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Tourist Perceptions of Degradation Caused by Coastal Nature-Based Recreation

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ABSTRACT / Tourist perceptions of environmental degradation caused by nature-based tourism activities in a coastal environment were determined in the Central Coast Region of Western Australia. Structured surveys were administered to 702 visitors over two peak seasons. Visitors were required to indicate their perceptions on a Likert-type scale. Activities assessed were swimming, boating, fishing, diving and snorkelling, (wind)surfing, sandboarding, four-wheel driving, (bush)walking, camping, horseriding and sightseeing. Tourists had significantly variable demographic characteristics over two seasons and participated in different activities. However, perception of environmental degradation of individual activities did not vary significantly between seasons, except for fishing, four-wheel driving and sandboarding. The age, origin and level of education of visitors had more effect on perceptions than gender or income group. Participation in an activity affected perceptions only for those who went fishing, sandboarding, four-wheel driving and sightseeing. Visitor perceptions were comparable to 'real' impacts documented in the recreation ecology literature. The results of this research indicate a need for improved visitor education and interpretation facilities.

Nature-based tourism and recreation is associated with some biophysical impacts in natural areas even at low levels of use (Liddle 1997, Hammitt and Cole 1998, Newsome and others 2002b, Cole 1993, Buckley 2001). As visitor numbers increase to an area, impacts tend to become more prevalent. Impacts may be direct or indirect, and in coastal areas they may be both land and water-based. Sandy coastal areas are naturally more vulnerable to recreation impacts due to the dynamic interactions between wind, waves and sediments (Carter 1988, Wong 1993, Clark 1996, Kay and Alder 1999). Single activities cause multiple impacts and each impact tends to exacerbate or compensate for other changes caused by recreation (Hammitt and Cole 1998). The total impact of recreation is a function of the intensity of impact and the areal extent of the impact (Cole 1994). The intensity of recreation impact is affected by frequency or amount of use, the type and behaviour of use (such as camping), the season of use and the environmental conditions or location (for example, dunes). The spatial distribution of use affects the areal extent of impact (Cole 1994).

Reliable data on resource characteristics, impacts, use patterns, and user characteristics is required to manage biophysical impacts as well as visitors (Hammitt and Cole 1998, Buckley and Pannell 1990, Cole 1993, Worboys and others 2001). Hence, understanding visitor attitudes is of value to resource managers (Stankey and Lucas 1982, Stankey and Schreyer 1986, Vaske and others 1995, White and others 2001). Indeed, most recreation management frameworks rely on user inputs (Stankey and others 1985, Graefe and others 1990, Newsome and others 2002b).

Visitor education is often recommended to counteract negative environmental impacts from use (Bramwell and Lane 1993, Cole 1993, Orams 1996, Hammitt and Cole 1998). Visitors tend to be receptive to educational messages if they think of themselves as part of the problem, have relatively low levels of prior knowledge and experience, and are part of small groups (Roggenbuck and Manfredo 1990). Hence, solutions to recreation management problems may be linked to understanding of how visitors use resources, how they think the resources should be used in the future, and how they view the severity of environmental problems (Burger 1998, Pigram 1993). Education can help reduce "avoidable impacts" such as littering, ad hoc campfires, inappropriate disposal of waste, and damage to vegetation. Much research has been directed toward determining acceptable standards for a variety of social and ecological impacts (Noe and others 1997, Roggenbuck and others 1993, Morin and others 1997, Goeft and Alder 2000, White and others 2001). Perception may be an indication of whether visitors would accept management based on their understanding of impact

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associated with recreation activities. There is a tendency for individuals with greater levels of environmental concern to be less accepting of recreation impacts, while individuals with lower levels of environmental concern tend to be more accepting of impacts (Floyd and others 1997).

Individual recreation activity preferences affect the way individuals support development of natural areas (Jackson 1987). This study found people who preferred self-propelled activities such as cross-country skiing, hiking, and canoeing supported management of natural areas maintained in an unaltered state. People who preferred mechanized activities such as trail biking and power boating supported development of resources for recreation. Various demographic and socioeconomic factors also affect environmental attitudes in various ways (Van Liere and Dunlap 1980, Lothian 2002). For example, Baysan's study showed that differences in environmental awareness were more strongly associated with differences in nationality than education levels and occupation (Baysan 2001). However, elsewhere no major differences were found in environmental perception of tourism impacts on the basis of tour type, mode of transport, or between Australian and overseas tourists (Hillery and others 2001). Although there has been considerable research into the physical attributes of recreation impacts (Liddle 1997, Sun and Walsh 1998), research on the perception of visitors of environmental harm associated with individual activities has not been reported. Visitors to natural areas are increasing and attitudinal research could help distinguish between visitor types, which could contribute to the success of management (Fennel 2001).

The aim of this research is to assess tourist perceptions of environmental harm caused by individual nature-based tourist activities in a coastal area. The objectives are to relate visitor perceptions to existing knowledge of degradation (based on the literature) associated with individual recreation activities and determine if demographics and factors such as participation in an activity affect perceptions. The study area is the Central Coast Region of Western Australia, extending directly north of the capital of Western Australia, for approximately 300km to the north (Figure 1).

Study Area

The Central Coast Region has a Mediterranean-type climate (Gentilli 1971), conducive to recreation all year round. The region extends over a coastal plain, and the coast is sheltered from the direct impact of ocean waves by an extensive chain of offshore reefs and small islands (Sanderson and Eliot 1999). The marine environment of the region is recognized to be part of one of the 25 global marine biodiversity hotspots (Roberts and others 2002). It is considered near pristine, and an 811-km^2 portion is currently gazetted as a Marine Park (Department of Conservation and Land Management 2000). This provides opportunities for a variety of activities including swimming, diving, snorkelling, (wind)surfing, boating and wildlife appreciation (Department of Conservation and Land Management and Conservation Commission Western Australia 2001).

The coast is sandy, although limestone outcrops occur frequently. The beaches are commonly less than 25 m wide and low-energy, where annual modal wave height is less than 0.5 m (Hegge and others 1996). Some higher energy beaches also occur where annual modal wave height is greater than 1 m and beaches may be over 50 m wide. Coastal landforms in the region include limestone promontories, various types of shoreline salients, and cuspate forelands (Sanderson and Eliot 1996). Dune morphologies include parabolic dunes, shore parallel ridges, deflation plains, and extensive mobile sand sheets. In the hinterland, laterite mesa-topped plateaus mark the flat landscape. The terrestrial environment is also part of the 25 global biodiversity hotspots (Myers and others 2000) and the numerous flowering species (Coates and Marchant 1998) are important visitor attractions.

The Central Coast is sparsely populated and the regional population is approximately 10,000 (Western Australian Planning Commission 2000). The region is characterized by wide-open spaces, low-levels of development, and extensive reserves of protected area (Figure 1). These, and diverse landscapes provide a spectrum of recreation opportunities including nature appreciation, sandboarding, camping and four-wheel driving (Western Australian Planning Commission 1996). Due to the limited sealed road access in the region, a four-wheel drive vehicle is needed to pursue most recreation activities in natural areas (Figure 1). In this article, four-wheel driving (synonymous to off-road driving) is referred to as a recreation activity on unsealed roads and in a natural area settings.

The coast has been historically accessible only at townships; however, a new coastal highway is planned for completion by 2005 (Rasdien 2002). Improved coastal access is expected to place pressure on biophysical resources, which is the region's main asset for nature-based tourism (Priskin 2001). Tourism is in its infancy and few nature-based attractions in the region provide even basic visitor facilities (Priskin 2001). Hence, the majority of visitors engage in self-organized activities. Whether the state of the region's natural tourism resources can be maintained over time will

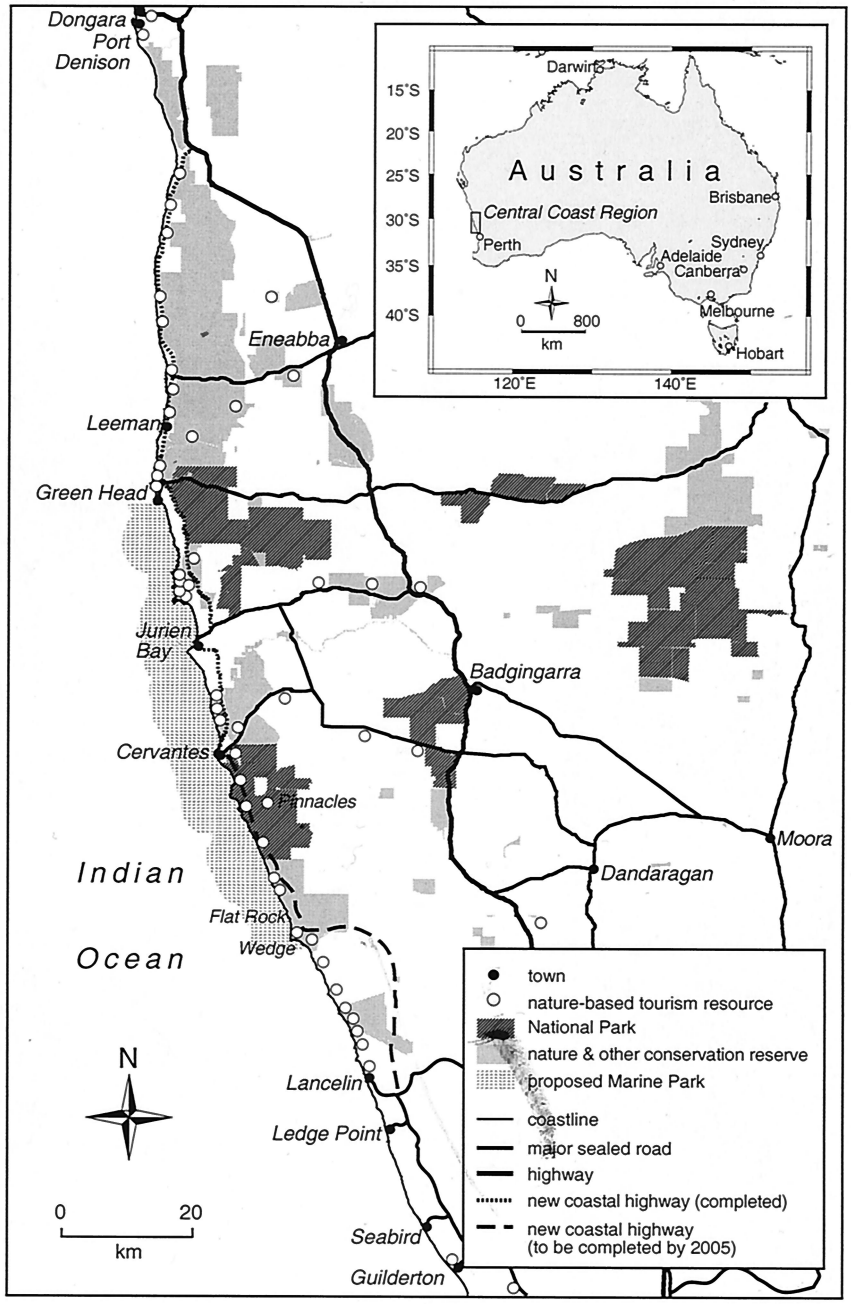

Figure 1. Regional setting of the Central Coast Region.

become a growing challenge. Although several studies in Western Australia explored aspects of visitor attitudes to the environment (Dowling 1993, Morin and others 1997, Goeft and Alder 2000), no research assessed visitor perceptions in the Central Coast Region. Therefore, results may prove useful for planning and management purposes, particularly since approximately 80% of all tourism and recreation occur in coastal areas of Western Australia (Donaldson and others 1995).

Methods

Tourist perceptions were measured via structured visitor surveys, which were administered in the summer (December/January) and spring (September/October) of 1999. Visitors are generally sparse in the region during other times of the year. In total, 702 surveys were administered using a stratified random sampling technique on the basis of local authority boundaries

(Ebdon 1985). Only independent visitors (i.e., not those on tours) were surveyed at nature-based tourism sites (Figure 1). Respondents were at least 15 years old and lived outside the study area. Visitors were approached randomly without consideration any of their characteristics, time of day, or behavior. This was done after the individual was leaving the attraction so their enjoyment would not be affected. This paper addresses sections of the survey that dealt with perceptions of recreation induced impacts.

Respondents were required to rate to what degree they believed individual recreation activities caused harmed to sandy coastal environments on a Likert-type scale. Activities were assessed using the scale where: 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful, and 6 = extremely harmful. Activities assessed were swimming, boating, fishing, diving and snorkeling, (wind)surfing, sandboarding, four-wheel driving, (bush)walking, camping, horseriding, and sightseeing. It was assumed that higher scores for each activity indicated higher levels of environmental awareness, even though not all activities may be of equal likelihood of being harmful to the environment. Each activity was rated by the author, according to its potential impact on the same scale as visitors perception of impacts (i.e., 1 = harmless to 6 = extremely harmful). The rating by the author was not shown to visitors during the survey. The scale was based on existing recreation ecology literature (Liddle 1997, Edington and Edington 1986, Hammitt and Cole 1998, Newsome and others 2002b). There is no list in the recreation literature that ranks recreation activities in order of likely impact. This is not surprising as different activities cause different impacts. However, it is recognized that some activities are more intensely impacting and have secondary or indirect impacts. For example, humans on foot exert less force on an area than horseriders or those four-wheel driving. The assessment assumed that the same numbers of people were participating in each activity. The activities were then rated on the basis of likely direct and indirect impacts in a sandy coastal setting. The likely impacts were based on recreational ecology literature reported from coastal areas, and these are briefly described for each activity in the results. It is acknowledged that the method is subjective; however, it provides a framework for evaluating visitor perceptions and relating these to known impacts of individual activities.

It was expected that responses would differ between seasons, among visitors who participated in certain activities, as well as between visitors of different demographic profiles. Nonparametric tests such as χ^2 and Kruskal-Wallis were used to test associations and analysis was completed in SPSS (Version 11). Results were considered significant at $P < 0.05$ (Siegel and Castellan 1988). Nonresponse cases were not considered in analysis.

Results

The demographic profiles of visitors was significantly different between seasons (Figure 2, $P \leq 0.001$) except for education (Figure 2c; $P > 0.05$) and visitors participated in different activities (Table 1).

Swimming

Swimming is a commonly pursued coastal activity (Fabbri 1990), and it can contribute to water contamination from oils, soaps, and fecal coliform (Liddle 1997, German Federal Agency for Nature Conservation 1997). However, sewage outfalls, oil spills, and other contaminations pose more serious threats to water quality (Kirkby 1996). On this basis swimming was considered as a "slightly harmful" activity.

For comparative purposes, the arithmetic mean was calculated for each activity to show perception of impacts associated with individual activities. The average perception was that swimming is "harmless" (Table 2; mean = 1.22) according to 84.8% of visitors (Figure 3a). Swimming was perceived as the least harmful marine-based activity, as well as the least harmful activity overall (Table 2). Kruskal-Wallis tests showed that visitor age, gender, and origin affected perceptions (Table 3). To determine differences between groups, the arithmetic mean was also calculated on the basis of different demographic subgroups. This indicated that females (mean = 1.33), visitors younger than 35 years (mean = 1.33), visitors with university education (mean = 1.29), and overseas visitors (mean = 1.57) perceived swimming to be more harmful than other groups (Table 3).

Boating

Power boating is associated with excessive noise, fumes, vibrations, oil spills, paint leakage, and sediment turbulence (Liddle 1997). Shallow environments are particularly vulnerable, and turbidity can affect wildlife and entire food webs (Murphy and others 1995). Mooring, propeller cutting, and erosion of plant roots can result in damage to seagrass meadows and coral communities (Davis 1977, Mosisch and Arthington 1998). Boat launching where no ramps are provided can also exacerbate erosion, as can boat wakes. Boating impacts depend on many variables including the size, shape, and speed of the boat. Even nonmotorized sailing may be disturbing (Batten 1977). For example, an area prohibited to sailers in England became virtually deserted

by several bird species after sailing was permitted (Edington and Edington 1986). On this basis boating was considered "very harmful."

The average perception of boating showed it was thought to be "slightly harmful" (Table 2; mean = 2.14). Overall, 47.5% of visitors responded to boating as "harmless" (Figure 3b). Kruskal-Wallis tests showed gender, age, education, as well as origin affected perceptions (Table 3). Females (mean = 2.32), visitor younger than 35 years (mean = 2.52), those with university education (mean = 2.38), and overseas visitors (mean = 2.65) perceived boating more harmful than the average visitor, as well as other groups (Table 3).

Fishing

Recreational fishing from vessels may have similar impacts to boating, as well as contribute to the decline of fish stocks, especially in areas already overfished (Clark 1996, Kay and Alder 1999, Newsome and others 2002b). Fishing also contributes to littering. Fishing lines and plastics frequently cause animal entrapment, leading to disabled animals and their death by starvation or increased predation (Edington and Edington 1986, German Federal Agency for Nature Conservation 1997, Environment Australia 2001). On this basis, recreational fishing was considered "very harmful."

Visitors had significantly different perceptions of whether fishing was harmful (Figure 3c, $P < 0.05$). The average (combined seasons) perception of fishing was that it is "slightly harmful" (Table 2; mean = 2.34). Those who fished during their trip rated it less harmful ($P < 0.001$) than visitors who did not fish. Kruskal-Wallis tests suggested visitor age, education, and origin influenced perceptions (Table 3). Visitors younger than 35 years (mean = 2.78), those with university education (mean = 2.67) and visitors from overseas (mean = 3.01) perceived fishing more harmful than other groups (Table 3).

Diving and Snorkeling

Diving and snorkeling, whether in a group or individually, can contribute to the disturbance of marine habitats and loss of biodiversity (Liddle 1991, Hawkins and Roberts 1993, Davies and Tisdell 1995, Orams 1999). Boat mooring and diving can stir sediment and create excessive turbulence, and this may disturb wildlife. Even if unintended, fins can easily break corals (Rouphael and Inglis 1997, Harriot and others 1997). However, some divers deliberately break corals for souvenirs. These impacts are of particular concern in easily accessible, shallow nearshore environments (Woodward and Hooper 1977, Senate on the Environment Recreation Communications and the Arts References Committee 1997, Schiel and Taylor 1999). On this basis diving and snorkeling were considered "moderately harmful."

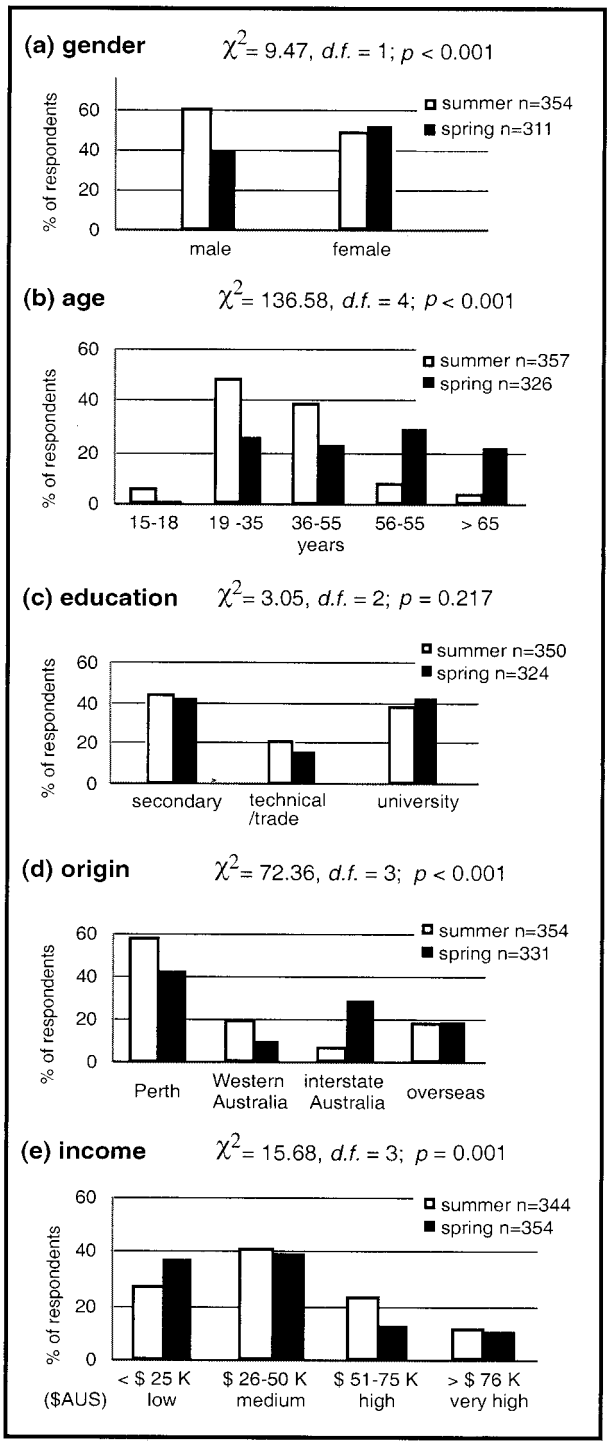

Figure 2. Demographic profiles in summer and spring and chi-square test results.

Table 1. Percent of participants in nature-based activities over two seasons and chi-square test results of perceptions between participants and non-participants in each activity[a]

Type	Activity	% of visitors participated		α^2test	d.f.[b]	p
		Summer	Spring			
Marine-based	Swimming	73.6	16.8	6.24	3	0.1
	Boating	34.8	4.8	8.49	5	0.131
	Fishing	60.1	18.9	55.79	5	< 0.001
	Diving/snorkelling	25.8	1.5	5.22	3	0.156
	(Wind)surfing	19.7	3.9	7.39	3	0.06
Terrestrial-based	Sandboarding	15.2	3.9	30.82	5	< 0.001
	Four-wheel driving	39.6	16.2	62.24	5	< 0.001
	Camping	27.2	61.3	10.30	5	0.067
	(Bush)walking	46.1	55.9	6.04	5	0.302
	Horseriding	0.6	23.1	2.50	5	0.777
	Sightseeing	44.4	0.9	12.96	3	0.005

[a]Activities were assessed individually, hence % values do not add up to 100.
[b]Where df < 5, categories were combined to not violate chi-square rules.

Table 2. Average perceptions of all visitors[a] and rank of activities on the basis of 'average' perceptions

Activity	Mean[b] perceptions and ranks[c] of perceptions						
	Combined seasons	Rank*	Did not participate in activity	Rank†	Participated in activity	Rank‡	activities perceived differently in seasons ($p < 0.05$)
Marine-based							
Swimming	1.22	1	1.29	1	1.16	1	
Boating	2.14	6	2.21	6	1.9	6	
Fishing	2.34	7	2.65	7	1.85	5	summer = 2.33; spring = 2.32
Diving/snorkelling	2.05	5	2.1	5	1.75	4	
(Wind)surfing	1.54	3	1.58	3	1.28	2	
Terrestrial-based							
Sandboarding	3.46	10	3.61	10	2.35	8	summer = 3.18; spring = 3.82
Four-wheel driving	4.27	11	4.59	11	3.54	11	summer = 4.02; spring = 4.59
Camping	3.05	8	3.16	8	2.94	9	
(Bush)walking	1.91	4	1.89	4	1.92	7	
Horseriding	3.2	9	3.23	9	3.26	10	
Sightseeing	1.47	2	1.4	2	1.71	3	

[a]Includes both participants and nonparticipants.
[b]Arithmetic mean responses, where 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful, 6 = extremely harmful.
[c]ranks = overall rank of activity from least harmful (1) to most harmful (11) by combined seasons (rank*), participants (rank†), and nonparticipants (rank‡).

The average perception of diving and snorkeling was that it is "slightly harmful" (Table 2; mean = 2.05). Overall, 46.4% of visitors believed diving and snorkelling were "harmless" (Figure 3d). Kruskal-Wallis tests showed the age group of visitors, level of education, and origin affected perceptions (Table 3). Visitors younger than 35 years (mean = 2.25), those with university education (mean = 2.26), and tourists from overseas (mean = 2.44) perceived diving and snorkeling to be more harmful than other groups (Table 3).

(Wind)surfing

Surfing and/or windsurfing may have similar impacts to swimming. The use of equipment may also disturb wildlife. Beaches may be also adversely affected, as access is required to get to many surfing spots, including its supporting facilities (Bird 1993). Where no parking is provided, surfers arriving by car can trample vegetation and destabilize foredunes by parking. The effect is likely to be more severe from windsurfing as larger spaces are required per individual to set up

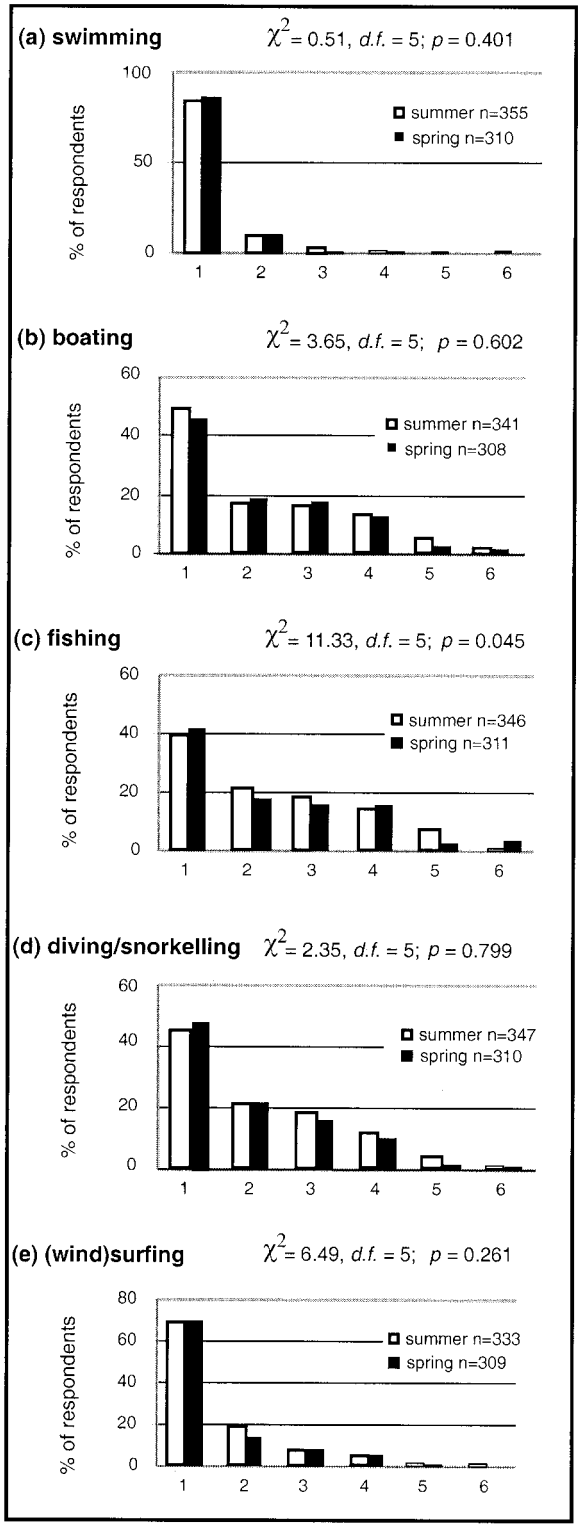

Figure 3. Perceptions of environmental harm associated with marine-based activities in summer and spring and chi-square test results, where 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful and 6 = extremely harmful.

equipment. On this basis, (wind)surfing was considered "moderately harmful."

The average response was that (wind)surfing is "harmless" (Table 2; mean = 1.54). Overall, 69.3% of visitors responded that (wind)surfing is completely "harmless" (Figure 3e). Kruskal-Wallis tests suggested gender, age, level of education, and the origin of visitors affected perceptions (Table 3). Females (mean = 1.67), visitors younger than 35 years (mean = 1.75), those with university education (mean = 1.69), and visitors from overseas (mean = 2.09) perceived (wind)-surfing as more harmful than other groups (Table 3).

Sandboarding

Sandboarding is similar to snowboarding except it requires steep, tall sand dunes preferably devoid of vegetation. Sandboarding impacts mainly by scarring vegetated dunes thereby increasing a dune's susceptibility to wind erosion. Sandboarding on bare dunes prevents plant growth, thereby maintaining the dune in an unstable form. An individual may destroy a whole strip of vegetation on a dune slope in a short period of time. Hence, in most areas of Western Australia sandboarding is prohibited. The biophysical impact of sandboarding has not been documented; however, observation suggests it is "very harmful."

Visitors had significantly different perceptions of harm associated with sandboarding (Figure 4a; $P < 0.05$). The average (combined seasons) perception of sandboarding was that it is "moderately harmful" (Table 2; mean = 3.46). Visitors in spring perceived sandboarding as more harmful. For example, 27.9% of summer visitors thought sandboarding was "harmless" compared to 18.6% in spring (Figure 4a). Participation in sandboarding affected perceptions ($P < 0.001$) and those who went sandboarding thought sandboarding was less harmful (Table 2; mean = 2.35 > 3.61). Kruskal-Wallis tests showed visitor age, education, and origin affected perceptions (Table 4). Visitors over 56 years (mean = 4.04), those with university education (mean = 3.73), and visitors from interstate Australia (mean = 4.13) perceived sandboarding to be more harmful.

Four-Wheel Driving

Four-wheel driving in coastal areas has been associated with a range of negative impacts, particularly if individuals do not travel on established tracks. Negative impacts include air and noise pollution, fuel leakage, crushing of vegetation, destabilization of the landscape, aeolian erosion, and spread of noxious weeds (Majer 1980, Gilbertson 1983, Lonsdale and Lane 1994). It also disturbs wildlife. Even low-level four-wheel driving

Table 3. Kruskal-Wallis test results (combined seasons) for the effect of demographic factors on perceptions for marine-based activities[a]

Activity	K-W test	*df*	*P*	Male	Female
Swimming	3.8	1	0.51	1.17	1.33
Boating	6.81	1	0.009	2.02	2.32
Fishing	1.41	1	0.235	2.26	2.44
Diving/snorkelling	3.4	1	0.065	1.97	2.14
(Wind)surfing	8.66	1	0.003	1.44	1.67

	K-W test	*df*	*P*	15–35 years	36–55 years	> 56 years
Swimming	19.33	4	0.001	1.33	1.2	1.14
Boating	52.08	4	< 0.001	2.52	1.97	1.77
Fishing	57.79	4	< 0.001	2.78	2.08	1.91
Diving/snorkelling	23.64	4	< 0.001	2.25	1.86	1.99
(Wind)surfing	29.54	4	< 0.001	1.75	1.42	1.37

	K-W test	*df*	*P*	Secondary	Technical/trade	University
Swimming	7.39	2	0.025	1.19	1.23	1.29
Boating	18.01	2	< 0.001	1.98	2.02	2.38
Fishing	31.67	2	< 0.001	2.06	2.18	2.67
Diving/snorkelling	20.32	2	< 0.001	1.86	2.05	2.26
(Wind)surfing	15.18	2	0.001	1.43	1.5	1.69

	K-W test	*df*	*P*	Perth	Western Australia	Interstate	Overseas
Swimming	29.51	3	< 0.001	1.13	1.14	1.27	1.57
Boating	23.87	3	< 0.001	2.03	1.86	2.2	2.65
Fishing	41.02	3	< 0.001	2.17	1.85	2.47	3.01
Diving/snorkelling	22.71	3	< 0.001	1.95	1.76	2.18	2.44
(Wind)surfing	41.41	3	< 0.001	1.41	1.44	1.46	2.09

	K-W test	*df*	*P*	Low <$25K	Medium $26–55K	High $56–75K	Very high >$75K
Swimming	5.1	3	0.165	1.23	1.29	1.17	1.26
Boating	2.73	3	0.435	2.22	2.19	2.07	2.06
Fishing	4.86	3	0.183	2.44	2.36	2.12	2.39
Diving/snorkelling	3.26	3	0.353	2.11	2.08	1.87	2.18
(Wind)surfing	2.67	3	0.445	1.54	1.6	1.46	1.6

[a]Individual demographic factors represent arithmetic mean perceptions; where 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful, 6 = extremely harmful.

can be damaging (Godfrey and Godfrey 1980, Anders and Leatherman 1987, Rickard and others 1994). Repetitive use prevents the natural environment from recovering, and over time dunes may be totally destabilized. On this basis, four-wheel driving is "extremely harmful." Indeed, it is one of the foremost coastal management problems in the Central Coast Region (Priskin 2001, 2003).

Visitors had significantly different perceptions about impacts of four-wheel driving (Figure 4b; $P < 0.001$). The average perception (combined seasons) was that four-wheel driving was "harmful" (Table 2; mean = 4.27). Visitors in the spring perceived four-wheel driving as more harmful. For example, 12.4% of summer visitors thought four-wheel driving was "harmless" compared to 5.4% in spring (Figure 4b). Participation in the activity affected perceptions ($P < 0.001$), and those who engaged in four-wheel driving perceived it to be less harmful (Table 2; mean = 3.54 < 4.59). Overall, four-wheel driving was perceived as the most harmful land-based activity and nature-based activity (Table 2). Kruskal-Wallis tests (combined seasons) indicated that visitor age, education, origin, as well as income group affected perceptions (Table 4). Visitors over 56 years (mean = 4.64), those with university education (mean = 4.54), visitors from interstate Australia (mean = 4.66), and those in the medium income group (mean = 4.45) perceived four-wheel driving as more harmful than other groups (Table 4).

Camping

Impacts of camping include soil compaction, loss of organic material, trampling, erosion, lighting of fires, littering, disposal of waste (biological and

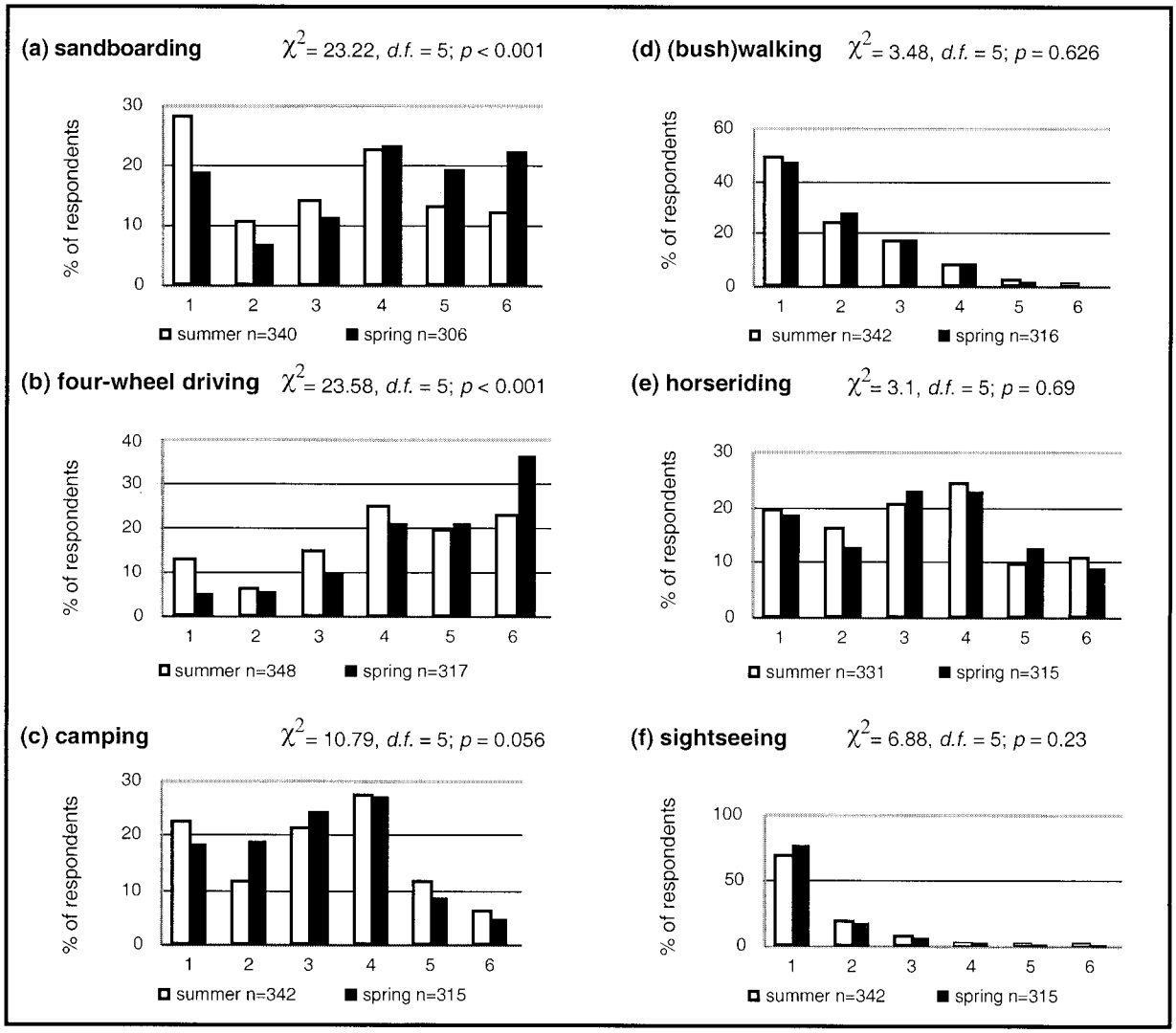

Figure 4. Perceptions of environmental harm associated with terrestrial-based activities in summer and spring and chi-square test results, where 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful and 6 = extremely harmful.

chemical), reduction of visual amenity and introduction of exotic species (Hockings and Twyford 1997, Hammitt and Cole 1998, Gajda and others 2000, Newsome and others 2002b). Even in controlled situations, camping in natural areas can disturb wildlife and, with the combination of overall impacts, it may be highly disturbing to ecosystems. On this basis camping was considered as "very harmful." Legislation in Western Australia prevents ad hoc camping if there is a designated campsite within 50 km. However, the fine for ad hoc camping is clearly not enough to deter it. Such camping is a management issue in the Central Coast Region, where dune swales provide sheltered campsites.

The average perception of camping was that it is "moderately harmful" (Table 2; mean = 3.05), although perceptions were well mixed (Figure 4c). Visitors who camped during their trip perceived it less harmful than visitors who did not camp (Table 2; mean = 2.94 > 3.16). Kruskal-Wallis tests showed visitor education and origin affected perceptions (Table 4). Visitors with university education (mean = 3.33) and visitors from overseas (mean = 3.22) perceived camping to be more harmful than other groups (Table 4).

(Bush)walking

The impact of hiking, walking, trekking or (bush)-walking is well documented (Liddle 1975, Hylgaard and

Table 4. Kruskal-Wallis test results (combined seasons) for effect of demographic factors on perceptions for terrestrial-based activities[a]

Activity	K-W test	*df*	*P*	Male	Female
Sandboarding	2.45	1	0.117	3.38	3.62
Four-wheel driving	0.4	1	0.53	4.22	4.33
Camping	2.52	1	0.113	3	3.14
(Bush)walking	0.71	1	0.79	1.89	1.94
Horseriding	1.21	1	0.271	3.3	3.16
Sightseeing	0.34	1	0.562	1.49	1.46

	K-W test	*df*	*P*	15–35 years	36–55 years	> 56 years
Sandboarding	29.04	4	< 0.001	3.14	3.46	4.04
Four-wheel driving	24.53	4	< 0.001	4.11	4.15	4.64
Camping	2.90	4	0.575	3.11	3.14	2.92
(Bush)walking	31.4	4	< 0.001	2.17	1.77	1.7
Horseriding	7.54	4	0.11	3.11	3.15	3.45
Sightseeing	18.64	4	0.001	1.64	1.42	1.29

	K-W test	*df*	*P*	Secondary	Technical/trade	University
Sandboarding	6.58	2	0.037	3.34	3.33	3.73
Four-wheel driving	7.59	2	0.023	4.16	4.09	4.54
Camping	17.92	2	< 0.001	2.84	2.97	3.33
(Bush)walking	26.39	2	< 0.001	1.74	1.88	2.11
Horseriding	3.66	2	0.161	3.09	3.28	3.32
Sightseeing	26.01	2	< 0.001	1.31	1.47	1.64

	K-W test	*df*	*P*	Perth	Western Australia	Interstate Australia	Overseas
Sandboarding	22.94	3	< 0.001	3.48	2.93	4.13	3.35
Four-wheel driving	10.41	3	0.015	4.18	3.98	4.66	4.41
Camping	11.2	3	0.011	3.1	2.59	3.1	3.22
(Bush)walking	24.5	3	< 0.001	1.81	1.7	2.05	2.24
Horseriding	32.9	3	< 0.001	3.23	3.23	3.82	2.64
Sightseeing	25.86	3	< 0.001	1.38	1.38	1.53	1.78

	K-W test	*df*	*P*	Low <$25K	Medium $26–55K	High $56–75K	Very high >$75K
Sandboarding	6.58	3	0.087	3.59	3.55	3.14	3.2
Four-wheel driving	8.17	3	0.043	4.17	4.45	4.2	3.85
Camping	0.86	3	0.835	2.98	3.1	3.13	3.09
(Bush)walking	4.11	3	0.25	1.91	2.02	1.84	1.75
Horseriding	3.5	3	0.32	3.29	3.25	3.19	2.88
Sightseeing	11.44	3	0.01	1.36	1.6	1.47	1.55

[a]Individual demographic factors represent arithmetic mean perceptions; where 1 = harmless, 2 = slightly harmful, 3 = moderately harmful, 4 = harmful, 5 = very harmful, 6 = extremely harmful.

Liddle 1981, McDonnell 1981, Kuss and Hall 1991, Cole 1995a, 1995b, Gallet and Roze 2001). Impacts include littering, soil compaction, reduced nutrients flows, reduced vegetation cover, spreading of noxious weeds and decline of vegetation communities near paths. In sandy coastal areas without any supporting facilities, impacts may be more severe, due to displacement of stabilising foredune vegetation (Andersen 1995, Kutiel and others 1999) and destruction of animal burrows and bird nests (Edington and Edington 1986, Burger 1995, Barros 2001). Hence, (bush)walking is "moderately harmful."

The average perception was that (bush)walking is "harmless" (Table 2; mean = 1.91). Overall, 47.7% of respondents indicated (bush)walking to be 'harmless' (Figure 4d). Participants perceived it as slightly more harmful than nonparticipants (Table 2; mean = 1.92 > 1.89). Kruskal–Wallis tests showed perceptions were influenced by visitor age, level of education, and origin (Table 4). Those younger than 35 years (mean = 2.17), tourists with university education (mean = 2.11), and visitors from overseas (mean = 2.24) perceived (bush)walking more harmful than the average, as well as other groups (Table 4).

Horseriding

Horseriding is highly impacting due to the magnitude of trampling caused by hoofs. In coastal areas vegetation loss can contribute to destabilization of sand dunes and erosion. Additionally, there is high risk associated with fecal material spreading noxious weeds and diseases (Buckley and Pannell 1990, Deluca and others 1998, Newsome and others 2002a). Horseriding could also contribute to the loss of biodiversity in an area. On this basis horseriding was considered a "harmful" activity.

The average perception of horseriding was that it is "moderately harmful" (Table 2; mean = 3.2), although perceptions were well mixed (Figure 4e). Those who went horseriding perceived it to be more harmful than nonparticipants (Table 2; mean = 3.26 > 3.23). Kruskal-Wallis tests showed perceptions were affected only by the origin of visitors. Interstate visitors (Table 4; mean = 3.82) perceived horseriding to be more harmful than other groups.

Sightseeing

Sightseeing is a passive, visual activity that involves appreciation of landscapes, and it is often difficult to separate it from other activities. It is the only activity in this research that does not have direct biophysical impacts. However, its secondary or indirect impacts in natural settings can be a source of disturbance (Edington and Edington 1986, Walker 1991). In undeveloped coastal areas such as the Central Coast Region, the lack of access and other facilities make sightseeing potentially harmful, because it means visitors explore new areas, thereby spatially diffusing impacts (Cole 1994). Thus, sightseeing can be associated with the direct impacts of four-wheel driving, bushwalking, and camping (Hercock 1999). In this context sightseeing was considered as moderately harmful.

The average perception of sightseeing was that it is harmless (Table 2; mean = 1.47) as indicated by 72.1% of respondents (Figure 4f). Visitors who went sightseeing perceived it more harmful than visitors who did not (Table 2; mean = 1.71 > 1.4). Kruskal-Wallis tests showed visitor age, education, origin, and income group affected perceptions (Table 4). Visitors younger than 35 years (mean = 1.64), university educated (mean = 1.64), overseas visitors (mean = 1.78), and visitors with medium income (mean = 1.6) perceived sightseeing more harmful than other groups (Table 4).

Discussion and Conclusions

The results indicate that nature-based tourists are aware of environmental impacts associated with individual activities, although to variable extents. This suggests visitor impact management strategies could be implemented in the study area and individuals may show positive response towards them. Overall, visitors perceived each activity to be less harmful than definitions by the author. This disparity is difficult to substantiate given the difficulties in measuring environmental impacts of individual activities and the limited knowledge of some activities in particular. Generally, the results point to requirements in further visitor education about the potential impacts associated with recreation activities in natural settings.

Visitors participated in different activities in different seasons (Table 1). Comparison of overall ranks from least to most harmful activity shows slight differences only (Table 2). Overall, perceptions were not significantly ($P < 0.05$) affected by participation in an activity except for fishing, sandboarding, and four-wheel driving (Table 2). Comparison of average perceptions showed those who participated in (bush)walking, horseriding, and sightseeing ranked these as more harmful activities than those who were nonparticipants (Table 2). Since these are activities that were perceived differently by participants and nonparticipants, these results indicate the need for continued visitor education.

Seasonality did not significantly (Table 1; $P \geq 0.05$) affect perceptions of impacts except for fishing, sandboarding, and four-wheel driving (Figure 34). This occurred even though visitors had significantly different demographic profiles in each season (Figure 2; $P \leq 0.001$) except for level of education. However, associations were found between perceptions and demographic factors (Tables 3 and 4). Kruskal-Wallis tests showed that the origin of visitors affected perceptions of all activities, while education and age affected perceptions the most. Gender and the income group of visitors had the least influence on perceptions overall.

Gender affected visitor perceptions of boating and (wind)surfing (Table 3). With the exception of sightseeing and horseriding, on average females perceived all other activities to be more harmful than males (Table 3 and 4).

Visitors in the summer were younger and 51.9% were less than 35 years old compared to 27.6% in the spring in the same age category (Figure 2b). Age influenced perceptions of all activities except camping and horseriding (Table 3 and 4). Arithmetic mean values showed visitors younger than 35 years perceived most activities as more harmful than older groups, except for sandboarding, four-wheel driving, camping, and horseriding (Table 3 and 4). The awareness of younger people may be related to an increase in environmental

education as well as exposure to a range of media, including the Internet. The media can play a significant role in shaping tourist behavior and raising awareness of issues. Perceptions could be influenced indirectly without this being the real purpose (Swarbrooke 1999). For example, certain television programs, guidebooks, and magazines encourage tourists to visit places off the beaten track. The implications are that negative impacts of tourism are spread to new areas. Wildlife programs in particular may contribute to an upsurge in demand for destinations set in fragile ecosystems (Swarbrooke 1999).

Older age groups (56 years and over) perceived only sandboarding and four-wheel driving more harmful than other age groups. Older people may have more experience with four-wheel driving, as they are more likely to afford a four-wheel drive vehicle compared to younger individuals. In Australia it is common for retirees to purchase a four-wheel drive vehicle to make the traditional around Australia trip. This generally also entails the purchase of a caravan (or RV) for comfortable travel. These groups may be members of four-wheel drive clubs, many of which promote environmentally friendly four-wheel driving through campaigns such as *Tread Lightly*.

Higher levels of education have been previously linked to higher environmental awareness (Lothian 2002). Education affected perceptions of harm for all activities except horseriding (Tables 3 and 4). University-educated individuals perceived impacts from all activities to be more harmful than other groups. Visitors with technical or trade qualifications perceived all activities to be more harmful than individuals with secondary education only, with the exception of sandboarding and four-wheel driving (Table 4).

The origin of visitors was different in summer and spring, although Western Australians constituted the majority in both seasons (Figure 2d). Visitor origin affected perceptions of all activities (Tables 3 and 4). Overseas visitors perceived all activities to be more harmful than other groups, except for sandboarding, four-wheel driving, and horseriding. Interstate visitors perceived activities to be more harmful than Western Australians, except for camping. Generally, visitors from regional Western Australia perceived the least harm caused by recreation. These results indicate a requirement for more environmental education for Western Australians. This is particularly important, as domestic tourism is the most important segment of the tourism industry in the state, constituting about 70% of all tourism (Western Australian Tourism Commission 2000). Additionally, few tourist attractions in the Central Coast Region have environmentally educational information. It is only provided in display boards and in pamphlets. Visitor education may need to be extended in form, as well as to local residents. In many cases local people may be equally or more responsible for environmental impacts than tourists. This needs verification through research. Perceptions of residents and tourists in an area tend to differ about impact and tourism in general. A study on the Greek coast found tourists perceived themselves (as a group) less responsible for negative environmental impacts from tourism than entrepreneurs or local residents (Kavallinis and Pizam 1994). A study in the Gascoyne Region of Western Australia found resident and visitor attitudes to be similar, and both viewed tourism as environmentally harmful. However, both groups ranked tourism more compatible with the environment than other land uses such as pastoralism, fishing and mining (Dowling 1993).

Personal income of visitors varied seasonally, with more spring visitors being in the low-income category, and more summer visitors in the high-income groups (Figure 2e). The income of visitors did not affect perceptions except for four-wheel driving and sightseeing (Tables 3 and 4). Comparison of mean perception values show visitors from low- or medium-income groups perceived most activities to be more harmful than visitors from higher income groups.

This research found average perceptions close to those defined by the author on the basis of recreation ecology literature (Table 2). Attitudes are a good indication of environmental awareness. However, for every activity, there were visitors who ranked even highly impacting activities as completely harmless. Although this group was a minority, it is potentially this group that may require more education about impacts from recreation in natural areas. It may also be this group that ignore signs, rules, and codes of conduct.

This survey was administered to visitors in a natural setting, and it revealed differences between visitors. It would be worthwhile to test similar environmental attitudes in an urban or seminatural setting and in other regions. Results could be also be compared to perceptions of those responsible for visitor resource management. Continued research on perception is needed as attitudes vary across cultures through time and space (Lothian 1994, 2002).

Although this research showed that visitors were generally aware of impacts associated with their activities, it does not mean that they will act in accordance with their opinions. Tourists may say that four-wheel driving is highly harmful, but that perception does not necessarily equate to responsible behavior. Available evidence indicates that often little relationship exists between verbal behavior or attitude and overt behavior

or action of a person (Mitchell 1989, Mihalic 2000). While this may not be the case with all tourists, it is certainly the case with some. Evidence to support this comes from declining environmental conditions in the Central Coast Region from four-wheel drive related recreation including fishing, boating and camping (Priskin 2001, 2003).

Tourists who are interested in learning about nature may be those who are already the most knowledgeable (Blamey 1995). Those who take most notice of tourist codes of behavior are those who probably need it least. Individuals with high levels of environmental concern tend to have greater interests in the environment, hence are more likely to be interested in learning about nature. Those who are more concerned about human impacts on the environment are likely to be more aware of and concerned about the environmental impacts of tourism. Individuals who are concerned about environmental matters are more likely to monitor their own impacts and seek environmentally friendly tourist activities. However, high levels of environmental concern among ecotourists were not matched by a high level of awareness about actual ways that holidays impact on the environment (Blamey 1995). Nature-based tourists and ecotourists have a greater tendency to be involved in matters pertaining to the environment such as belonging to a conservation group (Blamey 1995, p 114).

Attitudinal information of nature-based tourists in the Central Coast Region may prove useful to local government authorities and natural resources managers for formulation of local visitor management strategies. Tourist perception information has been used elsewhere to help formulate plans and policies for coastal areas heavily used for tourism and recreation (Cofer-Shabica and others 1990, Morgan and others 1993). In particular, information could be useful for formulating specific visitor education strategies for certain activities that are highly impacting, such as sandboarding, four-wheel driving, fishing, and camping. Indeed, several of these activities were perceived significantly differently between seasons as well as between participants and nonparticipants. Apart from highlighting differences in perceptions, the results suggest possible confusion or lack of understanding among visitors about the impacts. The Central Coast Region urgently needs visitor management strategies, especially locally relevant guidelines. Nature-based tourism is increasing and is projected to increase in the region upon completion of the coastal highway. Without the incorporation of education in the management of the region's resources, management will remain reactionary. Managers will seldom be able to get beyond treating symptoms to deal with the cause of problems (Hammitt and Cole 1998). Education is the basic foundation on which to build a complete management program. As tourism will increase to the area, further research needs to be completed. Levels of degradation need to be monitored and managed in a framework and social research needs to assess visitor satisfaction and acceptability of resource conditions and use characteristics of nature-based tourism resources. The perception of resource managers and visitors also needs to be compared and monitored over time.

Visitor perceptions may be useful for implementing appropriate visitor management strategies. The variability in visitor perception indicates variability of acceptance of management strategies for each activity and the need for visitor education, preferably through appropriate visitor interpretation in the Central Coast Region.

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