

Assessing the Sustainability of Seal tourism at Duiker Island, Hout Bay

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ABSTRACT

Pinniped focused tourism has grown rapidly both globally and in South Africa. In a 2002 survey South Africa was identified as having earned the most revenue from seal ecotourism of all the countries that engage in this activity. Seal tourism includes approaching colonies on foot, by kayak, on large and small motorised boats and more recently in the water through snorkelling and scuba diving activities. Like most wildlife tourism seal snorkelling operators can use their tours to educate clients about seal biology and threats, while providing them with a memorable physical experience with minimal impact on the seals. The goal of this research was to explore aspects of the demography, attitudes and values of tourists participating in two different seal viewing activities at the same island. Additionally, I investigated levels of satisfaction with each tour type, differences in the style of education provided by operators and which tour provided tourists and what facts tourists found most interesting. In the second part of the study I quantified the behavioural response of seals to tourists who entered the water to snorkel with seals in an attempt to assess potential impacts of immersive trips on seal behaviour.

The study was conducted at Duiker Island, near Hout Bay in the city of Cape Town between November 2019 and January 2020. This period coincides with the breeding season of Cape fur seals (*Arctocephalus pusillus pusillus*) and the peak tourist season. Questionnaires were distributed to both seal viewing tourists (n = 53) who had viewed seals from a large boat and seal snorkelling participants who had swum with seals at the island (n = 90). More women than men undertook both types of tour, though the proportion of men increased on snorkelling compared to viewing tours. Probit models revealed key behavioural and attitudinal differences between seal viewing and seal snorkelling participants with the latter being more pro-environmental. Seal snorkelling guides used a more interpretive style when educating tourists including the use of visual aids while seal viewing tours announced facts through a loudspeaker on the vessel. Seal snorkelling guides would also include information to awareness about plastic pollution and seal entanglement, with a donation box for a seal disentanglement program run by the Two Oceans Aquarium. Seal snorkelling participants listed an average of two facts they had learnt on the tour compared to a mean of 1.24 facts for seal viewing tours. Both tours were rated very highly for overall levels of satisfaction (seal snorkelling mean score = 9.17/10; seal viewing = 8.58/100).

Surface observations of seal behaviour in response to seal snorkelers in the water close to the boat suggested a minimal impact with most seals (88%) behaving neutrally and only 0.2 % engaged in avoidance behaviour. Below water observations revealed that seal numbers declined with increasing number of people in the water and seals adjusted both their position in the water column (more diving) and their activity (more active) in response to snorkeler presence. These findings suggest that both the number of snorkelers and the area over which they spread should be controlled so that seals can choose to avoid snorkelers and behavioural changes are localised to select demarcated areas. The presence of the guides in the water together with the tourists ensured there were no inappropriate interactions between seals and snorkelers (e.g. touching and biting by seals in response).

This is the first study on the thriving seal ecotourism industry at Duiker Island and reveals high levels of satisfaction by both seal viewing and seal snorkelling tourists. While there were measurable impacts of seal snorkelers on seals these were highly localised and unlikely to present an adverse impact on seals at the Island more generally. Controlling the number of operators and ensuring snorkelers are always accompanied by guides should ensure that this valuable business continues, potential impacts are minimised and negative interactions (e.g. bites from seals or people touching or feeding seals) are prevented.

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CHAPTER ONE: INRODUCTION

1.1 Cape Fur Seals

The Cape Fur Seal (*Arctocephalus pusillus pusillus*) is the only indigenous pinniped occurring in South Africa (David et al. 2003) with approximately ten breeding colonies situated along the country's shoreline (Kirkman et al. 2016). Cape Fur Seals are the largest of the fur seals (Kirkman et al. 2016) and highly sexually dimorphic with adult bulls being on average 4.33 times larger than adult females (Kirkman et al. 2016). Females give birth during summer and in the first few months post-partum and alternate between suckling their pups and foraging at sea for extended periods (Kirkman et al. 2016).

1.2 Conservation of Cape Fur Seals

The earliest records of seal exploitation date back to the first Dutch settlers in 1652 with seals utilised for their fur, meat and oil. This exploitation continued unregulated for centuries, with 23 seal colonies becoming extinct by the end of the 19th century (David & Van Sittert, 2008). However, Cape Fur Seals have not only been regarded as a resource; they have also been considered as a biological competitor by fishermen and fishing communities. The rapid drop in seal numbers resulted in the Cape Colony government providing legal protection for seals in 1893 (David & Van Sittert, 2008). Animal rights activists started putting pressure on the South African government to ban seal hunting, where finally in 1990 hunting seals was completely banned in South Africa (David & Van Sitter, 2008; Kirkman et al. 2016) and while the hunting of Cape Fur Seals is still legal in Namibia, they are currently protected by the Seabirds and Seals Protection Act 46 of 1973 and Marine Living Resource Act 18 of 1998 (Kirkman et al. 2016). In March 2015 Government Gazette No. 38600 was published defining approaching within 30 meters of a seal colony as “harassment” and stipulating the requirement of a permit for operators under the provisions of the National Environmental Biodiversity Act 10 of 2004. Like most policies, allocating legal protection to Cape Fur Seals is largely based on an anthropocentric ethical framework, where the decision is made in order to benefit humans. It may largely fall into the branch of anthropocentric conservatism, where protecting Cape Fur Seals is done in order to sustain their population for future generations of people. However, there are limitations in this ethical branch because while a majority may agree that they would want Cape Fur Seals alive for future generations, others who have an antagonistic

relationship with Cape Fur Seals, such as fishing communities, may disagree. The governmental decision to protect Cape Fur Seals falls therefore also into another branch of anthropocentrism, known as hierarchical instrumentalism, where Cape Fur Seals are sentient, they demonstrate what humans consider to be intelligent characteristics similar to our own and are therefore viewed as being worthy of protection. This branch of anthropocentrism becomes apparent as it is not only illegal to hunt Cape Fur Seals, it is also illegal to harass them (Holden, A., 2003).

1.3 Pinniped tourism

The predictable presence of Cape Fur Seals at colonies and their ready habituation to the close presence of both boats and humans has made them a viable ecotourism species, with a number of companies offering a range of different ways of viewing them. These include walking tours to land based colonies and motorboat, kayaking, swimming and scuba diving tours to island-based colonies. While pinniped tourism is a global phenomenon, it was estimated in 2001 that South Africa generated more money than any other country from ticket sales to view seals (Kirkwood et al. 2003).

Prior to weaning, pups begin to explore the waters around their natal colony (De Vos et al. 2015) and exhibit neophilia and playful behaviour towards objects in the water, including boats and people. These characteristics which are common to most pinnipeds, effectively predisposed the Cape Fur Seal to boat based ecotourism which was for a long time the only type of seal ecotourism (Kirkwood et al. 2003). Pinniped tourism in South Africa ranges from operators that focus specifically on seal colonies and haul out spots, to others which include seals as a part of an overall ocean experience. Tourism which involves seals has diversified greatly over the years, and a variety of options are available today, and include guided walking tours in Roberg, kayak tours in Simon's Town, Hout Bay and Waterfront, boat cruises in False Bay, Duiker Island, Gaansbaai and Bird Island, to "swim-with" experiences with either with scuba in Simon's Town or with snorkelling equipment in Duiker Island and Strawberry Rock.

With a growing desire for close encounters with wildlife in the ocean, both shark cage diving and swimming with seals have grown rapidly in recent years and are now a multi-million US Dollar global industry (Gallagher et al. 2011). Kirkwood et al. (2003) estimate that globally there are up to 160 pinniped-focused operators that service approximately 1.3 million tourists,

generating at least 12.6 million US dollars in ticket sales. South Africa had the highest revenue in ticket sales globally in 2002 when there were 15 known operators (Kirkwood et al. 2003), many of which include swimming with seals as an activity.

1.4 Classifying pinniped tourism

Many operators have classified seal tourism as ‘ecotourism’. Ecotourism was a term coined by Lascuniin in 1987, who described it as a form of tourism that involves travelling to areas that are relatively undisturbed and appreciating the plants and wildlife that can be found there (Lück 2003). Orams (1995) argues that no matter how much operators and tourists attempt to minimize their presence, they will always have an impact. The tourists and the tour operator are thus in a dilemma; their passion for wildlife is often why they choose to take part in the activity, but in doing so they are exacting a cost on the wildlife. Ecotourism can thus only exist on a continuum; from less to more environmentally impactful (Orams, 1995; Lück, 2003) and sustainability is thus dependent on minimizing the disturbance and improving the protection of the habitat which forms the basis of the economic activity (Orams, 1995; Zeppel and Muloin, 2008). Fennel (1999) states that already in 1965 Hertzler described the fundamental ideas that define ecotourism; where there is maximum recreational satisfaction for the tourist, maximum respect for the host culture and maximum benefits for the community that is hosting them, all while having a minimum impact on the on the environment.

1.5 The changing tourist

Western culture has had a long tradition of holding an anthropocentric view, believing humans to be superior to nature and thus deserving to be the ones to exploit it in any manner they choose (Lück, 2003). This long standing hegemonic Western ideology was described as the Dominant Social Paradigm (DSP). The DSP is characterised by the faith in unlimited amount of resources, a belief in the need for continuous growth within laissez-faire capitalist society, as well as a great trust in the problem-solving abilities of science and technology (Albercht et al. 1982; Lück, 2003). In recent years, Western society has been more exposed to the environmental devastations that are occurring globally and, as a result, an ecocentric ideology is gaining popularity (Lück, 2003). Researchers believe that a paradigm shift is in progress, with people transitioning from anthropocentric to ecocentric ideologies. Ecocentrism is not a new ideology, but rather new to the dominant social paradigm. Poon (1993) stated that the tourism industry

is in a crisis of uncertainty and change, as the tourist is becoming better educated, more experienced, more independent and more demanding than the traditional tourist. It is argued that tourists are demanding more meaning, truth, authenticity, education and interpretation from their tourist experiences (MacCannel, 1976; Roggenbruck & Williams, 1991; Lück, 2003). While the demanding tourist may place an increased pressure on the operators to provide a more authentic experience, their desire to be educated gives a platform for operators educate them about wildlife and conservation goals.

1.6 Education on tours

Wildlife tour operators have the platform to transfer knowledge and experience to the public. Included in this knowledge is an understanding of the various preventable threats that the species or ecosystem faces (Cowling et al. 2014). With tourists becoming more educated they are starting to demand authentic interpretation and education as a part of the experience. As operators try to satisfy this demand it is possible that it amounts to “preaching to the converted”, with most visitors’ sharing positive attitudes to wildlife already which is why they are taking part in the activity in the first place (Beaumont, 2001; Lück, 2003). However, there are indications that this may not always be the case, particularly in the case of urban ecotours which attract more diverse tourist groups. Consequently, urban ecotours are predicted to have a larger variation in the attitudes and levels of education of tourists.

1.7 Impacts of pinniped tourism

In more recent years there has been a growing concern about the potential negative impacts that pinniped focused tourism may have on seals. Boat traffic to and from seal colonies occasionally causes injuries to seals, following collisions or where boats or people approaching colonies have triggered stampedes causing injury to pups. Furthermore, in many places around the world seals are hand fed exposing seals to pathogens and causing habituation which in turn is linked to injuries to both people and seals (Newsome et al. 2008). Seals rely on their haul out spots for shelter from waves and spaces to rest and give birth. Disruption can lead to them being overexerted and reducing their breeding success (Boren, 2001).

Pups are born at the beginning of summer, which corresponds with the peak of the tourist season in South Africa, and while it may allow for a great spectacle for the tourist, it is a

vulnerable time for the seal pup. Maternal pup recognition is established early after birthing however, if frequent interruptions and stampedes are caused, this may limit the ability for these bonds to form (Kirkman et al. 2016). Continued disruptions of Hawaiian Monk Seals (*Monachus schauinslandi*) led them to abandon their haul out sites in Kure Atoll, only to return after protective measures were put into place (Cowling et al. 2014). Many seals have also become habituated to the presence of tourists allowing them to get extremely close with minimal observable impact on the seals. Others, however, are worried about the long-term possible consequences of this habituation, as it is still a modification of their natural behaviour (Boren, 2001).

1.8 Improving management

Orams (1999) developed indicators and recommendations that can be used to assess the impact of wildlife tourism, both on the environment as well as on the attitudes and behaviour of tourists. These indicators include measuring tourist satisfaction, improving education, measuring changes in attitudes and behaviours, minimizing disturbance to wildlife, improving habitat protection and contributing to the long-term health and viability of ecosystems. These indicators can be used to identify the sustainability of seal tourism in Hout Bay, South Africa. Understanding the impact that the seal tourism has on seals can allow for adjustments to be made if necessary, and if not, to protect these operations from unnecessary and adverse regulations imposed on them by government or other regulatory bodies.

Duiker Island, near the coastal town of Hout Bay in the City of Cape Town, South Africa, is a good example of a long-term seal tourism operation and is the study site for this project. The island is visited by both boat-based tourists all year round as well as seal diving/snorkelling tourists that are more seasonal. More details are provided in the methods section.

1.9 Aims of dissertation

Seal tour operators have the potential to use their platform to educate guests about wildlife and promote conservation goals, all the while giving their guests a memorable experience which has minimal impact on the wildlife. My goal was to understand to what extent this applies to seal snorkelling tours at Duiker Island, Hout Bay, with the hope that the information can shed light on the sustainability of the industry. To achieve this, I surveyed both seal viewing tourists

on a boat and seal snorkelling tourists that swam with seals using a hard copy questionnaire that was given to consenting participants after their respective seal experience. I used these questionnaires to compare the demographics, environmental attitudes and levels of satisfaction with the tour in addition to understand how guides used their platform to educate tourists and what information tourists learnt. Together, it was hoped that these data would provide an improved understanding of the seal snorkelling market, which may prove useful for operators to improve their product. Lastly, I aimed to measure potential impacts of seal snorkelling on seal behaviour, given that it is the more interactive of the two tour types on offer at the island. Specifically, I measured the response of seals both on the sea surface and below, using a combination of boat based and underwater cameras to quantify seal behaviour.

CHAPTER TWO: RESEARCH REVIEW

Due to the interdisciplinary nature of this thesis, the research review extends beyond the marine biological sciences. In order to gain a better understanding of the topic, this research review examines literature in fields of animal behaviour, conservation, tourism, sociology and psychology.

2.1 Previous human dimension studies

2.1.1 Environmental attitude

In order to develop a method to measure the ideological transition from an anthropocentric to a more ecocentric one, Dunlap and Van Liere (1978) developed the New Environmental Paradigm (NEP) scale. The NEP uses a 4-point Likert Scale, from strongly agree to strongly disagree to review eight pro NEP items and four anti NEP items. Since its creation, it has become one of the most widely accepted as well as documented tools for the measurement of environmental attitudes, in terms of both reliability and validity (Ogunbode, 2013). Anderson (2014) describes the NEP scale as a measure of the “pro-ecological” world view. Due to this, it has often been used to look for relationships between attitudes and environmental education or outdoor recreation. The use of the NEP in the tourism context however, was somewhat delayed, and first used by Uysal et al. (1994) to assess tourists’ perspectives of two national parks in the Caribbean (Lück, 2003). Ryan (1999) subsequently used a modified version of the NEP scale in order to examine visitors’ attitudes to Australian wildlife attractions. A few years later, Lück (2003) used a modified version of the NEP scale when studying swim-with dolphin tours. Through the years, the NEP scale has been gaining popularity, but it has also received some criticism. Some researchers have argued that the NEP scale lacked internal consistency among individuals’ responses and claimed that there was a weak correlation between individuals’ behaviour and their attitude (Anderson, 2012).

In response to the criticism, Dunlap et al. (2000) developed a new scale, where they changed outdated terminology, added more questions and includes a more balanced set of eight pro and seven anti-NEP items. While this scale has also been popular, it too has received critiques; including claims that it still misses some assessment elements and is therefore incomplete, and that the low correlation between attitude and actual behaviour persists (Anderson, 2012). While

the NEP scale has had some issues in itself, the way that it has been used by researchers has also been problematic, for example Howcroft and Milfont (2010) reported inconsistencies in how environmental attitudes have been measured, with ad hoc adaptations of the scales used, causing an “anarchy of measurement” (Howcroft & Milfont, 2010:143). The authors recommend that researchers use the 15-item scale to ensure consistency and to allow for comparisons between studies (Howcroft & Milfont, 2010).

2.1.2 Positive experience

A limited number of studies have been conducted on the benefits acquired by tourists on pinniped focused tours. Findings from these studies are similar to those conducted for marine mammals in general. Thus, Orsini and Newsome (2005) found that most tourists consider seeing the natural habitat in which seals live as important. Similar studies on whale watching have reported similar findings, with visitors’ rating ‘seeing the whales’, ‘being close to the whales’, ‘seeing other marine wildlife’, ‘the scenery and learning about the whales’ as important factors (Duffus & Dearden, 1993; Muloin, 1998; Foxlee, 2001; Andersen & Miller, 2006; Zeppel & Muloin, 2008). A study conducted by Booth (1998), found that when asking visitors to describe New Zealand fur seals, the majority (75%) chose positive words such as “lovely”, “beautiful” and “cute” to describe them. This finding was supported by Orsini and Newsome (2005), who found that most tourists (86%) viewing sea lions in Carnac Island, Australia rated their experience as positive.

2.1.3 Education on tours

Education together with positive experiences may influence the behaviour of visitors during the tour (i.e. preventing impact through tourists’ inappropriate behaviour) and may sometimes elicit longer lasting pro-environmental behaviours after the tour (Orams, 1996; Orams, 1997). Anderson and Miller (2006) believe that many visitors do not wish to cause any disturbance or harm to the animal they are viewing and consequently their impact(s) are largely a result of a lack of education. Consequently, many tourists demand to be educated so that they can minimise their impacts (Lück, 2003). In 1997, Orams conducted an experimental study comparing the long-lasting environmental behaviour of two groups. The experimental group received quality educational combined with dolphin interactions, whereas the control only received the dolphin interactions. He found that the experimental group reported being

significantly more environmentally friendly than the control group, even 2 -3 months after the experiment (Orams, 1997). Education can also allow for the participants to learn more about the wildlife they are interacting with. Lück (2003) found that between 66% and 69% of 733 visitors said that their knowledge on dolphins improved after swimming with them together with a guide. By contrast, tourists who went with operators that did not provide guides stated that they would have enjoyed learning more about the dolphins, their marine environment and the threats to this environment (Lück, 2003; Higham & Lück, 2007).

2.1.4 Shaping tourist attitudes

The educational experience provided by marine wildlife tour operators can play an important role in shaping the attitudes of tourists. For example, 27.7% of tourists who swam with Dwarf Minke whales stated that the experience changed their general attitude towards the environment (Birtles et al. 2002:44; Higham & Lück, 2007). Moscardo et al. (2004) found that changes in attitude resulting from positive wildlife experiences can lead to long term changes in their lifestyles and behaviour, including the donation of money to environmental organisations (Higham & Lück, 2007). In addition, Wilson and Tisdell (2003) found that 80% of visitors were convinced (after their whale watching experience) that more action should be taken to protect whales in Australia and 73% were convinced that a worldwide ban on whaling was needed. Furthermore, they found that 73% said that the whale watching experience made them more likely to report the mistreatment of whales or stranded or injured whales (Wilson & Tisdell, 2003).

2.1.5 Limitations in previous environmental and attitude studies

Most of the previous studies utilise self-reported environmental attitudes and behaviours. There is a chance that a social desirability bias will occur where the tourists report back what they believe is desired by the researchers. In this type of scenario, it may be that people who have been exposed to the educational programs are more aware about the issues of their non-environmental behaviours and therefore feel a stronger need to report back desired behaviours.

2.2 Previous impact studies

There is a growing literature on the effect's tourism may have on pinnipeds, most of which has focused on short-term effects (Kovacs & Innes, 1990; Shaughnessy et al. 1999; Lelli & Harris, 2001; Boren, 2002; Orsini & Newsome, 2005; Orsini et al. 2006; Newson & Rodger, 2008). These effects range from increased seal vigilance, to reduced reproductive success. Many authors of short-term studies have warned of the potential long-term negative effects which, although less conspicuous, can be more detrimental (Kovacs & Innes, 1990; Heinrich, 1995; Lidgard, 1996; Barton et al. 1998; Wright, 1998; Young, 1998; Constantine & Baker, 1999; Shaughnessy et al. 1999; Boren, 2002).

Previous research points to various challenges when assessing the impact of visitors. Firstly, there is a significant amount of variability within the responses of the seals. This variability differs between species, within species, between sites and with visitor activity (Kovacs & Innes, 1990; Lidgard, 1996; Barton et al. 1998; Young, 1998; Constantine & Baker, 1999; Shaughnessy et al. 1999; Suryan & Harvey, 1999; Britles et al. 2001; Boren, 2001; Burton & van den Hoff, 2002; Cowling et al. 2014). Burton and van den Hoff (2002) found that Southern elephant seals have a very high tolerance to the presence of human activity, and hardly responded to either helicopter noise or close human presence. Similar findings were apparent for Australian sea lions which did not have a strong response to either swim-with commercial tours or seal boat viewing tours. Harbour Seals and New Zealand Fur Seals are however more sensitive to human intrusion. Lelli and Harris (2001) found that Harbour Seals in the Gulf of Maine were very sensitive to human disturbance, with boat traffic being the strongest predictor of seal haul out number; in their 122 day observational study they observed 85 flushing events (seals stampeding into the water), 93% of which were caused by boating activity.

Lelli and Harris (2001) found that seal response varied with human activities. Of the 85 flushing events, 55% were caused by paddling boats and only 11% were caused by motorboats (Lelli & Harris, 2001). Similar responses were reported for New Zealand Fur Seals by Boren et al. (2002) who observed that they are more sensitive to kayaks than to motorboats. However, it was observed that land approaches triggered far greater avoidance responses than water approaches (Boren et al. 2002), a result they attributed to seals being more vulnerable on land compared to when they were in water (Boren et al. 2002).

Both the sex and age of seals are good predictors of their response to disturbance. Barton (1998) observed that female and juvenile New Zealand Fur Seals are more likely to adopt a 'flight' response to land-based approaches, whereas males and sub-adult males are more likely to defend their territory and adopt the 'fight' response (Barton et al. 1998). Similar observations were made by Boren et al. (2002) however, they also observed that female and juvenile seals were more interactive with swimmers in seal snorkelling tours, as the males are often guarding their territories. Female seals are more vulnerable to disturbance during pupping season, as increased vigilance can also lead to less time spent attending their pups. Female grey seals at Donna Brook in England were observed to be highly vigilant and to give birth later in the season in areas with higher human disturbance (Lidgard, 1996).

Boren et al. (2002) also observed an effect of habituation, with New Zealand Fur Seals displaying more neutral responses to both kayaks and other boats on Tonga Island, compared with islands which had less sea traffic. Seals becoming habituated to visitors is a key observation made by many previous researchers, while some authors argue that this is a benefit as it increases the seals tolerance and reduces the seals vigilance to the presence of people, others argue that this may have detrimental long term negative effects on the seals (Heinrich, 1995; Barton et al. 1998; Wright, 1998; Young, 1998; Born et al. 1999; Shaugnessy et al. 1999; Suryan & Harvey, 1999; Boren, 2002).

As research on the potential impact of human disturbance on seals grows, it raises the question as to how management should respond to the findings. For example, many countries have implemented minimum approach distances as a method to reduce human disturbance. The challenge with minimum approach distances is that the recommended minimum distance varies markedly between species, colonies and also the type human disturbance. Kirkwood et al. (2003) recommend a 10-meter minimum approach distance for Australian Sea Lions, whereas another study conducted by Orsini et al. (2005) found that Australian Sea Lions did not alter their response when varying the distance from greater than 15 meters down to 2.5 meters (Orsini et al. 2005). Boren et al. (2002) recommend a minimum approach distance of 30 meters for New Zealand Fur Seals however, they observed that seals were significantly less responsive to tourists' boats and kayaks compared to the controlled approaches made by the researchers. Due to the large variation in responses, it is likely that long-term monitoring of the impacts should be conducted on a case by case basis.

Studies have also examined the potential impact that seals may have on the tourists. Dans et al. (2016) found that Sea Lions in Argentina typically just swim around the tourists however, the third most common behaviour recorded was seals biting the tourists, especially if tourists attempted to touch them. While bites seldom broke the skin, they do warn that physical contact with the seals may result in being bitten and thus urged operators to strictly monitor and discourage such behaviour.

CHAPTER THREE: METHODOLOGY

3.1 Study site

This study was based at Duiker Island (34.0586° S, 18.3269° E) on the South West coast of the Cape Peninsula and approximately 4 km by sea from the harbour and town of Hout Bay (Figure 1). The island is approximately 0.4 hectares in size and serves as a haul out spot and breeding colony as well as a variety of marine birds. The island falls within the Table Mountain Marine Protected Area and is separated from the mainland by an approximately 95-meter-wide channel found on the eastern side of the Island. This channel which is protected from wave action is used by tour boat operators and recreational boats as safe space for viewing seals. The water surrounding the island is densely vegetated with kelp (*Ecklonia maxima*) and relatively shallow in comparison to Seal Island in False Bay.

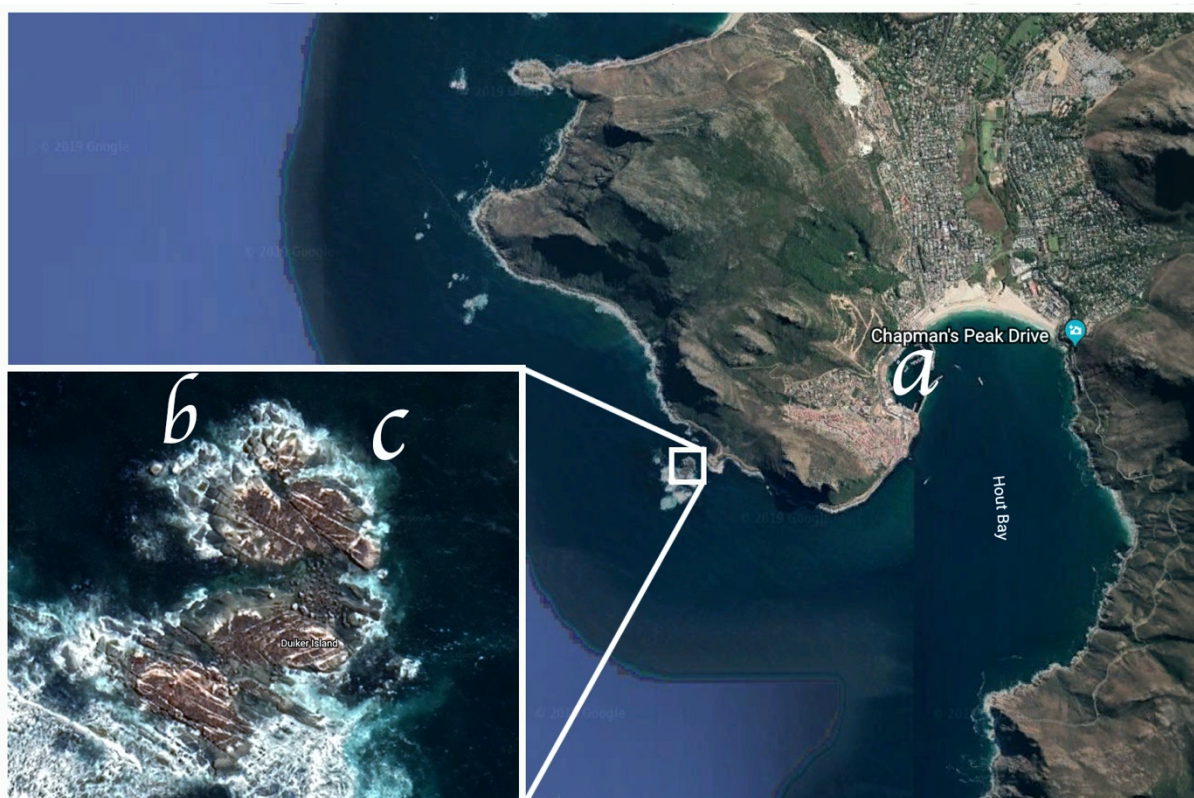


Figure 1: Map of Hout Bay and Duiker Island, South Africa. (a= Hout Bay Harbour, b = seal snorkelling location, c = seal viewing location.)

3.2 Seal snorkelling tours

Four companies offer snorkelling experiences to Duiker Island, two of these companies (Bucket List and Animal Ocean) consistently go to Duiker Island, whereas the other two (Capextreme and Into the Blue) mostly take tourists snorkelling at another haul out spot called Strawberry Rocks (33°58'43.8"S 18°21'37.6"E) and only go to Duiker Island if the visibility is poor at Strawberry Rocks. Prices range from 450 ZAR for students to 900 ZAR for adults. Before embarking the guests are given a briefing which utilizes visual cards, and are informed about the Duiker Island Cape Fur Seals' biology and behaviour, and how to interact with the seals. Tourists are then transported to the island (10 minutes journey time) on a solid hulled inflatable boat which can carry a maximum 10 guests, the skipper and 2 guides. Boats move through the Eastern channel to the Northern section of Duiker Island where they are safe from disturbance by the large seal viewing boats. Guests are given a briefing on how to put on their masks and fins and enter the water and are instructed by the skipper about where to swim and which areas should be avoided. The guides enter the water first, and they accompany the tourists in the water for the duration of the swim (ca. 45 minutes) and usually staying within 30 meters of the boat. Guides constantly instruct tourists to not go too close to Duiker Island, to avoid swimming close to the boat's engines and not to chase nor touch the seals. Guides provide constant feedback and answer tourists questions while swimming and on the boat.

3.3 Seal viewing tours

Many visitors are dropped at the Hout Bay harbour by tour bus operators as part of a fixed Peninsula tour package. There are four different seal viewing tour operators each with an office on the harbour quay and ticket prices range from South African Rand, R80 to R100 per adult, R60 for children under the age of 14 with children under 2 years going for free. All of the boats offer both covered and open deck viewing areas as they operate year-round in all weather conditions. The journey from the harbour to the island is approximately 20 minutes and has a panoramic view of steep mountains dropping precipitously into the ocean. When the boats arrive at Duiker Island, they approach from the South Eastern side. Information on the seals and the island are relayed through speakers on deck and commentary provided by either the captain or first mate. The boat then proceeds to move slowly along the eastern side of Duiker Island until it reaches the North East side of the island. The vessel then turns around and

proceeds again along the Eastern side of the island before returning to the harbour. The duration of each trip is approximately 45 mins with 10-15 minutes spent at the island.

3.4 Understanding the seal snorkelling tour market

3.4.1. Questionnaire distribution

All the guests on the two types of tours were invited to participate in the study which was conducted during November and December 2019. On the seal snorkelling tours I would announce at the end of the trip to all the guests that I would be handing out questionnaires as a part of my study. During this announcement, I would inform them about the study and tell them that their participation is completely voluntary. After participants had showered and changed into dry clothes they would complete the questionnaires in their own time (*sensu* Lück (2003)). Seal viewing participants were similarly informed about the project and asked to complete the questionnaire after the boat had left Duiker Island, so as not to interrupt the seal viewing experience and to allow sufficient time to fill in the forms before returning to the harbour. The questionnaire included demographical questions as well as opinion related questions, such as the NEP scale, where 1 indicates strongly agrees, and 5 indicates strongly disagrees. Furthermore, questions asked participants to rate various holiday activities according to how important participants considered them to be, with 1 indicating very important and 5 indicting those activities they considered unimportant on holiday.

3.4.2 Data processing and analysis

The questionnaire data was transcribed into Microsoft Excel which was used for descriptive analyses. Multivariate analyses were conducted predominantly in RStudio and the Statistical Package for Social Science (SPSS). I used either a Fishers exact test or a Chi-Square to test for statistical significance between the two tours for all nominal variables e.g., continent of origin, country of residence, level of education, gender, opinion on sealing. When testing for differences between groups using ordinal data (e.g., responses to the New Environmental Paradigm (NEP) Scale) I used a Wilcoxon Exact Rank test. Exploratory probit models were used to explore factors that might explain how participants rated their tour. Covariates included tour type, the number of interesting facts they reported having learned, their gender, age and continent of origin. Prior to the inclusion of covariates I performed Cronbach alpha reliability

tests in SPSS on the scale statements for each explanatory variable to determine if there was justification for combining variables. I used a Cronbach alpha value > 0.65 as my cut-off, after which additional analysis (e.g., cluster or factor analysis) would be performed on the combined indices.

3.5 Snorkellers effect on seal behaviour

3.5.1 Above water observations

Scan samples of seal behaviour at the sea surface were conducted from a 6m semi-rigid inflatable boat. The same observer (author) performed all scans. The observer was positioned at the front of the boat and every five minutes for a total of 55 minutes would slowly rotate so as to complete a 360° sample of the water around the boat. Scans were conducted at five-minute intervals for a total of 4.6 hours on five different seal snorkelling trips between 19th and 23rd of November 2019. Video footage was then analysed using BORIS (v.7.8.2) and the behaviour of each seal on the water surface was categorised as “Neutral, Interactive and Avoidant” (Boren et al. 2002; Cowling et al. 2013). The data were logged in Microsoft Excel, following which I determined the relative proportion of seals in each scan engaged in each of the three behaviours and then averaged these across scans to derive a mean +S.D. proportion of seals engaging in the three different behaviours.

3.5.2 Below water scan samples

An underwater GoPro camera (Hero 4s) was secured to a tripod with added weights to provide stability in the swell (Figure 2). The tripod was placed at a fixed location on the sea floor with the camera lens oriented to record a section of open water frequented by seals and seal snorkelers (Figures 3 and 4). The camera was put into position once snorkelers had been in the water for at least 30 minutes and recorded the behaviour of seals in the presence and absence of snorkelers for up to one hour depending on battery life. Data were collected for 11 independent snorkeler trips between 6th of December 2019 and 25th of January 2020. Video footage was analysed using BORIS (v.7.8.2) and the behaviour of seals recorded together with the presence and absence of snorkelers every two minutes.



Figure 2: The underwater camera (GoPro Hero 4s) mounted on a tripod with added weights for below water stability.

Seal behaviour was recorded as either active (e.g. swimming or playing) or inactive (e.g. thermoregulating) and their position in the water column as either at or below the sea surface. A Generalized Linear Model (GLM) was used to determine the effects of snorkeler number on seal number and a sign rank test was used to investigate whether more seals were active with or without snorkelers and whether more seals were on the surface or below with and without snorkeler's present.



Figure 3: A below water image of showing a seal active at the water surface in the presence of snorkelers.



Figure 4: A below water image showing seals inactive and active at the sea surface in the absence of snorkelers.

CHAPTER FOUR: RESULTS

4.1 Questionnaire Results

4.1.1 Demographics of the tourists

As can be seen in Table 1, most of the seal snorkellers sampled were from outside the African continent (95.6%) – mostly from Europe, compared to seal viewers, where 49.1% were from an African country (mostly from South Africa). Country of origin was the most significant demographic difference between the samples. Most participants of the seal snorkelling tour were from Europe (68.9%), followed by North America (13.3%). Out of all the demographics tested, the continent of origin was the most significantly different ($p < 0.001$) between the seal viewing and seal snorkelling tours.

Table 1: The continental origin expressed as a proportion of the participants of seals snorkelling and seal viewing tours.

Continent	Seal Snorkelling	Seal Viewing
Africa	4.4%	49.1%
Asia	10.0%	7.5%
Eurasia	0.0%	1.9%
Europe	68.9%	24.5%
North America	13.3%	9.4%
South America	3.3%	3.8%
No Response	0	3.8%

While questionnaire participants who identify as female were more commonly found on seal viewing vessels (64.2%), both types of seal tours had a higher proportion of people identifying as female compared with people who identified as male or other. There was however, not a significant difference between the two groups (Chi Square = 2.18, $p = 0.13$).

Table 2: Participants gender distribution on the seal snorkelling and the seals viewing tours.

Gender	Seal Snorkelling	Seal Viewing
Female	51.1%	64.2%
Male	48.9%	34.0%
Other	0.0%	1.9%

The average age of the seal snorkelling participants (32.7 ± 9.3 S.D.) was not statistically different (Chi Square = 34.895, $p = 0.699$) to the average age of the seal viewing participants (36.3 ± 11.6 S.D.). The age group distribution of the participants of the two groups was also not significantly different.

Table 3: The proportion of participants in different age groups on the seal snorkelling and seal viewing tours.

Age Group	Seal Viewing	Seal Snorkelling
12 – 21	5.7%	5.6%
22 – 31	34.0%	47.8%
32 – 41	32.1%	28.9%
42 – 51	15.1%	12.2%
52 or Above	13.2%	5.6%

The level of education amongst questionnaire participants was very similar between the two groups (Chi Square = 3.53, $p = 0.74$), with 40% of the seal snorkelling and 39.6% of the seal viewing participants having a postgraduate degree.

Table 4: Education distribution of the participants on the seal snorkelling and seal viewing tours.

Education	Seal Snorkelling	Seal Viewing
Postgraduate Degree	40.0%	39.6%
Undergraduate Degree	20.0%	17.0%
Technical Degree	8.9%	15.1%
High School Certificate	5.6%	5.7%
Trade Qualification	5.6%	3.8%
Other	20.0%	18.9%

4.1.2 Rating of experience

When asked to rate their tour experiences participants on both types of tours gave very high ratings (9.17/10 for seal snorkelling and 8.58/10 for seal viewing). When asked if they had any challenges during the experience, only 3.8% of seal viewing participants reported having challenges, whereas with seal snorkelling guests over half of them (50.9%) reported having

challenges. The challenges reported by seal snorkelling guests were mostly to do with the cold water (42.9%), sea sickness (23.8%) and 9.5% were related to equipment challenges.

4.1.3 Environmentalism

There was no statistical difference in the response of seal viewers (84.6%) and seal snorkelers (73.9%) (Fisher’s $p = 0.47$) when asked whether they oppose seal hunting. When asked whether it was acceptable to hunt seals as long as it is to regulate their populations, 13.5% of the seal viewing participants agreed compared to 22.7% for the seal snorkelers. There was no support for hunting seals for their fur in either group and there was a limited support for hunting seals regardless of the reasons.

Table 5: A comparison of seal snorkelling and seal viewing participants responses to seal hunting activities.

Tourist opinion on Sealing	Seal Viewing (n = 52)	Seal Snorkelling (n = 88)
Hunting seals is okay regardless.	0.0%	1.1%
Hunting seals is okay as long as it is to regulate the populations.	13.5%	22.7%
Hunting seals is okay if we use their fur.	0.0%	0.0%
Hunting seals is okay if we use their fur and there are many of them.	1.9%	2.3%
Hunting seals is not okay.	84.6%	73.9%

When tourists were asked to describe the Cape Fur Seal using a single word, the word was classified as positive for the majority of participants in both groups (Table 6) with a higher proportion of positive words used by seal snorkelers (65.9%) compared to seal viewers (54.2%). Thereafter, the most commonly used words were neutral followed by negative and lastly a word suggesting that the participant had confused the word ‘fur’ in the name Cape Fur Seal as being linked to their historical harvesting for culling to obtain furs.

Table 6: The number and percentage of positive, neutral, negative and confused words given by participants on both tours to describe Cape Fur Seals.

Word used to describe Cape Fur Seals	Seal Viewing (n = 48)	Seal Snorkelling (n = 82)
Positive	54.2%	65.9%
Neutral	25.0%	20.7%
Negative	10.4%	7.3%
Confused	10.4%	6.1%

I used the New Environmental Paradigm (NEP) questions (Dunlap and Van Liere 1978) to identify environmentalism in the participants. Questions focus on five categories: “reality of limits to growth”, “anti-anthropocentrism”, “fragility of nature’s balance”, “rejection of exceptionalism” and “possibility of an ecological crisis”. Eight questions are designed to represent a participant’s endorsement of the NEP while seven of the questions (labelled ^a in Table 7) endorse a dominant social paradigm (DSP). These seven questions were reverse coded prior to running a Cronbach’s alpha test ($\alpha = 0.557$) which suggests that the questions had a poor internal consistency. Only three of the questions were statistically different (Table 7) between the two seal groups, with the statement “the so-called ecological crisis facing humankind has been greatly exaggerated” having the lowest p-value ($p = 0.002$), with seal viewing participants varying between neutral and mild disagreement and seal snorkelling participants varying between mildly and strongly disagreeing (Table 7). There was also a statistical difference between the two groups’ averaged response as to whether “humans are meant to rule over the rest of nature” and “despite our special abilities humans are still subject to the laws of nature,” with seal viewing participants disagreeing less with the first statement and agreeing more with the second statement.

Table 7: Shows the mean, standard deviation (SD) and P-value (P) of results of NEP Scale questions comparing Seal Snorkelling Participants with Seal Viewing Participants. Seven questions (labelled ^a) if agreed with are meant to represent an endorsement of dominant social paradigm (DSP). The other eight items if agreed with are meant to represent an endorsement of a new environmental paradigm.

		Snorkelling		Viewing		P
		Mean	SD	Mean	SD	
Reality of limits to growth	We are approaching the number of people earth can support.	1.85	0.94	2.24	1.24	0.09
	^a The earth has plenty of natural resources if we just learn how to develop them.	2.24	1.11	1.63	0.87	0.27
	The earth is like a spaceship with very limited room and resources.	2.37	1.00	2.25	1.20	0.33
Anti-anthropocentrism	^a Humans have the right to modify the natural environment to suit their needs.	3.78	1.11	3.51	1.08	0.14
	^a Humans were meant to rule over the rest of nature.	4.01	1.27	3.43	1.47	0.01
Fragility of Natures Balance	Plants and animals have as much right as humans to exist.	1.39	0.70	1.43	0.85	0.93
	When humans interfere with nature it often produces disastrous consequences.	2.09	1.11	1.80	1.11	0.06
	^a The balance of nature is strong enough to cope with the impacts of modern industrial nations. The balance of nature is very delicate and easily upset.	4.21	1.01	3.94	1.16	0.20
Rejection of Exceptionalism	^a Human ingenuity will insure that we do NOT make the earth unliveable. Despite our special abilities humans are still subject to the laws of nature.	1.80	0.90	1.98	0.97	0.27
	^a Humans will eventually learn enough about how nature works to be able to control it.	3.02	1.14	2.71	1.17	0.14
		1.46	0.68	1.86	0.92	0.01
Possibility of an ecological crisis	Humans are severely abusing the environment.	3.21	1.10	2.94	1.27	0.22
	^a The so-called "ecological crisis" facing humankind has been greatly exaggerated.	1.58	0.97	1.69	0.92	0.27
	If things continue on their present course, we will soon experience a major ecological catastrophe.	4.15	1.09	3.49	1.23	0.002
		1.60	0.84	1.57	0.94	0.53

Note: 1 = Strongly Agree, 2 = Mildly Agree, 3 = Neutral, 4 = Mildly Disagree, 5 = Strongly Disagree

4.1.4 Environmental behaviour

Seal tour participants were asked to choose between four categories (Always, Often, Sometimes and Never) as to which best represented how often they engage in certain behaviours. Seal snorkelling participants consistently indicated engaging more frequently in environmentally friendly behaviour, compared with the seal viewing participants ($p < 0.05$ for all comparisons between groups, Table 8). The activity with the highest levels of overall agreement was recycling plastic for the seal snorkelling group and driving a car for the seal

viewing group. For both groups ‘contributing to an environmental organisation’ was the activity least likely to be performed.

Table 8: Participants reported engagement with potential environment influencing behaviours.

	Snorkelling		Viewing		Wilcox	P-Value
	Mean	SD	Mean	SD		
Recycle plastic	2.42	0.72	1.90	0.99	1584.50	0.002
Drive automobile	1.64	0.94	2.06	1.11	2902.00	0.01
Eat red meat	1.22	0.70	1.90	0.85	3339.50	0.000
Use plastic bags	1.25	0.90	1.76	0.93	2971.00	0.001
Contribute to an environmental organisation	1.07	0.69	0.69	0.62	1584.50	0.002
Pick up rubbish on the beach	1.30	0.91	0.96	0.94	1663.50	0.02

Note: Always = 3, Often = 2, Sometimes = 1, Never = 0

4.1.5 Activities during holidays

Seal tour participants were asked which activities they find important when going on holiday. The only activity that differed significantly ($p = 0.013$) was “doing things your friends have not done” for which seal viewing participants considered to be more important than seal snorkelling participants. Seal snorkelers considered ‘going on wildlife tours’ to be more of a priority than seal viewing participants but the difference was not statistically significantly different ($p = 0.06$).

Table 9: Participants reported importance of various activities while on holiday.

	Seal Snorkelling		Seal Viewing		Wilcox	P-Value
	Mean	SD	Mean	SD		
Going to new places	1.49	0.69	1.33	0.58	2010	0.12
Experiencing new culture	1.54	0.72	1.77	1.10	2470.5	0.45
Lying on the beach	3.35	1.19	3.02	1.24	1888	0.16
Doing things your friends have not done	3.43	1.24	2.84	1.30	1711.5	0.013
Visiting National Parks	2.10	0.77	2.39	1.00	2613.5	0.11
Spending time in the ocean	2.15	0.87	2.45	1.10	2615.5	0.12
Finding thrills and excitement	1.94	0.91	2.08	0.97	2512	0.37
Going on Wildlife Tours	1.90	0.74	2.24	1.01	2680.5	0.06

Note: 1 = Very Important, 2 = Important, 3 = Neutral, 4 = Somewhat Unimportant, 5 = Unimportant

4.1.6 Predicting who would be in the water (snorkelling) as opposed to viewing seals

Table 10 provides a set of exploratory models of why people who were interested in seals might ‘select’ seal snorkelling as opposed to seal viewing. I hypothesised that younger people would be more likely to opt for swimming (and older people would opt for the less physical seal viewing). $H_1 = \text{age of seal snorkeller participant} < \text{age of seal viewing participant}$. $H_0 = \text{no statistically significant difference in age between the two types of tours}$. Gender might also play a role, though as indicated in the above analysis, women dominated on both trips, but especially on the seal viewing. Model 1 in Table 10, which includes only these variables, shows that this is the case: being a female reduces the average marginal probability of being a snorkeller by 16 percentage points and every year of age reduces it by 1 percentage point. This model, however, is weak.

Given that seal snorkelling brings the participant in much closer contact with seals than is the case with seal viewing, I hypothesised that this activity was more likely to select for people

with strong pro-environmental practices and attitudes. I used a dummy variable taking a value of 1 if the respondent indicated that they ‘always’ recycled plastic to proxy for pro-environmental behaviour, and a dummy variable taking the value of 1 if respondents disagreed with the statement that the environmental crisis was grossly exaggerated to proxy for pro-environmental attitude. Model 2 includes these variables, and Model 3 also includes age and gender as controls. Model 3 shows that conditional on the other variables in the model, disagreeing with the statement that the environmental crisis is vastly exaggerated increases the average marginal probability of being a seal snorkeller by 19 percentage points, always recycling plastic increases it by 16 percentage points and never contributing to an environmental NGO reduces it by 26 percentage points.

Given that there were more people from Africa (mostly South Africa) on the seal viewing boat, Model 4 checks to see if the model remains robust if I include a further dummy variable for whether the respondent was from South Africa or not. Including this variable renders the effect of ‘always recycling plastic’ statistically insignificant. This may well be because it is easier ‘always’ recycling plastic in countries other than South Africa, notably the advanced capitalist countries of Europe and North America. Including this control also reduced the size and statistical significance of ‘never’ contributing to environmental organisations, but the effect remained substantive.

Table 10: Probit model predicting who would be in the water snorkelling with seals as opposed to on the boat (reporting average marginal effects).

	Model 1	Model 2	Model 3	Model 4
Female	-0.158* (0.077)		-0.190** (0.077)	-0.135* (0.077)
Age	-0.009* (0.003)		-0.009* (0.003)	-0.008** (0.003)
Disagrees that the environmental crisis is vastly exaggerated		0.243*** (0.069)	0.186** (0.070)	0.154** (0.065)
Always recycles plastic		0.162* (0.072)	0.156* (0.069)	0.112 (0.063)
Never contributes to environmental organizations		-0.196** (0.077)	-0.265*** (0.075)	-0.212** (0.072)
From South Africa				-0.428*** (0.080)
N	142	135	134	133
Pseudo R2	0.0435	0.1425	0.2074	0.3307
Prob>Chi-2	0.0173	0.000	0.000	0.000
AIC	184.44	157.63	148.62	127.92

*p<0.05, **p<0.01, ***p<0.001 Standard error in parentheses.

4.2 Seal snorkelling impact on seal behaviour

4.2.1 Above water scan

A total of 53 scans were recorded across 5 sampling sessions. During these scans 2271 seal behavioural observations were made. The mean number of seals on the surface was 42.8 with a s.d of 28.8 (range 5-103). Most seals (88.1%) had a neutral response to people in the water near the boat with 11.7% interacting with the people and 0.2% avoiding people.

4.2.2 Below water scans

Results from the GLM reveal a significant negative relationship (Estimate: -0.28863) between the number of people and number of seals (Table 11, Figure 5). A linear model on the data set produced a residual standard error of 2.435 and an adjusted R-squared 0.061, indicating that number of people present only explained the number of seals present 1.63% of the time. The scatter plot (figure 5) indicates a trend between the number of people being present in the area influencing the number of seals in a negative direction.

Table 11: Summary statistics of negative binomial GLM for the effect of number of people on the number of Cape Fur Seals.

Variable	Estimate	SE	Z	P
Intercept	0.61172	0.09	6.996	< 2.63e-12
Number People	-0.28863	0.09	-3.132	0.00174

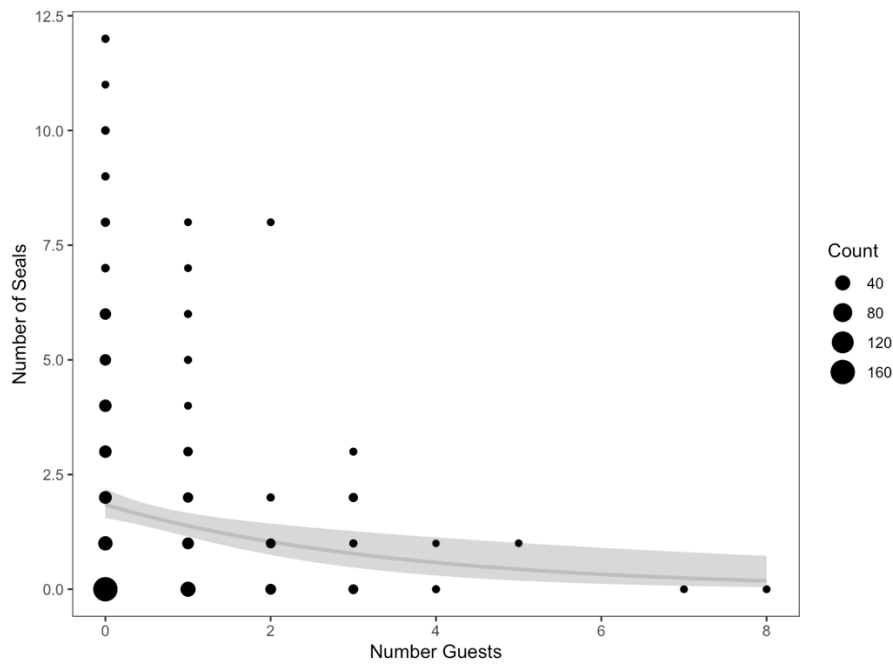


Figure 5: Predicted estimates of seal numbers from GLM. Grey ribbon indicates the 95% confidence interval.

4.2.3 Activity Budget of seals with and without snorkellers present

In 80% of the trials more seals were active when snorkelers were present versus absent (Figure 6). This difference was almost significant (sign rank test: $Z = 0.841$, $p\text{-value} = 0.06$). There was a lower proportion of seals at water surface when snorkelers were present compared to absent (Figure 7). However, this difference was not significant (sign rank test: $Z = 0.654$, $p\text{-value} = 0.14$).

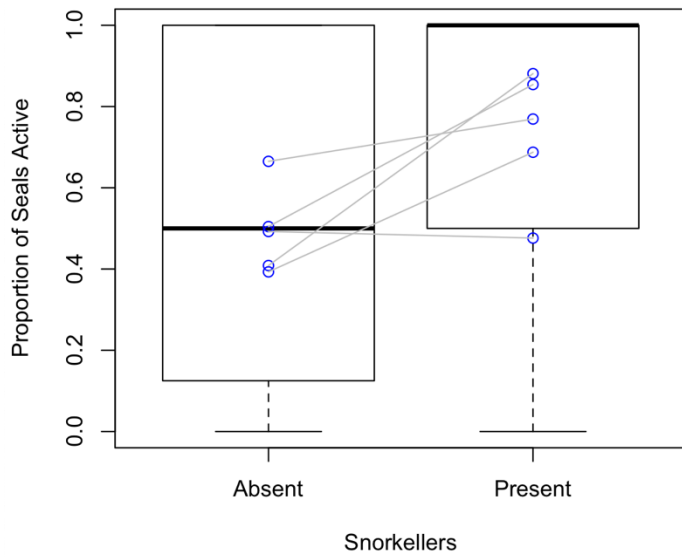


Figure 6: Box whisker plot showing the proportion of seals active in camera trap location while people are present compared to when people are absent. Boxes show interquartile range (IQR) and the thick line is the median, and whiskers outside the boxes indicate the 95% intervals.

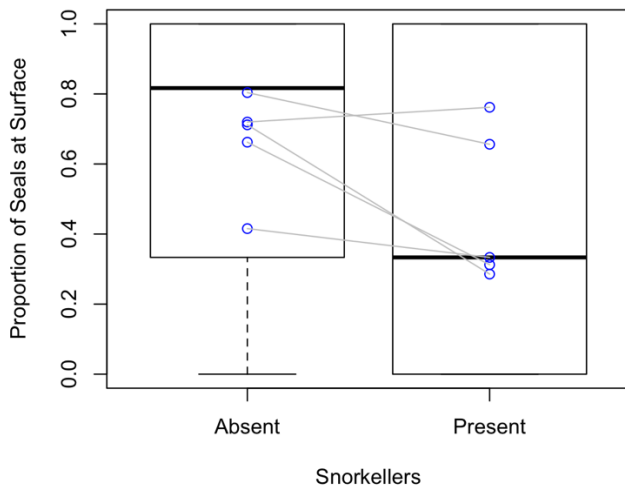


Figure 7: Box whisker plot showing the proportion of seals at the surface in camera trap location while people are present compared to when people are absent. Boxes show interquartile range (IQR) and the thick line is the median, and whiskers outside the boxes indicate the 95% intervals.

CHAPTER FIVE: DISCUSSION

5.1 Demographic characteristics of seal snorkellers

5.1.1 Demographics

The continental origin of the tourists differed significantly between people answering the questionnaires on the seal snorkelling tours and the control group of seal viewing tours. This was especially apparent with the representation of tourists from the African continent (mostly from South Africa). Considering that the questionnaires were distributed close to the Christmas holidays and the peak tourist season, it is likely that the proportion of foreigners is inflated for both groups (statssa.gov.za, 2019). Birtles et al. (2002) found that participants of minke whale tours around the Great Barrier Reef in Australia consisted predominantly of tourists from the United States of America and Europe. According to South African governmental statistics from December 2018, 74.4% of tourists were from Africa while 15.5% were from Europe and 4.2% were from North America (statssa.gov.za, 2019). The comparison of tourists by geographical origin for the seal viewing tours is closer to this general trend than for the seal snorkeller. Note that this data are from a different year and is not only for Cape Town but for all of South Africa. Gender response distributions showed that there were more female participants on both tours, but especially with regard to seal viewing. The larger proportion of women partaking in marine wildlife tours appears to be consistent with studies conducted in other countries (Finkler, 2001; Higham, 2001; Lück, 2003), where the percentage of participants who identify as female ranged from 55.6% to 58.1%. It is interesting that there is a gender difference of people present on ecotours and strange that previous studies have failed to offer any explanation for this. It is likely driven by a mix of socio-political, economic and cultural factors and that these differ across regions. While this is an interesting topic in and of itself, it was not one that the questionnaire was designed to investigate. More research is necessary to investigate such demographic differences.

5.1.2 Environmentalism on the tours

It proved to be more of a challenge to measure environmental attitudes than measuring demographics. The original NEP scale has been criticised for low internal consistency (discussed in Anderson et al. 2012). I therefore used an updated version of the NEP by Dunlap et al. (2000) to overcome this problem, yet the data collected showed a low internal consistency (Cronbach alpha: 0.557). This may be due to some questions being more accurate measures of ecological attitudes compared with others. For example, disagreeing that the “ecological crisis has been greatly exaggerated” may be a better proxy for pro-environmental attitudes than believing “animals and plants have the same right to exist as humans” which is vague and begs a lot of questions about what is meant by the ‘same right’ and whether the same right applies to both (sentient) animals and (non-sentient) plants. An anti-environmental meat-eater, for example, would probably disagree with that statement but a pro-environmental vegan might also disagree with it on the grounds that the rights accorded to humans and animals are seen as greater than those accorded to plants. Differing interpretations of this kind are likely to undermine the internal consistency of the NEP scale. The questionnaire was only available in English to participants, raising the possibility that aspects of the questionnaire might have been confusing per those where English was not their first language. Due to the vast variety of nationalities present amongst the participants to the questionnaire, many of whom were tourists visiting South Africa from overseas, it was unfortunately not possible with the resources allocated to have questionnaires in languages other than English.

Anderson et al. (2012) also observe a generally weak correlation between the attitudinal questions and questions probing behaviour. The results from the seal viewing and seal snorkelling questionnaire participants show that some of the responses to NEP questions correlated more with environmental behaviour than others. People who agreed more with opinions such as “humans were meant to rule over nature”, “humans have the right to modify their environment to suit their needs” and that “the balance of nature is strong enough to keep up with modern industrial nations” also reported eating more red meat, recycling less plastic and using more plastic bags.

Seal snorkeller were more likely than seal viewers to disagree with the statements that “humans were meant to rule over nature” and the “so called ecological crisis is strongly exaggerated”. There was a significant difference between the means for the seal snorkellers and the seal

viewers with regard to all “ecological behaviours” with the seal snorkelling participants having a higher mean indicating more pro-environmental behaviour than the average seal viewing participant. However, it is important to bear in mind that context probably also mattered, for example driving less in an automobile may be a better indicator of how good public transport the participants country has, than environmental friendliness per se. Similarly, the behaviour “picking up rubbish on the beach” would mostly apply to participants who live in proximity to beaches. Recycling plastic bags and using plastic bags may therefore be better predictors of pro-environmental attitudes however, these too depend on whether recycling programs or plastic bag alternatives are available to the people from different countries.

There is also likely a response bias where participants are completely truthful about their behaviours due to fear of judgement. Considering that this questionnaire was distributed after the seal tours, the experience of the seal tour may also influence the results. For example, during many of the seal snorkelling trips, guides would point out the threat to wildlife and the environment linked to plastics in the ocean and how this may lead to seal entanglement. Although this may influence the results of the questionnaire, the experiences may also have a longer impact on their attitudes and behaviour (Armstrong & Weiler, 2002; Barton et al. 1998; Edington & Edington, 1986; World Tourism Organization, 1992; Young, 1998).

5.1.3 Interpretation and education

Education and interpretation on a seal tour can increase benefits for both the experience of the tourists as well as reducing the impact that the tourists have on the seals. The education that is given by seal snorkelling guides can reduce the impact tourists have on seals. Prior to entering the water guests are told to not touch the seals and to allow the seals to approach them, as this is their best chance of getting a close encounter. When observing tourists it appeared that most of the tourists followed the instruction on how to behave with the seals. Boren (2001) observed a similar trend with seal snorkelling companies in New Zealand, where seal snorkellers are more likely to behave well if they have been given information about what behaviour is appropriate prior to the activity. The presence of guides in the water with snorkelers increases the chances that they follow the advice of the guides given they are aware that they are being observed.

While both the seal snorkelling company and the seal viewing company include an educational component in the tour, both the content and style of delivery vary. The seal snorkelling company provides a briefing on seal biology and behaviour prior to leaving the harbour including the use of visual aids, the tourists are informed as to how they should interact with the seals and are told to keep their hands to themselves and not to try and touch the seals. While on the boat, information is presented in a more ad hoc manner and is often shaped by what people are seeing during the journey to the island. The seal viewing company on the other hand does not utilize visual aids, and provides specific 'canned' information through speakers when the boat is stationary at Duiker Island. These differences were apparent when asking tourists to report back information that they had found interesting from the talks. Seal snorkelling tourists report back more information than the average seal viewing participant. These findings are consistent with Lück (2003) and Orams (1995) who found that quality information (interactive, non-canned) and the use of visual aid is often more effective than verbal only factual presentations. Tourists found information on seal behaviour to be the most interesting, followed by information on biological elements. Higham and Carr's (2002) study as well as Lück (2003) both found that participants wanted to be educated during the wildlife experience and if the interpretation was good that it would have a positive influence on the guest's experience.

5.1.4 Experience

According to Lück (2003) a highly satisfied tour participant is likely more willing to recommend the tour to family and friends. I found that participants on both trip types rated their experience very highly. The mean experience rating for the seal snorkelling tour was (9.17/10) whereas the mean experience rating for the seal viewing tour was (8.58/10). These results are quite similar to the results found by Birtles et al. (2002) which scored 9.36/10 for Minke Whale tours on the Great Barrier Reef. When asked where they had heard about the seal snorkelling tour, most said trip advisor (25.6%), friends (24.4%) and lastly family (12.2%). The findings demonstrates the importance of both word of mouth and a positive review on a widely used smart device application for tourism (Zeppel & Moulin, 2007; Boren, 2008).

5.2 Relationship between seal behaviour and snorkeller presence

Seal numbers in the water around a seal rookery are known to vary with both environmental factors (e.g., sea and air temperature, swell) and biological factors such as stage of reproductive cycle (Boren et al. 2008). While I recorded air temperature, I did not attempt to investigate the biotic and abiotic drivers of water use by seals around the island. There was substantial variation in the number of seals (5-103) recorded in the water around the seal snorkelling vessel on different days but their activity remained largely neutral (88% of seals) in response to human activity. Only 0.2% of all seals observed were classified as actively avoiding the seal snorkelling tourists and boat suggesting that the seals are habituated to the presence and behaviour of the people and equipment associated with seal snorkelling tours. Avoidance behaviours included dramatic changes in behaviour. For example, seals would rapidly move away from tourists or vocalise. Variation in seal presence and behaviour linked to seal tourism was also noted by Cowling et al. (2013), who reported that 54% of seals were neutral, 41% were interactive, and 5% were actively avoidant of the snorkeller presence. My results are more similar to those of Boren et al. (2008) who found that 64.4% of New Zealand fur seals showed a neutral response, 23.7% of seals were interactive and 5.8% avoided snorkellers.

It is possible that the comparatively higher levels of ‘neutral’ behaviour evident in seals in this study compared to those of Boren et al. (2008) and Cowling et al. (2013) reflects the frequency of exposure to people and boats, with higher neutrality a consequence of higher levels of habituation. Duiker Island has been visited by seal viewing boats since 1989 and seal snorkelling has been in progress since 2009. Additionally, Duiker Island is frequented by both recreational water users (e.g. small fishing boats, kayakers and surf skiers) and poachers harvesting both abalone (*Haliotis asinina*) and west coast rock lobster (*Jasus lalandii*) on almost a daily basis. These diverse activities, combined with up to eight seal snorkelling trips a day as well as occasional scuba diving tours, means that older seals would have had extremely high levels of exposure to boats and people in the water. Young of the year seals learn predation risk from older seals (De Vos et al. 2015) and the absence of a predator response by adults to people and boats may explain the neutral or interactive response from younger seals.

Prior to data collection I observed a kayaker approach the island closely while actively paddling. This event triggered a stampede by seals on the island and was accompanied by widespread avoidance behaviour by seals in the water. The limited number of seals actively

avoiding people and boats in this study does not mean that such activities have no adverse impacts on seals but that the initial impacts were not recorded because they occurred historically. Thus, when seal snorkelling tours first began it is possible that a higher proportion of seals would have displayed a negative or aversive response but that continued exposure without costs (e.g. chasing, harassing or hurting) may have resulted in their gradual habituation which is what I have measured in this study. This highlights the importance of before and after studies on the impacts of ecotourism on wildlife and cautions against statements that a particular activity has no measurable negative impact on the animals when the activity has been in progress for some time. The effects of habituation on New Zealand Fur Seals was studied by Boren (2001) where she compared various islands which had different histories of tourism exposure, she found that islands with increased exposure to tourism demonstrated less of a response to her controlled approaches (Boren, 2001).

Although measuring seal activity from a boat is a commonly used method (Boren, 2001; Boren et al. 2009; Cowling et al. 2013) it nevertheless has obvious limitations when attempting to measure the impacts of snorkelers on seal behaviour, as the observer can only record behaviours visible from the sea surface. I thus included a measure of below water responses, as recommended by Bicknell et al. (2016) of seals to seal snorkelers. Similar to the above water scans, the number of seals present below water varied markedly (0 – 12) between different days and sampling sessions on the same day. Consequently, I used a paired (presence versus absence) design within each sampling session to control for the potential impacts of abiotic (e.g., water temperature, swell size) and biotic (e.g., prey availability, predator presence) factors that vary in both space and time. Seal numbers varied inversely with people numbers in the underwater test (Figure 5) suggesting that seals avoid people below water in the chosen study area. Seal behaviour also changed in the presence of snorkelers with more seals actively swimming below when snorkelers are present. In the absence of snorkelers, the seals appeared to rest at the surface, heads inverted and flippers in the air, behaviour consistent with thermoregulation (Renouf, 2012). The differences in seal behaviour in the presence and absence was not significant but, rather than reflecting a weak effect of snorkelers, this is likely a consequence of small sample size. Of the 10 sampling sessions there were five in which no seals were present at all for either the presence and/or absence session. Thus, the final sample size was five greatly reducing the probability of being able to reject the null hypothesis. Despite this the p-value for the sign rank test of proportion of seals active when snorkelers

were present versus absent was 0.061 suggesting that with a larger sample size the difference will tend towards statistical significance. While not a cause for concern, this result does urge caution, both with respect to the number of snorkelers frequenting a given area as well as the number of operators or tours by operators on a given day. Together these findings contradict the above surface scans as they suggest snorkeler presence influences seal behaviour. However, the results are not directly comparable as the below water data are paired using a presence/absence comparison.

I had initially designed my experiment to measure seal behaviour and numbers during and after a seal snorkelling tour. However, I was not able to control for other companies arriving after the company I was working with had left to provide the 'after' data. Consequently, I had to resort to a presence/absence approach which is less informative but better than the above water approach of presence only data. Future research should make use of aerial drones to provide before and after data (tour arrival) for surface swimming seals. I had initially proposed this method of data collection but flying restrictions and permit application time possibly taking over a year for drone use within a Marine Protected Area prevented the use of this method within the timeframes of this project. Other studies on seals that have used drones include a study by (McIntosh et al. 2018) reveals the value of an aerial perspective when monitoring seals.

Our analysis of the relationship between seals and people in the water indicated that there were fewer seals in the water when people were in the water. Most seals were neutral about human presence but there was nevertheless a negative relationship suggesting that human presence in the water may well have had some impact on seal behaviour. This issue requires more research. If it can be shown that seals are adversely affected by the number of people in the water, then there might be a case for limiting exposure. Given that the people opting for the seal snorkelling are pro-environmental on key measures, it is likely that they will be open to a more restricted activity if they understand that this is to make sure that seals are not harmed in any way by snorkelling activity.

CHAPTER SIX: CONCLUSIONS

6.1 Conclusion

The seals at Duiker Island, Hout Bay have for decades been a popular tourist attraction that has provided the local community with both direct and indirect employment opportunities and boosted both the local and national economy. Initially, tours were limited to a single operator who offered seal viewing from the deck of a large (30m) motorised boat. With time, more operators have been given permits and currently there are 3 such operators resulting in a steady stream of boats visiting the island throughout the day and all year round in all but the most inclement weather. Initially I had planned to measure the impacts of these tours on seals on the island but preliminary data revealed no measurable effect of the boats on the seals. It is likely that the frequency of visits (a boat arrives approximately every 30 minutes) and the long history of such tours (31 years) has resulted in adult seals being completely habituated to the close proximity of a large boat. More recently the seal tourism industry has diversified and similar to global trends in wildlife tourism now include more interactive tours including swimming with seals using both snorkels (4 companies) and scuba diving (2 companies) equipment. Despite the importance of this industry to both the local and national economy and the potential impacts of activities that bring people into close proximity with wildlife (i.e. snorkelling) there have been no studies on either the socio-economic or ecological impacts of seal tourism.

My study is thus the first to investigate both sociological aspects of seal tourism (e.g. demography, attitudes to seals and the environment) as well as the potential impacts on seals from seal snorkelling activities. Overall, seal tourists expressed very high levels of satisfaction for both tour types, with seal snorkelling tours scoring slightly higher on average and participants having learnt more new facts, than on seal viewing tours. The latter might be a consequence of the more interpretative talks that snorkelling guides offer their tourists prior to departure (which included visual aids) in addition to the guided swims (plus commentary) with seals. Given the established link between ecotourism and conservation (Orams, 1996; Barton, 1998; Lück, 2003; Boren, 2008), the benefits of seal tourism may thus extend well beyond the financial returns to operators including improved conservation and attitudes towards both seals and other marine wildlife. Encouragingly, both seal viewing and seal snorkelling groups exhibited pro-environmental attitudes, with the latter scoring slightly higher with regards to activities that improve the environment (e.g. recycling) however, not with respect to opposition

to lethal management of seals for either regulation of seal numbers or their harvesting for furs. The combination of an enjoyable experience, improved education and minimal impact on seals associated with seal viewing trips is encouraging for the future sustainability of this well-established tourism venture.

Seal snorkelling by definition, is a more invasive form of tourism than seal viewing from a boat, as the former entails people freely interacting in very close proximity with seals. Indeed seal swim tours consider a trip successful when the target animal(s) come close to and interact directly with tourists. My observations of seal behaviour in the presence of snorkelers suggest that seals do adjust both their position in the water column and their behaviour. If tourists prevent seals from meeting their thermoregulatory or energetic requirements then they may displace them and reduce accessibility in the long term. However, there is little evidence for this with tours having been run in the same area for the last 11 years. Thus, while seals do adjust their behaviour in relation to snorkelers, the total area around the island that snorkelers routinely access is so small that seals can easily move away and continue with their natural behaviours a short distance away. Given that tour operators rely on seals being readily accessible and successful operators will ensure that tourist activities have a minimal impact on seals the advice from this study would be to curtail tourist activity to this one section and to not increase the number of tour operators and so lead to crowding of area.

Cape Fur Seals thus far have proven to be resilient to human activities at Duiker Island but it is important to stress that a lack of a clear response today does not mean that at the inception of these tours the impacts were not more marked. This highlights the importance of before and after studies prior to the inception of a new tourism venture, in addition to guidelines for operators to minimise potentially negative interactions. An example of the latter is when tourists approach a breeding bull's territory during the breeding season. Such events, although rare have resulted in tourists being charged at and even bitten. Preventing such negative interactions is possible with knowledgeable guides who are themselves educated in seal biology and subtle but important changes in behaviour of seals at the island. Overall the sustainability of seal tourism at Duiker Island looks assured with arguably the greatest threat being linked to sea level rise as a result of climate change. The highest point of Duiker Island is only 4 meters above the high water mark and thus even a small rise in sea level will threaten the use of this island as a breeding rookery for cape fur seals. Until this happens seal tourism

at Duiker Island is an exceptionally successful example of wildlife tourism in which both people and the wildlife may benefit with minimal damage to the environment in the process.

6.2 Limitations

The method of using voluntary questionnaires in order to collect data on participants in itself presents limitations as one is only able to collect data on those who agree to participate. Demographic data was collected to control for whether demographics of individuals might be better predictors for attitudes and experience than the seal tour which they participated in.

This method of gathering data likely generated some bias. For example, due to the less extreme nature of the seal viewing tours (compared to seal snorkelling), very young children were more likely to be present on the seal viewing tours. These children were however, either not willing or unable to participate in the questionnaire and were therefore not included in the data. This biased the reported age upwards on both tours, but more so with regard to seal viewing tours.

The large disparity between samples of men and women on the different vessels perhaps also partly be explained by the questionnaires being voluntary. For example, I noticed that with nuclear families where a father and mother were present with young children, one of the parents would agree to answer the questionnaire, while the other parent would watch the children. In more cases it was the person who identified as a woman who decided to answer the questionnaire.

Due to the amount of nationalities present on the tours, and lack of resources to make versions of the questionnaire in every participants home language, there is a likelihood that in some cases there were biases due to language barriers. Although I offered assistance and would try and explain the questions to the best of my ability, it is likely that some confusion remained.

6.3 Future Research

6.3.1 Human Dimensions

The study found that there are key differences in nationality and gender on the two different tours, and it is recommended that future researchers design a study that would be more appropriate for investigating these demographic issues. It is furthermore recommended that the approach taken should include more qualitative approaches, such as focus groups, interviews, and more open-ended questionnaires.

6.3.2 Impact on Seals

This thesis compared the behaviour of the seals in a specific location before and after the presence of people in the area. It is recommended that future studies attempt to understand more about the baseline of Cape Fur Seal behaviour, and that researchers also consider colonies not frequented by people. This would allow us to gain a better understanding of how becoming habituated to humans might affect seal behaviour.

Seal snorkelling tourism is conducted at various sites around the Cape Peninsula, such as Strawberry Rocks, Partridge Point, as well as multiple sites further up the east coast of South Africa. Future research should consider examining these locations too, and it could make for an interesting comparison, to compare the techniques used by both the operators as well as the impact that the presence of humans may have on seals at the various locations. While it has been shown that different pinniped species have different responses to the presence of human behaviour, (Boren., 2001) demonstrates that colonies of New Zealand fur seals also have different responses to the presence of humans. She argues that this likely reflects various stages of habituation.

The questionnaires were constructed in order to get a better understanding of the tourists' enjoyment, whether they learned anything on the trip, and their environmentalism. The questionnaire was limited to only being able to understand the tourist's ecological attitude after the trip. Further research could usefully include an experimental design to explore whether the experience itself changes key attitudes.

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APPENDIX: QUESTIONNAIRE

SEAL WILDLIFE TOURISM QUESTIONNAIRE:

We are conducting this survey to learn about you and your experience and to understand more about your opinions about various ocean related issues. Your input will assist a University of Cape Town study. Participation is voluntary and responses are confidential, you may stop at any time if you choose. *Please complete this survey and return it.*

1. Please specify your gender **(PLEASE TICK ONLY ONE)**
- Female
 - Male
 - Other

2. What city are you from? _____

3. What is your age? _____

4. What is your highest level of education? **(PLEASE TICK ONE)**
- No qualification
 - Undergraduate Degree
 - Technical Degree
 - High School Certificate
 - Postgraduate Degree
 - Trade Qualification
 - Other _____

5. What were the most interesting things you learned today?

- a _____
- b _____
- c _____

6. Which statement do you agree with the most?
(PLEASE TICK ONLY ONE)

- a Hunting seals is okay regardless.
- b Hunting seals is okay as long as it is to regulate their populations.
- c Hunting seals is okay if we use their fur.
- d Hunting seals is okay if we use their fur and there are many of them.
- e Hunting seals is not okay.

7. What word spring to mind when you think about Cape Fur Seals? _____

8. How often do you do the following?
(PLEASE TICK ONE ON EACH LINE)

- | | Always | Often | Sometimes | Never |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a Recycle Plastic | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b Drive an automobile | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c Use plastic bags | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d Eat red meat | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e Contribute financially to environmental organisations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f Pick up rubbish on the beach. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

9. Which of the following activities did you participate in during your visit?
(PLEASE TICK ALL THAT APPLY):

- Hiking
- Kayaking
- Penguin Viewing
- Cape Point
- Shark Cage Diving
- Other (please specify):

10 Do you agree or disagree with that:
FOR EACH QUESTION, PLEASE CIRCLE ONE.

	Strongly Agree	Mildly Agree	Neutral	Mildly Disagree	Strongly Disagree
a We are approaching the limit of the number of people the earth can support.	1	2	3	4	5
b Humans have the right to modify the natural environment to suit their needs	1	2	3	4	5
c When humans interfere with nature it often produces disastrous consequences	1	2	3	4	5
d Human ingenuity will insure that we do NOT make the earth unlivable	1	2	3	4	5
e Humans are severely abusing the environment	1	2	3	4	5
f The earth has plenty of natural resources if we just learn how to develop them	1	2	3	4	5
g Plants and animals have as much right as humans to exist	1	2	3	4	5
h Humans were meant to rule over the rest of nature	1	2	3	4	5

	Strongly Agree	Mildly Agree	Neutral	Mildly Disagree	Strongly Disagree
i The balance of nature is strong enough to cope with the impacts of modern industrial nations	1	2	3	4	5
j Despite our special abilities humans are still subject to the laws of nature	1	2	3	4	5
k The so-called "ecological crisis" facing humankind has been greatly exaggerated	1	2	3	4	5
l The earth is like a spaceship with very limited room and resources	1	2	3	4	5
m The balance of nature is very delicate and easily upset	1	2	3	4	5
n Humans will eventually learn enough about how nature works to be able to control it	1	2	3	4	5
o If things continue on their present course, we will soon experience a major ecological catastrophe	1	2	3	4	5

11. Was this your first time on a seal tour? **(PLEASE TICK ONE)**

- Yes _____
- No (If there was it?) _____

12. Is there anything you wish you could have changed with this experience?
(PLEASE TICK ONE)

- Yes (Please Explain) _____
- No _____

13. Was there anything you wanted to learn more about today?
(PLEASE TICK ONE)

- Yes (Please Explain) _____
- No _____

14. How would you rate your overall satisfaction with your seal tour experience(s)?

(PLEASE CIRCLE ONE NUMBER)

1 -----2-----3-----4-----5-----6-----7-----8-----9-----10
Very poor Excellent

15. Did you have any challenges during the experience?
(PLEASE TICK ONE)

- Yes (Please Explain) _____
- No _____

16. What is most important to you when going on holiday?
(PLEASE CIRCLE ONE ON EACH LINE)

	Very Important	Important	Neutral	Somewhat Unimportant	Unimportant
a Going to new places	1	2	3	4	5
b Experiencing new culture	1	2	3	4	5
c Lying on the beach	1	2	3	4	5
d Doing things your friends have not done	1	2	3	4	5
e Visiting national parks	1	2	3	4	5
f Spending time in the ocean	1	2	3	4	5
g Finding thrills and excitement	1	2	3	4	5
h Going on Wildlife Tours	1	2	3	4	5

17. How did you find out about the seal tour?
(PLEASE TICK ALL THAT APPLY):

- Brochure
- Friend
- Family
- Trip Advisor
- Other (please specify):

CODE OF CONDUCT

1. Sensitive periods: November to February. Precautions should be taken to avoid stampeding. Increase distance from colony by 5 meters and drive slower when passing the colony.
2. Operators should not clap or make noise in order to encourage stampedes.
3. Number of vessels present at once should not exceed 4.
4. Landings onto colony sites should be prohibited.
5. Boats should have 1 skipper and 2 guides present.
6. A minimum distance of 10 meters should be kept from the colony at all times (15 meters during sensitive periods)
7. Operators and guides are not to bait or chum in order to attract seals.
8. General visitor behaviour should be regulated:
 - A. Avoid blocking water access of pinnipeds
 - B. Avoid following pinnipeds
 - C. Avoid feeding pinnipeds
 - D. Avoid touching pinnipeds