napranum) and their lack of understanding and knowledge of crocodiles and crocodile habitats (Field notes).

5.4 - The effect of residence status, location and cultural background on expressed concern

The two measures of concern for safety, general and personal, were significantly correlated (Spearman $Rho=0.561$, $p=0.0001$). They were combined and recoded using percentiles values (25th, 50th, 75th). The concern about safety (redefined as *expressed concern*) was investigated in relation to residence status, location and cultural background as well as demographic variables.

The highest level of expressed concern about safety was found with Aboriginal respondents (71.79%, "a lot"), followed by residents in Weipa (57.5%, "a lot"). The level of expressed concern of Daintree residents was bimodal, either non-existent (35.48%, "not at all") or high (29.03%, "a lot"). Residents in Townsville also displayed a bimodal response with no concern (35.89%, "not at all") or moderate concern (31.91%, "moderately"). Visitors to Weipa (44.44%, "moderately") and Daintree (36.51%, "moderately") were moderately concerned (Table 5.4).

| Community groups | Expressed concern | | | | N values |
|----------------------|-------------------|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/Napranum | 5.13% | 2.56% | 20.51% | <u>71.79%</u> | 39 |
| Weipa residents | 11.25% | 3.75% | 27.50% | <u>57.50%</u> | 80 |
| Weipa visitors | 22.22% | 11.11% | <u>44.44%</u> | 22.22% | 18 |
| Daintree residents | <u>35.48%</u> | 19.35% | 16.13% | <u>29.03%</u> | 31 |
| Daintree visitors | 25.4% | 17.46% | <u>36.51%</u> | 20.63% | 63 |
| Townsville residents | <u>36.89%</u> | 13.93% | <u>31.97%</u> | 17.21% | 122 |
| Totals | 24.65% | 11.33% | 29.75% | <u>34.28%</u> | 353 |

Table 5.4 - Location, residence status and cultural background and expressed concern about safety, expressed as % of sample ($p=0.0001$, $n=353$)

5.5 - Effect of demographic variables on expressed concern

The effect of demographic variables on the level of expressed concern was not significant for age ($p=0.06059$, $n=353$), having children under 15 years old ($p=0.566$, $n=352$), occupation ($p=0.3197$, $n=320$) and employment ($p=0.6085$, $n=303$, for respondents in the labour force and $p=0.253$, $n=64$ for respondents not in the labour force) but was significant for education ($p=0.0264$, $n=346$), background ($p=0.0004$, $n=352$), length of residence near crocodile habitats ($p=0.0107$, $n=156$) and gender ($p=0.0163$, $n=353$).

5.5.1 - Background

Respondents from rural background (33.24% of all respondents) were very concerned about safety (50.85%, "a lot"). Those respondents included 82.05% of Aboriginal respondents, 61.29% of Daintree residents and 48.75% of Weipa residents (see demographic profile, Appendix 5); However, a number of respondents of non rural background also expressed moderate to high concern (Table 5.5). It may indicate that background *per se* may not be the relevant factor, but rather the locations where highest concern was expressed, that is near crocodile habitats (see Table 5.4).

| Background | Expressed concern | | | | N values |
|-------------|-------------------|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Rural | 19.49% | 6.78% | 22.88% | <u>50.85%</u> | 118 |
| Urban | 28.38% | 14.19% | <u>35.81%</u> | 21.62% | 148 |
| Rural/urban | 24.62% | 15.38% | 23.08% | <u>36.92%</u> | 65 |
| Other | 28.57% | 4.76% | 42.86% | 23.81% | 21 |
| Totals | 24.72% | 11.36% | 29.55% | <u>34.38%</u> | 352 |

Table 5.5 - Background and expressed concern ($p=0.0004$, $n=352$).

5.5.2 - Length of residence near crocodile habitats

Long term residence and short stays near crocodile habitats were associated with the highest expressed concern (Table 5.6).

| Residence | Not at all | Expressed concern | | | N values |
|---------------|------------|-------------------|------------|-------------------|----------|
| | | A little | Moderately | A lot | |
| up to 1 year | 14.29% | 14.29% | 14.29% | 57.14% | 14 |
| 1 to 5 years | 28.57% | 7.14% | 30.95% | 33.33% | 42 |
| 6 to 10 years | 28.57% | 0.00% | 21.43% | 50.00% | 14 |
| over 10 years | 5.81% | 5.81% | 22.09% | 66.28% | 86 |
| Totals | 14.74% | 6.41% | 23.72% | 55.13% | 156 |

Table 5.6 - Length of residence near crocodile habitats and expressed concern, excluding Townsville residents ($p=0.0107$, $n=156$).

These results however were not associated with greater factual knowledge, as knowledge scores were not significantly affected by length of residence near crocodile habitats, nor higher education but background (see Chapter 4). Rural background as in current residence rather than length of residence were most important in affecting expressed concern.

Although there was no significant relationship between expressed concern and occupation ($p=0.3197$, $n=320$), it should be noted that the highest concern ("a lot") was expressed by primary producers (41.18%), labourers (40.58%) and home keepers (39.02%), and the lowest by professionals (24%). This can be seen as an expression of both differences in background (rural/urban), residence near crocodile habitats and possibly gender as home keepers were usually women.

5.5.3 - Education

The effect of education showed that expressed concern was highest among respondents with primary education (60%, "a lot") (Table 5.7). However, those respondents were mostly found among Aboriginal communities and Weipa residents (see demographic profile, Appendix 5), so that education *per se* may not have been the significant variable but cultural background and location as shown in the distribution of expressed concern and community groups (Table 5.3).

| Education | Expressed concern | | | | N values |
|------------|-------------------|----------|------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Primary | 20.00% | 3.33% | 16.67% | <u>60.00%</u> | 30 |
| Secondary | 28.73% | 11.05% | 27.62% | 32.6% | 181 |
| Tertiary | 24.00% | 17.33% | 34.67% | 24.00% | 75 |
| Tafe/techn | 16.67% | 10.00% | 31.70% | 41.67% | 60 |
| Totals | 24.86% | 11.56% | 28.9% | 34.68% | 346 |

Table 5.7 - Education and expressed concern ($p=0.0264$, $n=346$).

5.5.4 - Gender and cultural background

The Effect of gender was investigated to outline possible culturally based gender difference, as it was the case for knowledge (see Chapter 4). Expressed concern was significantly higher, although overall not very high (36.69% "moderately" concerned, 30.77% "very" concerned) for non Aboriginal male respondents compared to female respondents ($p=0.0098$, $n=314$). It was likely to reflect the greater exposure to crocodiles of non Aboriginal male respondents as well as gender based difference in interest in crocodiles, already found in the knowledge of crocodiles. There was no significant relationship between gender and expressed concern for Aboriginal respondents ($p=0.3296$, $n=39$) and expressed concern was overall much higher (71.79% "very" concerned). It again pointed to cultural background (gender based) as a major determinant of concern about safety (Table 5.8).

| Gender | Expressed concern | | | | N values |
|-----------|-------------------|---------------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Female | | | | | |
| Non Abor. | <u>29.66%</u> | <u>17.93%</u> | 24.14% | <u>28.28%</u> | 145 |
| Abor. | 0.00% | 0.00% | 16.67% | <u>83.33%</u> | 18 |
| Male | | | | | |
| non Abor. | <u>24.85%</u> | 7.69% | <u>36.69%</u> | <u>30.77%</u> | 169 |
| Abor. | 9.52% | 4.76% | 23.81% | <u>61.9%</u> | 21 |
| Totals | | | | | |
| Non Abor | 27.07% | 12.42% | <u>30.89%</u> | <u>29.62%</u> | 314 |
| Abor. | 5.13% | 2.56% | 20.51% | <u>71.79%</u> | 39 |

Table 5.8 - Gender and expressed concern ($p=0.0098$ $n=314$) for non Aboriginal respondents, ($p=0.3296$, $n=39$) for Aboriginal respondents.

5.6 - Expressed concern and knowledge

There was no significant relationship between knowledge and expressed concern about safety (Spearman $Rho=0.137$, $p=0.102$, $n=352$; $Rho=0.194$, $p=0.232$, $n=36$ for Aboriginal respondents). However, respondents with most concern (Weipa residents) had also a high knowledge score by the reverse statement was not true:

not all respondents with high knowledge score had high concern (Daintree residents), which explained the weak correlation. Moreover, Aboriginal knowledge score was probably underestimated (see knowledge scores, Chapter 4). Greater knowledge was found among residents near crocodile habitats, which pointed to personal experience as a key factor in expressed concern (see Sections 5.9 & 5.10).

5.7 - Crocodiles as potential hazard

Respondents were asked to evaluate the hazard crocodiles represented (Question 2, see questionnaire, Appendix 2). The relationship between hazard perception and expressed concern indicated that as the awareness of crocodiles as dangerous animals increased, expressed concern increased, although only 39.5 % of the increase could be accounted by increase awareness of the danger (Spearman Rho=0.395, $p=0.0001$, $n=347$). In fact, crocodiles were not considered dangerous evenly by all respondents. They were considered very dangerous by residents of Hopevale and Napranum (76.92% "a lot"), which was congruent with their high expressed concern, compared to other groups for whom danger was not perceived so strongly. Weipa residents saw crocodiles as moderately (43.59%, "moderately") to very dangerous (47.44%, "a lot"); Daintree residents also saw crocodiles as very dangerous (54.85%, "a lot"). Again, it may be that the difference in expressed concern between Aboriginal residents and non Aboriginal residents was cultural. Daintree visitors were moderately aware of the danger of crocodiles and this was in agreement with their weaker concern. Weipa visitors in contrast thought crocodiles were very dangerous but not a concern for safety (see Table 5.9).

| Community groups | Perceived potential hazard | | | | N values |
|-------------------------|----------------------------|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | 2.56% | 7.69% | 12.82% | <u>76.92%</u> | 39 |
| Weipa residents | 5.13% | 3.85% | <u>43.59%</u> | <u>47.44%</u> | 78 |
| Weipa visitors | 5.56% | 5.56% | 33.33% | <u>55.56%</u> | 18 |
| Daintree residents | 3.23% | 25.81% | 16.13% | <u>54.84%</u> | 31 |
| Daintree visitors | 6.35% | 20.63% | <u>39.68%</u> | 33.33% | 63 |
| Townsville residents | 6.67% | 19.17% | <u>40.00%</u> | 34.17% | 120 |
| Totals | 5.44% | 14.61% | 35.24% | <u>44.6%</u> | 349 |

Table 5.9 - Perception of crocodiles as dangerous animals, expressed as % of sample, among community groups ($p=0.0002$, $n=356$).

5.8 - The nature of crocodile as a hazard

Respondents were asked to evaluate aspects of the risk of crocodile attacks likely to affect their concern. These were unpredictability, the lack of personal control, fatal outcome of crocodile attacks and the knowledge of past victims (Question 21, see questionnaire, Appendix 2). A majority of respondents saw fatal outcome (56.01%, "a lot"), unpredictability of attacks (51% , "a lot") and inability to prevent attacks (38.58%, "a lot") as major aspects of their concern. The knowledge of past victims was not important (38.32%, "not at all"). There were no significant difference between community groups regarding fatal outcome ($p=0.297$, $n=341$), as one would expect. There were, however, significant differences between community groups for unpredictability ($p=0.0142$, $n=337$), inability to prevent attacks and knowledge of past victims ($p=0.0001$, $n=334$), which gave an indication of perceived vulnerability of those respondents regarding attacks (Table 5.10).

| | Factors affecting personal concern | | | | p values | N values |
|------------------------------|------------------------------------|----------|------------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | | |
| Unpredictability of attacks | 12.03% | 12.89% | 24.07% | <u>51.00%</u> | <u>0.0002</u> | 349 |
| Inability to prevent attacks | 16.62% | 17.80% | 27.00% | <u>38.58%</u> | 0.0141 | 337 |
| Knowledge of past victims | <u>38.32%</u> | 13.47% | 22.46% | 25.75% | <u>0.0001</u> | 334 |
| Fatal outcome | 9.38% | 11.44% | 23.17% | <u>56.01%</u> | 0.2979 | 341 |

Table 5.10 - Factors affecting respondents' personal concern
($p < 0.005$ indicates significant differences between community groups).

5.8.1- The unpredictability of crocodile attacks

Unpredictability of crocodile attack, an important aspect of crocodile as a potential hazard (see Tables 5.10) was significantly different between community groups (Table 5.11).

| Community groups | Effect of unpredictability on level of concern | | | | N values |
|----------------------|--|----------|---------------|---------------|----------|
| | Not at all | A little | moderately | A lot | |
| Hopevale/Napranum | 17.95% | 2.56% | 12.82% | <u>66.67%</u> | 39 |
| Weipa residents | 6.33% | 8.86% | <u>43.04%</u> | <u>41.77%</u> | 79 |
| Weipa visitors | 29.41% | 0.00% | 29.41% | <u>41.18%</u> | 17 |
| Daintree residents | 10.00% | 23.33% | 16.67% | <u>50.00%</u> | 30 |
| Daintree visitors | 8.06% | 11.29% | 19.35% | <u>61.29%</u> | 62 |
| Townsville residents | 13.03% | 12.89% | 18.85% | <u>48.36%</u> | 122 |
| Totals | 12.03% | 12.89% | 24.07% | <u>51.00%</u> | 349 |

Table 5.11 - The effect of the unpredictability of crocodile attacks on concern about crocodile attacks expressed as % of sample among community groups ($p=0.0002$, $n=349$).

Visitors and residents alike saw the unpredictability of attacks as a major reason for concern, however residents near crocodile habitats, particularly Aboriginal respondents (66.67%, "a lot") and Daintree visitors (61.29%, "a lot") were more concerned, indicating the importance of vulnerability (referred as voluntariness of exposure in the risk literature, e.g. Fischhoff 1985; Sandman 1987). Vulnerability here was expressed in their perceived exposure to crocodile hazard and reflected that living near or visiting crocodile habitats obviously created the circumstances for interaction and risk. Aboriginal respondents expressed the highest concern about safety (see Table 5.3). At the same time, they saw the unpredictability of crocodile attacks as a major aspect of their concern (66.67%, "a lot"). This was not consistent with the belief in no accidental death (Douglas 1986). It may be that the question was not clear enough or that the attribution of responsibility to a death by crocodiles (crocodiles have been known to be used as agents of death, Taylor *pers. comm.*) did not preclude the fact that crocodiles' behaviour may be unpredictable for the non initiated.

5.9 - Risk assessment

No real attempt to define an objective risk was presented in this thesis, as it was assumed that risk was by definition a perceived phenomenon and not a objective measure of probability. However a graphic representation of human demography, crocodiles populations, reported sightings and location and dates of past attacks (interactions) as well as documented studies on attacks are presented in Appendix 4. An overview of the relevant factors of those known attacks was also provided: time of the year, day, circumstances at the water edge in the water, on the bank (see Section 5.13.3 and code book Appendix 2).

The way in which respondents assessed the risk of crocodiles attacks was investigated using a number of questions which included their perception of the number of crocodile attacks per year, their perception of change in the risk in recent years and what they thought it could be attributed to (increase in crocodile population size and behaviour, increase in human population and people's behaviour and experience, and increased media attention).

5.9.1 - Perceived number of attacks per year

Most respondents (51.03%, "don't know") could not provide an answer. However, Weipa residents (25.32% "don't know") seemed to be significantly more informed

or more aware of past crocodile attacks than other respondents ($p=0.0002$, $n=339$) (see Section 5.13.3), as 31.35% of Weipa residents would estimate the number of attacks per year as "less than 1 per year" which was reasonably accurate (Table 5.12).

| | Perceived number of attacks per year | | | | N values |
|-------------------------|--------------------------------------|--------------|-------------|------------|----------|
| | <= 1 per year | 1-5 per year | >5 per year | Don't know | |
| Hopevale/ Napranum | 18.92% | 18.92% | 2.7% | 59.46% | 37 |
| Weipa residents | 31.65% | 26.58% | 16.46% | 25.32% | 79 |
| Weipa visitors | 5.88% | 35.29% | 17.65% | 41.18% | 17 |
| Daintree residents | 20.69% | 17.24% | 3.45% | 58.62% | 29 |
| Daintree visitors | 14.52% | 19.35% | 4.84% | 61.29% | 62 |
| Townsville residents | 19.14% | 17.39% | 3.48% | 60.00% | 115 |
| Totals | 20.65% | 20.94% | 7.34% | 51.03% | 339 |

Table 5.12 - Perceived frequency of attacks among community groups ($p=0.0002$, $n=339$).

5.9.2 - Perceived change in risk in recent years

Most of the respondents who were unable to comment about any change in risk (17%, "don't know") were Daintree visitors (25%) and residents of Townsville (17%). There was however an even spread of answers from a little to a great change among other respondents. Aboriginal respondents (31.58%, "not at all") mostly thought that things had not changed (Table 5.13).

| | Perceived change in risk | | | | | N values |
|-------------------------|--------------------------|----------|------------|--------|------------|----------|
| | Not at all | A little | Moderately | A lot | Don't know | |
| Hopevale/ Napranum | 31.58% | 10.53% | 28.95% | 15.79% | 13.16% | 38 |
| Weipa residents | 15.00% | 15.00% | 35.00% | 22.50% | 12.50% | 80 |
| Weipa visitors | 5.56% | 22.22% | 38.89% | 27.78% | 5.56% | 18 |
| Daintree residents | 20.00% | 26.67% | 6.67% | 40.00% | 6.67% | 30 |
| Daintree visitors | 16.67% | 13.33% | 28.33% | 16.67% | 25.00% | 60 |
| Townsville residents | 9.09% | 28.10% | 27.09% | 20.75% | 17.00% | 121 |
| Totals | 14.99% | 20.17% | 27.09% | 20.75% | 17.00% | 347 |

Table 5.13 - Perceived change in risk, expressed as % of sample, among community groups ($p=0.0016$, $n=347$).

5.9.3 - Perceived reasons for the change in risk

The change in risk was mostly perceived as an increase (40.16%) rather than a decrease (13.48%) (n=203). It was not possible to assess differences between community groups because the wording of the question in its final format was not presented to respondents in Weipa and Napranum who represented 14.04% of all respondents.

Reasons presented to respondents as possible explanations for change fell into three categories, the first reason for change was attributed to increased crocodile population size, and/or behaviour, the second to increased human population size and/or behaviour, and the third to increased awareness of crocodiles as a safety issue (Questions 34b to 41, see questionnaire, Appendix 2). Proposed reasons for change in risk were the increase in human population near crocodile habitats (63.69% "strongly agree"), complacency about safety behaviour (41.92% "strongly agree"), the ignorance of safety (38.23% "strongly agree"), the increase in crocodile populations (33.89% "strongly agree") and indirectly increase in media attention which reflected greater awareness of the presence of crocodiles (43.81% "moderately agree").

Significant differences between community groups were found for all reasons except for the decrease of wariness of crocodiles, which there was no real consensus for, and the increase in media attention, which most respondents agreed on (Table 5.14).

| | Disagree | Moderately disagree | undecided | Moderately agree | agree | p values | N values |
|---|---------------|---------------------|-----------|------------------|---------------|---------------|----------|
| Increase in crocodile population (Q34B) | 8.39% | 9.06% | 10.40% | <u>38.26%</u> | <u>33.89%</u> | <u>0.0001</u> | 298 |
| decrease wariness of crocodiles | 21.07% | <u>23.09%</u> | 9.43% | <u>27.99%</u> | 17.61% | 0.067 | 318 |
| Not enough trapping of crocodiles | <u>28.84%</u> | <u>22.57%</u> | 12.54% | 16.3% | 19.75% | <u>0.0001</u> | 319 |
| More people in the area | 1.79% | 1.79% | 2.68% | 30.06% | <u>63.69%</u> | <u>0.0001</u> | 336 |
| People are not taking safety seriously | 4.19% | 10.48% | 3.29% | <u>40.12%</u> | <u>41.92%</u> | <u>0.0001</u> | 334 |
| Lack of knowledge | 4.59% | 9.48% | 1.83% | <u>45.87%</u> | <u>38.23%</u> | <u>0.0001</u> | 327 |
| Increased media attention | 2.54% | 10.48% | 7.94% | <u>43.81%</u> | <u>35.24%</u> | 0.5009 | 315 |

Table 5.14 - Reasons given by respondents for changes in risk.
($p < 0.005$ indicates significant differences between community groups).

The trapping of crocodiles

The trapping of crocodiles was significantly different between community groups ($p=0.0001$, $n=319$). It was strongly opposed by Daintree residents (55.17%, "strongly disagree") and visitors (42.59%, "strongly disagree"), perhaps reflecting the fact that crocodiles were an important tourist attraction. It was not opposed by Hopevale/ Napranum residents (38.46%, "strongly agree") (Table 5.15).

| There is not enough trapping of large crocodiles | | | | | | N values |
|--|-------------------|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | 15.38% | 12.82% | 15.38% | 17.95% | <u>38.46%</u> | 39 |
| Weipa residents | 21.62% | 20.27% | 1.35% | <u>29.73%</u> | <u>27.03%</u> | 74 |
| Weipa visitors | 25.00% | 37.50% | 6.25% | 18.75% | 12.50% | 16 |
| Daintree residents | <u>55.17%</u> | 13.79% | 3.45% | 6.90% | 20.69% | 29 |
| Daintree visitors | <u>42.59%</u> | 27.78% | 9.26% | 14.81% | 5.56% | 54 |
| Townsville residents | 25.23% | 25.23% | 24.30% | 9.35% | 15.89% | 107 |
| Totals | 28.84% | 22.57% | 12.54% | 16.3% | 19.75% | 319 |

Table 5.15 - Perception of trapping of large crocodiles among community groups ($p=0.0001$, $n=319$)

Complacency about the risk

Complacency about crocodiles was a major reason invoked (82.04%, "moderately" to "strongly agree") particularly among Weipa residents (58.23% "strongly agree") and visitors (58.82% "strongly agree") but not among Hopevale and Napranum residents (21.05% "strongly disagree"; 42.11% "moderately agree") (Table 5.16).

| People are not taking safety seriously | | | | | | N values |
|--|-------------------|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | 21.05% | 7.89% | 0% | <u>42.11%</u> | 28.95% | 38 |
| Weipa residents | 3.8% | 1.27% | 1.27% | 35.44% | <u>58.44%</u> | 79 |
| Weipa visitors | 0% | 5.88% | 0% | 35.29% | <u>58.82%</u> | 17 |
| Daintree residents | 3.7% | 25.93% | 3.7% | <u>37.04%</u> | 29.63% | 27 |
| Daintree visitors | 3.51% | 22.81% | 10.53% | <u>43.86%</u> | 19.3% | 57 |
| Townsville residents | 0% | 10.48% | 2.59% | <u>42.24%</u> | <u>46.55%</u> | 116 |
| Totals | 4.19% | 10.48% | 3.29% | 40.12% | 41.92% | 334 |

Table 5.16 - Perception of complacency among community groups ($p=0.0001$, $n=334$)

Increase in human populations

The increase of human population in the vicinity of crocodiles habitats was mostly invoked by the Daintree residents (90%, "strongly agree"), Weipa residents (81.82%, "strongly agree") and visitors (88.89%, "strongly agree"), reflecting the population growth as the result of economic development (tourism and mining) in those regions. Increase in human populations however was not perceived as strongly by Hopevale/Napranum residents (57.89% "strongly agree"), nor by Townsville residents (46.49% "strongly agree"). It would indicate that population growth in fact may be concentrated to certain locations and would affect respondents' perception of the change in risk at those locations (Table 5.17).

| There are more people coming into areas where crocodiles live | | | | | | N values |
|---|-------------------|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/Napranum | 5.26% | 5.26% | 5.26% | 26.32% | <u>57.89%</u> | 38 |
| Weipa residents | 0.00% | 1.30% | 0.00% | 16.88% | <u>81.82%</u> | 77 |
| Weipa visitors | 0.00% | 1.30% | 0.00% | 11.11% | <u>88.89%</u> | 18 |
| Daintree residents | 0.00% | 0.00% | 0.00% | 0.00% | <u>90.00%</u> | 30 |
| Daintree visitors | 0.00% | 1.69% | 1.69% | 40.68% | <u>55.93%</u> | 59 |
| Townsville residents | 3.51% | 1.75% | 5.26% | 42.98% | <u>46.49%</u> | 114 |
| Totals | 1.79% | 1.79% | 2.68% | 30.06% | 63.69% | 336 |

Table 5.17 - Perceived increase of human population near crocodile habitats, expressed as % of sample, among community groups ($p=0.0001$, $n=336$).

Increase in crocodile populations

The increase in crocodile population was an important reason for change in risk and was mostly invoked by residents in Hopevale/Napranum (52.78%, "strongly agree"), Weipa (54.17%, "strongly agree") and Daintree (42.86%, "strongly agree"); visitors would not know or would moderately agree (Weipa visitors, 80%, Daintree visitors, 32.65%, "moderately agree") (Table 5.18).

| Increase in crocodile populations | | | | | | N values |
|-----------------------------------|-------------------|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/Napranum | 16.67% | 11.11% | 2.78% | 16.67% | <u>52.78%</u> | 36 |
| Weipa residents | 1.39% | 5.56% | 2.78% | 36.11% | <u>54.17%</u> | 72 |
| Weipa visitors | 0.00% | 0.00% | 0.00% | <u>80.00%</u> | 20.00% | 15 |
| Daintree residents | 7.14% | 10.70% | 3.57% | 35.71% | <u>42.86%</u> | 28 |
| Daintree visitors | 22.45% | 16.33% | 12.24% | <u>32.65%</u> | 16.33% | 49 |
| Townsville residents | 5.10% | 8.16% | 21.43% | <u>44.90%</u> | 20.41% | 98 |
| Totals | 8.39% | 9.06% | 10.4% | 38.26% | 33.89% | 298 |

Table 5.18 - Perceived increase in crocodile populations, expressed as % of sample, among community groups ($p=0.0001$, $n=298$).

Perceived crocodile population size

When asked to estimate the crocodile population size though (Question 22, see questionnaire, Appendix 2), most respondents would not know (59.543%, "don't know"), particularly Daintree visitors (79.37%) and Weipa visitors (61.11%); Aboriginal respondents did not give an estimate either which reflected more their difficulty with the concept of quantification (also found in their different perception of time). Weipa residents gave estimates of a "100-500" (30.38%) and of ">1000" (22.78%). Daintree residents (38.71%) Townsville residents (24.79%) estimated crocodile populations at "<100" (Table 5.19).

| | Perceived present crocodile population size at the place of interview | | | | | N values |
|----------------------|---|---------------|----------|--------|---------------|----------|
| | <100 | 100-500 | 500-1000 | >1000 | Don't know | |
| Hopevale/Napranum | 7.89% | 18.42% | 0.00% | 18.42% | <u>55.26%</u> | 38 |
| Weipa residents | 2.53% | <u>30.38%</u> | 7.59% | 22.78% | 36.71% | 79 |
| Weipa visitors | 0.00% | 22.22% | 0.00% | 16.67% | <u>61.11%</u> | 18 |
| Daintree residents | <u>38.71%</u> | 12.90% | 3.23% | 3.23% | <u>41.94%</u> | 31 |
| Daintree visitors | 11.11% | 7.94% | 1.59% | 0.00% | <u>79.37%</u> | 63 |
| Townsville residents | <u>24.79%</u> | 3.31% | 1.65% | 0.83% | <u>69.42%</u> | 121 |
| Totals | 15.43% | 13.71% | 2.86% | 8.57% | 59.43% | 350 |

Table 5.19 - *Perceived crocodile population size at the place of interview, expressed as % of sample, among community groups (p=0.0001, n=350).*

When those figures were compared with existing population estimates (Q.NPWS 1989, see Table 1 Appendix 4), it was found that some Weipa residents had a reasonable grasp on population size while others were totally unrealistic. It may reflect the amount of interaction those respondents may have had with crocodiles. Some respondents in Weipa as in Daintree actually gave indices of density per km of river for known individual crocodiles (Field notes 1990). The 22.78% of Weipa residents who thought that there would be over a thousand crocodiles in the area may have in fact expressed an overwhelming concern rather than crocodile populations estimates *per se*. It should be noted that 24.79% of Townsville respondents gave a population estimate (there was no available statistics to match their estimate), which showed there were some respondents aware of their presence in that region despite the fact that crocodiles were not perceived as a public safety issue.

While most respondents did not actually know what the population of crocodiles was (59.43%), they still agreed to some increase in population size (38.26% "moderately", 33.89% "strongly") particularly residents near crocodile habitats, obviously the reflection of the salience of crocodiles at those locations (Table 5.17). The perceived increase in crocodile population by Daintree residents (42.86% "strongly agree", 35.65% "moderately agree") was not always matched by an

estimation of population numbers (41.94% "don't know") while 38.71% thought correctly that it was less than a hundred. The perceived increase in crocodile populations in Weipa (54.17%) was associated with a reasonably accurate estimate of population size (30.38%, "100-500").

It should be noted though that absolute numbers are not the best way to estimate population size and density should have been used for that question as it reflects the importance of habitat availability. However, it seemed easier at the time to ask respondents for a rough estimate to gauge their overall perception of the danger.

Public ignorance of crocodiles

The lack of knowledge about crocodiles was "moderately" (45.87%) to "strongly" (38.23%) invoked as responsible for change in risk (Table 5.20). However 25.64% of Hopevale/Napranum residents and 21.31% of Daintree residents "moderately disagreed" as they did for complacency (Table 5.16, in that reflecting the amount of knowledge and personal experience those respondents had about safety (see knowledge scores Chapter 4). It was in contrast with Weipa residents who also had high knowledge scores but somehow did agree that ignorance and complacency were responsible for perceived increase in risk.

| | People are ignorant about crocodiles | | | | | N values |
|-------------------------|--------------------------------------|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | 5.13% | <u>25.64%</u> | 0% | 30.77% | <u>38.46%</u> | 39 |
| Weipa residents | 1.27% | 2.53% | 1.27% | 41.77% | <u>53.16%</u> | 79 |
| Weipa visitors | 0% | 0% | 0% | <u>55.77%</u> | 53.16% | 18 |
| Daintree residents | 3.45% | 6.9% | 0% | <u>58.62%</u> | 31.03% | 29 |
| Daintree visitors | 11.48% | <u>21.31%</u> | 1.64% | <u>44.26%</u> | 21.31% | 61 |
| Townsville residents | 3.946% | 3.96% | 3.96% | <u>50.5%</u> | 37.62% | 101 |
| Total | 4.56% | 9.48% | 1.83% | <u>45.87%</u> | <u>38.23%</u> | 327 |

Table 5.20 - Perceived lack of knowledge as a reason for change in risk among community groups ($p=0.0001$, $n=327$).

5.9 - Perceived exposure to crocodiles

The relationship between expressed concern and perceived exposure was found the strongest and most significant (Spearman $Rho=0.49$, $p=0.0001$, $n=344$) and indicated that as perceived exposure increased so did expressed concern.

As expressed concern was overall low or moderate (Table 5.3), it was expected that a majority of respondents would not feel at risk particularly; A Chi-square test conducted on the different community groups showed that the majority of respondents did not feel at risk at all or very little (Table 5.21). However, a small fraction of respondents from Hopevale and Napranum and Daintree residents felt very exposed and rightly so, as their use of the wetlands showed (Section 5.10).

| Communities | Perceived exposure | | | | N values |
|----------------------|--------------------|---------------|---------------|--------------------|----------|
| | Nil/ very low | Low | Moderate | High/ Very high | |
| Hopevale/Napranum | 2.63% | <u>73.68%</u> | 7.89% | <u>15.79%</u> | 38/39 |
| Weipa residents | 5.06% | <u>77.22%</u> | <u>12.66%</u> | 5.06% | 79/80 |
| Weipa visitors | 5.88% | <u>76.47%</u> | 17.65% | 0.00% | 17/18 |
| Daintree residents | <u>20.00%</u> | <u>56.67%</u> | 6.67% | <u>16.67%</u> | 30/31 |
| Daintree visitors | 14.52% | <u>70.97%</u> | 9.68% | 4.84% | 62/63 |
| Townsville residents | <u>27.12%</u> | <u>57.63%</u> | 11.02% | 4.24% | 118/125 |
| Totals | 15.41% | 67.15% | 10.76% | 6.69% | 344 |

Table 5.21 - *Perceived exposure to crocodile hazard among community groups ($p=0.0006$, $n=344$).*

The lack of perceived exposure among Weipa residents (77.22%, "low"), despite the location near the largest crocodile population in the state, may be attributed to either low interaction with crocodiles or underestimation of their exposure or a combination of both. Weipa is a mining town designed to provide a familiar and secure environment to its residents in an outback location. As a result one would expect that the township people (Comalco employees) would feel reasonably remote from crocodiles unless they engaged in river based recreational activities (see Figures 5.4 & 5.5). A few residents expressed moderate exposure (12.66%, "moderate") and more likely represented the residents living on the outskirts of town and the mining community, the fishermen and residents living off the extensive river system ("wharf community").

Daintree residents did not feel exposed (20% "nil", 56.67% "low") except for a small group of respondents (16.67%, "high/Very high") in that presenting a similar pattern as Hopevale/ Napranum (73.68%, "low", 15.79%, "high/very high"). In the case of Daintree, the high exposure group probably included the graziers who, during the wet season when the River floods, have to round their

cattle to higher grounds (Field notes 1990). In the case of Aboriginal respondents, the low perceived exposure could be attributed to an essentially settled community life and limited opportunities for bush activities. For many, particularly for younger respondents, it would result in loss of knowledge and confidence, and could be seen as a contributing factor to expressed concern. The fact that only a small fraction of Aboriginal respondents felt exposed was interesting considering the amount of concern they exhibited compared to other residents (Table 5.3). The knowledge of the risk was there, hence the high expressed concern, but interaction may have become low particularly with the younger generation. Cultural (or social) factors may play a greater part in the expression of concern than the actual hazard itself (Douglas 1966). Visitors to the Daintree area and Weipa did not feel specifically exposed, despite their temporary residence in the area, which indicated that they would not be often in exposed situations or that they may have underestimated their exposure out of ignorance (see Chapter 4) or contempt.

5.10 - Interactions with crocodiles

An investigation of actual exposure was provided by a number of questions regarding the frequency of and length of visits to crocodile habitats and the pattern of use of wetlands by respondents (Questions 24, 25, 25b, 26, 27, see questionnaire Appendix 2) .

5.10.1 - Frequency and length of visits

Most respondents found themselves in crocodile habitats only "rarely" (25.95%) to "sometimes" (33.24%) either because they were not permanent residents of the areas where crocodiles are found (visitors and Townsville residents) or their activities limited their interaction (Weipa residents). In contrast, most Aboriginal respondents and Daintree residents did find themselves in crocodile habitats frequently (33.33% , 46.67% "all the time" respectively) (Table 5.22).

| | Frequency of visits | | | | | N values |
|----------------------|---------------------|---------------|---------------|------------|---------------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | |
| Hopevale/Napranm | 7.69% | 10.26% | <u>38.46%</u> | 10.26% | <u>33.33%</u> | 39 |
| Weipa residents | 2.50% | 16.25% | <u>52.50%</u> | 11.25% | 17.50% | 80 |
| Weipa visitors | 11.11% | 44.44% | <u>38.89%</u> | 5.56% | 0.00% | 18 |
| Daintree residents | 3.33% | 10.00% | <u>23.33%</u> | 16.67% | <u>46.67%</u> | 30 |
| Daintree visitors | 18.03% | <u>54.10%</u> | 13.11% | 4.92% | 9.84% | 61 |
| Townsville residents | <u>33.04%</u> | 24.35% | <u>30.43%</u> | 6.09% | 6.09% | 115 |
| Totals | 16.62% | 25.95% | <u>33.24%</u> | 8.45% | 15.74% | 343 |

Table 5.22 - Frequency of visits to crocodiles habitats, expressed as % of sample, among community groups ($p=0.0001$, $n=343$).

A high number of Aboriginal respondents (61.11%, ">28 days") and Daintree residents (68.97%, ">28 days") spent more than a month per year in crocodile habitats. Weipa residents despite their proximity to extensive crocodile habitats only occasionally spent time in crocodile habitats but for longer period (over a month) which indicated a pattern of holidays but also accounted for the small number of barramundi fishermen living in the area (Table 5.23).

| | Time spent in crocodiles habitats per year | | | | N values |
|----------------------|--|---------------|-----------|---------------|----------|
| | 1 day | 2-7 days | 8-28 days | >28 days | |
| Hopevale/Napranum | 8.33% | 19.44% | 11.11% | <u>61.11%</u> | 36 |
| Weipa residents | 10.67% | <u>25.33%</u> | 16.00% | <u>48.00%</u> | 75 |
| Weipa visitors | 6.67% | <u>40.00%</u> | 26.67% | 26.67% | 15 |
| Daintree residents | 13.79% | 3.45% | 13.79% | <u>68.97%</u> | 29 |
| Daintree visitors | <u>38.78%</u> | <u>34.69%</u> | 12.24% | 14.29% | 49 |
| Townsville residents | <u>30.56%</u> | <u>37.50%</u> | 15.28% | 16.67% | 72 |
| Totals | 20.65% | 27.9% | 14.86% | 36.59% | 276 |

Table 5.23 - Time spent in crocodile habitats, expressed as % of sample, among community groups ($p=0.0001$, $n=276$).

5.10.2 - Type of activities in crocodiles habitats

Work related and recreational activities were presented to respondents (Questions 26 & 27, see questionnaire, Appendix 2). By far recreational activities were the main reasons for being in crocodile habitats. A pattern of traditional recreational activities based on hunting, fishing and camping was dominant and popular with Weipa residents and visitors and Townsville residents, while a pattern of non exploitative recreational activities such as nature appreciation generally and bushwalking were most popular with Daintree visitors and a section of the Daintree residents, and to some degree with Weipa visitors (Figure 5.4).

Aboriginal respondents did a lot of fishing, camping and nature observation, far more than all other groups which indicated that cultural rather than recreational was a more appropriate word to qualify their activities. Given the cultural context, what was recreational for other groups may well have been subsistence for Aborigines so that the distinction with between work and non work categories became blurred (Glass, Muth & Flewelling 1990). It only demonstrated the cultural assumption made by the survey about the definition of work and recreation and its inadequacy to qualify Aboriginal activities in crocodile habitats (Figure 5.5).

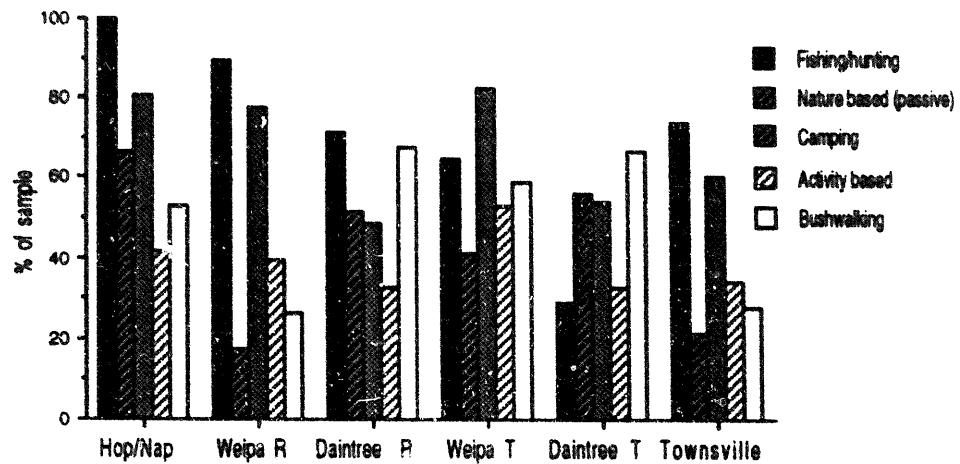


Figure 5.4 - Outdoor recreation activities, expressed as % of sample.
(n=36/39, n=76/80, n=28/31, n=17/18, n=52/63, n=80/125 respectively)

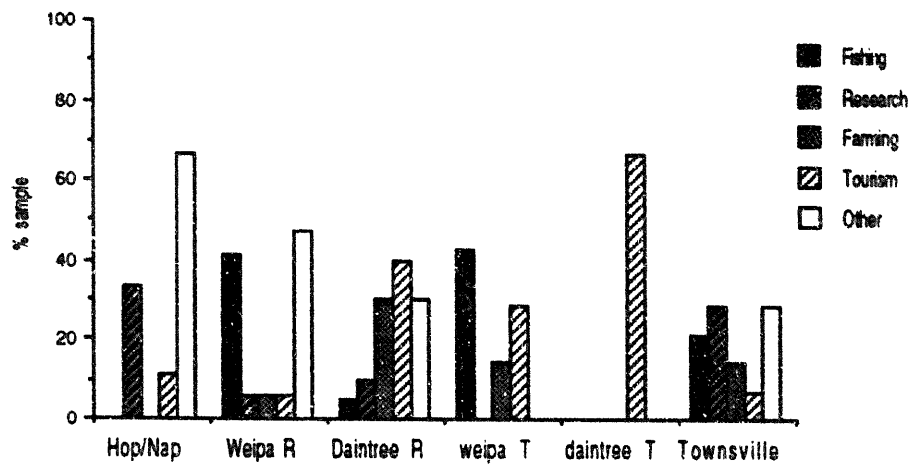


Figure 5.5 - Work activities in crocodile habitats, expressed as % of sample.
(n=4/39, n=17/80, n=20/31, n=4/18, n=3/63, n=14/125)
Note: See coding appendix 2 for "Other" category.

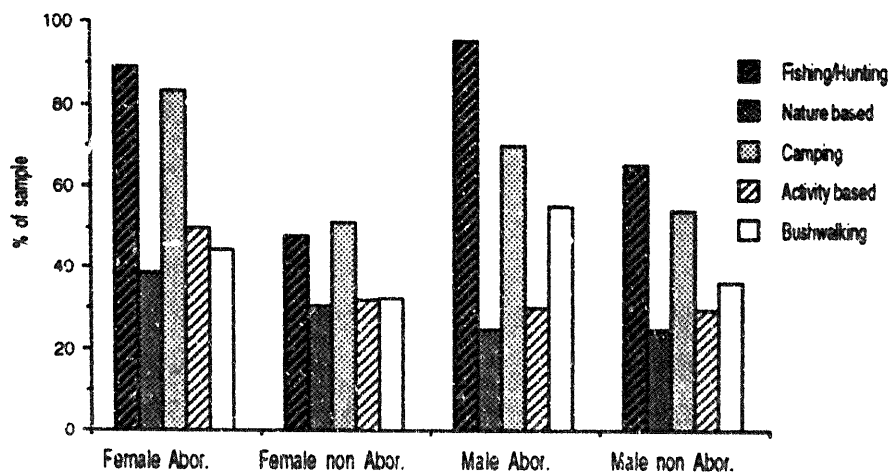


Figure 5.6- Recreational pattern in wetlands based on gender and cultural background (n=18, n=157, n=20, n=161 respectively).

Work activities in crocodile habitats represented only a small fraction of all activities of which the most significant were professional fishing in Weipa, farming and tourism in Daintree (Figure 5.6).

5.10.3 - Gender and risk exposure

While there was no effect of gender in perceived exposure ($p=0.5096$, $n=344$), there was a significant difference due to gender in actual exposure (expressed here as frequency of visit, $p=0.0045$, $n=343$) particularly for non Aboriginal respondents ($p=0.0031$, $n=304$) as shown on Table 5.24.

| Gender | Frequency of visits | | | | | N values |
|--------|---------------------|---------------|---------------|---------------|---------------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | |
| Female | <u>23.53%</u> | <u>33.82%</u> | <u>28.68%</u> | 4.41% | 9.56% | 136 |
| Male | 13.10% | 23.21% | <u>35.71%</u> | <u>11.31%</u> | <u>16.67%</u> | 168 |
| Totals | 17.76% | 27.96% | 32.57% | 8.22% | 13.49% | 304 |

Table 5.24 - Frequency of visits as affected by gender among non Aboriginal respondents ($p=0.0031$, $n=304$).

The majority of female respondents (86.03%) "never" to "sometimes" (28.68%) visited wetlands, while more than half of the male respondents (62.92%) did (35.57%, "sometimes"; 16.67%, "to all the time"). The pattern of use of wetlands showed that most of the use occurred as part of recreational activities, mostly based on hunting, fishing and camping, traditionally male dominated activities. Both sexes expressed low exposure (Table 5.21), however the level of use of wetlands by males was greater than by females which may place them as a higher risk group. A gender based pattern of recreational activities also showed that males engaged substantially more in fishing and hunting than females while other activities were similar for both sexes (Figure 5.6).

In summary, most Daintree residents expressed a low concern for safety and low perceived exposure while some would be highly exposed mostly as a result of work activities but also recreational activities. Aboriginal respondents express a high level of concern associated with low exposure, except for a small number, Weipa had a high level of concern with variable exposure depending on the work (fisherman) or leisure activities. Visitors and Townsville residents had low concern for safety with low level of exposure, mostly recreational activities fishing camping in Weipa and Townsville nature based and activity based recreation in Daintree. There was a bias towards male (non Aboriginal) being more at risk than females as a result of work and recreational activities.

5.11 - The experience of crocodiles

5.11.1 - Perceived Familiarity

Familiarity with crocodiles and crocodile habitats can be understood as a combination of knowledge and experience. Perceived familiarity was significantly correlated to expressed concern (Spearman $Rho = 0.15$, $p = 0.0045$, $n = 353$). Since knowledge was not significantly correlated to expressed concern (Spearman $Rho = 0.137$, $p = 0.102$, $n = 352$) while experience (as the frequency of crocodile sightings) was (Spearman $Rho = 0.337$, $p = 0.0001$, $n = 347$), it could be assumed that experience rather than knowledge was most important.

Respondents were asked to evaluate their familiarity with crocodiles and crocodile habitats (Question 9, see questionnaire Appendix 2). Perceived familiarity was significantly different between community groups ($p = 0.001$, $n = 356$) (Table 5.25). It was mostly expressed as high to very high by Aboriginal respondents (23.08% "4", 33.33% "5") and Daintree residents (38.71% "4", 29.03% "5"), moderate to high by Weipa residents (26.25% "3", 36.25% "4"), low for visitors (Weipa, 55.56%; Daintree, 39.68%, "2") and Townsville residents (27.2%, "low"; 28.8%, "3"). This pattern was consistent with the pattern of exposure (Table 5.21, Figures 5.4 & 5.5), experience (Table 5.26) and knowledge of crocodiles (see Chapter 4).

| | Expressed familiarity | | | | | N values |
|----------------------|-----------------------|--------|--------|--------|--------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Hopevale/Napranum | 5.13% | 17.95% | 20.51% | 23.08% | 33.33% | 39 |
| Weipa residents | 6.25% | 17.5% | 26.25% | 36.25% | 13.75% | 80 |
| Weipa visitors | 55.56% | 16.67% | 22.22% | 5.56% | 0.00% | 18 |
| Daintree residents | 6.45% | 6.45% | 19.35% | 38.71% | 29.03% | 31 |
| Daintree visitors | 28.57% | 39.68% | 19.05% | 11.11% | 1.59% | 63 |
| Townsville residents | 27.20% | 21.60% | 28.80% | 17.60% | 4.80% | 125 |
| Totals | 19.94% | 21.91% | 24.44% | 22.47% | 11.24% | 356 |

Table 5.25 - Expressed familiarity with crocodiles and crocodile habitats, expressed as % of sample, among community groups ($p = 0.0001$, $n = 356$).

5.11.2 - Experience of crocodiles

Respondents were asked how often and in what circumstances they had seen crocodiles, and if they did, what sort of experience they had (Questions 11, 12, 13, see questionnaire Appendix 2). As expected, there was a significant difference in the experience of respondents between community groups.

Frequency of crocodile sightings

Most respondents (54.86%) had seen crocodiles at least once and less than 10 times. Most residents had seen crocodiles "more than 10 times" while most visitors and Townsville residents had seen crocodiles between "5 to 10 times". However, there was significant proportion of Townsville residents had not seen crocodiles before (30.25%, "never") (Table 5.26).

| Communities | Crocodiles sightings | | | | N values |
|----------------------|----------------------|---------------|---------------|---------------|----------|
| | never | <5 times | 5-10times | >10times | |
| Hopevale/Napranum | 0.00% | 23.80% | 20.51% | <u>56.41%</u> | 39 |
| Weipa residents | 0.00% | 8.75% | 27.50% | <u>63.75%</u> | 80 |
| Weipa Visitors | 0.00% | 11.11% | 44.44% | <u>44.44%</u> | 18 |
| Daintree residents | 3.23% | 12.90% | 25.81% | <u>58.06%</u> | 31 |
| Daintree visitors | 3.17% | <u>44.44%</u> | <u>41.27%</u> | 11.11% | 63 |
| Townsville residents | <u>30.25%</u> | 22.69% | <u>36.13%</u> | 10.92% | 119 |
| Totals | 11.40% | 22.00% | 32.86% | 34.00% | 350 |

Table 5.26 - *Experience of crocodiles. Frequency of crocodiles sightings among community groups (p=0.0001, n=350).*

Circumstances of sightings

Most respondents had seen crocodiles both in the wild and in captivity. However, the sighting of crocodiles in "captivity only" was higher among Townsville residents (37.35%) and both Daintree (29.51%) and Weipa (22.22%) visitors (Table 5.27). The sighting of crocodiles in the "wild only" was higher among Aboriginal respondents (51.28%), residents in Daintree (29.03%) and Weipa (21.25%).

| Communities | Circumstances of crocodile sightings | | | N values |
|----------------------|--------------------------------------|---------------|---------------|----------|
| | Captive only | Wild only | Captive/Wild | |
| Hopevale/ Napranum | 2.56% | <u>51.28%</u> | <u>46.15%</u> | 39 |
| Weipa residents | 8.75% | 21.25% | 70.00% | 80 |
| Weipa visitors | 22.22% | 5.56% | <u>72.22%</u> | 18 |
| Daintree residents | 3.23% | 29.03% | <u>67.74%</u> | 31 |
| Daintree visitors | 29.51% | 8.20% | <u>62.30%</u> | 61 |
| Townsville residents | 37.35% | 16.87% | <u>45.78%</u> | 83 |
| Total | 19.87% | 21.15% | <u>58.97%</u> | 312 |

Table 5.27 - *Circumstances of sightings of crocodiles among community groups (n=312).*

That residents had seen crocodiles more frequently "in the wild" was to be expected, particularly from Aboriginal respondents (see Figures 5.4 & 5.5). The difference between the visitors to Weipa and Daintree was quite interesting and showed that the availability of crocodile attractions in the Daintree area (zoos and tourist cruises) was responsible for the greater frequency of crocodiles sightings among those visitors.

Personal experience accounts

A description of the experience of crocodiles by respondents showed a number of interesting features. Most respondents accounts described an experience of crocodiles in the wild, the majority of which were by residents (Figure 5.7).

There were a much smaller number of experience accounts with captive animals and those were accounts by Townsville residents and visitors primarily. Overall, the number of accounts by visitors and Townsville residents was much lower than for Weipa, Daintree, and Hopevale/Napranum residents. It would suggest that an experience in the wild had more value than an experience in a controlled situation.

The characteristics of the experience of respondents were defined in terms of the following emotional responses, "scared", "neutral", "cautious", "interested" and "aroused" (see code book, Appendix 2). The pattern of responses showed two dominant responses, fear ("scared"), and interest ("interested") (Figure 5.8). The dominant response to the experience in the wild was fear particularly among Aboriginal respondents (52.8%) and Weipa residents (40.7%). Fear was also mentioned in experiences with captive animals, but was not the dominant response (less than 30%). Interest in crocodiles was mostly expressed by the visitors and residents of the Daintree area with experience in the wild and with captive animals (Figure 5.8). In contrast, there was little interest in crocodiles as a result of their experience in the accounts of Weipa residents (18.5%) and Aboriginal respondents (11.1%). The amount and the nature of the interest in crocodiles were investigated separately in relation to the changes in attitudes towards nature in the last two decades (see Chapter 6). There was no obvious pattern emerging from other categories of responses. "Neutral" feelings, which expressed the lack of concern about crocodiles generally, were found particularly among Weipa visitors and may have reflected an absence of interaction with the species and /or a lack of interest. These feelings, however, were found among all groups and may have reflected the attitude "they don't worry me" already expressed by a number of respondents (see Chapter 3). "Cautious" feelings as a result of experiences in the wild represented less than 10% of responses of residents and visitors, except in the case of Weipa visitors. Townsville residents and Weipa visitors expressed some "Cautious" feelings as a result of experiences with captive animals. "Aroused" responses were expressed both in accounts in the wild and with captive animals only with a few residents in Daintree and in Townsville. These may be connected to the thrill associated with seeing crocodiles.

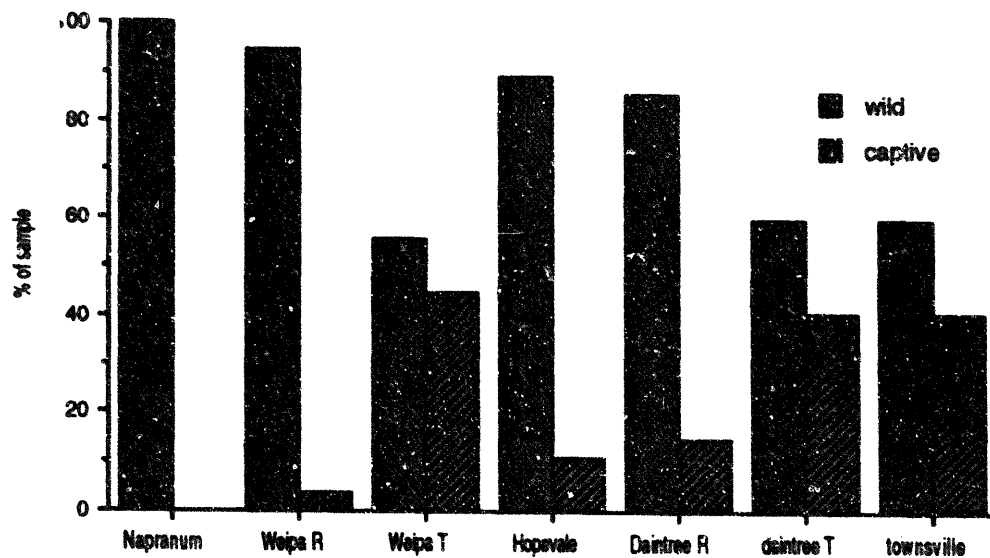


Figure 5.7 - Personal experience accounts: circumstances, expressed as % of sample (n=20, n=56/80, n=9/18, n=18/19, n=27/31, n=37/63, n=47/125 respectively)

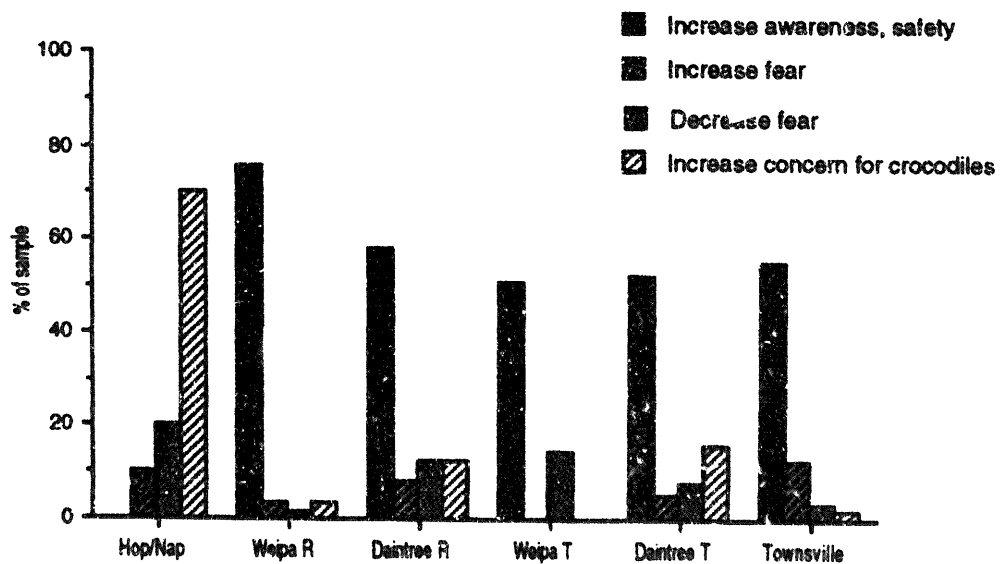


Figure 5.9 - Personal experience: influence on feelings towards crocodiles. (n=30/39, n=63/80, n=24/31, n=7/18, n=38/63, n=56/125 respectively)

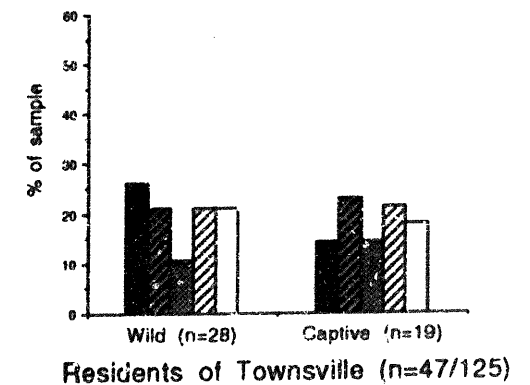
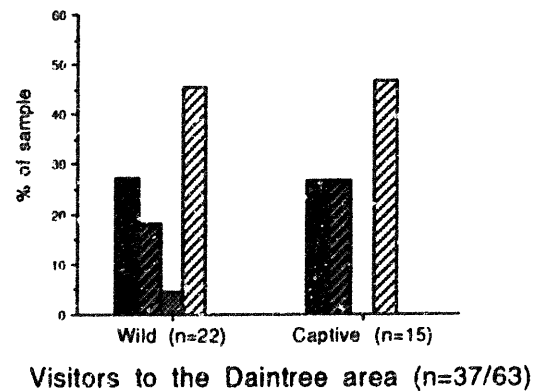
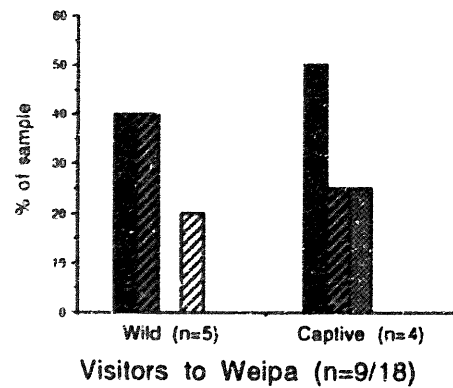
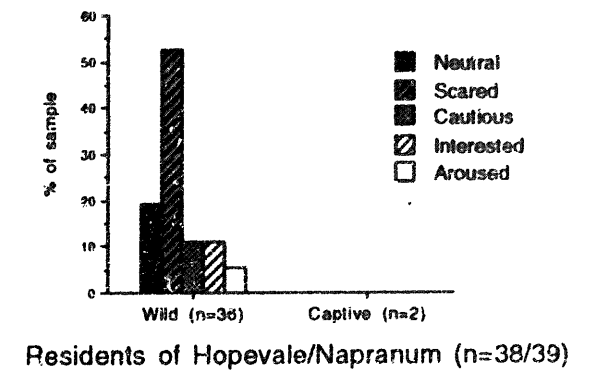
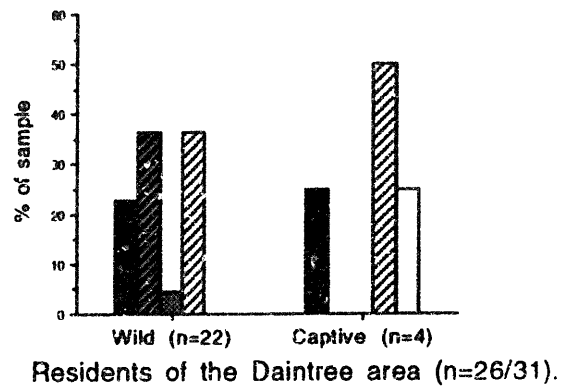
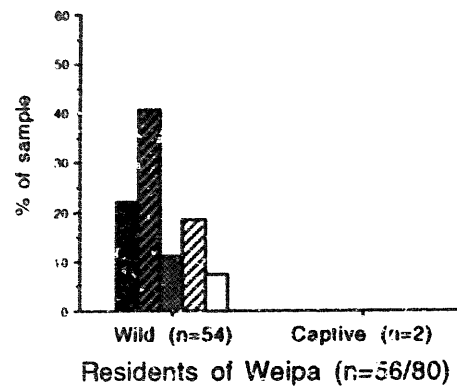


Figure 5.8 - Personal experience accounts among community groups: emotional responses.

Impact of personal experience of crocodiles

The impact of personal experience on feelings and attitudes towards crocodiles (Question 14, see questionnaire Appendix 2) showed that Residents in Daintree (54.85%, "a lot") and Hopevale/Napranum (55.26%, "a lot") were very affected by their personal experience compared with Weipa residents (33.33%, "a lot") (Table 5.28). This pattern was consistent with previous results on actual exposure (frequency and length of stay in wetlands) where the highest use of wetlands was found both in Daintree and Hopevale/ Napranum. However, personal experience accounts showed a distinct pattern of response with Daintree residents expressing both fear and interest and Aboriginal respondents and Weipa residents expressing mostly fear and much less interest (Figure 5.8).

| | Personal experience: influence on feelings towards crocodiles | | | | N values |
|----------------------|---|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/Napranum | 18.42% | 10.53% | 15.79% | <u>55.26%</u> | 38 |
| Weipa residents | 25.64% | 12.82% | <u>28.21%</u> | <u>33.33%</u> | 78 |
| Weipa visitors | <u>66.67%</u> | 11.11% | 5.56% | 16.67% | 18 |
| Daintree residents | <u>25.81%</u> | 12.90% | 6.45% | <u>54.84%</u> | 31 |
| Daintree visitors | <u>38.98%</u> | 22.03% | 16.95% | <u>22.03%</u> | 59 |
| Townsville residents | <u>44.74%</u> | 22.37% | 22.37% | 10.53 | 76 |
| Totals | <u>34.67%</u> | 16.67% | 19.33% | <u>29.33%</u> | 300 |

Table 5.28 - *Effect of personal experience on feelings towards crocodiles (p=0.0001, n=300).*

Visitors and Townsville residents were not as affected by their experience, the result of their limited use of wetlands (Tables 5.22 & 5.23), and circumstances of their experience (Figures 5.7 & 5.8). Some of the Daintree visitors (38.98%, "moderately" to "a lot") felt more affected by their experience than Weipa visitors (22.23%, "moderately" to "a lot"), probably the result of their temporary residence in the area and exposure to crocodile information, also reflected in the different level interest expressed in their experience accounts.

A description of the type of effect personal experience had on respondents came under the following items: experience resulting in an "increase of awareness of crocodiles and safety", "increased fear", "decreased fear" and "increase empathy" towards crocodiles (Question 15, see questionnaire and code book, Appendix 2; Figure 5.9). While for non Aboriginal respondents the dominant effect was "increased awareness and safety", the dominant response for Aboriginal respondents was an "increase in empathy for crocodiles" with no effect on awareness and safety.

The fear of crocodiles

Most respondents "rarely" to "sometimes" expressed fear of crocodiles, except Aboriginal respondents who did "most times" to "all the time" (53.85%) (Table 5.29). This reflected the fact that respondents rarely found themselves in a situation of danger where fear would arise (as their level of exposure indicated). However, respondents with comparable level of exposure such as Aboriginal respondents and Daintree residents (Table 5.21) expressed a different level of fear: Aboriginal respondents were more likely to express fear than non Aboriginal respondents (Table 5.29 & Figure 3.1). It may be explained both by the long history of interaction and a different attitude towards fear (see Chapter 6).

| | Are you personally afraid of crocodiles? | | | | | N values |
|----------------------|--|---------------|---------------|------------|---------------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | |
| Hopevale/Napranum | 17.95% | 10.26% | 17.95% | 23.08% | <u>30.77%</u> | 39 |
| Weipa residents | 10.00% | 23.75% | <u>47.50%</u> | 12.50% | 6.25% | 80 |
| Weipa visitors | 22.22% | 22.22% | <u>38.89%</u> | 5.56% | 11.11% | 18 |
| Daintree residents | 20.69% | 20.69% | <u>31.03%</u> | 13.79% | 13.79% | 29 |
| Daintree visitors | 15.87% | 25.40% | <u>33.33%</u> | 9.52% | 15.87% | 63 |
| Townsville residents | 19.47% | <u>27.43%</u> | <u>26.55%</u> | 7.08% | 19.47% | 113 |
| Totals | 16.67% | <u>23.39%</u> | <u>32.75%</u> | 11.11% | 16.08% | 342 |

Table 5.29 - Occurrence of fear of crocodiles among community groups ($p=0.0172$, $n=342$).

Although most respondents did not expressed fear very often (as they would never or rarely be faced with crocodiles), they considered crocodiles as very dangerous (Table 5.9). The study of what made crocodiles fearsome provided a indication of the reasons behind their perception. This is discussed in detail in chapter 6 in conjunction with the study of the fascination crocodiles also generated.

Knowledge and the fear of crocodiles

Most respondents "moderately" (32.61%) to "strongly" (28.27%) agreed with the statement that more knowledge of crocodiles would result in less fear. It was significant that those who "strongly agreed" were Daintree residents and visitors (Table 5.30), two groups with a good access to information (Chapter 4). It may be seen as the expression of a belief in and support for public education to promote safety awareness (see Figure 3.1).

| | Increased knowledge about crocodiles results in less fear | | | | | N values |
|----------------------|---|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/Napranum | 35.14% | 5.14% | 2.7% | 32.43% | 24.32% | 37 |
| Weipa residents | 17.95% | 25.64% | 1.28% | 26.92% | 28.21% | 78 |
| Weipa visitors | 22.22% | 16.67% | 0.00% | 55.56% | 5.56% | 18 |
| Daintree residents | 23.33% | 6.67% | 6.67% | 13.33% | 50.00% | 30 |
| Daintree visitors | 4.92% | 21.31% | 3.28% | 32.79% | 37.70% | 61 |
| Townsville residents | 11.76% | 5.04% | 8.40% | 52.10% | 22.69% | 119 |
| Totals | 16.03% | 13.41% | 4.66% | 37.61% | 28.27% | 343 |

Table 5.30 - Increase knowledge and fear of crocodiles among community groups ($p=0.0001$, $n=343$).

The low knowledge scores and limited exposure to crocodiles of Daintree visitors also may have explained their responses. Despite the general agreement on the effect of knowledge in reducing fear, there was no significant positive correlation between knowledge scores and expressed concern (Spearman $Rho=0.137$ $p=0.102$, $n=352$). Instead, there was a significant positive correlation between experience (expressed as the number of crocodiles seen) and expressed concern (Spearman $Rho=0.337$, $p=0.0001$, $n=347$), indicating that knowledge *per se* did not affect expressed concern, rather personal experience would be the key factor in expressed concern. This was congruent with the responses of a number of residents who disagreed with the above statement; Aboriginal respondents (35.14%, "strongly disagree"), Daintree residents (23.33%, "strongly disagree") and Weipa residents (25.64%, "moderately disagree"; 17.95% "strongly disagree"). It pointed to the fact that those who agreed with the value of knowledge in decreasing fear lacked the personal experience those who disagreed had (see Sections 5.10 & 5.11).

Research elsewhere has shown that high knowledge of crocodiles was accompanied by higher level of anxiety among resident communities near crocodile habitats (Ross 1989). In the present survey, knowledge from experience rather than just vicarious knowledge of crocodiles resulted in greater anxiety; this was particularly the case of Aboriginal respondents who consistently through the study expressed that anxiety.

The role of personal experience: a summary

There was a range of reactions to crocodile sightings, depending on the circumstances (in the wild or in captivity), and frequency of encounters (rarely to very often). There were among all groups a proportion of respondents whose attitudes towards crocodiles were "not at all" influenced by crocodile encounters

(20% to 35%). Residents though, were more affected ("moderately to a lot") compared to visitors ("not at all, a little"). Residents had seen less crocodiles than visitors but a greater proportion in the wild. "Increase awareness and safety" was the dominant response to crocodile encounters for all groups except for Aborigines where "increased concern for crocodiles" was the dominant response. Personal experience accounts were mostly of encounters with crocodiles in the wild. Experience in the wild generated a mix of emotional responses with fear in all cases and interest for the Daintree visitors and residents, but not for the Weipa and Hopevale/ Napranum residents. Why should Daintree residents expressed more interest in crocodiles than Weipa residents or Aboriginal respondents? Residents had high knowledge scores, but a distinct response for expressed concern: it was significantly higher in Weipa and in Aboriginal communities reflecting a different use of wetlands, as well a distinct social environment, economy and management presence. (see Chapter 6 for the study of empathy towards crocodiles).

By contrast, experiences with animals in captivity did not generate strong fear responses but much greater interest with some degree of arousal. The value of experience and emotional responses such as fear can be seen as an positive mechanism for decision making under threatening circumstances (Vining 1987; Ewert 1988). Anecdotal evidence from Aboriginal respondents suggested that fear should be seen positively because it maintained a level of alertness of the dangers of crocodiles and was the best way to avoid complacent behaviour (Field notes 1990). Support for this positive evaluation of fear may be seen in Aboriginal responses on how often they were afraid of crocodiles: 53.85% of "most times" to "all the time" (Table 5.28), compared to 18.55 % of Weipa residents and 27.58% of Daintree residents, despite the fact that the latter groups spend more time in crocodile habitats (Section 5.10). It would seem that personal experience was very important in generating fear (and respect) and the necessary alertness for appropriate behaviour.

5.12 - Safety behaviour

Respondents' personal control was investigated by asking how respondents felt about safety precautions and their value and what was their safety behaviour (avoidance, risk taking and safe behaviour) (Questions 23, 24, 29, 30, 31 & 32, see questionnaire Appendix 2).

5.12.1 - The value of safety precautions

Safety precautions were perceived as very important by all respondents (83.67%) and there was no significant difference between community groups ($p= 0.7911$, $n= 349$). Respondents were asked to give a description of the type of safety precautions they used. Responses were coded into 6 categories: "no precautions at all", the use of "local knowledge" and information, "observation" (signs of crocodiles), "avoidance" (no swimming, stay away from water edge, no fish scraps, no pattern of activities, use daylight etc.), "aggressive methods" (use of weapons), "defensive methods" (go in groups, light a fire, take the dog, etc...)(see code book, Appendix 2).

By far the most common strategy was "avoidance", particularly with Weipa visitors and "observation" (Figure 5.10). "Aggressive methods" were used by Weipa residents and visitors, Townsville residents and Aboriginal respondents. "Local knowledge" was of important for residents but mostly for Aboriginal respondents which was congruent with their pattern of response for communication channels (see Chapter 4). "Observation" strategies called for comment because they could only be useful if one knew what to look for. It was unlikely that visitors and Townsville residents would, although they claimed to be observant, because of their low level of interaction and use of wetlands, lack of knowledge and experience of crocodiles and crocodile habitats (see Chapter 4 and Section 5.11). It was likely that their answers reflected more whatever information they gathered on safety behaviour rather than actual experience. In contrast, Aboriginal respondents gave a wealth of devices based on careful observation of the behaviour of crocodiles as well as defensive strategies, including the use of a watch person at all time while other members of a group engaged in activities (fishing or swimming for instance). However, a place had to be checked out thoroughly first for signs of crocodiles (Field notes 1990). Commonly cited observation strategies were the water temperature, the presence of barramundi, the study of the reeds and the presence of land slides (Field notes 1990). Anecdotal evidence also indicated that personal immunity was also secured through ritual identification of individuals going into crocodile habitats. For example, the use of a leaf from a certain tree impregnated with sweat was used to determine whether to cross a creek or not, if it sunk one would not (Ernie Hall, *pers. comm.*, Napranum).

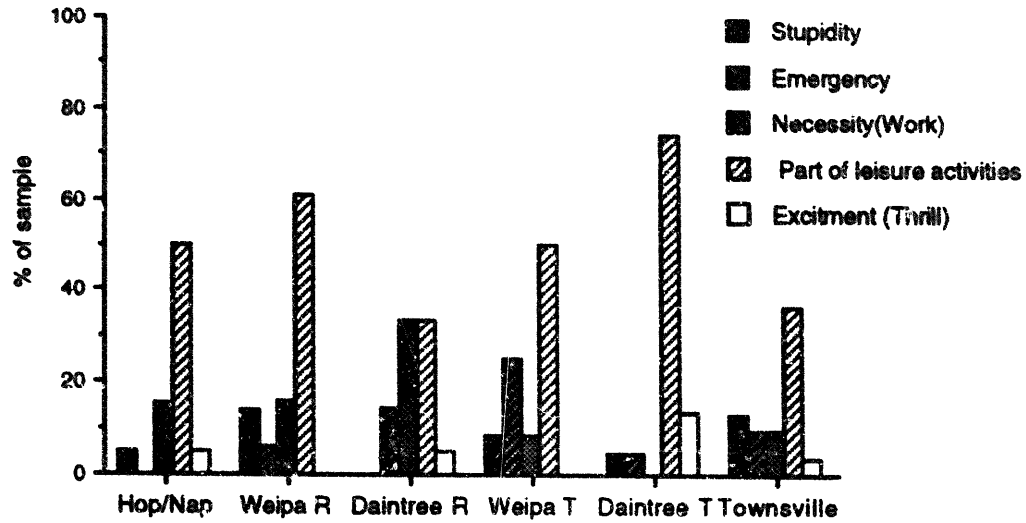


Figure 5.11 - Reasons for taking risks in crocodile habitats, expressed as % of sample. (n=20/39, n=51/80, n=21/31, n=12/18, n=23/63, n=55/125 respectively)

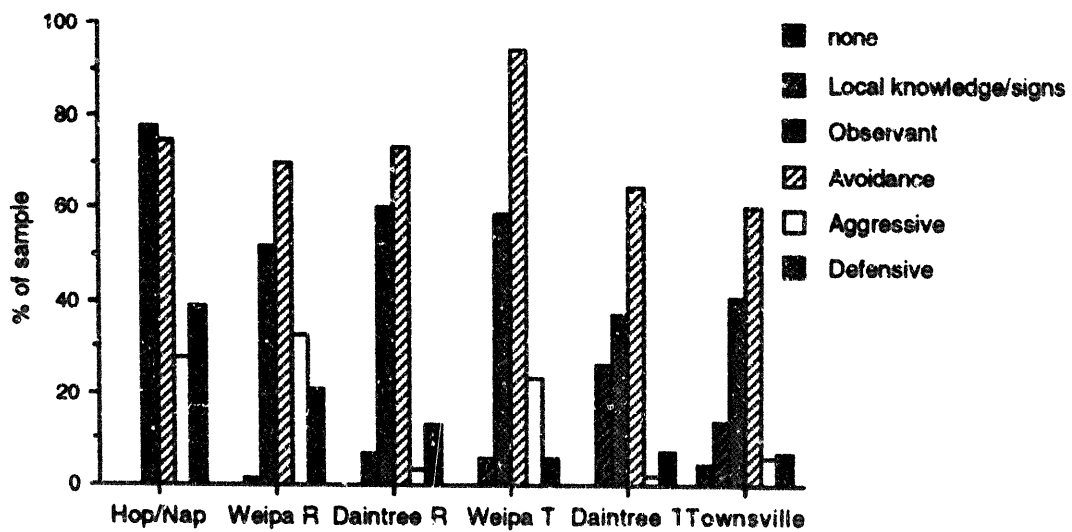


Figure 5.10 - Safety precautions used in crocodile habitats, expressed as % of sample (n=36/39, n=78/80, n=30/31, n=17/18, n=59/63, n=88/125 respectively)

A number of devices were also known to Aboriginal respondents in case of an attack. For example, a twig from a milky pine was used in Hopevale to stick in the jaws of a crocodile, preventing it from closing them (Field notes 1990). Another common method recorded by early explorers (Huxley 1928) and still used today was the poking of the crocodile's eyes or swimming under it and pulling its hind legs apart (see Section 5.13.3).

5.12.2 - Components of safety behaviour

The components of safety behaviour identified were avoidance, risk taking and following safety precautions (Table 5.31)

| Behaviour | Components of safety behaviour | | | | | p values | N values |
|----------------------|--------------------------------|---------------|-----------|---------------|---------------|----------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | | |
| Avoidance (Q24) | <u>21.55%</u> | 7.77% | 14.84% | <u>30.39%</u> | <u>25.44%</u> | 0.0040 | 283 |
| Safe Behaviour (Q30) | 1.42% | 0.71% | 2.13% | <u>28.37%</u> | <u>67.38%</u> | 0.0001 | 282 |
| Risk taking (Q 31) | <u>43.11%</u> | <u>36.75%</u> | 15.19% | 3.18% | 1.77% | 0.0867 | 283 |

Table 5.31 - Components of safety behaviour, expressed as % of sample ($p < 0.005$ indicates significant differences between community groups).

While most respondents said they followed safety precautions at all time, the pattern of avoidance and risk taking shed light on actually what people were more likely to do. While there was a negative correlation between the following of safety precautions and risk taking behaviour (Spearman $Rho = -0.328$, $p = 0.0001$, $n = 279$) and between avoidance behaviour and risk taking behaviour (Spearman $Rho = 0.229$, $p = 0.0001$, $n = 273$), there was a weak positive correlation between Avoidance behaviour and the following of safety precautions (Spearman $Rho = 0.178$, $p = 0.0035$, $n = 271$), indicating that the following of safety precautions was not necessarily associated with avoidance of areas where crocodiles had been seen.

A number of respondents did not avoid places where crocodiles had been seen (21.55%). They may have been engaging in risk taking behaviour or they may have been knowledgeable about what safety precautions to follow (see Figure 5.10). Avoiding known crocodiles places and following safety precautions in crocodile habitats were significantly different between community groups ($p = 0.004$, $n = 283$, $p = 0.0001$, $n = 282$ respectively). Risk taking was uncommon (43.11% "never", 36.75% "rarely") and not significantly different between community groups ($p = 0.0867$, $n = 283$).

Expressed safe behaviour

The majority of respondents said they followed safety precautions "most times" (28.37%) to "all the time" (67.38%) particularly Aboriginal respondents (88.57%, "all the time") and Daintree visitors (92%, "all the time") (Table 5.32).

| | Expressed safe behaviour | | | | | N values |
|----------------------|--------------------------|--------|-----------|---------------|---------------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | |
| Hopevale/Napranum | 2.86% | 0.00% | 0.00% | 8.57% | <u>88.57%</u> | 35 |
| Weipa residents | 1.32% | 0.00% | 1.32% | <u>32.89%</u> | <u>64.47%</u> | 76 |
| Weipa visitors | 0.00% | 0.00% | 6.25% | 18.75% | <u>75.00%</u> | 16 |
| Daintree residents | 0.00% | 3.70% | 3.70% | 14.81% | <u>77.78%</u> | 27 |
| Daintree visitors | 2.00% | 0.00% | 0.00% | 6.00% | <u>92.00%</u> | 50 |
| Townsville residents | 1.28% | 1.28% | 3.85% | <u>53.85%</u> | 39.74% | 78 |

Table 5.32 - *Safe behaviour, expressed as % of sample, among community groups (p=0.0001, n=282).*

In contrast, a significant number of Townsville residents and Weipa residents only followed safety precautions "most times" (53.85%, 32.89% respectively). Those results may reflect the lack of knowledge (in the case of Townsville residents) and limited experience of crocodiles (in both cases) of those respondents, but also the likeliness of those respondents to take risks under certain circumstances. The importance of safety precautions for other respondents, particularly Aboriginal respondents was matched by the type and amount of precautions they actually took (Figure 5.11).

Risk taking behaviour

While risk taking was "never" (43.11%) or "rarely" (36.75%) (Table 5.31), the circumstances in which it could occur were investigated because respondents may not have admitted to risk taking readily, but also because it was important to investigate the potential occurrence of risk taking activities. The range of reasons given by respondents included "carelessness", "emergency", "necessity" (part of work) "incidental to leisure activities" and for "thrill" (see code book, Appendix 2).

By far the dominant response was "incidental to leisure activities" except for Daintree residents (Figure 5.11), which indicated that recreation rather than work was mainly responsible for providing the circumstances of risk taking behaviour to the majority of respondents. In Weipa, relevant activities were recreational fishing and/or hunting and camping, while in Daintree swimming, waterskiing, horse

riding for example were more likely (Figures 5.4 & 5.5). Some residents in Daintree (most likely cattle graziers) and in Weipa (most likely fishermen) indicated risk taking as a "necessity" and incidental to their work (Field notes 1990) (Figure 5.11). Aboriginal respondents indicated recreational activities as circumstances for risk taking. However, whether it was incidental to recreational or work activities was a matter of definition of what constituted work, subsistence and recreation in that cultural context (Section 5.10). Anecdotal evidence suggested that Aborigines may have taken calculated risks based on their intimate knowledge of crocodile behaviour and their habitat (as other residents did for work purposes), but also based on an unwarranted belief of personal immunity as mentioned previously.

Risk taking behaviour and gender, cross cultural differences

Risk taking arose mostly from recreational activities except for a few residents in Weipa and Daintree, where it was work related. It was found earlier that time spent in crocodiles habitats was significantly affected by gender and was culturally based since a significant gender difference was found only with non Aboriginal respondents ($p=0.0031$, $n=304$) (Table 5.33). Pattern of recreational activities showed that there was a difference in the importance of recreational fishing and/or hunting between non Aboriginal males and females (Figures 5.4 & 5.5). Risk taking behaviour responses followed the same pattern: there was a significant gender difference for non Aboriginal respondents ($p=0.0021$, $n=248$) not for Aboriginal respondents ($p=0.4202$, $n=35$) (Table 5.33). Non Aboriginal males were more likely to engage in risk taking behaviour.

A gender based pattern of risk taking associated with a gender based recreational use of the wetlands for non Aboriginal respondents ($p=0.0021$, $n=248$) may explain the likelihood of risk taking in Weipa (Table 5.31). The male dominated community was very focussed on recreational hunting, fishing and camping (Figure 5.4). This was also the case for Townsville residents and to a much lesser degree, for Weipa visitors. Those respondents did not readily admit to risk taking, but by the same token did not follow safety precautions as often as other groups (Table 5.33).

| Cultural background | Gender | Risk taking behaviour | | | | | N values |
|---------------------|--------|-----------------------|--------|-----------|------------|---------------|----------|
| | | Never | Rarely | Sometimes | Most times | All the times | |
| Aboriginal | Female | 60.00% | 20.00% | 20.00% | 0.00% | 0.00% | 15 |
| | Male | 40.00% | 40.00% | 10.00% | 5.00% | 5.00% | 20 |
| | Totals | 48.57% | 31.43% | 14.29% | 2.86% | 2.86% | 35 |
| Non Aboriginal | Female | 55.77% | 33.65% | 8.65% | 0.96% | 0.96% | 104 |
| | Male | 32.64% | 40.28% | 20.14% | 4.86% | 2.08% | 144 |
| | Totals | 42.34% | 37.50% | 15.32% | 3.23% | 1.61% | 248 |

Table 5.33 - Risk taking behaviour and gender expressed as % of sample - Cross cultural considerations
($p=0.4202$, $n=35$ for Aboriginal respondents, $p=0.0021$, $n=248$ for non Aboriginal respondents).

It was found previously that knowledge was similarly affected by gender as non Aboriginal males knew more about crocodiles than females (Chapter 4). The greater knowledge and interest in extractive outdoor recreational activities of male respondents may be related to an utilitarian view of nature and a symbolic meaning of nature (including crocodiles) as a challenge to "culture" (and masculinity). This symbolism can be seen in the essentially masculine Australian identity shaped in the course of the settlement of the country. The importance of the frontier in this development and in today's attitudes to nature in the region may explain gender based patterns (Ward 1978, Hodge & Mishra 1990; White 1981; Fitzgerald 1986).

While it was possible to use frontier attitudes for the interpretation of a gender based pattern of recreational activities and risk taking in resident communities, an alternative explanation was needed for visitors to the region (Daintree visitors) where risk taking took place incidental to recreational activities similarly in both genders and likely a reflection of a "carefree" feeling commonly found in holiday makers (Figures 5.11 & 5.5).

Avoidance behaviour

The frequency of avoidance of crocodile places by respondents who had been to crocodile habitats was different among community groups (Table 5.34). Avoidance behaviour occurred "most times" (30.39%) particularly with Aboriginal respondents (34.29%), Weipa residents (44.87%) and Weipa visitors (31.25%) and "all the time" (25.44%) particularly with Daintree residents (41.38%) and Daintree visitors (30.61%) and was negatively correlated to risk taking behaviour (Spearman $Rho=-0.229$, $p=0.0002$).

| | Avoidance of places where crocodiles have been seen | | | | | N values |
|----------------------|---|--------|---------------|---------------|---------------|----------|
| | Never | Rarely | Sometimes | Most times | All the time | |
| Hopevale/Napranum | <u>22.86%</u> | 11.43% | 5.71% | <u>34.29%</u> | 25.71% | 35 |
| Weipa residents | 11.54% | 6.41% | 21.79% | <u>44.87%</u> | 15.38% | 78 |
| Weipa visitors | 6.25% | 12.50% | <u>31.25%</u> | <u>31.25%</u> | 18.75% | 16 |
| Daintree residents | <u>27.59%</u> | 6.90% | 13.79% | 10.34% | <u>41.38%</u> | 29 |
| Daintree visitors | <u>22.45%</u> | 4.08% | 18.37% | 24.49% | <u>30.61%</u> | 49 |
| Townsville residents | <u>31.58%</u> | 9.21% | 6.58% | 25.00% | 27.63% | 76 |
| Totals | <u>21.55%</u> | 7.77% | 14.84% | <u>30.39%</u> | 25.44% | 283 |

Table 5.34 - Avoidance behaviour expressed as % of sample among community groups ($p=0.004$, $n=283$).

A number of respondents "never" avoided those places (21.55%) and represented 22.86% of Hopevale/Napranum residents, 27.59% of Daintree residents, 22.45% of Daintree visitors and Townsville residents (31.58%); Those respondents would include those exhibiting risk taking behaviour out of ignorance, and low experience of crocodiles and crocodiles habitats (Daintree visitors and Townsville residents), and those taking calculated risk, but whose knowledge, experience of crocodile would be appropriate and whose primary activities were based on wetlands (residents in Hopevale/Napranum and Daintree) (Chapter 4 & Section 5.11). Work activities, rather than recreational activities were most likely to be associated with low avoidance behaviour (Figures 5.4, 5.5 & 5.6) and necessity as a reason for risk taking (Figure 5.11). For instance, Daintree residents involved in the Daintree river crocodile cruises would not avoid crocodile places as their job would depend on their ability to locate crocodiles to show the visitors; graziers having to move cattle to high grounds during floods would not either (Field notes 1990). As very few Weipa residents spent time in wetlands as part of their work (fishermen primarily), there was a high level of avoidance behaviour (and low risk taking behaviour).

The lower level of avoidance in Daintree (residents and visitors) and Townsville compared to Weipa (residents and visitors) was also a reflection of those respondents' risk perception at those locations. Expressed concern was higher in Weipa than in Daintree and Townsville (Table 5.3). Townsville residents overall had little interaction with crocodiles and wetlands (Figures 5.5 & 5.6), so that the low avoidance behaviour of certain respondents was quite surprising and perhaps more statement about restriction of recreational use.

Avoidance behaviour with Aboriginal respondents may have been related to risk assessment as with other respondents, but to the fact that certain areas may have been avoided for cultural reasons.

The effect of crocodile signs on safety behaviour

Respondents were asked to evaluate crocodile signs' effectiveness in promoting safe behaviour (Question 50 see questionnaire Appendix 2).

It was found that crocodile signs near rivers and swamps were a major source of information about crocodiles (see Chapter 4) and overall encouraged respondents to behave safely (53.78% "strongly agree"). However, there was significant differences between community groups ($p=0.0001$, $n=344$) (Table 5.35).

| Crocodile signs near rivers and swamps encourage respondents to behave safely | | | | | | N values |
|--|--------------------------|----------------------------|------------------|-------------------------|-----------------------|-----------------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | 2.7% | 5.41% | 5.41% | 27.03% | <u>59.46%</u> | 37 |
| Weipa residents | 5.19% | 15.58% | 2.60% | <u>56.44%</u> | 18.18% | 77 |
| Weipa visitors | 556.00% | 0.00% | 0.00% | <u>66.67%</u> | 27.78% | 18 |
| Daintree residents | 3.45% | 6.90% | 0.00% | 17.24% | <u>72.41%</u> | 29 |
| Daintree visitors | 0.00% | 1.61% | 0.00% | 24.10% | <u>74.19%</u> | 62 |
| Townsville residents | 0.00% | 2.48% | 2.48% | 31.40% | <u>63.64%</u> | 121 |
| Totals | 2.03% | 5.81% | 2.03% | 36.34% | <u>53.78%</u> | 344 |

Table 5.35 - Crocodile signs and safety behaviour among community groups ($p=0.0001$, $n= 344$).

While most respondents (53.78%), including Daintree residents (72.19%) visitors (74.19%) and Townsville residents (63.64%) "strongly agreed" with the value of signs in promoting safety behaviour, Weipa residents and visitors "moderately agreed" (58.44% and 66.67% respectively); this was consistent with their risk assessment: "people do not taking safety seriously and are ignorant about crocodiles" were major reasons for perceived increased risk (Table 5.16). Aboriginal respondents "moderately" (27.03%) to "strongly agreed" (59.46%).

Anecdotal evidence suggested that the position of signs may not always be appropriate and may not take into account seasonal fluctuations of crocodile habitats (Field notes 1990). In fact, the position of those signs was primarily based on the amount of usage of a particular area (boat ramp, major river crossings near roads and in that sense would be of no use to respondents using more remote locations as it was likely to be the case of Aboriginal respondents and Weipa residents.

Safety behaviour and expressed concern

Most respondents established no connection between safe behaviour and their expressed concern despite their acknowledgement of the importance of safety precautions (Spearman $Rho=0.126$, $p=0.345$ $n=281$). It was shown earlier that respondents identified crocodiles as an unpredictable hazard against which they felt they had little or moderate control depending their familiarity with crocodiles and crocodile habitats and their assessment of the risk (see Sections 5.8 & 5.9).

However, factors other than individual safety behaviour, knowledge and experience may be at play in the expression of concern. Those may be termed *in toto* social factors. They include communication networks, and trust in institutions and expert judgements (see chapter 4), media attention and the impact of fatal accidents, attribution of blame and perceived costs and benefits of conservation policies.

5.13 - Salient events, media attention and expressed concern

5.13.1 - Crocodile attacks and level of concern about safety

Respondents were asked to evaluate their concern after an attack they could remember and, if possible, describe it (Questions 19 & 20, see questionnaire, Appendix 2). The overall response was "none" (40.7%) or "little" concern following a crocodile attack except for a number of Aboriginal respondents (46.88%, "a lot") and to some Daintree residents (20.00%, "a lot"). (Table 5.36).

| | Concern about safety after crocodile attacks | | | | N values |
|--------------------|--|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | 15.62% | 12.50% | 25.00% | <u>46.88%</u> | 32/39 |
| Weipa residents | <u>38.89%</u> | 29.10% | 22.22% | 9.72% | 72/80 |
| Weipa visitors | <u>53.33%</u> | 20.00% | 26.67% | 0.00% | 15/18 |
| Daintree residents | <u>36.67%</u> | 20.00% | <u>23.33%</u> | <u>20.00%</u> | 30/31 |
| Daintree visitors | <u>47.37%</u> | 28.95% | 18.42% | 5.26% | 38/63 |
| Townsville | <u>46.94%</u> | 20.41% | 19.65% | 16.84% | 98 |
| Totals | <u>40.70%</u> | 22.81% | 19.65% | 16.84% | 285/356 |

Table 5.36 - *The effect of crocodile attacks on the level of concern about safety among community groups ($p= 0.0007$, $n=285$).*

Absence of concern could be attributed to the fact that only a few respondents would have been closely associated with such an event to be affected to a significant degree,

to the rarity of those events and to the importance attached to them in the community.

For instance, the knowledge of past victims (Table 5.10) did not affect visitors and Townsville residents' concern while there was a range of responses for residents; Weipa residents were "moderately" concerned (35.44%) and Daintree residents were either "not at all" concerned (33.33%) or "very" concerned (30%); Aboriginal respondents were "very" concerned (63.16%) (Table 5.37).

| | Effect of the knowledge of past victims on concern | | | | N values |
|----------------------|--|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | 18.42% | 2.63% | 15.79% | <u>63.16%</u> | 38 |
| Weipa residents | 22.78% | 13.92% | <u>35.44%</u> | 27.85% | 79 |
| Weipa visitors | <u>35.29%</u> | 11.76% | 23.53% | 29.41% | 17 |
| Daintree residents | <u>33.33%</u> | 23.30% | 13.33% | <u>30.00%</u> | 30 |
| Daintree visitors | <u>48.28%</u> | 22.41% | 18.97% | 10.34% | 58 |
| Townsville residents | <u>52.68%</u> | 9.82% | 19.64% | 17.86% | 112 |
| Totals | <u>38.32%</u> | 13.47% | 22.46% | <u>25.75%</u> | 334 |

Table 5.37 - *The Effect of the knowledge of past victims on the level of concern about safety among community groups (p=0.0001, n=334).*

The knowledge of past victims followed a similar pattern of responses as the previous question and indicated that an personalised and identifiable victim was an important aspect of public concern (Sandman 1987). The importance of the recollection of those specific events and their significance to the communities in which they took place may explain why Aboriginal communities were very concerned and why the knowledge of the victim was most important to them, while the responses of Weipa and Daintree residents were variable. Both Weipa and Daintree communities have had the experience of dramatic and well publicised incidents (1975 and 1985 respectively, see Section 5.13.3). However, Weipa residents were moderately concerned, the result of the high population turnover and the fact that very few respondents among the present residents had any recollection of the 1975 attack on P. Reimers; they in fact remembered the attack on Beryl Wruck which did not take place in that community. Daintree residents had a very good recollection of the attack on Beryl Wruck in 1985 (see Table 5.40). However, there was mixed responses as to what its effect was (Table 5.36 & 5.37). Residents in Daintree may have been quite shaken by that event but may not have been prepared to accept it.

This was quite in contrast with Aborigines' response of high level of concern as a result of past attacks. When one considered that these respondents cited events other respondents had mentioned, but also events that took place at least 40 years ago

(concerning Aboriginal victims), one is quite astonished at the fact that the influence of past attacks on concern is still strong compared to other residents. Explanations for such finding may be found in the long term residence of Aborigines and their wariness and fear of crocodiles (Section 5.7) but also on how they perceived those events. As pointed before, in Aboriginal culture, accidents are socially explained, they are not the result of chance; as a result, the social implications of a death by a crocodile may be far reaching for those communities, hence the high concern about those events even if they occurred in the distant past; for example, an incident which occur in the 1940s in Hopevale (Table 5.40) was still discussed between the relatives of the victim and other clans involved (Field notes 1990). It is likely that attacks concerning Aboriginal and non Aboriginal victims would called for a different response and that a double standard may have applied for different categories of victims: Aboriginal victims may well call for Aboriginal type of response while not for a unrelated non Aboriginal victim (Figure 5.12).

It was interesting to compare the Aboriginal response with Daintree residents' response to similar dramatic events. Most Aboriginal respondents were very concerned while Daintree residents had mixed responses, some very affected, other not, and others in between. This may be interpreted as a sign of a community confusion in the attribution of responsibility. Blaming the victim has been seen as reinforcing social internal control while shifting the blame outside (the crocodile or fate for instance) may be seen as reinforcing loyalty (Douglas 1986). While Aboriginal respondents did blame the victim (a non Aboriginal victim), it was not to the same extent as Daintree residents (Figure 5.20). The retaliation against crocodiles in Daintree following the attack on Beryl Wruck (1985) involved the indiscriminate killing of 25 animals (Field notes 1990). The impact of such event was profound and polarized an already economically and socially divided community, whose responses through the survey came consistently as bimodal. It was of course the result of recent social changes, but perhaps that fatal incident act as a catalyst of deeper social phenomenon (Field notes 1990).

In summary, salient events affected people only if resident at the time of an attack (since attacks were a rare occurrence) and in relation to social mechanisms of attribution of blame (a function of cultural background) by the concerned community.

5.13.2 - Media attention

The way in which crocodile attacks have been reported in the media was another component of public concern about risk and safety. Obviously, crocodile attacks do not occur often but they have dramatic outcomes and are the centre of intense social discourse particularly through the media.

There has been only one fatal incident and two non fatal incidents reported in the media since 1989 in northern Australia and complacency may have set in. Somehow, the coverage of the last incidents has not attracted as much media as did the first incidents in the mid 1980s (Beryl Wruck, Daintree, 1985, Kate Mcquarie, Staaten river, 1986, Ginger Meadows, Prince regent river, 1987). The last two attacks (1989, 1990) concerned two Aborigines in the Northern Territory (Daly river) and were not fatal due to their knowledge of appropriate coping strategy and luck of those individuals. The last non Aboriginal victim also never got the same amount of coverage (Telecom man in Groote Island, 1990).

Recollection of attacks

Respondents were asked to name an attack they could remember and give details about it in an open ended question (Questions 18 & 19, see questionnaire Appendix 2). Most respondents could remember an attack occurring in the last 5 years, few actually remembered one account in the last year except for Weipa residents (42.5%) and visitors (33.33%). Aboriginal respondents were vague about a date (Table 5.38).

| | Recollection of crocodile attacks | | | | | N values |
|----------------------|-----------------------------------|---------|--------|---------------|--------------------|----------|
| | <1 yr | 2-5 yrs | >5 yrs | Cannot recall | Cannot recall when | |
| Hopevale/Napranum | 7.69% | 33.33% | 28.21% | 15.38% | 15.38% | 39 |
| Weipa residents | 42.50% | 37.50% | 8.75% | 6.25% | 5.00% | 80 |
| Weipa visitors | 33.33% | 44.44% | 0.00% | 16.67% | 5.56% | 18 |
| Daintree residents | 12.90% | 77.42% | 6.45% | 3.23% | 0.00% | 31 |
| Daintree visitors | 23.81% | 26.98% | 7.94% | 39.69% | 1.59% | 63 |
| Townsville residents | 21.60% | 52.80% | 4.00% | 20.80% | 0.80% | 125 |
| Totals | 25.00% | 52.80% | 4.00% | 18.54% | 3.65% | 356 |

Table 5.38 - *Recollection of crocodile attacks, expressed as % of sample, among community groups. (p=0.0001, n=356).*

Accuracy of recollection

How accurate the date of those recollections was showed that residents were quite accurate while visitors and Aboriginal respondents were not (Table 5.39).

Obviously the relevance of the information to respondents was responsible for better recollection and accuracy. The variation with Aboriginal respondents can be attributed to a different concept of time not inaccuracy *per se*.

| | Accuracy of date of recollection | | | | N values |
|----------------------|----------------------------------|------------|-----------|------------|----------|
| | Accurate | Inaccurate | No answer | Don't know | |
| Hopevale/Napranum | 53.33% | 0.00% | 16.67% | 30.00% | 30 |
| Weipa residents | 68.52% | 9.26% | 3.70% | 18.52% | 54 |
| Weipa visitors | 44.45% | 0.00% | 9.09% | 45.45% | 11 |
| Daintree residents | 79.31% | 10.34% | 0.00% | 10.34% | 29 |
| Daintree visitors | 20.45% | 13.64% | 6.82% | 59.09% | 44 |
| Townsville residents | 54.32% | 6.17% | 1.23% | 38.27% | 81 |
| Totals | 53.82% | 7.63% | 4.82% | 33.73% | 249 |

Table 5.39 - Accuracy of recollection, expressed as % of sample for different groups ($n=0.0001$, $n=249$)

5.13.3 - Crocodile attacks accounts

Respondents accounts of crocodile attacks were identified using documented attacks from a range of published sources (Hermes 1987; Edwards 1988; Webb & Manolis 1989, Ross & Garnett 1989) regional newspapers (Townsville Daily Bulletin, Cairns Post) and personal communication from Jack Field (Queensland Department of Primary Industry, Cairns). Most attacks reported by respondents could not be identified as specific events (34.10%), particularly in the case of visitors (Weipa visitors, 50% of "unidentifiable reports", Daintree visitors, 59.46% of "unidentifiable reports"), and Townsville residents (46.8% of "unidentifiable reports" (Table 5.40). Residents were more precise in their descriptions. Daintree residents were very specific in their accounts (7.14% of unidentifiable reports), while Weipa residents and Hopevale and Napranum residents were much less so (38.57% and 22.58% of "unidentifiable reports" respectively). However, attacks best remembered were the attack on Beryl Wruck in 1985 in Daintree (30.02%) followed by the attack on Ginger Meadows in 1987 in Prince Regent River, WA (7.70%), on Kate McQuarie in 1986 in the Staaten river, Gulf of Carpentaria (6.79%), and the last one concerned a telecom employee in Groote island, Cape York Peninsula in 1990 (5.72%) (see Table 5.40). It showed that memorable events were not necessarily the most recent ones, but the ones which attracted the most media attention, such as the fatal attack in Daintree in 1985.

The first three were widely reported in the media, the last one was very recent. A brief review of the media coverage of those few well reported attacks showed how victims were well identified, their life described in detail and the horror of their fate presented with a profusion of graphic and verbal imagery which all emphasised the gruesomeness and bestiality of crocodiles. The carelessness of the victims was

also the subject of media attention but did not overrule the perceived unjust fate that stroke them. The last attack on the Telecom employee did not raise such passion except at a local level. One has to ask what were the features of those attacks that triggered an high emotional response in the public with such lasting effects. These had to be found in the culturally based perception of nature as a source of fear and fascination and in the vulnerability of victims which the media actually reflected and also suggested. Unfortunately it was beyond the scope of this project to provide a media analysis of such events although it would certainly provide useful insight on the cultural aspects of attitudes towards dangerous wildlife and nature generally.

| Attacks | Hopevale/ Napranum (n=30) | Weipa residents (n=70) | Weipa visitors (n=14) | Daintree residents (n=28) | Daintree visitors (n=37) | Townsville residents (n=94) | Totals (n=273) |
|------------------------------|---------------------------------|------------------------------|-----------------------------|---------------------------------|--------------------------------|-----------------------------------|-------------------|
| Daintree R., QLD (1985) | 32.26% | 18.57% | 7.14% | 75.00% | 21.62% | 25.53% | 30.02% |
| Staaten R., QLD (1986) | | 2.85% | 14.29% | 10.71% | 2.70% | 9.57% | 6.79% |
| Groote Isl., QLD (1990) | 14.29% | 7.14% | 3.57% | 5.57% | 2.70% | 1.10% | 5.72% |
| Prince Regent R, WA (1987) | 3.23% | 10.00% | 14.29% | 3.57% | 8.11% | 6.38% | 7.70% |
| East Alligator R., NT (1987) | | 2.86% | | | 2.70% | 1.10% | 1.10% |
| Daly R. NT (1989) | 3.23% | 5.71% | | | | 6.38% | 2.53% |
| Kakadu Nat. Park, NT (1985) | | | | | 2.70% | 1.10% | 0.61% |
| Hopevale, QLD (1930?) | 6.54% | | | | | | 1.10% |
| Aurukun, QLD (1952) | 3.23% | | | | | | 0.40% |
| Bamaga, QLD (1986) | 6.45% | | | | | | 1.07% |
| Gove, NT (1990) | | 1.43% | | 2.70% | | | 0.70% |
| Mission R, Weipa, QLD (1975) | 12.90% | 2.86% | | | | | 2.62% |
| Unidentified reports | 22.58% | 38.57% | 50.00% | 7.14% | 59.46% | 46.8% | 30.10% |

Table 5.40 - Crocodile attacks accounts. Identification of specific incidents by respondents.
Note: Identification was done using a range of clues provided by the respondents themselves. Results are expressed as % of sample.

The attacks mentioned and their description varied between communities (Table 5.40). It was interesting to see that Aboriginal respondents overall could remember a wider range of past attacks compared to non Aboriginal respondents and often events that took place a long time ago. This was a reflection of their long term residence (see demographic profile, Appendix 5). For instance, Napranum residents could remember the attack on P. Reimers (1975) while the Weipa residents did not. Hopevale residents also mentioned an attack that took place about 70 years ago (Pohlner 1986) and is still the object of heated debate as to why it happened and how. It was interesting that they also were the group with the highest recollection of the most recent attack in Groote Island (1990). As other respondents, their recollection of the Beryl Wruck attack (1985) was the highest which may suggest

that their geographic and cultural isolation may not be as significant as usually assumed.

The number of respondents accounts of the attack on Beryl Wruck (1985) was an indication of media attention but also a reflection of the fact that the survey was conducted in Queensland. Visitors rather than residents would mention attacks that occur elsewhere in northern Australia. The overwhelming mention of that attack with the Daintree residents (75%) was a testimony of its importance for that community. In many ways, as in Aboriginal communities, the event is still discussed and responsibility still sought despite the retaliation on the crocodiles following the attack.

The characteristics of the attacks mentioned above were described in terms of the victim characteristics (gender, cultural background), the circumstances in which they took place (in relation to the water), their outcome (fatal or survival), their location and date (see code book, Appendix 2). Seventeen attacks were documented. Most occurred during the summer months which may reflect the increased activity of crocodiles and unfortunately coincide with an increase in water based recreational activities (Pooley, Hines & Shield 1989). Seven of those occurred while the victim was swimming, 8 while the victim was at the water edge, on the beach, fishing or sleeping and two where the victim was canoeing. Eight of the victims were female and 9 were males, 10 attacks were on non Aborigines and 7 on Aborigines. The outcome was fatal in 11 cases and in 4 was not; of the survivors, 3 were Aboriginal and 1 non Aboriginal.

Those were then matched with respondents' accounts. It provided an insight on which aspects of those attacks were most remembered (Figure 5.12). Attacks were described in terms of the victims themselves, the circumstances of attacks, the outcome and the responsibility behind those events. It was found that most respondents could remember attacks where the victim was a female (52.01%) rather than a male (28.57%) which reflected the fact that the most reported attacks were on females. This was particularly the case in Townsville (61.7%) and for Daintree residents (71.43%). Swimming was the most remembered circumstance of attack (52.01%) particularly in Daintree (89.29%). In contrast, being at the water edge was not so well remembered (21.61%) which was interesting as half of the attacks mentioned occurred while the victims were at the water edge. It would suggest that respondents were not necessarily aware of the risks of being close to the water so well as being in the water. A majority of

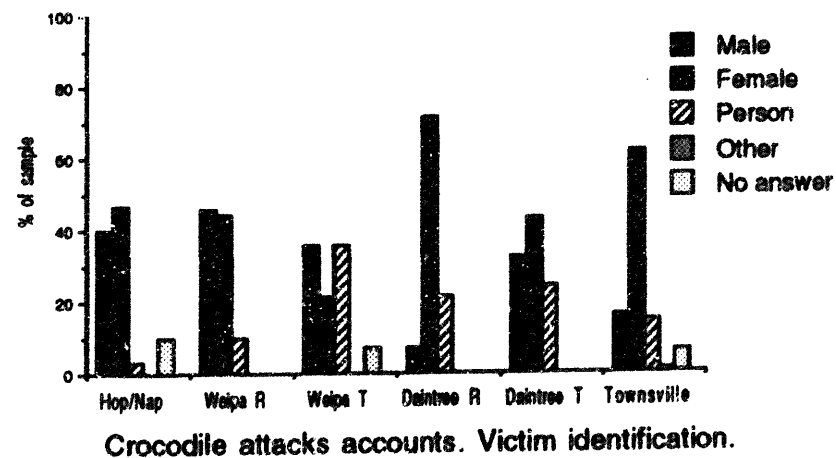
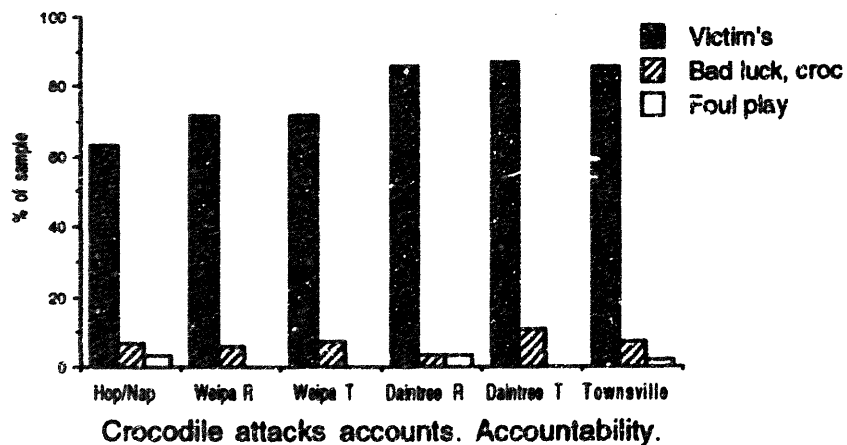
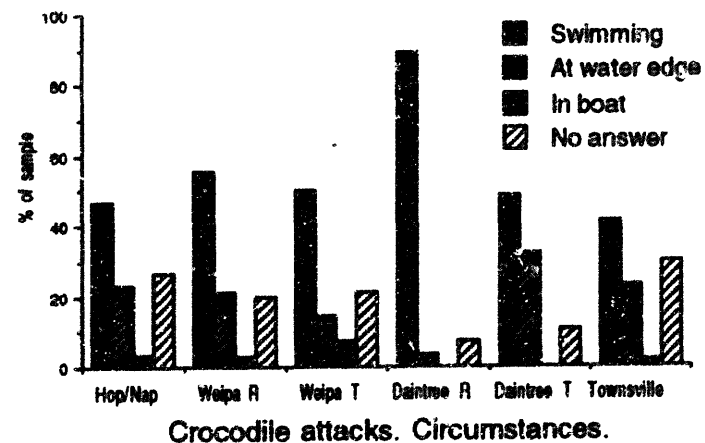
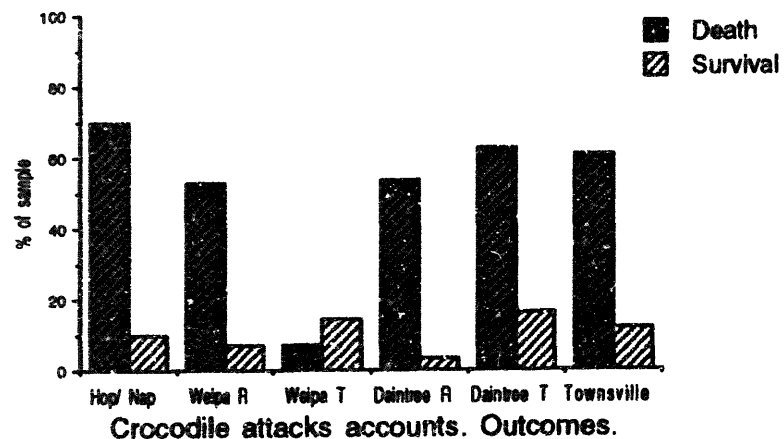


Figure 5.12 - Crocodile attacks accounts: outcome, victim identification, responsibility and circumstances (n=30, 70, 14, 28, 37, 94 respectively).

respondents could remember best attacks with a fatal outcome (56.41%), mostly residents of Hopevale/Napranum (70%), Daintree visitors (62.16%) and Townsville residents (60.64%), while a significant proportion of Weipa visitors (71.43%), Weipa residents (40%) and Daintree residents (42.86%) did not give any answer for outcome. How the responsibility was perceived by respondents showed that the victim was usually blamed for the accident (78.75%). This was mostly the case of non Aboriginal respondents particularly in Daintree (85.71% for residents and 86.49% for visitors) and in Townsville (85.11%). Aboriginal respondents were not as strong about blaming the victim (63.33%) and a significant proportion did not give any answer to that question (26.67%). Very few respondents answered they did not know (Figure 5.12).

5.14 - Summary and discussion

The salience of crocodiles as a safety issue was primarily a function of location and cultural background. However, crocodiles (as other wildlife related threats) were not the major concern for most respondents. The results showed that crocodiles were increasingly selected as a salient concern by both visitors and residents following a geographic transect from Townsville to Weipa (Figure 5.2). It coincided with an increased awareness of their presence associated with an increase in crocodile population density (Q.NPWS 1988-9) and remoteness from the wider community. This was a clear indication of the importance of location rather than resident status *per se* (temporary visitors were also concerned) in the selection of a particular risk for social attention and was congruent with the concept of vulnerability for a risk to be perceived at all (Hewitt 1983; Douglas 1986). There was a greater concern among Aboriginal compared to non Aboriginal residents in the vicinity of crocodile habitats which indicated that those responses may also have been culturally determined and reflecting distinct social organisations (Douglas 1986; Douglas & Wildavsky 1982).

The distribution of expressed concern among community groups reflected the social and geographical relevance of public safety and was consistent with the increased salience of crocodiles as a threat. It was overall low for non Aboriginal respondents except for residents of the remote community of Weipa and for Aboriginal respondents. Aboriginal respondents were very concerned about safety, significantly more than other residents near crocodile habitats; expressed concern increased following a northerly transect (Townsville to Weipa) irrespective of residence status (permanent or temporary); residents near crocodile habitats were more

concerned than Townsville residents. Expressed concern about safety did not only reflect the concern about personal safety (personal exposure to a particular hazard) but also the concern for public safety which involved social values and processes (equity between social costs and social benefits for instance).

Background, education and gender affected the distribution of expressed concern. Rural residents, respondents with primary education and non Aboriginal males were most concerned about safety. Aboriginal and non Aboriginal residents alike were mostly of rural background and had the largest percentage of respondents with primary education (except for Townsville residents). Visitors, in contrast, were mostly of urban background, part an economically privileged social fragment and only temporarily confronted with the presence of crocodiles at their holiday destination. Demographic categories of expressed concern about safety may in fact only have described the pattern of awareness of crocodile as a threat as a function of location, residence and cultural background rather than demographic characteristics *per se*. Alternative explanations of risk perception as presented in risk studies emphasise social influences on individual responses to risk and nature (see Figure 1.4 Chapter 1). The Grid and Group model, based on two orthogonal social axis, one of social constraints (Grid index) and one of group membership (Group index), defined 4 quadrants representing 4 types of social organisations and related cosmologies from which one could predict attitudes towards nature and risk. This model actually was in agreement with studies on the determinants of environmental concern (awareness) where a distinction was made between environmental concern *per se* and activism as a function of socialisation processes (Mohai 1985). This approach may in fact be more relevant to cross cultural studies where social expectations and socialisation processes affect environmental concern quite significantly (Taylor 1969; Dwyer & Hutchison 1990; Kellert & Berry 1987). In the present study, it was possible to identify certain groups with those ideal categories (Home keepers as "atomised individuals", Aboriginal respondents as "hierarchic individuals", farmers, fisherman and to some extent tourist operators as "network individuals"); however, the value of the model was hindered by a number of local factors which limited its use in interpreting the results. Residence near crocodile habitat affected expressed concern significantly; artificially grouped individuals in a remote location also expressed high concern about safety (Comalco employees in Weipa), artificially displaced individuals were unconcerned (visitors), and a culturally based gender pattern was also present.

It was difficult to establish a hierarchy of contributing factors to expressed concern about safety. Correlations were significant but not very strong although individual dependent variables (perceived exposure, perceived familiarity, knowledge, perceived hazard, experience) were in most cases significantly different between community groups. The reading of the contribution of different factors to expressed concern was therefore based on both the findings of the analysis, the qualitative analysis of open ended questions describing those factors and the ethnographic material gathered prior and during field work (Chapter 2).

By far the most significant factor was the perceived exposure of respondents which reflected their level of interaction with crocodiles and crocodile habitats, determined the impact of their personal experience on knowledge (expressed familiarity), risk assessment, and affected their safety behaviour. Respondents with low interaction were not concerned.

Respondents' perceived exposure to crocodile as a hazard was overall low, except for small number of Aboriginal respondents and Daintree residents whose perceived exposure was high and a few Weipa residents who thought it was moderate. Among those respondents, the frequency of and time spent in wetlands was quite high compared to others residents. This supported the initial statement of the remoteness of wildlife related threats such as crocodiles from most respondents' everyday life and the vicarious and essentially social nature of their concern. This was well illustrated in the knowledge of crocodiles respondents had, as mostly based on vicarious sources rather than personal experience (see Chapter 4). Wetlands were mostly used for recreational purposes (primarily recreational fishing and /or hunting), essentially a male dominated activity with non Aboriginal respondents, except for Daintree residents and a few Weipa residents whose work activities took them regularly into wetlands (tourism, farming and commercial fishing) and Hopevale/ Napranum respondents partly for subsistence and partly for cultural reasons.

Some level of personal experience of crocodiles was found among most respondents, particularly among residents near crocodile habitats for whom it was an important source of information and component of their attitudes towards crocodiles. Personal experience accounts were primarily of encounters with crocodiles in the wild even though most respondents had rarely had such encounters. Those were predominantly accompanied by fear unlike those with captive animals where interest/fascination in the animal dominated. Perhaps watching the animal behaviour from a secure and

controlled viewpoint, prevented the development of a healthy fear and left a feeling of excitement. There was, as a result, some danger of misreading the animal behaviour in captive situations and this may have contributed to the existing myths about crocodiles particularly with regards to their hunting and feeding behaviour as it was expressed in the knowledge of crocodiles (see Chapter 4). The impact of personal experience depended on the circumstances of those encounters : experience in the wild had a greater impact on feelings towards crocodiles and usually resulted in greater awareness of crocodiles and safety, while experience with captive animals did not affect respondents so much. Experience in the wild only was found among residents near crocodile habitats, particularly Aboriginal respondents and to a much lesser degree Daintree residents and Weipa residents. The greatest proportion of experience with captive animals was found among visitors and Townsville residents. The predominance of experience in the wild was associated with high expressed concern, as with Aboriginal respondents, and the predominance of experience in controlled situations was associated with low expressed concern, as in Townsville residents. There was a range of level of expressed concern about safety between these two poles depending on location and social factors. Although most residents in Daintree and Weipa gave accounts of personal accounts in the wild, expressed concern was much higher in Weipa than in Daintree and reflected both different level of perceived exposure but also different social circumstances (remoteness of Weipa). Similarly, experience with captive animals was associated with low expressed concern among Weipa visitors but high expressed concern with Daintree visitors and reflecting different level of interest and exposure to information on crocodiles and safety. There was no significant correlation between knowledge and expressed concern. Emotions generally seem to play a significant part in decision making in unexpected situations and to produce lasting changes (Oatley 1989; Ewert 1988). The application of this concept may be of importance for risk education. Increased emotional level in individuals may create a state of attention and receptivity necessary to process new information efficiently (for a discussion of the concept of mindfulness and environmental education see Pearce & Moscardo 1988).

Crocodiles were perceived as a major hazard by most respondents particularly by those by those near crocodile habitats and by Aboriginal respondents and their potential danger was the second most important factor affecting expressed concern. Fatal outcome, followed by unpredictability of attacks and helplessness were major factors affecting the concern about crocodile attacks. Unpredictability of attacks was significantly higher with Aboriginal respondents and Daintree visitors for quite

opposite reasons, in the first instance because of knowledge and experience, and in the second instance because of ignorance and little experience combined with high exposure to information on crocodiles and safety.

Respondents' risk assessment was full of inconsistencies and strongly affected by cultural differences and residence near crocodile habitats. The majority of respondents could not provide an answer on the frequency of attacks (residents gave more accurate estimates than visitors). The study however did not discriminate between fatal and non fatal attacks which may have been a source of confusion.

The inconsistencies in the respondents' assessment of the risk was in part the result of lack of supporting information but also a reflection of the lay person's difficulty with probabilistic thinking. There is a tendency to confuse the severity of the harm with the probability of occurrence of the harmful event which result in the overestimation of the risk, particularly at times when harmful events are the subject of high media attention (Sandman 1987; Brown 1989).

The perceived change in risk (probability of attacks) in the last 5 years was mostly perceived as an increase by most respondents and reflected residence near crocodile habitats, perceived exposure and cultural differences. Townsville and Weipa residents did perceive a moderate change; visitors were unsure; Aboriginal respondents and some of the Daintree residents saw no or little change. Reasons for change were attributed to an increase in crocodile populations, strongly expressed by residents in the vicinity of crocodiles habitats even though most did not know or could not give a reasonable estimate of crocodile population size (except in Weipa), rather than a change in the behaviour of crocodiles or lack of removal of crocodiles by trapping (except in Weipa and Hopevale/Napranum). The increase in human populations near crocodile habitats particularly in the Daintree region and Weipa, the overall complacency and ignorance of crocodiles (except for Aboriginal respondents) and increased media attention were also mentioned.

Most respondents recognised that human demography and human behaviour (complacency, ignorance of crocodiles, particularly of their potential hazard, and media attention) were more to blame in the increase of risk than crocodile population size and behaviour *per se*. This again reinforced the social nature of the concern about safety as being more a people's problem than a crocodile problem. However, crocodiles were often made responsible after a crocodile attack (see Daintree attack for example). Anecdotal evidence suggested that complacent

behaviour and ignorance were usually attributed to others (Field notes 1990) and individual respondents may have felt some degree of personal immunity ("I do the right thing myself"). This general trend though was not expressed with Aboriginal respondents where neither complacency nor ignorance were seen as having an effect on a change in risk if there was such a change, and the potential hazard of crocodiles was fully acknowledged at all time.

The uncertainty about risk assessment was compounded by the level of availability and quality of information on crocodiles. For instance, no comprehensive risk assessment was available at the time of the survey. Respondents therefore had to rely on a variety of information channels of variable quality, i.e. local knowledge with the expected degree of inaccuracy and the media mostly. The uncertainty about risk information combined with residence near crocodiles habitats and perceived exposure may produce an undesirable and volatile situation which could easily turn into a crisis in the case of fatal accidents. The importance in on going risk communication between risk bearers and risk managers and public consultation have been advocated in many situations involving technological risks resulting in a decrease in public concern (Covello, McCallum & Pavlova 1987; Goodland 1992).

In the case of personal risks such as dangerous wildlife, increased personal control may be seen as the power to influence management decisions but also as individual safety behaviour. In the case of crocodiles, the most commonly used strategy was the avoidance of perceived risky situation and the use of careful observation. However, safety behaviour as presented by the respondents was misleading; a few respondents actually listed strategies that they could not have been using because of their limited experience of crocodiles and crocodile habitats (visitors, Weipa and Townsville residents); at the same time, very few respondents actually admitted to risk taking behaviour despite most respondents giving a description of circumstances in which they would take risks, whether a calculated risk or out of ignorance or incidental to work or even recreational activities in wetlands. Although no significant relationship between safety behaviour and expressed concern was statistically established, it was fair to say that the amount of individual control respondents may have had, had an impact on their expressed concern in that showing the effect of familiarity and experience (Douglas 1986; Sandman 1987). The study showed that respondents with experience of crocodiles actually did not feel any less concerned on the contrary and this had to do with the fact that the more one knows about a risk the more anxiety one may feel (Ross 1989). The knowledge of dangerous circumstances

symbolised. The rather strong social control imposed on residents by the mining company within the boundaries of town may in fact have created a situation by which unacceptable social behaviour would take place outside the physical and social boundaries of the community. The dichotomy between inside/outside, social/asocial was reflected in the very layout of the town, community structure and social rules. The "wharf" community situated on the fringe of the township looked outwards to the river system (outside) and embodies asocial individualistic behaviour; the local pub there was considered a place of disorderly behaviour and witnessed the murder of German Jack, a locally famous crocodile shooter only weeks prior to the survey (Field notes 1990). A large number of crocodile stories, and their local heroes, emerged from that social group and infiltrated the rest of the community through word of mouth; rumour is after all an important channel of communication in isolated communities (Turner & Paz 1980). Rumour though is not an accurate source of information because it is by essence second hand, but it is powerful as it is an *in lieu* of adequate information in that contributing greatly to expressed concern (Douglas 1986). Considering the overall low exposure of many of those residents to crocodiles and the stated channels of communication in that community, I would suggest that that rumour had an important part to play in the residents' expressed concern along with the fact that the Weipa/ Port Musgrave, north of the township is an area of high crocodile population density which made that community quite vulnerable to undesirable encounters. Recreational hunting and fishing of the residents may have been interpreted as both recreation but also a social statement, and as an acknowledgment of the powerful image of the frontier, an essential cultural material for the social construction of the Australian identity (Ward 1978; White 1980; Hodge & Mishra 1990).

The impact of media could not be statistically correlated to expressed concern. However, the pattern of use of communication channels provided an indication of their role (see Chapter 4). The importance of media attention in focusing the public on particular issues and shaping public opinion should not be overlooked. In the case of crocodiles, the media were found a major source of information on risk (crocodile attacks), no matter how little trust respondents attributed to them; news in this study had little credibility while natural history books and Television documentaries were highly regarded. How justified that evaluation was needed some comments. While it was easy to say that the media were by essence after a scoop and sensationalism (reflecting opinions rather than facts), the same could not be said of documentaries (See Chapter 4). The amount of media attention crocodiles were able to generate was demonstrated to the author during the course of this study. Following

a press release issued by James Cook University, the news of the project spread fast and were followed by two days of harassment from nationwide media representatives (print media and radio stations). It was interesting to note that most journalists, when asked why they thought crocodiles were newsworthy, indicated exoticism, the danger and fascination as good elements for a scoop (Field notes 1990). It was more difficult to analyse the way in which animal life is presented in natural history documentaries. This would constitute a whole new approach in the study of attitudes towards nature and may use deconstruction theory used in literary criticism to unravel the process by which animals and nature are socially constructed. A number of studies have looked at the use of animals in advertising (Shepard 1978) and in children's literature (Sokolow in Kellert 1983) and at animal symbolism in the context of multicultural Australia (Croft 1991).

In this study, media attention was investigated through the analysis of respondents' accounts of crocodile attacks, an indirect measure of the degree of social attention crocodiles attracted. Although there were inherent problems with information retention, it was interesting to see that some crocodile attacks were more vividly imprinted into respondents' memory. Why this selection was the interesting point. It was of course the result of the proximity of respondents to a particular event (both in time and space) but also an inherent part of the way in which those events were recorded and presented to the public. The most cited crocodile attack was that on Beryl Wruck which took place in Daintree in December 1985. It had in common with other "famous" attacks a set of circumstances which made the victim even more vulnerable to the predatory assault, in this case, she was a woman, it happened on a Christmas night. The *innocence* of the victim was the necessary condition of the *evil* intention of the aggressor. However, the doubt was casted on this victim/aggressor relationship by the fact that the victim was intoxicated at the time, which provided a superimposed message of individual responsibility as well as of an unjust fate.

Crocodile attacks are by far the most reported news on crocodiles. They focus public attention on the unacceptability of their presence rather than on issue of public safety. Safety does not make the news. The emotional response to crocodile attacks is intense and irrational judgments about the risk are made. Media attention epitomize the underlying social conflict regarding the status of their habitat in the region and the legitimacy of management regime and institutional context. Crocodiles become a symbol of the local environmental politics (Tighe 1986). High public concern reflect social inadequacies and failure of current management procedures.

Responsibility and blame, in the absence of adequate channels, fall on the crocodiles themselves as it occur following the attack in Daintree in 1985.

This interpretation was based on cultural assumptions about death from natural causes as accidental, not a predictable event as it would be if the victim, the reporter and the society were Aboriginal. While it may be accepted that the blame rest on the victim 's irresponsible behaviour or fate rather than on institutional failure (O'Riordan 1976), from an Aboriginal perspective, the importance of establishing causality would be crucial in restoring social harmony.

Most respondents were prompt to identify the victim of an attack as the one to blame, in that reflecting the fact that personal risks (and safety) were not calling for social but individual responsibility or fate. There is today however a shift in attitudes towards social responsibility, traditionally seen as being found only in subsistence societies, in the way centralized institutions are increasingly held responsible for individual predicaments (Douglas & Wildavsky 1982). While social responses are now common in disasters and technological risks, it is not so for small scale personal risks such as wildlife related hazards. However, the issue of public safety is an integral part of crocodile management and as such the consequences of management decisions should imply some level of social liability. As respondents said, though, they still regard individuals as responsible for putting themselves in an exposed situation, at the same time they expressed the need for risk management in areas such as Weipa. In the present circumstances, the locus of control in crocodile management do not rest just with individuals' risk management but with agencies with international federal and state mandates. Management agencies have a social obligation to risk communication and prevention.

To conclude, although crocodiles were not perceived as a major threat to most respondents' everyday life, public safety was an important social issue particularly for residents near crocodile habitats. Attitudes to threat and safety mechanism were strongly affected by both situational and socic-cultural factors. In the next Chapter, those factors are investigated in relation to wildlife values and include a discussion of crocodile symbolism.

CHAPTER 6

THE CULTURAL ASPECTS OF ATTITUDES TOWARDS CROCODILES

In the previous chapter, the review of crocodiles as hazard showed that risk perception was affected by the cultural and social backgrounds of respondents. The values attributed to crocodiles and how they were expressed are presented in this chapter. It is placed in the context of the cultural themes from which attitudes towards nature and wildlife are derived. Animal preferences, empathy towards crocodiles, ecological, recreational and exploitative values as well as the symbolism associated with the fascination and fear of crocodiles are investigated.

6.1- Animal preferences

Respondents were asked to rank their interest in a number of animal species, genus or order (Question 51 questionnaire, Appendix 2). These included domesticated species, invertebrate species (marine and terrestrial), fish, reptiles, and amphibians.

The animals which were of greatest interest to respondents (ranked as '1st') were the barramundi (14.89%), reflecting both its commercial and recreational value in the region, the dog (16.85%) and the horse (12.36%), the only two domesticated species of the question, eagles (11.52%), corals (10.11%) and finally crocodiles (9.55%). All these animals could be seen as recreational assets of the region. The most favoured species ("1st rank") were either domesticated mammals (it would have been useful to discriminate between domestic and wild mammals) or useful or attractive wildlife species (barramundi, eagles, corals). Animals least favoured ("6th to 12th rank") were snakes (45.22%), native frogs (44.94%), butterflies (37.36%) and crocodiles (36.24%). Those species were either dangerous to humans or phylogenically distant (see Figure 6.1 and Table 6.1).

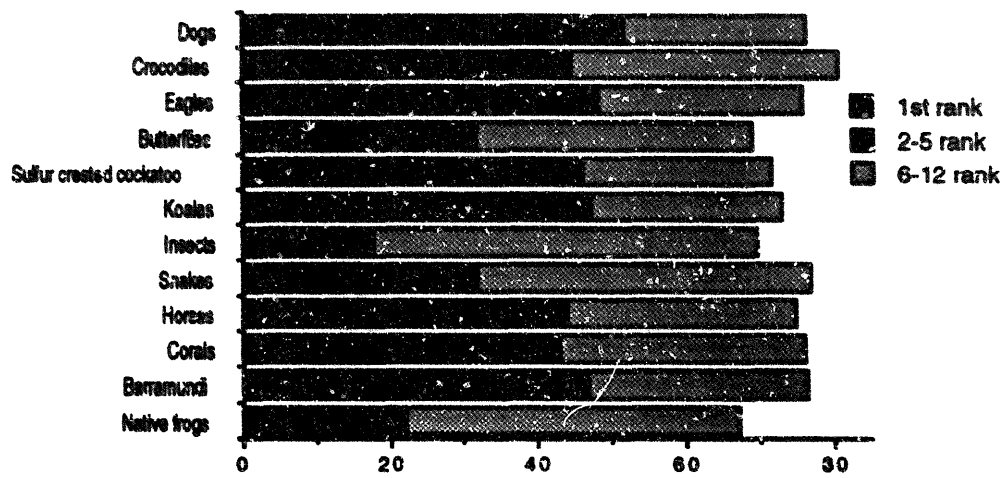


Figure 6.1 - Animal preferences among all respondents (n=356)

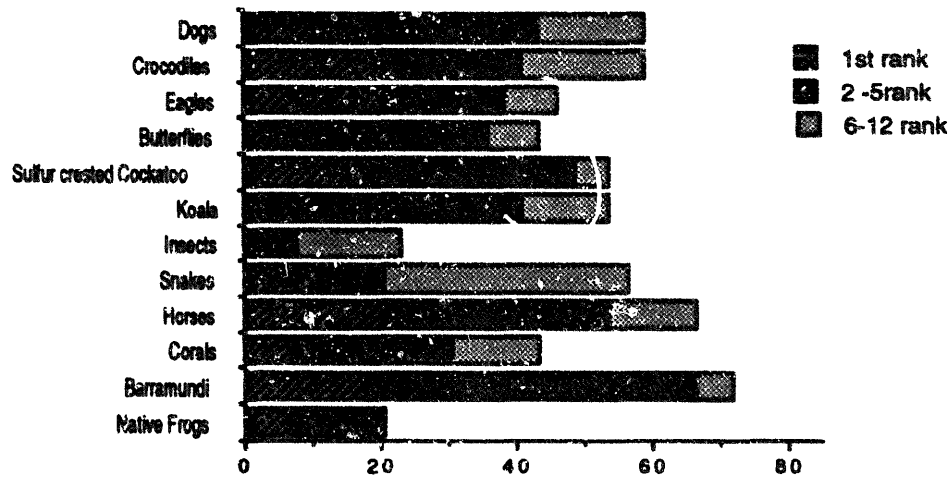


Figure 6.2 - Animal preferences among Aboriginal respondents (n=39)

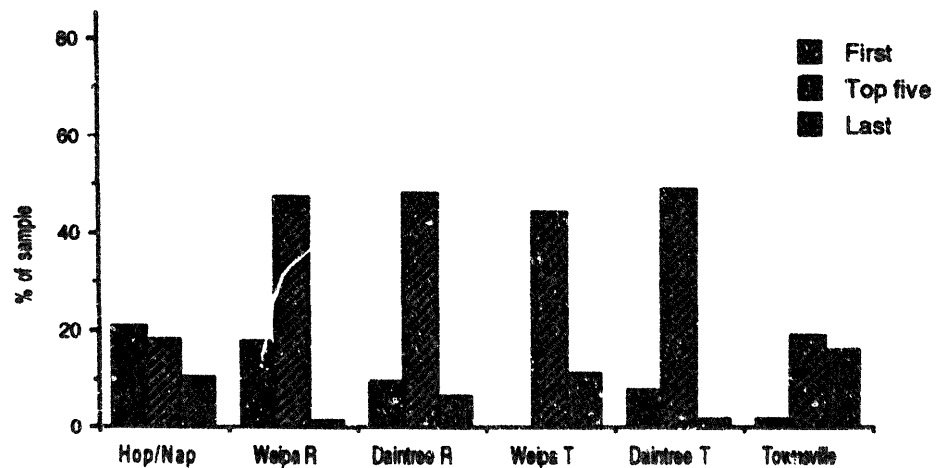


Figure 6.3 - Interest in crocodiles, expressed as rank and % of sample. (n=39, n=80, n=31, n=18, n=63, n=125 respectively)

| | Animals preferences | | |
|--------------------------|---------------------|-----------------|------------------|
| | 1st rank | 2nd to 5th rank | 6th to 12th rank |
| Native frogs | 5.34% | 16.84% | <u>44.94%</u> |
| Barramundi | <u>14.89%</u> | 32.02% | 29.49% |
| Corals | <u>10.11%</u> | 32.87% | 33.15% |
| Horses | <u>12.36%</u> | 31.46% | 31.18% |
| Snakes | 5.9% | 25.84% | <u>45.22%</u> |
| Insects | 2.54% | 15.17% | <u>51.97%</u> |
| Koalas | 8.71% | 38.76% | 25.84% |
| Sulphur crested Cockatoo | 7.58% | 38.76% | 25.56% |
| Butterflies | 3.93% | 27.81% | <u>37.37%</u> |
| Eagles | <u>11.52%</u> | 37.08% | 27.53% |
| Crocodiles | <u>9.55%</u> | <u>35.11%</u> | <u>36.24%</u> |
| Dogs | <u>16.85%</u> | 35.11% | 24.72% |

Table 6.1 - Animal preferences among all respondents expressed as the % of sample (n= 356).

Animal preferences among Aborigines differed significantly in their overall response rate, their ranking of crocodiles, eagles, koalas, horses (Figure 6.2). It was interesting to note that the koala was not seen as appealing to those respondents and the reason given was that they did not occur in the area (Field notes 1990); The least mentioned animals were native frogs and insects. The high ranking of the Sulphur crested Cockatoo was related to the fact that it was an important totem in Hopevale (Field notes 1990). It is likely that the crocodile and the eagle were also highly ranked for similar reasons - although only indirect evidence was given to the author (crocodiles totems are very common in Cape York Peninsula). Given the important role of Aborigines in the pastoral development of North Queensland, it was not surprising to see the horse ranked high among those respondents.

Both Aboriginal and non Aboriginal classifications showed the importance of familiarity, utility and symbolism as criteria for classification. Studies have shown that the perception of animals was dependent on size, intelligence, aesthetics, dangerousness, damage to property, phylogenic relatedness, domesticity, social structure, texture, cultural and historical relationships. Kellert (1985b) found that the most disliked animals were invertebrates (mostly stinging insects) and unattractive animals (amphibians, reptiles and fish) and the most liked animals were domesticated mammals (dog and horse). Paterson (1990) found that the dog, the horse, the cat and the dolphin were most popular with children while the rat, the crocodile, the wolf and stinging insects were the least popular. In the present study similar trends were found. However, a native fish species, the barramundi was ranked high along with the dog and the horse because of its regional commercial, subsistence and recreational values.

6.2- Crocodiles as species of Interest

The more specific interest in crocodiles ("1st rank") was found to be affected by location and cultural factors. Residents near crocodile habitats showed the highest percentage of interest in crocodiles ("1st rank"), representing 20.51% of Aboriginal respondents, 17.5% of Weipa residents and 16.31% of Daintree residents in that mirroring the selection of crocodiles as a threat (see Figure 5.3). These results indicated that the physical presence of crocodiles stimulated both concern and interest (Figure 6.3). However it should be noted that many Aboriginal respondents did not rank crocodiles at all (41.03%) compared to other respondents. The purpose of the question (interest in animals) and the method (ranking) may not have been relevant for Aboriginal respondents, as often their interest was either influenced by special associations (for example the Sulphur crested Cockatoo totem in Hopevale) with certain species in the list (Field notes 1990). Visitors did not see crocodiles as a animal of particular interest and generally ranked them "2th to 5th" in Daintree (49.21%) and Weipa (44.44%). Townsville residents were even less interested and crocodiles were ranked "6th to 12th" by 73.6% of those respondents (Table 6.2).

| | Interest in crocodiles | | |
|----------------------------|------------------------|-----------------|------------------|
| | 1st rank | 2nd to 5th rank | 6th to 12th rank |
| Hopevale/ Napranum (n=39) | 20.51% | 20.51% | 17.95% |
| Weipa residents (n=80) | 17.5% | 48.75% | 21.25% |
| Weipa visitors (n=18) | 0% | 44.44% | 44.44% |
| Daintree residents (n= 31) | 16.13% | 48.39% | 6.45% |
| Daintree visitors (n=63) | 7.94% | 49.21% | 4.76% |
| Townsville (n=125) | 1.6% | 19.20% | 73.6% |

Table 6.2 - The interest in crocodiles among community groups (n=356).

6.3- The empathy towards crocodiles

The typology of attitudes towards animals developed by Kellert (see Table 1.1) was adapted for the study of attitudes towards crocodiles. Relevant attitudes were *naturalistic* (interest in wildlife and the outdoor) *ecologistic* (interest in the ecosystem interactions between species and habitats), *moralistic* (concern with the right and wrong treatment of animals), *utilitarian* (concern for the practical value of species and their habitats), *dominionistic* (satisfaction from the mastery of animals), *negativistic* (fear of animals) and *symbolic* (as expressed in the fear and the fascination for crocodiles). The *utilitarian* (farming value), the *ecologistic* (ecological value) and the *naturalistic* (recreational value) values were

investigated in more detail because of their relevance to the management of crocodiles in the region.

| | Empathy towards crocodiles | | | | | p* value | N value |
|---|----------------------------|---------------------|-----------|---------------------|-------------------|---------------|---------|
| | Lower empathy | | Undecided | Higher empathy | | | |
| | Strongly disagree | Moderately disagree | | Moderately agree | Strongly agree | | |
| Crocodile's right of existence in their habitat (Q60) | 2.6% | 1.72% | 0.6% | 25.3% | <u>69.8%</u> | 0.29 | 348 |
| Public education to respect crocodiles and to behave safely (Q61) | 1.1% | 0.3% | 0.3% | 12.7% | <u>85.6%</u> | 0.06 | 347 |
| Crocodiles provide a unique experience of nature (Q 62) | 3.3% | 4.2% | 3.3% | 34.2% | <u>54%</u> | <u>0.006</u> | 330 |
| It is cruel to keep crocodiles in captivity (Q64) | 16.6% | 24.3% | 10.9% | 26.9% | 21.3% | <u>0.0001</u> | 338 |
| | Strongly agree | Moderately agree | Undecided | Moderately disagree | Strongly disagree | | |
| No excitement and adventure without crocodiles (Q63) | 11.3 | 15.2 | 47.8 | 19.9% | <u>48.9%</u> | 0.08 | 335 |
| Crocodiles are a nuisance in the tropics (Q65) | 16.6% | <u>24.3%</u> | 10.9% | <u>26.9%</u> | 21.3% | <u>0.0001</u> | 338 |

Table 6.3- Spectrum of attitudes towards crocodiles for all respondents, following Kellert's classification of animal values, ethical/ecological, naturalistic, dominionistic, utilitarian.
(*p<0.05 indicates significant differences between community groups).

There was no significant difference between groups regarding crocodiles' right to existence in their environment, the need to educate people to behave safely, and the value of crocodiles as symbol of adventure (Questions 60, 61 & 63, see questionnaire Appendix 2). Most respondents "strongly agreed" (69.8%) that crocodiles should have the right to exist in their environment ($p=0.29$, $n=348$) and that people should be educated to respect crocodiles and follow safety precautions at all time (85.6%) ($p=0.06$, $n=347$), in that reflecting ethical and ecological considerations and acknowledging the relevance of appropriate behaviour in crocodile habitats. A majority of respondents also "strongly disagreed" to the fact that there was no adventure and excitement in the tropics without crocodiles (57%) ($p=0.08$, $n=335$). The low occurrence in the study of the *dominionistic* attitude, usually found in sport hunters (Table 6.3), was in contrast with the American situation where sport hunting and fishing are very important and well organised activities (Kellert 1978,1983; Starnes 1980; Heberlein 1987; Valentine 1984).

There was however, significant differences between community groups regarded crocodiles as a unique experience of nature (question 62, $p=0.006$, $n=330$), the cruelty of keeping wild crocodiles in captivity (question 64, $p=0.0001$, $n=338$) and crocodiles as a nuisance (question 65, $p=0.0001$, $n=338$).

6.3.1 - Moralistic attitude

There was no obvious pattern for this question. However, the significance of the Chi-square test was primarily due to the strong disagreement by a number of Aboriginal respondents (31.58%, "strongly disagree") and to a lesser extent by Weipa residents (38.46%, "moderately"; 19.34%, "strongly disagree"). A few respondent were "undecided" particularly Townsville residents (18.42%) and Daintree visitors (15%) although the former group would give a balance response of agreement (41.23%) and disagreement (40.35%) while the latter group would rather disagree (60.67%). Weipa visitors would also disagree (55.55%) (Table 6.4).

| | It is cruel to keep wild crocodiles in captivity | | | | | N values |
|-------------------------|--|---------------------|---------------|------------------|----------------|----------|
| | strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | <u>31.58%</u> | 10.53% | 2.63% | 28.95% | 26.32% | 38 |
| Weipa residents | 19.34% | <u>38.46%</u> | 2.56% | 19.23% | 20.51% | 78 |
| Weipa visitors | 16.67% | 22.22% | 5.56% | <u>33.33%</u> | 22.22% | 18 |
| Daintree residents | 16.67% | 23.33% | 10% | 23.33% | <u>26.67%</u> | 30 |
| Daintree visitors | 5% | 13.33% | <u>15%</u> | 30% | <u>36.67%</u> | 60 |
| Townsville residents | 15.79% | 25.44% | <u>18.42%</u> | 29.82% | 10.53% | 114 |
| Totals | 16.57% | 24.26% | 10.95% | 26.92% | 21.3% | 338 |

Table 6.4 - Moralistic attitude among community groups ($p=0.0001$, $n= 338$).

Those respondents (Aboriginal respondents, Weipa residents and a few of Daintree and Townsville residents) who did not see captivity as cruel towards crocodiles may in fact have expressed an interest in a crocodile farming and a utilitarian view of animals (as shown in the distribution of farming value of crocodiles among those groups, section 6.5 this chapter). The notion of cruelty implied that animals were perceived as sentient beings. Animals ranking low in animal preferences often because of their distant phylogenetic relationship to humans may not be seen as sentient. Crocodiles because of their danger may not have attracted much humane feelings (see Chapter 1). Some Aboriginal respondents saw captivity as undesirable and perhaps unlawful given their attribution of moral status to animals and their

place in Aboriginal worldview, others may have seen captivity in relation to farming and income generation, as an extension of the pre contact use of crocodiles as a source of human subsistence (Field notes 1990). A number of those respondents mentioned the existing crocodile farm (Edward River Crocodile Farm Pty Ltd) at Pormpuraw (Edward River, Cape York Peninsula). The treatment of wild animals by Aborigines in many ways do not differ to that of domesticated animals raised by farmers for human consumption (Morton 1991).

6.3.2 - *Utilitarian attitude*

Most respondents would "moderately" (29.79%) to "strongly" (33.33%) disagree with the statement that crocodiles are a nuisance in the tropics (Table 6.5).

| | Crocodiles are a nuisance in the tropics | | | | | N values |
|-------------------------|--|------------------|-----------|---------------------|-------------------|----------|
| | Strongly agree | Moderately agree | Undecided | Moderately disagree | Strongly disagree | |
| Hopevale/ Napranum | 10.53% | <u>34.21%</u> | 0% | 23.68% | <u>31.58%</u> | 38 |
| Weipa residents | 15% | <u>30%</u> | 2.5% | <u>31.25%</u> | 21.25% | 80 |
| Weipa visitors | 5.56% | 27.78% | 5.56% | <u>33.33%</u> | 27.78% | 18 |
| Daintree residents | <u>26.67%</u> | 6.67% | 0% | 16.67% | <u>50%</u> | 30 |
| Daintree visitors | 1.67% | 15% | 6.67% | 28.33% | <u>48.33%</u> | 60 |
| Townsville residents | 7.08% | 12.39% | 15.04% | 34.51% | 30.97% | 113 |
| Totals | 10.03% | 19.76% | 7.08% | 29.79% | <u>33.33%</u> | |

Table 6.5- *Utilitarian attitude among community groups (p=0.0001, n=339).*

Half of Daintree residents "strongly disagreed" (50%) reflecting the importance of crocodiles as a tourist attraction and its economic benefits. Some Daintree residents (26.67%, "strongly agree", likely to include graziers) and Weipa residents (30%, "moderately agree", likely to include barramundi fisherman) saw crocodiles as a nuisance, an economic cost as well as a personal risk (Field notes 1990). However, the pattern of interaction of the majority of the respondents (see Table 5.22) and the limited impact of crocodiles on most respondents' livelihood may have explained the spread of opinions. Aboriginal respondents either "strongly disagreed" (31.58%) or "moderately agreed" (34.21%). The bimodal pattern of responses was also found in risk perception (see Tables 5.21 & 5.22).

Daintree visitors strongly disagreed (48.33%) while Weipa visitors only moderately did (31.25%). Townsville residents moderately disagreed (34.51%).

between questions 62 and 63 (recoded) (Spearman $Rho = -3.709$, $p = 0.0002$) indicating a compatibility between the idea of crocodiles as a unique experience crocodiles and as an attraction for adventure and excitement. There was no significant correlation between question 64 and other statements (see Table 6.3).

A composite score of empathy towards crocodiles was constructed using the above statements (Questions 60, 61, 62, 63, 64, 65). *Higher empathy* was defined as agreement with statements 60 and 61 (ethical / ecological value), 62 (naturalistic / recreational value), 64 (moralistic value) and disagreement with statements 63 (dominionistic value) and 65 (utilitarian value), the last two questions were recoded accordingly (Table 6.3); the reverse response pattern indicated a *lower empathy*.

Scores were recoded into 2 groups using 50th percentile value of 24. This index of empathy discriminated between respondents on their level of the utilitarian-ecological attitude (Table 6.3). The effect of demographic variables, as well as location, resident status and cultural background on the index of empathy were investigated.

The effect of location, residence status and cultural background on empathy

A majority of respondents had "lower empathy" towards crocodiles. Lower empathy was mostly found in residents and visitors in Weipa, residents of Hopevale and Napranum, and among a number of residents in Daintree residents and Townsville; "higher empathy" towards crocodiles was found in the Daintree region (the majority of residents, and visitors) and Townsville residents (Table 6.7). The concept of empathy used in this study was culturally biased towards an ecologically based environmental attitude (see Chapter 1). This was found not to appropriately account for Aboriginal views; it was not possible using this definition to differentiate their view from the utilitarian view of other respondents (see chapter 1). While the utilitarian attitude towards the non animal world is based on the right to exploit in western thought, it is based on a system of extended moral rights in Aboriginal thought which commands human responsibility for the welfare of non humans as well as their use for human subsistence (see Chapter 1).

| | Empathy towards crocodiles | | N values |
|----------------------|--------------------------------|---------------------------------|----------|
| | Lower (<24 median value) | Higher (>24 median value) | |
| Hopevale/ Napranum | <u>63.16%</u> | 36.84% | 38 |
| Weipa residents | <u>63.75%</u> | 36.25% | 80 |
| Weipa visitors | <u>55.56%</u> | 44.44% | 18 |
| Daintree residents | 43.33% | <u>56.67%</u> | 30 |
| Daintree visitors | 30.65% | <u>69.35%</u> | 62 |
| Townsville residents | <u>57.85%</u> | 42.15% | 121 |
| Totals | <u>53.85%</u> | <u>42.15%</u> | 349 |

Table 6.7- *The empathy towards crocodiles among respondents (p=0.0012, n=349).*

Empathy, knowledge and expressed concern

There was no significant correlation between respondents' empathy and their knowledge of crocodiles (Spearman $Rho=0.057$, $p=0.2851$, $n=349$) indicating that respondents' empathy must have been the result of factors other than information and probably linked to cultural values and expressed concern (Tables 5.3 & 5.4). Greater knowledge was found among residents near crocodile habitats (Tables 6.2 & 6.3). Those respondents were the ones with the least empathy towards crocodiles, and also the ones most concerned about safety. It was found that empathy was negatively correlated to expressed concern (Spearman $Rhc=-0.133$, $p=0.0134$, $n=346$). The negative correlation was high for Aboriginal respondents (Spearman $Rho= - 0.203$, $p= 0.02161$, $n= 38$), however, knowledge was positively correlated to empathy for those respondents ($Rho=0.327$, $p=0.00046$, $n=38$), indicating a close relationship between knowledge and empathy for Aboriginal respondents (possibly elders or totemites). Daintree residents had a higher empathy for crocodiles associated with a low level of expressed concern and a high knowledge score, which may have reflected the importance of crocodiles as an tourist attraction.

The effect of demographic variables on empathy

The level of empathy towards crocodiles was not significantly affected by rural/urban background ($p=0.8679$, $n= 348$), age ($p=0.2128$, $n=349$), gender ($p=0.3577$, $n=349$) and length of residence ($p=0.353$, $n=154$ residents near crocodile habitats only) but by occupation ($p=0.0159$, $n=318$), education ($p=0.0001$, $n=344$) and employment ($p=0.011$, $n=301$).

Occupation

| Occupation | Empathy towards crocodiles | | n values |
|----------------------|----------------------------|--------------|----------|
| | lower (<24) | Higher (>24) | |
| Labourer | <u>57.35%</u> | 42.65% | 68 |
| Trade/tech./cleric./ | <u>52.14%</u> | 47.86% | 117 |
| Paraprofessional | | | |
| Professional | <u>40%</u> | <u>60%</u> | 75 |
| Home keepers | <u>72.5%</u> | 27.5% | 40 |
| Primary producers | <u>61.11%</u> | 38.89% | 18 |
| Totals | <u>53.46%</u> | 46.54% | 318 |

Table 6.8 - Level of empathy in relation to occupation ($p = 0.0159$, $n = 318$)

"Lower empathy" was found among primary producers (61.11%), which was consistent with other findings on the *utilitarian* attitude of primary producers generally (Kellert 1978). Home keepers (most likely to be women) also expressed "lower empathy" (72.5%), despite no significant gender difference *per se* in the level of empathy. Home keepers also had lower knowledge scores (Table 4.8). Female respondents had overall a low knowledge score (Table 4.4), low interaction with wetlands (Table 5.24) and lower expressed concern in the case of non Aboriginal females (Table 5.8). Professionals had a significantly "higher empathy" towards crocodiles (60%) and included visitors to Daintree region. Those respondents were from a middle class urban background (see demographic profile, Appendix 5). Socio-demographic status (associated with education and urban background) as determinants of environmental concern (here "higher empathy" towards crocodiles) has been criticised (see Chapter 1). In this study, it was difficult to discriminate between the effect of residence near crocodile habitats from socio-demographic status because the majority of professionals were found in the visitor sample and in only a few residents of Daintree area. This pattern of response must be seen in relation to expressed concern and knowledge of respondents. Although professionals had "higher empathy" towards crocodiles, they knew little about them, in contrast with primary producers who had significantly higher knowledge scores but significantly "lower empathy" (Table 4.8).

Employment

"Higher empathy" was found with the unemployed (70%) while "lower empathy" was found with unpaid helpers (71.79%), CDEP workers (83.33%), retired respondents (61.11%), pensioners (62.50%) and self employed (56.76%) (Table 6.9). Wages earners, the majority of respondents ($n = 199$) and students ($n = 21$) were evenly divided between "lower" and "higher empathy".

| Employment | Level of empathy | | N values |
|-----------------|------------------|--------|----------|
| | lower | higher | |
| Unemployed | 30% | 70% | 20 |
| Unpaid helpers | 71.79% | 28.21% | 39 |
| Self/ employer | 56.76% | 43.24% | 37 |
| Wages/ Salaries | 49.75% | 50.15% | 199 |
| CDEP* | 83.33% | 16.67% | 6 |
| Totals | 52.82% | 47.18% | 301 |
| Students | 47.62% | 52.38% | 21 |
| Retired | 61.11% | 38.89% | 18 |
| Pensioners | 62.50% | 37.5% | 24 |
| Totals | 57.14% | 42.62% | 63 |

Table 6.9 - Level of empathy and employment pattern ($p=0.0111$, $n=301$ for respondents in the labour force, and $p=0.5558$, $n=63$ for respondents not in the labour force). *Note: Community Development Employment Program, Aboriginal respondents only.

The "lower empathy" of unpaid helpers was consistent with that of home keepers (Table 6.8) and related to gender and possibly social marginality (Kellert & Berry 1987; McStay & Dunlap 1983; Blocker & Eckberg 1989; Mohai 1985; James & Thompson 1989). The "lower empathy" of older respondents has been found in previous studies (see Chapter 1). "higher empathy" towards crocodiles was found with unemployed could not be readily explained. Those respondents were interviewed in Townsville (see Demographic profile, Appendix 5) where the level of empathy was found overall lower (Table 6.7). CDEP workers were exclusively Aboriginal respondents and their expressed "lower empathy" has been discussed in above (see Table 6.7).

Education

Respondents with a primary (63.33%) or secondary (64.04%) education had "lower empathy". Tertiary educated respondents (37.33%) and respondents with TAFE/ technical training (40.98%) had "higher empathy". Most tertiary educated respondents were visitors to Daintree and some of Daintree residents. Secondary education was mostly found in Hopevale/ Napranum residents, Weipa residents and visitors, and Townsville residents (see Demographic profile, Appendix 5). Those groups displayed "lower empathy" towards crocodiles (Table 6.7).

| Education | The level of empathy towards crocodiles | | N values |
|-----------------|---|--------------|----------|
| | Lower (<24) | Higher (>24) | |
| Primary | 63.33% | 36.67% | 30 |
| Secondary | 64.04% | 35.96% | 178 |
| Tertiary | 37.33% | 62.67% | 75 |
| TAFE/ Technical | 40.98% | 59.02% | 61 |
| Totals | 54.07% | 45.93% | 344 |

Table 6.10 - Level of empathy in relation to education ($p=0.0001$, $n=344$).

The use of demographic variables to explain the variation in empathy towards crocodiles seems to suggest that socio-demographic status may be associated with "higher empathy", as indicated by the consistent pattern of empathy with occupation, employment and education. However, as mentioned earlier, it was difficult to distinguish this effect from the effect of residence in the region, as most of those respondents were visitors. It was unfortunate that there was no significant difference in relation to background (rural/ urban) to support this finding. It may be due to the fact that Townsville residents were coded as "urban" (see code book, Appendix 2) which was relevant in the context of the study of crocodile as a risk and for knowledge scores, because it had in common the non residence near crocodile habitats with visitors; it was not necessarily useful in the context of empathy because it did not discriminate between Townsville residents who expressed values similar to those of rural respondents from those of visitors to the region of urban background. To differentiate between social status and residence, it would have been necessary to have a random visitors sample, which was not possible.

6.4 - "Willingness to pay"

How consistent with possible management options was with the empathy towards crocodiles. Respondents were asked to give an opinion on the relevance of compensation for negatively affected users of wetlands because of crocodiles, and on the restriction of use of certain areas of wetlands for the benefit of crocodile conservation (Questions 65 & 68, see questionnaire, Appendix 2). There was no significant correlation between respondents' level of empathy and the notion of no compensation for affected users (Spearman $Rho=0.55$, $p=0.3212$) and a significant correlation with the restriction of use of wetlands (Spearman $Rho=0.265$, $p=0.0001$).

6.4.1- Compensation for adversely affected users of wetlands

Most respondents "strongly agreed" with the idea of not compensating farmers and fishermen for their losses to crocodiles (44.92%) and represented 76.47% of Weipa visitors, 76.39% of Weipa residents, and 57.14% of Aboriginal respondents. In contrast, 33.33% of Daintree residents and 31.67% Daintree visitors "strongly disagreed". There was no clear pattern in the response of Townsville residents. A number of residents in Weipa (18.06%), Hopevale/Napranum (17.14%) and Daintree (13.33%) thought compensation should be considered in that reflecting the fact that those communities had the highest percentage of respondents exposed to

crocodiles (and adversely affected) through their use of the wetlands for work (farmers, fisherman) recreation or subsistence (Aboriginal respondents) (see Chapter 5, Section 5.10). However, this did not in most people's eye warrant compensation. The distinction between financial costs and social costs may clarified these responses. What respondents may have expressed was that the community at large should not take on financial costs of private operations. However, financial compensation could seen as a a way to alleviate the social costs of protecting crocodiles from unnecessary shooting. It is likely that those who denied compensation were not the cost bearers.

| | Farmers and fisherman should not be compensated for their loss because it is part of their work (Q66) | | | | | N values |
|-------------------------|---|---------------------|-----------|------------------|----------------|----------|
| | Strongly disagree | Moderately disagree | Undecided | Moderately agree | Strongly agree | |
| Hopevale/ Napranum | <u>17.14%</u> | 0% | 8.57% | 14.14% | <u>57.14%</u> | 35 |
| Weipa residents | <u>18.06%</u> | 2.78% | 0% | 2.78% | <u>76.39%</u> | 72 |
| Weipa visitors | 11.76% | 5.88% | 5.88% | 0% | <u>76.47%</u> | 17 |
| Daintree residents | <u>13.33%</u> | 13.33% | 13.33% | 26.67% | <u>33.33%</u> | 30 |
| Daintree visitors | 10% | 16.67% | 15.5 | 26.67% | <u>31.67%</u> | 60 |
| Townsville residents | 9.91% | 10.81% | 24.32% | <u>28.83%</u> | 26.13% | 111 |
| Totals | 12.92% | 8.92% | 13.54% | 19.69% | <u>44.92%</u> | 325 |

Table 6.11 - Respondents 'view on "Compensation for farmers and fishermen " ($p=0.0001$, $n=325$).

6.4.2 - Restriction on use of wetland acceptability

Respondents were asked to give their opinions on the possibility of restriction of use of wetlands for the benefit of crocodile conservation (Question 68, see questionnaire, Appendix 2).

Most respondents "moderately" (37.35%) to "strongly" (41.05%) accepted the possibility of some control of use of wetlands, particularly visitors to the Daintree area (64.52%). Weipa residents "moderately" accepted (44.74%) while Daintree residents were prepared to accept restrictions (44.44%, "a lot"). In Hopevale and Napranum, respondents were divided with 42.86% prepared to accept restrictions ("a lot") and 37.14% "not at all" (Table 6.12).

| | Acceptability of restriction on the use of some areas of wetlands to allow for the proper management of crocodile populations | | | | N values |
|-------------------------|---|----------|---------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | <u>37.14%</u> | 8.57% | 11.43% | <u>42.86%</u> | 35 |
| Weipa residents | 18.42% | 9.21% | <u>44.74%</u> | 27.63% | 76 |
| Weipa visitors | 7.14% | 0% | <u>64.29%</u> | 28.57% | 14 |
| Daintree residents | 14.81% | 11.11% | 29.63% | <u>44.44%</u> | 27 |
| Daintree visitors | 3.23% | 3.23% | 29.03% | <u>64.52%</u> | 62 |
| Townsville residents | 4.55% | 14.55% | <u>43.64%</u> | 37.27% | 110 |
| Totals | 12.04% | 9.57% | 37.35% | <u>41.05%</u> | 324 |

Table 6.12 - Respondents' opinions on the possibility of restricting use of certain areas of wetlands for conservation purposes ($p=0.0001$, $n=324$).

Residence near crocodile habitats (where the effect of restrictions would apply) and general attitudes towards crocodiles may have affected these results. Daintree visitors, who showed the greatest willingness to accept restrictions, and a higher empathy towards crocodiles (Table 6.7), would not be dramatically affected by such management actions; it reinforced the importance of location and residence status rather than demographic status of those respondents in determining the level of support for conservation measures.

Weipa visitors and residents as well as Townsville residents were only moderately willing to accept some restrictions, perhaps because some of them were the primary users of wetlands either for work or recreation (Section 5.10). A majority of these respondents also expressed lower empathy towards crocodiles (see Table 6.7), reflecting in some their expressed concern about safety (see Table 5.4), but more generally cultural factors such as frontier attitudes in the case of non Aboriginal respondents and a different worldview in the case of Aboriginal respondents. Lower empathy and unwillingness to change attitudes towards wildlife and wildlife management expressed by non Aboriginal respondents were not necessarily associated with expressed concern about safety and residence near crocodile habitats, but reflected historical attitudes towards nature, authority and social control, characteristic of frontier attitudes (Frawley 1991a, White 1981).

The acceptability of human management may be interpreted in the context of the perceived human impacts on crocodiles and the role attributed to crocodiles in wetlands (Section 4.5). The perceived importance of human impacts was significantly correlated to the acceptability of restriction (Spearman $Rho=0.307$,

$p=0.0001$, $n=308$) and to a lesser degree to the perceived importance of crocodiles in wetlands (Spearman $Rho=0.214$, $p=0.0001$, $n=300$). Both the latter were also significantly correlated (Spearman $Rho=0.286$, $p=0.0001$, $n=300$).

The role of crocodiles was perceived as very important to essential by most respondents (particularly by Daintree residents), while the perceived effect of human impacts was perceived as moderate by a majority of respondents. Daintree residents however perceived human impacts as high and Aboriginal respondents saw either no great effect or significantly less than other respondents (Table 4.8). Loss of habitat rather than direct effect on the species itself was the most commonly cited effect, except for Aboriginal respondents who saw the crocodiles "lifestyle" to be affected (see Figure 4. 2).

The polarised response given by Aboriginal respondents regarding their willingness to accept some management control was difficult to interpret. It was obvious that having used wetlands for thousands of years with no known detrimental effect to crocodile populations, why should they change now given their perception of a little impact of humans on crocodiles (see Table 4.8 & Figure 4.2). However, there was a number of Aboriginal respondents wishing to accept restrictions for the benefits of crocodiles, consistent with their concern for crocodiles' "lifestyle" and expressing Aboriginal worldview and relationship to the non human world rather than as a consequence of human (Aboriginal) impacts *strictu sensu*. The concern for the welfare of crocodiles encompassed the impacts of the wider community and as such Aboriginal respondents may have had the same position in principle as other respondents.

6.5 - Valuation of crocodiles

6.5.1- The value of crocodiles

Respondents were asked to say how valuable they thought crocodiles were. (Question 53, see questionnaire, Appendix 2). Responses were significantly different between community groups ($p=0.0001$, $n=338$). Crocodiles were considered as very valuable by a majority of Daintree residents (51%, "5") compared to Weipa residents (32.43% "4") and Aboriginal respondents (31.58% "5" & 31.58% "3"). Daintree visitors and Townsville residents showed a similar response pattern (37.1% "5" and 31.62% "5" respectively) (Table 6.12). Visitors to Weipa thought

crocodiles had no value at all (38.89% "1") which was interesting and consistent with the comparatively lower interest of that group in crocodiles (Table 6.2).

| | Perceived value of crocodiles | | | | | N values |
|-------------------------|-------------------------------|--------|---------------|---------------|--------------------|----------|
| | Not at all valuable 1 | 2 | 3 | 4 | Very valuable 5 | |
| Hopevale/ Napranum | 7.89% | 10.53% | <u>31.58%</u> | 18.42% | <u>31.58%</u> | 38 |
| Weipa residents | 17.57% | 12.16% | 13.51% | <u>32.43%</u> | 24.32% | 74 |
| Weipa visitors | <u>38.89%</u> | 11.11% | 22.22% | 11.1% | 16.67% | 18 |
| Daintree residents | 13.79% | 10.34% | 13.79% | 10.34% | <u>51.72%</u> | 29 |
| Daintree visitors | 3.32% | 4.84% | 27.42% | 27.42% | <u>37.1%</u> | 62 |
| Townsville residents | 1.71% | 7.69% | 23.08% | <u>35.9%</u> | 31.62% | 117 |
| Totals | 9.17% | 8.88% | 21.89% | 28.11% | <u>31.95%</u> | 338 |

Table 6.12a - Perceived value of crocodiles among community groups ($p=0.0001$, $n=338$).

Three crocodiles values (ecological, farming, recreational) were investigated in more detail following previous findings of significant differences between groups in the perception of crocodiles as a nuisance (utilitarian), a unique experience of nature (recreational) and their place in nature (ecological) (Tables 6.3, 6.4 & 6.5). There was significant differences between groups regarding these values (Table 6.13).

| | Crocodile values | | | | | p values | N values |
|------------|------------------|-------|-------|-------|--------------|----------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | | |
| Farming | 19.9% | 10.1% | 13.6% | 22.5% | <u>34.4%</u> | 0.0001 | 346 |
| Recreation | 13.6% | 15.3% | 22.5% | 23.1% | <u>25.4%</u> | 0.0001 | 346 |
| Ecological | 7.3% | 3.2% | 12.3% | 23.7% | <u>53.7%</u> | 0.0029 | 342 |

Table 6.13 - Crocodile values for all respondents ($p<0.05$ shows significant differences between community groups).

6.5.2 - The farming value of crocodiles

The farming value of crocodiles was considered high by quite a number of respondents (34.39%, "high"). Residence in the region as a whole rather than just near crocodile habitats was an important factor for the high score of farming value (Table 6.14). The highest farming value was found among Aboriginal respondents ((98.42%, "high") Daintree residents (43.33% "high") and Townsville residents (36.13%, "high"). Low farming value was found among a quite a number of Daintree residents (33.33%, "low"). The bimodal response pattern among Daintree residents has been encountered previously and reflected the social fabric of this community (see Demographic profile, Appendix 5) and the conflicting interests of

primary producers and tourists operators regarding crocodiles. A large number of Daintree Visitors (43.55%) attributed a low farming value to crocodiles in sharp contrast with Weipa visitors (44.44% "4") who attributed crocodiles a much high farming value.

| | The farming value of crocodiles | | | | | N values |
|-------------------------|---------------------------------|--------|--------|---------------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 high | |
| Hopevale/ Napranum | 10.53% | 2.63% | 2.63% | 15.79% | <u>98.42%</u> | 38 |
| Weipa residents | 12.66% | 3.8% | 15.19% | <u>37.97%</u> | 30.38% | 79 |
| Weipa visitors | 0% | 11.11% | 11.11% | <u>44.44%</u> | 33.33% | 18 |
| Daintree residents | <u>33.33%</u> | 13.33% | 3.33% | 6.67% | <u>43.33%</u> | 30 |
| Daintree visitors | <u>43.55%</u> | 16.13% | 14.52% | 14.52% | 11.29% | 62 |
| Townsville residents | 13.45% | 12.61% | 18.49% | 19.37% | <u>36.13%</u> | 119 |
| Totals | 19.36% | 10.12% | 13.58% | 22.54% | <u>34.39%</u> | 346 |

Table 6.14 - The farming value of crocodiles among community groups ($p=0.001$, $n=346$).

The high farming value found among Aboriginal respondents may be seen as reflecting the lack of employment opportunities in communities and the existing model of the Aboriginal run crocodile farm at Edward River (Cape York Peninsula). Their interest in crocodile farming was consistent with cultural values whereby animals although having a special place nonetheless still are the basis for subsistence (see Chapter 1).

6.5.3 - The recreational value of crocodiles

There was no clear pattern of response for the recreational value (Table 6.15).

| | The recreational value of crocodiles | | | | | N values |
|-------------------------|--------------------------------------|--------|--------|---------------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Hopevale/ Napranum | 7.89% | 13.16% | 23.68% | 13.16% | <u>42.11%</u> | 38 |
| Weipa residents | 3.8% | 5.06% | 22.78% | <u>35.44%</u> | 32.91% | 79 |
| Weipa visitors | 5.56% | 22.22% | 16.67% | 27.78% | 27.78% | 18 |
| Daintree residents | <u>30%</u> | 3.33% | 26.67% | 6.67% | <u>33.33%</u> | 30 |
| Daintree visitors | 17.74% | 14.52% | 22.58% | 24.19% | 20.97% | 62 |
| Townsville residents | 16.81% | 25.21% | 21.85% | 21.01% | 15.13% | 119 |
| Totals | 3.58% | 15.32% | 22.54% | 23.12% | 25.43% | 346 |

Table 6.15 - The recreational value of crocodiles among community groups ($p=0.0001$, $n=346$).

Recreational value was "high" with Aboriginal respondents (42.11%) as they saw crocodiles as an attraction for tourists, rather than for themselves (Field notes 1990) and by Daintree residents (33.33%), for similar reasons; however, a number of Daintree residents had the opposite view (30%, "low") and may have included respondents not connected with the crocodile based tourist industry. Weipa residents considered that crocodiles had some recreational value (35.44% "4") which may reflect the importance of outdoor recreation for those residents (Figures 5.4 & 5.5). There was a spread of opinions among Daintree visitors and Townsville residents clearly indicating that crocodiles did not necessarily interest those respondents; it was consistent with their ranking of crocodiles in animal preferences (Table 6.2). A number of Weipa visitors attributed crocodiles high recreational value (35.44%, "4"; 32.91%, "5") indicating the place of crocodiles in their "adventure to the tip of Cape York Peninsula", but not matched by a specific interest in crocodiles themselves (Table 6.2).

6.5.4 - The ecological value of crocodiles

The ecological value of crocodiles was perceived as "high" by a majority of respondents (53.51%), including 60% of Daintree residents and 61.29% of Daintree visitors, 63.64% of Townsville residents and 47.06% of Hopevale/Napranum residents (Table 6.16).

| | The ecological value of crocodiles | | | | | N values |
|-------------------------|------------------------------------|-------|--------|---------------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Hopevale/ Napranum | 17.65% | 5.88% | 17.65% | 11.76% | <u>47.06%</u> | 34 |
| Weipa residents | 10.39% | 3.4% | 10.39% | <u>38.96%</u> | 36.26% | 77 |
| Weipa visitors | 11.11% | 5.56% | 11.11% | <u>38.89%</u> | 33.33% | 18 |
| Daintree residents | 10% | 0% | 13.33% | 16.67% | <u>60%</u> | 30 |
| Daintree visitors | 1.61% | 0% | 17.74% | 19.35% | <u>61.29%</u> | 62 |
| Townsville residents | 4/13% | 4.13% | 9.09% | 19.01% | <u>63.64%</u> | 121 |
| Totals | 7.31% | 3.22% | 12.28% | 23.68% | <u>53.51%</u> | 342 |

Table 6.16 - *The ecological value of crocodiles among community groups (p=0.0029, n=342).*

Responses were not so clearly defined with Weipa residents (38.96%, "4" and 36.36%, "high") and Weipa visitors (38.89%, "4" and 33.33%, "high"). Although most respondents attributed high "ecological value" to crocodiles, this was not necessarily associated with the knowledge of what ecological function crocodiles may have had in wetlands (see Chapter 4, Section 4.4).

6.5.5 - Relationship between crocodile values

"Farming" value was positively correlated to recreational value (Spearman $Rho=0.33$, $p=0.0001$, $n=344$) but negatively correlated to the ecological value (Spearman $Rho=-0.145$, $p=0.0001$, $n=339$) and to the level of "empathy" towards crocodiles (Spearman $Rho=-0.238$, $p=0.0001$, $n=344$). Empathy and ecological values were positively correlated (Spearman $Rho=0.273$, $p=0.0001$, $n=339$). Ecological value was weakly correlated to recreational value (Spearman $Rho=0.115$, $p=0.0344$, $n=340$). It indicated that farming and recreation were perceived as compatible activities. Most of the northern Queensland community attributed high farming value to crocodiles, as opposed to the Daintree visitors, expressing in that their interest in the development of a new industry in the region, and some recreational value, reflecting local pattern of recreation in wetlands (see Figure 5.4). In contrast, respondents who saw the ecological value of crocodiles did not see farming and only a marginally recreation as compatible activities. This was interesting because people interested in nature conservation may not want to engage in nature based recreational activities (visitors to the Daintree area did spent little time in wetlands, see Section 5.10). It may in fact reflect the essentially vicarious nature of that interest. What was defined as "higher empathy" towards crocodiles in the previous section may in fact be more related to the ecological value of crocodiles while "lower empathy" may reflect more utilitarian value.

6.6 - Effect of demographic variables on crocodile values

Crocodile values were investigated in relation to gender, age, education, background and occupation (Table 6.17).

| Values | Demographic variables | | | | |
|--------------------|--|---------------------------------------|---|---|---------------------------------------|
| | Sex | Age | Education | Occupation | Background |
| Farming value | $p=0.2772$ | <u>0.0258</u> $n=346$ | <u>$p=0.0001$</u> $n=341$ | <u>$p=0.0001$</u> $n=315$ | $p=0.3273$ |
| Recreational value | <u>$p=0.008$</u> $n=346$ | 0.6041 $n=346$ | $p=0.042$ $n=341$ | $p=0.2605$ | $p=0.739$ |
| Ecological value | 0.8049 | $p=0.8837$ | <u>$p=0.0064$</u> $n=339$ | $p=0.1185$ | <u>0.0163</u> $n=341$ |

Table 6.17- The effect of gender, age, education, occupation and background on perceived crocodiles values ($p<0.005$ indicates significant differences between community groups).

6.6.1 - Farming value and demographic variables

Farming value was significantly affected by age ($p=0.0258$, $n= 346$) occupation ($p=0.0001$, $n= 315$) and education ($p=0.0001$, $n= 341$).

Age

"Farming" value was significantly "high" among older respondents (61+ years, 60.61%, "high"). However, the majority of respondents were between 15 and 45 years old and there was not such a difference between "low" and "high" farming value (Table 6.18).

| Age | Farming value | | | | | N values |
|----------|---------------|--------|--------|--------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| 15-30yrs | <u>24.31%</u> | 12.5% | 17.36% | 20.14% | <u>25.69%</u> | 144 |
| 31-45yrs | <u>20.69%</u> | 9.48% | 11.21% | 23.28% | <u>35.34%</u> | 116 |
| 46-60yrs | <u>11.32%</u> | 7.55% | 13.21% | 28.3% | <u>39.62%</u> | 53 |
| 61yrs+ | <u>6.06%</u> | 6.06% | 6.06% | 21.21% | <u>60.61%</u> | 33 |
| Totals | 19.36% | 10.12% | 13.58% | 22.54% | <u>34.39%</u> | 346 |

Table 6.18 - Farming value of crocodiles and age ($p=0.0258$, $n=346$).

Education

Primary educated respondents thought crocodiles had a high farming value (83.33%, "high"). As the level of education increased, the farming value of crocodiles decreased and it was found the lowest with tertiary educated respondents (31.08%, "low"). Primary educated respondents included mostly Aboriginal respondents while tertiary educated respondents included primarily visitors to the Daintree area, some residents in Daintree and Townsville (see Demographic profile, Appendix 5).

| Education | Farming value | | | | | N values |
|------------|---------------|--------|--------|---------------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Primary | 6.67% | 3.33% | 0% | 6.67% | <u>83.33%</u> | 30 |
| Secondary | 17.05% | 10.23% | 13/07% | 23/86% | <u>35/86%</u> | 176 |
| Tertiary | <u>31.08%</u> | 16.22% | 13.51% | 20.27% | 18.92% | 74 |
| Tafe/Techn | 18.03% | 6.56% | 21.31% | <u>29.51%</u> | 24.59% | 61 |
| Totals | 19.35% | 10.26% | 13.49% | 22/58% | 34.31% | 341 |

Table 6. 19 - Farming value of crocodiles and education ($p= 0.0001$, $n=341$).

Occupation

The farming value of crocodiles was highest among primary producers (83.33%), labourers (39.71%), trade persons, clerical employees and paraprofessionals (34.19%) while it was the lowest with professionals (34.25%) (Table 6.20).

| Occupation | Farming value | | | | | N values |
|------------------------------------|---------------|--------|--------|--------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Labourer | 17.65% | 7.35% | 10.29% | 25% | <u>39.71%</u> | 68 |
| Trade/techn./Clerical/Paraprofess. | 16.24% | 8.55% | 18.8% | 22.22% | <u>34.19%</u> | 117 |
| Professional | <u>34.25%</u> | 19.18% | 9.59% | 16.44% | 20.55% | 73 |
| Home duties | 10.26% | 10.26% | 15.38% | 33.33% | <u>30.77%</u> | 39 |
| Primary producers | 0% | 0% | 5.56% | 11.11% | <u>83.33%</u> | 18 |
| Totals | 19.05% | 10.48% | 13.65% | 22.22% | <u>34.6%</u> | 315 |

Table 6.20 - Farming value of crocodiles and occupation ($p=0.0001$, $n=315$).

The farming value of crocodiles, which represented an utilitarian attitude towards animals generally, was highest among older respondents, respondents with primary and secondary education, all primary producers and one third of blue collars and some white collars. This identified specific groups in the communities surveyed such as farmers from the Daintree area (most of them being over 60 years old), the small number of fisherman in Weipa, Aborigines (primary education), labourers and home keepers, and the majority of residents in the region (see Demographic profile, Appendix 5) whose utilitarian attitudes could be seen in the context of the frontier attitudes described earlier (see Chapter 1). Weipa visitors, demographically distinct from the visitors to the Daintree area but close to the residents in the region (see Demographic profile, Appendix 5) conformed to the regional pattern. It was significant that Daintree visitors, a demographically homogeneous group (young, educated and professionals) did not see any farming value in crocodiles.

6.6.2 - Recreational value and demographic variables

The recreational value of crocodiles was significantly affected by gender ($p=0.0008$, $n=246$) and education ($p=0.042$, $n=341$).

Education

High recreational value was associated with primary education (55.17%, "high"). The majority of respondents with primary education were Aboriginal respondents and some of the primary producers (see Demographic profile, Appendix 5). As

mentioned earlier, Aboriginal respondents thought crocodiles were an attraction for non Aborigines (Table 6.21).

| Education | Recreational value | | | | | N values |
|------------|--------------------|--------|--------|--------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Primary | 13.79% | 6.9% | 10.34% | 13.79% | <u>55.17%</u> | 29 |
| Secondary | 12.99% | 16.38% | 25.42% | 23.16% | 22.03% | 177 |
| Tertiary | 13.51% | 21.62% | 21.62% | 25.68% | 17.57% | 74 |
| Tale/Techn | 13.11% | 9.84% | 22.95% | 24.59% | 29.51% | 61 |
| Totals | 13.2% | 15.54% | 22/87% | 23.17% | 25.22% | 341 |

Table 6.21 - *Recreational value of crocodiles and education* ($p=0.042$, $n=341$).

Although a majority of people saw crocodiles as a unique experience of nature (Table 6.6) and despite their commercial promotion in the Daintree area and their use as a major symbol of northern Queensland (see further this chapter), crocodiles did not attract high recreational value. It may be interpreted in the context of their potential danger, the overall "lower empathy" of most respondents towards them and low ranking in animal preferences.

Gender

The recreational value of crocodiles was influenced by gender (Table 6.22). While there was a significant effect of gender on recreational value for non Aboriginal respondents ($p=0.0114$, $n=308$), there was none for Aboriginal respondents ($p=0.5671$, $n=38$), indicating the cultural basis of this difference as previously mentioned for the knowledge of crocodiles (see Chapter 4) .

| Gender | Recreational value of crocodiles | | | | | N values |
|--------|----------------------------------|--------|--------|---------------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Female | <u>20.42%</u> | 19.01% | 20.42% | 21.83% | 18.31% | 142 |
| Male | <u>9.04%</u> | 12.65% | 24.1% | <u>26.51%</u> | <u>27.71%</u> | 166 |
| Totals | 14.29% | 15.58% | 22.45% | 24.35% | 23.38% | 308 |

Table 6.22 - *Recreational value and gender among non Aboriginal respondents* ($p=0.0114$, $n=308$).

High recreational value of crocodiles was found primarily in non Aboriginal male respondents (26.51%, "4" and 27.71%, "5"). Quite a number of female respondents attributed a low recreational value (20.42% "1") and a much smaller number a high "recreational" value (18.31%, "5", and 21.83%, "4"). These results mirrored in fact the findings of pattern of use of wetlands (Figures 5.4 & 5.5) and indicated that male respondents were more likely to use wetlands for recreation and work, however not with a difference which could explain the difference in the responses of males and females. It may be that female actually were passive recreationists (go along with the family), but may not be particularly

interested in the type of outdoor recreation they engaged in, and this was reflected in those results. It was shown too that females (at home particularly) had "lower empathy" towards crocodiles generally (Table 6.8).

The recreational value of crocodiles which represented the *naturalistic* attitude towards animals was highest among respondents with primary, secondary and technical education and among non Aboriginal male respondents. Occupation, age, background had no significant effect on recreational value of crocodiles. The recreational value of crocodiles was found higher among residents near crocodile habitats (Weipa, Daintree residents and Hopevale/Napranum) rather than among visitors (even Weipa visitors) and seemed to be associated with recreational fishing particularly in remote areas where crocodile viewing may be an bonus. Visitors obviously thought there were other recreational opportunities in the area (see animal preferences). The recreational value of crocodiles may also be affected by their dangerousness. The effect of gender should be seen as an important cultural trait of western culture where wild animals generally and fierce ones in particular are seen a challenge to masculinity.

6.6.3 - Ecological value and demographic variables

Education ($p=0.0064$, $n=336$), and background ($p=0.0163$, $n=341$) were the two demographic variables which had any significant effect on ecological value.

Background

The majority of respondents gave crocodiles a high ecological value (53.37%, '5'), and it was mostly associated with "urban" background (62.59%, '5') (Table 6.23).

| Background | Ecological value of crocodiles | | | | | N values |
|-------------|--------------------------------|-------|--------|--------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Rural | 8.11% | 2.7% | 17.12% | 26.13% | <u>45.95%</u> | 111 |
| Urban | 4.08% | 2.72% | 10.2% | 20.41% | <u>62.59%</u> | 147 |
| Urban/rural | 12.7% | 1.59% | 12.7% | 26.98% | <u>46.03%</u> | 63 |
| Other | 10% | 15% | 0% | 25% | <u>50%</u> | 20 |
| Totals | 7.33% | 3.23% | 12.32% | 23.75% | <u>53.37%</u> | 341 |

Table 6. 23 - Ecological value of crocodiles and background ($p=0.163$, $n=341$).

Education

The ecological value of crocodiles was perceived as "high" by the majority of respondents (53.69%) but most specifically by tertiary educated respondents (72%) (Table 6.24).

| Education | Ecological value of crocodiles | | | | | N values |
|-------------|--------------------------------|-------|--------|--------|---------------|----------|
| | Low 1 | 2 | 3 | 4 | 5 High | |
| Primary | 17.86% | 0% | 7.14% | 21.43% | <u>53.57%</u> | 25 |
| Secondary | 7.43% | 2.86% | 17.71% | 23.43% | <u>48.57%</u> | 175 |
| Tertiary | 2.67% | 4% | 2.67% | 18.67% | <u>72%</u> | 75 |
| Tafe/Techn. | 8.2% | 4.92% | 9.84% | 31.15% | <u>45.9%</u> | 61 |
| Totals | 7.37% | 3.24% | 12.09% | 23.6% | <u>53.69%</u> | 339 |

Table 6.24 - Ecological value of crocodiles and education ($p=0.0064$, $n=339$).

Urban respondents with tertiary education included the visitors to Daintree and some of its residents and some of Townsville residents (see Demographic profile, Appendix 5). However, those community groups had an overall low knowledge score (Tables 4.3 & 4.6) superficial understanding of the role of crocodiles in the ecosystem (Figure 4.2) and hardly any interaction with crocodiles. It may suggest that environmental concern did not imply knowledge and experience but was rather an expression of political, social and cultural choice. The remoteness of those respondents from the locus of management conflicts made their position fairly easy to hold.

6.7- The symbolic and historical aspects of attitudes towards crocodiles.

This was perhaps the most important and yet the most difficult aspect of attitudes to assess. As outlined by Kellert (1987) and Shepard (1978), animal as symbols are an important aspect of human growth and communication systems.

In the study of animal preferences, it was shown that factors such as size, domesticity, intelligence, phylogenic relatedness, aesthetics, dangerousness texture social structure and cultural associations were responsible for the dislike and fear of animals. The most disliked animals were unattractive, and associated with human injury, often invertebrates and reptiles (Kellert 1985b; Paterson 1990). This was also illustrated by the present study (Sections 6.1 & 6.2). The symbolic aspects of crocodiles which were responsible for their unpopularity were investigated by asking respondents to indicate the reasons they thought made

crocodiles both fearsome and yet fascinating (Questions 17 & 70, see questionnaire, Appendix 2).

Based on the assumption that what is a source of fear may also be a source of fascination, the same dimensions were used for both questions on fear and fascination. They were based on a number of studies which had looked at the fear of animals (Fenton and Hills 1988; Bowd 1983, 1984a & 1984b; Ewert 1988) and animal symbolism (Miller 1983; Graham & Beard 1990; Kellert 1985b; Shepard 1978; Willis 1974). This study identified a number of dimensions of fear and fascination: "physical appearance", "primitiveness", "anthropomorphic features" and other culturally produced features, "predation", mystery and "uniqueness" as a species and "current status" (rare or common) (see code book for details, Appendix 2).

6.7.1 - The fear of crocodiles

In chapter 5, it was shown that most respondents had not experienced any fear of crocodiles except Aboriginal respondents and very few of the residents of Weipa and Daintree (Tables 5.28 & 5.29) who had personal experience of an encounter with a crocodile in the wild (Figure 5.6). Fear was readily expressed by Aboriginal respondents and a major aspect of their attitude and concern about safety, unlike other respondents (Figure 5.7).

Respondents were asked to explain what made crocodiles fearful. The overwhelming response was "predation" for all groups. This was quite expected as crocodiles are one of the very few natural predators capable of taking humans as a prey. The second most significant dimension was the "physical appearance" of crocodiles (jaws, teeth scales, claws) particularly with Aboriginal respondents and visitors (Figure 6.4). "Predation" was a particularly important aspect of fear among Daintree residents and was probably related to the crocodile attack on Beryl Wruck in Daintree in 1985. It was somehow lower than other groups for the Weipa visitors, despite their presence in "crocodile country". Those respondents in fact indicated "primitiveness" as the major aspect of their fear; they were not highly concerned about safety either (Tables 5.3 & 5.4) but had high knowledge of crocodiles (Table 4.3) and crocodile attacks (Table 5.40).

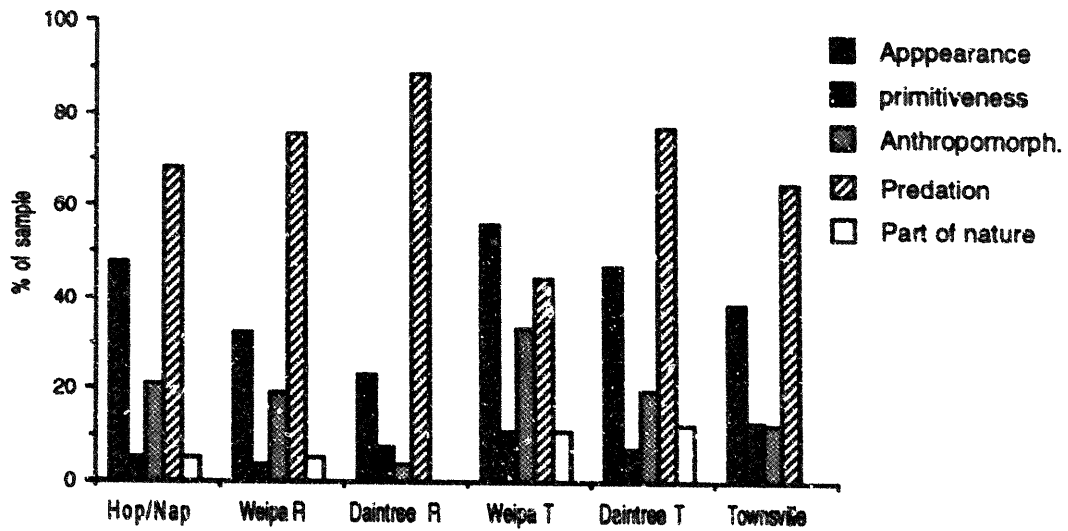


Figure 6.4 - Major components of the fear, of crocodiles, expressed as % of sample (n=39, n=80, n=18 n=31, n=63, n=125)

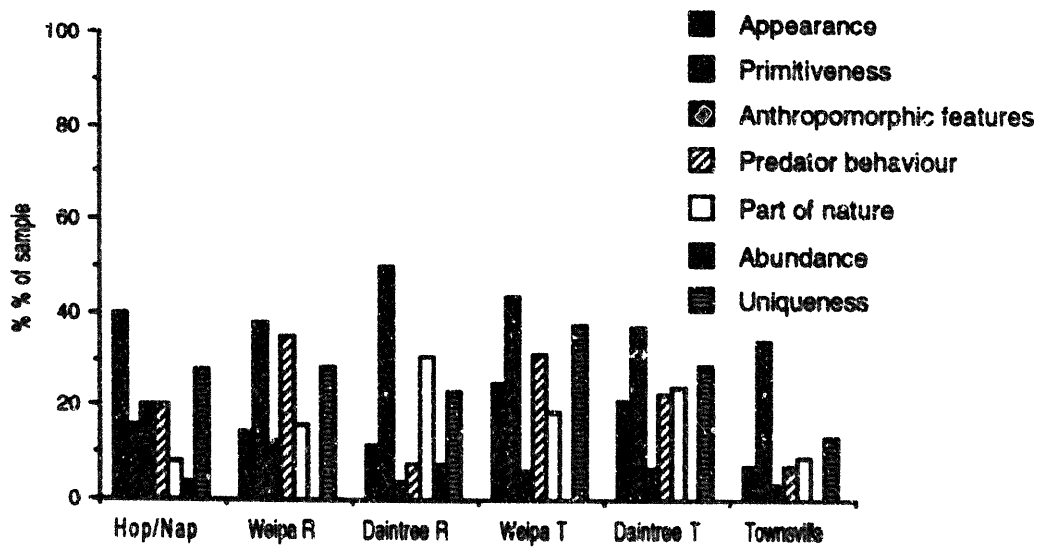


Figure 6.5 - Components of the fascination for crocodiles, expressed as % of sample (n=39, n=80, n=18 n=31, n=63, n=125)

The association between "physical appearance" and "predation" in the fear of crocodiles was interesting because the visual element on its own may trigger a strong emotion of fear at the thought of the act of predation on humans in the absence of a real situation. The perceived monstrous appearance of crocodiles and perceived absence of emotions (both expressing phylogenetic remoteness) may be interpreted as sign of primitiveness and animality (as opposed to humanity).

6.7.2 - The fascination for crocodiles

Respondents were asked to say how fascinating crocodiles were (Question 69, see questionnaire, Appendix 2). A majority of respondents (47.67%, "a lot"), including residents near crocodile habitats and visitors, thought crocodiles were "very" fascinating animals. In contrast, Townsville residents thought they were only "moderately" (32.2%) to "very" (33.05%) fascinating. Respondents who had no fascination for crocodiles were predominantly Aboriginal respondents (29.73%, "not at all") and Weipa residents (21.52%, "not at all"). It may be that living close to a large crocodile population may reduce the fascination and instead promote a healthy fear and respect for crocodiles. It was certainly true of Aborigines who admitted to their fear unlike Weipa residents (see Table 5.29, Figure 3.1 & Field notes 1990). Both groups were the most concerned about safety (see Table 5.4).

| Community groups | The fascination for crocodiles | | | | N values |
|-------------------------|--------------------------------|----------|------------|---------------|----------|
| | Not at all | A little | Moderately | A lot | |
| Hopevale/ Napranum | <u>29.73%</u> | 5.41% | 8.11% | <u>56.76%</u> | 37 |
| Weipa residents | <u>21.52%</u> | 1.27% | 25.32% | <u>51.9%</u> | 79 |
| Weipa visitors | 16.67% | 0% | 27.78% | <u>55.56%</u> | 8 |
| Daintree residents | 16.67% | 10% | 20% | <u>53.33%</u> | 30 |
| Daintree visitors | 0% | 11.29% | 29.03% | <u>59.68%</u> | 62 |
| Townsville residents | 13.56% | 21.19% | 32.2% | <u>33.05%</u> | 118 |
| Totals | 15.12% | 11.05% | 26.16% | <u>47.67%</u> | 344 |

Table 6.25 - The fascination for crocodiles among community groups ($p=0.0001$, $n=344$)

It was found that the dominant features of fascination were "primitiveness", "uniqueness" and "predation" for non Aboriginal respondents and "physical appearance" and "uniqueness" for Aboriginal respondents (Figure 6.5). The way in which people perceived crocodiles reflected different cultural constructions of animals which were expressed in animal preferences as well as in the attributes of

fear and fascination. Coping symbolically with crocodile as a potential predator of humans may be expressed in a variety of ways according to cultural circumstances. In a western context, "primitiveness" and "predation" may be seen as attributes of non human (beasts), a symbol of evil, chaos and irrationality and a reminder of the moral boundary between humans and non humans. "Predation" (on humans) may be used as a symbol of transgressing that boundary and may be responsible for the morbid fascination for crocodile attacks (see Section 5.13.3). The fundamental fear of being eaten by a crocodile may be seen as a way to confront the taboo of cannibalism which prevents humans from eating human flesh in western culture (Graham & Beard 1990).

During the survey, crocodiles have been qualified as "evil", "treacherous", "canny", "vicious", "sleazy" (Field notes 1990). These adjectives in fact expressed anthropomorphic descriptions of crocodile behaviour as well as a fundamental ignorance of crocodilians' biology and ecology (see Chapter 4). They have been referred to as killing machines by some male respondents, a combination of power and efficiency combined with absence of feelings and a reason for fascination (Field notes 1990). Other respondents clearly indicated that crocodiles were evil and some even said that Barrat Creek, where Beryl Wruck was attacked (Daintree 1985), was an evil place too (Field notes 1990).

However, this ethnocentric interpretation could not be used to explain Aboriginal responses. Aboriginal stories feature crocodiles as essentially humanised with feelings and predictable behaviour (see Appendix 6 and Chapter 1). They often portray old crocodiles, perhaps reflecting a gerontocratic society, who steal young women for sexual purposes or as wily, sly and great cowards (Gordon 1986; Hall per. comm., Heath 1980; McConnell 1957; Napranum, Field notes 1990; Roth 1984). They also can be benevolent to their totemites (McConnell 1957; Yununpigi 1986). Stories of old Aboriginal men riding crocodiles are not unheard of in Cape York Peninsula (Bennett 1983). What those stories show is the integration between the human and the non human world in contrast with the dualistic view of western culture. This humanised perception of crocodiles, whether feared or venerated do not conform with a pyramid of the life forms, from primitive to advanced, with humans at the apex and sole moral agents as it is presented in western tradition. Instead, the extension of moral rights to animals means that their behaviour may be predictable, provided appropriate rituals are performed.

Why would "physical appearance" and "uniqueness" rather than "primitiveness" (unlike other respondents) be important in both the fear and the fascination (when expressed) of crocodiles for Aboriginal respondents may be related to differences in cultural patterning of perception and cognitive processes. Those differences have been investigated in comparative studies of folk taxonomies and scientific taxonomy (Berlin, Breedlove & Raven 1973; Dwyer 1985). Those studies showed that classification of entities are patterns imposed upon the world arising from the interactions of people with the world, different people use using different criteria for grouping and different modes of explanation to reconnect entities (Dwyer 1985). Aboriginal animal classification have been seen to differ from the scientific classification: for example, lizards in *Kuuk Thaayorre*, the language of the Edwards River Community (Cape York Peninsula), are classified on the basis of body shape and merge together a number of related species (see lizard classification system Taylor 1984, PHD vol 1, p. 50). This may explain why "physical appearance" of crocodiles was presented as the major attribute of fear and fascination, perhaps because it is an important cognitive tool for establishing discontinuities in the physical world in Aboriginal culture. However a number of Aboriginal respondents did not expressed any fascination at all, it may be seen in the fact that fascination implies some element of unfamiliarity and dissimilarity which obviously would not apply in the case of crocodiles but could apply to others aspects of their environment than could not be readily explained.

6.8 - The crocodile as a symbol of northern Queensland

Crocodiles are represented widely in the imagery of northern Queensland. Respondents were asked how appropriate crocodiles were as a symbol of the region (Question 76, see questionnaire Appendix 2). Most respondents identified the crocodile as "quite appropriate" (40.88%) representing 50% of Weipa residents and visitors, 43.33% of Daintree visitors and 40.17% of Townsville residents. Aboriginal respondents (48.57%), Daintree residents (50%) and visitors (45%) thought it was an "appropriate" to "very appropriate" symbol (Table 6.26). While the majority of Daintree residents thought the crocodile was the symbol of the region, 30% of the community did not, again showing the polarity of attitudes in that community.

| Crocodiles as a symbol of northern Queensland | | | | | |
|---|---------------------------|------------------------|----------------------|-------------------------|----------|
| | (Very) & inappropriate | Quite inappropriate | Quite appropriate | (Very) & appropriate | N values |
| Hopevale/ Napranum | 11.43% | 8.57% | 31.43% | <u>48.57%</u> | 35 |
| Weipa residents | 2.5% | 17.5% | <u>50%</u> | 30% | 80 |
| Weipa visitors | 11.1% | 16.67% | <u>50%</u> | 22.22% | 18 |
| Daintree residents | <u>30.00%</u> | 0% | 20% | <u>50%</u> | 30 |
| Daintree visitors | 8.34% | 3.33% | <u>43.33%</u> | <u>45%</u> | 60 |
| Townsville residents | 15.39% | 9.4% | <u>42.17%</u> | 35.05% | 117 |
| Totals | 11.76% | 9.71% | <u>40.88%</u> | <u>37.64%</u> | 340 |

Table 6.26 - Crocodiles as a symbol of northern Queensland among community groups ($p=0.0001$, $n=340$).

6.8.1 - Alternative symbols

The few respondents who thought it was not an appropriate symbol suggested primarily attractive plants or animals as alternative symbols (Question 77, see questionnaire, Appendix 2). Weipa visitors proposed fishing which indicated the purpose of their trip to Cape York Peninsula and Daintree visitors reef/rainforest and the beach (Figure 6.6).

6.8.2 - Reasons for popularity

Respondents were asked to suggest reasons for the extensive use of crocodile images in northern Queensland (Question 75, see questionnaire, Appendix 2). "Tourism" and "publicity" were the most cited reasons particularly with Daintree residents and Weipa visitors. Daintree visitors indicated that it was because they were a native species. Aboriginal respondents saw warning and protection of crocodile images against complacency (Field notes) (Figure 6.7).

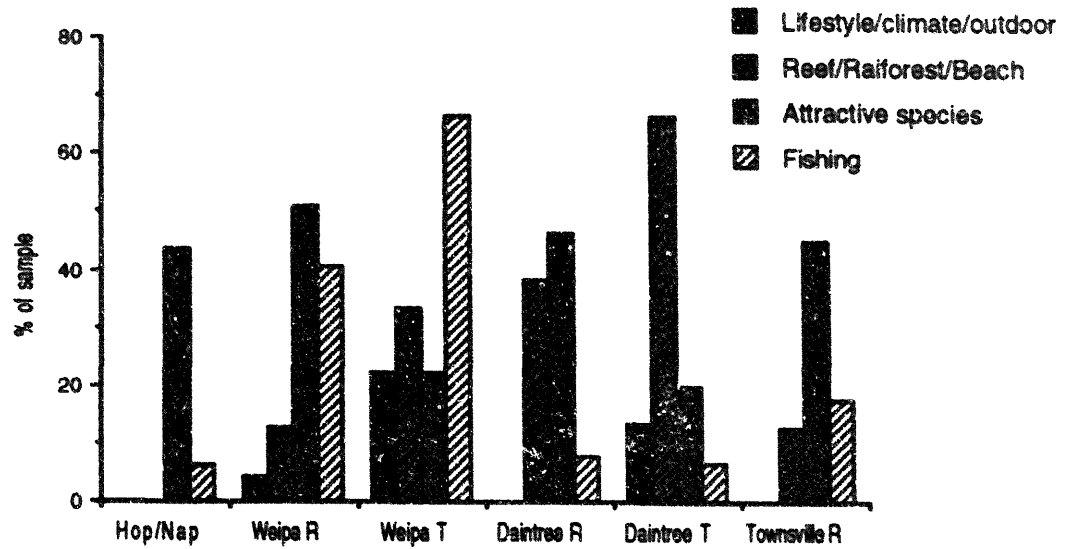


Figure 6.6 - Alternative symbols proposed for North Queensland.
(n=7, n=16, n=5, n=9, n=7, n=29 respectively)

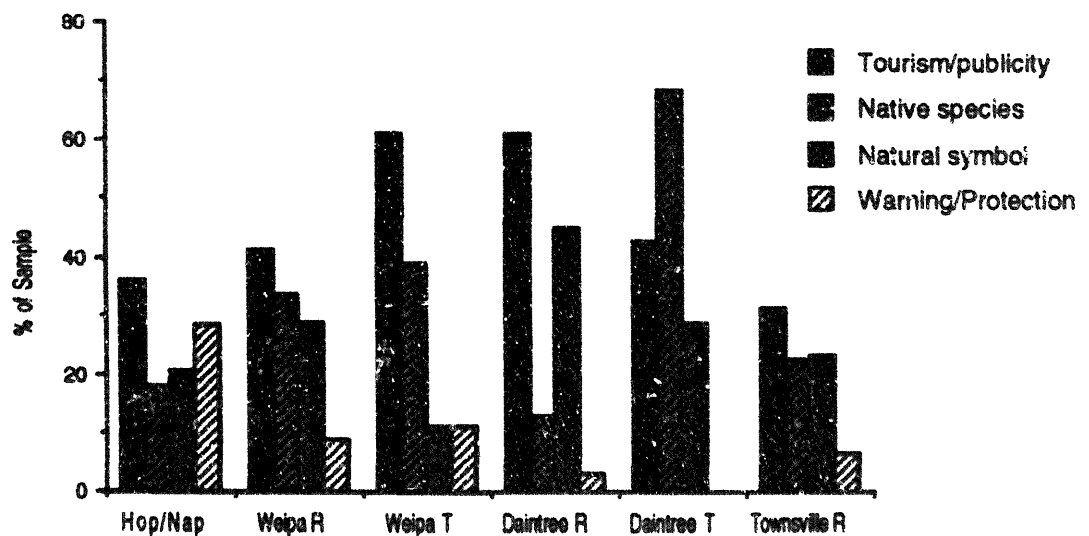


Figure 6.7 - Reasons for the use of crocodile images in North Queensland
(n=39, n=80, n=18, n=31, n=63, n=125 respectively)

6.8.3 - Crocodile stories

Types of stories

Respondents were asked to tell a crocodile story if they could remember any (Question 74, see questionnaire Appendix 2). The main sources of the stories were coded as "advertising", "films", "children's stories", "true stories", "Aboriginal legends", "T-shirts", "jokes", "songs and poems", and "cartoons" (see code book, Appendix 2). The response rate was low overall for that question since respondents felt often embarrassed or had no recollection of a story at the time of the interview. The most cited sources were "advertising", "films", and "true stories" (Table 6.26). Crocodiles in the stories were either portrayed as "good and comical", or "bad, frightening and untrustworthy" (Table 6.27).

| Sources of crocodile stories | Community groups | | | | | |
|------------------------------|-----------------------|--------------------|-------------------|-----------------------|----------------------|-------------------------|
| | Hopevale/ Napranum | Weipa residents | Weipa Visitors | Daintree residents | Daintree visitors | Townsville residents |
| Advertising | 12% | 28.33% | 0% | 5.55% | 3.7% | 15.15% |
| Films | 4% | 25% | 46.15% | 27.78% | 46.30% | 53.03% |
| Children stories | 8% | 3.33% | 0% | 0% | 9.26% | 1.51% |
| True stories | 36% | 25% | 15.38% | 44.44% | 12.96% | 22.73% |
| Aboriginal legends | 16% | 0% | 0% | 11.11% | 0% | 0% |
| T-shirts | 12% | 5% | 0% | 0% | 14.81% | 0% |
| Jokes | 4% | 6.66% | 0% | 5.55% | 5.55% | 6.06% |
| Songs and poems | 4% | 1.66% | 30.77% | 0% | 3.7% | 1.51% |
| Cartoons and comic strips | 4% | 5% | 7.7% | 5.55% | 3.7% | 0% |
| N values | 25 | 50 | 13 | 18 | 54 | 61 |

Table 6.27 - Sources of crocodile stories among community groups.

"True stories" were mostly told by residents near crocodile habitats (Hopevale/Napranum, 36%; Weipa, 25%; Daintree, 44.44%) and would be from local experience or nature documentaries as suggested by the pattern of response on communication channels (see Table 4.13), and the salience of crocodiles both as an environmental threat and species of interest with those groups (Tables 5.2 & 6.3). Stories from films (*Crocodile Dundee* particularly) were most common with visitors both in Weipa (46.15%) and Daintree (46.30%) as well as Townsville residents (53.03%) and some Weipa residents (25%). The fact that "advertising" was cited by Weipa residents, Hopevale/Napranum respondents and Townsville residents is circumstantial and associated with the showing of a television advertising in Queensland for a dental product at the time of the survey (July/September 1990).

It was interesting to note that while Aboriginal respondents had a wide spectrum of sources for stories which included Aboriginal and non Aboriginal sources, the reverse was not the case except for a few Daintree residents. If anything, this reflected the poor knowledge of Aboriginal culture among non Aboriginal respondents.

Anthropomorphic representations of crocodiles

A majority of respondents (59.83%) did not provide description of the type of image crocodiles had in their story, including most of Weipa residents (76.25%) and visitors (77.78%) and Townsville residents (66.4%). However, for those who did, crocodiles were seen as either "good/comical" (17.42%) or "bad/frightening" (16.29%) (Table 6.28).

| | Anthropomorphic representation in crocodile stories | | | | N values |
|-------------------------|---|---------------------|-----------------------|-----------|----------|
| | Comic/good | Bad/ frightening | Accessory to human | Realistic | |
| Hopevale/ Napranum | 20.51% | 7.69% | 2.56% | 12.82% | 17 |
| Weipa residents | 16.25% | 6.25% | 0% | 1.25% | 19 |
| Weipa visitors | 11.11% | 11.11% | 0% | 0% | 2 |
| Daintree residents | 22.58% | 25.81% | 0% | 3.23% | 16 |
| Daintree visitors | 25.40% | 39.63% | 4.76% | 1.59% | 43 |
| Townsville residents | 12.8% | 12% | 1.6% | 7.2% | 42 |
| Totals | 7.42% | 16.29% | 1.69% | 4.78% | 143 |

Table 6.28 - Crocodile anthropomorphic representations among community groups (n=143).

Crocodiles were considered rather as "good" characters by Aborigines (20.51%) and Weipa residents (16.25%) for different reasons. Aboriginal respondents gave "true stories" from personal experience or Aboriginal legends as most important sources. Weipa residents gave "films" and "advertising" as well as "true stories" (Table 6.26), but not necessarily from personal experience (Table 5.25 & 5.26). They were considered rather "bad and frightening" characters by Daintree visitors (39.68%) and Daintree residents (25.81%).

6.9 - Summary and discussion

A composite measure of empathy towards crocodiles was constructed using "ecological", "naturalistic", "moralistic", "dominionistic" and "utilitarian" values. The distribution of those values among community groups was significantly

different for the "naturalistic" (crocodiles as a unique experience of nature), "utilitarian" (perception of crocodiles as nuisance in the tropics) and "moralistic" values (attitudes towards the cruelty of keeping crocodiles in captive conditions) and discriminated between respondents primarily on their level of "utilitarian" and "naturalistic" attitudes rather than "moralistic" attitude. Two distinct level of empathy of quasi equal strength but of significantly unequal distribution between community groups were identified. "Higher empathy" towards crocodiles was found among Daintree visitors and about half of the Daintree residents while "lower empathy" was found among a majority of Weipa residents, Townsville residents, Daintree residents, Weipa visitors and Aboriginal respondents. Unlike the distribution of expressed concern about safety, the distribution of empathy was not solely affected by residence near crocodile habitats and local economic factors which indicated a broader pattern of attitudes towards nature. Employment, occupation and education significantly affected empathy towards crocodiles. Higher empathy was found among tertiary educated and professional respondents while lower empathy was associated with primary and secondary education, primary producers, home keepers and CDEP workers (Aboriginal respondents). Since the sample of visitors was biased towards higher socio-demographic group and the sample of Daintree residents was too small to draw conclusions, it was not possible to discriminate between residence in the region and socio demographic factors *per se*. The ecological (ethical), farming (utilitarian) and recreational (naturalistic) values of crocodiles were further investigated in order to focus respondents on specific aspects of empathy towards crocodiles.

Crocodiles were overall considered an asset by the one third of respondents. Most respondents attributed high ecological value to crocodiles, fewer respondents attributed high farming value and high recreational value. Age, education and occupation affected the farming value: it was very high among Aborigines and generally higher among residents and Weipa visitors. Gender and education affected the recreational value: it was higher among primary educated respondents, Aboriginal respondents and non Aboriginal male residents near crocodile habitats compared to visitors and Townsville residents. Education and background affected ecological value: it was high with Daintree residents and visitors and Townsville residents.

Farming and recreational values were positively correlated in that acknowledging recreation as a use (see Odell 1980 for a discussion of utility). Recreational value was weakly correlated to ecological value but farming value was negatively

correlated to ecological value, which confirmed the initial distinction between lower and higher empathy as the polarisation between utilitarian and ecological perspectives on a ecological (ethical) - utilitarian (recreational/farming) continuum. Empathy was positively correlated to ecological value and negatively correlated to farming value.

The pattern of lower versus higher empathy, which distinguished broadly between most residents of Queensland and Daintree visitors was in fact modified by local factors of residence, economy and cultural background and reflected in the distribution of ecological recreational and farming values among community groups. The values attributed to crocodiles presented a pattern of incompatibility between utilitarian (farming rather than recreation) and ecological (ethical). Aboriginal respondents, who expressed a lower empathy and attributed high farming value to crocodiles also assigned high recreational ecological value.

The demographic characteristics of the two groups (lower and higher empathy) were admittedly quite different and to attribute environmental concern and awareness (high ecological value and high empathy towards crocodiles) to socio-demographic variables was tempting. While it was found in all tertiary educated and professional respondents displayed a higher empathy towards crocodiles, the reverse was not true, since high empathy was found in other respondents with a different social background. By the same token there was no effect of background on empathy; this may have been an artifact of the sample design, since Townsville residents were included into the category "urban background" and it was likely that those respondents were not in fact very socially dissimilar to other respondents in northern Queensland. While this was of little consequence for the perception of risk - it was strongly associated with residence near crocodile habitats (see chapter 5) - it affected the discriminatory value of the background variable here. These findings were consistent with other studies on the inconclusiveness of demographic variables (class hypothesis, background, age, gender), as major determinants of environmental concern (Buttel & Flinn 1978; Van Liere & Dunlap 1980; 1981; Mohai 1985; Samdahl & Robertson 1989). One reason proposed for inconsistency was the generality of the issues investigated (Van Liere & Dunlap 1980). In the present study a specific and relevant aspect of environmental concern was investigated. However, as the selection of threats and animal preferences showed, the interest in crocodiles and the concern about public safety were not very salient with most respondents except if living living near crocodile habitats.

Alternative explanations of the relationship between social status and environmental awareness have been proposed, and may be relevant to this study. It was found that respondents whose occupation was "Home duties" showed very low empathy as they did show high concern about safety (see chapter 5). Since women formed the majority of this group, one could have expected to see gender differences affecting empathy but none was found. The concept of social marginality which result from low level of personal control and high level of social control and result in a fatalist attitude to life may be used to interpret those results. This approach, taken in risk studies, emphasises socially construction attitudes to nature and risk as the expression of social organisation types (Figure 1.4). Socially marginal individuals (high "grid" - high social control and low "group" - loose membership to groups) have a fatalistic approach and low environmental concern (Rayner 1985; Douglas 1986, Douglas & Wildasvsky 1982; James & Thompson 1989; Milton 1991). However, in this study, it was inconsistent with the "unemployed" who did give just an opposite answer which could not be explained except in terms of gender differences, ie those respondents would happen to be males, with recreational time on their hands. Other studies have shown that environmental activism rather than environmental concern was related to social status (Mohai 1985; Taylor 1989; Dwyer & Hutchison 1990) which would support the concept of social marginality. Those results illustrated the importance of the socialisation process and power distribution in shaping attitudes, but also the difficulty of identifying single causes to a complex issue such as environmental awareness.

Utilitarian values and lower empathy towards crocodiles were found mostly in respondents associated with extractive activities (primary producers: graziers of Daintree and professional fishermen in Weipa), which was consistent with other studies or/and associated with recreational fishing and hunting activities, the latter being male dominated (Kellert 1978; Kellert & Berry 1987). This attitude has its cultural origin in the the pioneer ethic of early settlement and expression in frontier attitudes (Frawley 1991a & 1991b). Northern Queensland still presents itself as the last frontier and the crocodile offers a suitable symbol of a wilderness to tame and to control. Recreation provided opportunities to re-create the experience of early settlement and the gender based effect on recreational value among non Aboriginal respondents as the cultural expression of the Australian identity (Ward 1978; White 1981; Hodge & Mishra 1990; Fitzgerald 1986). The "Australian myth" attracted the Weipa visitors to Cape York Peninsula and was also found among Weipa residents, irrespective of their actual level of interaction with

crocodiles and wetlands and knowledge. This image was associated with the development of the wetlands as an expression of human control.

Ecological views may be seen as the reflection of the current environmental discourse which emphasise the concept of interrelationships of ecological events and the finite nature of resources and which advocate a change in societal values and attitudes towards the environment (Ecologically Sustainable Development). The social and political impact of these emerging values affect resource uses decisions in the region including crocodiles and wetlands. Local conflicts arise because of conflicting values and interests as local residents who overall hold more traditional utilitarian views are likely to be affected by those decisions.

The attribution of high ecological value was related to the social and geographic distribution of the costs and the benefits of management decisions. Townsville residents, although they had a lower empathy towards crocodiles and ascribed utilitarian value to crocodiles, also attributed high ecological value. However, those respondents were unlikely to bear the costs of crocodile management decisions and this was reflected in their lack of interest, knowledge, interaction, and awareness of possible risk of crocodiles, unlike Daintree visitors or Aboriginal respondents.

The social costs of crocodile management were perceived in terms of personal risk and/or loss of opportunities. In Weipa for instance, the importance of personal risk was the major element of the social cost, which was reflected in the lower level of empathy and attribution of high utilitarian value. For those residents, there was an unacceptability of co-existence with crocodiles which was expressed in their high concern about safety (higher than one would expect given their low level of interaction). The powerful local regulatory authority associated with remoteness from crocodile management decision making in fact contributed to a volatile situation and a sense of limited personal control and high social control. Increased personal control may have been expressed in illegal shooting of crocodiles - there is evidence of it occurring (Field notes 1990). As indicated earlier, this community was also culturally masculine. The importance of crocodiles stories in this context was very strong and passed on from older male residents to younger ones and some form of initiation was happening as newly arrived young workers had to get their first gun and vehicle and go out bush hunting pigs in crocodile country (Field notes 1990). An important event in the recreational activity calendar of Weipa was the Croc Enduro motorbike race which symbolised the association between strong men and crocodiles. This unique socio-cultural context would in fact reinforce the

predominantly lower empathy and utilitarian attitude of those respondents and discourage any ecological sentiment. This situation was unfortunate given the importance of that location for crocodile conservation (Q.NPWS 1989).

It could be said that high ecological value (not necessarily associated with higher empathy) of crocodiles was a statement of intention made by many respondents, while the high utilitarian value (most often associated with lower empathy) of crocodiles was an expression of cultural values but also of the practical constraints perceived by respondents. The divorce between those two trends was accentuated by living near crocodiles because the reality and the intention were not perceived as compatible and were almost inevitably presented as a conflict between economic development (and/or public safety) and crocodile and wetlands conservation, particularly at times of crisis such as a crocodile attack. After the attack of Beryl Wruck in Daintree in 1985 for example, the polarisation of attitudes in the Daintree village was tremendous and was articulated as a conflict of human interests versus crocodile interests beyond the issue of public safety and into the realm of environmental politics (Righe 1986) with the emergence of a major rift in the community at large arising from latent economic, social, cultural and political divisions. One may say that the crocodile have come to symbolise those conflicts and nowhere was it more visible as in the Daintree region. Crocodiles as a threat to humans became the threat to regional development and crocodiles became public enemy No 1. The attack then provided the justification for eradication but also the justification for the use of crocodile habitats for unplanned development. The major challenge facing proponents of sound environmental management is to convince all parties of the compatibility of development and conservation as it is presented in the integrated concept of Ecologically Sustainable Development. One important process advocated towards this goal has been public participation in decision making processes and regional environmental planning (see Chapter 1; Benzaken in prep.).

The classification of attitudes towards crocodiles presented in terms of a dichotomy between high utilitarian and ecological values and lower/higher empathy did not fit Aboriginal responses adequately and did not discriminate on the basis of cultural background. This was a problem of method, as it was previously suggested. Aboriginal respondents should have been investigated differently, and there was a cultural bias intrinsic to the study's underlying cultural assumptions regarding the nature of the relationship between nature and humans. Aboriginal respondents were found to have lower empathy towards crocodiles (sharing in that a utilitarian attitude expressed in a high farming value and recreational value (as a tourist

attraction). However they equally attributed a high ecological value to crocodiles (they have their place) despite their acknowledgement of their danger and residence near their habitats (unlike Daintree residents). The compatibility of those otherwise polarised aspects of empathy with non Aboriginal respondents was a fundamental cultural difference. There is no contradiction in those two aspects in Aboriginal culture because the world both crocodiles and humans belong to is a source of physical and spiritual subsistence (Yengoyan 1987; Rose 1988; Palmer 1991; Morton 1991). As it was shown by Rose (1988) Aboriginal ethics have their origin in the "dreaming" and are based on principles of reciprocity, autonomy, responsibility and symmetry, which confer all living entities with a set of moral rights and duties and a code of practice towards each other. However, Aboriginal ethics should not simply be equated to an ecological model of integrated functional relationships (see Chapter 1).

Crocodile symbolism permeated all aspects of their valuation. The crocodile did not feature as the favourite of animal preferences unless relevant to respondents. Residents had an increased interest in crocodiles in that mirroring their increase in expressed concern. The Crocodile featured high with Aboriginal respondents because it may have been an important totem species and because it was considered an agent of death. The criterion to the ranking of animals was somehow different for Aboriginal and non Aboriginal groups. Familiarity may have been at the basis of ranking but what was familiar to one group was not necessarily to the other, and the ranking of unfamiliar animals did not occur for Aboriginal respondents unlike non Aboriginal respondents who could have a vicarious interest in particular species. There was also in non Aboriginal classification the assumption of a hierarchy of beings based on the concept of primitiveness and advanced which provided the rationale for the dimensions for like and dislike (interest or fear) of animals. This does not occur in Aboriginal ranking.

Reasons for the dislike and fear of crocodiles were attributed to their predation and physical appearance primarily; however those same characteristics, associated with primitiveness (except for Aborigines) were cited as reasons for the fascination crocodiles generated. Cultural association with the demon are common in the Judeo Christian tradition, for which the crocodile may have provided a graphic representation. Unlike other "noble" predators (lions for instance) crocodiles have come to symbolise bestiality and antisocial behaviour and are associated with the human taboo of cannibalism (Graham & Beard 1990). What may be at the source of the identification of crocodile with evil may be both their predator behaviour but

also their dissimilarity to humans (amphibious, cryptic, cold blooded, ferocious, powerful and primitive). The cultural process of establishing boundaries between humanity/animality, socially acceptable/ unacceptable behaviour do not necessary apply across cultures. The duality inherent of western worldview which establishes a hierarchy of life forms with humans as the most advanced and only moral agents, separates humans from the non human world. Notion of primitiveness (and inferiority) are associated with this view although now being challenged by some evolutionary scientists as being a cultural construction not a evolutionary concept (Gould 1991). The notion of primitiveness was not meaningful to Aboriginal respondents, however, physical appearance was an important aspect of Aboriginal perception of crocodiles that the study could not explained but that were recorded for other animals (frogs were particularly disliked, Field notes 1990).

The importance of the crocodile as a symbol showed that it was identified with northern Queensland primarily because of tourism and advertising, however, its image was rather ambiguous (except for Aboriginal respondents) and very few respondents actually could articulate their perception of the crocodile as a symbol. Daintree visitors and residents however were more able to do so than other respondents. Although respondents thought the crocodile was a good symbol, they had difficulty defining it, reflecting perhaps the problem of culturally integrating their unfamiliarity with the tropics. However, one may see in the identification of the crocodile with tourism a new form of totemism where the crocodile has come to symbolise a new concept of nature and land use (recreation and tourism and vicarious enjoyment). Prior to that, crocodiles were only a pest to eradicate and an obstruction to European expansion. The crocodile symbol used in tourism is certainly very friendly and inviting and far away from its species counterpart. In many ways one could say that tourism is capitalising on the crocodile as an endangered species in a vanishing habitat, an important totem of the environmental discourse (Morton 1991). Crocodile icons were very popular in northern Queensland and for most respondents (see Appendix 7), they were a symbol of a new prosperity, except for Aboriginal respondents who saw the value of crocodiles images in the protection they confer to their users (T-shirts for example, Field notes 1990). There was an internal contradiction in the status of the crocodile. It was perceived as a symbol of dangerous wilderness and a symbol of attractive and exotic experience. While the species was feared, often despised but also fascinating and commanding respect and a symbol of freedom, the crocodile image was friendly and amusing, the object of jokes. The cultural humanisation and trivialisation of crocodiles were made possible by the essentially vicarious experience of crocodiles

most respondents would have and the moral division between non humans and humans. However this paradox is exposed every so often when a crocodile attack occurs and it is culturally perceived as a violation of the sacredness of humanity that no retaliation on crocodile populations could restore.

Crocodiles stories were true stories with respondents having had personal experience of crocodiles and respondents interested in natural history (residents). Most cited sources were films and television advertising, wildlife documentaries and of course Paul Hogan's *Crocodile Dundee*, the most popular Australian film. "Crocodile Dundee" has been the object of a number of critical analysis (Clark MS; Morton 1991; Morris 1988). Clark (MS) and Morton (1991) argue that Mick Dundee the bush hero and symbol of Australianness in fact appropriated Aboriginal culture to legitimate his rights to the land and its resources by the dispossession of Aboriginal inhabitants.

To conclude the determinants of empathy towards crocodiles, as for the attitudes towards crocodiles as a threat, go beyond simple demographic categorisation and must take into account socio-cultural factors which are common to Western thinking but also specific to the Australian historical and cultural context. The generalisation of those assumptions to Aboriginal respondents failed to produce an adequate profile of their views and cultural differences when explicit through the results could not always be interpreted.

CHAPTER 7

CONCLUSION

In the previous chapters, the major aspects of attitudes towards crocodiles were investigated. To conclude, the trends observed and implications for management are discussed. The limitations of the study and areas for future research are also presented.

7.1 - Methodological considerations

Several methodological considerations must be acknowledged in the interpretation of the results. These concern the representativeness of the sample, the reliability and validity of the data collected, the quality of the survey instrument, choice of variables and level of analysis.

Logistic constraints limited the survey to English speaking respondents and excluded non English speaking visitors (Japanese visitors particularly). However, the location of the survey somehow restricted sampling error quite significantly because Japanese visitors in fact were concentrated in a few locations and mostly outside the survey sites. As a result, visitor sampling was biased towards domestic tourists and European tourists with a good knowledge of English. Time limitations also excluded visitors travelling in group tours. The sample size of the visitors to Weipa was admittedly small although representative of the level of visitation to Weipa at the time of the survey. The study was regionally based and the views of visitors, although providing a contrasting view, did not really represent the views of the communities they came from. Furthermore, they were not influenced by their usual social networks, but rather by unfamiliar circumstances. The temporary nature and motivation of their visit may in fact have affected their response significantly. However, the study could not evaluate those factors. Overall the sample was biased towards residents although visitor numbers were representative of each specific site surveyed. It was acceptable however, given that residents accounted for most crocodile attack victims and were most affected by management decisions. Aboriginal respondents from Napranum and Hopevale were analysed as one group despite some local differences. Although random sampling was initially intended in both those communities, the sample was biased towards older respondents, because it was difficult (and culturally inappropriate) to secure

interviews with younger respondents. When it was possible however, the pattern of answers was quite different from that of the older generation and reflected the social change taking place in those communities. Furthermore, the established protocol for social interactions did not lend itself to a survey approach, because it was unlikely that all relevant information would be communicated to the interviewer in a one off situation. Literacy, language barriers and differences in logical thinking may also have affected the results. However, those difficulties could be dealt with to some extent through good preliminary investigations of community networks, personal introduction into the communities and a good deal of interviewing skills. The ability to obtain comparative results made it worthwhile. However, no comparative results between urban and remote Aborigines could be obtained, so that the differential effect of residence near crocodiles could not be dissociated from cultural factors.

Residence near crocodile habitats, residence status and cultural background proved the most useful independent variables although in the case of Aboriginal respondents no differentiation between residence and cultural background could be made. Demographic variables although useful to identify social groups did not alone explain variations in the distribution of knowledge empathy and risk perception and were obscured by residence status and wider cultural and social factors. However, gender emerged as an important variable to assess cultural differences between Aboriginal and non Aboriginal respondents and to explain the impact of cultural and historical factors specific to region on attitudes towards crocodiles.

Because of the administration of the survey by interviewers, the validity and reliability of the results were satisfactory. Interviewers were all familiar with interviewing procedures; they were briefed and all being females, attracted the same interviewer bias. The validity of Aboriginal information was obtained through experienced interviewing, however, gender interviewer bias would have been difficult to evaluate.

The questionnaire used in the survey had limitations in that it was too long and some questions proved *at posteriori* unnecessary to the development of an understanding of attitudes, and consequently were not used in the analysis. The overall information obtained from respondents also showed that valuable data were in fact collected qualitatively through open ended questions - the value of open ended questions as has been emphasised by Geer (1988) - participation observation and informal interviews. Those were particularly useful to identify social networks and to provide support for the interpretation of quantitative information. For instance, it

proved very useful to understand the consistent polarity of responses in the Daintree area and to interpret Aboriginal responses. It can be said that social context is very important in shaping a set of attitudes and alternatives methods could be used to analyse attitudes within that context. Qualitative analysis could be considered for future research given the availability of computer tools. The study was intentionally exploratory and the analysis of the survey results was purposely descriptive since the data collected would not allow for inferential statistics without violating the assumptions of those statistics. However, the results may be used in developing hypotheses which could be used for further predictive studies.

7.2. - Discussion of results and management implications.

The results presented in the previous chapters can be conveniently summarised graphically by two apposed triangles including knowledge (or experience), expressed concern and empathy at the tips and which sides indicate identified relationships between them (Figure 7.1).

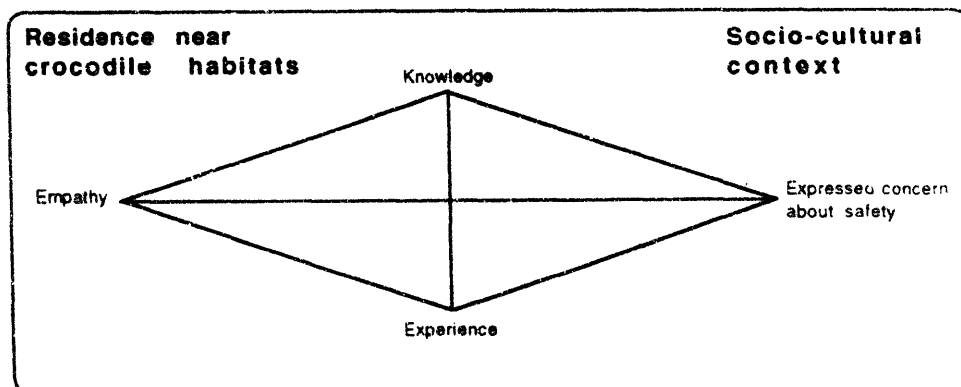


Figure 7.1 - *The relationships between knowledge, experience, expressed concern and empathy.*

7.2.1 - The social and spatial basis of public safety

The study identified public safety as a salient issue in the management of crocodile as primarily a function of close residence near crocodiles habitats and cross cultural factors. The perception of risk was found to be negatively correlated to the amount of empathy towards crocodiles and accounted for the reticence of most residents' willingness to accommodate for crocodiles conservation. However, while this was a major consideration, the expressed concern about crocodile as a threat

was surprisingly low except in the Weipa/Port Musgrave area (Cape York Peninsula) and among Aboriginal respondents, clearly reflecting both the large population of crocodiles in those areas, the isolation of those communities and cultural differences.

The amount of exposure respondents had to crocodiles and crocodile habitats was decisive in their expressed concern. While most had a vicarious knowledge and experience of crocodiles, the few that in fact had personal experience were most concerned about the risk. The perception of public safety was very much affected by local factors and the way in which management was perceived to deal with the issue, despite the fact that most respondents would agree that carelessness was usually responsible for fatal accidents. This indicated a shift from individual responsibility towards social responsibility for the management of personal risks, leaving to management the decision as to what level of control should be left to individuals. At the same time, residents did not see that their views were adequately represented in management decisions. It was significant that most residents near crocodile habitats favoured crocodile population control. There were however differences between the residents Cape York Peninsula and the east coast of Far North Queensland regarding the need for crocodile population control. It was very strongly expressed by the residents in Weipa, compared those of the east coast; it may be explained by the isolation of those respondents which may have reinforced their perception of risk and left them vulnerable to internally generated fears and rumour.

However, the different set of circumstances in terms of the size of the crocodile population, risk assessment and management presence may not alone explain those differences. The changes which have taken place in the Cairns - Cooktown area in the last fifteen years have affected the economic and social profile of the region (Reynolds 1992). Those include the influx of new residents from southern cities and the major tourist destination the region has become. The change in resident communities' structure and expectations was illustrated in the Daintree Cape Tribulation area where two lifestyles co-existed (not always harmoniously), essentially reflecting the change in the economic and social orientation. The importance of those factors in the perception of public safety and empathy towards crocodiles should be given consideration because they may reflect wider social concerns which ultimately affect crocodile management. Community responses to crocodile attacks may be seen as social indicators of underlying conflicts of interests. On the one hand residents associated with the tourism industry capitalizing the natural environment and on crocodiles as an attraction and on the

other hand those associated with traditional activities who saw the new industry as a threat to their lifestyle and for whom crocodiles fundamentally remained just a hazard.

The study did not investigate respondents' safety behaviour *per se*, limiting itself to document respondents' own assessment. While it was impossible to verify the accuracy of respondents' responses, it was significant that although risk taking was not readily admitted by respondents, the circumstances in which it took place were well described. They were mostly incidental to respondents recreational activities, in that reflecting the dominance of recreation in the use of wetlands. Fishing and camping were by far the most mentioned activities and were most popular with non Aboriginal male residents and the few visitors to Cape York Peninsula - who in fact were demographically similar to residents. Results showed that most respondents knew of safety procedures while not necessarily following them for a number of reasons ranging from ignorance of when they would be of relevance in the case of tourists for example, to whether they would be an inconvenience in respondents' activities. The desirability of safety behaviour was most important for Aboriginal respondents unlike most other respondents, the reflection of the importance of right conduct in crocodile habitats as well as use of wetlands. It was matched by an array of safety precautions both practical and symbolic not found with other respondents. Although most respondents were keen to know more about safety, it may not have gone as far as restricting their recreational activities. For instance, the promotion of a free holiday lifestyle may in fact be in conflict with the constraints imposed by safety behaviour. The information regarding dangerous activities and circumstances presented in Queensland National Parks and Wildlife Service crocodile signs and brochures however, was used primarily by visitors, while residents would rather use personal experience and local networks and as such be more vulnerable to misleading information and rumour. The low probability of fatal encounters certainly was conducive to some complacency.

Change towards more responsible safety behaviour may require more than just information about the risks. While most respondents knew about safety precautions, actual experience was not there to support their vital importance. Personal experience of crocodiles, when available, was characterised a range of emotional responses depending on whether that experience was with animals in the wild or in captivity, fear and/or interest being the dominant responses. An aroused state may be an important factor in promoting learning and a change of attitude which could be followed behaviour change. The expression of fear was an major factor in the

expressed concern of Aboriginal respondents and certainly was seen as a positive element of safe behaviour. However, for most non Aboriginal respondents, fear was seen as a negative emotion to overcome through better understanding of crocodiles rather than to cultivate in order to maintain some awareness and avoid complacency about the risk. Personal experience of crocodiles was overall limited even with residents near crocodile habitats and was often confined to controlled situations such as zoos and boat cruises which removed the sense of vulnerability from which a healthy respect for crocodiles may develop. When personal experience was not available to respondents, the crocodile signs were in fact effective on site reminder of potential danger.

7.2.2 - The ambiguous nature of the empathy towards crocodiles

It is important to note that while crocodiles are not usually considered very highly in animal preferences (Paterson 1990; Kellert 1985b) primarily because of negative symbolic associations, the interest they generated grew with being in their vicinity even temporarily, as the responses of visitors showed. This interest was expressed in the respondents' requirement for more information about safety but also about the biology and ecology of the species. There was also an overall appreciation of crocodiles as an object of fascination, however not so much with Aboriginal respondents where different forms of symbolic associations prevailed. The fascination many respondents expressed arose from the perceived uniqueness and primitiveness of crocodiles; Aboriginal respondents only saw uniqueness as a reason for fascination, emphasising the cultural basis of attitudes towards animals. Fascination was not necessarily connected to actual knowledge of the species itself. The understanding of the biology and ecology of Saltwater crocodiles was for the most part vague and anecdotal, mostly vicarious and related to safety, with a number of misleading misconceptions about the animal's behaviour, even with respondents familiar with crocodiles. It was significant that there was little congruence between crocodiles as a species and crocodile as a socially constructed image, since they were considered an appropriate symbol of the region. The overall limited personal experience of crocodiles in their own environment and the way in which respondents acquired knowledge of crocodiles may in fact have reinforced this paradox. Most respondents drew their knowledge from the media with differential evaluation of their trustworthiness, depending on the community group and the sources themselves. The essentially vicarious nature of the knowledge and appreciation of crocodiles raise questions about the social process of constructing images of crocodiles. The image of crocodiles presented by the few respondents who could tell a

crocodile story certainly reflected the confusion between the symbol and the day to day reality of living with crocodiles.

7.2.3 - The promotion of positive attitudes towards crocodiles

The study investigated a number of hypotheses regarding environmental awareness and positive attitudes towards animals. The first one was that demographic variables may be used as predictors of positive attitudes. The belief that environmental concern was related to socio demographic status, (education, occupation, urban residence) has been criticised (Mohai 1985; Dwyer & Hutchison 1990; Van Liere & Dunlap 1980; Taylor 1989) and in the present study was found inconclusive; the effect demographic factors on empathy towards crocodiles was obscured by the effect of residence status; for instance, a significant amount of the higher socio-economic group was restricted to respondents not residing in the area, therefore less likely to be affected by management decisions, except for some of the Daintree residents, however, the sample size there was too small to draw any significant conclusion.

The second hypothesis was that the knowledge of crocodiles would promote positive attitudes towards their conservation. The results of the survey showed no significant correlation between empathy and knowledge except for Aboriginal respondents. Implications for management are far reaching because public education is regarded by management agencies as an important tool to promote positive attitudes towards conservation policies. In fact, greater knowledge (and personal experience) was associated with greater risk awareness, a deterrent to empathy towards crocodiles. It should be noted though that this pattern closely fitted the pattern of residence near crocodiles.

The conclusion of the study indicates that empathy towards crocodiles may be the result of wider cultural factors in which attitudes are embedded while specific values attributed to crocodiles the effect of local factors of residence near crocodile habitats. The homogeneous pattern of lower empathy of the region as opposed to higher empathy outside the region, affected demographic distinctions of socio economic status and may be explained in broader socio-cultural terms. The study identified a distinct culturally based gender pattern of risk awareness and knowledge for non Aboriginal respondents. The greater use of wetlands by males resulted in a greater awareness of crocodiles as a threat, and crocodiles were generally better known and appreciated for their recreational value by males respondents. This interest in crocodiles may be traced to the symbolism of crocodiles as representing

a image of power and wilderness. This image happened to coincide well with the frontier ethics of the area, the basis of the gender based social construction of Australianness. Recreation in fact allowed to re-create the experience of the pioneering days. This image was important in attracting visitors to Cape York Peninsula. The basically utilitarian view of nature in the region was expressed in the popularity of crocodile farming and crocodiles as a tourist asset with residents near crocodile habitats. It also acknowledged the priority of safety for those respondents. However, it was significant to see that a majority of respondents identified ecological value as an important attribute of crocodiles despite a largely imprecise understanding of what it actually meant. It may reflect the importance of the environmental discourse of the day rather than personal circumstances. The study did not effectively distinguish between the lower empathy of Aboriginal respondents and that found in the wider community, primarily because of the definition of empathy used by the study which poorly accounted for Aboriginal worldview.

7.2.4 - Cross cultural considerations

Cross cultural differences were found throughout the survey despite methodological constraints. For example, the evaluation of the knowledge of safe behaviour did not account for Aboriginal greater familiarity with wetlands and crocodiles and was biased towards the expectation from an average non Aboriginal person unfamiliar with that type of risk. The outstanding concern about crocodiles as a threat could not be explained just in terms of risk exposure, which was not very different from other residents near crocodile habitats, but in relation to Aboriginal worldview of moral unity and predictability which meant that death could not be accidental but the result of some moral misconduct and a source of great concern. It is common to see Aborigines swimming in waterways of northern Australia (Webb & Manolis 1989; Field notes 1990), and Aboriginal contempt for crocodiles may seem extraordinary for the average Australian. It can only be explained by their intimate knowledge of crocodile behaviour and the certitude of right action however, not precluding the chance of a fatal accident as the records of attacks showed. It is quite different situation for European Australians for which crocodiles are considered unfamiliar and an unacceptable hazard perhaps because of the perception of superiority of humans over the non human world. The identified cultural assumptions underlying attitudes towards non humans in western culture did not explain Aboriginal animal preferences satisfactorily. The study of wildlife values in management has shown that assumptions were made on the part of wildlife managers regarding what the

public's valuation of animals specifically in a cross cultural context (Caughley 1985). As pointed out by Kellert & Berry (1987), wildlife management programmes are designed by middle class western white males and as such represent a narrow focus of public views.

7.3 - Management Implications and recommendations

The first significant finding of this study is the importance of regional variations in attitudes and as such the necessity of fine grain management strategies in the implementation of broader management goals. Throughout the study, it became apparent that while crocodile conservation may be perceived as an issue of wider significance, it was at the local level that management issues arose. Regional and cultural factors are crucial in determining future directions and the successful implementation of policies.

The second important finding was the need for effective risk communication. As the knowledge of crocodiles was not connected with more empathy towards crocodiles but rather with higher perception of risk, it is important for management to reconsider the focus of public education in achieving management goals. Public safety programmes should be developed and should identify target groups based on activity, and location, as it was shown that certain activities (recreational fishing, commercial fishing and farming) were more likely to expose those engaged in them; the culturally based gender pattern associated with activity pattern should also be considered. The importance of trust in sources of information stressed in risk studies are relevant to crocodiles management. The study identified an overall trust in the expertise of wildlife personnel and reliance on crocodile signs for on site information. However, it was mostly used by visitors rather than local residents. More interactive information should be available which allows for a mindful processing of information and promotion of the desired safety behaviour. Programmes specifically aimed at local residents involving their active participation should be promoted. A number of such initiatives have occurred in Aboriginal communities where community rangers collect and disseminate information from Aboriginal elders and wildlife agencies. Those schemes promote on going communication and better understanding between local residents and wildlife management agencies.

The importance of on going risk assessment in risk communication should be systematic. In that regard, the study showed that respondents did not have the

knowledge of dangerous circumstances, largely because of their imprecise knowledge of the biology and ecology of the species, as they correctly assessed, the need to relate information to specific and relevant situations, and the lack of personal experience of crocodiles and their habitats. This was evident in the detail of the knowledge scale and in the comparison of crocodile attacks accounts and actual analysis of those same events.

The acceptability of risk and the promotion of positive attitudes towards crocodile conservation will depend on the perception an equitable distribution of benefits and costs of management policies. The results of this study showed the salience of crocodiles as a environmental threat - which can be considered as a social cost - increased with proximity to crocodile habitats; it was perceived as a negative consequence of conservation policies by most resident populations, regardless of actual individual exposure, as their expressed need for crocodile population control showed, clearly pointing to a social rather than an personal concern. The perceived benefits of those policies were unevenly appreciated and more difficult to ascertain even though the ecological value of crocodiles was acknowledged. In practical terms however, the economic benefits of conservation policies may be seen in the regional development of "sustainable" industries based on the attraction of protected areas and wildlife and commercial exploitation of the species, when possible. This approach has been taken by a number of agencies responsible for the management of crocodiles and alligators worldwide including in the Northern Territory of Australia. Important requirements for the success of those policies are an adequate involvement of local populations in the management decisions and locally accrued benefits (Goudberg, Cassells & Valentine 1991; Valentine 1989). The study identified some dissatisfaction with management decisions particularly among resident populations. This could easily turn into open conflict, in the event of a fatal encounter and would jeopardize the acceptability of management decisions. The *Nature Conservation Act 1992* (Queensland) under which the management of crocodiles is administered includes some level of public involvement in the decision making process. The value of public participation has been widely debated (Arnstein 1969; Craig 1986; Cassells & Valentine 1988; Wynne 1989; Environment Defenders Office 1991; James 1991). Arguments against it include the lack of representativeness of the participants, the high costs and the lengthy process involved. However, the benefits include additional information, accountability of the decision making process and acceptability of implementation, improved communication and education of those involved and a wider concern for community interests. In the case of dangerous wildlife management, the commitment of those

participating and public ownership of management decisions may reduce future conflict situations (Benzaken in prep.).

7.4 - Future research

A number of avenues for future research are presented below. They arise from both the conclusions and the limitations of the study.

Given the regional basis of this study, it would be of interest to expand its scope to other regions where crocodiles occur and evaluate the factors affecting the characteristics and distribution of attitudes. International visitors could not be targetted in this study and given the likely increase in visitation to the area in the future, an investigation of their attitudes should be considered. Finally, urban Aborigines should be surveyed in order to obtain comparative results with Aborigines of remote communities. The shortcomings of the study in addressing adequately cross cultural issues also warrants an in depth study Aboriginal attitudes with a focus on social change and contemporary issues of crocodile management. Areas of importance are the identification of management issues from an Aboriginal perspective, documentation of Aboriginal knowledge, management practices and social networks and its relevance to crocodile management in the context of future management of wetlands.

The study identified the importance of personal experience in acquiring knowledge, however, knowledge was not associated with empathy but rather with higher risk perception. An evaluation of the range of crocodile experiences should be conducted in order to identify the relevant factors affecting the relationship between knowledge, attitude and behaviour. This information would provide a basis for the design effective public education on safety and conservation.

An important area of research waiting to be studied is the analysis of the process of constructing images of wildlife and nature and their social meaning in the context of the current environmental discourse. Given the importance of the media in this process, various types of media could be considered each with their own characteristics of message content, style and impact: nature documentaries and their role in promoting a familiar yet removed image of wildlife; popular crocodile images in literature and advertising; evil images provided by media particularly at time of fatal incidents. The social basis of endangered wildlife for instance, a corner stone of the environmental concern has already attracted some interest (Shepard

1978; Kellert 1985c). Morton (1991) suggests a new form of totemism which establishes a link between the survival of species and the survival of *Homo sapiens*.

To conclude, the present study despite its limitation has demonstrated the importance of regional and socio-cultural factors in attitudes towards wildlife and wildlife management. The ambiguous meaning of crocodiles as dangerous wildlife and species to protect can be seen as culturally constructed and socially expressed in concern for public safety and in the empathy towards crocodiles. Cultural encoding however was found to differ quite significantly for Aboriginal and non Aboriginal respondents and reflected throughout the study. The essentially mediated experience of crocodiles most respondents had, the social and cultural background and perceived spatial distribution of social costs and benefits of conservation policies were crucial in shaping attitudes recorded in the study.

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APPENDIX 1

LOCATIONAL MAP

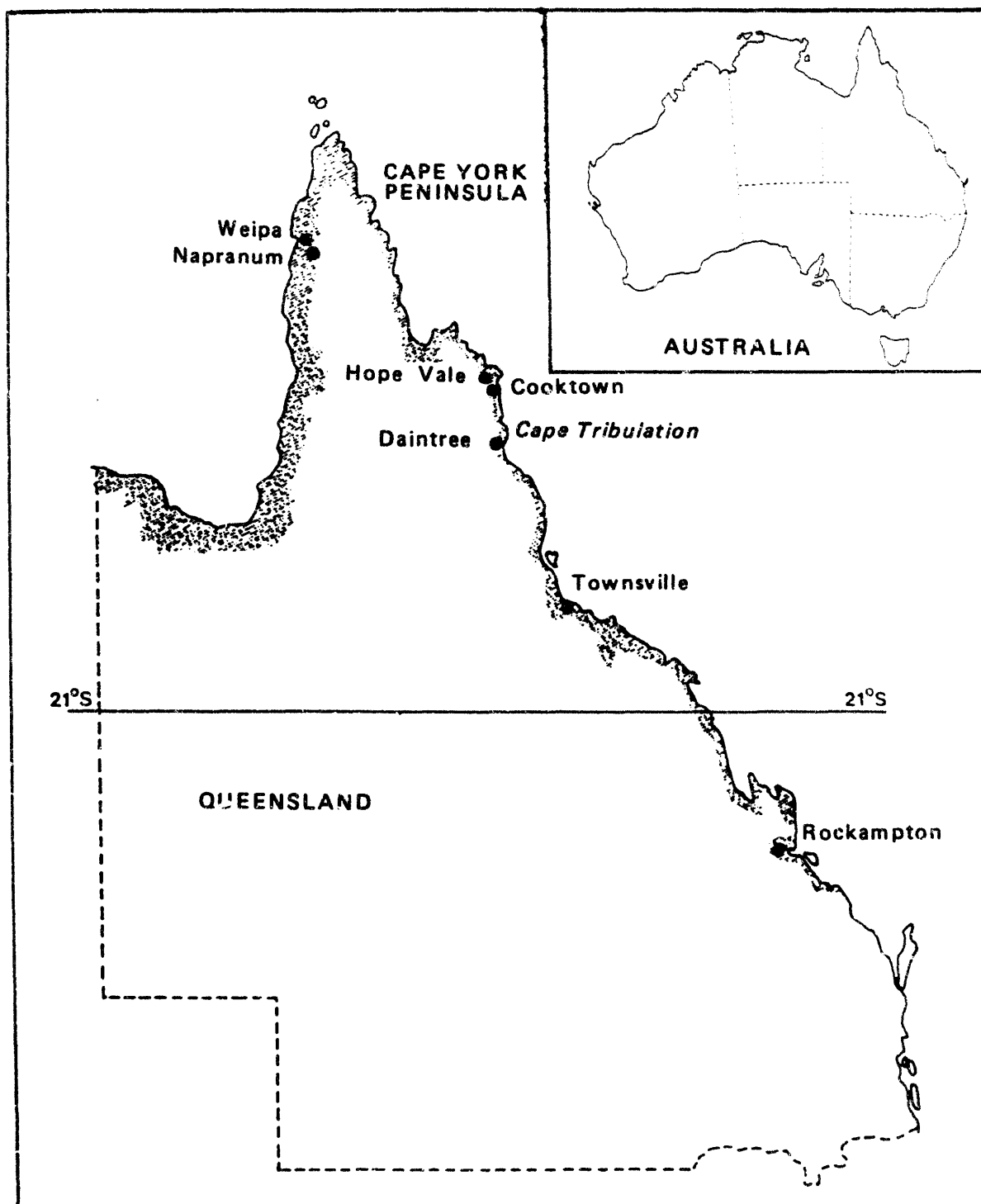
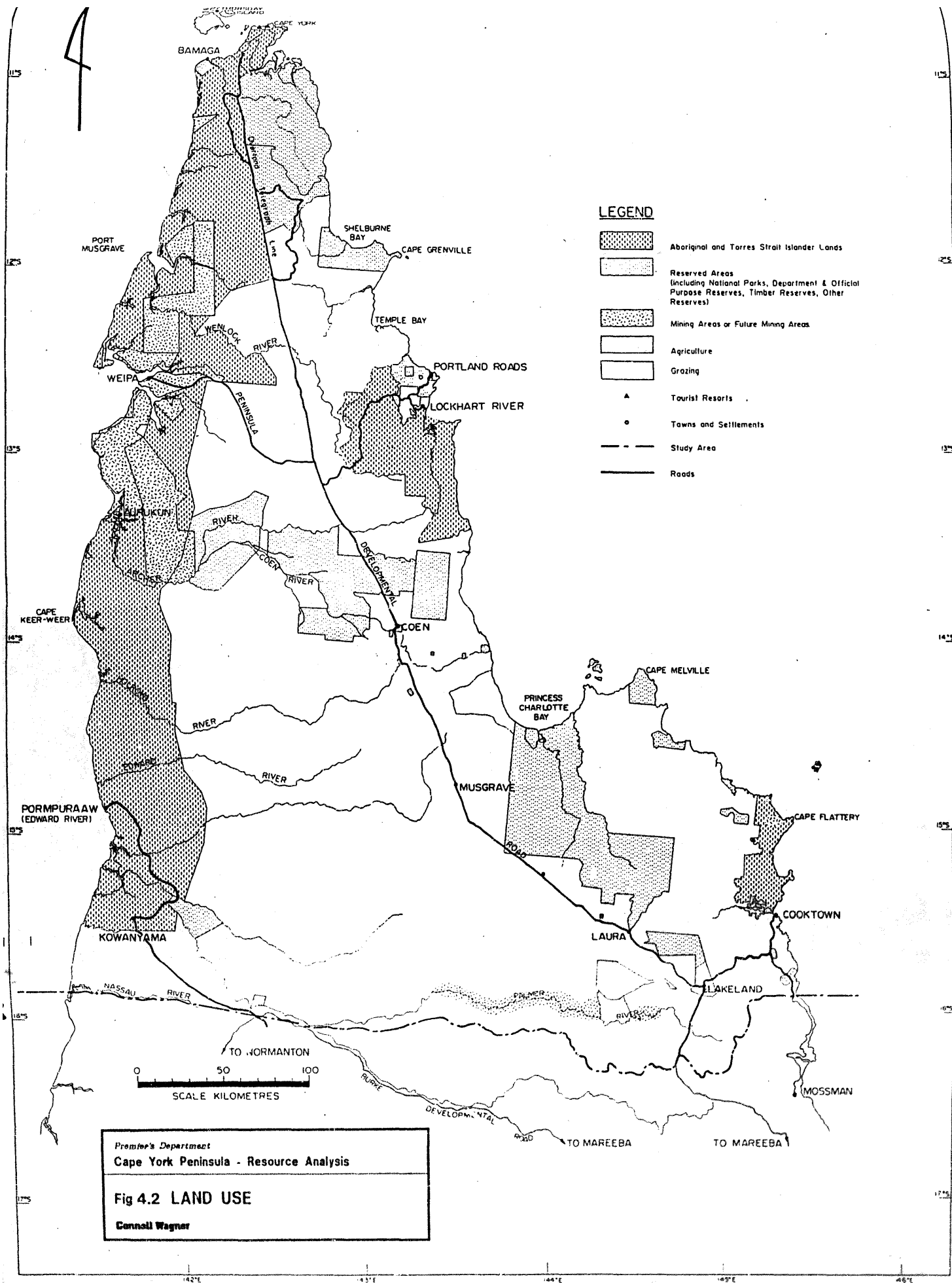


Figure 1- Location map of survey area. (dashed area shows the distribution of *Crocodylus porosus*).



APPENDIX 2 QUESTIONNAIRE

COMMUNITY ATTITUDES TO CROCODILES IN NORTH QUEENSLAND

The increasing demands on wetlands in northern Queensland for development, together with the recovery of crocodile populations since protection in the 70s', have changed the circumstances of encounter between people and crocodiles. An increased awareness of their presence near populated areas has led to concern for public safety. As a result, an assessment of this situation is required.

Ms D. Benzaken, a Master's student in Tropical Ecology with the Department of Geography at James Cook University (Townsville), is investigating attitudes towards crocodiles in northern Queensland communities situated in the vicinity of crocodile habitats. The project considers an aspect of natural risk which has attracted little attention within the extensive study of environmental threats. The study of community attitudes provides a valuable tool for resource management and can be used in the production of relevant educative programmes.

The survey will be conducted at Weipa, the Cooktown/Daintree region and Townsville, where community structure, pattern of recreational activities, and present development (mining, fishing industry and tourism) are expected to affect the perception of crocodiles significantly.

Please, answer the following questionnaire, your contribution will be highly appreciated.

NOTE: The information collected in this questionnaire is confidential.

Respondent number:

Date:

Location:

KNOWLEDGE SCALE

For each statement, please tick one box only.

Q1- In Australia, crocodiles are only found in tropical coastal areas.

☐ untrue

☐ unsure

☐ true

Q2- In Queensland, crocodiles can be found as south as Rockampton

☐ untrue

☐ unsure

☐ true

Q3- There are two different species of crocodiles found in north Queensland, the Saltwater crocodile and the freshwater crocodile.

☐ untrue

☐ unsure

☐ true

Q4- Crocodiles are considered an endangered species by international legislation, therefore they are totally protected and their trade strictly regulated.

☐ untrue

☐ unsure

☐ true

Q5- The Saltwater crocodile is always found in tidal rivers and mangroves, never in freshwater swamps and billabongs.

☐ true

☐ unsure

☐ untrue

Q6- The Freshwater crocodile is always found in freshwater.

☐ true

☐ unsure

☐ untrue

Q7- Crocodiles are known to travel long distances.

☐ untrue

☐ unsure

☐ true

Q8- Salt water crocodiles are never found on beaches.

☐ untrue

☐ unsure

☐ true

Q9- It is safe to swim regularly at the same place where it is known that crocodiles have never been seen before.

☐ true

☐ unsure

☐ untrue

Q10- It is safe to swim in shallow, fast running rivers.

☐ true

☐ unsure

☐ untrue

Q11- If you cannot see a salt water crocodile in or near a body of water, then it is safe to swim.

☐ true

☐ unsure

☐ untrue

Q12- Camping at the edge of the water is usually safe even if there is a warning sign near by.

☐ untrue

☐ unsure

☐ true

Q13- Large salt water crocodiles may approach your camp if food scraps are left around.

☐ untrue

☐ unsure

☐ true

Q14- It is safe to fish from the water edge with your feet in the water, so long as you can see the bottom.

☐ true

☐ unsure

☐ untrue

Q15- Crocodiles are not usually hunting at night.

☐ true ☐ unsure ☐ untrue

Q16- Crocodiles are shy animals and usually avoid people

☐ untrue ☐ unsure ☐ true

Q17- Crocodiles always hunt their prey from the water.

☐ untrue ☐ unsure ☐ true

Q18- Crocodiles only attack when threatened.

☐ true ☐ unsure ☐ untrue

Q19- Crocodiles are more aggressive during the summer months (Nov to March).

☐ true ☐ unsure ☐ untrue

Q20- Most Saltwater crocodile attacks on humans are unsuccessful, and individuals have the opportunity to escape.

☐ untrue ☐ unsure ☐ true

Q21- Saltwater crocodiles are slow on land.

☐ true ☐ unsure ☐ untrue

Q22- Saltwater crocodiles usually stalk their prey.

☐ true ☐ unsure ☐ untrue

Q23- Salt water crocodiles can stay submerged up to an hour.

☐ true ☐ unsure ☐ untrue

Q24- Saltwater crocodiles feed mostly on fish, and don't usually hunt large mammals.

☐ untrue ☐ unsure ☐ true

Q25- Crocodiles are cannibals.

☐ untrue ☐ unsure ☐ true

Q26- Crocodiles store there prey for future feeds.

☐ true ☐ unsure ☐ untrue

Q27- Salt water crocodiles help to keep a balance among the other animals and plants in their habitat.

☐ true ☐ unsure ☐ untrue

Q28- Saltwater crocodiles are territorial.

☐ untrue ☐ unsure ☐ true

Q29- Female Saltwater crocodiles look after their young.

☐ untrue ☐ unsure ☐ true

Q30- 90% of born Saltwater crocodiles do not reach adulthood.

☐ untrue ☐ unsure ☐ true

Q31- Crocodiles' body temperature depends on the surrounding temperature.

☐ true ☐ unsure ☐ untrue

Section 1

Q1-How would you describe your attitude to crocodiles:
(What you feel about them, what ought to be done about them..)

.....

.....

.....

(In this section, please tick one box only unless it is specified otherwise)

Q2-How dangerous to people would you say crocodiles are ?

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| not at all | a little | moderately | a lot | don't know |

Q3- Do you agree that Freshwater crocodiles and Saltwater crocodiles are equally dangerous?

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| agree | moderately agree | undecided | moderately disagree | disagree | don't know |

Q4-Do you agree that large Saltwater crocodiles only(more than 2m in length) are dangerous to people?

| | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| never | rarely | sometimes | most times | all the time | don't know |

Q5-Because of crocodiles, how concerned are you about the safety of people in this area?

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| not at all | a little | moderately | a lot | don't know |

Q6-Because of crocodiles, how concerned are you about your personal safety?

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| not at all | a little | moderately | a lot | don't know |

Q7-How would you estimate the chance of being harmed by a crocodile in this area?

| | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| nil | very low | low | moderate | high | very high | Don't know |

Q8- Which, of the following list are the greatest source of concern to you?

(Please, score the item of greatest concern as 1, the second as 2, the third as 3 etc..., use only one rank number for each item)

| | |
|--|---|
| <input type="checkbox"/> crocodiles <input type="checkbox"/> cyclones <input type="checkbox"/> heart attacks <input type="checkbox"/> floods <input type="checkbox"/> tropical diseases (mosquito born diseases, tropical infections...) | <input type="checkbox"/> car accidents <input type="checkbox"/> snakes <input type="checkbox"/> jellyfish <input type="checkbox"/> wild pigs <input type="checkbox"/> sharks <input type="checkbox"/> skin cancer <input type="checkbox"/> Aids |
|--|---|

Q9-How familiar are you with crocodiles and crocodile habitats?

(Circle the appropriate answer)

Not familiar 1 2 3 4 5 very familiar

Q10-What would your estimate of the population of crocodiles be in this area?

----- ☐ Don't know

Q11-How often have you seen crocodiles?

- ☐ never
☐ once to 4 times
☐ 5 to 10 times
☐ more than 10 times

If you answer "never" to question 11, please go to question 16

Q12-If once or more, in what circumstances?

- ☐ in a captive situation (zoo or farm)
☐ in the wild situation
☐ in both situations

Q13-If you have had any experience with crocodiles, (either in the wild or captive)

please describe a particularly striking experience...

- When -----
 - Where, -----
 - Who with -----
 - What happened -----

 -What you did-----

 -How you felt-----

Q14-How much has your personal experience influenced your feelings towards crocodiles?

☐ ☐ ☐ ☐ ☐
 not at all a little moderately a lot don't know

Q15-If it has, in what way?

Q16- Are you personally frightened of crocodiles?

☐ ☐ ☐ ☐ ☐ ☐
 never rarely sometimes most times all the time don't know

Q17-What make crocodiles such frightening creatures to you?
(Is it their physical appearance, primitiveness, predator behaviour...?)

.....

Q18- Can you recall when was the last crocodile attack in the North?

☐ ☐ ☐ ☐

less than less than more than cannot
a year 5 years 5 years recall any

Q19-Can you recall the circumstances in which happened?

.....

-What were your feelings at the time ?

.....

-What was the immediate consequence of the attack?

.....

-How could it have been avoided?

.....

-How did you learn about it?

.....

Q20-Overall, how concerned about safety were you at the time of the attack?

☐ ☐ ☐ ☐

very moderately slightly not at all
concerned concerned concerned concerned

Q21-To what extent each of the following factors contributes to your concern about the risk of a crocodile attack?

-Not knowing when and where a crocodile will appear.

☐ ☐ ☐ ☐ ☐

not at all a little moderately a lot don't know

-Your inability to prevent crocodile attacks.

☐ ☐ ☐ ☐ ☐

not at all a little moderately a lot don't know

-Knowing of someone who was attacked by a crocodile.

☐ ☐ ☐ ☐ ☐

not at all a little moderately a lot don't know

-The often fatal outcome as a result of an encounter.

☐ ☐ ☐ ☐ ☐

not at all a little moderately a lot don't know

Q22-How would you estimate the number of crocodile victims in North Queensland annually?

☐ individuals ☐ don't know

Q23-How important do you think safety precautions are to prevent accidents?

☐ Very important
 ☐ moderately important
 ☐ slightly important
 ☐ not at all important
 ☐ don't know

Section 2

For each question please one answer only unless it is specified otherwise.

Q24-Do you avoid places where you know crocodiles have been seen?

☐ never
 ☐ rarely
 ☐ sometimes
 ☐ most times
 ☐ all the time
 ☐ don't know

Q25-How often do you go to places where crocodiles live (i.e. tropical rivers, billabongs and swamps)?

☐ never
 ☐ rarely
 ☐ sometimes
 ☐ most times
 ☐ all the time
 ☐ don't know

If you answer 'never' to question 25, please go to section 3.

Q25b-How long for do you usually go where crocodiles live?

-----day(s), month(s) per year
 -----,year(s) (*delete not applicable*)

Q28-Do you usually go in tropical wetlands and rivers...?

☐ alone
 ☐ with a friend
 ☐ with my family
 ☐ with a group
 ☐ with work team
 ☐ other

Q26- Which of the following outdoor activities would take you into crocodile habitats?(Tick as many as needed)

| | |
|---|---|
| <input type="checkbox"/> diving | <input type="checkbox"/> swimming |
| <input type="checkbox"/> camping/caravaning | <input type="checkbox"/> BBQing |
| <input type="checkbox"/> fishing | <input type="checkbox"/> hunting |
| <input type="checkbox"/> bushwalking | <input type="checkbox"/> birdwatching |
| <input type="checkbox"/> holidaying | <input type="checkbox"/> Flora and fauna collecting |
| <input type="checkbox"/> sightseeing | <input type="checkbox"/> natural photography |
| <input type="checkbox"/> other _____ | |

☐ Not applicable

Q27- Which of the following work activities would take you into crocodile habitats?

| | |
|--|---|
| <input type="checkbox"/> fishing | <input type="checkbox"/> farming |
| <input type="checkbox"/> research | <input type="checkbox"/> tourist operations |
| <input type="checkbox"/> food collecting | <input type="checkbox"/> other _____ |

☐ Not applicable

Q29-Could you briefly describe the precautions you would usually take while in an area where crocodiles might be found?

.....

.....

.....

Q30-To what extent do you follow safety precautions?

☐ ☐ ☐ ☐ ☐

all the most sometimes rarely never

time times

Q31-How often must you take risks and disregard safety precautions?

☐ ☐ ☐ ☐ ☐

all the most sometimes rarely never

time times

Q32-If you do take risks, could you explain why?

.....

.....

.....

Section 3

Q33-How much do you think the risk of crocodile attack has changed in the last 5 years?

☐ ☐ ☐ ☐ ☐

not at all a little moderately a lot don't know

Q34-If there is a change in the risk of crocodile attack, would you say it has

☐ increased ☐ Decreased ☐ N/A

Of the following possible explanations, which are closest to your views? (Please tick one box only)

Q34b-There is an increase in crocodile numbers.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly

disagree disagree agree agree

Q35-Large crocodiles are no longer wary of people.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly

disagree disagree agree agree

Q36-There is not enough trapping of large crocodiles.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly

disagree disagree agree agree

Q37-There are more people coming into areas where crocodiles live.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly

disagree disagree agree agree

Q38- People are not taking safety seriously.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly

disagree disagree agree agree

Q39-People are ignorant about crocodiles.

☐ ☐ ☐ ☐ ☐ ☐

strongly agree moderately agree undecided moderately disagree strongly disagree don't know

Q41-Crocodiles are the centre of increasing media attention.

☐ ☐ ☐ ☐ ☐ ☐

don't know strongly moderately undecided moderately strongly
disagree disagree agree agree

Section 4

For each statement, please tick one box only unless it is stated otherwise.

Q42-My knowledge of crocodiles is

☐ nil ☐ poor ☐ reasonable ☐ good ☐ very good

Q43-How easy is it for you to get the facts on crocodiles ?

☐ ☐ ☐ ☐ ☐

| | | | | | |
|-----------------------|-----------------------|-------------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| very easy | moderately easy | moderately difficult | | very difficult | don't know |

Q44-Please indicate from the following list which source(s) have contributed to your knowledge of crocodiles.(Tick the appropriate box and use provided scale card for ranking

| Yes | no | Credible/ rustworthy (Q47) |
|-----|----|----------------------------------|
|-----|----|----------------------------------|

1-My personal experience

2-Experiences of my friends and relatives

**3-Tourism personnel(as in zoos/
tourists cruises/travel agents)**

4-National Parks and other wildlife personnel

5-The local news
either tv or paper

6-National TV networks
Current affairs programs

7-Documentaries and books on natural history

8-Weekly magazines

9-Specialist magazines(outdoor recreation/farming/fishing etc..)

10-Scientific publications

11-Tourist brochures

12-On site crocodile signs

13-Other:-----

Q47-In your opinion, what would be the most credible source of information of your interest?

(Using the following scale, assign a number to the items on question 44)

Not at all/ 1 2 3 4 5 highly credible
credible

Q45-How would you describe the information on crocodiles available to you ?
(please circle the appropriate number)

Inappropriate 1 2 3 4 5 very appropriate ☐ DK

Insufficient 1 2 3 4 5 sufficient ☐ DK

very 1 2 3 4 5 not at all ☐ DK
sensational sensational

Q46-Which of the crocodile items would you like to read about?(Please tick as appropriate)
which would interest you most?(Please rank)

yes no Rank(1 to 6)

Safety

Farming

Ecology/biology

Management practices

Crocodile attacks

Other:-----

Q48-How important to you is the information you have obtained on crocodiles?
(Please circle as appropriate)

Very 1 2 3 4 5 not at all
important important

How much do you agree with the following statements?*(Please tick as appropriate)***Q49-**do you agree that learning more about crocodiles make them less fearsome.to you
☐ ☐ ☐ ☐ ☐ ☐

don't know strongly disagree moderately disagree undecided moderately agree strongly agree

Q50-Do you agree that crocodile signs near rivers and swamps encourage you to behave safely.
☐ ☐ ☐ ☐ ☐ ☐

don't know strongly disagree moderately disagree undecided moderately agree strongly agree

Section 5

Q51- How interesting are the following animals to you?*(please rank the following items using 1 as the most interesting, 2 the second most, etc..., use one rank number only per item)*

| | |
|---------------------------------------|--|
| <input type="checkbox"/> Native frogs | <input type="checkbox"/> Koalas |
| <input type="checkbox"/> Barramundi | <input type="checkbox"/> Sulfur crested cockatoo |
| <input type="checkbox"/> Corals | <input type="checkbox"/> Butterflies |
| <input type="checkbox"/> horses | <input type="checkbox"/> Eagles |
| <input type="checkbox"/> Snakes | <input type="checkbox"/> Crocodiles |
| <input type="checkbox"/> Insects | <input type="checkbox"/> Dogs |

Q52-Can you explain your choice for the species you ranked first and last?

Q53-In your opinion,how valuable are crocodiles?*(circle the appropriate number)*

Not at all 1 2 3 4 5 very valuable

valuable

Q54-to what extent each of the following factors contribute to the value(or no value) of crocodiles?*(Tick the appropriate number)*

high 5 4 3 2 1 low

Their use in farming for
skins and other products

As an attraction for outdoor
recreation

Their role in the
balance of nature

Q56-How important do you think crocodiles are in tropical rivers and swamps?
☐ ☐ ☐ ☐ ☐ ☐

Not important moderately important Important very important essential don't know

Q55-Do you know why?(what is their role in nature?)

.....

Q57-How much do you think humans' activities in tropical wetlands affect the life of crocodiles?

☐ ☐ ☐ ☐ ☐ ☐
 not at all a little moderately quite greatly Don't know

Q 58-Can you explain your response?

.....

For each statement, please tick one box only unless it is stated otherwise.

Q60-Crocodiles as a wild animal have the right to exist in their environment.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

Q61-People should be educated to respect crocodiles and to follow safety precautions at all time when in their habitat.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

Q62-Crocodiles provide a unique experience of nature.

☐ ☐ ☐ ☐ ☐ ☐
 agree moderately undecided moderately disagree don't know
 agree disagree

Q63-There is no excitement and adventure without crocodiles in the tropics.

☐ ☐ ☐ ☐ ☐ ☐
 agree moderately undecided moderately disagree don't know
 agree disagree

Q64-It is cruel to keep wild crocodiles in captive conditions.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

Q65-Crocodiles are a nuisance in the tropics.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

Q66-Fishermen and farmers should not be compensated for their losses to crocodiles because it is part of their work.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

Q68-How prepared are you to accept restrictions on the use of some areas of wetlands to allow proper management of crocodile populations?

☐ not at all ☐ a little ☐ moderately ☐ quite ☐ greatly ☐ Don't know

Section 6

Q69-Do you think crocodiles are fascinating creatures?

☐ not at all ☐ slightly ☐ moderately ☐ greatly ☐ Don't know

Q70-Can you explain reasons why (or why not)?

.....

Q74-Can you recall a crocodile story (joke, ad, film etc..) you read, heard or saw? What was the storyline? Was the crocodile a good or bad character, comical or other.?

.....

Q75-Crocodile images are widely used in North Queensland. Can you think of reasons why this is?

.....

Q76- As a symbol of the North, the crocodile is

☐ Very appropriate ☐ appropriate ☐ Quite appropriate ☐ Quite inappropriate ☐ inappropriate ☐ Very inappropriate

Q77-If not appropriate, can you think an alternative symbol?

.....

Section 7

For each statement, please tick one box only unless it is specified otherwise

Q78-What is your usual residence (Town, State, Country)?

Q79-How long have you been in this area:

(Circle relevant time unit)

_____ days/weeks/ months/ years

Q80-What is the purpose of your stay in this area?

Yes no

Work

Holiday

Retirement

Family ties/birth

Visiting relatives

Choice of residence

Study

Other: _____

IF YOU ARE A VISITOR TO THE AREA PLEASE FILL THIS SECTION.

For each statement, please tick one box only unless it is specified otherwise.

Q81-As a visitor to the area, I travel..

- | | |
|--|---|
| <input type="checkbox"/> By buses and public transport | <input type="checkbox"/> By 4WD vehicle |
| <input type="checkbox"/> Hitchhiking | <input type="checkbox"/> By motor bike |
| <input type="checkbox"/> own car | <input type="checkbox"/> other: _____ |

Q82-As a visitor to the area, I travel...

- ☐ In a group
- ☐ With friends or relatives
- ☐ On my own

Q82b- As a visitor I usually stay at/in...

- ☐ Camping ground
- ☐ Caravan/units
- ☐ Motel/resort
- ☐ backpackers
- ☐ Friends and relatives
- ☐ Other

Q83- As a visitor, my reason to come to this area is:

.....

.....

Q84-As a visitor to this area, are you concerned about local issues such as crocodiles?

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| not at all | a little | moderately | a lot | quite a lot | don't know |

Q85- As a visitor to the area. do you agree that you should take into account what the locals say and do about crocodiles?

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| don't know | strongly disagree | moderately disagree | undecided | moderately agree | strongly agree |

Q86- As a visitor, do you agree that your opinions on the crocodile issue are as important as the opinions of the local residents.

☐ ☐ ☐ ☐ ☐ ☐
 don't know strongly moderately undecided moderately strongly
 disagree disagree agree agree

IF YOU ARE A RESIDENT TO THIS AREA, PLEASE FILL THIS SECTION.

for each statement, please tick one box only unless it is specified otherwise

Q87- As a resident to this area, do you feel attached to the place and the people?

☐ ☐ ☐ ☐ ☐ ☐
 not at all a little moderately quite greatly don't know

Q88- Do you belong to any particular association(s) in the community? if so please indicate which .

Q89- As a resident, how well do you think your views are represented in decisions regarding the crocodile issue in the area?

☐ very well
☐ well
☐ moderately
☐ poorly
☐ very poorly
☐ No participation

Q90- As a resident, do you consider the crocodile issue as a local issue. only?

(tick one only)

☐ ☐ ☐ ☐ ☐ ☐
 not at all a little moderately quite greatly don't know

Q91- As a resident, do you feel that the public should be more concerned about the local implications of crocodile management decisions?

☐ ☐ ☐ ☐ ☐ ☐
 not at all a little moderately quite greatly don't know

Section 8

For each question, please tick one box only unless it is specified otherwise

Q92- Please can you indicate your age? _____

Q93-Sex ☐ male
 ☐ female

Q94- Place of birth (yourself).

☐ Australia
☐ Overseas. which country: _____

Q95- Place of birth (mother).

☐ Australia
☐ Overseas. Which country: _____

Q96-Place of birth(father).

- ☐ Australia
☐ Overseas. Which country:_____

Q97-Could you please indicate your ethnic background:

.....

Q98- Could you please indicate your marital status?

☐ ☐ ☐ ☐ ☐

never married separated divorced widowed
 married not divorced

Q99-Number of children under 15 years old:

Q100-What is your level of education:-----
 (Primary,secondary, tertiary)

Q101-What training /qualifications do you hold:-----

Q102-What is your occupation (Profession /Trade, other)-----

Q103-are you presently employed as:

- ☐ Wage/salary earner
☐ Self employed
☐ Employer
☐ Unpaid helper
☐ Unemployed

Q104-I am not in the labour force.

- ☐ Pensioner
☐ Retired
☐ Student

Q105- What is your annual income (Before tax):

Q106- Are you practising a religion?

which:-----, none-----

Q107-Where have you spent most of your life ? for how long?

- ☐ in a small town _____years
☐ in a large city _____years
☐ in a station or farm _____years
☐ in a mission _____ years
☐ other:_____ _____years

THANK YOU FOR YOUR TIME.

IF YOU WISH TO MAKE ANY COMMENTS, PLEASE DO SO IN THE REMAINING SPACE.

.....

CODE BOOK

1 - CODING OF SCALES AND CATEGORICAL DATA

| | | |
|------------------|------------|---|
| Locations | Weipa | 1 |
| | Napranum | 2 |
| | Daintree | 3 |
| | Cape Trib | 4 |
| | Hopevale | 5 |
| | Townsville | 6 |
| | Townsville | 7 |

Interviewers

| | |
|-----|----|
| DB | 1 |
| DV | 2 |
| WG | 3 |
| LB | 4 |
| TC | 5 |
| JO' | 6 |
| AP | 7 |
| OF | 8 |
| OK | 9 |
| SS | 10 |
| KD | 11 |

1.1 - Scales

Scale 1 (3 Intervals), see knowledge scale (Questions 1-31)

| | | |
|----------------|-----|------|
| untrue/unsure | = 3 | true |
| correct answer | = 1 | |
| not correct | = 2 | |

Scale 2 (5 Intervals)

Agree(strongly agree)=5, moderately agree=4, undecided=3, moderately disagree=2, .disagree(strongly disagree)=1

S1Q3, S2Q34 to Q41, S5Q49, Q50, S5 Q60 to 66, S7 Q85, Q86.

Scale 3 (5 Intervals)

never=1....All the time=5

(S1Q4,Q24,Q25, S2Q30, Q31)

Scale 4 (4 Intervals)

not at all=1, a little(slightly)=2, Moderately(quite)=3, a lot (greatly, very)=4

Statements: S1Q2,Q5,Q14, Q21a,b,c,d, S3Q33, S5Q57, S6Q69, S7 Q84, S8Q87, S8Q90,Q91.

Adjectives: Concerned(S1Q20),important(S1Q23, S5Q56),

Scale 5 (5 Intervals)

Not at all (adjective).....1,. 2, 3, .4,5 Very(adjective)

Adjectives:Familiar (S1Q9), appropriate,sufficient, sensational (S5Q45a,b,c).. important, (S5Q48, S5 Q56), credible (S5Q47), valuable (S5 Q53).

low (Statement) 1, 2, 3, 4, 5 high.

S5Q54

Scale 6 (6 Intervals)

very innapropriate=1, inappropriate=2, quite (moderately) inappropriate=3,

Quite(moderately) appropriate=4, appropriate=5, very appropriate=6

(S6Q76)

scale 7 (4 Intervals)

very difficult=1, moderately difficult=2, moderately easy=3, very easy=4

(S5Q43)

Scale 8 (5 Intervals)

Nil=1, poor=2, reasonable=3, good=4, very good=5

S5Q42

Scale 9 (4 Intervals)

Nil=1, very low/ low=2, moderate=3 , high/ very high=4

S1Q7.

1.2 - Categories

Ranking questions S1Q8, S5Q51

in each enter rank no, if no rank then enter 88(N/A).

Cards were used for those two questions.

S1-Q11.

never=1,

once(less than 5 times)=2,

more than 5 times up to 10 times=3,

more than 10 times=4.

S1-Q10

Crocodile population estimates:

1 to <100 1

100 to <500 2

500 to 1000 3

>1000 4

S1-Q12

Experience with crocodiles:

Captive only 1

Wild only 2

Both 3

S1-Q16

If respect value=77

S1-Q22

number of individuals attacked per years

<=1 1

>1 to 5 2

>5 3

S2 -Q25b

How long in Crocodile habitats:(days per year)

| | |
|------------|---|
| 1 day only | 1 |
| 1 to 7 | 2 |
| >7 to 28 | 3 |
| >28 | 4 |

S2-Q28

| | |
|-------------------------|---|
| Alone | 1 |
| With friends and family | 2 |
| With group or team work | 3 |
| Other | 4 |

Recreational activities

(S2 Q26):

yes=1, no=2

S2-Q26 f/h

exploitative activities: include fishing and/or hunting.

S2-q26 nat

nature based activities :birdwatching, photography, flora and fauna collecting, crocodile spotting.

S2-Q26 Camp

camping, firewood collecting, food collecting, BBQ.

S2-Q26 swim9

Incidental leisure activities: swimming, diving, motorbike riding, waterskiing, 4wd driving, horse riding, sunbaking etc..

S2-Q26bush

Bushwalking can be associated with f/h or nat, as well as sight seeing on its own (include any mention of walking).Note: difficulty to categorise Aboriginal activities as either work or recreational.

Work activities**(S2 Q27)**

criteria for work: it must be a source of income whether casual or not to be distinguish from leisure activities (tourist operations, i.e. tours attractions), not just hospitality).

For each category, yes=1, no=2.

Other category: include prof photography, maintenance works, sewerage, transport, power lines seed collecting for Comalco (aborigines), ex Crocodile shooter, SES, wharf jobs, army reserve, educational projects, food gathering (aborigines), timber cutting, floating logs, patrolling (ranger).

S5- Q44**Categories of media:**

in each yes=1, no=2.

Personal experience:

of friends and relatives includes also local knowledge, and anything which is word of mouth. In aboriginal terms, importance of elders.

Other category:

includes Comalco video on crocodiles, library, schools, crocodile attack books, dreamtime stories, tide books.

S5-Q44-11: zoos displays (include national parks in people's mind?)

S5-Q46 (areas of Interest)

For each category, yes=1, no=2.

If yes, then enter rank number, if no, then enter 88(N/A).

other: Psychology relationship to the environment, history, way crocodiles think.

S5-Q47**Credibility of sources: ranking of S5Q44:**

if yes, then enter rank number (1 first priority to 6 least).

if no then enter 88(N/A)

S7-Q78**Categories of residence**

| Recoded as: | | Entered as: | |
|-------------|-------------|-------------|----------------------------------|
| 1- | local | 1 | |
| 2 - | QLD | 2 | STATES WITH CROCODILES |
| | NT | 3 | |
| | WA | 4 | |
| 3- | VIC | 5 | STATES WITHOUT CROCODILES |
| | SA | 5 | |
| | NSW | 5 | |
| | ACT | 5 | |
| 4 - | UK | 6 | OVERSEAS. |
| | EUROPEAN | | |
| | (NOT UK) | 7 | |
| | USA/Canada | 8 | |
| | JAPAN | 9 | |
| | ASIA | | |
| | (NOT JAPAN) | 10 | |
| | other | 11 | |

S7-Q79**Length of residence in the area (residents only)**

| Recoded as: | | Entered as: | |
|----------------|-----------------|-------------|---------------------|
| missing value- | 1 day | 1 | (visitors) |
| | >1 to 1 week | 2 | |
| | 7 to 28 | 3 | |
| 1 - | >28 to 1yr | 4 | Temporary residents |
| 2 - | >1yr to 5yrs | 5 | Semi permanent |
| 3- | >5yrs to 10 yrs | 6 | Permanent |
| 4- | >10 yrs | 7 | Long term residents |

Length of residence (visitors only)

1 to 3 categories, 4 to 7 missing value.

S7-Q80

For each category,

yes=1, no=2.

Other category:moved by force.

TOURISTS**S7-Q81****Travel:**

| | |
|---|---|
| public transport (bus, plane, hike, etc..) | 1 |
| private transport (car includes hire,bike boat, WD vehicles | 2 |
| other | 3 |

S7- Q82

| | |
|-------------------------------|---|
| Alone | 1 |
| With friends and relatives | 2 |
| With group as in tours | 3 |
| Other | 4 |

S7-Q82b**Accommodation types**

| | |
|-----------------|---|
| Camping | 1 |
| Caravan/units | 2 |
| Motels/resorts | 3 |
| Backpackers | 4 |
| Friends and rel | 5 |
| Other(boat..) | 6 |

RESIDENTS**S8-Q88**

Yes=1, no=2, no answer=77.

If yes then

S8Q88which

| | |
|-------------|--|
| Religious | 1 |
| Community | 2 (include political association) |
| Sport | 3 |
| Environment | 4 |
| Cultural | 5 (include clans cultural activities) |
| Profess | 6 (include tourism association |
| Other | 7. |

If more than one category, even out occurrence.

S8-Q89

| | |
|------------------|---|
| no participation | 1 |
| Very poorly | 2 |
| Poorly | 3 |
| Moderately | 4 |
| Well | 5 |
| Very well | 6 |

S9-92

Age groups

| | |
|-----------|---|
| >15 to 30 | 1 |
| >30 to 45 | 2 |
| >45 to 60 | 3 |
| >60 | 4 |

S9-Q93

Male=1

Female=2

S9-Q94

Place of birth:

write state if Australia

or country if overseas.

S9-Q97

| | |
|--------------------------------|---|
| Indigenous | 1 |
| (Aboriginal, Islander, mixed) | |
| British descent | 2 |
| Non British European | 3 |
| (anyone with some non British | |
| Asian | 4 |
| Other (south America) | 5 |

Indigenous is culturally defined as person belonging to . This includes Aboriginal, Islander, part Aboriginal (Aboriginal/Islander/European.

S9-Q98

| | |
|------------------------|---|
| Never married | 1 |
| Married/de facto | 2 |
| Separated not divorced | 3 |
| Divorced | 4 |
| Widowed | 5 |

S9-Q99

Children under 15 yrs old

yes=1, no=2

S9-Q100

Levels of education:

| | |
|----------------|---|
| Primary | 1 |
| Secondary | 2 |
| Tertiary | 3 (include nurses) |
| TAFE/technical | 4 (include all apprentices from Comalco and anyone with some technical qualification) |
| Other | 5 |

S9-Q101

Qualifications:

| | |
|--------------------|---|
| None | 1 |
| Trade/techn/cleric | 2 |
| Professional | 3 |

S9-Q102

Occupation:

Recoded as:

Entered as

| | | |
|-----|--|---|
| 1 | -None | 0 |
| | -Unskilled lab | 1 |
| | -Skilled lab | 2 (bar work) |
| 2 | -Trade/techn/ -sales/ paraprofess/cleric | 3 (hairdresser, park ranger, tour guides...), 5 (secretaries, police women, teacher aids |
| 3 - | Profess/managerial | 4 (include tour operators, Aboriginal representatives, nurses) |
| 4 - | Home duties | 6 |
| 5 - | Primary producers Fishermen/farmers | 7 |

S9-Q103

Present employment:

| | |
|---------------|---|
| Unemployed | 1 |
| Unpaid helper | 2 |
| Self/employer | 3 |
| Wage/salary | 4 |
| CDEP | 5 |

(Aboriginal employment scheme in remote communities)

S9-Q104

Not in the labour force:

| | |
|-----------|---|
| Student | 1 |
| Retired | 2 |
| Pensioner | 3 |

S9-Q107**BACKGROUND**

1 - Rural only

(include station/farm
mission, small town)

2 - Urban only

(include larger towns and cities)

3- Both rural/urban

4 - Other

(include overseas, living on a ship, any of the above and the 2 previous.

Missing values: entered as

DK = 99

N/A = 88

No answer = 77

2 - OPEN ENDED QUESTIONS

S1-q1M - Attitudes towards crocodiles

management oriented:

S1-Q1M1-leave them alone

S1-Q1M2-should be controlled (in population areas, i.e. removed, culled, farmed, exploited)

S1-Q1M3-public education (plus people should learn to live with them, be more careful, wary)

S1-Q1E

feeling oriented:

S1-Q1E1-**positive** (interested, fascinated, respect, awareness for a distinct unique wild animal with a place in nature; or upset or angry if saw a dead croc)

S1-Q1E2-**negative** (fear, hate due to ugliness danger, unpredictable cruel, nuisance nature of the animal.

S1-Q1E3-**neutral** (not worried about them, they're okay, irrelevant, indifferent)

S1-Q1E4-**cautious, wary, respectful** because of danger

note: people have the perception that crocodile populations will grow indefinitely unless some human control is applied

S1-q8A- Sallience of crocodiles as an environmental threat

yes=1, no=2

is croc first?

S1-Q8B

is croc in top 5?

S1-Q14

experience with crocodiles, effect on feelings:
seen /not seen any (see S1Q11)

S1-q13

see correlation between:

| | 1(WILD) | 2(CAPTIVE) |
|---------------|---------|------------|
| 1(neutral) | (1) | (6) |
| 2(scared) | (2) | (7) |
| 3(cautious) | (3) | (8) |
| 4(interested) | 4 | 9 |
| 5(aroused) | 5 | 10 |

1-Q13-SET Circumstances of personal experience

categories of experiences:

- 1-experience in the **wild**
- 2- experience in a **captive** situation (zoo/farm)

S1-Q13-EM Personal experience

types of feelings (personal accounts)

- 1-no concern/neutral
- 2-scared/frightened/horrified
- 3-respectful/aware/cautious
- 4-interested/curious/excited/impressed.
- 5-aroused/surprised/awed

S1Q15- Effect of personal experience

- 1=increase respect, awareness, knowledge, safety.
- 2=increase fear, disgust, need culling (aggressiveness)
- 3=decrease fear
- 4=increase liking and interest, defensive of crocs, concern for crocs,

S1Q17-

reasons why frightening

S1Q17A- physical appearance (size, teeth, nails, scales)

S1Q17B- primitiveness (primeval, prehistoric, survived for so long)

S1Q17C- anthropomorphic features (no emotion, cold-blooded, sly, not to be trusted, they are like people, cunning, intelligent) and **other culturally produced features** (stories, their reputation, image, media, publicity)

S1Q17D- predator behaviour (man-eating, movement unpredictable, strong, speed)

S1Q17E- part of nature (wild, untamed, awesome) and **unknown** (mysterious, know little about them)

S1Q17F- abundance (rare, they are here)

S1Q17G- unusual, unique (as a whole or a particular aspect of physiology, biology or behaviour)

S1Q18

Accuracy of the date:(little accuracy is expected)

yes=1/no=2

S1Q19- Crocodile attacks

References used for crocodile attacks identification: Edwards, H . 1988; Crocodile attacks, field notes 1990, J. shields, DPI Cairns pers. comm.; Townsville Daily bulletin; Cairns Post; Pohlner, J.1986;
categories of attacks mentioned (1 column)

- 1-1985-Beryl Wruck (Daintree river) drunk, Midnight, swim.died.
- 2 1986-Kate Mcquarrie (Staaten river), deckhand, Swam to boat, died.
- 3-1990 - telecom man (Groote Eylands).drunk slept on ramp. died.
- 4-1987-Ginger Meadows -female American tourist-(Prince Regent River WA) swam in cascades died.
- 5-1987 Mc Loughlin. (Cahill crossing East Alligator river), fishing from crossing, taken while wading across at high tide.died.
- 6-1989-Aboriginal man (Daly river), drunk head in the water, survived by poking the eyes of the crocodile.
- 7-1990.Aboriginal woman (Daly River), camping on the bank, sleeping. survived , her son wrestled with the crocodile and poked it in the eyes.
- 8-1986-Borrooloola, 2 men slept on river bank (MacArthur river) drink one was taken. died.
- 9-1980-(Wyndham)2 men on the beach at night one went for a midnight swim died.
- 10-1979-Nhulumbuy (Gove, NT). 1male diver taken, died.
- 11-1980-Nhulumbuy (gove, NT) .Aboriginal woman taken while fishing in billabong, died.
- 12- Feb 1985-Val Plumwood. (KaKadu nat. Park.) canoeing. grabbed but released survived.
- 13- Unidentified reports
- 14- 60 years ago - aboriginal woman (Hopevale, QLD) went for a bath in river, her little girl saw her taken (Hopevale filed notes, no date available).
- 15- 1952 -Aboriginal woman, baby and old uncle (Aurukun) canoe capsised, uncle saved them all (recorded in Cairns Post, Shield , pers. comm.)
- 16- 1986- (Bamaga) Islander man asleep on beach (drunk), left on the beach after a fight on a boat (J. Shields, pers. comm). Died.
- 17- Oct 1988. Nhumumbuy (Gove, NT), Aboriginal man was fishing at water hole (same as in 1980) (J. Sields pers. comm) died.
- 18- -April 1975- Peter Reimers (Mission River) went for a "cool off" in shallow water. Died.
- 19 - no answer

Crocodile attacks accounts

For each account record when available:

S1-Q19A

categories of victims:

- 1-male
- 2-female
- 3-person
- 4-other (horse)

S1-Q19B

ethnic categories:

- 1-aborigines/Islanders
- 2-non aborigines
- 3 no answer

S1-Q19C

circumstances

- 1-swimming
- 2-at water edge(fishing, sleeping,drinking, bathing, wading)
- 3- kept as pet
- 4- boat
- 5- no answer

S1-Q19D

outcome

- 1-death (taken, caught)
- 2-survival
- 3 - no answer

S1-Q19E

categories of responsibilities:

- 1-own fault , could have been avoided(stupidity, not enough precautions taken, drunk)
- 2-other (bad luck, croc's fault, one of those things)
- 3-foul play, suspicious circumstances
- 4- no answer
- 5- Don't know

Safety precautions**S2Q29A-**

no precaution

yes=1no=2

Precautions categories:

S2-Q29B-Ask for local information on where they are, read signs or maps, listen to tour guide

S2-Q29C-look for crocodile signs and be observant alert (land slides, bubbles movements etc water temperature, barramundi around etc....)

S2q29D-avoidance strategies

no swimming /stay away from water edge, no fish scraps, no hands overboard, stay in boat, no pattern of activities , daylight, etc....)

S2Q29E-aggressive methods weapons (guns, spears sticks)

S2-q29F-safeguard, defensive methods (take dog, go with group, light fire, good boat, wire mesh, horse, speak loudly at night, have bright light)

S2-q29g-other (first aid box)

S2Q32 Reasons for taking risks

- 1=stupidity, ignorance, carelessness, lazy ,drunk
- 2=emergency
- 3=necessity (fishing/farming)
- 4= part of leisure activities
- 5= excitement and thrill (showing off, one crowded hour of life is worth an age without a name)

S5-q51A- Sallience of crocodiles a a species of interest**yes=1, no=2**

is croc 1st?

S2Q51B

is croc in top 5?

S5Q51C

is croc last?

S5-q51D**wild=1, domestic=2**

is 1 wild or domestic

S5QQ51E

is 12 wild or domestic?

S5Q52A(no1) reasons 1st ranking1=**emotional** (like, love, pets, part of sport, frightening, not threatening, independence, presence)2=**aesthetic** (visual, movement, sound)3=**familiarity** (common, in contact with them)4=**abundance** (rare, dying out, elusive, endangered)5=**knowledge** (interest, curiosity, know nothing about them)6=**totem****S5-Q52B Reasons for last ranking**1=**emotional** (dislike, dangerous, horrible, wild, nuisance, don't trust them)2=**aesthetic** (ugly)3=**familiarity** (not familiar, don't have much to do with them)4=**abundance** (common, ordinary, domestic, nothing special)5=**knowledge** (boring, know nothing about them, insignificant)**S5Q55****role of crocodile in wetlands**1= **no purpose**, no particular role2= **vague purpose** to it(all creatures here for a reason, balance of nature, part of ecosystem- answers imply that crocs have some sort of use, though they may not know what it is)3=**Ecological purposes** (predator and control of prey populations including feral populations, scavenger cleans up rivers of dead animals, part of food chain, competition)4=**other**(food, skins effect on tourism)5=**they are just there, living** their life like us, reproducing (answers have no implication of use, living is sufficient purpose)**S5-Q58****Impacts****S5Q58A**-loss or pollution of habitat(encroachment/displacement)**S5Q58B**-**Direct action** on crocs: direct killing, removal, collecting eggs**S5Q58C**-affect their **food sources** and feeding habits(depletion of, competition for, shift to scavenging this includes people.)**S5Q58D**-Distress or **disturbance** of crocs(annoyance, crowding, upset their lifestyle)**S5Q58E**-**positive effect** on crocs (protection, clearing of land-warm water-increase in nos of crocs)

S5Q70

reasons for fascination

S5Q70A- physical appearance (size, teeth, nails, scales)

S5Q70B- primitiveness (primeval, prehistoric, survived for so long)

S5Q70C- anthropomorphic features (no emotion, cold-blooded, sly, not to be trusted, they are like people, cunning, intelligent) and **other culturally produced features** (stories, their reputation, image, media, publicity)

S5Q70D- predator behaviour (man-eating, movement unpredictable, strong, speed)

S5Q70E- part of nature (wild, untamed, awesome) and **unknown** (mysterious, know little about them)

S5Q70F- abundance (rare, they are here)

S5Q70G- unusual, unique (as a whole or a particular aspect of physiology, biology or behaviour)

S5Q74A

Crocodile stories

Sources of stories

1=advertising (dentist, fruit loops, for zoos)

2= films (Croc Dundee, Return to Eden)

3= children's stories (Peter Pan, Rudyard Kipling, nursery rhyme)

4= true stories (documentaries, friends, rumours, books, news)

5=aboriginal legends

6= t-shirts

7= joke

8=songs and poems (See You Later....., Never Smile.....)

9= cartoons and comic strips (Swamp, Wailigator, Gary Larson, The Best of Bunji)

S5-Q74B

anthropomorphic character

1= comic Good,amusing

2=Bad, frightening, untrustworthy

3= accessory to enhance human character , to make fun of ,or make a hero out of human

4= realistic, just a crocodile, bad and good

S5Q75

Crocodile Images

S5Q75A-tourism,publicity, money

S5Q75B-native to north QLD, they are here

S5Q75C-emotional value (fascination/interest/ fear/symbol of nature, wilderness)

S5Q75D-education,warning,awareness,protection, totem

S5Q77

Alternative symbols

S5Q77A- lifestyle, climate, open free area, outdoor recreation

S5Q77B-reef/rainforest/beaches/wetlands/waterfall

S5Q77C-aesthetics,cute and cuddlies (plants or animals)

S5Q77D-fishing/sports (barra, marlin)

S5Q77E- other (economy: sugar cane, bananas, pineapples, mining, tourism, roads, aboriginals, aboriginal symbols)

S7Q83

reasons for visiting the area

1= to go to the top, adventure, travel

2= novelty, look at different country, uniqueness, never been here before

3= tourism work

4= holidaying, sightseeing, touring, convenience, recommended by friends

5= visiting family and friends

6= nature, rainforest, beaches, reef, river, birdwatching, crocs, bushwalking

7= sports (fishing, bicycling)

3 - KNOWLEDGE SCALE

The questions were established using the QNPWS brochure for the safety questions, a questionnaire put together by Glen Ross for his own study, information on the biology and ecology of crocodiles, some common myths heard during preliminary field work and comments by Laurie Taplin (QNPWS). Some questions were related to crocodile behaviour most likely to have influence on human/crocodile interaction, safety knowledge, some factual knowledge on ecology that I did not think most people would know. In many instances the responses were probabilistic rather than true/false; it was impossible to measure 100% either way because of the nature of the questions. Correct answers were determined using QNPWS answers (pamphlets and experts) and my own knowledge.

Correct answer=1 wrong answer=2 unsure=3

Q1-untrue=1 (Fresh water crocodiles are found inland)

Q2-true=1

Q3-true=1

Q4-true=1

Q5-untrue=1

Q6-unture=1

Q7-true=1

Q8-untrue=1

SAFETY KNOWLEDGE

Q9-untrue=1 (Conservative answer) Aborigines would answer true because they say they check.

Q10-true=1 (See QNPWS brochure)

Q11-untrue=1

Q12-untrue=1

Q13-true=1

Included in scraps are fish, turtle and dugong remains; problem because Aborigines do not consider that human food scraps attract crocodiles so they say untrue, had to include a broader category for scraps or alternatively, distinguished between the 2 and outlined the cultural differences. Food scraps=white men food scraps. When I did the questionnaire, I used the QNPWS pamphlet to design the safety questions, It highlighted the fact that safety questions were culture specific. "Food scraps" concept has not the same

meaning. Recommendation: have 2 sets of advice or include definition of the concept.

Q14-untrue=1

Q15-untrue=1

Q16-true=1

Q17-unture=1

Q18-untrue=1 (Attack when hungry as well)

Q19-true=1

(More active and visible because of the mating season). Sexual activity involves male aggressive display towards each other, the same may happen towards humans. Most people answered that question, having in mind the breeding season. It is hard to say if they thought they felt more at risk because of it. Overall though, I have the impression that they were thinking from the animal point of view.

Q20-untrue=1

This was a biased answer because that's what most people say. What I think and it needs checking. Most attacks are in fact unsuccessful and not reported except 2 recently in the Daly river, successful attacks were on people with diminished awareness. Ambiguous question. A reported way to escape include poking the eyes of the crocodile (Aborigines). That question may be seen as a measure of awareness of crocodile as a risk(dread)

Q21-untrue=1

(over short distances they are not over long distances). Difficult question because one can't assume that they are active all the time so they are slow but at the same time they can be so fast when needed. Speed was mentioned as a factor which frightened people. So I decided that the knowledge of their potential speed was more important, for safety reasons.

Q22-untrue=1

Crocodiles are opportunistic feeders and usually choose a technique of least energy expenditure such as working the tides or taking easy food items at hand, they are not active hunters like mammalian carnivores, they don't need to feed as often as mammals either.

Q23-true=1

Q24-untrue=1

Q25-true=1

Q26-untrue=1 (Will have fresh meat whenever available)

Q27-true=1

- Q28-true=1** (Breeding adults during breeding times, juveniles and young adults are not and often excluded from established territories by larger animals).
- Q29-true=1** (Females are known to guard the nest and help the hatchlings to the water).
- Q30-True=1**
- Q31-True=1**

APPENDIX 3

CROCODILE AND ALLIGATOR MANAGEMENT: A REVIEW OF STRATEGIES REGARDING INTERACTIONS WITH PEOPLE

1 - The management of alligators in the USA

1.1 - Louisiana (Joanen & McNease 1987)

The American alligator (*Alligator mississippiensis*) ranges from northern Carolina to Texas. The status of its population is based on population densities and is classified as endangered (48.1% of their range), threatened (5.9% of their range) or threatened due to similarity of appearance (recovered: 46.0% of their range) (U.S Fish and Wildlife Service, *endangered species Act 1973*). The existing population is estimated at 379 000 (1983 estimates Louisiana only, Joanen & McNease 1987).

There is a long history of trade in southern America. The use of alligators for skins dates back to the 1770's and commercial trade started around the 1800's (Aubudon in Joanen & McNease 1987). The current management in Louisiana, based on the sustained yield harvest was initiated in 1972 and the alligator is considered a commercial wildlife species (*Department of Wildlife and Fisheries Act 550, 1970*). A complex system of applications, licences, tags and report forms was necessary to implement the management programme. Alligator harvests show that an average of 15 000 to 16 000 animals are harvested per year (1983 estimates, Joanen & McNease 1987). Ninety per cent of the privately owned wetlands are opened to hunting, the size of animals taken is around 2.13 m and the catch consists of large males, immature males and quiescent females as a result of the timing of the open season (September), the time of the day (daytime only), zonation, use of approved hunting techniques (line and hook only in canals, shooting only in open waters). The impact on the population shows that animals are taken in the proportion of their size class in the hunting area and that total numbers today are just below the 1900 estimates based on reconstructions from alligator harvest (Taylor & Neal 1984). Meat and parts are sold along with skins and the proceed of the industry.

Nuisance alligator control

A programme was initiated in 1979. The number of tags and hunters licences issued is based on the number of complaints received. After being investigated randomly by personnel from the Department of Fisheries and Wildlife. in 1984, 34 hunters killed 225 alligators. The skins, meat and parts are the responsibility of the hunter and/ or local government. The regulated harvest programme has virtually eliminated illegal poaching.

1.2 - Florida (Hines & Abercrombie 1987)

A similar management approach has been used in Florida by the Florida Game and Freshwater Fish Commission (GFC). The three components in the management of alligators are nuisance alligators programme (NACP), experimental harvesting and alligator ranching and farming, and public acceptance of conservation and management through commercialisation of the resource, based on the principle of value added conservation. An important aspect of the sustained yield management programme is that a portion of the commercial value of alligators must be used for conservation of the species. Although the relationship between commercial exploitation and conservation is not clear, the result of sustainable harvesting programme in Louisiana and recent experimental harvesting in Florida form the basis for the present management philosophy of the GFC: a biologically and economically sound harvest programme can be developed without the complete knowledge of the relevant demographic processes (Hines & Percival 1987). The concept of value added conservation has allowed for interest groups to be involved in the conservation of alligators. For Instance, the Florida Alligator Farmers Association directly supports (financially and personnel) research on private land and have vested interests in the preservation of wetlands. The development of ranching schemes and harvesting programmes provides them with a substantial income. The impact of vested interests and of the general public (private landowners, farmers for instance) in the management remains to be investigated.

The nuisance alligator control programme (NACP).

A mean of 2147 alligators were harvested between 1978-1986 and the number of alligator complaints and nuisance alligator harvested have increased significantly over the period. Alligators attacks on humans averaged 5 per year (see section on attacks). Permits are issued to take alligators of 1.2 m and above in close proximity

to human activity in or near the water, alligators posing a threat to animals and livestock and traffic hazard alligators. A study of the NACP from 1977 to 1986 showed that since the programme was started in 1977, complaints have increased from 4 914 in 1978 to 7 289 in 1984 and were lower 6106 in 1986. Over that period, the number of alligators harvested as a result increased dramatically from 1871 animals(1978), to 3049 (1986) showing the importance of the programme in the overall alligator commercial harvesting despite some indication of a decrease in the number of complaints received (Woodward, David & Hines 1987, p. 103).

2 - Dangerous endangered wildlife management in developing countries

2.1 - The management of crocodiles in Zimbabwe (Child 1987)

There has always been conflicts between crocodiles and the rural people who depend on water bodies for their domestic needs and for those of their livestock. There is no eating of crocodiles and crocodiles eggs and the destruction of crocodiles is viewed as a service to the community. The Protection of crocodiles (*Crocodylus niloticus*) is secured under the *Wildlife Conservation Act (1962)* and 12.7 % of Zimbabwe is under protective legislation. The ownership of wildlife is with the land holder since 1975 (*Parks and Wildlife Act, 1975*). The motivation behind this move is that it is impractical to attempt to safeguard a species through legislation and law enforcement alone, unless local people are at least tolerant towards it. Law enforcement can be largely ineffective if it is against public opinion, this is particularly the case of large predators like crocodiles, lions, cheetahs and large dominant herbivores which seriously compete with legitimate human livelihoods. Unless people derive some benefit from them, the animals are considered more like pests and are of less value than the destruction they are responsible for.

The management of crocodiles therefore is justified in human terms and at a local level. The department of National Parks and Wild Life is concerned with the management of the wild population inside and outside the estate. Control of harvesting, restocking when appropriate, law enforcement and the capture or killing of problem crocodiles. The correct use of wildlife has emerged as an economically significant form of land use especially in areas of low agricultural productivity and is an indirect way of controlling the degradation of marginal lands, while providing the local population with a sustainable rural production. The problem of the common is different as wildlife is the common property. Overall

though, the application of this philosophy has resulted into very positive public responses. The central role of the people whose the resource occurs on in the conservation of that resource is now recognized by CITES (preamble). Regarding problem crocodiles, the legislation recommends destruction when it is not possible to capture the animal for relocation or for breeding . The destruction of large crocodiles is highly discouraged because of the biological investment they represent. A concurrent education programme is aimed at promoting the economic and biological values of crocodiles in order to make them more acceptable to the local populations. The establishment of rearing stations form the basis of an crocodile industry. Evaluation of the management over the years is positive. As crocodile populations have recovered, there is a sizable legal crocodile industry and a concomitant reduction of illegal activities. There still remains important issues as the rearing of crocodiles in captivity for foreign currency still competes with humans needs as the supply of protein foods is scarce.

2.2 - The management of crocodiles In India (Whitaker 1987)

Three species occur on the Indian continent, *Crocodylus. palustris*, *C. porosus*. and *Gavialis gangeticus*. The traditional use of those animals was for food, meat and medicine, *G. gangeticus* particularly was hunted as a trophy but also used extensively for medicine: the fat, the cloacal musk, glands, the penis and gall bladder. Hunting for skins (from 1960 to 1970) and habitat loss have been the major factors in the decline of crocodile populations: intensification of river fishing using nylon nets greatly affected *G. gangeticus*.; in the south, the destruction of almost all mangroves on the Malabar coast, Andaman and Nicobar islands to agricultural lands for landless settlers. ironically the construction of dams have offset the extinction of crocodilians and provided them with a habitat substitute. Protective legislation started in the 1970's (*Wildlife Protection Act, 1972*) and a management programme was established with the help of the the (Food and Agriculture Organization (FAO) and the United Nations Development Program (UNDP). Captive breeding and research are conducted by a private company, the Madras Crocodile Bank, aiming at the rehabilitation of the population of the three crocodiles species. The success of the crocodile programme is attributed to the location of rearing stations and the restocking areas within previously or specifically gazetted sanctuaries, national parks and reserves. Law enforcement of the legislation prohibiting the killing of wild crocodiles has been moderate as crocodiles are subject to great animosity and the source of conflicts between the local population's interests and conservation policies, particularly in the Andaman

Islands where settlers are encroaching in *C porosus* habitats. Habitat conservation is seriously hampered by the presence of human populations near all crocodiles habitats. The cutting of wood for fuel and construction material, the local fishing industry and large scale development projects such as hydroelectric schemes and dams all are constantly limiting the expansion of crocodile habitats and slowing down recovery.

2.3 - The management of crocodiles in Papua New Guinea (Holland 1987)

Two species of crocodiles are found in Papua New Guinea, *C. norwegiensis* and *C. porosus*. The former occurs along the coast at high density, despite heavy exploitation, in densely vegetated swamps of lowland areas. In contrast, *C. porosus* is found in open waters and estuaries and in the islands. There is a considerable overlap between the two species. The *Crocodile Trade Ordinance Act, (1966)*, established government control over the skin trade (use of licences to local councils), regulated hunting with traditional hunting rights of landowners above a certain size but prohibited the commercial sale of such crocodiles in order to protect the breeding stock. The killing of very young crocodiles is now prohibited and a wasteful practice, people are encouraged to sell them to farms. The habitat protection is under the *Fauna Protection and Control Act (1976)* and emphasises grass roots conservation with the establishment of wildlife management areas with rules drawn up by local communities.

The bulk of the industry in Papua New Guinea is still based on direct hunting of crocodiles for their skin in the wild, usually by landowners. Crocodiles meat is also consumed. The government control is at the trade level, as only licensed traders can buy skins. Hunting is a seasonal activity (dry season) and associated with of a subsistence economy. It is more a cash crop as hunting increases with good skin prices. Ranching was initially developed at village level but now is mostly carried out by large commercial farms. The local population is not attuned to the goals of the crocodile management but see crocodiles as a resource to be exploited; the management regulations of hunting are not always understood but accepted provided there is adequate support by local councils, the repository of rules. Since the protective legislation was introduced, crocodile populations were allowed to recover, while a crocodile industry developed successfully, a combination of large tracks of habitats and low human populations densities. There is no mention in this report of crocodile problems as it would seem that dangerous crocodiles can be eliminated by landowners under the present regulations. Village and community

attitudes in Papua New Guinea for instance has shown the importance of local traditions for the successful implementation of crocodile conservation programmes. Initially a number of farms were started in villages and failed due to the lag in monetary gains to the villagers, ignorance and the fact that hunting crocodiles had always occurred. Farming was an outside element to the village life and as such became the object of village conflicts about their management. Furthermore, the villagers are nomadic and leave the village regularly to hunt and collect food and leave the farms unattended. At the same time, crocodiles skins had in the past been used for exchange for goods. The challenge was to introduce a cash system to buy live farm reared young crocodiles so that that money could be used for exchange and killing for skins would decrease.

2.4 - The management of other dangerous wildlife in the context of national parks.

2.4.1 - The Palamau Reserve and the Dudhwa (India) (Saharia 1984)

The example of the Palamau Tiger Reserve in Bihar (India) shows that the introduction of stall feeding and rotational grazing of domestic cattle, the establishment of a waterhole network and a cattle vaccination programme have been well accepted by the local villagers; however, major conflicts still remain, as the prohibition to kill wild ungulates is resulting in the destruction of crops. The employment of villagers and the supply of equipment to scare the animals away is supported by the management. The benefits of the programmes perceived by the local populations are the improved water regime, the regrowth of forests and there is a better acceptance of the conservation programme as it is linked to the socio economic development of the people, within their traditional resource system.

Dudhwa National Park (Kheri district, Uttar Pradesh, India) is an example of the conflict between two land uses, agriculture and reserves and the problem of protecting potentially dangerous wildlife. Dudhwa National Park is one of the last remnant of marshy flood plains at the foothills of the Himalayans and is the habitat of the Gangetic Gharial, tigers, elephants, wild boars and a variety of ungulates. Most of the habitat has been drained and converted to agriculture and colonised. The Park is surrounded by a large number of villages. Within a declared buffer zone to the north of the Park, 41 tribal Tharus villages are found. When the Park was established, Tharus were given special permission to graze their cattle, to collect

firewood and construction material and to fish villagers in the south of the park were given no special consideration.

The conflict between the ecological and scientific values of the park to the scientists and the economic value of the area to local farmers has been sharply focused by the problem of men eating tigers roaming into sugarcane fields to the south of the park and killing 93 villagers in 4 years, thus jeopardizing the validity of the conservation programme in the area. A survey of the villagers' attitudes showed that the farmers were not prepared to accept the costs of the protective policy. The ban on killing tigers, in their view was responsible for their lack of fear of humans. They felt it was their right to protect their livelihood and they should not be prosecuted for it. If the government was to protect the tigers, then, tigers should be contained to the limits of the parks, or sufficient protection should be provided to the local residents. Experts found that the seasonal influx of tigers from the park to the sugarcane fields was mostly due to a continuous habitat of tall grass - sugar cane favoured by tigers during the monsoon, as a result of the lack of a proper grazing succession by herbivores in the park resulting in their emigration from the park into the sugarcane fields, followed by the tigers.

2.4.2 - The Royal Chitwan National Park (Nepal) (Mishra 1984)

The case of the Royal Chitwan National Park in Nepal also describes the conflicts inherent to the establishment of a national park in an area of important agricultural use (Mishra 1984). The cost in human lives due to attacks by tigers and rhinoceroses, the destruction of the crops and the costs associated with the loss of use of the park area are major sources of conflicts. The park is home to tigers, rhinoceroses and a number of large ungulates. Tigers attacks and rhinoceros mauling on the neighbouring villagers have produced resentment and polarized public opinion with some degree of political manipulation. The loss of cattle to the tigers and the leopards is also resented, as cattle represents valuable assets to the villagers. The use of traditional forest produce and the grazing of cattle is now forbidden in the park; people in breach of the regulations have to pay a fine. The travel costs associated with those changes are not well accepted, since the use of the park nowadays seems restricted to affluent foreigners only. Crop destruction by Park rhinoceroses is probably the main source of conflict, as entire crops are lost to the villagers.

The government instigated a resettlement programme in a better agricultural area free of marauding ungulates, in accordance with the villagers. Such measures are

costly and not without political and economic consequences and therefore limited. In an attempt to create benefits to the local populations, the management has instigated talks with the local village representatives to see what they perceived as benefits. While tourism may have benefited the country as a whole, it did not *per se* benefit the villagers directly, only providing seasonal employment in menial tasks mostly, since educational opportunities are few in the area. On the other hand foreign presence in the area has affected market prices significantly. The real benefits to the local residents is in the conservation of soil and water, a benefit poorly understood, and not appreciated in the light of every day living.

The difficulty of making the Park accepted is a measure of the wide difference in the goals behind the Park management and people's legitimate expectations. The management opted for public education and participation and the provision of some access to renewable Park resources. The climate of mistrust between Park staff and villagers had to be overcome. The organisation of a public meeting by the park to discuss villagers needs were a obvious and successful step as the villagers felt they were part of the park processes that affected them.

Access to tall grass for building material is now granted, for a nominal fee to keep a record of usage. An average of 50 000 to 60000 permits are issued every year; the grass season last 15 days in January and attracts people from far away, since most of the grass outside the Park is now gone. From the Park point of view, the benefits of such an exercise are not only a good image but a management tool to maintain the grazing succession that has operated for thousands of years under human pressure, thus ensuring that habitat structure is adequate. This is not happening in the Indian side of the Park where the problem of the tall grass and man eating tigers is dealt with in a different way; the right type of ungulates was introduced to maintain habitat structure. The grass cutting scheme is a form of compensation for the villagers and is a short term solution to the wider problem far beyond the understanding of the local population. They are the recipient of costs generated else.

The two previous situations are examples of what happens when a reserve is set aside, which goals are poorly understood by local residents, in an area of well established resource use with some indication of resource overuse and environmental degradation. The park in fact accentuates the pressure on the remaining areas for necessary commodities creating an artificial scarcity at first and then a real one as resources become depleted and the park then becomes the only avenue for those resources.

APPENDIX 4

RISK ASSESSEMENT AND DOCUMENTED STUDIES ON CROCODILE ATTACKS

Crocodile attacks are not well documented and have been the subject of few systematic studies. Documented attacks exist for the Nile crocodile (*Crocodylus niloticus*) in Africa, the American alligator (*Alligator mississippiensis*) in Florida and the Estuarine crocodile (*C. porosus*) in Australia.

Attacks In Africa (Pooley 1989)

Forty three cases were recorded in northern Zululand. Of the 43, 39 occurred during the summer months (Nov to April), when crocodiles are active and resume feeding after the winter months, migrating to the remaining large bodies of water in search of food. Twenty were non fatal and the fact of young crocodiles of 2 to 2.5 m in length, while 23 were fatal and the result of large animals. The victims were taken while in the water, only in 5 cases where the victims alone. Attacks on boats have been recorded and are believed to be a territorial response, as it has been seen that the people were able to swim safely ashore. The ferocity and aggressivity of large animals combined with their hunting techniques leave very few chances of escape and very few bodies were retrieved when the attacker was a large animal. For the local villagers, crocodile attacks are considered a fact of life, as crocodiles have been integrated in their systems of beliefs.

Crocodile attacks In Florida (Hines 1989)

Recorded attacks between 1949 and 1988 are 100 of which 6 were fatal between 1976 and 1988. In all cases, The victim was in the water or at the water edge, and hunger seemed to have been the reason for attack. Alligators are fish eaters and do not usually take animals as large as an adult human. They have been reported though to take calves, dogs, swines and goats, and it would be expected that small humans fit into their size class prey. The documentation of aggressive behaviour shows that female at the nest displays defensive behaviour but rarely aggressivity. Male aggressive displays are not necessarily followed by attacks but are more a deterrent for potential aggressors. It is suggested that harassed animals are less likely to be aggressive than undisturbed large animals. The contribution of the practice of

feeding the alligators has been suggested as a reason for attacks, although no documented evidence is available.

Crocodile attacks in Australasia (Shield 1989)

Documented attacks are few outside Australia, but occasional statistics of attacks by the Estuarine crocodile (*C. porosus*) in the Australasia region shows regular predation of villagers living near waterways in Melanesia, Indonesia and the Philippines: sixty-two villagers from one village of northern Irian Jaya (1960), 6 fatal attacks on the Sarawak Lupar River (1975 to 1984). The sites of fatal attacks in northern Australia between 1975 and 1987 is presented in Figure 2. Twelve documented fatal attacks in northern Australia between 1975 and 1988 have shown that most occurred during the summer months. It reflects the seasonal pattern of activity of crocodilians (feeding and sexual activity) and unfortunately coincides with the increase in water based recreational activities of local residents during that period. The crocodiles responsible for attacks were only documented for 37 cases. In 17 cases, the animal was over 4 metres long and probably a male, as females do grow rarely to reach this size. *C porosus* grows to a large size (up to 7 metres) and is known to prey on cattle dogs and pigs and occasionally on humans, as they fall in the same size class prey. Reasons for attacks have been hunger as 27 cases of fatal attacks showed that the victims' body were partially or completely consumed. Territorial responses have been mentioned, although no documented evidence is available. There has been only one documented instance in which the same crocodile was found to attack boats

To conclude, the lack of documentation on crocodile attacks is interesting for two reasons. The areas where crocodilians live are inhabited by populations who have always seen crocodile fatalities as part of an integrated system of beliefs about the world, therefore the need to explain those fatalities in terms other than those beliefs are irrelevant and the risk is accepted and retaliation if any is strictly regulated by socio-cultural factors. This is in contrast with the record of fatalities in the USA and Australia, where crocodiles are perceived as a culturally unacceptable hazard. Scientific explanations may be sought to reduce the risk of crocodile attacks in those latter places and solutions always involve the control of crocodiles populations, rather than the promotion of attitude changes. The fact that risk assessment is not well established and that procedures to reduce the risk are not well defined or loosely implemented is the sign of low social investment in that type of risk usually the responsibility of the individual victim, not society.

Problem of risk assessment

A risk assessment is a combination of a probability of interaction between crocodiles and humans and perceptual factors. Most important in the determination of the probability is the human demography in relation to crocodile population estimates (Table 1), the pattern of human activities and of crocodiles. The probability of fatal encounter is overall minimal.

| Location | River systems | Crocodile density Crocodiles /km, (Kms of river surveyed) | human Population |
|---|---|---|---------------------|
| Hopevale | Cape Flattery Endeavour R. | 0.4 (20)* 1(28)* | 817*** |
| Napranum/Weipa | (Embley R. Pine R. Mission R.) Port Musgrave | 0.9 (450)** 0.8 (250)** | 3824*** |
| Daintree/Cape Tribulation (Douglas shire) | Daintree R. Mossman R. Bloomfield R. | 0.9 (30.5)* 0.3 (8)* 0.5 (8)* | 7385*** |
| Townsville | Alligator Ck Ross R. | - - | 112013*** |

Table 1 - Crocodile populations density and human population at the locations investigated in the study.

Sources: * Q.NPWS 1991 data, QNPWS, ** 1988 data, QNPWS, *** ABS 1986.

Comalco 1990, Taylor 1988, 1989).

However, one fatal attack has an enormous impact on the perception of that probability as shown by the pattern of reports of crocodile sightings (Figures 1 a, b, c, d). The number of complaints received by the QNPWS during 1984 - 1987 was 314 reports, referring to 331 crocodiles. Sixteen were freshwater crocodiles and 97 non problem Estuarine crocodiles. Problem reports amounted to 201 crocodiles of which 35 were removed to farms (Q.NPWS 1989). The number of reports of crocodile sightings and consequent removal show that most animals were sighted in the Townsville-Cooktown Coast and were at a pick in 1986 and 1987, most likely reflecting the impact of the crocodile attack on Beryl Wruck in Daintree in December 1985, rather than any change in crocodile populations or human activities. This illustrates the importance of perceptual factors in risk assessment and the necessity to monitor public perception and have on going risk communication.

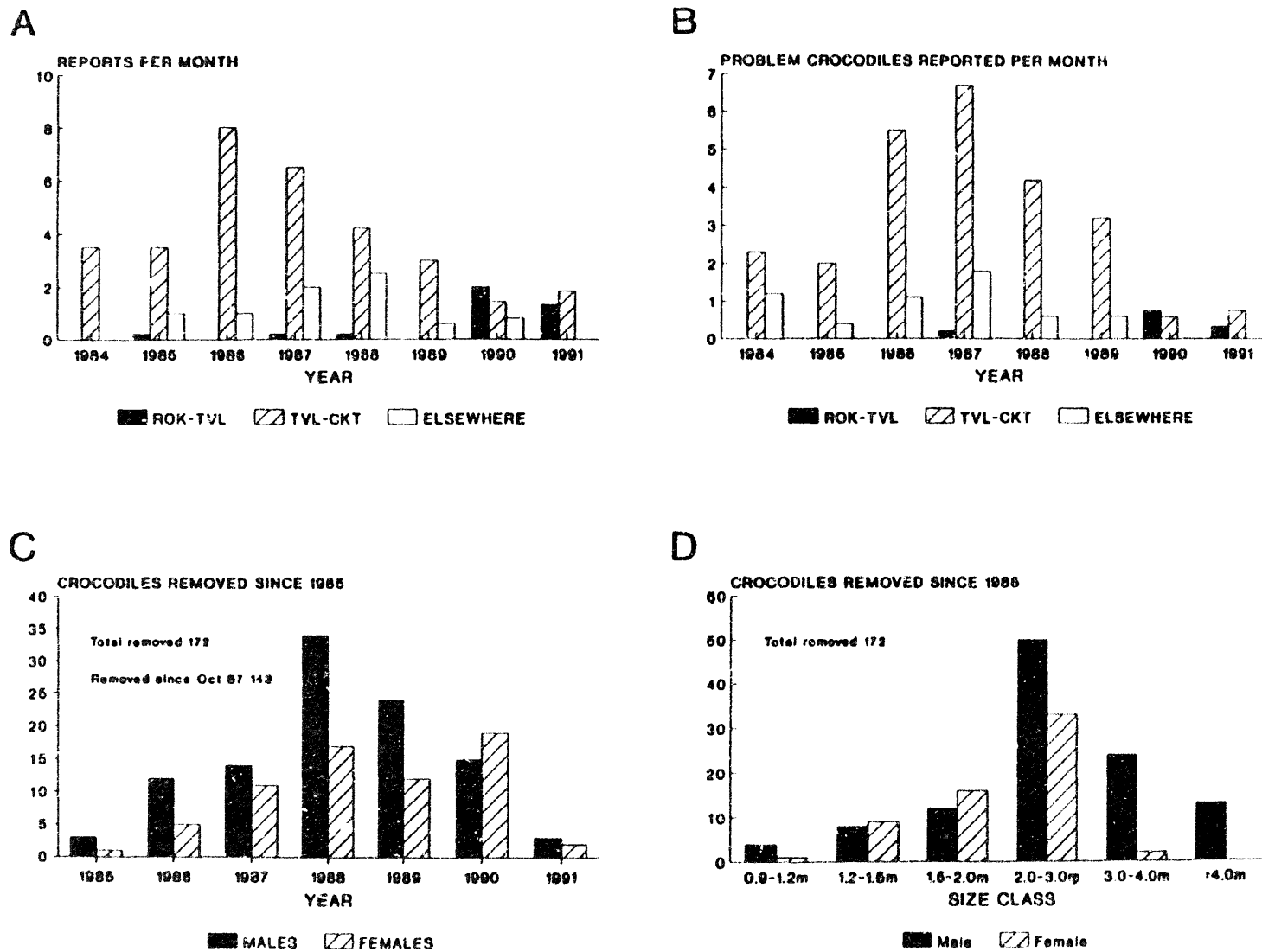


Figure 1 - risk assesement. Problem crocodiles: reports of sightings and crocodiles removed in Queensland since 1985. (Source: Queensland National Park and Wildlife Service 1991).

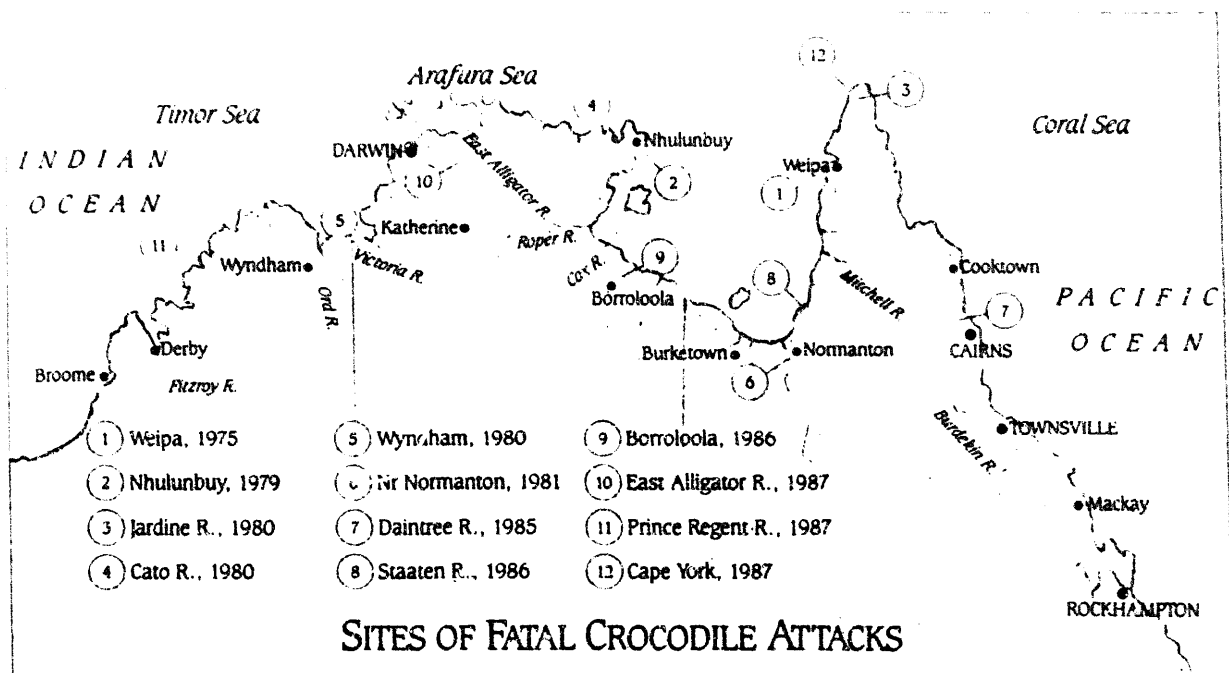


Figure 2 - Sites of Crocodile attacks in Northern Australia between 1975 and 1987.
(Source: Edwards 1988, p. 105).

APPENDIX 5

DEMOGRAPHIC PROFILE OF RESPONDENTS

The demographic information relative to sex ratio, marital status, number of children under 15 years old, education, background and occupation, length of residency (residents) and accommodation type, visitor status and length of stay (visitors) is presented for each community group.

1 - Hopevale and Napranum

| | | | | |
|----------------|----------|----------|----------|------|
| Age | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
| Percentage (%) | 30.8 | 25.6 | 25.6 | 17.9 |

| | | |
|----------------|--------|------|
| Sex | Female | Male |
| Percentage (%) | 46.1 | 53.8 |

| | | |
|----------------|---------------|------------------|
| Marital status | Never Married | Married/de facto |
| Percentage (%) | 23.1 | 61.5 |

| | | |
|---------------------------|------------------|---------------|
| Children under 15 yrs old | Without Children | With Children |
| Percentage (%) | 56.4 | 43.6 |

| | | | | |
|----------------|---------|-----------|----------|-------------|
| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
| Percentage (%) | 41 | 46.2 | 2.6 | 7.7 |

| | | | | |
|----------------|-------|-------|-------------|-------|
| Background | Rural | Urban | Rural/Urban | Other |
| Percentage (%) | 82.1 | 0 | 17.9 | 0 |

| | | | | | |
|----------------|--------|------------------------------------|--------------|-------------|-------------------|
| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
| Percentage (%) | 28.2 | 33.33 | 5.13 | 20.51 | 0 |

| | | | | | |
|----------------|------------|---------------|----------------|--------------|-------|
| Employment | Unemployed | Unpaid helper | Self/ Employer | Wage/ Salary | CDEP |
| Percentage (%) | 3.12 | 25 | 0 | 50 | 21.88 |

| | | | | |
|---------------------|-------------------|---------------------------|-----------------------|---------------------|
| Length of residence | Temporary (<1 yr) | Semi permanent (1-5 yrs) | Permanent (6-10 yrs) | Long term (>10 yrs) |
| Percentage (%) | 0 | 2.56 | 0 | 97.44 |

Table 1 - Demographic profile of Hopevale/ Napranum residents (n=39).

Hopevale and Napranum respondents were under 30 yrs old (30.8%), however the population under 25 years old in those those communities was 64% (Napranum) and 56.7% (Hopevale) and the mean age for males is 24.8 and for female 28 in Napranum and 24.3 years old and 22.03 years old in Hopevale for the total population (Taylor 1988), which indicates that the sample was biased towards older age groups (see interviewing cultural bias for explanation). Most respondents had only primary education (41%) compared to other groups, all were from the region itself, employed as labourers (Community Development Employment Program - CDEP - and community employees 28.2%) or women at home (20.51%) and community services (33.33%). All respondents had been in living in those communities for more than 10 years.

2 - Weipa residents

| | | | | |
|----------------|----------|----------|----------|-----|
| Age | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
| Percentage (%) | 41.2 | 38.7 | 17.5 | 2.5 |

| | | |
|----------------|--------|------|
| Sex | Female | Male |
| Percentage (%) | 41.2 | 58.7 |

| | | |
|----------------|---------------|------------------|
| Marital status | Never Married | Married/de facto |
| Percentage (%) | 32.5 | 63.7 |

| | | |
|---------------------------|------------------|---------------|
| Children under 15 yrs old | Without Children | With Children |
| Percentage (%) | 56.2 | 43.7 |

| | | | | |
|----------------|---------|-----------|----------|-------------|
| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
| Percentage (%) | 5 | 48.7 | 13.7 | 31.2 |

| | | | | |
|----------------|-------|-------|-------------|-------|
| Background | Rural | Urban | Rural/Urban | Other |
| Percentage (%) | 48.7 | 11.2 | 30 | 0 |

| | | | | | |
|----------------|--------|--|--------------|-------------|-------------------|
| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
| Percentage (%) | 25 | 38.75 | 13.75 | 13.75 | 8.75 |

| | | | | | |
|----------------|------------|---------------|-------------------|-----------------|------|
| Employment | Unemployed | Unpaid helper | Self/ Employer | Wage/ Salary | CDEP |
| Percentage (%) | 1.25 | 13.75 | 10 | 75 | 0 |

| | | | | |
|---------------------|----------------------|------------------------------|--------------------------|------------------------|
| Length of residence | Temporary (<1 yr) | Semi permanent (1-5 yrs) | Permanent (6-10 yrs) | Long term (>10 yrs) |
| Percentage (%) | 10 | 36.25 | 75 | 0 |

Table 2 - Demographic profile of Weipa residents (n=80).

Weipa respondents were characterised by a large proportion of under 30 yrs old (41.2%) (ABS 1986, 29.4%) and few older residents (2.5% of respondents >60 yrs old) (ABS 1986 1.73%), predominantly of rural background (48.7%), largely employed by the mining company as labourers, technicians, trade persons or clerical employees with secondary (48.9%) and Tafe education (31.2%); there was however a small proportion of residents involved in the local barramundi fishing industry and port activities (8.75%) and a significant number of women at home (13.75%), since female employment was not readily available. Most respondents had been in Weipa between 6 to 10 years (75%) or 1 to 5 years (36.25%), with no residents having been in the area over 10 years. this is a reflection of the Comalco company policy of not allowing people to buy property and

retire in Weipa rather than the wish of the community as many respondents would have considered that option if it had been available (Field notes 1990).

3 - Weipa visitors

| | | | | |
|----------------|----------|----------|----------|-----|
| Age (years) | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
| Percentage (%) | 27.8 | 38.9 | 27.8 | 5.6 |

| | | |
|----------------|--------|------|
| Sex | Female | Male |
| Percentage (%) | 38.9 | 61.1 |

| | | |
|----------------|---------------|------------------|
| Marital status | Never Married | Married/de facto |
| Percentage (%) | 27.8 | 61.1 |

| | | |
|---------------------------|------------------|---------------|
| Children under 15 yrs old | Without Children | With Children |
| Percentage (%) | 61 | 38.9 |

| | | | | |
|----------------|---------|-----------|----------|-------------|
| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
| Percentage (%) | 0 | 50 | 16.7 | 27.8 |

| | | | | |
|----------------|-------|-------|-------------|-------|
| Background | Rural | Urban | Rural/Urban | Other |
| Percentage (%) | 22.2 | 33.3 | 22.2 | 11.1 |

| | | | | | |
|----------------|--------|------------------------------------|--------------|-------------|-------------------|
| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
| Percentage (%) | 11.11 | 33.33 | 22.22 | 0 | 11.11 |

| | | |
|----------------|----------|----------|
| Visitor status | domestic | Overseas |
| Percentage (%) | 88.89 | 11.11 |

| | | | | | |
|-----------------------|---------|--------------|--------------|------------|-------------------|
| Accommodation | Camping | Caravan/unit | Motel/resort | Backpacker | Friends/relatives |
| Percentage (%) (n=78) | 93.75 | 0 | 0 | 0 | 6.25 |

| | | | |
|-----------------|-------|----------|-----------|
| Length of visit | 1 day | 2-7 days | 8-28 days |
| Percentage (%) | 18.75 | 43.75 | 37.5 |

Table 3 - Demographic profile of Weipa tourists (n=18).

Weipa visitors were mostly a much older group (66.7% between 30 and 60 yrs old) of mixed backgrounds, with secondary (50%) and technical education (27.8%), trade persons and clerical employees (33.33%) and some professionals (22.22%), mostly domestic visitors (see table 4, appendix 1). The small sample

size (n=18) does not allow for generalisation although those visitors were quite typical of visitors to Cape York Peninsula.

4 - Daintree/ Cape Tribulation residents

| Age | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
|----------------|----------|----------|----------|------|
| Percentage (%) | 22.6 | 41.9 | 16.1 | 19.4 |

| Sex | Female | Male |
|----------------|--------|------|
| Percentage (%) | 38.7 | 61.3 |

| Marital status | Never Married | Married/de facto |
|----------------|---------------|------------------|
| Percentage (%) | 35.5 | 54.8 |

| Children under 15 yrs old | Without Children | With Children |
|---------------------------|------------------|---------------|
| Percentage (%) | 80.6 | 19.3 |

| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
|----------------|---------|-----------|----------|-------------|
| Percentage (%) | 16.1 | 38.7 | 25.8 | 12.9 |

| Background | Rural | Urban | Rural/Urban | Other |
|----------------|-------|-------|-------------|-------|
| Percentage (%) | 61.3 | 0 | 29 | 9.7 |

| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
|----------------|--------|------------------------------------|--------------|-------------|-------------------|
| Percentage (%) | 25.81 | 16.13 | 29.03 | 0 | 25.81 |

| Employment | Unemployed | Unpaid helper | Self/ Employer | Wage/ Salary | CDEP |
|----------------|------------|---------------|----------------|--------------|------|
| Percentage (%) | 0% | 0% | 38.46% | 61.54% | 0% |

| Length of residence | Temporary (<1 yr) | Semi permanent (1-5 yrs) | Permanent (6-10 yrs) | Long term (>10 yrs) |
|---------------------|-------------------|---------------------------|-----------------------|---------------------|
| Percentage (%) | 3.23 | 32.26 | 10% | 53.33% |

Table 4 - Demographic profile of Daintree residents (n=31).

Daintree has a broader age range (41.9% of 30 to 45 yrs old) with a significant proportion of residents over 60 yrs old (19.4%), of rural background (61.3%), with a significant proportion of tertiary educated people (25.8%); a significant proportion of those residents are self employed (38.46%) as primary producers (25.81%) or in the tourist industry (29.03%). All the women interviewed were working either on the farm or in the tourist industry (0% of unpaid helper). A significant proportion of residents at lived in area for more than 10 years (53.33%) while there was a number of temporary residents (32.26%)

5 - Daintree/Cape Tribulation visitors

| | | | | |
|----------------|----------|----------|----------|-----|
| Age | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
| Percentage (%) | 54 | 30.2 | 6.3 | 9.5 |

| | | |
|----------------|--------|------|
| Sex ratio | Female | Male |
| Percentage (%) | 49.2 | 50.8 |

| | | |
|----------------|---------------|------------------|
| Marital status | Never Married | Married/de facto |
| Percentage (%) | 52.4 | 38.1 |

| | | |
|---------------------------|------------------|---------------|
| Children under 15 yrs old | Without Children | With Children |
| Percentage (%) | 80.9 | 19 |

| | | | | |
|----------------|---------|-----------|----------|-------------|
| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
| Percentage (%) | 1.6 | 33.3 | 41.3 | 23.8 |

| | | | | |
|----------------|-------|-------|-------------|-------|
| Background | Rural | Urban | Rural/Urban | Other |
| Percentage (%) | 28.6 | 47.6 | 17.5 | 4.8 |

| | | | | | |
|----------------|--------|------------------------------------|--------------|-------------|-------------------|
| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
| Percentage (%) | 7.94 | 28.57 | 46.03 | 4.76 | 0 |

| | | |
|-----------------------|----------|----------|
| Visitor status (n=60) | Domestic | Overseas |
| Percentage (%) | 73.33 | 26.67 |

| | | | | | |
|-----------------------|---------|--------------|--------------|------------|--------------------|
| Accommodation | Camping | Caravan/unit | Motel/resort | Backpacker | Friends/ relatives |
| Percentage (%) (n=62) | 25.81 | 19.35 | 29.04 | 22.58 | 3.23 |

| | | | |
|-----------------|-------|----------|-----------|
| Length of visit | 1 day | 2-7 days | 8-28 days |
| percentage (%) | 15.09 | 52.83 | 32.08 |

Table 5 - Demographic profile of Daintree tourists (n=63)

Daintree visitors were mostly under 30 yrs old (54%), with a high proportion of tertiary educated people (41.3%), of urban background (47.6%), mostly domestic tourists rather than overseas tourists (73.3%) (see refusal and cultural biases for explanation, Chapter 2).

6 - Townsville residents

| | | | | |
|----------------|----------|----------|----------|------|
| Age | >15 - 30 | >30 - 45 | >45 - 60 | >60 |
| Percentage (%) | 44 | 31.2 | 13.6 | 11.2 |

| | | |
|----------------|--------|------|
| Sex ratio | Female | Male |
| Percentage (%) | 50.4 | 49.6 |

| | | |
|----------------|---------------|------------------|
| Marital status | Never Married | Married/de facto |
| Percentage (%) | 21.6 | 60.8 |

| | | |
|---------------------------|------------------|---------------|
| Children under 15 yrs old | Without Children | With Children |
| Percentage (%) | 56.8 | 43.2 |

| | | | | |
|----------------|---------|-----------|----------|-------------|
| Education | Primary | Secondary | Tertiary | Tafe/Techn. |
| Percentage (%) | 3.2 | 67.2 | 120.8 | 7.2 |

| | | | | |
|----------------|-------|-------|-------------|-------|
| Background | Rural | Urban | Rural/Urban | Other |
| Percentage (%) | 4.8 | 84 | 8.8 | 10.8 |

| | | | | | |
|----------------|--------|------------------------------------|--------------|-------------|-------------------|
| Occupation | Labour | Trade/Tech. Clerical/ Paraprofess. | Professional | Home duties | Primary producers |
| Percentage (%) | 19.2 | 36.8 | 16 | 15.2 | 0.8 |

| | | | | | |
|----------------|------------|---------------|----------------|--------------|------|
| Employment | Unemployed | Unpaid helper | Self/ Employer | Wage/ Salary | CDEP |
| Percentage (%) | 7.84 | 17.65 | 8.82 | 65.69 | 0 |

| | | | | |
|------------------------|-------------------|---------------------------|------------------------|---------------------|
| Length of residence | Temporary (<1 yr) | Semi permanent (1-5 yrs) | Permanent (6 -10 yrs) | Long term (>10 yrs) |
| Percentage (%) (n=114) | 8.77 | 28.95 | 12.04% | 48.15% |

Table 6 - Demographic profile of Townsville residents (n=125)

The demographic profile of Townsville residents, being a larger and random sample exhibited a broader range of values for all variables investigated. Noticeable was the large proportion of tertiary educated respondents due to the presence of the university, the predominantly urban background and the fairly low number of labourers and higher proportion of clerical trade and technical employment, which is indicative of the administrative orientation of the town and importance of service industries. A significant proportion of respondents had lived in Townsville for more than 10 years (48.15%).

A Chi-square test was applied to the demographic information provided in the questionnaire. There were significant differences between the 6 community groups initially identified for age ($p=0.0205$, $n=356$), education ($p=0.0001$, $n=349$) occupation ($p=0.0001$, $n=323$) and employment -residents only- ($p=0.0001$, $n=240$) , Background ($p=0.0001$, $n=355$), length of residence - residents only- ($p=0.0004$, $n=256$). There was no significant differences for sex ($p=0.7015$, $n=356$), length of visit ($p=0.8141$, $n=69$) visitor status, domestic or overseas , ($p= 0.1695$, $n=78$) for visitors in Weipa and Daintree.

Membership to community associations was significantly different between communities ($p=0.0083$, $n=267/275$). It was high in Weipa (59.49%) and Daintree (60%) and low in Townsville (36.97%). When looking at what sort of association people belonged to, there was a significant difference between communities ($p=0.001$, $n=126$). Overall, sport represented 40% of all associations mentioned, and was predominant in Weipa (56.52%) and Townsville (47.73%) residents, community based activities (29.365% of all sample) were important in Aboriginal communities (38.89%) and among Daintree residents (50%), cultural activities (only 11.905% of total sample) were only significant in aboriginal communities (33.33%), membership to environmental groups (3.175% of total sample) was significant only in the Daintree residents (16.67%).

Variables which exhibit significant differences between groups may provide useful information as independent variables in the way they reflect the importance of as independent variables would be the residence status, cultural background, and location.

How representative of the whole population the sample was difficult to establish because the statistics available were too old (ABS 1986) not available (statistics on visitors) or incomplete (statistics on aboriginal communities). Therefore, the above tables provide a basic social description of those communities.

APPENDIX 6

Aboriginal crocodiles stories.

Examples of crocodile stories are numerous in northern Australia. Many portray crocodiles with human moral attributes, involved in human like concerns. These are a few documented stories from Cape York Peninsula.

The story of the of the fight between the Freshwater crocodile (Min Kena) and the Saltwater crocodile (Pikuna) and how they came to be where they live. Kendall Holroyd people (McConnel 1957).

Pinkuna was man eating, dangerous and greatly feared. He lived in tidal waters, feeding of fish as the tides came in and went out. He had a hole under the water. He was wily and sly and a great coward. In most stories he is depicted as a wife stealer and a rapist of women. His insatiable and illicit appetites are the butt's of man ridicule and irony and they delight in getting even with him. But for his own can's men, he is a hero and they believe they can't be harmed by him and there are stories of taming Saltwater crocodiles.

The Milbi story of the Endeavour River (Gordon & Haviland 1986).

Ganhaarr the Crocodile stole a woman and her child; the women lived with him as a wife in his cave. One day, the crocodile was asleep on a bank and she managed to escape and was soon rescued by her people who then decided to spear the crocodile if it came after her. but He did not. It is said that she started laying crocodile eggs because of her long stay in the crocodile cavern. This story was also recorded in my field notes in Hopevale (1990).

How the crocodila got a wife (Mapoon) (Roth 1984) .

The Crocodile created the Batavia river and left a group of Aborigines stranded in the process, they asked him to let them go across, the Crocodile agreed to carry them on his back. He did so until and when he returned a second time to fetch the only woman left behind, he dived and took her under and swam under the Pennifeather river with her.

The first Crocodile of the Embley and Archer rivers (Pennifeather River) (Roth 1984).

The first Crocodile was fashioned by an old blackfellow because he could no longer hunt himself. He used a iguana for a model and kept it on a rope and taught him to fish and catch turtles dugongs and then men and women until the crocodile got loose and decided to hunt for himself. However, he never attacked his creator.

The crocodile and the Blue tongue lizard (Napranum, Cape York Peninsula) (Field notes 1990).

The people of Napranum told the story of the Blue Tongue Lizard and the Crocodile where the Saltwater Crocodile tricks the Blue Tongue Lizard into lending him his set of powerful teeth for fishing and hunting and never gave them back.

The story of Liwaya the Sting Ray and Pawa the Crocodile (Wutati, Shelburne Bay, Cape York Peninsula) (Thomson 1933 in Chase 1986)

It is the story of journey of those Dreaming beings from the Pascoe River to the Torres Strait Island in a canoe and how they created important sacred sites in eastern Cape York Peninsula. For example White Point (Shelburne Bay) where their canoe capsized: *Liwaya* fell with its white belly up, and can today be seen as a white sand dune (*Wulungun*).

APPENDIX 7

**INTERPRETIVE MATERIAL, TOURIST AND ADVERTISING MATERIAL FEATURING
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Page 12 Port Douglas & Mossman Gazette January 11, 1990

Crocs find new home

TWELVE of Port Douglas' most jaded and ferocious visitors arrived in town on Saturday.

After a comfortable flight from Darwin in their own made-to-measure capsules, the travellers took up residence in waterside accommodation exclusively booked for them.

The group was rather snappy on their arrival and took every opportunity to complain and attack staff but they soon revealed themselves to be no more than a group of shy and homesick adolescents.

The guests, of course, were none other than a group of freshwater crocodiles, the latest attraction at the

Rainforest Habitat.

Varying in size up to 1½ metres the crocodiles will be a permanent fixture at the park and hopefully, in time, settle in and commence breeding.

The ropeable reptiles are accommodated to National Parks and Wildlife requirements in a special enclosure with double safety fencing.

A family of ducks which had been living on the pond, were more than willing to shift homes in order to make way for these hungry creatures.

At \$600 each, the crocodiles represent a sizeable investment, but they are already proving a favourite with visitors to the Habitat.



Page 4 Port Douglas & Mossman Gazette January 11, 1990

Port fishermen have rare find

THE FINDING of box jellyfish in the guts of trevally, as recently reported by Ben Cropp, was the first record of the notorious stinger being eaten in the wild by the fish.

Mr Cropp, a marine expert, said a Port Douglas fisherman had hauled in a net of box jellyfish and a species of trevally which contained box jellyfish in their guts.

Dr Bob Hartwick from James Cook University, a leading expert on box jellyfish, said that assuming the box jellyfish have been correctly identified is a rare and useful observation that has not been recorded before.

"We don't have a good list of known predators of box jellyfish, we are only just starting to draw up such a list now," he said.

"While it has been shown in captivity that fish such as trevally will eat box jellyfish, and although feeding experiments done under these conditions do tell us something, it doesn't prove that it definitely happens in the wild," he said.

Conclusive proof such as gut analysis is necessary before something can be said to be a predator.

Dr Hartwick said that statements about reduction in predators leading to an increase in numbers of box jellyfish are way out.

"Numbers of box jellyfish are not easily predicted

as there is not enough information about the jellyfish to make conclusive statements.

"Although we know more about the jellyfish than before, there are many details about what controls them that we do not know.

"We are only just beginning to draw up a list of predators and to go on and say that increases and decreases in numbers of predators are leading to an increase in box jellyfish number is extraordinary difficult and requires lots more sampling first.

"Just because something eats something else, doesn't mean that they are controlling their numbers.

"Crocodiles eat people, but they don't control the number of people around," was his analogy.

Attitude to crocs to be investigated

A PROJECT aimed at investigating community attitudes and their relevance to crocodile management began in the Cairns to Daintree region on January 8, this year.

Ms Domonique Banzaken, a Masters student from James Cook University, is investigating attitudes in North Queensland communities in the vicinity of crocodile populations.

"The study of community attitudes provides a valuable tool for management and can be used in the production of relevant educative programmes," said Ms Banzaken.

"Future development and crocodile conservation programmes alike depend on the understanding of public attitudes towards the development of relevant policies by concerned institutions."

According to Ms Banzaken, the project considers an aspect of natural risk which has attracted little attention within the extensive study of environmental threats.

Increasing demands on wetlands in North Queensland for development, together with the recovery of crocodile populations since protection in the 70's, have changed the circumstances of encounter between people and crocodiles.

Crocodiles are a major hazard of coastal tropical regions. An increased awareness of their presence near populated areas has led to concern for public safety, as a result an assessment of the new situation is required.

The project will be conducted at Weipa, the Cooktown/Daintree region and Townsville, where community structure, pattern of recreational activities, and present development (mining, fishing, industry and tourism) is expected to affect the perception of crocodiles significantly.

"The participation of informants with wide ranging opinions, interests and occupations is essential to the relevance of this project," said Ms Banzaken.

Further information will be provided to interested people. If you wish to contribute to the project, please write and leave a contact phone or address at "Attitude to crocodiles", GPO Cairns, GPO Daintree, or GPO Mossman.

Mail will be collected from January 8 - 16. Strict confidentiality will apply.

Croc poaching evidence found

EVIDENCE of crocodile poaching was found this week during the National Parks and Wildlife's annual crocodile population survey.

Wildlife Officer Mr George Krieger said a headless skeleton of a three metre crocodile was found on a saltpan near the Mission River.

Mr Krieger estimated the crocodile was killed a month or two ago.

National Parks surveyed 450 kilometres of Weipa riversystems this week, counting crocodiles in the Mission, Embley, Wenlock and Pine Rivers and Tentpole Creek.

Mr Krieger said the Wenlock River and Tentpole Creek area had the highest crocodile population because of nearby freshwater swamps, the breeding grounds of the reptiles.

Survey indicates childcare need

THE initial results of a survey of childcare needs and employment preferences of women in Weipa show most non-working mothers would prefer a daycare centre and would prefer to do some work outside the home.

The survey by the Childcare Working Party canvassed Weipa and Evans Landing women not in full-time employment on child care needs, their skills and jobsharing.

Result analyst Ms Bridget Blackwell said 197 people responded to the survey, 176 of them not in the full-time workforce.

"The working party has been delighted by the response rate, approximately 88 percent of the target population," she said.

The working committee said they would like to thank respondents for their comments and time

and the distributors for their work on the survey.

The survey showed the average age of children was six years, with over half of them under the age of five.

Most people preferred their spouse to care for the children if necessary, followed by a Day Care Centre and neighbours.

The reasons most women didn't work was the lack of part time work and the lack of and cost of child care.

Most women said they would prefer to work from 9.00am to 3.00pm.

Seventy-three percent of respondents said they would be prepared to job-share.

More than half of non-working women in Weipa have some post-secondary qualifications, such as TAFE, university, CAE or other tertiary studies.

Duo become naturalised Australians



TWO Weipa residents became Australian citizens last week in separate ceremonies.

Mr Derek (Rick) O'Donnell took the Oath of Allegiance, becoming an Australian citizen last Thursday.

Originally from New Zealand, Mr O'Donnell has spent the last 17 years

living in Australia.

Town Manager Mr Lew Rojahn also conducted the citizenship ceremony for Mrs Felicidad (Lettitia) Beeby on Friday.

Mrs Beeby, originally from the Philippines, took the Oath of Allegiance in front of a small group of family and friends.



Above left: Mr Lew Rojahn presents Mr O'Donnell with his citizenship certificate and a small tree to signify his new beginning.

Above right: New Australian citizen Mrs Beeby, with husband Michael and son Christopher.

No results from Regen dingo baiting

NO dingoes were killed up till yesterday as a result of the baiting programme being carried out by Regeneration.

Regeneration Superintendent Dr Bruce Foster said none of the 1080 baits had been eaten, but said it was probably the way the baits were set up.

"The meat is tied up with chicken wire so no other animal can take it away and hawks won't pick it up," he said.

He said the baits were only being laid at night to protect any roaming dogs during the day.

"The baits are removed each morning and put out again at night," Dr Foster said.

Regeneration is carrying out the baiting programme after dingoes damaged irrigation and other equipment.

Attitudes to crocodiles surveyed

SELECTED Weipa residents will be surveyed on their attitudes to crocodiles over the next three weeks as part of a James Cook University study.

Geography Masters student Ms Dominique Benzaken will survey about 150 randomly selected people on their opinions and awareness of crocodiles.

Ms Benzaken said Weipa was chosen as a survey centre because of the crocodile population in the area, which had increased over the last two decades.

"It will be interesting to see the results, Weipa being in the area where there are a lot of crocs and they're very visible," she said.

She said an important part of the survey was designed to find out how people formed their

opinions on crocodiles and where their information came from.

Ms Benzaken said she was also interested in comparing the attitudes of Europeans and Aborigines to crocodiles.

"They'd provide a different cultural background," she said.

Ms Benzaken said the survey was the first of its type, and would provide important information on public opinion which could be used in future policy-making.

"It's important to get some sort of coverage of public opinion," she said.

Ms Benzaken, assisted by Jaymie O'Keefe and Toni Craig will conduct the survey, which will also include Townsville and the Daintree Region.

She said Townsville will act as a control.

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Grisly croc scenes Limbs missing from attack victim's body

By BILL PICKERING at the scene. Photographs by JOHN LITSTER.

DETECTIVES today hope to examine the carcass of a crocodile believed responsible for killing a woman in the Gulf country on Tuesday.

The crocodile, estimated to be 5.5 metres long, was shot about 8am yesterday and sank to the bottom of the Staaten River near Karumba. It had been trapped between two nets the previous night.

The dismembered body of Katherine (Katy) Anne McQuarrie, 30, of Karumba and formerly of Marumbi, was discovered early yesterday by the skipper of the barra-mundi fishing vessel Kiana, Bob McNeill, and fellow seaman Des Trumble.

Mr McNeill had been with Ms McQuarrie when she was taken by the crocodile. Her arms and legs were missing from her body when she was found.

The crocodile still had a hold of the woman's body and was later shot by Mr Trumble.

Detectives from Mt Isa and National Parks and Wildlife Service officers from Townsville stayed at the scene last night and hope to retrieve the crocodile carcass when it rises to the surface.

Det Sergeant Neil Campbell said at Staaten River yesterday investi-

gations showed the woman had been taken by a crocodile.

Her body will be flown to Karumba today and then to Mt Isa for a post mortem examination.

A visibly upset Mr McNeill said the dead woman had been employed by him as a deck hand for the past two weeks.

"They had been crossing Van Hook Creek, a tributary of the Staaten River, in chest-high water when the woman was attacked."

"We were pretty exhausted after walking for nearly seven hours. I had reached the boat first but couldn't get on board, so I walked around the front and just as I climbed up and had one foot on the deck I heard this raggedy scream," Mr McNeill said.

"It (the crocodile) had grabbed her by the torso I went for my gun I couldn't help."

"There was a splash and Katy screamed. It dragged her beneath the water. It surfaced with the body in its mouth. I aimed, but the gun misfired."

The misadventure began early Tuesday morning when the motor on a dinghy used by Mr McNeill and the woman broke down when they were setting nets in a creek.

They were forced to make their way back on foot to the Kiana, which took nearly seven hours without food or water.

Mr McNeill said they reached the bank of the creek only metres from

the fishing vessel and started to wade in chest-high water.

"The crocodile took Katy when she was two metres away from me," Mr McNeill said.

He immediately radioed for help and three fishing vessels and crews in the vicinity responded to his call.

Three large nets were set and Katherine McQuarrie's body and the crocodile were trapped 12 metres from where the attack occurred.

Both Mr McNeill and Mr Trumble estimated the crocodile's size to be 5.5 metres.

Mr McNeill called for "an open season on crocodiles for two years" - saying the number had grown steadily in the Gulf.

"I have seen the numbers grow up this river in the past five years," he said.

Referring to Ms McQuarrie's death, Mr McNeill said: "You can't blame the crocs. They are wild creatures. We've just got to get the numbers down, but I don't want to see them exterminated."

He said he had been involved in the fishing industry for seven years and fishermen often cleaned their boats while standing in the Staaten River.

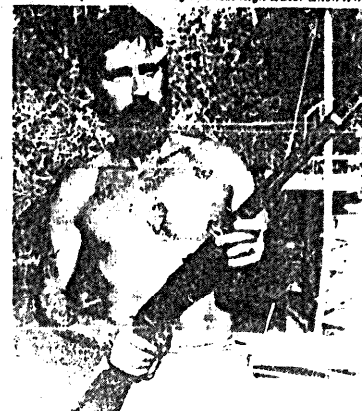
Mr Trumble described crocodiles as "a menace".

"There are many crocs around here. They can see you, but you can't see them."

He too called for an open season on them.



SKIPPER Bob McNeill points to the spot in the Staaten River where Katy McQuarrie was taken by a crocodile on Tuesday. The pair were wading in chest-high water when it happened and were just metres from the safety of the boat.



CREW member Des Trumble with the gun he used to shoot the crocodile that killed Katy McQuarrie. Now, he says, it's time for an open season on crocs.

Ennis: don't strip the Gulf rivers

BRISBANE — A North Queensland tourism industry leader has called for a sensible reaction to the latest North Queensland crocodile death.

Gulf Savannah Tourist Organisation chairman Bill Ennis said from Karumba yesterday there had been a great deal of knee-jerk reaction regarding the crocodile population of North Queensland since the attack in the Staaten township two months ago.

"I certainly hope that the emotional response is not played on in relation to this crocodile attack as we most certainly do not want to see all our river systems stripped of the crocodile population due to an error of judgment by somebody who, basically, took a chance," Mr Ennis said.

"I hope that people do not get this out of perspective. It is a tragedy, but it would have been a tragedy if there was a chance of crocodile attack, swimming to those waters."

Mr Ennis said: "People in the Gulf Savannah are fully aware of the dangers posed by the crocodile population."

"However, we have learned to live with them and respect their ways. The Gulf Savannah is a wilderness area where taking chances is a way of life."

"Anybody who swims in the waters of Gulf rivers and especially someone who is involved in the fishing industry knows that they take a chance," Mr Ennis said.

Locals say 'leave decisions to us'

DECISIONS in relation to Tuesday's tragic crocodile attack in Van Hook Creek in the Gulf should be left to those who make use of their homes according to a Gulf local authority spokesman.

Gulf Local Authorities Development Association (GLADA) chief executive John Courtney said yesterday that it should not be left up to people with little understanding of the region and its way of life.

Mr Courtney said the Gulf Savannah wilderness region, which lies behind the Atherton Tableland, is adjacent to Cairns and extends to the Northern Territory.

It had for some time been researched by GLADA as a possible wilderness management zone.

The residents were engaged in four very distinct industries - fishing, mining, logging and tourism.

The industries were connected and all of them relied on the wilderness environment for their livelihood.

The wilderness management plan is based on the premise of balance whether it be the balance of visitors to the region in relation to tourism, a balance of the population with respect to the mining industry or a balance of crocodiles in the Gulf rivers.

Mr Courtney said:

"To achieve this balance we must manage our environment so it is beneficial to each industry and a continuing asset for each of the individual communities which also rely on the wilderness for their existence."

The fishing industry for instance, has specially established a wetlands management scheme along the coastal strip of the lower Gulf, which is a very sensible approach to managing a wilderness resource.

"The tourism industry, however, is acutely aware of the problems facing the industry and is in fact sharing the concerns of producers from outside the Gulf Savannah - which can be detrimental to the longevity of the wilderness component and the unique asset which sustains each industry livelihood, and that of each community."

Mr Courtney said the crocodile attack on the deckhand of a barra-mundi boat in the Staaten River had

Everingham angry at Lindy claims

CANBERRA — Former Northern Territory Chief Minister Paul Everingham yesterday angrily denied suggestions that there had been a perversion of justice in the prosecution of Mrs Lindy Chamberlain.

Mr Everingham challenged Federal Attorney-General Lionel Bowen to repeal outside Parliament remarks he made in the House on Tuesday, and to relate them directly to Mr Everingham's role as Territory Attorney-General during the Azaria Chamberlain trials.

Story, PAGE 2.

Council turns sprinklers on

WATER restrictions eased in Townsville from midnight last night.

Under the new restrictions Townsville people will again be able to use garden sprinklers.

Details, PAGE 3.

ASEAN allies fear election outcome

HONG KONG — Two of the Philippines' allies in South-East Asia may fear a spread of communism in the region following violence and allegations of fraud and intimidation in Friday's presidential election.

As the Philippines National Assembly delayed issuing the result of the contest between President Ferdinand Marcos and opposition candidate Corason Aquino, the official media or Indonesia and Thailand said instability in Manila could affect their countries.

Report, PAGE 6.

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Culling views differ

AIR Queensland chairman Sir Sydney Williams yesterday urged visitors to Far North Queensland to exercise commonsense precautions in "croc country".

However, Member for Barron River Martin Tenni, who has already called for the removal of crocodiles from some parts of the North, predicted more attacks unless immediate action was taken.

Sir Sydney said that the Gulf and sections of North Queensland were true wilderness areas for adventurers.

"In the spirit of the true adventure, there is an element of risk and precautions must be taken," he said.

Air Queensland will open in May a \$14 million tourist development on the tip of Cape York to be known as Cape York Wilderness Lodge, which will specialise in adventure holidays.

"The element of danger is attracting people to the region in growing numbers, but they must be aware the dangers are real," he said.

"Tourists are safe provided they seek local knowledge."

Mr Tenni, however, said immediate action to reduce crocodile numbers was needed.

"The tragedy at Staaten River did not come as any surprise as I have been predicting further crocodile attacks for some time now," he said.

"The only surprise was that it came sooner than I thought it would."

"Although the circumstances of the Staaten River tragedy are different to the Daintree River attack last December, the latest incident is further proof of the revival of crocodile numbers in the Far North."

Mr Tenni said that trawler skipper Bob McNeill and the dead crew member appeared to have been placed in a difficult situation of having to spend a night ashore along the crocodile-infested river banks or risking a swim to their boat.

A few years ago they could have made that swim to their boat in reasonable safety.

Mr Tenni said he would continue pressing for the removal of all known crocodiles from within his electorate.

"Public education on the risks posed by crocodiles was not the answer to the crocodile problem within my electorate, which runs from the northern suburbs of Cairns to the Bloomfield River, south of Cooktown," he said.

"Only last weekend, I had to caution children who were foolishly ignoring crocodile warning signs and were swimming in a local creek only a short distance from my home."

"The last thing I want to see is a crocodile attack on innocent children in the Far North."



A crocodile in the Staaten River, where the attack on Katy McQuarrie took place.

Daintree swim to protest croc trapping

A SWIM across the Daintree River by tour operator Brian Strike on Saturday attracted national media coverage and produced some local controversy.

Mr Strike, who is known for his strong views in favour of environment protection, said he thought of the

idea as a protest against the continued removal of crocodiles from rivers in the region and the continuing destruction and sale of rainforest.

He said despite Labor's promise of protection, trappers were still allowed to take any crocodile above 1.2 metres.

"I'm beginning to doubt Labor is fair dinkum about protecting the crocodiles," Mr Strike told the *Gazette* after his swim.

Mr Strike who is described as a "larrikin at heart" by friends and colleagues raced the last ferry across the Daintree

on Saturday evening before one of the largest crowds ever seen at the crossing.

"I wanted to show there were so few crocs left in the Daintree it was safe to swim across," Mr Strike told the *Gazette*.

Before the race crowds gathered on both banks of the river and as Strike waded out into the water from the northern bank for the start of the race people poured onto the ferry to watch the action.

Around the ferry the river was teeming with boats carrying sightseers, television and radio crews, press photographers and reporters.

Such was the flurry of activity no self-respecting croc would have come within cooee within the

ferry and strike was probably safer swimming the river than driving on the Bloomfield Road.

Previous partner of Brian Strike and his current booking agent, Vince O'Flaherty, said by Sunday he began receiving calls from all over Australia.

"I did nine or ten interviews that night," Mr O'Flaherty told the *Gazette*.

"It made the national news on the three commercial TV networks as well as the ABC and 'most of the major radio networks'."

The media was well alerted to the coming event by a spread in Saturday's *Courier* mail and on Saturday evening crews thinking they had an exclusive story were as amazed as the locals to see how much media had turned up.

While some have

CROCODILE FEEDING TIME
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STRIKE 100 to 1



A BIG crowd enjoyed a trip across the Daintree River on the last crossing made by the *Cape Tribulation Gateway* when tour operator Brian Strike swam the river to register his complaint against continued crocodile trapping.

praised the tour operator's actions because of the widespread publicity it has brought to the Daintree region, others have condemned the stunt as irresponsible.

Dean Clapp, owner of the *Crocodile Express*, said although he had advised Brian against the swim he said "the outcome was incredibly good for the Shire" in terms of the widespread publicity.

"I thought it was irresponsible but Brian refused to be talked out of it."

characters do outrageous things and Brian fits the bill perfectly."

Mr Clapp said with the number of boats around the swimmer it had been perfectly safe and consideration should be given to making the swim an annual event.

Member for Barron River, Dr Lesley Clark, said while she had sympathy with Mr Strike's sentiments, she didn't think it was a sensible way of drawing attention.

"Had he been taken, it would have been counterproductive," Dr Clark said.



TOO many stuffed crocodiles and not enough of them left alive in their natural habitat was the point made by Brian Strike, left. Former ferry operator Tony Fapani, (right), shares Mr Strike's opinion.

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\$2000 reward to catch croc killer

THE shooting of a crocodile on the banks of the Daintree on Saturday has angered tour boat operators who united to offer a \$2000 reward leading to identification of the perpetrator.

Fatally injured, the 4.5 metre crocodile entered the river and was lost to sight until its floating body was seen on Wednesday afternoon by Daintree Rainforest River Train drivers Peter Dwyer and Kerri Young.

Mr Dwyer said the body, floating belly up,

was trapped in cottonwoods not far from where it entered the water.

"I think the animal was shot from the bank rather than the river, as no one

would be likely to shoot it from a boat and get away unseen when the river was so busy on Saturday," Mr Dwyer said.

The crocodile, a large

and well known animal, one of whose nicknames was "Slimey", was described as "one of the old standbys" by Janet Lafferty, a partner in the

Daintree River Cruise Centre.

A shot was heard at 1.50 pm on Saturday and at 9.30 in the afternoon, Rod Miller, skipper on a Daintree Wildlife Safari boat, was one of several people who noticed the crocodile lying "in an unusual position" with its head facing up the bank.

Taking a closer look, Rod saw a bullet hole in the animal's side and blood coming from its mouth.

His approach prompted the animal to

slip into the water leaving a patch of blood on the bank.

All Daintree River boat operators as well as several land-based tour operators and shop owners have clubbed together to guarantee the reward.

Lee Lafferty who owns and operates the Daintree River Cruise Centre said he had known Slimey for several years and could identify it by several features including an old shaped tooth.

He said it was the busiest day on the river so far this year and estimated 1,000 people saw Slimey the day it was shot.

The place where the crocodile is believed to have been shot is upstream from the ferry, on the southern bank, beside a cane paddock.

David Patterson from Daintree Rainforest River Trains tied up the floating corpse and National Parks and Wildlife Service officers have been informed of the finding.



LYING contentedly in her favourite spot on the banks of the Daintree in happier times, the old breeding female known as Slimey (or Berthe) was shot here on Saturday and found dead floating in the river on Wednesday. Photo by Daintree Reef and River Cruise Centre.



**CROCODILE ATTACK
SHOW DAILY 3.00 P.M.**

*Show also
includes:*

Snake Handling, Cassowary
Feeding and Talk on Dingoes

Both Fresh and Saltwater
Crocodiles

Souvenirs and Refreshments
Open daily 9.00 am to 5.00 pm
40km North of Cairns on the
Cook Highway

PHONE: (070) 55 3576

Tourists snap up crocodile insurance

By FIONA KENNEDY

CYNICS might argue that John Devaney has hatched an insurance broker's dream: a policy under which only one in 1.5 billion holders is expected to claim.

Mr Devaney, a Cairns-based brokerage manager, figured indemnity against shark and crocodile attacks was something visitors to north Queensland would buy, simply so they could laugh about it with the folks back home.

So a few weeks ago, the manager of Tropical Insurance Brokers established Gone Troppo underwriting agency, secured the backing of American Home Assurance as underwriters, and launched a scheme that, for a \$10 outlay, would cover anybody mauled by a shark and/or crocodile within six months of opening a policy for up to \$40,000.

He only wishes he had thought of it earlier.

"I think our bank manager wishes we'd been selling it for six months," Mr Devaney said yesterday, brandishing an A2-sized poster that serves as a policy-holder's proof of insurance.

At a rough estimate, Mr Devaney believes the likelihood of a policy-holder being attacked during the six-month period is one in 1.5 billion.

"We'll either have a claim right at the beginning or after 1.5 billion sales," he said.

"It's proving very popular with the overseas tourists. We've had people sending copies (of posters) back to Ireland and one sending a copy back to Wales with a note saying 'I'm covered if anything happens to me, Mum'."

"I think most of them believe it's a joke — yet it's genuine. I don't think people are buying it because they're genuinely scared of getting bitten by a shark or a crocodile, but if you do..."

"Our Japanese contacts believe the Japanese will go for it like wildfire but they want to see it in English."

The policies are couched in regular insurance policy jargon and, Mr Devaney, who also sells business and home insurance, says that, despite the apparent flippancy, he will pay out.

Amounts recoverable range from \$12,000 for loss of a foot to \$20,000 for loss of life. To claim \$40,000, the victim must be killed by a simultaneous shark-crocodile attack.

The Australian 7/2/92

Crocodiles in Queensland



estuarine crocodile

Bill Green



freshwater crocodile

Crocodiles in Queensland

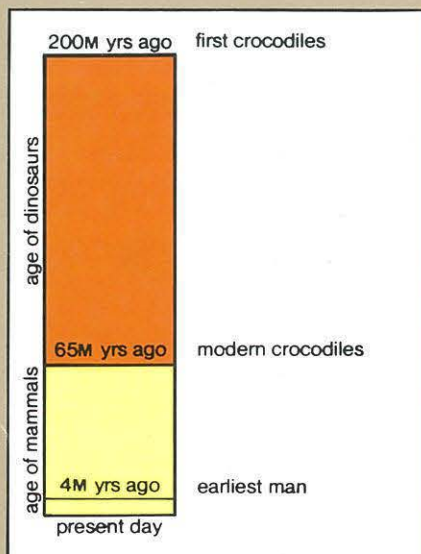
A living dinosaur

If scientists discovered a dinosaur alive today, worldwide interest would follow. Yet crocodiles are living dinosaurs – the last remaining members of the Class Archosauria, the ruling reptiles of the Mesozoic era.

Crocodiles are a very ancient group whose ancestors were around before the great age of dinosaurs 200 to 65 million years ago. They lived alongside *Tyrannosaurus rex*, the most formidable predator to stalk the earth, and the huge plant-eating *Brontosaurus* or thunder-lizard. Crocodiles lived through the Cretaceous era when the dinosaurs disappeared. They survived the break-up of the ancient world when continents split and drifted across the globe, forming great mountain ranges where they collided. They even lived through the Ice Ages of the last two million years when ice-sheets periodically covered much of the world and primitive people were driven to warmer climates near the equator. Yet today's crocodiles are little different from their prehistoric relatives.

Only in the last 50 years has the continued existence of crocodiles been threatened. Many species have disappeared from much of their former range after intense hunting for hides. Many are threatened with extinction, especially in south-east Asia.

Australia is one of the very few places where estuarine crocodiles (*Crocodylus porosus*) are sufficiently common to have some chance of survival and the only country where freshwater crocodiles (*Crocodylus johnstoni*) are found. Australians then have a responsibility to conserve and manage the country's crocodile populations carefully.



General biology

Estuarine crocodile ('saltie'), *Crocodylus porosus*

Habitat: Estuarine crocodiles are seen most often in the tidal reaches of rivers but are common in freshwater lagoons and swamps. Small populations can be found hundreds of kilometres from the sea. Individuals are sighted occasionally on Great Barrier Reef and Torres Strait islands.

Size: Males can grow to at least 6m but most large animals seen are less than 4m. Males appear to mature at about 3 – 4m at an estimated age of 15 years. Females rarely exceed 4m and may begin nesting at 2 – 3m at an apparent age of 10 years.

Reproduction: Nesting occurs in the wet season (November – March). A large mound of vegetation and soil is built and about 50 eggs laid inside. The female usually guards the nest, hiding in a nearby wallow. Incubation takes about 90 days. Many nests are lost to flooding, and pigs and goannas take eggs.

Food: Young salties feed on small animals including crabs, prawns, fish, insects and occasional snakes and mammals. Many prey are taken from the water's edge as they come to feed or drink.

Distribution: Estuarine crocodiles occur from India, through south-east Asia to Australia. In Queensland, they occur from Rockhampton north to Cape York and the Gulf of Carpentaria.

Appearance: Apart from their large size as adults, salties can be recognised by their broad snouts. Small salties may be difficult to distinguish at a distance.

Large animals can be dangerous to humans.

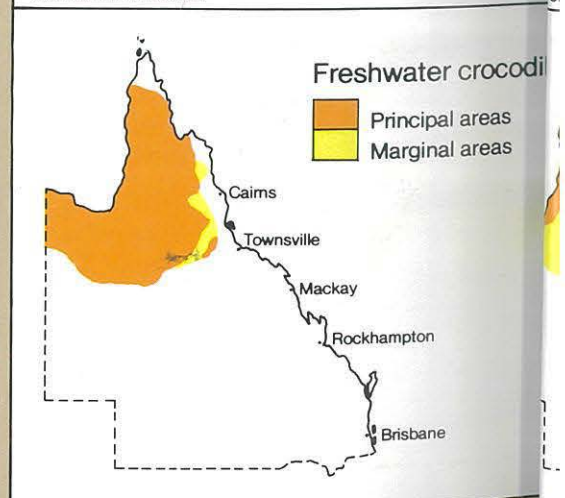
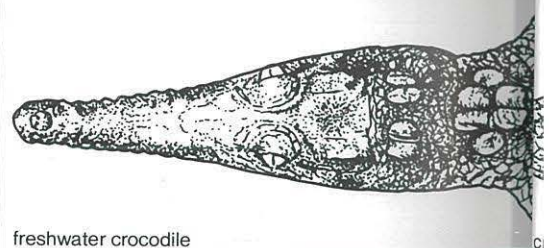
Freshwater crocodile ('freshie'), *Crocodylus johnstoni*

Habitat: Freshwater crocodiles are very common in upstream freshwater rivers and billabongs. They can be found also in the tidal waters of some rivers.

Size: Males grow to at least 3m but animals over 2.5m are rare. Females rarely exceed 2m. Males mature at about 2m and females at 1.5m, both at an estimated age of 12 years.

Reproduction: Nesting occurs in the late dry season (August/September) when about 12 eggs are laid in a hole, usually dug in a sandbank near the water. The female does not usually guard the nest or dig wallows. Incubation takes 65 – 90 days, allowing the young to hatch before the first floods of the wet season.

Food: Freshwater crocodiles feed primarily on insects, spiders, fish, frogs, lizards, turtles and birds. Mammals are taken occasionally. Even large animals tend to take very small food items. Much feeding takes place along the water's edge.



Distribution: Freshies occur only in Australia where they are still common in many inland waters. In Queensland, they are found mainly in the rivers of Cape York Peninsula and the Gulf.

Appearance: Freshwater crocodiles have a narrow snout and a row of four large scales at the base of the head.

Freshwater crocodiles are not dangerous to humans.

Nesting

Estuarine crocodile nests consisting of mounded vegetation and earth may be found in grass beds or

fringing forest along the banks of watercourses or deep freshwater swamps. The female often guards the nest, hiding in a wallow dug near the nest when disturbed. Freshwater crocodiles lay eggs in simple holes in sand or soil near the water's edge. The female may stay near the nest but appears not to guard it.

Do not disturb crocodile nests: Nesting crocodiles may be aggressive. If you locate a nest, advise your local wildlife ranger.

When the young crocodile hatches from its egg, its squeaking attracts the adults which excavate the nest and carry the young in the mouth to the water – without harming them. Unhatched eggs may even be rolled around on the tongue to help the young emerge. Adult crocodiles may remain near a group of hatchlings in the water and offer some protection for several months. Distressed hatchlings squawk loudly, often attracting the attention of nearby adults.

Do not interfere with hatchlings. Mum or dad may be nearby and come to the rescue!

How and where to see crocodiles

Observing estuarine crocodiles in the wild is difficult because they are very shy and usually stay under water while people are about. However, in some streams such as the Daintree River north of Cairns, crocodiles may be seen basking or swimming during the day.

Crocodiles bask most frequently in the winter months when the water is cold. They may haul themselves onto sand or mudbanks or climb among mangroves. Look for slide marks along the river banks as evidence of their presence. A quiet trip down river in a stable boat may allow you to spot crocodiles. Don't approach too closely.

Freshwater crocodiles may be seen more easily in the wild as they can be found in clear streams and billabongs and are more abundant than estuarine crocodiles. If you sit by a billabong or take a quiet walk along the riverbank, numbers of freshwater crocodiles may be seen basking in the sun or floating near the surface. Very often crocodiles are not spotted until they splash into the water a few metres away. Look for them surfacing for air immediately after they dive. Only their eyes and the tips of the snouts will be visible. Once they have taken a breath they may stay down 20 minutes or more.

Experience has shown that it is safe to swim in areas where freshwater crocodiles are common. There has been no recorded instance of an unprovoked attack on a person by a freshwater crocodile. They are very inoffensive but will bite if interfered with and can cause severe lacerations.

'Problem' crocodiles

More crocodiles have been seen in recent years, leading to speculation that crocodile numbers have risen dramatically since shooting ended in 1972. While numbers have increased, many recent sightings are attributable to crocodiles being less wary of people. Very often, 'problem' crocodiles are in the 1.5–2.5m range (the size class known to be very mobile) and many would have travelled long distances from where they were born. Potentially dangerous crocodiles in populated areas are captured by Q.NPWS officers and relocated or given to commercial crocodile farms and zoos. Removal of all crocodiles from natural habitat is an unrealistic approach to crocodile management. Management of Australia's crocodile populations is a difficult but worthwhile task.

Crocodiles are protected

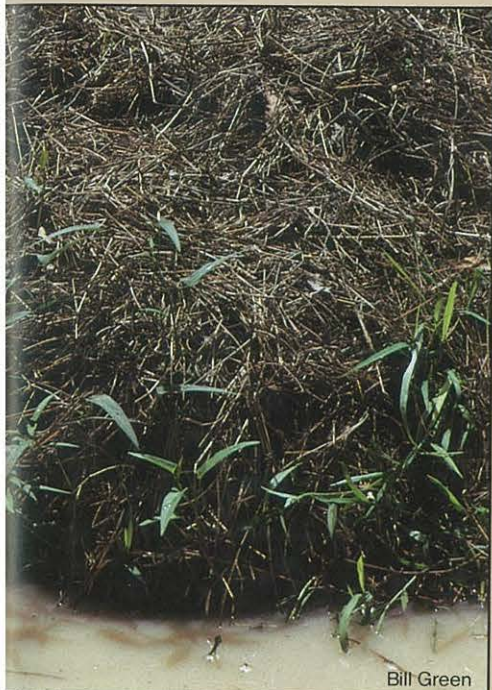
Australia's two species of crocodiles are protected nationally and internationally.

Unnecessary interference with them or their eggs is illegal. However, if an estuarine crocodile is posing any threat to humans, it is legal to destroy the crocodile. To possess or take parts of crocodiles such as skulls and skins or whole stuffed crocodiles is an offence. Poaching or killing for sport should be reported urgently to your local Q.NPWS office.

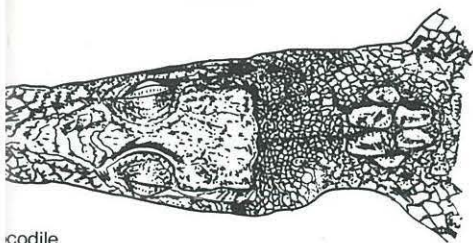
Research into crocodiles

Q.NPWS research programs are examining aspects of freshwater and estuarine crocodile's biology. The broad aims are:

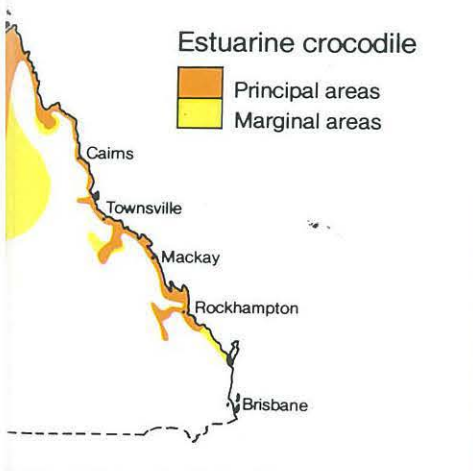
- to assess numbers and distribution of crocodiles
- to understand their ecological role in aquatic ecosystems
- to understand their reproductive biology and population dynamics so that farming can be managed on sound conservation principles
- to encourage conservation and management of healthy wild populations of crocodiles while minimizing the risk to people.



Bill Green



codile

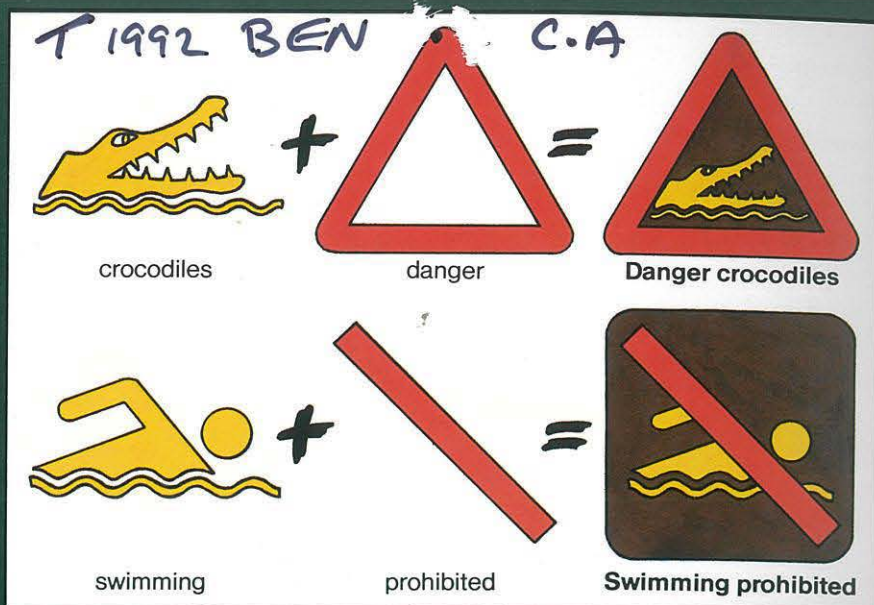


Crocodile warning

Throughout northern Queensland this sign is erected at access points to rivers, creeks, swamps and billabongs where there is a danger from estuarine crocodiles.

The crocodiles' warning sign is often combined with the no swimming sign.

Absence of a warning sign does not mean there are no estuarine crocodiles in an area. If in doubt, obtain local advice and be crocodile-wise in your behaviour.



What not to do



How to be crocodile wise

In areas where estuarine crocodiles may be present you should:

- be aware of crocodiles – keep your eyes open
- not feed or otherwise interfere with crocodiles, small or large
- avoid areas where large crocodiles or their nests have been seen
- camp at least 50m from the water's edge
- stand at least a few metres back from the water's edge when fishing and don't stand on logs overhanging deep pools
- not clean fish, prepare food or engage in other activities on the water's edge and adjacent banks
- dispose of food scraps and animal carcasses (including fish) away from areas where people gather
- swim only in areas of shallow rapids well away from deep water
- swim in groups rather than alone
- keep arms and legs inside boat hulls.

Photographs by Bill Green by courtesy of Professor Harry Messel, School of Physics, University of Sydney.

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