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Short- and long-term changes in the intensity of responses of pinnipeds to tourist approaches in Cabo Polonio, Uruguay

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ABSTRACT

Wildlife watching has become an important constituent of commercial tourism, and opportunities to encounter wildlife have proliferated and diversified. After regular tourist visits to a wildlife population, the intensity of behavioural responses to tourist approaches is expected to change due to diverse mechanisms, including habituation, sensitisation, social learning and population displacement. The village of Cabo Polonio (Uruguay, 34°24′S, 53°46′W) is small, but in summer, there is a massive influx of people, with more than 30 000 tourists entering Cabo Polonio in January alone. The rocky cape of Cabo Polonio is a haul-out site mainly occupied by South American fur seal (*Arctocephalus australis)* males and South American sea lions (*Otaria flavescens)*. No monitoring or guided tours occurred at this continental colony. We examined changes in the intensity of behavioural responses of pinnipeds to tourist approaches at two temporal scales: (i) throughout a season, by comparing results from spring 2014 and summer 2015, and (ii) throughout the years, by comparing data from spring 1996 with those from spring 2014. We found that peopleś attitude and distance of approach influenced the animals' behaviour. The responsiveness of the pinnipeds almost tripled after two decades. We propose that the fence built in 1997 to protect the colony produced a paradoxical effect: instead of reducing the disturbance produced by tourists, it appears to increase it. This decrease in tolerance of tourism throughout the years goes against the argument that animals habituate to human presence after long-term exposure.

1. Introduction

Free-range wild animals can interact with humans in two main ways: (i) they can move to or remain in a location where humans are settled (e.g., by urbanisation); or (ii) they can passively interact with humans as a consequence of ecotourism or nature-based tourism. Both types of interactions involve similar cognitive responses to the same nonthreatening stimulus, i.e., humans (Geffroy et al., 2015). Wildlife watching has become an important part of commercial tourism, and opportunities to encounter wildlife have proliferated and diversified (Knight, 2009; Higham et al., 2008). The relevant aims of wildlife watching are to produce a sustainable economic activity for local people, to collaborate to increase conservation awareness among tourists and to prevent other unsustainable uses of wildlife and their environment. Thus, scientific research assessing short- and long-term responses of wildlife to human approaches is of fundamental importance.

Knight (2009) recognised a contradiction between the search for wildness by tourists and the fact that most 'wild' animals are human-averse and avoid human interactions. If exposure to humans persisted long enough and animal populations evolved their behaviour and stress physiology to address such long-term disturbance, they would probably lose part of their original nature due to domestication processes (Geffroy et al., 2015). However, a certain degree of habituation or tolerance should be desirable because tourist and research activities require some closeness to animals and predictability of wildlife response (Knight, 2009). After regular tourist visits to a wildlife population, the intensity of response shown by its members to tourist approaches is expected to decrease due to multiple mechanisms, including habituation. Animals should show a decrease in response through time, which is normally attributed to a habituation process that occurs when an individual is repeatedly exposed to a stimulus (Thorpe, 1956), to social learning (Higham and Shelton, 2011), or to the most respondent animals having left the area in a way that the remaining population is composed of the most tolerant individuals (Bejder et al., 2006). However, constant exposure to a stimulus may also produce the opposite: an increase in responsiveness due to a process of sensitisation (review by Bejder et al., 2009).

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The Uruguayan village of Cabo Polonio is very small, with approximately 400 'ranchos', simple houses used mostly by tourists as temporary residences, especially during the summer (from December to February). The permanent population is only 95 people occupying 53 ranchos (2011 data published by Uruguayan Institute of Statistics, http://www5.ine.gub.uy), but in summer the influx of people is enormous, with more than 30 000 tourists entering Cabo Polonio in January alone (Cabo Polonio National Park records, pers. com.). The rocky cape of Cabo Polonio is a haul-out site occupied mainly by juvenile, sub-adult and adult males of South American fur seal (*Arctocephalus australis)* and a few individuals of South American sea lion (*Otaria flavescens*) (10% of the individuals of the colony approximately). This aggregation is maintained almost all the year round increasing substantially from November to March due to the exclusion of males from the breeding colonies on the islands located in front of the cape (Vaz Ferreira and Ponce de León, 1984). Reproductive activities of *A. australis* and *O. flavescens* peak in late November and mid-January, respectively (Vaz Ferreira and Ponce de León, 1984). While tourists cannot reach the islands, the rocky continental haul-out is easily accessible and close to the village and the sandy beaches. No vigilance occurs regarding the interactions between tourist and animals, so every person can stay and approach the colony wherever and as long as they desire. In 1997, a wire fence was installed, and since then it has been the only management strategy directed to restrain human access to the colony by setting this limit (Cassini et al., 2004). The fence did not include the complete area where the animals haul out, so there are areas where tourists can still approach the animals unrestrictedly. There were no guided tours or personnel from the National Park who provided information on the colony. In summary, Cabo Polonio's colony is unique because (i) it is the only continental population of *A. australis* in the world (all the others are on islands), and (ii) it is probably one of the only colonies of pinnipeds in the world with easy access and close to a populated beach that does not possess any type of control over tourist behaviour.

In a previous study of this colony, one of us showed that the intensity of pinniped response in 1996 depended mainly upon tourist behaviour and tourist-pinniped distance (Cassini, 2001). In this new study, we also measured these two factors and analysed if their impact on the behaviour of pinnipeds changed with time. Our objective was to examine changes in the intensity of behavioural responses of pinnipeds from Cabo Polonio to tourist approaches, at two temporal scales: (i) throughout a season, by comparing results from spring 2014 (November and December) and summer 2015 (January and February), and (ii) throughout the years, by comparing data from spring 1996 with those from spring 2014.

2. Methodology

2.1. Study area

In south-eastern Uruguay, at Cabo Polonio National Park (34°24′S, 53°46′W), a passive touristic experience of observing two pinniped species can be undertaken. In front of Cabo Polonio rocky cape, three small islands (Islas de Torres) are located, Rasa and Encantada Islands and an islet (Vaz-Ferreira, 1956). These islands are an important breeding area for both species.

In 1997, a wire fence (160 m long × 1 m high) was set up around the colony with the intention of restricting tourist approaches. This easily accessible fence consisted of four wire strands held by wooden sticks, leaving approximately 1.5 ha for the animals to use at low tide. The fence does not protect the whole colony, thus there were two sectors with no fence (Fig. 1) where tourists could approach the animals without any restriction. Despite the presence of boards with a "no trespassing" warning, the fence is easily crossed and is more a symbolic limit than an effective barrier.

2.2. Behavioural sampling

In 1996, data were collected only in spring, from 8 November to 17 December (Cassini, 2001) from 09:00 h to 19:00 h in the whole area of the colony due to the lack of a fence. During the 2014–2015 season, approaches were recorded both in sectors protected by the fence (II and III, Fig. 1) and sectors without protection (I and IV, Fig. 1), and observations of pinniped behaviour in response to visitor approaches were conducted daily from 08:00 h to 19:00 h for 80 days divided into two periods: spring (12 November–20 December 2014) and summer (8 January–18 February 2015). There was only one observer collecting data (CTC). Before the beginning of the data collection period, the reliability of her observations was validated by comparing her measurements with those made by an experienced observer who participated in the two previous studies. A total of approximately 500 h of observations was registered at the end of the data collection period.

We used the same methodology applied in previous studies (Cassini 2001, Cassini et al., 2004). We remained close to the colony area at a great enough distance not to disturb the animals but that allowed us to have a good view of the entire rookery in order to record tourist approaches to the pinnipeds. The number of approach records depended on the frequency of their occurrence. In 1996, when the protection of the fence was not there, each tourist approach that occurred in the colony area was recorded. During the 2014–2015 season, tourist approaches were recorded in the same way in the non-protected sectors, and only when visitors crossed the fence in the protected sectors. The following information was recorded for each tourist approach: (1) duration, from the moment at which the tourist crossed the fence until they did it again in order to leave the colony (in the protected sectors) or from the moment at which the tourist left the walking path to approach the animals until they returned to the path (in the non-protected sectors); (2) distance of the nearest tourist to an animal, measured in 'animal units', considering that the average size of an *A. australis* adult (the most abundant category in the colony) was approximately 1.5 m; (3) the size of the group of tourists (individual, couple, family, larger group); (4) tourist attitude and (5) pinniped behaviour. The following behaviours of visitors (attitudes) were recorded for each member of the tourist group: movement speed (slow walk, normal walk, run), voice level (low/whisper, normal, shout), hand movements (e.g., waving, clapping or throwing objects). Regarding the behaviour of the animals, the pinniped responses recorded were 'rest', when there was no response; 'alert', when one or more animals changed posture from lying to sitting in response to tourist approach; 'threat', when animals oriented their head with open mouth towards the tourists or when they moved towards the tourists; 'retreat', when one or more individuals of the colony moved backwards a few metres; and 'leaving' the rookery, when the animals moved into the sea (Cassini 2001; Cassini et al., 2004). We recorded only the responses of those individuals in the zone where the approach occurred considering all or the majority of the animals found in that area.

To generate a quantitative measure of animal responsiveness, we assigned values of 0, 1, 2, 3 and 4 to rest, alert, threat, retreat, and leaving, respectively. We allocated this ordinal scale because previous studies indicated that this order of behaviour represents a gradient of animal disturbance or stress (Cassini et al., 2004; Cassini 2001). For each approach recorded, we only considered the highest score of pinniped responsiveness (observed in at least one individual) and the most disturbing attitude of the tourists (observed in at least one member of the group approaching the animals) for the data analysis. We performed two factorial ANOVA using the maximal response of the animals as the dependent variable. Regarding the independent variables, we considered those that were significant in previous studies: tourist behaviour (calm or intermediate/intense) and tourist-pinniped distance (< 10 m or > 10 m) (Cassini, 2001). The third variable considered was year (1996 and 2014, in the first analysis) or season (spring [November–December] 2014 and summer [January–February] 2015, in the