Establishing tourism guidelines for viewing Australian Sea Lions *Neophoca cinerea* at Seal Bay Conservation Park, South Australia

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ABSTRACT

The establishment of approach distances between wildlife and tourists is a useful tool for resource managers involved with wildlife tourism. Such guidelines are especially beneficial at locations with high tourism activity and potentially dangerous wildlife, but need to be based on research to ensure an evidence-based balance between tourist experience and wildlife protection. At Seal Bay Conservation Park (SBCP), large numbers (>100,000 annually) of tourists regularly interact with a breeding colony of Australian sea lions *Neophoca cinerea*, which has been listed as threatened under the EPBC Act. To determine guidelines for approach distances we experimentally subjected individuals and groups of sea lions to approaches by 1 to 10 pedestrians to measure the distance at which the animals reacted and the type of behaviour displayed during that reaction. These trials were carried out on both the beach where tourists are allowed access with guides, as well as in areas that are usually undisturbed by human activity. At the current recommended minimum approach distance of 6 m, 28% of sea lions on the tourist beach and 51% of sea lions in other areas exhibited a change in behaviour and some displayed aggressive behaviour. Based on these results, we recommend that SBCP managers increase the approach distance to 10 m.

Key words: marine mammal, *Neophoca cinerea*, controlled approaches, wildlife tourism, human disturbance

Introduction

Human disturbances are widely recognised as the primary cause of most of the population declines and extinctions of non-human species. Conspicuous examples of these disturbances include climate change, water pollution and vegetation clearing. Other more subtle human activities, however, may also have adverse consequences for the behaviour, welfare, and possibly even survival of individual animals or species. Such is the case with wildlife tourism, which can have benefits for animals, their habitat, and the local community, but it also has the potential for negative impacts, such as risk to tourists, habitat modification or loss, and/or the alteration of behaviours essential for maintenance, fitness, and survival.

Natural resource managers who are involved with wildlife tourism may use minimum approach distances, also called set-back distances, to minimise disturbance to the animals of interest and provide a safety boundary to decrease the likelihood of aggressive acts toward tourists. Ideally, these distances should be established empirically. Often, however, minimum approach distances are nonexistent or based on anecdotal information, due largely to a lack of resources to empirically establish such boundaries. The latter is the case at Seal Bay Conservation Park (SBCP) on Kangaroo Island in South Australia, where more than 110,000 tourists a year view a colony of Australian sea lions *Neophoca cinerea*, a species listed as threatened under the Commonwealth's EPBC Act (Fig.1).

Figure 1. Tour group on the Main Beach at Seal Bay Conservation Park observing sea lions.

Pp 225 - 232 in *Too close for comfort: contentious issues in human-wildlife encounters,* edited by Daniel Lunney, Adam Munn and Will Meikle. 2008. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

A variety of effects of human disturbance on pinniped species have been documented in other studies. Some have measured an increase in vigilance (Boren *et al.* 2002; Engelhard *et al.* 2002; Orsini 2004), which may effectively reduce the vital haul-out resting and recovery period. Alterations of maternal behaviour, such as reduced attending and suckling time, as well as increased aggressiveness toward pups have also been observed (Kovacs and Innes 1990). While females of some species were found to exhibit an elevated level of pup protection in areas of high disturbance, this was coupled with an associated increase in aggression directed at tourists (Constantine 1999). Human recreational beach activities have caused some species to relocate hauling out and breeding to suboptimal sites, which ultimately led to population declines (Gerrodette and Gilmartin 1990; Johnson and Lavigne 1999). Orsini (2004) evaluated the responses of *N. cinerea* in Western Australia to pedestrian approach and reported increased levels of vigilance at all distances from tourists, <2.5 m to >15 m. However, Boren *et al.* (2002) found that another species of otarid responded variably to approaches depending on location, which suggests the need to collect colony-specific data for this family when quantifying disturbance impacts.

Determining minimum approach distances for tourists viewing sea lions has been identified as a research and management recommendation in The Action Plan for Australian Seals (Shaugnhnessy 1999). Current National Parks and Wildlife South Australia (NPWSA) guidelines at SBCP require tour groups to remain at least 6 m from sea lions, and that groups include no more than 50 people. These guidelines were based solely on the experience of SBCP rangers. They should be re-evaluated, however, based on empirical evidence so that sea lions are mostly engaging in typical, non-disturbed behaviours. To facilitate this, we conducted controlled approach experiments to evaluate the distance at which sea lions become aware of pedestrian activity and to examine the effect that varying numbers of people in a group have on sea lion response distance and response type.

Methods

This study was conducted in three areas within the boundaries of Seal Bay Conservation Park (36° S, 137° 20'E) located on the southern side of Kangaroo Island, South Australia. These sites were chosen so that we could compare reaction distances and behaviours of sea lions between an area with frequent human activity, the Main Beach (MB), and areas with little to no human activity, the Western Protected Area (WPA) and Old Road (Figs. 2-4). All areas are situated within a system of sand dunes. The WPA beach is flanked by a cliff on the northern side, approximately 20 m high, that sea lions easily and frequently climb to reach the dunes. Density of sea lions has been observed to average 0.050 animals/linear metre on the WPA during breeding seasons, and 0.025 animals/linear metre outside of breeding seasons; on the MB, density was 0.090 animals/linear metre during pupping and 0.074 animals/linear metre during non-breeding seasons (Lovasz, unpublished data). It is unknown how often or even if individual sea lions move between these different areas.

Fieldwork was carried out during one breeding season (November 2004) and one non-breeding season (May 2005) to investigate if breeding status affected sensitivity to human activity. To examine if differences in size of a tour group had an effect on reaction distance or category

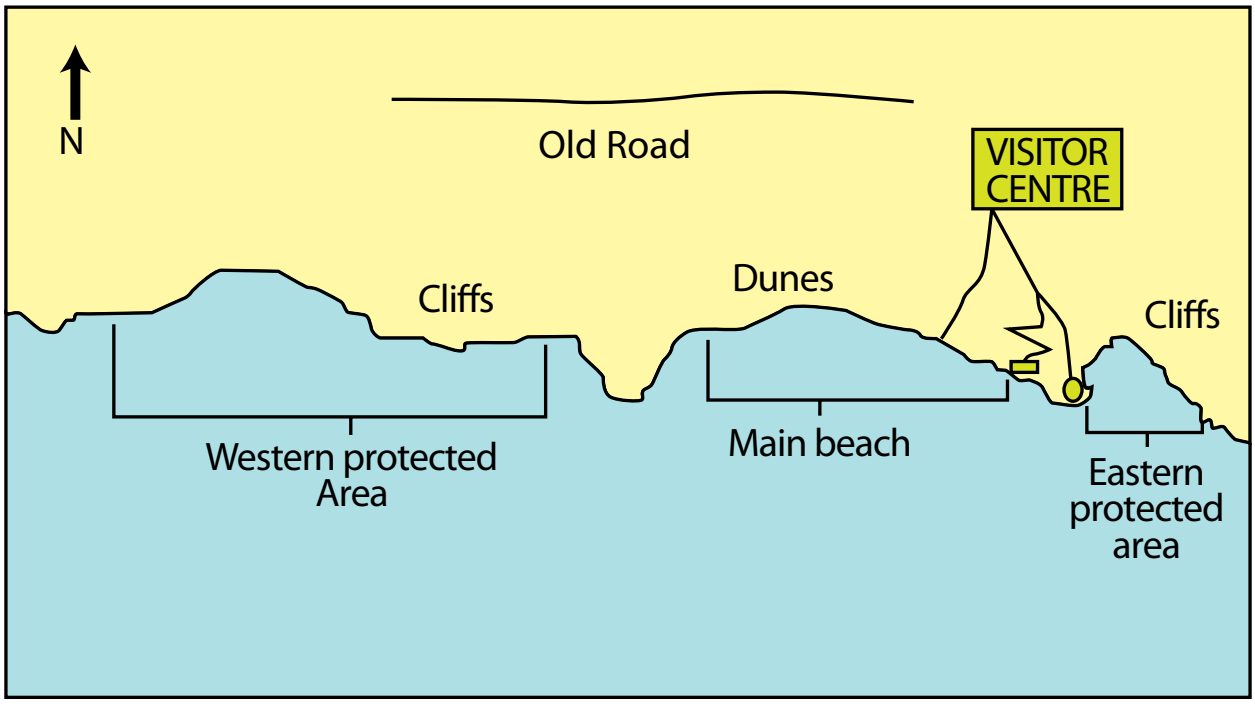

Figure 2 Map of Seal Bay Conservation Park.

Figure 3 The Main Beach, as seen from the lookout at the eastern end of the beach. The walkway providing visitor access to the beach can be seen in the upper right; at bottom is the boardwalk, from which visitors can view the eastern end of the beach.

Figure 4 Old Road behind Main Beach, looking east.

of response (listed in Table 1), approach group sizes were experimentally varied, using groups of one, three, four, five, eight, or ten volunteer people. Volunteers included Seal Bay staff and administrators, members of the Kangaroo Island community, and university students with Biological Sciences backgrounds. During the sampling sessions of this study, MB was open to tour groups throughout the day from 0900 to 1700, with fluctuating numbers of people (ranging from 0 to 125) on the beach during those times.

Table 1. Response categories for controlled approaches (adapted from Boren *et al.* 2002)

Response category	Definition
Neutral	No change in behaviour
Change	Altered behaviour from pre-approach state, including opening eyes, lifting head, etc
Interact	Non-aggressive movement toward approaching group
Avoid	Movement away from approaching group
Aggression	Vocalising, opening mouth, lunging head, shaking head, or charging toward approaching group

At the start of each sampling session, date, temperature, and wind direction and speed were recorded by a WX-918 weather station (Dick Smith Electronics) at the Seal Bay visitors' centre. Approaches were carried out between the hours of 0930 and 1800 during mild weather conditions (no precipitation, wind <30 km/h, and temperatures between 14.5 and 21.5° C). Experiments were performed at each site from one to four times per day, with a minimum of one hour between experimental approaches at any site. Any sea lion that was accessible to approach without danger to researchers or animals and had not been within 10 m or 10 minutes of a previous approach or tourist disturbance was available to be selected as the focal animal. Only animals in sandy areas with no vegetation were selected to control for variances in sounds made by pedestrian footfalls on different surfaces. There were no visual impediments on the approach paths that were taken. During approaches, group members wore tan-coloured pants and shirts, similar to the uniform worn by National Parks and Wildlife South Australia tour guides, to reduce variation in visual stimuli (Fig. 5).

Figure 5 Controlled approach group walking toward a group of sea lions (photo courtesy Andrea Kunnemann).

Immediately before each replicate approach, the site, general description of location on beach with regard to landmarks, sex /age class (Table 2), and starting behaviour (Table 3) of the focal animal were recorded. The group then walked directly toward the focal sea lion at a constant pace of 0.5-1.0 m/s, starting at a distance of 25-30 m from the animal. During the approach, one group member at a time

Table 2. Age/sex class descriptions for *N. cinerea*

Class	Description
Adult male	Dark brown with white to yellow mane
Adult female	Two-toned pelage, darker dorsally and lighter ventrally
Subadult male	Large male, dark pelage, but with no mane
Juvenile male	Large male with grey pelage and spotted chest
Juvenile	Two-toned pelage, but smaller than adults
Pup	Have moulted natal pelage; grey to tan pelage
Brown pup	In natal (brown to black) pelage

spoke in normal conversational tones. The distance at which the focal animal first responded to or became aware of being approached by looking at or following the group with their eyes was estimated and recorded along with response behaviour (Table 3). These data were also collected for all neighbouring sea lions within 3 m of the focal animal. If the initial reaction of the focal animal was non-aggressive and occurred when we were more than 2 m away, the approach continued until either a second response was elicited or we were within 2 m of any animal. If the initial reaction was aggression, interaction, or avoidance (see Table 1) and/or occurred within 2 m of the sea lion, the group immediately retreated quietly to at least 25 m away.

Results

A total of 342 approaches were completed. On average, sea lions became vigilant when the approaching group was 6.5 m away. Although mean distance at first reaction did not vary significantly between age-sex classes (single factor ANOVA, $F_{4,252} = 2.19$, $P = 0.07$) (Fig. 6), adult males generally reacted earlier than other groups, at an average distance of 7.7 m. Across all focal animals, sea lions in areas with little human activity (WPA and Old Road) became aware of pedestrian approach at a greater distance than those on the MB (Fig. 7). Sea lions in this colony became vigilant at greater average distances during the non-breeding season than during breeding (Fig. 7). When experimental groups working outside of breeding season had reached the current SBCP recommended minimum approach distance of 6 m, 29.7% (n = 33) of animals on the MB had altered their behaviour, as had 55.6% (n = 20) in the other areas. During breeding season, fewer animals had responded when approaching groups reached 6 m (25.4%, n = 30 on MB, 46.1%, n = 35 for WPA and Old Road combined).

Table 3. Definitions of sea lion behaviours recorded prior to and during controlled approaches

Behaviour	Definition
Eye open	One or both eyes are opened wide enough for observer to see iris
Eye close	Both eyes closed
Lying down	Entire body, including head, is resting on ground or other surface
Head up	Head is lifted so that jawline below posterior of mouth is off ground while remainder of body is resting on ground or other surface
On foreflippers	Body weight is supported by front flippers and posterior skeletal structure; anterior body raised off ground
Grooming	Scratching self with claws, rubbing self with flipper, biting self, rolling on sand, or rubbing body parts together
Head back	Up on foreflippers with head >90° from parallel with ground
Suckling	Pup or juvenile has mouth contacting nipple of an adult female
Being suckled	Adult female with pup or juvenile having mouth contacting nipple
Head lunge	Head moved sharply and quickly toward approaching group or individual, usually with mouth open and head up
Mouth open	Lower jaw dropped away from upper teeth with lips parted so that a space can be clearly seen between the two
Walk	Limb movement propelling locomotion in a forward or backward direction; may involve all four limbs in a lateral sequence of footfalls (LH, LF, RH, RF) or the hind limbs being dragged as forelimbs are moved alternately (RF, LF). Stride interval >0.6 seconds
Gallop	Lateral sequence of footfalls propelling subject forward at a stride interval of ≤0.6 seconds
Vocalise to pup	Made by female; a trilling sound
Vocalise to mum	Made by pup or juvenile; can be trilling sound, usually higher in tone than the call of the female, or a single sustained note
Other vocalisation	Sound made by males, usually aggressive in nature

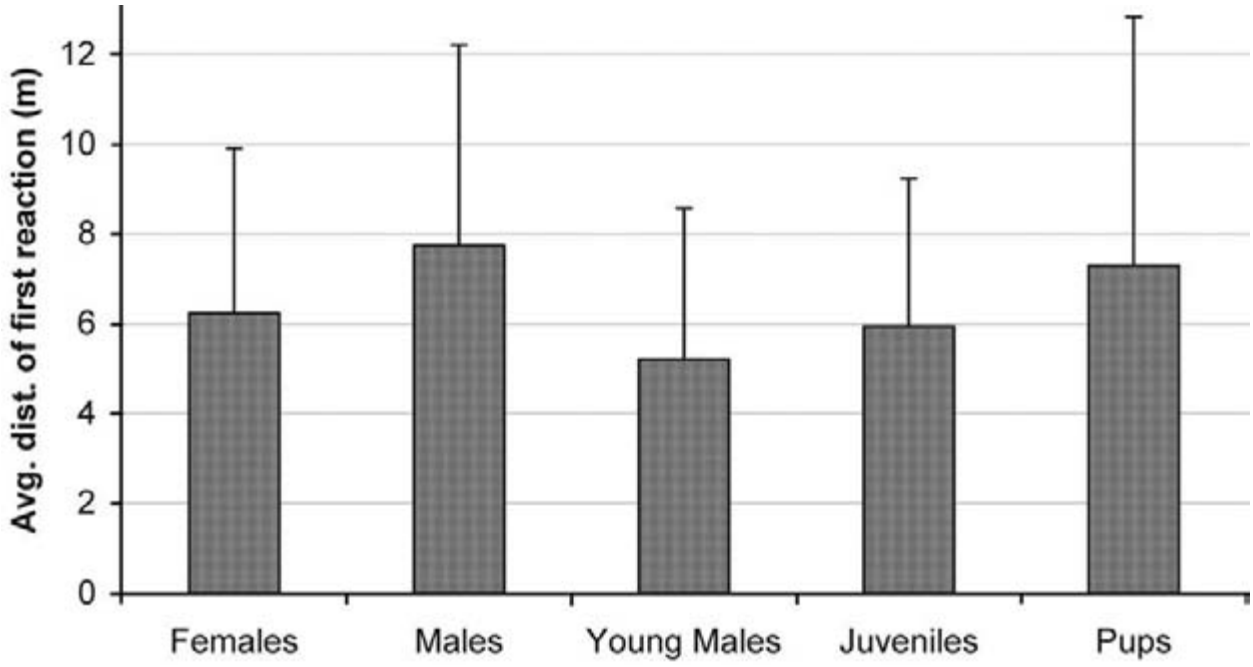

Figure 6 Distance of sea lion initial reactions to human approach by age/sex category for all beaches and breeding seasons combined (n = 257). Shown are means +1 SD.

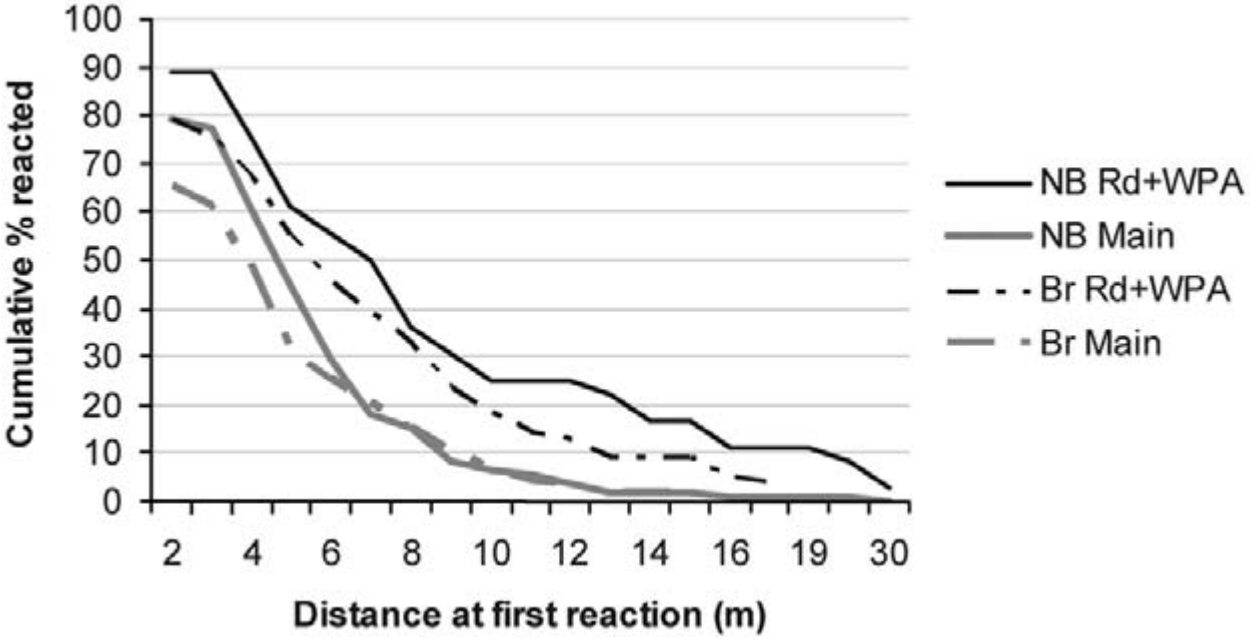

Figure 7 Cumulative percent of distances at which Sea lions first became aware of approach for breeding season (Br) and non-breeding (NB) on the Main Beach (n = 115) and Old Road and WPA combined (Rd+WPA, n = 74).

Adult males during breeding season reacted at significantly greater distance to a single person approaching than to a group (single factor ANOVA, $F_{2,20} = 3.94$, $P = 0.04$) (Fig. 8). The number of people in an approaching group did not significantly affect the distance at which other age-sex classes of sea lions first reacted.

Proportionally fewer sea lions on MB altered their behaviour in response to approach than those in the seldom-disturbed areas (Fig. 9). Most subjects responding to approach displayed the reaction category "change" (Fig. 10), although there were some incidental displays of aggression (Fig. 11) toward the approaching group (by 6.5% of animals responding on MB and 3.3% of reacting animals on WPA). When all beaches and breeding seasons are grouped, the majority (>85%) of sea lions at all approach distances exhibit the reaction category "change". If this category and "neutral" responses are removed to better examine the other reactions, it becomes apparent that distance of approach affected rates of "aggression" inversely with distance, and that rates of "avoidance" increased as approach distance increased (Fig. 12).

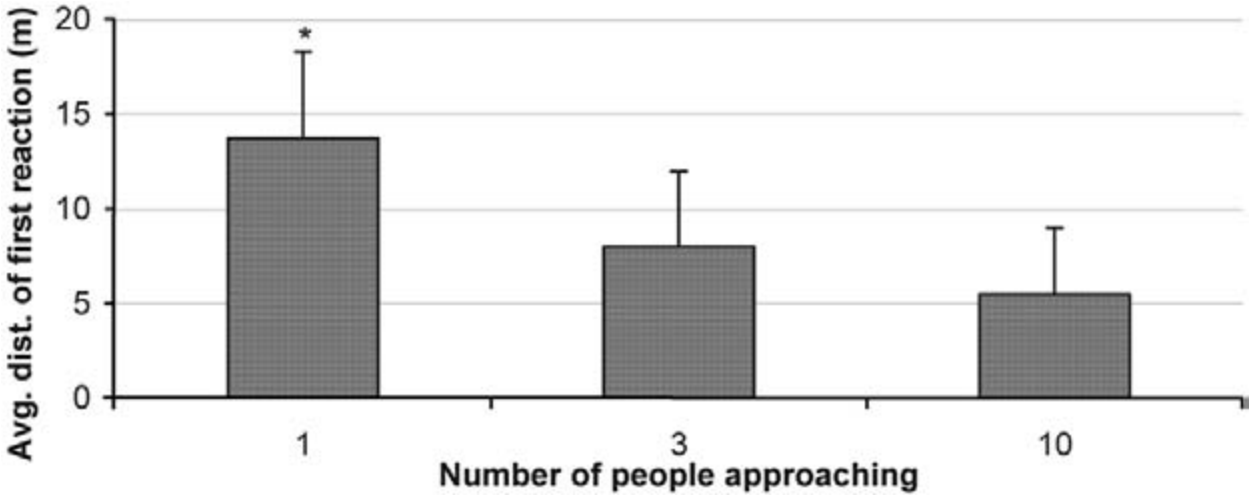

Figure 8 Effect of number of people in group on average distance at which male N.cinerea first became vigilant in response to approach during breeding season (n = 23). Shown are means +1 SD. Asterisk indicates statistical difference ($P < 0.05$).

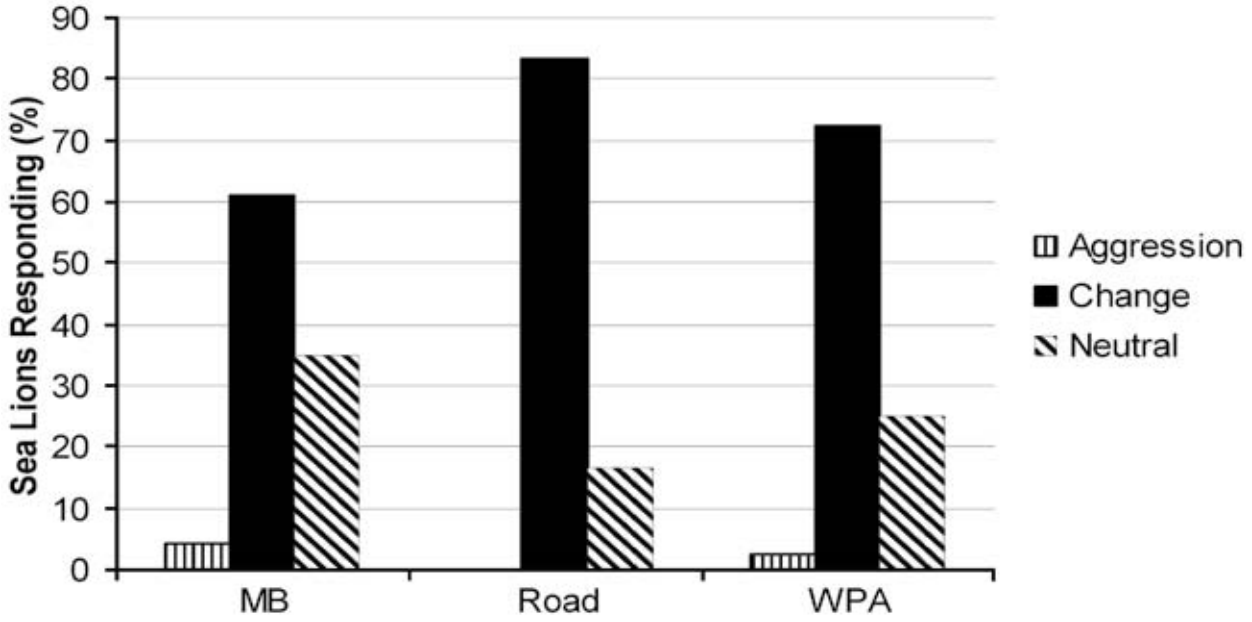

Figure 9. Category of initial sea lion response to approaching groups for Main Beach (MB, n = 118), Road area (RD, n = 36), and Western Protected Area (WPA, n = 40).

Figure 10. Female sea lion on Old Road exhibiting a change in behaviour by looking toward people approaching.

Figure 11. Female sea lion in dune area exhibiting aggression by flaring whiskers and opening mouth toward photographer.

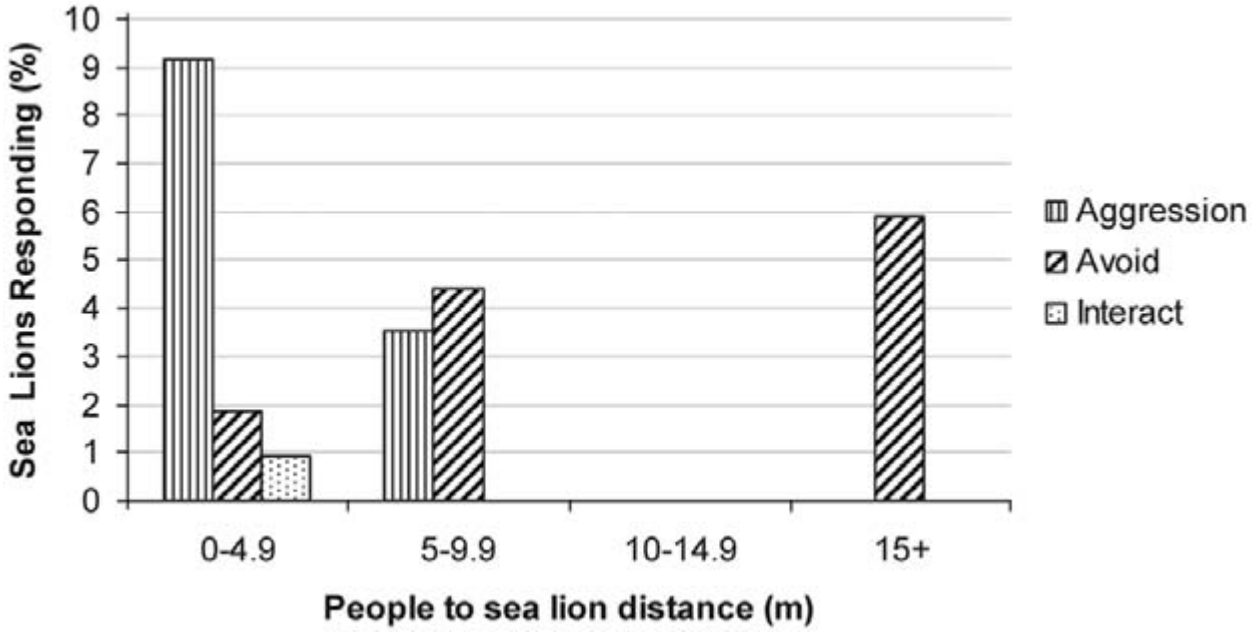

Figure 12. Frequencies of response types in relation to distance between approaching group and sea lions for all areas. Responses of "neutral" and "change" have been eliminated so that differences between these less-frequently occurring behaviours could be more easily seen.

Discussion

This study showed that the most important factors to the distance at which sea lions in this colony responded to approach were location (areas exposed to tourist activity versus control sites) and season. The type of behaviour displayed as animals were approached also depended on location, but equally vital was the distance at which the reaction occurred, with shorter response distances more likely to result in displays of aggression. Variations in the number of people in an approach group affected the distance at which sea lions reacted based on age/sex class of the target animal combined with season.

Increased distance at first reaction on the Main Beach compared to other areas is indicative of tolerance, or the intensity of disturbance that an animal accepts at a given point in time. It can reasonably be inferred, however, that the tolerance on the MB observed in this field study is a reflection of long-term habituation of individual sea lions since the colony has been exposed to tourism for almost 50 years, which is twice the average lifespan of Australian Sea Lions. Habituation, or a reduction in response based on repeated exposure to a stimulus which has neither positive nor negative consequences, has historically been considered a useful adaptation due to the resulting decrease in energy expenditure. The long-term effects of such behavioural modification, however, must be determined. For instance, pup counts of *N. cinerea* at SBCP decreased between 1985 and 2003 (Shaughnessy *et al.* 2006). One cause that has been suggested for this decline is fatal interactions with commercial fisheries, which could be exacerbated through an increase of animals that are habituated.

It is difficult to assess what role the breeding season plays in the distance of first reaction and number of people in an approaching group. This study was carried out during just one breeding season, which occurred during an Austral summer, and one non-breeding season, during the winter. Since the *N. cinerea* pupping interval is 17-18 months, the breeding cycle is non-seasonal. This study would therefore need to be carried out over a several year period to determine if season, breeding status, or a combination of the two factors affect reactions to tourist approaches.

Management recommendations

Acceptable levels of disturbance to animal populations are subjective and have been determined according to a multitude of standards, usually influenced by the interests of the stakeholders involved. For the purposes of establishing minimum approach distances and limits on tourist numbers at SBCP, managers must consider the two key requirements of sustainability at most nature-based tourism sites: 1) maintaining the appeal of the site for tourists and 2) protection of habitat to the extent that fitness of the animals of interest is not adversely affected. With regard to the former, surveys show that the satisfaction of tourists viewing wildlife is inversely related to crowding in the area of interest (Buckley and Pannell 1990), which supports keeping the numbers of tourists and group sizes at their current level. As for the latter, it is recommended that long-term monitoring of the colony for causes of mortality (especially those of non-moulted pups), behavioural changes, and responses to varying aspects of tourist behaviour (e.g., activity level, sitting versus standing while on beach) be undertaken to ensure that guidelines are sustainable for the future.

Given that up to 30% of animals on the MB are responding to human presence at 6 m and that all instances of aggression occurred at less than 10 m, our results suggest that the current set-back distance is unsustainable with regard to the safety of both tourists and Australian Sea Lions. According to the results of this study, expanding the minimum approach distance to 10 m would decrease the percentage of animals responding on the MB to around 6.5%

(6.78% during breeding season, 6.31% outside of breeding). This is comparable to the response of South American Fur Seals *Arctocephalus australis,* which also ceased exhibiting aggressive behaviours and minimised retreats at >10 m approach by tourists (Cassini 2001). Tourists viewing Elephant Seals *Mirounga leonina* (LeBoeuf and Panken 1977 in Kovacs and Innes 1990) and New Zealand Sea Lions *Phocarctos hookeri* (Beentjes 1989 in Constantine 1999) from a distance of 10 m or more eliminated all outward signs of disturbance in those species.

Time ashore is vital for pinniped resting and recovery periods after prolonged foraging trips, as well as breeding and moulting. Disruption of these processes could have detrimental or even fatal consequences while the animals are at sea, and may impact on reproductive success due to altered behavioural patterns. Adjusting the minimum approach distance at SBCP to 10 m would minimise the possibility of adverse disturbance and so assist in the preservation of *N. cinerea* maintenance and survival activities to facilitate the sustainability of tourism at this site.

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