CRC REEF RESEARCH TECHNICAL REPORT

VISITOR EXPERIENCES AND PERCEIVED CONDITIONS ON DAY TRIPS TO THE GREAT BARRIER REEF

C. Scott Shafer, Graeme J. Inglis,
Victoria Y. Johnson and Nadine A. Marshall
CRC Reef Research Centre

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CRC Reef Research Centre
c/- James Cook University
TOWNSVILLE Q 4811
Phone: (07) 4781 4796
Fax: (07) 4781 4099
Email: crcreef@jcu.edu.au

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FOREWORD

The Great Barrier Reef Marine Park is the world's largest marine protected area and is among the world's first marine protected areas. The Great Barrier Reef Marine Park Authority's responsibility to ensure the environmental well-being of the world's largest coral reef system requires not only that human activities are managed for sustainability, but also that the Authority respond positively to changing patterns of human use.

When the Marine Park was started in 1978, most human activity was extractive - taking natural resources from the environment in the form of fishing or collecting with little consideration of sustainability. Now, 20 years later, fishing and collecting are managed with the objective of ecological sustainability, there has been an increasing trend towards human activities focussed on appreciation of the Great Barrier Reef environment in the form of tourism and recreational cruising and boating. This trend complements the World Heritage listing of the Great Barrier Reef, and has the potential to provide many avenues for productive, collaborative relationships between Marine Park management and interests.

Much effort has been devoted during the life of the Marine Park to understanding the ecological processes of the Great Barrier Reef and the effect of human activities on those processes. While our understanding is far from complete (and it is unlikely ever to be complete), over time we have learned generally to ask the right questions that lead to sufficient information to make management decisions. We have developed a basis for understanding ecological processes.

We are now embarking on a similar learning process in relation to human use and perceptions of the Great Barrier Reef, but with two important differences. The first is that while the Authority has a role in creating suitable conditions for a diversity of experiences and appreciation of the Marine Park, it is a role that must necessarily be shared. Indeed it may only be effective with the cooperation and active participation of other interests such as the public and the marine tourism industry. The second is that most decisions required in this process will necessarily be of the type this report refers to as "wicked" decisions, by which an outcome is not necessarily 'correct' in an abstract sense, but is nevertheless useful. It is desirable that Marine Park stakeholders and interests are participants in developing and

implementing any management regime. It is essential that they are involved when the purpose of managing human use is only or primarily how it affects other human use.

This report is an important contribution to the processes of understanding the more subtle values people attribute to the Great Barrier Reef and of exploring systematically how that understanding can be better developed, practically implemented; and to providing a common basis for consideration of the issue by Marine Park stakeholders and managers. In particular, it demonstrates that there is a need to consider factors affecting human 'satisfaction' with their experience of the Great Barrier Reef. It highlights areas where the 'right' questions may now be systematically asked in order to develop cohesive policies and management systems based on ecological, social and economic issues.

Ian McPhail
Chair
Great Barrier Reef Marine Park Authority

SUMMARY

Large growth in tourism and associated infrastructure development within the Great Barrier Reef Marine Park over the past 10 years has prompted calls for research into the carrying capacity of coral reefs for recreation and tourism. Past research has, however, shown clearly that attempts to determine a single numerical limit to the use of natural environments are misguided and inevitably subjective and that limiting use alone does not adequately protect the natural and aesthetic qualities of the resource. Contemporary planning frameworks such as the "Limits of Acceptable Change" (LAC) model rely instead on the use of indicators and standards of environmental quality to direct management of natural environments. These are determined on the basis of natural and aesthetic conditions desired for the quality of the resource by stake-holders and managers. Establishing such a framework requires an understanding of the range of opportunities sought by visitors and the conditions that influence perceptions of environmental quality. To date, few studies have attempted to identify specific conditions which could be used to develop standards for determining acceptable change in coral reef environments.

In this report, we describe the types of experiences had by day-trip visitors to the GBR and the conditions that influenced them. Our purpose was to examine the range of qualities (or "benefits") that visitors seek from a reef trip and how the attainment of these qualities is modified by the natural and social environments experienced on the trips and by characteristics of the respondents themselves. The study had seven principal objectives:

1) To determine the types of people who visit the GBR on day-trips and how they vary in the way they perceive the GBR.
2) To determine if and how activities (particularly snorkelling), in which visitors were involved, influenced their perceptions.
3) To determine what visitors value about reef sites.
4) To determine if visitors to natural marine areas receive similar levels of benefits and react to environmental conditions in ways similar to those reported for terrestrial environments.
5) To determine the conditions present during the reef experience that were most influential on visitors' experiences and thus useful in the selection of indicators in a LAC process.
6) To determine the range of experiences that exists which might contribute to a "spectrum" approach to managing tourist day-trips on the Great Barrier Reef.

7) To determine the extent to which "large" and "small" tourism operations accessing the GBR may be providing different types of experiences.

Self-administered questionnaires were completed by 1,922 day-trip visitors to the Great Barrier Reef Marine Park, between June 1995 and February 1996. Respondents were passengers on one of four tourism operations that visited reef sites in the Cairns or Central Sections of the Marine Park. Two of the operations were based at offshore pontoons and transported up to 450 passengers per day ("large" operations), whilst the remaining two carried fewer than 50 passengers daily ("small" operations). Questionnaires were provided in three languages (English, German and Japanese) and were administered on repeated trips with each operator throughout the 9 month period to encompass a range of seasonal and weather conditions. The questionnaire was designed to measure different attitudinal, behavioural and demographic characteristics. Visitors were asked to rate how much the trip provided them with different benefits as a part of their experiences (e.g., get some exercise, meet people, learn about a coral reef) and the influence that different physical, biological and social conditions had on their enjoyment of the trip. Demographic information was used to characterise the experience according to different types of visitors.

The survey received a good response rate (97%). Respondents came from 33 different countries, but were mostly from Australia (41%), Japan (14%), Britain (14%) and the USA (13%). A large proportion of visitors (45%) on the trips had not previously visited a coral reef and only 27 % had been to the Great Barrier Reef before. Of those who had, approximately 33 % had made their previous trip to the GBR within the preceding week.

Four main classes of benefits were identified from the responses: (1) experiencing nature, (2) relaxing and escaping from normal routines, (3) excitement with family and friends, and (4) being physically active. *Experiencing nature* generally rated as the most important benefit, whilst *social interactions* and *experiencing solitude* were only moderately important. Five general types of reef visitors were identified on the basis of these benefit classes: (1) people who predominantly escaped from their normal routine and experienced nature, (2) visitors who shared their experience of the natural environment with friends and family, (3) those who experienced nature without taking part in physical activities (e.g. snorkelling), (4) people who were very enthusiastic about all aspects of the trip, and (5) people who were generally not enthusiastic about any particular part of the trip. The five groupings were characterised by

important demographic differences. For example, Japanese visitors were more likely to be members of groups (2) and (5). The "enthusiasts" group (4) was generally younger than other groups, more likely to have participated in snorkelling and contained a large proportion of female Australian visitors. Both the less-active (group 3) and unenthusiastic visitors (group 5) were more likely to be male and included a large proportion of people who did not snorkel.

Most of the questions on conditions experienced during the trip were rated as positive influences on the visitors' enjoyment. The most influential items related to natural features of the environment (aspects of the corals and fishes) and services offered by the staff, respectively. The more neutral, and in some cases negative, influences related to the number of people or human-made structures present at the site and to the physical weather and water conditions.

The influence of biophysical conditions on enjoyment was remarkably consistent across operations with only slight, site-specific variations. There were, however, important differences between the experiences offered by "small" and "large" operators. In general, small operators carried a larger proportion of younger passengers and return visitors to the GBRMP. Participation in snorkelling and diving was also generally greater on the small boats. Visitors on small operations were also more likely to rate the social conditions of the trip, including the number of other people, as a positive influence than were visitors to the pontoon sites. The relative proportions of "enthusiastic" (group 3) and "indifferent" (group 5) reef visitors also varied among small and large operations, with the former being most represented on small boats and the latter on trips to pontoons.

This study reveals a range of reef experiences within and among different types of day-visits to the GBRMP. Natural conditions at the visited sites were overridingly the most important influences on enjoyment of the trips, but visitors showed little discrimination among sites with substantially different coral assemblages and settings. There were, however, notable differences between large and small operations in the benefits visitors received from travelling to the reef and in their perceptions of a quality experience. These related mostly to the social conditions present during the trip. Thus, there is a need for a greater understanding by reef and industry managers of the range of opportunities and experiences that are sought by visitors to the GBRMP, so that planning can incorporate measures to both protect and provide for the existing diversity of opportunities. A comprehensive knowledge will only be possible following

characterisation of the experiences sought on a broader range of trip types and geographic settings than that used in the present study.

1. INTRODUCTION

Australia's Great Barrier Reef Marine Park (GBRMP) was established in 1975 to protect the unique natural values of the Great Barrier Reef, the world's largest continuous complex of coral reefs. Although the principle reason for its creation was conservation of the natural environments of the reef (GBRMP Act, 1975), the GBRMP was established as a multiple use protected area to allow for a range of existing activities within its boundaries, including commercial fishing and shipping, maritime and island recreation, traditional hunting and tourism (Kenchington 1990; Craik 1992). Management of the GBRMP, therefore, seeks to optimise a range of natural, social, cultural and economic values that are placed on the environments of the Great Barrier Reef and its islands by the local, national and international communities.

The natural features of the GBRMP have been the focus of considerable research over the past 20 years (Fairweather 1989), but there is only limited information available on the social and cultural environment of the Marine Park. Growth in coastal agriculture, urbanisation, shipping, mining and tourism within and adjacent to the park has raised concerns that some of the aesthetic and cultural values associated with popular areas of the park are being compromised by increased human activities (Kenchington 1991; Craik 1992). Greatest growth has occurred in tourism. In the past 14 years, tourist visits have increased by over 100%, from around 150,000 visitor-days in the early 1980's to more than 1.5 million visitor-days in 1994-95 (Williams 1996). This growth is expected to continue to increase at a rate of 10% annually into the next century (BTR 1992; Driml 1994, Williams 1996).

Changes in ship technology and infrastructure have greatly increased the range of reefs that are accessible by tourism operations and the number of people that can be transported daily to individual locations. Nevertheless, > 95% of all visitor-days are currently spent within < 5% of the Marine Park, on the reefs and islands off Cairns and the Whitsunday region (Williams 1996; Dinesen & Oliver 1997). The increase in visitation to these two areas, in particular, has raised questions among managers and other users of the GBRMP about the ability of the park to sustain desired levels of social and biophysical quality. More specifically, there are concerns about how much visitation individual sites within the Marine Park can sustain and to what level they should be developed and/or directly managed. Anecdotal information suggests that there have been significant changes in community attitudes to the development of tourism infrastructure in the GBRMP over the past 10 years (Alder 1996; Inglis 1997), with managers,

residents and tourists now beginning to call for limits on certain types of activities (Carey 1993; McPhail 1995; Alder 1996). There is, however, a paucity of information on how different users perceive and experience the natural and social resources of the GBRMP and, therefore, how those experiences might change with further growth in tourism. To be able to manage the GBRMP for a range of experiences, it is first necessary to understand what those experiences consist of and how they are influenced by change in the social and biophysical setting, including changes in the types and amount of use.

1.1 Purpose and Approach

In this study, we attempt to apply some of the concepts developed by research on visitor experiences in terrestrial environments to a marine (coral reef) setting. A large number of studies has been done to understand and manage visitor experiences in terrestrial and riparian protected areas in National Forests or on Wild and Scenic Rivers in the USA, but it is unclear how these concepts may be applied to tourism and recreation in marine environments. Three related concepts were used to guide the research: (1) recreational carrying capacity (Wagar 1964; Graefe et al. 1984; Stankey & McCool 1984; Shelby and Heberlein 1986), (2) the Recreational Opportunity Spectrum (ROS) (Driver & Brown 1978; Clark & Stankey 1979) and (3) the Limits of Acceptable Change framework (Stankey et al. 1985).

This report contains two major parts. In the first (Chapter 2), we briefly review the three guiding concepts outlined above and examine the potential for tourism management in the GBR based on these approaches. The second major section (Chapter 3) describes an initial phase of research conducted to determine the relationship between perceived environmental conditions and the experiences of day visitors to the GBR. By studying visitor use in marine environments in ways similar to previous terrestrial studies, there is the potential to combine perception/experience data from visitors and ecological data to manage marine protected areas such as the GBRMP.

Figure 1. The Great Barrier Reef Marine Park, Australia.

2. BACKGROUND

2.1 Carrying Capacity

Ecological carrying capacity

The idea that natural resources have an innate capacity to withstand exploitation by humans (a "carrying capacity" or "sustainable yield") has been a fundamental concept in environmental management for well over 30 years (Wagar 1964). The "carrying capacity" concept has its origins in ecology and range management, where it was used to describe the maximum stocking rates that could be applied to natural or agricultural environments without noticeable deterioration in the quality of the resource or the stock (Odum 1959). As modern resource management has struggled to deal with issues of human use of natural environments, the concept has been expanded to other disciplines and, for the past 20 years, has been used as the theoretical basis for establishing limits to the use of natural areas by humans (Shelby & Heberlein 1986; Stankey 1991). In a very general sense, the carrying capacity of a park or recreation area can be described as the "amount and type of visitor use that can be appropriately accommodated within the area" (Manning et al. 1996). The concept has most often been used by resource managers to deal with increased recreation and tourism in terrestrial situations. Substantial increases in visitation to marine environments in many parts of the world, however, have recently led to attempts to estimate the carrying capacity of coral reefs for marine tourism (e.g. Salm 1986; Hawkins & Roberts 1993, in press; Scura & van't Hof 1993; Davis & Tisdell 1995). Such attempts to estimate a carrying capacity for marine tourism ignore the substantial amount of social and ecological research in terrestrial environments which suggests that simplistic notions of a single, objectively-defined level of use are unrealistic.

Although the carrying capacity concept has considerable heuristic value, there are a number of practical problems involved in its implementation. The most fundamental difficulty is how to determine the threshold capacity for use of an area. Conceptual work by Wagar (1964) suggested that recreational settings have many different carrying capacities depending on which part of the environment was examined. The rate and severity of deterioration in natural conditions within a protected environment are not simply a function of the number of visitors it receives, but are influenced by a range of other natural and human factors, including the sensitivity of the surrounding environment to disturbance, the types of activities pursued by

recreationists and their behaviour in the landscape. For example, the response of terrestrial plant communities to the impacts of bush walking and camping is influenced by the type of vegetation in the affected area, the soil on which it occurs, and the slope, drainage, aspect and elevation of the site and whether or not the recreationist chooses to avoid contact with the plants (Kuss 1986, Cole & Landres 1996). The extent and spatial distribution of impacts are determined by the degree of correspondence between the distributions of sensitive areas and the pattern of use of the landscape by bushwalkers and campers (Marion & Cole 1996).

Rouphael & Inglis (1995, in press) have shown that similar, complex relationships exist between the use of underwater sites by SCUBA divers and changes in the natural resource. The ecological impacts caused by SCUBA diving are strongly influenced by the behaviour of the divers in the water and the physical and biological characteristics of the dive site. Recent studies have also shown that the impacts of diving can be significantly mitigated by on-site briefings that alert divers to the ecological consequences of their behaviour (Medio et al. 1997).

Most ecological changes associated with recreational use of terrestrial parks and wilderness areas are relatively localised and have not involved extirpation of entire populations of plants and animals (Cole & Landres 1996). Even if this was possible, it would be difficult to establish absolute limits to use against a background of large spatial and temporal variation in the abundances and life-histories of the affected species (Oliver 1995). There are no objective criteria for when an ecological community is normal or healthy and, as a consequence, it is not possible to set a goal for the management of natural resources that does not involve some judgement about the acceptability of change in the surrounding conditions (Shrader-Frechette & McCoy 1993).

Social carrying capacity

Much of the research on environmental carrying capacities over the past 20 years has focussed on managing the experiential aspects of recreation. Wagar (1964) and Lucas (1964) extended the notion of carrying capacity to include the social environment of natural areas. Social carrying capacity was defined as a level of use beyond which a person's experience in an environment was negatively affected by other users. Thus, optimum levels of use were sought by examining peoples' perception of others using the recreational setting and how the quality of their experience was affected by the presence of others (e.g., Stankey 1973), including the effects others had on the natural environment. By the late 1970's, research had shown that there were also no consistent relationships between the number of people using an outdoor environment and the influence (positive or negative) that they had on recreational experiences (Graefe et al. 1984; Stankey & McCool 1984; Shelby & Heberlein 1984). Variety in the activities pursued, settings and personal expectations of different users makes a single desirable level of use very difficult to determine. Any given natural setting is likely to have a range of potential capacities, but the appropriate one can only be determined with reference to well-defined management objectives for the range of activities that are desired.

Establishing carrying capacities for recreational settings involves both descriptive and evaluative components (Shelby and Heberlein 1986). That is, it is necessary to obtain descriptions of the relationships between the behaviours or activities of recreationists (including the number of users) and the consequences of those behaviours (e.g., change in quality of the experience or the environment) as a first step in setting a limit to use. Deciding on an actual limit to the amount of use requires judgements about the desirability of the consequences of different behaviours within the management area. Such judgements are inevitably value-laden (Shelby & Heberlein 1984).

Carrying capacity for tourism

In the context of tourism, carrying capacity has been used to describe relationships between use and environmental change at two different scales. The first, at a regional scale, concerns changes in the character of destinations associated with increasing demand and development in the region. According to Butler (1980), tourism destinations pass through six recognisable stages of development: "exploration", "involvement", "development", "consolidation",

"stagnation" and "decline". The tourism "life-cycle", as these stages have become known, describes changes in the market and image of a destination from its discovery and use by small numbers of adventurous travellers, through a period of rapid growth and infrastructure development, to a point where the number of visitors begins to stabilise and, eventually, to decline. Recent literature (Martin & Uysal 1990) has associated the phase of decline with exceedence of the destination's carrying capacity for tourism, because it is often associated with substantial changes in the surrounding natural and social environment and visitor experiences.

The carrying capacity concept has also been used to describe relationships between individual tourist activities and patterns of change in the physical and social environments of particular sites, in much the same way that it has been used in studies of wildland recreation (e.g., Wall 1982; Martin & Uysal 1990; Pearce & Kirk 1986; Hall 1974; Inskeep 1987; Coccossis & Parpairis 1992, Clark 1991). Such studies are usually smaller in scale and scope, in that they involve a limited number of activities and do not include regional changes in the economic or political setting of the activities.

Carrying capacity has consistently been used as the framework to discuss the potential for limits on visitation in order to protect local social qualities (e.g., culture, friendly atmosphere) and the natural environment (flora and fauna), but has rarely been implemented effectively as a management strategy, because the point at which deterioration occurs is not easily measured nor predicted, but is determined by a complex set of ecological and social conditions. The question of how many people is too many is a complex one and simple answers do not exist. Contemporary approaches to this issue have abandoned attempts to measure limits to use and rely instead on indicators and standards of environmental quality (Stankey et al. 1985, Shelby & Heberlein 1986, Graefe et al. 1990). These are chosen to reflect the conditions of resource protection and visitor experience that are desired in the setting. Thus, the theoretical "carrying capacity" is said to be exceeded when the standards of quality have been breached. A number of prescriptive frameworks has been formulated to guide the development of standards for recreational settings. To date, these have mostly been used in terrestrial environments. Two are outlined below:

2.2 The Recreational Opportunity Spectrum

The recreational opportunity spectrum concept was developed by U.S. Forest Service in the 1970's to manage increasing and diverse recreational use of its wildland areas. Understanding the diversity of experiences sought (Driver & Brown 1978) in a wide range of environments (Clark & Stankey 1979) was seen as a necessary first step to managing recreation resources in a democratic fashion. In providing for high density, intensely managed experiences in developed areas at one end of the spectrum and for solitude and freedom in preserved wilderness landscapes at the other end, researchers stressed the benefits of providing opportunities for everyone and not simply managing for the average experience (Shafer 1969).

In terrestrial environments, the ROS is a framework that includes six land management classes based on the amount and type of human modification and use: 1) *primitive* = non-motorised, low intensity of use, remote and undeveloped; 2) *semiprimitive non-motorised*; 3) *semiprimitive motorised*; 4) *roaded natural*; 5) *rural;* and 6) *urban* = motorised, high intensity, near to population center and highly developed. Thus, separate parks and, in some cases, separate areas of the same park were zoned according to the land management class that had been assigned to it. The classes were based largely on the degree of human technology, use and modification of the park. While these classifications have provided an easily understood management framework, research on the concept has revealed mixed results (e.g., Virden & Knopf 1989; Yuan & McEwen 1989). It appears that recreationists vary in the experience they seek within the opportunity spectrum depending upon the activities they engage in. That is, the six classes that are currently specified do not appear to reflect real and consistent classes of recreational experience.

ROS in the GBRMP

The need for a ROS-type approach to regional tourism planning in the GBRMP was identified as early as 1980-81. A tourism workshop convened by the GBRMPA recommended that "*a variety of reef experiences be made available*" and that "*differences in scale and cost of facilities will correspond to differences in function and location*" (GBRMPA 1981). Subsequent authors (Kenchington 1991, Scherl, Valentine & Millard 1993) have also proposed the use of ROS in the GBRMP, but the concept has not been purposefully applied in the management of marine recreation. An ROS type situation exists *de facto* among tourist

operations currently using the GBRMP, with highly developed, large volume operations and smaller tourist boats, often accessing different sites. This has evolved without formal planning for both recreational experience and conservation. Little work has been done to understand the potential for systematic management of recreational or tourist activities based on such a concept.

The ROS provides a framework for the designation and subsequent management of marine environments with no to low use at one extreme (e.g., science reserves, wilderness areas) to those set aside to accommodate high use at the other (e.g. floating hotels, island resorts). It is generally assumed that, within each given classification, different environmental (social and biophysical) conditions may be more or less important to users and/or different standards of acceptable conditions may exist. It was this notion that led to the integration of the ROS concept into the more current Limits of Acceptable Change (LAC) planning system. In the LAC system, the development of opportunity classes is identified as a precursor to selecting important conditions as indicators of an environment and the experience it offers. That is, unlike the ROS system, opportunity classes are not prescribed, but are identified as part of the planning process.

2.3 Limits of Acceptable Change

The Limits of Acceptable Change (LAC) (Stankey et al. 1985), Visitor Impact Management (VIM) (Graefe et al. 1990) Carrying Capacity Assessment Process (C-CAP) (Shelby & Heberlein 1986) and Quality Upgrading and Learning (QUAL) (Chilman, Foster and Everson 1990) have evolved as a result of the difficulties with the conventional carrying capacity approach. These systems take very similar approaches in planning for the use of natural areas for recreation and tourism and vary only slightly in the way they are implemented. In the following sections, the LAC approach will be used as the basis for discussion in order to clarify the process, without getting lost in a comparison of the different approaches.

The LAC process formulated by Stankey et al. (1985) consists of nine major stages (summarised in Fig. 2). The first involves the identification of public issues or concerns in an area. This might, for example, involve the identification of important distinctive natural features of the park or characteristics of human use of the park's resources. For example, the existence of attractive features or unusual species habitat, current use and projected use (recreation/tourism and heavier industry) based on access to population centres or economic

trends. In the GBRMP, this may require integrating existing knowledge on the location of special habitat for fishes or corals, the distribution of tourism activities of different types and patterns of use of the marine park by indigenous communities, local recreational users and commercial fishing and shipping.

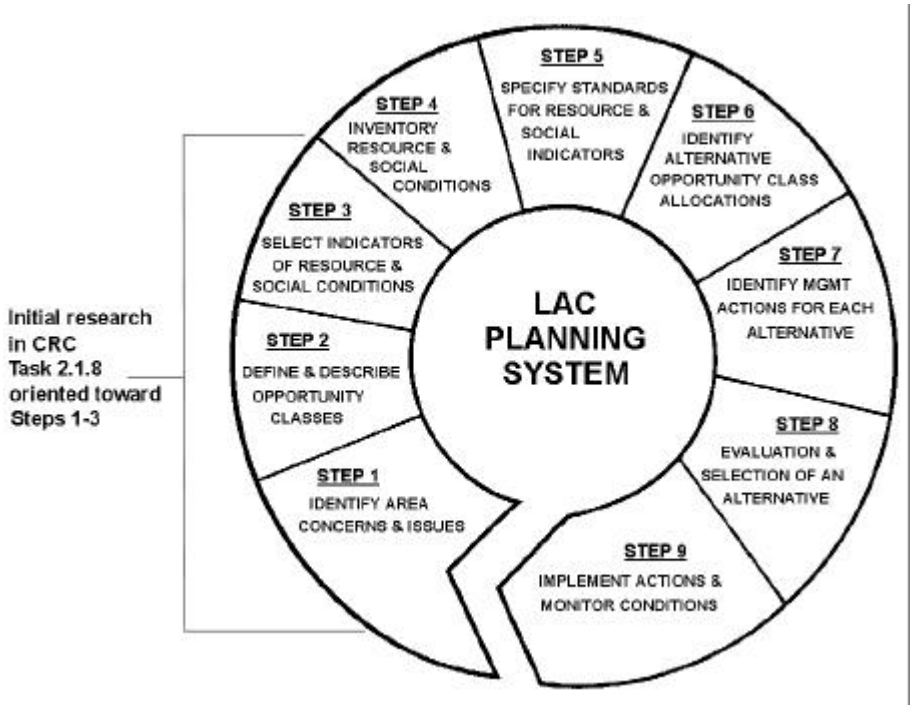

Figure 2. The Limits of Acceptable Change (LAC) planning system. (After Stankey et al. 1985)

This compiled knowledge is then used to plan the second step of the LAC process, in which opportunity classes are described and defined for different environmental settings. Opportunity classes may be based on the patterns of existing use, but can act to guide the course of future development. For a resource like the GBRMP, this is best done at an intermediate level of planning within the existing framework of Sections and Zones, where these larger planning areas are more finely classified to represent a range of environments and resource uses that are deemed appropriate. For recreation and tourism, there may be some areas zoned as environmentally sensitive where no human visitation would be allowed; areas where low density dispersed use might be appropriate; as well as areas where high density, more developed use, is accepted. The final outcome would be a group of classifications that represent the range of conditions which managers then strive to maintain.

The third step in the LAC process involves the selection of specific, measurable indicators which represent the conditions desired in each opportunity class. In the GBRMP these

indicators might represent biophysical conditions relating to the natural environment or social conditions related to the presence of structures or other people, or conflicts between different types of users of the marine park. It is important to select indicators that reflect relevant change in conditions and which managers can quantify and monitor effectively (Merigliano 1990).

Step four of the LAC planning process is simply the construction of an inventory of the current condition of the environment, as reflected by the indicators identified in the previous step. Thus, baseline conditions in the indicators are determined against which any subsequent change can be assessed (Step 5). Determining the acceptability of such change involves the development of standards for each indicator (e.g., How many more or fewer people encountered on a trip are acceptable? How many additional or fewer broken coral colonies at pontoon sites are acceptable?). The overall approach requires collaborative identification of indicators and setting of standards by scientists, stake-holders and resource managers and requires a commitment to monitoring changes in the chosen indicators.

The first five steps in the LAC model were intended to address the inadequacies of a "straight" carrying capacity approach to visitor management in natural areas. The final four deal with implementing standards where they are appropriate and then monitoring the specified conditions to determine when and if change becomes unacceptable.

2.3.1 Applying LAC in a recreation/tourism setting in marine environments

Although Stankey (1991) addressed the issue of Limits of Acceptable Change in marine environments, he stopped short of indicating what opportunity spectra might exist or what conditions could be of use as indicators when actually implementing the system in a marine setting. Apparently few researchers have attempted to develop specific conditions which could be used in developing standards for use levels and change in coral reef environments. Oliver's (1995) application of a LAC approach to a port dredging project provides one example of how key steps in the process were used to determine the acceptability of environmental changes associated with a major development activity. An interdisciplinary group of scientists and natural resource managers developed indicators and standards for corals near the dredge site and decided upon appropriate actions to be taken if the standards were exceeded.

In terrestrial environments, research on visitor experiences and impacts has resulted in extensive lists of items that can be used as indicators of the condition of the natural and social resource (e.g., Whittaker 1992; Watson & Cole 1993). No such lists exist for coral reef environments. In the following sections, we propose a range of conditions that may interact to influence both the experience of the visitors and changes in the biophysical environment of coral reefs.

A LAC-type approach to the management of visitors requires a good understanding of how people perceive the resource they are using. The challenge is to measure how visitors feel about an experience and place, so that parts of the experience and/or environment can be selected and monitored for acceptable change over time. This presumes that at least some of the "important" aspects of the environment should be determined by visitors (lay people). In coral reef environments, activities take place in natural settings above and below the surface of the water. The impacts caused in and reactions to these different components of the environment are likely to be quite different and there will be a range of conditions in each setting which influence peoples' experiences and, in turn, their behaviour.

2.4 Benefits of natural environments

In order to meet the ROS requirement in step 2 of the LAC system it is helpful to measure what it is people are getting from an experience. Again, theory holds that different settings provide different experiences. Measuring what people receive from a trip to a natural place like the GBR has most often been accomplished in terms of benefits received (Driver & Brown 1978; Driver et al. 1987). Being close to nature, spending time with family, escaping a routine, sharpening skills and having some excitement are examples of benefits that people might receive from such experiences (Driver et al. 1987). If people are receiving different amounts of these benefits in different environmental settings, then there may be some justification for maintaining these differences through the spatial designations of areas or resources that best provide each of these benefit groups.

2.5 Conditions Influencing Coral Reef Visitors

Different settings are likely to require that different indicator conditions be selected or that different standards be set for the same indicator conditions. In step 3 of the LAC system specific indicator conditions must be defined in order to select those that are feasible for use in

the setting of standards for reliable monitoring. In a coral reef environment, the broad classes of conditions will be much the same as those of terrestrial environments. That is, the experience of the visitor and state of the resource will be determined by the condition of the natural, social, managerial and physical components of the resource (Scherl et al. 1993). Corals, fish and other marine life represent the natural conditions. The numbers and types of people one travels with and/or encounters comprise elements of the social condition. The restrictions or liberties allowed by resource managers or operator staff represent the conditions of on-site management. Physical conditions of the setting, such as weather and water conditions, may also influence the experience. The uniquely marine aspects of the setting (e.g. corals, fish, waves and currents) are less a part of most people's day to day experience than are the conditions on land or above the water and it is likely that people will perceive the two settings quite differently (e.g., different levels of acceptability).

2.5.1 Corals

Corals are a dominant visual feature of the underwater landscape of coral reefs. Corals of different shapes, sizes and colours grow together giving form, texture and colour to the underwater landscape. In many ways, they are similar to the plants and forests on land, which provide texture and form in terrestrial settings. They are also similar to vegetation in that they provide habitat for many of the other animals that live on the reef. Individual aspects of corals (size, shape, colour) may be perceived in different ways by those viewing it and may have different amounts of influence on the marine experience of visitors to the setting. For example, concerns are often raised about the colour of coral as portrayed in light enhanced photography compared to that which is viewed under "natural" light conditions. Natural light often produces less brilliant colour in corals. In a related study, Fenton & Johnson (submitted) have shown how day-trip visitors to the GBRMP, who have limited prior experience of these environments, associated the health of coral reefs with the colourful, idealised representations of these settings that they see on tourism brochures and other media.

We know little about peoples' ability to perceive different types (species) of coral. The most obvious distinctions are among corals of different morphologies (shapes), commonly described with words like plate, branching and boulder. These shapes are primary in providing texture and form. Corals can also vary in size. Older coral colonies may grow to be quite large and may dominate the attention of viewers. Sites dominated by large plate and boulder colonies have been compared to old-growth forests (Done 1995) and may be particularly attractive to

those with experience in looking at coral reef environments. The composition of these features may also be important to their impact on viewers. In some cases, corals grow in diverse assemblages with a variety of shapes, sizes and colours creating a complex image. In other instances "gardens" of a single species (or very similar species) will extend for many meters across the reef. We know little about how these different coral assemblage characteristics influence those viewing an underwater landscape.

2.5.2 Fish and Other Marine Life

Fish, marine mammals, and animals like echinoderms and molluscs are also present on coral reefs and one may easily see 50 different species during a brief snorkel or SCUBA dive. There are few nature based experiences which allow people to see so many different animal species in a relatively small area or over such a short period of time. Roggenbuck et al. (1993) found that, among wilderness recreationists, the number of wild animals seen was rated as very influential and surmised that this condition was "critical to the experience..." (p. 191). Shafer and Hammitt (1995) found that recreationists were very concerned with the number of different species seen and seeing specific types of wildlife and that they often behaved in ways to increase their chances of seeing wildlife.

As with corals, the more than 1100 species of fish present in the GBRMP (Randall et al. 1990) encompass many different shapes, sizes, colours and assemblages. Because of most peoples' unfamiliarity with reef wildlife and a lack of research on it we know little about its influence. The size of fish may influence people in much the same way that it does with terrestrial wildlife. Larger species are more conspicuous and garner more attention. The colours of fish can be quite brilliant and varied making them more attractive. Schooling species can also be of interest because of their sheer magnitude and movement. A better understanding of the relative influence of marine wildlife on visitors and what aspects of it are most important is needed.

2.5.3 Weather

Physical conditions related to weather have never played much of a role in studies of recreation or tourism experiences. Driver's (1977) motivation scales included items related to temperature but few studies have tried to measure the importance of such conditions, probably because they cannot come under the control of resource managers. Marine tourism situations

differ slightly in that a decision can be made about whether to travel to reefs under certain weather conditions or how to advise customers about the choice of a trip. In marine environments, weather conditions may have a higher degree of influence on recreation and tourism experiences than in terrestrial environments. This may be particularly true on day-trips comprised largely of people with little experience of travelling on the open ocean.

Conditions are most evident in the surface of the ocean which serves as the travel medium. Winds are common at sea and equate with waves and swells which, in turn, makes travel uncomfortable for some people. Tour operators post wind speeds and related surface conditions daily as an indicator of what one can expect during the trip. Air and water temperatures influence the comfort of those snorkelling or diving. Visibility in the water is influenced by winds and currents associated with weather conditions and can have a direct affect on how much people see during their visit.

2.5.4 Other People

The number of boats or other human-made structures in the water, the distances between them, the types of boats or activities they support and the number of people on a boat or participating in an activity are all "social" conditions which may influence both user experiences and the marine life (Manning et al. 1996). These conditions have been at the center of research dealing with social carrying capacity (e.g., Graefe et al. 1984; Vaske et al 1986; Shelby 1980). This research has shown that the number of people, what they do and where they are encountered are important influences on visitor experiences (e.g., Stankey 1973, Roggenbuck et al. 1993) Research has also indicated that visitors are more highly influenced by evidence of inappropriate human behaviour (e.g., litter, damaged vegetation, noise) than any other conditions (Roggenbuck et al. 1993; Shafer and Hammitt 1995).

In marine recreation and tourism settings, social conditions similar to those in non-marine settings exist and need to be better understood in the carrying capacity and LAC frameworks. We must learn more about the way that people perceive others whether they are travelling with them or observe another party across the reef. The key question is: Does the number of people one encounters matter in this environment?

The level of technology needed to transport and care for groups of people in marine settings is high. Large motorised boats, pontoons and elaborate moorings are a common part of many

tourist's experiences in the GBRMP. How do people perceive this human technology? Are they happy that these things exist for their safety and convenience or would they rather see less of it amongst the natural environment they have come to experience?

This range of conditions interacts to influence human experiences on the GBR. In the remainder of this report, we have attempted to measure some of the relative influence of each set of conditions as a preliminary step toward application of an LAC framework.

3. PHASE ONE OF CRC TASK 2.1.8

3.1 Purpose

The first phase of this research was designed as an investigation of the relationships between use and resources in marine settings. The purpose was to understand the types of experiences had by visitors to the GBR and the conditions that influence such experiences. Coral reef sites used for day-trip tourism were selected as the focus for the research. Operations where snorkelling was a primary activity were selected in order to integrate research on social and physical impacts at specific sites. Within the GBRMP, snorkelling has, perhaps, the greatest participation rate of all active marine tourism pursuits. Bureau of Tourism Research (1995) figures indicate that approximately 13% of inbound tourists to Australia go snorkelling, most of whom do so on the Great Barrier Reef. This number has been growing steadily over the past eight years, with a 53% increase in the total numbers of visitors going snorkelling and SCUBA diving since 1989 (BTR 1995). Recent studies by CRC Reef researchers have suggested that 34% of first time visitors and 12% of return visitors to the GBR see the reef from permanently moored pontoons (Pierce et al. 1997), where the principal activity is snorkelling.

We wanted to learn more about visitors' experiences on the reef and about their interactions with the biophysical environment. Looking at day-use visitors and, more specifically, at the subset of snorkellers was selected to meet that purpose. This portion of the study was designed to acquire data of a social nature by measuring visitor perceptions and behaviours. Data related to actual change in the biophysical resource (i.e., corals) due to visitor behaviour will be reported elsewhere. The following objectives guided this portion of the study in an effort to gain information to support a LAC approach to planning.

1) To determine the types of people who visit the GBR on day-trips and how they vary in the way they perceive the GBR.
2) To determine if and how activities (particularly snorkelling), in which visitors were involved, influenced their perceptions.
3) To determine what value visitors place on reef sites.
4) To determine if visitors to natural marine areas receive similar levels of benefits and react to environmental conditions in ways similar to those reported in terrestrial environments.
5) To determine the conditions present during the reef experience that were most influential on visitors' experiences and thus useful in the selection of indicators in a LAC process.
6) To determine the range of experiences (as measured through benefits provided and the perception of conditions) that exists which might contribute to a "spectrum" approach to managing tourist day-trips on the Great Barrier Reef.
7) To determine the extent to which different types of tourism operations accessing the GBR may be providing different types of experiences to visitors.

The first two objectives were intended to provide basic information for tourist operators or managers about differences in activities and visitors. The final three objectives also deal with visitor differences but specifically address steps in the LAC planning process related to defining opportunity classes and developing useable indicators.

4. METHODS

4.1 Selecting Tourist Operators

The cooperation of the tourism industry was necessary for the completion of this research. Several criteria were used to select the tourism operations used in this research: 1) the number of tourists they were carrying to reef use sites and thus the intensity of use they represented, 2) the types of activities offered (i.e., snorkelling), and, 3) the type of site they used (e.g., outer reef, island/reef). Four companies agreed to cooperate in the research by allowing us access to their customers.

Two of the companies (hereafter referred to as Oper 1 and Oper 2) represented larger, high intensity use operations capable of carrying up to 450 passengers daily to reef sites. The other two operators (Oper 3 and Oper 4) represented smaller, lower intensity use, operators. Oper 3 and Oper 4 used vessels capable of carrying between 20 and 50 passengers daily to reef

sites. In all four cases these operators provided visitors approximately 4 hours of on-site activity time through the middle of the day (eg., 11 am to 3 pm). All four operators offered snorkelling as their primary in-water activity, while three of the four also offered scuba diving. All four operations offered guided snorkelling tours as a supplement to the regular snorkelling activity. Oper 1 and Oper 2 travelled to "pontoon sites" where their vessels were moored to a permanent, anchored pontoon structure. These facilities also offered the opportunity for "dry" underwater observation through submerged observation decks and semi-submersible boat rides.

4.2 Study Sites

Operators 1, 2 and 3 used "outer reef" sites. These varied in the underwater features present. Generally, the sites used by Oper 1 and 3 were back-reef lagoons with depths that ranged from 2 to 15 meters below the reef flat. Oper 3 differed from the other three operators in that they moved among three different snorkelling sites during the day, whereas each of the other operators travelled only to a single site. The site of Oper 2 was within a deep channel between two mid-shelf reefs. The pontoon was moored close to the reef edge which dropped away steeply from the reef flat to a depth of 40 - 50 meters at the outer edge of the platform. Oper 4 used an island and fringing reef site approximately 11 km from the mainland coast. The snorkelling area at Oper 4's island/reef site ranged in depth from 1 to 8 meters depending on tides. Each site had a substantial cover of hard corals (> 10%) comprised of a variety of morphological types (e.g., branching, massive). Differences in the types of sites visited by the operations posed limitations in portions of the analysis where specific comparisons are made among "sites". However, we were more concerned (in this portion of the study) with looking at different experiences associated with different types of operation. Each "day on the reef" was thus treated as a separate entity in parts of the analysis. In most cases that "day" was limited to a single site, but in one case included three sites.

4.3 Survey Instrument

The survey instrument was designed as a self administered questionnaire. This method was selected for several reasons. Previous work had been carried out on similar day use reef visitors at an island/reef site by Scherl et al. (1993) using interpretive (personal interview) methods. Their research provided a good basis for the development of a more quantitative survey instrument that could be distributed across a greater number of respondent at more sites. We felt that this method would provide results that were able to be more generalised for day use tourism on the GBR while meeting logistical constraints imposed by the time and money available for data collection.

The instrument (see Appendix 1) contained six sections, each designed to measure different attitudinal, behavioural and demographic characteristics. The first section asked visitors to respond to open ended questions regarding things that "added to" or "detracted from" their reef experience. This allowed visitors to express thoughts without being "led" to do so before

they were asked to respond to a series of closed ended questions that asked similar questions about influences on the experience. The second section of the survey asked visitors to provide information about past visitation/experience on the GBR and/or at other reef sites.

The third and fourth sections of the questionnaire queried visitor perceptions about the reef site and the nature of the experience they had enjoyed. Section three presented a list of nine reasons that humans might value places on the GBR. The list was constructed based on wording in legislation surrounding the formation of the GBRMP and designated park/protected areas in general. Visitors were asked to rate how important each item was to the value of the site they visited using a five point scale ranging from "not at all" to "extremely." Also included in this section was a list of 16 potential benefits (Driver 1977) that the trip may have provided. Respondents were asked "how much the trip provided" each of the 16 items (e.g., get some exercise, meet people, learn about a coral reef) again using a five point response scale ranging from "not at all" to "extremely." These personal benefit items were used to measure specific aspects of "experience." Past research (eg., Brown & Haas 1980; Manfredo et al. 1983; Kaltenborn & Emmelin 1993) indicates that these types of benefits represent important aspects of peoples' experience in natural environments.

Section four presented respondents with a more extensive and specific list of 24 items related to physical, biological and social conditions present on this type of trip. Items were generated to represent attributes of coral and fish conditions (e.g., colour of coral I saw, total amount of coral I saw, size of the fish I saw, types of fish I saw), attributes related to physical conditions (e.g., temperature of the water, depth of the water) attributes related to social conditions (e.g., number of other people on the vessel) and, attributes of the operator's staff (e.g., information provided by the staff). Respondents were asked to judge how much each of the items influenced their enjoyment of the trip and to indicate this by ticking a seven point scale. The scale ranged from "very negatively" to "very positively" and included a mid point labelled "no influence either way." Respondents were also asked: 1) to rate eight specific conditions (e.g., the total amount of coral, the number of people) on a three point response format "too few/little, about right, too much/many;" 2) to rate the condition of corals and fishes at the site using a five point format from "poor" to "excellent" and; 3) to score a single item to rate the trip as a whole using a ten point format ranging from "poor" to "excellent."

The final two sections of the survey asked about behavioural and demographic characteristics. Section five asked respondents to indicate what activities they had participated in during their time at the reef site. More specifically, it asked those who snorkelled and dived how often they had previously participated in these activities, if they touched any coral and why. Finally, section six completed the questions with several demographic items (e.g. gender, age, country of citizenship). The questionnaire was made available in three languages: German, Japanese and English. (see Appendix 1.)

4.4 Sample

There were three primary concerns in obtaining a representative sample of day use visitors who were travelling to the GBR. The first was temporal representativeness based on times of year and days of the week. This was of importance because conditions such as temperatures, winds and rain vary across the "wet" and "dry" seasons in which visitation occurs. Sampling across different days of the week was also important as records of operators indicated that the number of visitors travelling on a given vessel vary systematically by the day of the week. The second consideration was related to the state of the tide at the destination sites. This study was integrated with observational research on snorkellers to determine the frequency and types of interactions (impacts) with coral that were occurring. It was hypothesised that tide levels would be an important variable in these interactions because they determine the distance between a floating snorkeller and the coral substratum. That is, a high tide would potentially have a stronger "buffering" effect between snorkellers and the corals below than would a low tide. Given logistical limitations, it was decided that blocks of four consecutive days would be selected to represent seasons of the year and days of the week. These four day blocks were also chosen using tide tables so that low, medium or high tide levels were distributed among the blocks to be sampled. Blocks of days were selected over a nine month period from June 1995 to February 1996. Seventy five days, representing 18 blocks of days, were used for sampling during this period.

The third concern was for representativeness of the sample within a given trip (i.e., on a given vessel). On the larger vessels of Oper 1 and Oper 2 visitors were dispersed across seating on upper and lower decks, some of which were inside (air conditioned) some outside. A complete census of a these large vessels was not possible, so we attempted to obtain a sample of 12 - 15% of the number of visitors on each trip. Seating areas were randomly selected

based on the proportion of seats in a given section of the vessel. For example, if 100 - 150 people were seated in the main cabin then approximately 10 to 15 were sampled while the upper deck might seat 20 requiring that only two or three be sampled there. Seats used as the starting point to approach passengers in this scheme were selected to represent an even spatial distribution within a given seating area.

The smaller vessels were sampled slightly differently. Oper 3 carried a maximum of 20 passengers who could be censussed by a single member of the research team. Oper 4 agreed to distribute the survey to passengers themselves (CRC staff distributed surveys on each of the other 3 operations). The vessel carried a maximum of 50 passengers and about 20% of the boat-load was surveyed on each trip.

The questionnaire was administered on the return trip from the reef. On larger vessels, the captain made a general announcement that CRC research staff were on board and that some passengers would be approached by one of the researchers and asked (on a voluntary basis) to complete a short survey about their day on the reef. This procedure was also followed on the smaller vessels, however, researchers and/or staff members made their own requests for participation in the survey. Where only a percentage of the boat-load was being sampled, if a chosen passenger declined to participate, a person sitting next to them was asked to participate until a positive response was given.

Using these methods, 1,985 potential respondents were approached and asked to participate in the study. Most (97%, n = 1,922) accepted a questionnaire. Ninety five percent of the questionnaires collected (n = 1,818) were useable while 5% (104) were incomplete and not used in the analysis. The final sample of 1818 was distributed among operations as follows: Oper 1, n= 800; Oper 2, n=462; Oper 3, n= 290; Oper 4, n= 266.

4.5 Analysis

4.5.1 Determining What Benefits Reef Trips Provide

Several analytical steps were carried out to understand the benefits provided to visitors by day-trip to the reef. The 16 benefit items were evaluated by Factor Analysis to simplify additional analysis and interpretation. Principle components with a varimax rotation was used to extract factors. Factors were only interpreted as part of the solution if they had an

eigenvalue of at least 1 and explained at least 5 percent of the variance. Items were interpreted as belonging in a factor (domain) if they had a loading of at least 0.30 and did not load similarly on any other factors. A K-Means Cluster Analysis was then used to group respondents using the factored benefit domains as independent variables. As Romesburg (1979) has pointed out, selecting a proper cluster solution (i.e., number of clusters) based on attitudinal data is largely dependent on its usefulness in light of the study objectives. The cluster solution used here was determined to provide an interpretable typology of visitors while maintaining a statistically significant separation among cluster means, for scores on all four benefit domain (dependent) variables. These visitor types were then compared across demographic, participation and perception variables to examine relationships between benefits received and other aspects of the reef experience.

To examine in more detail the different types of visitors on day-trip operations and how they perceive and use the reef (Objectives 1 & 2), we looked at the relationships between the experiences had by different groups of visitors, how those groups were comprised and how active they were on the trip (i.e. participation in different activities). Differences in the demographic and behavioural characteristics (including participation in snorkelling and diving) of groups resolved in the benefit clusters were examined by ANOVA and chi-square tests. Finally, using benefit cluster membership as a dependent measure of the recreational experience, a chi-square test was used to determine if visitors within the different clusters were associated with different types of reef trip operations (e.g. large vs small operations).

4.5.2 Influence of Conditions on Experience

In order to develop indicators useful to the LAC process and to understand how conditions influenced visitors, the responses to 24 condition items were measured. These condition items were then analysed by Factor Analysis to group sets of variables that reflected different visitor experiences. The resulting factors were then used as independent variables in several analyses (ANOVA and t-test) designed to determine how conditions were related to experience. An important part of this analysis was to determine if visitors were receiving different benefits, and/or were being influenced in different ways by different types of operations and trip conditions.

5. RESULTS

5.1 Description of Day Visitors in the Great Barrier Reef Marine Park

Table 1 contains descriptive information on the relative proportions of males and females on each of the four operators involved in the study. The total sample contained similar proportions of females (n=876, 51%) and males (n=850, 49%). Table 2 relates information on the different age categories of visitors using the different operators. For the sample as a whole, the mean age was 38.5 years (range between 9 and 83 years), but there were significant differences in the average ages of visitors who accessed the reef with the four operators involved in this study. On Oper 1 and Oper 2, the larger operators, the average ages of passengers were 41 and 37 years, respectively. Oper 3 and Oper 4 (small operators) generally carried younger passengers (average age = 34 and 36 years, respectively). Approximately half of the sample held a university or technical degree (Table 3).

Respondents listed 33 countries of citizenship. Eighty two percent of the sample came from just four countries: Australia (41%), Japan (14%), Britain (14%) and USA (13%) (Table 4). Of the Australian respondents, most (60%) were from NSW and Victoria (Table 5). Approximately 80% of all visitors were travelling with family or friends as indicated in categories of "partner/spouse" (44%), "family" (23%) and "friends" (13%) (Table 6).

Table 1. The gender of day-trip visitors to the GBRMP by operator

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
Female	47.8	51.1	52.5	57.0	50.8
	(363)	(218)	(148)	(147)	(876)
Male	52.2	48.9	47.5	43.0	49.2
	(396)	(209)	(134)	(111)	(850)
Total	100.0	100.0	100.0	100.0	100.0
	(759)	(427)	(282)	(258)	(1726)

Source: CRC Reef Research Centre (1996)

Table 2. The age distribution of day-trip visitors to the GBRPM by operator[1]

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
Less than 20 years	7.5	4.7	10.1	5.7	6.9
	(59)	(21)	(29)	(15)	(124)
20-29 years	21.0	28.0	28.9	35.4	26.1
	(165)	(126)	(83)	(93)	(467)
30-39 years	20.8	25.3	28.6	22.4	23.4
	(164)	(114)	(82)	(59)	(419)
40-49 years	19.2	22.2	23.7	18.3	20.5
	(151)	(100)	(68)	(48)	(367)
50-59 years	16.8	10.7	6.3	11.8	12.8
	(132)	(48)	(18)	(31)	(229)

60 years or more	14.7	9.1	2.4	6.5	10.1
	(116)	(41)	(7)	(17)	(181)
Total	100.0	100.0	100.0	100.0	100.0
	(787)	(450)	(287)	(263)	(1787)

Mean age = 38.5 years

[1]Age was measured as a ratio level variable but is presented here in categories for comparison purposes.

Source: CRC Reef Research Centre (1996)

Table 3. The maximum level of education for day-trip visitors to the GBRMP by operator

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
Primary	2.2	2.2	2.4	0.4	2.0
	(17)	(10)	(7)	(1)	(35)
Secondary	20.9	28.2	16.0	18.0	21.5
	(165)	(127)	(46)	(47)	(385)
Some university or technical	27.8	27.9	18.5	29.5	26.6
	(219)	(126)	(53)	(77)	(475)
University or technical degree	49.1	41.7	63.1	52.1	49.9
	(387)	(188)	(181)	(136)	(892)
Total	100.0	100.0	100.0	100.0	100.0
	(788)	(451)	(287)	(261)	(1787)

Source: CRC Reef Research Centre (1996)

Table 4. The country of citizenship of day use visitors to the GBRMP

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
Australia	29.1	57.6	56.0	35.6	41.5
	(230)	(260)	(158)	(94)	(742)
USA	18.6	3.1	14.9	9.8	12.8
	(147)	(14)	(42)	(26)	(229)
Japan	16.8	13.1	0.0	24.6	14.4
	(133)	(59)	(0)	(65)	(257)
UK	16.2	7.1	12.1	19.7	13.8
	(128)	(32)	(34)	(52)	(246)
Germany	5.3	5.8	6.4	1.9	5.1
	(42)	(26)	(18)	(5)	(91)
New Zealand	3.2	3.3	2.1	0.8	2.7
	(25)	(15)	(6)	(2)	(48)
Canada	2.9	1.3	1.4	2.7	2.2
	(23)	(6)	(4)	(7)	(40)
Other Europe	5.4	7.1	6.0	3.4	5.7
	(43)	(32)	(17)	(9)	(101)
Other Asia	0.4	0.4	0.0	0.4	0.3
	(3)	(2)	(0)	(1)	(6)
Other	2.0	1.1	1.1	1.1	1.5
	(16)	(5)	(3)	(3)	(27)
Total	100.0	100.0	100.0	100.0	100.0
	(790)	(451)	(282)	(264)	(1787)

Source: CRC Reef Research Centre (1996)

Table 5. The states in which Australian day use visitors to the GBRMP resided

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
Queensland	21.3	20.5	8.6	19.2	17.9
	(42)	(44)	(12)	(15)	(113)
New South Wales	29.4	37.2	25.0	42.3	32.7
	(58)	(80)	(35)	(33)	(206)
Victoria	25.9	29.3	42.9	14.1	29.4
	(51)	(63)	(60)	(11)	(185)
South Australia	9.1	6.5	11.4	7.7	8.6
	(18)	(14)	(16)	(6)	(54)
Western Australia	7.6	3.3	12.1	11.5	7.6
	(15)	(7)	(17)	(9)	(48)
Tasmania	1.5	2.3	0.0	3.8	1.7
	(3)	(5)	(0)	(3)	(11)
Northern Territory	1.0	0.0	0.0	0.0	0.3
	(2)	(0)	(0)	(0)	(2)
Australian Capital Territory	4.1	0.9	0.0	1.3	1.7
	(8)	(2)	(0)	(1)	(11)
Total	100.0	100.0	100.0	100.0	100.0
	(197)	(215)	(140)	(78)	(630)

Source: CRC Reef Research Centre (1996)

Table 6. The types of groups that day use visitors to the GBRMP travelled with

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
I am alone	3.4	3.3	6.5	11.3	5.0
	(27)	(15)	(18)	(29)	(89)
With partner/spouse	43.8	49.8	35.8	41.0	43.7
	(348)	(226)	(100)	(105)	(779)
With family	22.8	26.7	21.5	18.0	22.9
	(181)	(121)	(60)	(46)	(408)
With friends	10.8	11.9	16.1	19.9	13.2
	(86)	(54)	(45)	(51)	(236)
Organised group	10.8	3.3	7.9	1.6	7.1
	(86)	(15)	(22)	(4)	(127)
Business associates	2.0	1.1	3.9	1.6	2.0
	(16)	(5)	(11)	(4)	(36)
Other	6.4	4.0	8.2	6.6	6.1
	(51)	(18)	(23)	(17)	(109)
Column Total	100.0	100.0	100.0	100.0	100.0
	(795)	(454)	(279)	(256)	(1784)

Mean number of people in travel group (all operators) = 5.3
Source: CRC Reef Research Centre (1996)

5.2 Visitors' Past Experiences in Coral Reef Environments

Nearly half (45%) of all visitors had not previously been to a coral reef. Twenty seven percent of respondents had, however, visited the GBRMP before this trip (Table 7) and 40% had been to coral reefs outside the marine park. A significantly larger proportion of passengers on small operations (41% cf 21%) had previously visited the marine park ($?^2$ =

80.99, $p < .0001$). Almost one third (29.5%) of past trips done by visitors to the GBRMP had occurred within the past seven days (Table 8). Again, a significantly higher than expected proportion of these trips were taken by visitors using the two smaller operators ($?^2 = 39.73$, $p < 0.001$). While our data did not allow us to determine what type of trip(s) visitors had taken, one of two situations may exist. A "maturing" process may be occurring in some visitors leading them to chose smaller operators based on increased familiarity with the area or confidence in their ability to undertake ocean travel. These visitors may also be predisposed to a certain type of experience leading them to select smaller operations for most of their trips.

Table 9 indicates the sections within the GBRMP where visitors who had been to the marine park before had taken their most recent trip. Most had been taken in the Cairns and Central sections of the park. Because our sampling was carried out in the Cairns and Central Sections this finding is not surprising. There were, however, trends across the different operations. Oper 2, located in the Central section, appears to have had passengers who were as likely to have taken their last trip in the Cairns Section as in the Central. Also, visitors to the two small operators (Oper 3 and Oper 4) showed a different pattern from those using the larger operations. A significantly larger than expected proportion of passengers on small operations took their last reef trip in the same area as the current trip (i.e., the Cairns Section) ($?^2 = 6.28$, $p < 0.05$). Data on past visits suggested that those using small operations were more likely to have taken an additional reef trip quickly and that they were also more likely to take that additional trip in the same section of the park.

Table 7. Response of day use visitors to the GBRMP to the question: Had you ever visited the Great Barrier Reef Marine Park before today?

Response	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Total
No	81.4	75.4	59.9	57.4	72.9
	(646)	(343)	(173)	(148)	(1310)
Yes	18.6	24.6	40.1	42.6	27.1
	(148)	(112)	(116)	(110)	(486)
Total	100.0	100.0	100.0	100.0	100.0
	(794)	(455)	(289)	(258)	(1796)

Source: CRC Reef Research Centre (1996)

Table 8. Amount of time past since visitors' last trip to a reef in the GBRMP[1]

Amount of time past	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % n)	Oper 4 % (n)	Row Total
7 days or less	19.0	15.4	39.7	47.3	29.5
	(28)	(18)	(46)	(53)	(145)
Between 8 days and 1 year	25.2	13.7	15.5	31.3	21.5
	(37)	(16)	(18)	(35)	(106)
Between 1 year and 5 years	33.3	46.2	23.3	10.7	28.9
	(49)	(54)	(27)	(12)	(142)
More than 5 years ago	22.4	24.8	21.6	10.7	20.1
	(33)	(29)	(25)	(12)	(99)
Column Totals	100.0	100.0	100.0	100.0	100.0
	(147)	(117)	(116)	(112)	(492)

[1]*Based only on those visitors who indicated they had previously been to a reef in the GBRMP*
Source: CRC Reef Research Centre (1996)

Table 9. The sections of the GBRMP in which visitors had taken their most recent trip[1]

Section of the GBRMP	Oper 1 % (n)	Oper 2 % (n)	Oper 3 % (n)	Oper 4 % (n)	Row Total
Cairns[2]	39.6	28.2	23.6	55.6	36.9
	(59)	(31)	(26)	(60)	(176)
Central	28.9	14.5	51.8	24.1	29.8
	(43)	(16)	(57)	(26)	(142)
Mackay/Capricorn	0.7	0.9	1.8	3.7	1.7
	(1)	(1)	(2)	(4)	(8)
Column Total	100.0	100.0	100.0	100.0	100.0
	(149)	(110)	(110)	(108)	(477)

[1]*Based only on those visitors who indicated they had previously been to a reef in the GBRMP*
[2]*Cairns section includes trips from: Port Douglas, Cairns and Mission Beach*
Central section includes trips from: Townsville and Airlie Beach/Whitsundays
Mackay Capricorn section trips from: Mackay and Gladstone
Source: CRC Reef Research Centre (1996)

5.3 Participation in Activities at Reef Sites

All of the tourism operators, except Oper 3, offered a range of activities to visitors at reef destination sites (Oper. 3 offered only snorkelling as an activity). The "pontoon" sites (Oper 1 & 2) provided four activities that allowed viewing of the underwater environment: an underwater observatory and semi-submersible vessels were available for passive viewing, while snorkelling and scuba diving were available for those willing to get in the water. Table 10 provides results on the basic participation rates in these activities. Over 80% percent of visitors at pontoon sites made use of the two "passive viewing" opportunities and almost as many (70-80%) snorkelled. Only a small percentage (between 11% & 14%) of those who snorkelled at pontoon sites took a snorkelling tour with a reef interpreter. Scuba diving also had a relatively low rate of participation (between 10% & 16%). At the pontoon sites of Oper

1 and Oper 2 the snorkel tour was an additional cost and was limited in the number of people who could participate for logistical reasons. Scuba diving was also an additional cost where it was offered it, and was limited in the total number of participants due to availability of instructors and equipment. Seventy five percent of visitors who chose to scuba dive also snorkelled at some other time during the day.

Table 10. Rates of visitors participation in on-site activities across the four operators in the sample[1]

Activity	Oper 1 % (n(	Oper 2 % (n)	Oper 3[2] % (n)	Oper 4 % (n)
Went into an underwater observatory	81.2 (643)	86.5 (397)	NA	NA
Took a semi-submersible ride	82.1 (654)	84.1 (386)	NA	NA
Went snorkelling	71.4 (570)	81.0 (370)	99.3 (286)	93.6 (249)
Took a snorkelling tour[3]	10.6 (60)	13.9 (51)	61.1 (173)	59.3 (146)
Went SCUBA diving	9.8 (78)	16.0 (73)	NA	16.2 (43)

[1]Activity variables were measured using a "yes" "no" format. Only the "yes" responses have been reported in this table
[2]NA means that an activity was not available with that operator
[3]Of those who snorkelled
Source: CRC Reef Research Centre (1996)

Differences were again apparent between the smaller and larger operators in regard to rates of participation in activities. Some of these differences were attributable to differences in the provision of facilities at the site. That is, those travelling with smaller operators did not have an opportunity to use observatories or semi-submersibles as a part of their underwater viewing. There were, however, lower rates of participation in snorkelling among visitors on the larger operations than on smaller vessels ($?^2$ = 154.53, p <0.001). Many participants choosing smaller operators may have done so because these companies promoted a specific snorkelling experience. Those travelling with small operators were significantly more likely to have snorkelled before ($?^2$ = 14.28, p < .001) and had a higher mean ratio of snorkelling experience on coral reefs than those with large operators (0.59 cf 0.45; t = 4.93, p < .001). Past research on experience (broadly including issues of involvement, specialisation and commitment) supports the notion that people with higher levels of previous experience are often more aware and purposive in choosing to engage in an activity (Schreyer et al. 1984).

5.4 Benefits Provided by the Great Barrier Reef

The term "benefit" is used here to refer to any potentially positive qualities provided to society at large and/or individuals. Research in the benefits of recreation and leisure is extensive (eg., Driver, Brown & Peterson 1991). We have attempted to measure only a small portion of potential benefits here in order to establish some basis for the different reasons to value the GBRMP and the experiences that people have within it.

5.4.1 Valuing Reef Sites

Visitors were asked to respond to nine things that coral reefs in the GBRMP could be valuable for. Table 11 lists the nine reef value items in descending order of importance. In general, respondents felt that the reef sites they visited were "very" to "extremely" valuable for conservation opportunities, the natural processes that occurred there and the educational opportunities they offered. In contrast, most apparently felt that these sites were only "slightly" to "moderately" valuable for economic opportunity and spiritual meaning.

5.4.2 Personal Benefits from the Reef Visitation Experience

Table 12 includes the 16 benefit items listed in descending order of importance according to how much the reef trips provided each benefit to visitors. As might be expected in nature based tourism, "experiencing the beauty of nature" and the feeling of "being in a natural place" were scored most highly. Learning about nature was also seen as being well provided by these reef trips. By comparison, meeting people, developing skills and experiencing solitude were rated as only "slightly" to "moderately" important benefits. Day use reef trips of the type sampled here appear to provide visitors mostly with benefits related to experiencing aesthetic beauty while learning about a type of natural environment which is new and different.

Table 11. Visitors' perceptions of the importance of nine potential uses to the value of places in the GBRMP

	Response category						
Use Type	not at all important % (n)	slightly important % (n)	moderately important % (n)	very important % (n)	extremely important % (n)	mean	std. dev
Conservation Opportunities	1.1 (20)	2.5 (44)	7.1 (126)	20.6 (366)	68.7 (1219)	4.52	0.82
Natural Processes	1.1 (19)	3.0 (53)	6.8 (121)	28.2 (501)	60.9 (1080)	4.44	0.83
Educational Opportunities	1.0 (17)	3.9 (70)	12.9 (228)	35.6 (632)	46.6 (827)	4.23	0.89
Scientific Research	4.9 (83)	6.3 (112)	16.5 (291)	30.2 (534)	42.2 (746)	3.99	1.12
Recreational Opportunities	1.6 (29)	4.7 (84)	22.3 (397)	41.6 (740)	29.8 (530)	3.93	0.92
Cultural Heritage	7.6 (133)	10.5 (185)	15.9 (280)	25.3 (445)	40.7 (716)	3.81	1.28
Historical Meaning	9.5 (164)	17.4 (301)	23.1 (401)	25.5 (442)	24.5 (425)	3.38	1.28
Economic Opportunities	23.4 (405)	20.9 (363)	26.5 (459)	19.7 (342)	9.5 (165)	2.71	1.28
Spiritual Meaning	29.9 (517.)	18.8 (326)	25.4 (404)	15.1 (261)	12.8 (222)	2.62	1.38

Source: CRC Reef Research Centre (1996)

Table 12. Visitors' perceptions of how much their trip to the GBRMP provided 16 possible benefits

Benefit Item	Mean Value[1]	Std. Deviation
Experience the beauty of nature	4.69	0.55
Be in a natural place	4.42	0.75
Experience something new and different	4.30	0.86
Experience an undeveloped environment	4.17	0.92
Learn about a coral reef	4.07	0.95
Learn more about nature	4.05	0.89
Escape the normal routine	4.03	1.03
Have some excitement	3.73	0.96
Rest and relax	3.56	1.10
Be physically active	3.23	1.11
Be close to friends or family	3.19	1.39
Be with others who enjoy things that I enjoy	3.15	1.13
Get some exercise	3.03	1.11
Meet new people	2.57	2.57
Develop skills	2.55	1.21
Experience some solitude	2.35	1.29

[1]*Mean Value is based on a 5 point response format where 1 = not at all, 2 = slightly, 3 = moderately,*

4 = very much, 5 = extremely
Source: CRC Reef Research Centre (1996)

Four benefit domains were extracted on the basis of scoring of the 16 benefit items (Table 13). The *experiencing nature* domain contains six benefit items which reflect a theme related to appreciating the beauty of, and learning about, a different type of natural environment. *Restful escape* was the second most important benefit domain provided to visitors. This domain is comprised of three items related to getting away and relaxing. The third ranking domain was *excitement with family/friends*. This domain was made up of four items which appeared to indicate that day-trips to the reef were allowing many people to exercise and have some excitement as a part of an outing with significant others. The *physically active* domain contained three items and was interpreted as indicating that reef trips provided visitors opportunities for interaction with new acquaintances while being involved in activities. This domain represented benefits provided at the lowest level of the four domains that emerged.

Table 13. Reef trip benefit domains resulting from a factor analysis of visitor scores on 16 benefit items

Domain Name Benefit Items	factor loading	overall mean[1]	alpha
Experiencing Nature			
experiencing the beauty of nature	0.72		
experiencing something new and different	0.72		
being in a natural place	0.69	4.29	0.80
experiencing an undeveloped environment	0.66		
learn about a coral reef	0.65		
learn about nature	0.62		
Restful Escape			
rest and relax	0.82		
experience some solitude	0.63	3.31	0.59
escape the normal routine	0.48		
Excitement with Family/Friends			
be close to family or friends	0.73		
get some exercise	0.68	3.27	0.69
be with others who enjoy things that I enjoy	0.48		
have some excitement	0.46		
Physically Active			
develop skills	0.76		
be physically active	0.59	2.79	0.64
meet new people	0.57		

[1]*Mean Value is based on a 5 point response format where 1 = not at all, 2 = slightly, 3 = moderately, 4 = very much, 5 = extremely*

Source: CRC Reef Research Centre (1996)

5.4.3 Clustering Visitors Based on Benefits Provided by Reef Trips

While the four domains described above reflect some of the overall benefits provided by day-trips to the reef, they do not provide any understanding of how visitors may differ in the amounts of these benefits that they received.

The five types (clusters) of visitors identified as useful in describing the sample are included in Table 14. Information on the way that the clusters scored the different benefit domains provides insight on the relative levels of benefits that these different groups of people received from their reef trip. The first type of visitor received benefits related to experiencing nature with their travelling companions. This group was comprised of 408 (25%) visitors, who we named the *nature with others* group. The second type of visitor most appreciated the escape and restfulness aspects of their trip, combined with the opportunity to experience nature. This group was also made up of 408 (25%) visitors and was named the *nature escapists*. The third type of visitor appeared to receive little from their reef trip except benefits associated with experiencing nature. The 285 (17%) visitors who made up this group were named the *passive naturalists*. Type four represents a group of visitors who appeared to be very different from the passive naturalists in that they felt the trip provided a lot of each of the four benefit domains. This group of 373 (22%) visitors might be thought of as feeling generally enthusiastic about the experience and were named *enthusiasts*. The fifth type of visitor scored trip benefits quite low relative to the other four groups and were, in many ways, the antithesis of the *enthusiasts*. This group was either relatively unemotional about the trip or simply did not get much out of it in spite of their good intentions. Using the first interpretation as a guide we named this group of 178 (11%) visitors the *indifferent day-trippers*.

Table 14. Five GBRMP visitor clusters, based on how much of the four benefit domains were provided by reef trips

	Visitor Clusters				
Benefit Domains	1. nature with others n = 408	2. nature escapists n = 408	3. passive naturalists n = 285	4. enthusiasts n = 373	5. indifferent day-trippers n = 178
experiencing nature	4.13[1]	4.46	4.34	4.71	3.23
physically active	2.82	2.70	2.07	3.87	1.75
excitement with family/ friends	3.67	3.10	2.48	4.12	2.25
restful escape	2.90	3.83	2.48	4.11	2.67

1 Numeric values represent group means based on a 5 point scale of benefits provided by the trip, where 1="not at all" to 5="extremely"
Source: CRC Reef Research Centre (1996)

5.4.4 Relationships Between Visitor Characteristics and Visitor Clusters

Comparisons among the five visitor types, on three demographic and one behavioural variable, are presented in Table 15. There were significant age differences between the *passive naturalists*, who were significantly older (Mean = 42.8 yrs.) than all other types and the *enthusiasts*, who were significantly younger (Mean = 34.2 yrs.) than all others. There were also gender differences between the five visitor groups. The *enthusiasts* group comprised a larger proportion of female (62%) visitors whilst the *indifferent day-trippers* contained a larger proportion of males (64%). Males were also over represented among *passive naturalists* (53.5%) and the *nature with others* (53.9%) types of visitors.

Table 15. Comparisons of characteristics of visitors travelling to the outer Great Barrier Reef dependent on benefit cluster membership.

	Benefit Clusters						
Characteristic Variables	1. nature w/others	2. nature escapists	3. passive naturalists	4. enthusiasts	5. indifferent day-trippers	test stat	p value
Age in years	39.3[a]	38.1[a]	42.8[b]	34.2[c]	39.8[a]	F=16.65	< .0001
Gender	%(n)	%(n)	%(n)	%(n)	%(n)		
Female	46.1 (178)	51.4 (201)	46.5 (128)	62.1 (220)	35.9 (61)	x^2= 38.39	< .0001
Male	53.9 (53.9)	48.6 (190)	53.5 (147)	37.9 (134)	64.1 (109)		
Citizenship							
Australian n = 688	37.8 (128)	57.8 (200)	44.1 (89)	61.2 (197)	51.7 (74)	x^2= 199.80	< .0001
United States n = 211	13.0 (44)	18.5 (64)	18.3 (37)	15.2 (49)	11.9 (17)		
Japan n = 229	37.2 (126)	5.5 (19)	5.4 (11)	13.0 (42)	21.7 (31)		
United Kingdom n= 224	12.1 (41)	18.2 (63)	32.2 (65)	10.6 (34)	14.7 (21)		
Activity Participation							
Snorkel							
no	12.6 (51)	15.0(61)	27.0 (77)	9.4 (35)	29.0 (51)	x^2= 60.62	< .0001
yes	87.4 (353)	85.0 (345)	75.0 (208)	90.6 (337)	71.0 (125)		
Dive[1]							
no	83.7 (241)	89.8(238)	95.7 (220)	81.3 (169)	90.6 (125)	x^2= 28.41	< .0001
yes	16.3 (47)	10.2 (27)	4.3 (10)	18.8 (39)	9.4 (13)		

[1]*Includes only visitors travelling with operators who offered diving*
Source: CRC Reef Research Centre (1996)

As indicated previously, citizens from four countries (Australia, Japan, the United Kingdom and the United States) made up 82% of day-trip visitation in our sample. For this reason we have presented only those four countries in Table 16. There were differences among the five types of visitors based on their country of citizenship. The *nature with others* type of visitor included a much larger than expected proportion of Japanese respondents (55% of Japanese respondents) and a somewhat lower than expected number of Australians (18.6% of Australian respondents). On the other hand, *nature escapists* had a higher than expected proportion of Australians (29% of Australian respondents) and a lower than expected number of Japanese (8% of Japanese respondents). Japanese visitors were also under represented

among the *passive naturalists* (5% of Japanese respondents) while British visitors were somewhat over represented in that group (29% of British respondents). Australians were also more likely than expected to be members of the *enthusiasts* group (29% of Australian respondents). Finally, Japanese visitors made up a higher than expected proportion of the *indifferent day-trippers* (13% of Japanese respondents).

The largest differences in benefits received from reef trips appeared to be between Australians and Japanese. Australian respondents were more likely to be among visitors who were experiencing nature while escaping for some rest and relaxation or, among those who were experiencing high levels of all the benefits. Japanese respondents were more likely to be classified as visitors who enjoyed nature with their friends/family or as being indifferent, scoring low on all benefits in question. In comparison, visitors from the United States and Great Britain were relatively evenly distributed among the five types, more than would have been expected given their overall representation in the sample.

The groupings also reflected relative levels of participation in activities on the trips. *Enthusiasts* were significantly more likely to have gotten into the water and participated in snorkelling or diving. *Passive naturalists* and *indifferent day-trippers* were significantly less likely to take part in these two activities. To some extent, this validates the benefit "package" of the *passive naturalists* because this group indicated that they received less of the activity related benefits (eg., developing skill, being physically active). These results also indicate that the two visitor types most different in the overall levels of benefits they received (*enthusiasts* and *indifferent day-trippers*) were the most different in their approach to experiencing the environment. *Enthusiasts* were more likely to get into the water and take an active approach to see the environment in more detail, while indifferent day-trippers were more likely to stay dry and experience the environment from a distance.

5.4.5 Relationships Between Trip Type and Cluster Type

As explained in an earlier section, tourism operators used in the study were of two general size classes - large and small - based on number of passengers they carried and the facilities they provided. Table 16 indicates that a significantly greater proportion of visitors who travelled with "small" operators fell into the *enthusiast* category (32% of respondents on small operations), while *passive naturalists* (20% of respondents on large operations) and

indifferent day-trippers (12% of respondents on large operations) were more likely to have travelled with a "large operator."

Table 16. Relationship between visitors benefit cluster membership and type of operator used to access the GBRMP

Type of operator[1] % (n)	Benefit Clusters 1. nature w/others % (n)	2. nature escapists % (n)	3. passive naturalists % (n)	4. enthusiasts % (n)	5. indifferent day-trippers % (n)	test stat	p value
Large = 69.0 (1138)	71.6 (292)	65.0 (265)	81.8 (233)	56.0 (209)	78.1 (139)	$?^2 = 62.12$	< .0001
Small = 31.0 (514)	28.4 (116)	35.0 (143)	18.2 (52)	44.0 (164)	31.9 (39)		

[1]Operator type was determined a priori based on the type of site visited and the number of passengers carried. Large operators visited "pontoon" sites and had a mean passenger load of 219. Small operators visited sites without pontoons and had a mean passenger load of 25.
Source: CRC Reef Research Centre (1996)

There were similar differences among the benefit clusters in the way they rated their overall experience on the reef. The single item measure of the day-trip experience was operationalised in the question: "How would you rate your trip today?" and was followed by a 10 point response format from 1 = poor to 10 = excellent. While all five clusters indicated they had a positive experience on the reef there were significant differences among the groups (Table 17). *Enthusiasts* were most likely to rate the experience very positively and differed significantly from the other four groups (mean = 9.0). The *indifferent day-trippers* scored their experience significantly lower than the other four groups (mean = 6.8).

Table 17. Comparison of visitors' overall experience rating based on benefit cluster membership

	Benefit Cluster Membership nature w/others	nature escapists	passive naturalists	enthusiasts	indifferent day-trippers	test statistic	p value
Overall experience[1] score	8.3^a	8.6^b	8.2^a	9.0^c	6.8^d	F=71.38	.0000

[1]Mean values based on ten point scale where 1 = poor to 10 = excellent.
Different superscripts on mean values indicate significantly different means between clusters at the p<.05 level based on a S-N-K Multiple Ranges Test.
Source: CRC Reef Research Centre (1996)

5.5 The Influence of Day-trip Conditions on Experience

Items on the influence of conditions during the trip are listed in Table 18 in descending order, from the most positive to most negative influences on the enjoyment of the trip. In general, most visitors indicated that the 24 items had at least a somewhat positive influence on their enjoyment. There was, however, a distinct pattern in the type and level of influence that

individual condition items had on the sample as a whole. Nine of the thirteen most positively influential items dealt with the natural attributes (coral and fish) at the reef site. The service(s) offered by the staff of the operations were also among the most positive influences on the day. Items ranking 14th through to 19th were predominantly related to weather conditions such as temperature and wind that were present during the trip. Items relating to weather condition were generally scored as less positive (in some cases as negative) influences on enjoyment. Four of the five least influential items represented what we have referred to as social conditions. These items related to the number of people present in different places during the trip and were items scored as having a neutral influence for the sample as a whole.

Table 18. Visitor perceptions of the influence of 24 conditions on their experience

Condition Item	mean[1]	std. deviation
Helpfulness of the staff	6.14	.91
Types of fish I saw	6.12	.95
Size of the coral I saw	6.11	.95
Total amount of coral I saw	6.09	.94
Number of different kinds of coral	6.03	.98
Information provided by the staff	5.98	1.01
Colour of the fish I saw	5.90	1.08
Clarity (visibility) of the ocean water	5.88	1.22
Colour of the corals I saw	5.85	1.17
Appearance of the staff	5.81	1.05
Total number of fish I saw	5.80	1.18
Behaviour of the fish	5.64	1.15
Size of the fish I saw	5.62	1.12
Temperature of the air	5.29	1.44
Depth of the water	5.28	1.23
Temperature of the water	5.20	1.46
Number of animals other than coral or fish that I saw	5.16	1.39
Sea conditions during the trip from/to shore	5.05	1.60
Number of people on the main boat	4.65	1.33
Number of people snorkelling	4.65	1.40
Currents in the water around the reef	4.62	1.26
Number of people on the pontoon	4.61	1.35
Amount of wind	4.50	1.45
Number of human-made objects in the water	4.34	1.47

[1]Mean was calculated based on a seven point response format where 1= very negatively, 2= negatively, 3= somewhat negatively, 4= no influence either way, 5= somewhat positively, 6= positively, 7= very positively
Source: CRC Reef Research Centre (1996)

While the overall mean values suggested a neutral influence for items with lower rankings, frequency distributions of physical and social items (see Appendix 2) indicated that these conditions were those with the highest percentages of negative influence responses. For example, the "amount of wind" and the "number of human made objects in the water" were

both scored as having a negative influence by over 20% of the sample. We should note here that given the neutral wording of these items it was not possible to determine if these negative scores were due to perceptions that there was too much or too little of these influences. For example, more human made objects in the water may be desirable to people who see this condition as relating to safety. However, a test on the relationship between the sites indicated that those sites with more human-made objects and those with fewer (i.e., pontoon vs. no pontoon) were perceived differently. Visitors who scored this condition as being more negative to their enjoyment were also significantly more likely to have visited a pontoon site ($?^2 = 37.10$, $p < .0001$).

A similar situation existed for the conditions which were related to numbers of people on the trip. A relatively small percentage of visitors (12 to 13 %) in the overall sample scored these conditions as having a negative influence on their experience. However, for these "social" conditions it appeared to be more relevant to look at differences in the positive influence they had. Those travelling on "smaller" operations were significantly more likely to indicate that the number of people positively influenced their enjoyment. And, when asked, in a related item, to rate "the number of people on this trip" as "too few," "about right," "too many" or "no opinion," those travelling on smaller operations were significantly more likely to have an opinion or to say "about right" than those on larger operations (Table 19).

Table 19. A comparison of ratings of the number of people on the trip by visitors who travelled with small and large tourist operators in the GBRMP.

	Rating categories for number of people on this trip					
Operator type travelled with	too few % (n)	about right % (n)	too many % (n)	no opinion % (n)	test statistic	p value
Large	1.8 (22)	69.4 (868)	20.7 (259)	8.1 (84)	$?^2 = 114.16$	<.0001
Small	0.9 (5)	92.2 (506)	3.3 (18)	3.6 (20)		

Source: CRC Reef Research Centre (1996)

5.5.1 Past Experience and Condition Ratings

People who had not visited the GBRMP before were more likely, than those who had, to say they had "no opinion" when asked to rate corals. Those who had visited the GBRMP in the past may have felt they had more of a basis from which to judge and thus rate the corals. Respondents with past visits to the park were more likely, than those without past visits, to say that the amount or coral and different types of coral they saw were "about right." The two

groups did not differ in the way they rated the number or kinds of fish they saw. When asked to rate the number of people on the trip, those with past visits to the GBRMP were more likely to say "about right" while those who had not been there were more likely to say "too many" people were present ($?^2$ = 13.28 df = 3, p < 0.004). As described in Sections 5.2 and 5.5, in general, small day-trip operations contained a larger proportion of return visitors to the GBRMP than the large, pontoon operations.

Visitors who had previous experience in the GBRMP also gave corals a lower overall rating than those who had not previously visited the marine park (mean = 4.02 and 4.20 respectively; t = 4.48, p < 0.001). There was no difference in how conditions relating to fish at the sites were rated by return and novice visitors (mean = 401 and 4.09 respectively; t = 1.35, p = 0.18). All of the items we measured related to coral conditions consistently showed a difference between those with prior GBRMP experience and those without. However, all items related to fish consistently indicated no differences in the way these two groups perceived fish conditions.

5.5.2 Snorkelling Participation and Condition Ratings

Several tests were run to determine if visitors who snorkelled during the trip perceived conditions any differently than those who did not. Snorkellers were generally younger than non-snorkellers by an average of 10 years (Table 20). They were also more likely to be male and to have had more formal education than non-snorkellers. Several tests revealed differences in perceptions of conditions between visitors who snorkelled and those who did not (Table 21). In all operations, snorkellers tended to rate the overall coral and fish conditions at the sites significantly higher than those who did not snorkel. Analyses of only those visitors who travelled with operators offering the choice of "dry" viewing of the underwater environment (i.e., trips to pontoons) indicated that snorkellers and non snorkellers did not differ in the way they rated coral conditions. However, there were consistent differences in the way the two groups rated fish. Visitors who did not get into the water were significantly more likely to say there were too few total fish or too few different fish at the site and also rated the overall fish condition significantly lower than snorkellers (Table 21).

Table 20. Comparisons of demographic characteristics between visitors who participated in snorkelling and those who did not during day-trips to the outer Great Barrier Reef.

	Participation in snorkelling			
Characteristic	Yes	No	test stat	p value
Age in years	36.7	47.0	t = 10.67	0.000
Gender	% (n)	% (n)		
female	48.9 (694)	59.2 (180)		
male	51.1 (699)	40.8 (124)	$?^2$ = 10.63	0.0011
	100.0 (1393)	100.0 (304)		
Education				
primary	2.0 (29)	1.8 (6)		
secondary	19.4 (284)	31.4 (101)		
some tertiary	26.6 (389)	26.4 (85)	$?^2$ = 24.58	0.0000
completed tertiary	52.0 (760)	40.4 (130)		
	100.0 (1462)	100.0 (322)		

Source: CRC Reef Research Centre (1996)

There was also a significant difference in the proportion of snorkellers and non-snorkellers who rated the number of other people on the trip as influencing their enjoyment (Table 20). In general, this difference was slight, with most respondents in each group choosing the "about right" category (69% & 70% respectively). A slightly larger proportion of snorkellers thought that there were too many other people on the trip. Apparently snorkellers as a group would preferred to have fewer people on their trip than those who did not snorkel. Nevertheless, the number of people present on the trip did not have an undue influence on the enjoyment of either snorkellers or non-snorkellers. The difference between responses to the rating measure and the influence measure, on conditions related to the number of people, may provide insight on the relative *acceptability* of other people to visitors. That is, if asked directly, snorkellers said that they would prefer fewer people but, at the same time, they did not consider the number present on the trip as *"unacceptable"*.

Table 21. Comparisons of mean condition ratings between visitors who participated in snorkelling and those who did not during day-trips to the outer Great Barrier Reef with operators who offered "dry" viewing activities on-site.

	Participation in snorkelling			
Condition item	Yes	No	test stat	p value
the corals I saw were[1]	4.15	4.10	t = 0.79	0.43
the fish I saw were	4.00	3.84	t = 2.28	0.02
	% (n)	% (n)		
different kinds of coral				
too few	4.2 (39)	5.8 (18)		
about right	86.9 (813)	84.2 (261)		
too many	3.8 (36)	4.2 (13)	$?^2$ = 1.83	0.60
no opinion	5.1 (48)	5.8 (18)		
	100.0 (936)	100.0 (310)		
different kinds of fish				
too few	24.0 (224)	31.3 (98)		
about right	69.7 (650)	60.7 (190)		
too many	2.3 (21)	2.2 (7)	$?^2$ = 9.31	0.02
no opinion	4.0 (37)	5.8 (18)		
	100.0 (932)	100.0 (313)		
number of people				
too few	1.2 (11)	3.5 (11)		
about right	69.3 (647)	69.7 (216)		
too many	21.8 (204)	17.4 (54)	$?^2$ = 10.37	0.01
no opinion	7.7 (72)	9.4 (29)		
	100.0 (934)	100.0 (310)		

[1]*The first two items are reported mean values based on a five point scale from 1 =poor to 5=excellent.*
Source: CRC Reef Research Centre (1996)

5.5.3 Developing Condition Domains

Table 22 contains the five condition domains that resulted from a factor analysis of the 24 condition items. Condition items relating to natural attributes (e.g., fish, coral), the operator's staff, the weather and other people on the trip formed easily interpretable domains. As was the case with the benefit domains, these condition domains were used to examine differences in visitor perceptions in relation to other variables. We have named the domains to reflect the items that they contain. Overall, the *corals* domain had the most positive influence on experience with a mean value of 5.99 (6.0 representing "positive" on the 7-point response scale). *Staff* received essentially the same overall score as corals with a mean value of 5.98. The *fish* domain received a slightly lower score (mean = 5.65), representing a score between "somewhat positive" and "positive" on the response scale.

There was a substantial difference in the level of positive influence had by these first three domains and those relating to *weather* and *other people*. The mean score for influence of

weather, was closer to "somewhat positive." This indicates a majority still scored *weather* as a positive influence, but a sizeable proportion of respondents (ca. 16%) scored the items in this domain as having some negative influence. Weather conditions varied over the 9 month sampling period with some days being cooler, windier and rainier than many would have preferred. Finally, the *other people* domain received the lowest mean score. The mean score for this domain (4.52) was in the "no influence" to "somewhat positive influence" range. The item "number of people on the pontoon" was removed from the final factor analysis (although it did factor in this domain when included) because not all respondents had used pontoon sites during their trip.

There were differences in the way that visitors scored these domains based on percentages within a given response category. Most aspects of the trips were typically rated as positive. A more specific break down helps to understand where negative influences may exist. This information can be helpful in determining points of concentration for operators, planners and managers. Frequency distributions for the three most positive condition domains (*corals, staff* and *fish*) indicated that only one or two percent of the entire sample scored these conditions below four (i.e., in the negative influence range). However, for the domain of *weather,* over 16% of respondents scored in the negative range. The influence of *other people* was even more negative, with 25% of visitors scoring this domain in the negative range. It appears that *weather* and *other people* were the only two types of conditions measured in this study that had much potential for a negative influence on enjoyment of the reef.

5.5.4 The Influence of Conditions Across Operators/Sites

The final part of the results presents a summary of findings on the influences of conditions in each of the trips used in the study on visitor experience. Mean influence values shown in Table 23 indicate that significant differences existed among all trips on all five condition domains. Of particular interest are some of the trends in these influence scores. For example, Oper 3 scored a significantly more positive level of influence on the two biophysical condition domains of *coral* and *fish* than any other trip. Part of this positive influence may be attributable to the fact that this operator visited two or three reef sites on a given trip while all others had a single site destination. Thus, visitors on Oper 3 may have experienced a wider variety of fish and coral by visiting additional sites.

Table 22. Condition domains developed based on visitor perception of influence on their experience

Condition Domain Items	Item Loading[1]	Overall mean[2]	alpha
Corals			
size of the coral I saw	0.76		
total amount of coral I saw	0.70		
colour of the corals I saw	0.66	5.99	0.83
number of different kinds of coral I saw	0.65		
clarity (visibility) of the ocean water	0.43		
Staff			
helpfulness of the staff	0.80		
appearance of the staff	0.76	5.98	0.74
information provided by the staff	0.64		
Fish			
size of the fish I saw	0.73		
total number of fish I saw	0.70		
colour of the fish I saw	0.68		
types of fish I saw	0.65	5.65	0.85
number of animals other than corals or fish I saw	0.65		
behaviour of the fish	0.64		
depth of the water	0.54		
Weather			
temperature of the air	0.79		
amount of wind	0.77		
sea conditions during the trip to/from shore	0.73	4.92	0.79
temperature of the water	0.69		
currents in the water around the reef	0.44		
Other People			
number of people snorkelling	0.80		
number of people on the main boat	0.76	4.52	0.68
number of human-made objects in the water	0.64		

[1]*Item loadings are factor loadings for each item as determined through factor analysis*
[2]*Mean values were calculated based on a seven point scale where 1= very negatively, 2= negatively, 3= somewhat negatively, 4= no influence either way, 5= somewhat positively, 6= positively, 7= very positively*
Source: CRC Reef Research Centre (1996)

There was also a tendency for visitors travelling with Opers 3 and 4 to score the *staff* condition more positively than those travelling with Opers 1 and 2 (Though the score for one of the pontoon sites visited by Oper 1 did not differ from Opers 3 and 4). This trend may have been partially due to the lower visitor:staff ratio of Opers 3 and 4. The high level of influence that all the staff of all operations had on the experiences of their customers is worth noting. These results reinforce the notion that on-board personnel play an important role in presenting the GBR to visitors. Operator staff are a key component in an experience and have the potential to shape peoples' attitudes and behaviours on the GBR.

Table 23. Comparison of the perceived influence of condition domains on enjoyment among visitors on six different trips to reef areas on the GBR.

Condition Domain	Mean level of influence by operator/trip[1]							
	1/a	1/b	1/c	2	3	4	test stat	P value
Corals	6.13^{a}	5.89^{ab}	5.94^{b}	5.92^{ab}	6.30^{c}	5.93^{ab}	F=11.75	<.0001
Staff	6.06^{ad}	5.93^{ab}	5.85^{ab}	5.86^{b}	6.08^{cd}	6.19^{cd}	F= 7.98	<.0001
Fish	5.61^{ab}	5.45^{ab}	5.51^{a}	5.65^{b}	6.07^{c}	5.67^{b}	F=21.16	<.0001
Weather	5.31^{a}	4.81^{b}	4.39^{c}	4.69^{b}	5.32^{a}	5.15^{a}	F=26.98	<.0001
Other People	4.34^{ab}	4.23^{a}	4.42^{ab}	4.42^{b}	5.11^{c}	5.08^{c}	F=29.85	<.0001

1 Mean values were calculated based on a 7 point scale where 1="very negative," 4="no influence" and
7="very positive." Trips represent four operators with Operator 1 having trips to three different reef sites (1/a, 1/b, 1/c).
Superscripts without common letters indicate significant differences in mean values at the .05 level based on Student-Newman-Keuls multiple range tests.

Figure 3 shows the differences in the mean condition domains for fish and coral among the four operators and six different trips offered. Generally, coral conditions had a more positive influence on enjoyment than did fish, however, groups differed in their perceptions of both. A one-way ANOVA revealed significant differences among trips in the ratings of the fish ($F = 21.16$, $p < .0001$) and coral ($F = 11.75$, $p < .0001$) domains. Differences occurred due to Oper 3 having significantly (SNK tests, $p < .05$) higher ratings than all other groups on both these variables. It is likely that the additional sites offered during the Oper 3 trip contributed to the higher level of influence.

Weather conditions and *other people* appeared to have a greater potential for negative influence on experiences than the other types of conditions we measured. We were able to examine the perceived influence of weather on visitor enjoyment along with the actual conditions recorded. Table 24 shows a comparison of two weather conditions which were recorded on trips we sampled. There were significant differences in average air temperature and relative wind speeds across the six trips. The pattern of mean values in table 24 is similar to that of the influence of weather in table 23. In particular, visitors who travelled on days with lower wind speeds and warmer temperatures (Opers 1/a, 3 and 4) were more positively influenced by the weather as a part of their experience.

When the *other people* condition was compared a distinct pattern emerged between large and small operator types (Figure 4). Visitors on large operations (Opers 1 & 2) indicated that *other people* were a neutral influence on their enjoyment while those travelling to the reef on the small operations indicated that this condition had a "somewhat positive" influence on their enjoyment. The one-way ANOVA indicated that significant differences did exist among the six trips ($F = 29.85$, $p < .0001$). A multiple range SNK test indicated that no differences existed among the trips offered by large operators nor did they exist between trips offered by small operators. However, responses from visitors on each of the small operators differed significantly from those on each of the large operators.

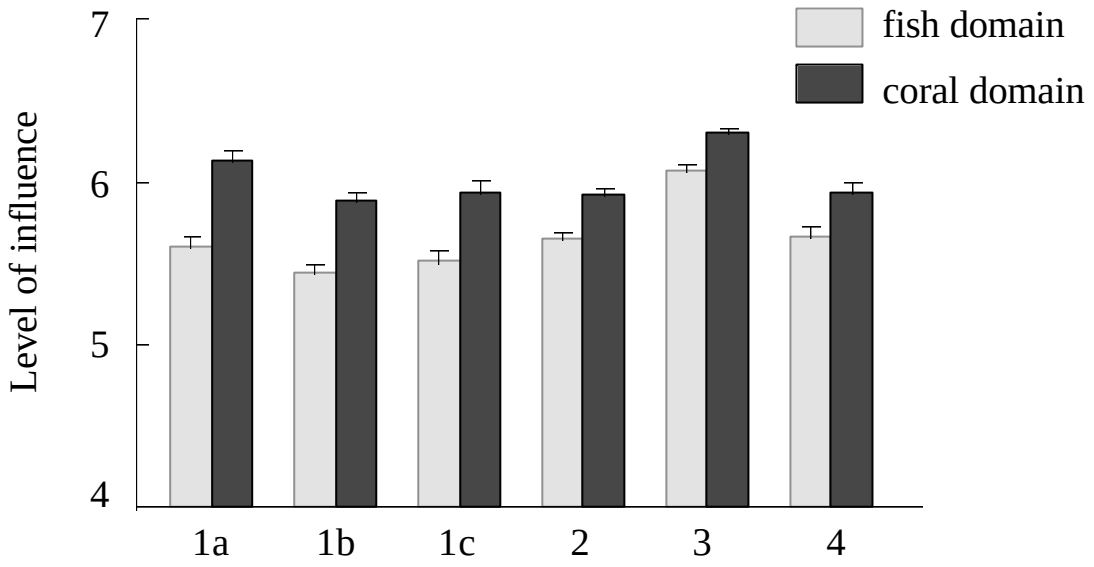

Figure 3. Comparison among mean values of influence for the "coral" and "fish" condition domains on the experiences for visitors travelling on six different trips to reef areas on the GBR. Numerical codes indicate the four operators used in the study. Alphabetic sub-codes denote the three pontoon sites used by Oper. 1.
Source: CRC Reef Research Centre (1996)

Table 24. Comparison of air temperature and wind speed measures among six different trips taken to reef areas on the GBR.

Measure	Mean value by operator/trip 1/a	1/b	1/c	2	3	4	test stat	p value
Air temperature at time of trip[1]	26.6	25.6	23.8	25.0	25.9	27.1	F=36.94	<.0001
Wind speed on day of trip[2]	1.3	1.7	1.8	1.6	1.3	1.3	F=28.33	<.0001

1 Air temperature means are shown in degrees Celcius and are based on data obtained from the Australian Institute of Marine Science.

2 Mean values for wind speed are based on a three point interval scale where 1=0-10 knots, 2=11-20 knots and 3=21-30 knots.

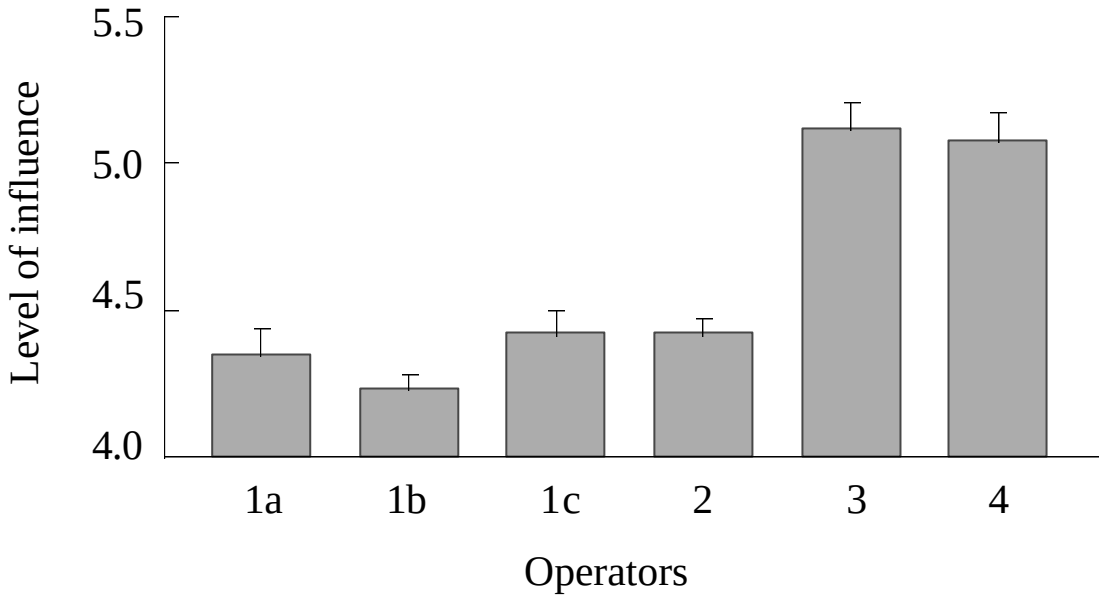

Figure 4. Comparison among mean values of influence of the "other people" condition domain on the experiences of visitors on six different trips to reef areas on the GBR. Numerical codes indicate the four operators used in the study. Alphabetic sub-codes denote the three pontoon sites used by Oper. 1.
Source: CRC Reef Research Centre (1996)

Figures 3 and 4 provide a visual comparison of trends in the two biophysical conditions and the *other people* condition among the six trip types. Trends in the way visitors rated biophysical conditions do not appear to reflect any pattern related to operator type and are more likely to be related to differences in site specific features. Figure 4, on the other hand, depicts distinct differences in the way the *other people* condition was scored by those travelling with smaller versus larger operators. Results indicated that the *other people* condition was of greater consequence, and in a positive way, to those accessing the reef on smaller vessels. On average, those travelling on large vessels seemed to feel that this condition was of less consequence than other conditions on the trip.

6. DISCUSSION

When comparing our sample of Great Barrier Reef visitors to those of studies done in terrestrial environments, a number of similar patterns emerge in the types of benefits that visitors received and in the way they are influenced by specific types of conditions. The attitudinal scales in our survey indicated that visitors evaluated the natural environment as the most important influence and something they received the most benefit from. Visitors

indicated that benefits and conditions related to the presence of other people were less important and less influential than those relating to nature. This trend has been found consistently in terrestrial environments. There are management and marketing issues related to this pattern which deserve more attention and which are discussed below.

As could be expected of an international tourist destination such as the GBR, there is diversity among visitors and within the range of options for them to access reef sites. Our results indicate that there are different profiles of people travelling with different operators to sites on the outer GBR. Although, in many cases, these people are travelling to broadly similar settings each type of visitor is engaging in different activities, perceiving conditions differently and, ultimately, experiencing the reef in different ways. Findings related to differences in experiences provide preliminary support for the concept of a spectrum approach to the designation of areas for different levels and types of use, as suggested by the Limits of Acceptable Change concept. However, more broad-based research across a greater range of operations and environments is needed to direct management actions of this type.

6.1 Country of Citizenship and Past Visitation

The first objective of this study was to determine if different types of people differed in their perceptions of the reef. Australia, Japan, Britain and the USA were the top four countries represented among our sample of day use visitors. The most prominent differences occurred between Japanese and Australians. In contrast to Australians, the experiences of Japanese visitors seem to have been particularly enhanced by the benefits of time spent with family and friends. Japanese were also more likely than Australians to indicate low levels of all possible trip benefits. Receiving more of a benefit from family and friends may occur due to the relative isolation that any non-English speaking culture would encounter on board a vessel dominated by English-speaking passengers. It is likely to be harder for Japanese visitors to interact with people outside their travel group causing them to rely more closely on friends and family for social interaction. The lower rating of the overall reef experience by Japanese visitors may occur because many Japanese travel to the GBR as a part of a travel package that includes other destinations within Australia. A reef trip may, therefore, not be as high a priority to some of these visitors. It is also possible that limitations in the measurement instrument led to some of the these differences. While we used professional translators to equate meanings of the questions in other languages with those in the English survey, there is always the possibility of error introduced upon translation by slight changes in meaning.

Australian visitors were more likely to have made the GBR a specific destination. Recent research conducted for GBRMPA (Huf & Douglas 1995) indicated that the GBR was a well recognised and important symbol in the eyes of the Australian public. Many Australians have indicated that the GBR is a place they plan to visit. Choosing to visit the GBR specifically and recognising it as an icon of Australia may help explain why Australians were most likely to receive higher levels of all benefits from their reef experience. Bureau of Tourism Research (1995) statistics indicate that international visitors to Australia most frequently nominate the Great Barrier Reef as the thing they most want to experience before leaving the country.

In general, tourists who had previously visited the GBR were more likely to rate the condition of corals lower than first time visitors. Other research in outdoor recreation has shown that higher levels of prior experience result in a higher level of sensitivity to the setting (Hammitt & McDonald 1983; Virden & Schreyer 1988). In this study, return visitors were more likely to feel that they did not see enough coral and they did not rate overall coral conditions as well as first time visitors. Past visitors were significantly less likely to say that too many people were on their trip. Visitation on the GBR has been increasing steadily and rapidly (as much as 30% per annum in some areas) over the past 20 years with the most dramatic increases occurring in the past 5 years (Carey 1993; Craik 1993; Driml 1994). Return visitors to the GBRMP were, however, more likely to travel on smaller vessels and, therefore, were more likely to experience smaller numbers of people on their current trip than on the previous one. While 12% of past visitors did indicate there were too many people on their trip, a higher percentage (17%) of first time visitors felt this way. First time visitors may also have come with expectations of lower use on the GBR. Promotional information depicting a coral reef environment where few people are encountered may cause unrealistic expectations among some visitors (Fenton & Johnson, submitted).

It is beyond the scope of this study to determine why these perceptions existed but change in corals and increased reef visitation are often anecdotally cited as important impacts on the GBR associated with tourism development. Those who had visited before may be reacting to situations which they perceive as different from the past. Dustin and McAvoy (1982) have pointed out that people often adapt to changing conditions or are displaced to different environments in search of the conditions they once experienced. Even small differences in visitor perceptions of conditions between past visitors and first timers are worth noting

because many may already have been displaced to other settings. A "product shift" may be occurring in some reef visitors. This is a process in which they psychologically redefine what a day-trip to the outer barrier reef is in terms of coral conditions and numbers of people (Shelby et al. 1988; Shindler & Shelby 1995). For example, visitors with more experience may have "shifted" their perception regarding the number of people to better match the current situation on the reef because they were more aware of it and have adjusted their expectation. Others may have been displaced from the larger operators to smaller ones. They may have "coped" with what they perceive to be increasing numbers of visitors on large vessels and pontoons by selecting smaller operators to achieve a desired experience.

6.2 Contribution of Activity Participation to Experience

A large proportion of all tourists in the survey (70-80%) participated in "wet" activities at the reef sites they visited. Results indicated that those who snorkelled or dived were significantly more likely to have received greater levels of benefits from the trip. On trips with pontoons as destinations, snorkellers rated corals, fish and their overall day on the reef as better than those who did not snorkel. Such ratings are likely to have occurred because snorkellers came in closer contact with the corals and fish, more fully experiencing the environment in which they live. At pontoon sites where some visitors chose to view corals from a vessel or observatory, they were less likely to see as much of the texture and colour present in the coral or see as many different kinds of fish as someone who snorkelled the area.

The primary aim of nature-based recreation and tourism is to provide experiences in the natural environment and it appears that day use reef visitors who explored the environment more closely more fully realised that aim. Snorkelling represented a new and different experience for many of these visitors which may have enhanced feelings of learning and skill development that other visitors did not receive. A comparison of benefit cluster groups showed that those who were most enthusiastic about their experience on the GBR (the *enthusiast* group) received the highest levels of all benefits and were more likely to have snorkelled. *Passive naturalists* on the other hand were significantly less likely to have snorkelled. Those more passive in their encounter with the reef obtained high levels of benefits associated with seeing and learning about nature but received much lower levels of benefits related to being active, excitement with family/friends and escape. Snorkelling may help bring people closer to the natural environment but it may be contributing even more to

individual experiences by providing a vehicle for being physically active and sharing a new experience with others.

How Visitors Value the Reef

Understanding reasons for valuing reef sites within the GBRMP is important to making decisions about how to designate and manage such sites. The nine items presented in Table 11 were intended to measure individuals' perceptions of the reasons humans may value the Great Barrier Reef. The meanings that people assign to places in the environment are often related to how strongly they feel about how it changes. The more that public and private managers of natural resources can understand about such meanings the more they can prepare for how to implement change (or the lack there of) that will be agreeable to users and the public at large. Overall, visitors felt that the reef sites they visited were most important for conservation, the natural processes that existed there and the opportunities to learn. Of least importance were economic opportunities and potential spiritual meanings associated with the sites. It is noteworthy that visitors placed a low level of importance on economic values as they travelled with operators who derive such value from reef use. This item may have been somewhat confounded by its interpretation as an issue that related to other forms of exploitation of natural resources, such as mineral extraction or commercial fishing. The low rating of spiritual value may need more research from the standpoint of indigenous people. Aboriginal and Torres Strait Islander people have had a long-standing spiritual relationship to sites on the GBR. It is likely that day use visitors on the GBR have a low level of awareness about this spiritual relationship with reef places and, therefore, rated it as of less value.

The list suggested to respondents was necessarily limited in scope but, results provide some orientation toward more specific questions that could be raised about reasons to value coral reef environments. For example: "How does the way day tourists valued the sites they visited compare to the perceptions of those who frequent reef sites for recreational or commercial reasons?", "Why are tourists assigning these levels of value to the reef sites they visit and what do these values really mean?" (i.e., What are "conservation opportunities" and/or "economic and spiritual meanings"?). The answers to these questions can inform decisions about marine park zoning designations based on social values expressed in legislation at the federal (GBRMP Act) and at International (World Heritage) levels.

The mapping of these values (as well as other attitudes about human use of the environment) has strong potential as a management tool. Maps portraying human values of reefs, by site, would add a useful layer of information to the decision making process. The mapping tool has

the potential to help legitimise the meanings that users assign to reefs. Meanings associated with natural environments can be as important to the sociopolitical component of management as types of corals and fish inhabiting an area are to the biophysical component (Williams & Patterson 1996).

Benefits of Day Use Visitation on the GBR

The broad benefits provided to visitors through experiences in land- and water-based natural environments appear to be very similar. Research on terrestrial environments, much of it conducted in land based parks and forests, has indicated that people visiting such areas do so predominantly to experience and learn about nature. Most visitors in such studies had been experiencing undeveloped mountains, forests and rivers (e.g., Brown & Haas 1980; Lucas 1985; Manfedo, Driver & Brown 1983; Schreyer & Roggenbuck 1978). The visitors we questioned on the GBR were experiencing a marine environment but, as with other natural environments, the benefits they received were mostly related to experiencing nature and learning about it. The second greatest benefit on reef trips was related to rest/relaxation and escape. Almost without exception, past research in terrestrial areas has also revealed that benefits related to rest, relaxation and escape have been next in importance behind experiencing and learning about nature.

In general, our findings on the benefits of visiting a reef site on the GBR mimic those of land based environments. This may be partly due to the fact that items presented to visitors were based on those used in research in land based environments. However, respondents scored the items in a way which revealed that reef trips appear to provide the same pattern of benefits as trips into national forests. Research conducted by Scherl et al. (1993) on the GBR's Lady Musgrave Island and Reef, revealed a similar pattern of benefits using a different methodology. For example, Scherl et al. found that when they asked visitors to talk about their reef/island experience the highest percentages of topics mentioned dealt with positive evaluations of the physical environment, contemplating nature, and the reef and island ecosystems.

The fact that visitors to the GBR are provided with benefits related to seeing and learning about nature, and an escape from the usual day-trip experiences, provides additional justification for the need to understand how the natural and social environment is providing these benefits and what changes in the environment might detract from them. The benefits

that people take away from their trip to the Great Barrier Reef form the core of their experience. Their experience is used to assign meaning to the resource and that meaning has implications for people's reaction to change and the management policy which directs why and how change will occur.

Conditions Influencing Day-trips to the Great Barrier Reef

When asked about specific conditions, visitors indicated they were most influenced, and in a positive way, by corals, fish and the professional staff in charge of their trip. As with benefits, visitor reactions to more specific conditions showed that components of the natural (biophysical) environment were most influenced their enjoyment. In particular, the influence of corals received the highest influence score. Corals are largely responsible for the form of the landscape which is viewed in the underwater environment of a reef much as geological features and vegetation are in terrestrial environments. Research in terrestrial landscapes has investigated the influence of complexity, texture, mystery, legibility and coherence on peoples' visual preferences (for a review see Kaplan & Kaplan 1989). Visual preference in terrestrial environments is believed to be dependent on the human ability to understand and the desire to explore. Complexity and texture are components of environmental exploration that have been positively related to preference for landscapes (e.g., Herzog 1987). The complexity and texture of a coral reef may play a large part in the strong positive influence that corals had on visitor enjoyment. Visual preference research with underwater environments in general, and corals in particular, will be important as visitor perceptions of reefs are included in the management process.

In recent studies of wilderness users, condition items related to negative impacts on the natural environment (trees, soils, litter) due to visitor behaviour have been most important, or of most concern, to respondents (Roggenbuck et al. 1993, Shafer & Hammitt 1995). Visual preference research can help in determining how people perceive coral reefs and thus how they might perceive changes in them. Research in terrestrial environments suggests that users are able to detect various levels of damage to trees, soil compaction and pieces of litter in the environment. The ability to detect damage on a coral reef is much less clear but may be every bit if not more influential to visitor experiences than items measured here. Preliminary investigations by CRC Reef researchers suggest that inexperienced reef visitors lack an appropriate cognitive framework to distinguish the condition of reef sites based on natural features or damage to natural features (Fenton & Johnson, submitted; Rouphael, unpubl. data).

For example, Rouphael (unpubl. data) found no difference in perceptions of the condition of coral reef sites by SCUBA divers despite substantial differences in coral cover between the sites (> 15% difference in the cover of hard corals) and a 4-fold change in the number of broken colonies at the same sites over the 12 months that the study took place.

Another condition that is rated very positively by people in terrestrial environments is encounters with wildlife. Although corals are animals, fish are more likely to be associated with "wildlife" by visitors to the reef. While fish were scored as one of the most positive influences they were less positive in their influence than coral at every site in this study. Almost 25% of visitors who got in the water to snorkel indicated that they saw too few fish and 31% of people who only engaged in "dry" viewing activities indicated seeing too few fish. Seeing fish may be highly important to people and the fact that many visitors felt they saw too few may have resulted in this less positive overall influence for conditions related to fish. Certainly, larger species such as Maori Wrasse, reef sharks, rays and groupers attract special attention and may heighten an individual's experience just as a koala, moose or giraffe might in their respective terrestrial environments.

The staff of the tourist vessels also had a very positive influence on visitor enjoyment. In particular staff helpfulness was scored as the highest condition item of the 24 that were posed. Scores for these items generally were very positive about the staff on the operations that assisted in this study and they should also indicate that operational conditions are very influential on the way that visitors experience the GBR. The current training and licensing programmes in place for operators and their staff are important. It may be especially important to continue staff development training on the latest knowledge of the GBR ecosystem and it management. Our results indicate that staff have the potential to be very influential with such knowledge.

Physical conditions that were part of peoples' trips were more variable in their level of influence on enjoyment. For example, items related to temperature were scored by 13% of all respondents as having some level of negative influence. Larger numbers of people indicated that sea conditions and wind had a negative influence on them. Sea sickness adversely affects some reef visitors and is likely to be the reason for the negative influence. While weather can certainly play a part in the enjoyment of terrestrial environments, the sea conditions that result from high winds have the added potential for negative influence through motion sickness.

Other people present, and evidence of human development, were also variable in the way they seemed to influence people. We sought to examine components of social carrying capacity which has been based on the assumption that other people are an important influence on experiences in natural environments. Conditions related to numbers of other people tended to elicit the highest percentages of neutral and negative responses from visitors. There is some question about the relevance of number of people in the mind of many visitors. Snorkellers appeared to be more influenced by the number of people than people who did not go snorkelling, but these ratings were confounded by differences in the relative proportions of people who went snorkelling on large and small operations. It is possible that the behaviour of some snorkellers in the water affected perceptions of crowding, as on busy days, when many people are present in the confined snorkelling areas they often bump into each other and/or find themselves needing to navigate among the less experienced. Although the *numbers of people* item was rated quite neutrally across the sample as a whole, it did appear to have different potentials for positive influence on reefs trips among those who chose different types of trips (see below). Finally, items relating to the number of human made objects in the water received the highest percentage of negative responses among the 24 items and seemed to indicate that some people were particularly sensitive to infrastructure at reef sites. Terrestrial wilderness users react very negatively to obvious human impacts like litter, worn campsites and other visual intrusions on the naturalness of the landscape. This issue of human behaviour and presence on the reef deserves future attention so that specifics about perceptions of change can be better understood.

6.3 Taking an Experience-Based Approach to LAC on the GBR

Increases in day use visitation on the outer Great Barrier Reef have been the source of conflict between operators and managers and between different types of users. One of the primary concerns among managers has been the potential degradation of coral reef sites due to the increase in use. Actual physical changes in corals and fish are difficult to measure and even more difficult to relate to specific human activities. As a part of this research we have attempted to gain insight to these relationships at a site specific scale and will address the findings elsewhere. Corals are touched, abraded and broken and fish are attracted to tourist locations from other parts of the reef (Sweatman 1996; Nelson & Mapstone 1998). In the short- to medium term (<5 years), it appears that there is no significant net change in reef community structure associated with these activities, but, it is unclear if there are any long-

term consequences of these changes in corals and fish. Existing information suggests relatively rapid recovery upon removal of the tourism operation (Inglis 1997).

An experience-based approach to designating use (types and amounts) and selecting indicators in a LAC process can provide a systematic method for meeting the goals of natural resource managers and tourism operations. Both seek to maintain a diversity of opportunities for visitors to the marine park. The last three objectives of this study were intended to address issues that more directly apply to implementing a LAC approach to managing tourist day use on the GBR. We wanted to determine if visitors were having different experiences on the reef and if different conditions were having different levels of influence on them.

The type of experience visitors had differed based on the "packages" of benefits they received from their reef trips. When those benefit packages were compared across operators it was apparent that different experiences were related to different types of trips. While all the operators in our sample offered high levels of benefits relating to nature and learning, large operators allowed some visitors to be more passive in their enjoyment of the reef by offering a wider range of activities and a more developed on-site setting. Visitors travelling with smaller operators were more likely to have received benefits associated with active participation and escape from others. Through lower levels of development, smaller operators required their visitors to pursue "wet" activities if they wanted to see the underwater environment, while their smaller passenger loads may be helping to provide more of the escape benefit.

While many passengers book passage on trips from a distance or as a part of a package tour, it is still likely that the type of operators available play a role in that choice. Some visitors no doubt choose larger operators because they offer more variety in activities (e.g., wet and dry) to access the underwater environment. Facilities on larger vessels, the development at their destination sites (e.g., pontoons), and the larger loads of passengers may be perceived as safer and more comfortable than those of smaller vessels. Smaller operators on the other hand offer the option of lower levels of development and a more intimate group experience. Importantly, a large proportion of return visitors to the GBRMP appear to choose smaller operations. This same pattern has been found in a broader CRC Reef study on market segmentation within the marine tourism industry (Pierce et al. 1997). Perceptions of conditions support the differences found in benefits packages and indicate that the two types

of operation in this study represent two different points in a spectrum of ways to experience the GBR.

6.4 Implications for Managers and Tourist Operators

The primary implication of this study is obvious. If managers and operators wish to continue to provide a sustainable resource, which meets human expectations as one of the great natural wonders, the biophysical environment and the social environment must be well cared for. Visitors of all nationalities and with various feelings about their experience overwhelmingly agreed that seeing and learning about the natural resource was what they took away from this experience and that natural resource conditions had the most positive influence on their enjoyment.

Future research must continue to examine changes that occur to components of the natural environment as a result of different uses of the GBRMP in order to balance use with resource conservation goals. Greater attention to behaviour management and site design could help accommodate large numbers of visitors at individual sites. For example, systematic site analysis for the purpose of placing flotation devises or platforms for snorkellers and well designed interpretive trails, for use by diver and snorkellers, could assist in making sites more durable. Some pontoon operations have already embarked on such exercises.

Managers and operators should also be conscious of the fact that accessing the reef under different "social" conditions is of consequence to some visitors. Diversity currently exists in the day use visitation system on the GBR and appears to be appreciated by those using it. Such diversity should be maintained for the purpose of offering different experiences to suit different tastes and research is needed on the best ways to achieve this.

6.4.1 Opportunity Classes on Coral Reefs

While more information is needed, there is potential for extending the findings of this study to the designation of tourist zones or opportunity classes on the GBR. The development of zones that designate levels of use, types of use, level of development, and method of access can provide for a range of opportunities to suit different experiences sought by visitors while helping to protect biophysical resources within the GBR. This is the first step toward expanding on the simple carrying capacity concept.

An experience-based tourism zoning system would need to take into account more highly developed places (eg., floating hotels) and areas with very low or no use allowed (eg., reef wilderness). As mentioned in the Introduction to this report, the concept of experience-based zoning is not new, but has not yet had any practical application. Reef use areas, could be situated to compliment other uses. High use area are likely to be more compatible with pontoon operations than those areas frequented by small crafts which carry people who would prefer to be away from such development. Wilderness designations might include areas of high cultural or biological value and be exclusive of certain types of use (e.g., motorised travel). Such designations may also limit travel to only a few vessels a week and no two to be present within a certain distance of each other. Such areas could be controlled as habitat preserves while protecting yet another marketable experience for GBR visitors. Figure 5 provides an example of where current and potential use types might be arranged for zoning settings for tourist experiences on the outer reef of the GBRMP. Research is needed to determine the full range of existing opportunity classes and the influence that conditions of place, resource availability and others have on the experience. Such research would necessarily need to include a broader range of stakeholders and users of the GBRMP.

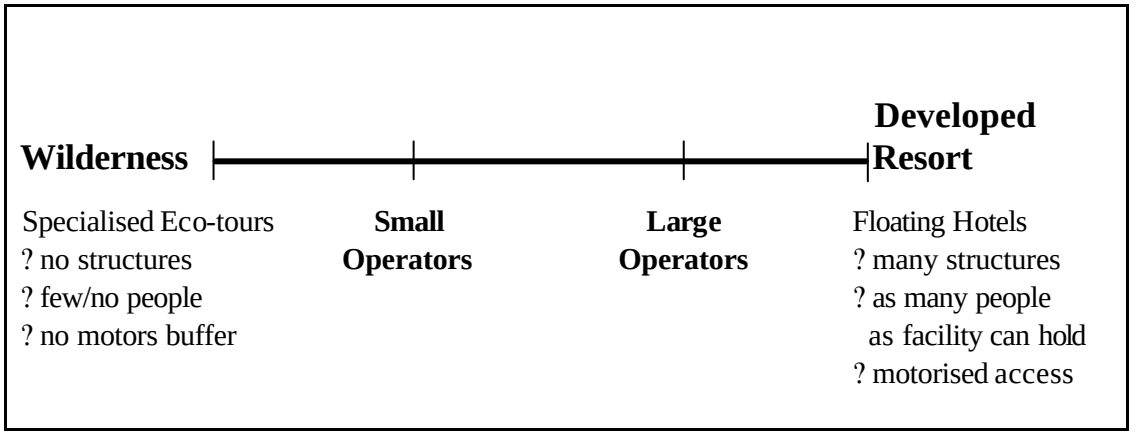

Figure 5. An example of potential use categories in reef based tourism arranged along a spectrum based on levels of access and development.

6.4.2 Selecting Indicators

While physical indicators of conditions (eg., coral breakage) at tourist sites may still be forthcoming it will be some time before we are able to judge the levels of acceptable change in such a condition based on how it may effect the ecology of the reef or perceptions of scenic beauty. Corals and other biophysical attributes are not only important to the ecological integrity of the GBR but are also what people come to see. More work is needed in this area from a social as well as ecological standpoint. More information is needed about how people

perceive corals and other components of these reef environments. We need to continue to work toward understanding how visitor use causes changes in assemblages of corals and/or fish given the prominence that these attributes hold in the minds of managers and users.

The most promising indicator condition which came out of this study was the number of other people on a trip. This condition indicator has the potential to be quantified in a number of ways based on needs for acceptability to reef visitors in different settings. In situations where the number of people is determined to significantly impact experiences it may be feasible for managers to negotiate passenger limits at a level which is acceptable. On the larger operations studied here, there were some negative influences when vessels were running closer to capacity however, most passengers indicated a "neutral" to "somewhat positive" influence for this condition. Findings related to this "number of other people" indicator suggest that more thought should be directed toward understanding the effect that zones, for different sizes of vessels and concentrations of people, could have in helping to maintain acceptable experiences and resources. If zones were established to accommodate certain use levels then larger vessels could be prohibited from lower use zones where smaller numbers of people appear to have a positive influence on enjoyment. This condition needs more clarification through direct questions of visitors on how many people they feel are acceptable on their trip. Questions regarding acceptable numbers within activities such as snorkelling and diving need to be asked in order to quantify numbers at which experiences may be negatively impacted. Operators could use such activity-based information to develop and manage a range of snorkelling areas at one site to suit different tastes. Additional "people" conditions that need to be more carefully investigated include the acceptability of other vessels (commercial operators or private recreational) in the area and how their sizes, types and distances between (spacing) influences the visitor experience.

7. CONCLUSION

The Great Barrier Reef Marine Park is a natural resource of regional, national and global importance. Its designations as a Marine Park and World Heritage Area indicate that special feelings are held about it by the national and international community. Demand for increasing visitation to the area is occurring because of the natural values for which it has been recognised. Park planners and managers, tourist operators and the Australian public face the task of determining what type of park it will become in the next 20, or even 100, years of its

existence. Part of this involves determining how visitors will experience the reefs and islands. The tourism industry has called for the development of additional destinations and diversification of opportunities to serve "a more specialised nature tourism market, such as ecotourism, scientific/research tours, remote location holidays." (Office of the Co-ordinator General, 1994, p. 26). Planners and managers are concerned with increasing use, conflicts between uses and potential damage to the biophysical resource. The designation of zones to provide and protect different experiences (specialised markets) can also act to protect special biophysical settings.

Decisions about how to use and manage the GBRMP for tourism can be classified as "wicked" problems (Allen & Gould 1986). As Stankey (1991) pointed out, "wicked problems have no 'correct' solution, only answers that are more or less useful." (p.12) Developing tourism on the GBR in a sustainable manner will require that a full spectrum of use be taken into account. Decisions which limit uses in some areas and favour use in others often fall under the "wicked" heading, but greater input from all stakeholders should help point the way to solutions that are more, rather than less, useful.

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10. APPENDICES

Appendix 1. Questionnaire

Environment and Experience on the Great Barrier Reef

A Study Conducted by:

The Cooperative Research Centre for the Great Barrier Reef

The Association of Marine Park Tourism Operators

The Great Barrier Reef Marine Park Authority

The Australian Institute of Marine Science

The Department of Primary Industries

James Cook University

The Cooperative Research Centre for the Great Barrier Reef has been established to assist in the ecologically sustainable development of the Great Barrier Reef World Heritage Area. As a part of managing for quality in the environment and in visitor experiences, the Cooperative Research Centre is collecting information from visitors like you. The purpose of the study is to gain a better understanding of how different aspects of the Great Barrier Reef environment influence visitors. By providing information about your experience today you will help to ensure proper management of this unique natural resource.

Your participation in this study is voluntary. However, only a select number of reef visitors will be asked to complete a survey so your help is very important. This questionnaire will take about 10 to 15 minutes to complete. All answers you give are confidential.

If you have any questions about this study please contact us at the Cooperative Research Centre:

Dr Scott Shafer
Dr Graeme Inglis
Environment and Experience Study
CRC Reef Research Centre
James Cook University
Townsville, QLD 4811

Tel: (077) 81 4976
Fax: (077) 81 4099
Email: crc.reef@jcu.edu.au

Experiencing the Great Barrier Reef

SECTION I. General Responses About Your Trip Today

Please answer questions 1 and 2 by **ticking yes or no**. **If you tick yes** for either (or both) please provide a brief written answer. Be as specific as possible.

1. Think about your trip today, were there things that stand out as <u>adding to</u> your enjoyment?

_____ no If no, go to number 2 below

_____ yes

If yes, please tell us <u>what</u> these things were and <u>where</u> (example - boat, water, island) each occurred.

a. The thing that added most to my enjoyment

was:_____

Where did it occur? _____

b. Another thing that added to my enjoyment was:

_____

Where did it occur? _____

2. Were there things during today's trip that stand out as <u>detracting from</u> your enjoyment?

_____ no If no, go to Section II, next page.

_____ yes

If yes, please tell us <u>what</u> these things were and <u>where</u> (example - boat, water, island) each occurred.

a. The thing that detracted most from my enjoyment

was:_____

Where did it occur? _____

b. Another thing that detracted from my enjoyment

was:_____

Where did it occur? _____

Please answer all questions on the pages that follow even though some may appear similar to what you have told us in Section I above. Your participation is appreciated.

SECTION II. Visiting the Great Barrier Reef

Please tick the space that best represents your answer.

1. Had you visited the Great Barrier Reef Marine Park before today?
____ no If no, go to question 2 below
____ yes

1a. About how many times have you been to a reef in the Marine Park before today?
_____ times before

1b. When was your last trip to a reef in the Marine Park?

____ in the last 7 days
____ between 8 days and 1 month ago
____ between 1 month and 1 year ago
____ between 1 year and 5 years ago
____ more than 5 years ago

1c. What area was your last trip to a reef in the Marine Park taken from? (tick one)

____ Cairns
____ Port Douglas
____ Mission Beach
____ Townsville
____ Airlie Beach/Whitsundays
____ Mackay
____ Gladstone
____ other -specify _____

2. Have you ever visited coral reefs other than those of the Great Barrier Reef Marine Park?

____ no
____ yes If yes, about how many others _____

2a. How do you feel other coral reefs you have visited compare to what you have seen here? (tick one)

____ Today's reef was better than others I have seen
____ Today's reef was about the same as others I have seen
____ Today's reef was not as good as other's I have seen

Section III. Importance of the Great Barrier Reef to People

Places on the Great Barrier Reef may be important for many reasons. **Thinking about your main destination** (reef, island, etc.) today, how important are each of the following to the value of that place?

Please tick a space for each item. For example.....( ) ( ) (?) ( ) ( )

The destination today is valuable for:

scientific research. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

recreational opportunities. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

cultural heritage. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

Section III continued

The destination today is valuable for:

natural/ecological processes. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

spiritual values. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

economic opportunities. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

historical meaning. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

educational opportunities. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

conservation opportunities. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

Some things that visitors might get from today's trip are listed below. Please indicate **how much the trip provided each of these for you by ticking a space**.

This trip allowed me to:

be close to friends or family. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

get some exercise. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

experience the beauty of nature. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

meet new people. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

have some excitement. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

experience an undeveloped environment. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

rest and relax. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

learn more about nature. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

experience some solitude. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

be with others who enjoy things that I enjoy. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

develop skills. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

escape the normal routine. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

be in a natural place. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

experience something new and different. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

learn about a coral reef. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

be physically active. ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

SECTION IV. Evaluating of Some Conditions During Your Visit

Items listed below **may have influenced your enjoyment** today in a positive or negative way. Please indicate how each of these items influenced your enjoyment by **ticking a space from *very negatively* to *very positively*** for each.

I was influenced by the:

types of fish I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
clarity (visibility) of the ocean water.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of people snorkelling.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
size of the coral I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
information provided by the staff.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of people on the pontoon.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
total number of fish I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
colour of the corals I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
sea conditions during the trip from/to shore.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
behaviour of the fish.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of human-made objects in the water.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
total amount of coral I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
temperature of the water.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
appearance of the staff.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
size of the fish I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
currents in the water around the reef.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of people on the main boat.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
colour of the fish I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
temperature of the air.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of animals other than coral or fish (clams, sea stars) that I saw	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
depth of the water.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
helpfulness of the staff.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
amount of wind..	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )
number of different kinds of coral I saw.	( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( ) ..... ( )

Section IV continued

Now , please **rate some conditions** that may have influenced your experience today. Rate each item as indicated by ticking one of the spaces provided.

I feel:

the *total amount* of coral I saw was	( )	( )	( )	( )
the *total amount* of fish I saw was	( )	( )	( )	( )
the *total amount* of animals other than coral and fish (clams, sea stars, etc.) I saw was.....	( )	( )	( )	( )
the visibility in the water was.....	( )	( )	( )	( )
the depth of the water was.....	( )	( )	( )	( )
the *number of different kinds* of coral I saw was.....	( )	( )	( )	( )
the *number of different kinds* of fish I saw was.....	( )	( )	( )	( )
the number of people on this trip was.....	( )	( )	( )	( )

overall, the coral I saw was.....	( )	( )	( )	( )	( )	( )
overall, the fish I saw were.....	( )	( )	( )	( )	( )	( )

How would you rate your trip today?
(Please <u>circle a number</u> that best represents your feeling.)

1 --------	2 --------	3 --------	4 --------	5 --------	6 ---------	7 --------	8 --------	9 --------	10
poor		fair		good		very good			excellent

SECTION V. What You Did Today

Please indicate which activities you were involved in today. (tick the appropriate spaces)

1. Did you go into an underwater observatory <u>on a pontoon</u> today?

_____ no
_____ yes, If yes, how many? _____ time(s) today

2. Did you take a semi-sub/glass bottom boat trip?

____ no
____ yes If yes, how many? _____ trip(s) today

Section V continued

_____

3. Did you snorkel today?

_____ no If no, go to question 4 below
_____ yes

3a. Had you snorkelled before today?
_____ no
_____ yes If yes, about how many times? _____ How many of those times were on coral reefs? __

3b. About how many different times did you go into the water to snorkel today?
_____ time(s) today

3c. Did you go on a guided snorkelling tour?
_____ no
_____ yes

3d. Did you touch any coral today (with hands, fins, etc. that you are aware of)?
_____ no
_____ yes

If yes, please tick the item that best describes why you touched the coral.
_____ to balance myself
_____ to rest because I was tired
_____ to see what it felt like
_____ touched by accident
_____ other (please specify) _____

4. Did you scuba dive today?
_____ no If no, go to Section VI next page
_____ yes

5. Have you ever scuba dived before?
_____ no If no, go to 5b.
_____ yes

5a. About how many dives have you done?
_____ less than 5
_____ 6 to 15
_____ 16 to 50
_____ 51 to 100
_____ more than 100

5b. Did you touch any coral today (with hands, fins, etc. that you are aware of)?
_____ no
_____ yes

If yes, please tick the item that best describes why you touched the coral.

_____ to balance myself
_____ to rest because I was tired
_____ to see what it felt like
_____ touched by accident
_____ other (please specify) _____

SECTION VI. General Characteristics

Please tick the spaces and/or fill in the blanks to best answer each question.

1. What type of group are you travelling with today? (tick all that apply)

____ I am alone
____ with partner or spouse only
____ with family
____ with friends
____ organised group or club
____ business associates
____ other, please specify _____

2. Including you, how many people are in the group(s) you ticked in #1 above? _____ people

3. Are you (tick one) _____ female _____ male

4. In what year were you born? 19 _____

5. What is the highest level of education you have completed? (tick one)

_____ primary _____ secondary _____ *some* university or technical ____ university or technical degree

6. In what country are you a citizen? _____
_____
name of country state or region (if applicable)

THANK YOU FOR YOUR HELP

If there are other things you would like to tell us please do so here :

_____

_____

_____

_____

_____

_____

Appendix 2. Frequency table for condition influence items from all operations

Condition Variable	very negatively n (%)	negatively n (%)	somewhat negatively n (%)	no influence either way n (%)	somewhat positively n (%)	positively n (%)	very positively n (%)	mean	std. dev
Helpfulness of the staff	0 (0.0%)	2 (0.1%)	9 (0.5%)	102 (5.7%)	252 (14.0%)	700 (38.8%)	740 (41.0%)	6.14	.91
Types of fish I saw	3 (0.2%)	7 (0.4%)	17 (0.9%)	85 (4.7%)	244 (13.5%)	721 (39.9%)	730 (40.4%)	6.12	.95
Size of the coral I saw	2 (0.1%)	5 (0.3%)	12 (0.7%)	101 (5.6%)	276 (15.3%)	660 (36.5%)	750 (41.5%)	6.11	.95
Total amount of coral I saw	0 (0.0%)	4 (0.2%)	17 (0.9%)	103 (5.7%)	260 (14.5%)	714 (39.7%)	701 (39.0%)	6.09	.94
Number of different kinds of coral	1 (0.1%)	5 (0.3%)	15 (0.8%)	123 (6.8%)	305 (16.9%)	670 (37.2%)	682 (37.9%)	6.03	.98
Information provided by the staff	5 (0.3%)	8 (0.4%)	20 (1.1%)	125 (7.0%)	281 (15.6%)	738 (41.1%)	619 (34.5%)	5.98	1.01
Colour of the fish I saw	4 (0.2%)	15 (0.8%)	30 (1.7%)	140 (7.8%)	327 (18.2%)	677 (37.8%)	600 (33.5%)	5.90	1.08
Clarity (visibility) of the ocean water	10 (0.6%)	24 (1.3%)	88 (4.9%)	92 (5.1%)	272 (15.1%)	663 (36.7%)	658 (36.4%)	5.88	1.22

cont. over...

Appendix 2 continued

Condition Variable	very negatively n (%)	negatively n (%)	somewhat negatively n (%)	no influence either way n (%)	somewhat positively n (%)	positively n (%)	very positively n (%)	mean	std. dev
Colour of the corals I saw	11 (0.6%)	10 (0.6%)	82 (4.5%)	104 (5.8%)	323 (17.9%)	673 (37.3%)	602 (33.4%)	5.85	1.17
Appearance of the staff	1 (0.1%)	1 (0.1%)	9 (0.5%)	278 (15.4%)	274 (15.2%)	705 (39.2%)	532 (29.6%)	5.81	1.05
Total number of fish I saw	7 (0.4%)	15 (0.8%)	75 (4.2%)	148 (8.2%)	311 (17.3%)	672 (37.3%)	602 (33.4%)	5.80	1.18
Behaviour of the fish	6 (0.3%)	7 (0.4%)	15 (0.8%)	347 (19.4%)	320 (17.9%)	619 (34.6%)	477 (26.6%)	5.64	1.15
Size of the fish I saw	4 (0.2%)	11 (0.6%)	37 (2.1%)	266 (14.8%)	402 (22.4%)	648 (36.1%)	428 (23.8%)	5.62	1.12
Temperature of the air	26 (1.5%)	40 (2.2%)	161 (9.0%)	300 (16.8%)	282 (15.8%)	597 (33.4%)	382 (21.4%)	5.29	1.44
Depth of the water	8 (0.5%)	17 (1.0%)	48 (2.7%)	513 (28.9%)	304 (17.1%)	570 (32.1%)	313 (17.7%)	5.28	1.23
Temperature of the water	24 (1.4%)	45 (2.5%)	167 (9.4%)	355 (20.1%)	272 (15.4%)	537 (30.4%)	369 (20.9%)	5.20	1.46
Number of animals other than coral or fish that I saw	31 (1.7%)	55 (3.1%)	87 (4.9%)	377 (21.1%)	419 (23.5%)	502 (28.1%)	315 (17.6%)	5.16	1.39

cont. over ...

Appendix 2 continued

Condition Variable	very negatively n (%)	negatively n (%)	somewhat negatively n (%)	no influence either way n (%)	somewhat positively n (%)	positively n (%)	very positively n (%)	mean	std. dev
Sea conditions during the trip from/to shore	53 (2.9%)	68 (3.8%)	183 (10.2%)	386 (21.4%)	252 (14.0%)	464 (25.8%)	395 (21.9%)	5.05	1.60
Number of people on the main boat	22 (1.2%)	54 (3.0%)	148 (8.3%)	798 (45.0%)	217 (12.2%)	341 (19.2%)	194 (10.9%)	4.65	1.33
Number of people snorkelling	29 (1.6%)	66 (3.7%)	204 (11.4%)	678 (37.9%)	246 (13.7%)	368 (20.5%)	200 (11.2%)	4.65	1.40
Currents in the water around the reef	17 (1.0%)	40 (2.3%)	153 (8.7%)	833 (47.1%)	236 (13.4%)	325 (18.4%)	163 (9.2%)	4.62	1.26
Number of people on the pontoon	28 (1.8%)	46 (2.9%)	136 (8.7%)	725 (46.3%)	173 (11.0%)	286 (18.3%)	173 (11.0%)	4.61	1.35
Amount of wind	44 (2.5%)	88 (4.9%)	229 (12.8%)	699 (39.1%)	209 (11.7%)	334 (18.7%)	187 (10.4%)	4.50	1.45
Number of human-made objects in the water	70 (4.1%)	69 (4.0%)	212 (12.3%)	842 (48.8%)	130 (7.5%)	189 (11.0%)	213 (12.3%)	4.34	1.47