Human Interactions with Seals, Sea Lions & Walruses

An Annotated Bibliography

Yasmine M. Elmahdy
Michael Lück
Brooke A. Porter

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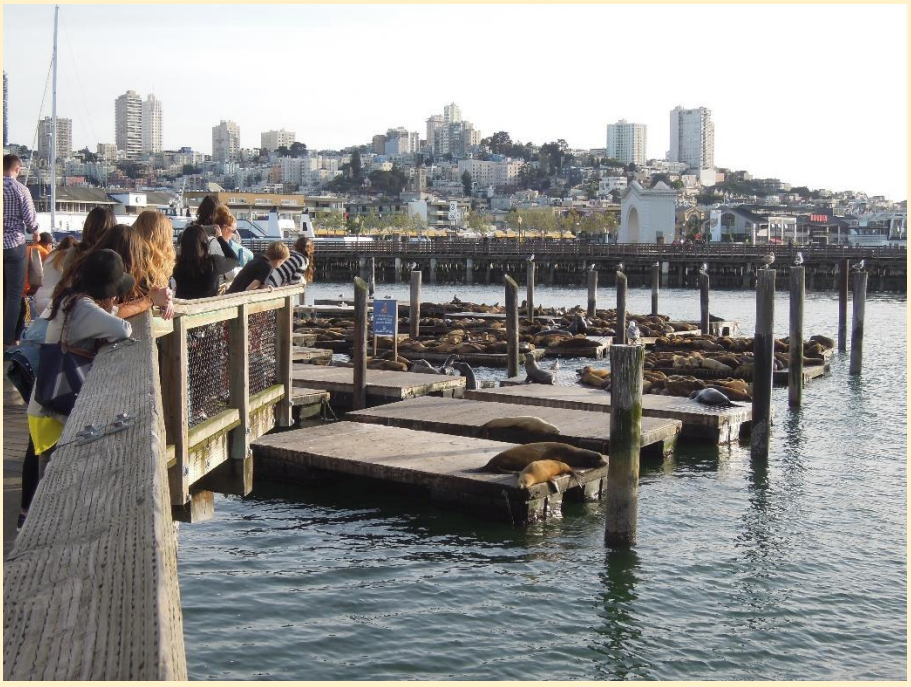
1. INTRODUCTION

This is the fourth of a series of annotated bibliographies, published by Dotterel Publishing. The aim of this series is to provide a comprehensive overview of the literature pertaining to specific touristic and leisure activities, in particular (but not limited to) wildlife viewing activities. These annotated bibliographies will aid researchers and other interested persons and organisations locate relevant literature.

The main part of this document is divided into two sections: The first section is a *reference bibliography*, listing works in alphabetical order. The second section is an *annotated bibliography*, adding short abstracts/summaries to most of the works listed in the first section, again in alphabetical order.

We have included references from a variety of sources, mostly from academic journals, books, theses and dissertations, conference proceedings and technical reports. While the majority of sources relate directly to pinniped watching, we have also included some works on general tourism and recreational activities and the effects these may have on seals, sea lions and walruses, as well as some conversation related works. We acknowledge that there are also numerous non-academic books and websites on pinnipeds and touristic/recreational activities related to these species; however, these would be virtually impossible to include in a systematic manner due to the sheer volume of these.

While this is an extensive bibliography, we do not claim it to be complete. In fact, we aim to regularly update this bibliography, and gratefully accept any suggestions for inclusion. Please email suggestions with publication details to dotterelpublishing@gmail.com



Tourists observing Californian Sea Lions (*Zalophus californianus*)
at Pier 39 – Fisherman's Wharf, San Francisco, USA

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Young, C., Gende, S. M., & Harvey, J. T. (2014). Effects of vessels on Harbour seals in Glacier Bay National Park. *Tourism in Marine Environments*, *10*(1/2), 5-20. https://doi.org/10.3727/154427314X14056884441626

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South American Sea Lions (*Otaria flavescens*) – Punta Lomo, Argentina

3. ANNOTATED BIBLIOGRAPHY

A

Authors: Acevedo-Gutierrez, A., Acevedo, L., Belonovich, O., and Boren, L.
Year: 2011
Title: How effective are posted signs to regulate tourism? An example with New Zealand fur seals
Journal: Tourism in Marine Environments
Volume: 7
Issue: 1
Pages: 39-41
Abstract: Increased tourism has augmented harassment to wildlife and posted signs are often utilised to manage such interactions. This study determined whether signs increased tourist compliance with regulations to remain >10m from New Zealand fur seals *(Arctocephalus forsteri)* at Kaikoura Peninsula. Acevedo-Gutierrez and colleagues observed 362 tourist groups interacting with seals. The percentage of groups in which all members respected the posted distance was similar whether tourists saw the signs or not [60.6% vs. 65.9%; G(1)=0.98. *p*= 0.32]. The findings reveal that posted signs were ineffective in increasing compliance to regulations and suggest that alternative approaches must be considered to increase regulation compliance and better manage interactions between tourists and wildlife.

Authors: Acevedo-Gutierrez, A., Acevedo, L., and Boren, L.
Year: 2010
Title: Effects of the presence of official-looking volunteers on harassment of New Zealand fur seals
Journal: Conservation Biology
Volume: 25
Issue: 3
Pages: 623-627
Abstract: An increased number of tourists viewing animals in the wild have increased stress on these animals. Many wildlife-viewing locations depend on voluntary compliance with posted regulations to protect animals from tourists because of the cost of employing on-site enforcement staff. However, voluntary compliance is ineffective. The presence of official-looking volunteers may reduce the occurrence of wildlife harassment by tourists. To examine this possibility, Acevedo-Gutierrez and colleagues observed tourists interacting with 5- to 12-month-old New Zealand fur seals (*Arctocephalus forsteri*) at the well-known Ohau Stream waterfall while in the presence or absence of a young woman in plain sight wearing a neon vest (i.e., observer) and when an observer was not present. The authors observed 254 tourist groups at the waterfall when young seals were present. The percentage of groups in which at least one person harassed (approached, touched, or threw objects) a young seal was two-thirds lower when the official-looking observer was present. Frequency of harassment was inversely associated with observer presence. Programmes in which volunteers work at tourist sites are popular in countries with high tourism rates, such as New Zealand. The findings reveal that a relatively inexpensive and effective tourism-management strategy may be to post such volunteers as observers at sites where tourists view wildlife.

Authors: Allen, S., Ainley, D. G., Page, G. W., and Ribic, C. A.
Year: 1984
Title: The effect of disturbance on harbor seal haul out patterns at Bolinas Lagoon, California
Journal: Fishery Bulletin
Volume: 82
Issue: 3
Pages: 493-500
Abstract: This study used field observation and two time lapse motion picture cameras to monitor numbers of harbour seals and of disturbances at Bolina Lagoon, California, and to provide information on tidal height. The findings showed that peak numbers occurred during the summer. During nonbreeding seasons, high numbers occurred at low tides, and during the breeding season they occurred in early afternoon except when haul out areas were flooded. According to the authors, seals were disturbed by humans on 71% of days monitored. The primary source of disturbance were people in canoes. The findings showed that human activities closer than 100m lead seals to leave haul out sites more than activities at greater distances.

Authors: Andersen, S. M., Teilmann, J., Dietz, R., Schmidt, N. M., and Miller, L. A.
Year: 2012
Title: Behavioural responses of harbour seals to human-induced disturbances
Journal: Aquatic Conservation: Marine and Freshwater ecosystems
Volume: 22
Issue: 1
Pages: 113-121
Abstract: This paper evaluates the effectiveness of seal reserves to prevent human-induced disturbances to harbour seals, *Phoca vitulina* in Denmark. Experimental disturbances were conducted in Anholt seal reserve (one of the most important seal reserves in Denmark). Particularly, the behavioural responses (alert distance, flee distances, flight initiation distance and flight duration) of harbour seals to approaching boats and pedestrians were examined. The study was conducted during three periods related to harbour seals' breeding cycle. The findings showed that in all periods, harbour seals were alerted by boats at significantly greater distances compared with pedestrians (560–850m and 200–425m, respectively). Similar differences in the flight initiation distances were detected, 510–830m for boats and 165–260m for pedestrians. In most cases seals were alerted and began to flee when the approaching boat was outside the reserve, whereas they did not respond to approaching pedestrians until after they had entered the reserve. The seals displayed shorter-lasting and weaker responses during the breeding season. They were more unwilling to flee and returned to the haul-out site promptly after being disturbed, in some cases even during the disturbance. According to the authors, this seasonal tolerance is most likely appertaining to a trade-off between fleeing and nursing during the breeding season, thus not an sign of habituation. The authors recommended that the reserve boundaries on land be placed at least 425m from the haul-out area and the boundary at sea should extend to at least 850m from the haul-out area to ensure sufficient (year-round) protection from disturbances.

B

Author: Back, J. J.
Year: 2010
Title: Behavioural responses of Australian fur seals to boat-based ecotourism
Academic Department: School of Life and Environmental Sciences
University: Deakin University
Thesis Type: Master of Science thesis
Abstract: This study examined Australian fur seal behavioural responses to boat approaches at breeding colonies in Bass Straight. Results indicated that responses varied based on previous exposure to boats, approach distance, and time of day, and provided valuable information to management agencies regarding the effective management of ecotourism.

Authors: Back, J. J., Hoskins, A. J, Kirkwood, R., and Arnould, J. P. Y.
Year: 2018
Title: Behavioural responses of Australian fur seals to boat approaches at a breeding colony
Journal: Nature Conservation
Volume: 31
Issue: -
Pages: 35-52
Abstract: In Australia, a multi-million-dollar industry depend on viewing the Australian fur seal (*Arctocephalus pusillus doriferus*), mainly via boat visits to breeding colonies. According to the authors, regulation of boat approaches differs by site and no systematic investigations have been carried out to inform management guidelines. This study aims to investigate probable effects of disturbance, experimental boat approaches were made to a colony at Kanowna Island in northern Bass Strait and seal responses were monitored utilising instantaneous scan sampling. The study found that colony attendance (individuals remaining ashore) was affected by approach distance and time of day, but was not influenced by environmental variables or season, whereas onshore resting behaviour was affected by approach distance, ambient temperature, wind direction and time of day. Onshore resting behaviour decreased following experimental boat approaches to 75m, but alterations in abundance of individuals ashore were not detected at this distance. In contrast, approaches to 25m brought out a strong response, with a steep reduction in the number of individuals ashore. This response was strongest when approaches took place in the morning, with a decline of approximately 47% of individuals, compared to a decline of 21% during afternoon approaches. In regard to onshore resting behaviour, afternoon approaches to 75m caused minimal response. The remaining three combinations of approach distance and time of day had a similar pattern of reductions in the proportion of individuals engaging in onshore resting behaviour. The strongest response was again detected during approaches to 25m conducted in the morning. These behaviour changes indicate that unrestricted boat-based ecotourism at Australian fur seal colonies has the potential to increase energy expenditure and reduce the number of seals ashore. According to the authors, increasing minimum approach distances to ≥75m and/or restricting visits to afternoons may minimise these impacts at Kanowna Island during the post-molt and non-breeding seasons.

Author: Baird, S. J.
Year: 2001
Title: New Zealand fur seals – summary of current knowledge New Zealand
City/State: Wellington
Institution: Ministry of Fisheries
Report Number: Aquatic Environment and Biodiversity Report No. 72
Date: 2011
Abstract: This outline of available information about New Zealand fur seals (*Arctocephalus forsteri*) identifies the primary studies that contribute to knowledge of fur seals, in particular in relation to their incidental capture in commercial fisheries, as a resource for fishery managers. Some information is available to describe pup production and dietary and foraging characteristics, but this information is colony specific and often represents a small number of seasonal surveys. Although the life history is generally well understood, there is less information available on the basic population parameters of this fur seal. The current estimate of population numbers for the entire region is unknown; however, since the mid 1970s, there appear to be increases in numbers at some breeding colonies and expansion of areas colonised by these fur seals. Where several time series of data exist, such as the annual pup production data for three colonies on the west coast of the South Island over the last 20 years, the results are yet to be published.
The interaction between commercial fishing activity and fur seals has been described and quantified annually for major fisheries, especially trawl fisheries in which larger factory trawlers operate, but information that could describe the likelihood of fur seal interactions with the fishing activities of smaller vessels that operate in inshore fisheries is lacking. This report summarises the main body of literature relating to fur seal life history, distribution and abundance, diet and foraging, marine and terrestrial habitat, and fisheries interactions including factors affecting capture and mitigation methods. The main knowledge gaps identified include fur seal population dynamics, population numbers throughout New Zealand (or at least for those breeding colonies which are located close to fishing grounds), interactions between fur seals and fisheries for which observer coverage is moderate, low, or non-existent, proportion of the sex and life stages that are removed by fishing each year, and the provenance of the fur seals caught in fishing gear. The main recommendations are for a coordinated approach to define the best strategy for obtaining population parameters and determining comparable population estimates; the data from the west coast South Island main rookeries be published or released for analysis; and that the observer coverage of commercial fisheries, particularly those that are operated close to fur seal breeding colonies, is increased to provide improved estimates of the incidental captures.

Author: Barkai, A.
Year: 2017
Title: Olrac Observer: An interactive citizen science, data collection platform with applications for ecotourism
Conference Name: The 9th International Congress on Coastal & Marine Tourism: Global challenges – local solutions
Conference Location: Gothenburg, Sweden
Page: 25
Abstract: Every day, countless vessels, from cruise ships, sightseeing tours to recreational fishing vessels roam the oceans. Collectively, these vessels are exposed to a myriad of environmental conditions, pollution events and observe enormous amounts of marine life. The collective data-gathering potential of these vessels is tremendous. Our vision is that each one of these vessels could become a data collection platform, relying predominantly on localised

observation data collected at a ground-roots level and with a strong focus on spatial and temporal distributions. The author and his team of programmers have developed such a data collection platform that can transform this vision into reality, the Olrac Dynamic Marine Observer (OlracDMO). OlracDMO is made of two components, a vessel unit for real time recording of observations while at sea and a web-server for the management of observations from numerous vessels. These units have the capacity to gather, store and manage a variety of observational data types, in many forms and formats, on one integrated platform. OlracDMO is a highly interactive tool, which assists casual observers (no technical skills is needed) in describing and identifying a variety of observations such as marine species, sea birds, pollution, debris, other vessels and more.
OlracDMO allows users to capture images of the observations they made during their tour, store them on their own computer, send them to the central website for public viewing as well as giving them the ability to create a trip diary in the form of a printed or digital multimedia booklet. This software encourages tourists to learn and explore the environment they have come to experience while contributing to the public's general knowledge of the ocean and marine conservation efforts. OlracDMO is currently designed to allow users to record and identify sightings of 89 mammal species, 359 birds, 35 sharks and rays, seven turtles, four pollution types, 51 other vessels, eight ghost fishing devices and more.
OlracDMO has been designed to enhance the experience of eco-tourists and contribute with vital observations toward marine conservation. However, it also has the potential to assist tour operators who can use OlracDMO collection of observations (website, trip booklets) to create awareness of their operations and to use them as part of marketing campaigns to attract marine eco-tourists. This information can also be used by tour operators to optimise their trips by identifying marine sighting hotspots that maximise experiences of marine life at sea.

Authors: Barton, K., Booth, K., Ward, J., Simmons, D. G., and Fairweather, J. R.
Year: 1998
Title: Visitor and New Zealand fur seal interactions along the Kaikoura coast
City/State: -
Institution: Tourism Research and Education Centre (TREC)**,** Lincoln University
Report Number: Report No.9 /1988
Date: September 2018
Abstract: This study attempts to integrate both biological and socio-psychological aspects of the visitor/fur seal encounter in New Zealand. It addresses the visitor experience (with seals) as well as examining the effects of visitors upon the seals. This study aims to: 1) determine behavioural changes in fur seals in response to the activities of visitors and 2) determine visitors' behaviour towards seals and the factors influencing this behaviour. The study was conducted at three sites: Kaikoura Peninsula, Ohau Point and Barney's Rock. The findings showed that fur seals' responses to human approach were influenced by their sex. Adult females responded by flight (they rapidly entered the sea). Juveniles exhibited similar behaviour although pups (year one and two age classes) sought safety in rock crevices. The findings revealed that the presence of an approacher and the response of an adult female to an approacher had a "domino effect" on neighbouring females and juveniles, triggering awareness and escape responses. In regard to adult males and sub-adult males, the findings showed that 53 percent of bulls reacted to an approacher with a threat response, 44 percent moved away from the approacher and three percent (only one bull) entered the sea. Furthermore, the findings showed that most visitors passively viewed seals. The majority of the visitors felt they did not affect the seals even though some visitors were clearly negatively affecting the seals. Hence, visitors' perceptions of their impact are misjudged. Similarly, visitors did not perceive any danger from the seals even though some visitors are harmed by seals' reactions to visitor

behaviour every year. According to the authors, most visitors are satisfied with their experience – one of the main reasons behind their satisfaction was seeing seals in their natural environment. The study also reported that most visitors did not read interpretation signs – and therefore did not read the recommendation to remain five metres away from seals.

Authors: Bellman, K., Bennett, S., James-Hussey, A., Watson, L., Ottaway, A., and Sayer, S.
Year: 2019
Title: Please do not disturb! The growing threat of seal disturbance in the United Kingdom: Case studies from around the British coast
Institutions: Seal Protection Action Group and Cornwall Seal group Research Trust
Date: July 2019
Abstract: The tourism sector contributes to an estimated 10.2% of global gross domestic product (GDP), as well as providing 10% of employment worldwide. This sector is continually expanding with the growing popularity of ecotourism, including interest in the coastal environment, wildlife and recreational activities.
Recreational water sports and ecotourism expansion have resulted in increasing numbers of interactions between wildlife and human (anthropogenic) activities, which have been observed to have potentially harmful consequences, such as disturbance to many species. This results in negative impacts on individual animals and populations in both the short and long term.
Seals are vulnerable to disturbance as a result of their need to haul out on land for vital rest and to breed. If scared or disturbed by human activity, stressed seals may be flushed into the sea before they have replaced their oxygen supplies, heat and energy. This can affect their ability to successfully breed and seriously compromise their life expectancy.
Seals have behavioural and physiological responses to human disturbance. They may become more alert and prematurely flush, stampede or tombstone into the sea resulting in site abandonment. At the same time each seal's heart, breathing rate and stress levels will have been increased.
Case studies from around the UK have highlighted high levels of seal disturbance at sensitive haul-out sites that overlap with popular recreation and tourist destinations. These were located in Southwest England, Northwest Wales, Northeast England and Northeast Scotland.
Causes of this disturbance include land, sea and air-based activities. For example, motorised vessels, jet-skis, kayaks, SUPs and wildlife watching tours from the sea; land-based anglers, wildlife photographers, walkers, dogs off leashes, as well as air-borne drones, light aircraft and helicopters.
Many sites experienced disturbance incidents during the majority of observation or survey days. In Southwest England, stampedes at one site in a single survey occurred up to 10 times in just 70 minutes (one every 7 minutes) as a result of disturbance. The maximum number of seals that stampeded into the sea in a single survey was 220. Northeast England recorded almost 700 disturbance incidents in just one month and in Northeast Scotland, two new-born pups were trampled and killed as a result of a stampede caused by human disturbance.
The devastating impacts suffered by individual seals as a result of human disturbance cannot continue. It is essential to conserve this vital species that regulate environmental ecosystems, which local communities value, and businesses depend upon for their economic prosperity.
Current levels of cumulative disturbance around highly sensitive seal sites cannot go uncontrolled, given that they are most likely already unsustainable and likely to escalate in the future.
Funding for monitoring and management schemes are desperately needed to protect these globally rare and vulnerable marine mammals from human disturbance. The Seal Alliance have provided recommendations to help tackle the issue.

Author: Bertella, G.
Year: 2018
Title: An eco-feminist perspective on the co-existence of different views of seals in leisure activities
Journal: Annals of Leisure Research
Volume: 21
Issue: 3
Pages: 284-301
Abstract: This study adopts an ecofeminist perspective and examines leisure activities involving seals taking place in Tromsø, Norway. According to the author, the study aims to contribute to the discussion of the existence of different conceptualisations of wild animals, with specific attention to their implications in regard to animal welfare and wellbeing, and the promotion of specific ways humans view wild animals and themselves. The data were collected through local media, promotional material and history literature consultation, in addition to participant observation. The findings suggest four co-existing conceptualisations of seals: as part of the local cultural heritage, as entertainers, as friends and pets, and as prey and pest. These conceptualisations are discussed in connection with the components of the leisure experience (education, entertainment, self-identity construction), animal welfare and wellbeing, and the ethical implications of how local people perceive the seals and view themselves as humans.

Authors: Bishop, A., Pomeroy, P., and Twiss, S. D.
Year: 2015
Title: Breeding male grey seals exhibit similar activity budgets across varying exposures to human activity
Journal: Marine Ecology Progress Series
Volume: 527
Issue: -
Pages: 247-259
Abstract: Human-wildlife interactions can be incidental or direct through activities such as wildlife tourism. In the presence of anthropogenic activities, some animals exhibit behavioural alterations such as increased vigilance or spatial displacement. Thus, chronic exposure could be adverse to individual fitness through loss of energy or time. Pinnipeds are exposed to human activities in the aquatic environment and on land, but the degree of exposure varies across a species' geographic distribution. For example, breeding colonies of grey seals *Halichoerus grypus* along the mainland coast of England are exposed to anthropogenic disturbance in the forms of tourism and military activities; however, many offshore colonies are relatively undisturbed. Due to the recent expansion of mainland colonies, the impacts of human presence during the breeding season are of urgent interest for managers. Therefore, the aim of this study was to test for any behavioural adjustments associated with anthropogenic presence by comparing the activity budgets of individual male grey seals at a mainland colony with activity budgets from two isolated colonies. The authors found no evidence of differences in the male activity budgets for time spent in nonactive behaviours across colonies, and of the three colonies, males on the mainland spent the least amount of time alert. This indicates that as capital breeders, selection for conservation of energy is potentially overriding short-term costs of local stressors or that males at the mainland colony have habituated to human presence. The results demonstrate the importance of understanding species- and life history-stage-specific selection pressures when considering management actions.

Authors: Blundell, G. M., and Pendleton, G. W.
Year: 2015
Title: Factors affecting haul-out behavior of harbor seals (*Phoca vitulina*) in tidewater glacier inlets in Alaska: Can tourism vessels and seals coexist?
Journal: PLoS ONE
Volume: 10
Issue: 5
Article: e0125486
Abstract: Large numbers of harbour seals (*Phoca vitulina*) utilise habitat in tidewater glaciers in Alaska for breeding, pupping, and molting. Glacial fjords are also well-known tourist destinations; nevertheless, visitation by many vessels can lead to disturbance of seals during critical life-history phases. Blundell and Pendleton examined factors influencing haul-out behaviour of harbour seals at a glacial site frequented by tour vessels. In 2008-10, they deployed VHF transmitters on 107 seals in Endicott Arm, Alaska. The authors remotely observed presence and haul-out behaviour of tagged seals and documented vessel presence with time-lapse cameras. Blundell and Pendleton assessed the effect of physical and environmental factors on the probability of being hauled out, duration of haul-out bouts, and as factors associated with the start and end of a haul out. The study found that location, season, hour, and interactions of location by year, season, hour, and sex significantly affected haul-out probability, as did weather, ice, and vessels. Seals were more likely to be hauled out with greater ice availability during the middle of the day, and less likely to be hauled out if vessels were present. Cruise ships had the strongest negative impact; however, the majority of vessel types negatively affected haul-out probability. Haul-out duration was longest in connection with starting on incoming tides, no precipitation, clear skies, occurring in the middle of the day, and ending in the late afternoon or evening. End of haul outs was associated with low ice availability, increasing cloud cover, and vessel presence; large-sized tour vessels or all-vessel-types combined were important predictors of ending a haul-out bout. Probability of being hauled out was highest in June, during pupping season. According to the authors, potential disturbances of harbour seals could be mitigated, allowing longer resting times for seals and fewer interruptions for nursing pups, if vessels focussed the majority of visits to glacial habitat to before or after the hours of 08:00-17:00 or, less optimally, 09:00-16:00.

Authors: Boncoeur, J., Alban, F., Ifremer, O. G., and Ifremer, O. T.
Year: 2002
Title: Fish, fishers, seals and tourists: economic consequences of creating a marine reserve in a multi-species, multiactivity context
Journal: Natural Resource Modeling
Volume: 15
Issue: 4
Pages: 387-411
Abstract: This paper investigates some economic consequences of creating a marine reserve on both fishing and ecotourism, when the range of controllability of fishing effort is limited and the impact of the reserve on ecosystem is considered. The issue is illustrated by the example of creating a no-take zone in part of a region where fishing is managed through a limited entry license system, and which is inhabited by two interacting stocks: a stock of prey (fish) and a stock of predators (seals). While the former is targeted by commercial fishing, the latter is not subject to harvest but is a potential basis for a commercial non-extractive activity (seal watching). Analysis is conducted with the help of a bioeconomic model combining the features of marine reserve modelling and of multispecies modelling. Following a description of the model, results of several simulation runs are presented. These show that creating a marine

reserve has more complex economic implications than predicted in studies focused exclusively on one stock and/or commercial fisheries. More specifically, the model shows that the dynamics of the two interacting stocks reduces the benefits of the no-take zone for the fishing industry, while it makes the creation of this zone provide an opportunity for the development of ecotourism. Due to these dynamics, the model suggests that the optimal size of the reserve is larger when ecotourism is taken into account along with fishing activities.

Author: Boren, L. J.
Year: 2001
Title: Assessing the impact of tourism on New Zealand fur seals (*Arctocephalus forsteri*)
Academic Department: Zoology
University: University of Canterbury
Thesis Type: Master of Science
Abstract: Marine mammal viewing and encounters are significant tourist activities in some areas of New Zealand - it was estimated in 1992 that at least 300,000+ tourists took part in marine related tourism in New Zealand annually, and the industry has grown considerably since then. While ecotourism can have positive outcomes (e.g. generating revenue and increasing environmental awareness), if it is not managed effectively, it can also have a negative impact on the target species and their environment. Effective management requires an understanding of how the target species react to tourist activities. According to the author, it is important to know:

- If the animals are modifying their behaviour and if so how can we measure the changes in behaviour?
- Are the changes in behaviour biologically significant?
- How can we prevent or mitigate any negative effects of eco-tourism on marine mammals?

New Zealand fur seals, *Arctocephalus forsteri,* are the only marine mammal found regularly ashore on accessible sections of the New Zealand coastline and are therefore the target of both land and sea-based tourism. The time that fur seals come ashore to breed (Nov-Feb) coincides with the peak tourist season making it important that we understand the implications of tourist/seal interactions on the behaviour as well as the reproductive success of the species.
Three study sites were chosen to reflect a spectrum of visitor density, type of tourism, and anticipated fur seal sensitivity. Two experimental sites, the Kaikoura coastline and Tonga Island in Abel Tasman National Park both attract a large number of tourists for viewing by boat, and kayak, and by land in Kaikoura. A control site, Whakamoa, on the Banks Peninsula, which receives no tourist traffic, was used to compare responses of seals to various approach types. Data were collected during the Austral summer seasons 1999/2000 and 2000/200l. Behaviour was observed using focal animal and instantaneous scan sampling, while attributes of tourist approaches were tested experimentally via controlled approaches. Approaches were broken into land, kayak and boat approaches, and the following factors were manipulated: distance, noise, frequency of approach, and size of group approaching.
In the first field season (1999-2000), focal animal observations were carried out on 277 individual seals representing five different gender/age classes: adult male, adult female, sub-adult male, juvenile and pup. In the second field season (2000-2001), focal animal data were collected on 124 mother/pup pairs. Over both field seasons 162 hours of instantaneous scan data were collected. Controlled approaches by land, kayak, and boat were carried out during both seasons and data were collected on 3525 seals. Frequency approach data were collected by land (n=13 seals), and by kayak (n=55 seals) in the first field season. Also in the first field season, the impact of group size was tested on 97 seals by land. Seals' responses to tourist approaches were recorded during both seasons, on land and at sea in both boats and kayaks

(n=3699 seals approached). Data were collected on 327 seals approached by a commercial guided walk in the second field season. A total of 33 commercial swim-with-seal programmes were observed during the second season. A mark-recapture experiment was carried out at Ohau Point and Tonga Island breeding colonies both seasons (n=167 pups sampled) to assess pup productivity and condition at these sites.
The results from this study indicate that fur seals are changing their behaviour in response to tourist activities. The thesis details the results of the behavioural sampling. Focal animal data collected on all gender/age groups suggests that there are significant differences in the behavioural repertoire of seals based on site and gender/age differences. Focal animal data collected on mother/pup pairs suggests that time spent 'nuzzling' was significantly less at Tonga Island ($p<0.019$) although no significant differences were observed in mother/pup association time between sites. Instantaneous scans showed significant changes in seals' behaviours in response to tourist disturbance. They also showed significant differences in colony behaviour between sites ($p<0.000l$), as well as behavioural changes within the colonies over the two seasons ($p<0.042$).
The results of the experimental data from the controlled approach aspect indicate that fur seals respond more strongly to land-based approaches than sea-based approaches ($p<0.00l$). Response to different approaches also varied by site with more avoidance responses displayed at the control site ($p<0.005$). There was no significant correlation between group size and fur seal response or the frequency of approach and seal response. Results from the guided walk showed that seals' responses varied significantly based on the distance of approach, and the size of the group approaching. The responses of seals to the guided walk were also compared to responses of seals approached by tourists without a 'guide; the presence of a guide reduced the number of avoidance responses by as much as 15%. No significant difference was found in seals' responses to swims organised by different companies, however, particular human behaviours were observed to increase the likelihood of seals avoiding the swimmers.
The data have shown that seal responses vary based on a large number of factors, and that seals may habituate over time in areas of high tourist activity. This study indicates that current management guidelines are not preventing negative impacts in tourist/seal interactions. Strategies are recommended to lessen the overall impact of eco-tourism activities on fur seals including new minimum approach distances (land approaches - 30 m at nonbreeding sites, prohibited at breeding sites; kayak approaches - 20 m at breeding sites; boat approaches - 30 m at all locations). Long-term monitoring is required to assess the possible impacts of tourism on the reproductive success of the species.

Author: Boren, L. J.
Year: 2007
Title: Guiding effectively: Experience, knowledge and decision making to reduce tourist impact on New Zealand
Conference Name: 5th International Coastal & Marine Tourism Congress: Balancing marine tourism, development and sustainability
Conference Location: Auckland, New Zealand
Abstract: Pinniped tourism has been growing world-wide, and within New Zealand a host of opportunities exist for viewing New Zealand fur seals and sea lions in their natural environment. Recent work has investigated the impact of land and sea-based tourism on New Zealand fur seals in the Kaikoura and Abel Tasman regions, and has shown that sea-based approaches result in less avoidance from the seals, and having a guide present greatly reduces the chance of disturbance. However, the effectiveness of the guide on reducing disturbance will depend on their experience and knowledge of the target species and environment. At Point Kean, Kaikoura Peninsula, distance restrictions on seal-swim programmes have been replaced

with an operator "Code of Conduct" where the onus of managing a group of tourists in differing situations lies completely with the guide. In this study, the author revisits guides from the Kaikoura region and all seal-swim operators in New Zealand to determine how effective the new "Code of Conduct" has been, the guide's knowledge of the target species, as well as what they feel would be a way forward to increase their effectiveness in minimising the impact of viewing New Zealand pinnipeds
in their natural environment.

Authors: Boren, L. J., Gemmell, N., and Barton, K.
Year: 2002
Title: Tourism disturbance on New Zealand fur seals *Arctocephalus forsteri*
Journal: Australian Mammalogy
Volume: 24
Issue: 1
Pages: 85-96
Abstract: Marine mammals are significant tourist attractions around New Zealand, however, the impact of eco-tourism on these species is poorly documented. Effective management to mitigate any negative effects requires an understanding of target species' reactions to tourist activities. Boren and colleagues have studied the effects of tourist activities on New Zealand fur seals (*Arctocephalus forsteri*) using a novel combination of observations and controlled approaches. Three study areas were selected reflecting a range of visitor density, type of tourism, and the anticipated sensitivity of fur seals to disturbance. Behaviour was observed using instantaneous scan sampling and attributes of tourist approaches were tested experimentally by controlled approaches. Approaches were made on land, by kayak, and motorboat. Fur seal responses and the distance at which the seal responded were recorded. The results indicate that *A. forsteri* behaviour was being modified by tourist activities. Habituation was occurring at study areas with high levels of tourist activity. Approachers following current minimum approach distances still caused some animals to modify their behaviour and new minimum approach distances are recommended based on controlled approaches to seals at all study areas. This work demonstrated that controlled approaches can be a useful tool to develop effective management guidelines to lessen impacts from eco-tourism activities.

Authors: Boren, L. J., Gemmell, N., and Barton, K.
Year: 2007
Title: The role and presence of a guide: Preliminary findings from swim with seal programmes and land-based seal viewing in New Zealand
Conference Name: 5th International Coastal & Marine Tourism Congress: Balancing marine tourism, development and sustainability
Conference Location: Auckland, New Zealand
Abstract: Marine mammal tourism is increasing world-wide and pinnipeds are increasingly a target of guided tourism ventures, in the form of "walk" and "swim-with" seal programmes. This paper aimed to quantify the response of seals to commercial seal-swim operations and guided walks; compare responses of seals to guided versus unguided tours; and determine what human behaviours were more likely to elicit an avoidance response from the seals. Both guided and unguided commercial seal-swims, as well as freedom/independent swims were monitored in Abel Tasman National Park, and Kaikoura, located in the South Island of New Zealand in the 2000/2001 austral summer. The behaviours of seals approached during seal swims were monitored from kayak or land-based platforms. Seal behaviour in response to a guided walk on the Kaikoura Peninsula was also monitored; landing is not permitted on Tonga Island so land-based approaches were not observed there. Commercial seal-swims elicited fewer

avoidance responses than independent swimmers, however, no significant differences were found between seal-swim companies. The benefit of having a guide present on guided walks to view seals was considerable with 15% fewer seals responding to the guided walk than independent land-based tourist approaches. Key factors that influence seal responses to tourist approaches include group size; seals responded significantly more to groups of seven to nine tourists, than to tour groups of smaller size. The data presented here highlights some key factors that influence seal responses to tourist approaches, and also shows that the presence of a guide significantly reduces the amount of avoidance responses from seals. As the popularity of seal tours increases this information will be useful in establishing guidelines to effectively manage encounters with positive outcomes for both animals and tourists.

Authors: Boren, L. J., Gemmell, N., and Barton, K.
Year: 2009
Title: The role and presence of a guide: Preliminary findings from swim with seal programs and land-based seal viewing in New Zealand
Journal: Tourism in Marine Environments
Volume: 5
Issue: 2-3
Pages: 187-199
Abstract: Marine mammal tourism is increasing worldwide and pinnipeds are increasingly a target of guided tourism ventures, in the form of "walk" and "swim-with" seal programmes. This article aimed to quantify the response of seals to commercial seal swim operations and guided walks; compare responses of seals to guided versus unguided tours; and determine what human behaviours were more likely to elicit an avoidance response from the seals. Both guided and unguided commercial seal swims, as well as freedom/independent swims were monitored in Abel Tasman National Park, and Kaikoura, located in the South Island of New Zealand in the 2000/2001 austral summer. The behaviours of seals approached during seal swims were monitored from kayak or land-based platforms. Seal behaviour in response to a guided walk on the Kaikoura Peninsula was also monitored; landing is not permitted on Tonga Island so land-based approaches were not observed there. Commercial seal swims elicited fewer avoidance responses than independent swimmers; however, no significant differences were found between seal swim companies. The benefit of having a guide present on walks to view seals was considerable, with 15% fewer seals responding ("changing behaviour" or "avoiding") to tourists on guided walks than independent land-based tourist approaches. Key factors that influence seal responses to tourist approaches include group size: seals responded significantly more to groups of seven to nine tourists than to tour groups of smaller size. The findings presented in this study highlight some key factors that influence seal responses to tourist approaches, and also show that the presence of a guide significantly reduces the amount of avoidance responses from seals. As the popularity of seal tours increases, this information will be useful in establishing guidelines to effectively manage encounters with positive outcomes for both animals and tourists.

Authors: Born, E. W., Riget, F. F., Dietz, R., and Andriashek, D.
Year: 1999
Title: Escape responses of hauled out ringed seals (*Phoca hispida)* to aircraft disturbance
Journal: Polar Biology
Volume: 21
Issue: -
Pages: 17-178
Abstract: Arctic marine mammals may be subject to human-induced disturbance from various air traffic, mostly in connection with exploration and exploitation of non-renewable resources. The escape responses (i.e. leaving the ice) of hauled out ringed seals (*Phoca hispida*) to a low-flying (150 m) fixed-wing twin-engine aircraft (Partenavia PN68 Observer) during strip censuses in eastern Greenland (June 1984) and to a low-flying (150 m) helicopter (Bell 206 III) during reconnaissance in north-western Greenland (May 1992) were recorded. Overall, 6.0% of the seals ($N_{tot} = 5040$) escaped as a reaction to the fixed-wing aircraft. Seals escaped less than about 600 m in front of the aircraft. The overall probability of escaping was 0.21 within a 200-m-wide centre zone, 0.06 on the side of the aircraft (100–300 m from the flight track), and 0.02 between 300 and 500 m from the track. The probability of escaping was found to be influenced by the time of day, relative wind direction and wind chill. Overall, about 49% of all seals ($N_{tot} = 227$ cases) escaped as a response to the helicopter. Seals entered the water a maximum of about 1250 m in front of the aircraft. At wind chill values below 1100 kcal/m^2 h, the probability of escaping was 0.79 in the 200-m-wide centre zone. On the sides the probability of escaping decreased up to about 500 m from the flight track whereafter it remained constant at about 0.30 up to about 1450 m. During the helicopter surveys wind chill was the only environmental factor found to have an additional effect on the probability of escaping. The study indicated that the risk of scaring ringed seals into the water can be substantially reduced if small-type helicopters do not approach them closer than about 1500 m, and small fixed-winged aircraft not closer than about 500 m.

Authors: Buckley, R. C., Morrison, C., and Castley, J. G.
Year: 2016
Title: Net effects of ecotourism on threatened species survival
Journal: PLoS ONE
Volume: 11
Issue: 2
Article: e0147988
Abstract: Many threatened species rely on ecotourism for conservation funding, but simultaneously suffer direct ecological impacts from ecotourism. For a range of IUCN-Redlisted terrestrial and marine bird and mammal species worldwide, Buckley and colleagues used population viability analyses to calculate the net effects of ecotourism on expected time to extinction, in the presence of other anthropogenic threats such as poaching, primary industries and habitat loss. Species for which these calculations are currently possible, for one or more subpopulations, include: orangutan, hoolock gibbon, golden lion tamarin, cheetah, African wild dog, New Zealand sea lion, great green macaw, Egyptian vulture, and African penguin. For some but not all of these species, tourism can extend expected survival time, i.e., benefits outweigh impacts. Precise outcomes depend strongly on population parameters and starting sizes, predation, and ecotourism scale and mechanisms. Tourism does not currently overcome other major conservation threats associated with natural resource extractive industries. Similar calculations for other threatened species are currently limited by lack of basic population data.

Author: Burns, G. L.
Year: 2015
Title: Animals as tourism objects: Ethically refocusing relationships between tourists and wildlife
Editor: K. Markwell
Book Title: Animals and tourism: Understanding diverse relationships
Publisher: Channel View
Pages: 44-89
Abstract: Tourism is based on human pursuit of personal satisfaction. It exists within an ethical framework that is instrumental in approach: that is, the industry is based on valuing its product by its use to the tourist. The product is an object constructed for human consumption. When that product is an animal, appreciating it only for its extrinsic value downgrades, or even denies, its capacity for independent agency. In this situation, tourism can exemplify an anthropocentrically focused relationship that objectifies animals and leaves them as the underprivileged counterparts.
This chapter examines the role of animals as tourism objects and the changes offered to human and animal relations as a result of the movement toward more ethically responsible forms of tourism. It explores what the emergence of 'responsible' tourism means for objectifying and commodifying animals, especially in wildlife tourism contexts. Although literature on commodification and objectification of wildlife in captive tourism settings is widespread, it is still largely absent within the context of wildlife in nature-based tourism settings. This chapter discusses literature on objectification, and on responsible tourism, before turning to how engagement with these terms might provide a useful explanatory tool for the current relationships between tourists and wildlife.
As tourism scholars and practitioners look toward more responsible ways to engage with tourism objects, be they people, landscapes or animals, they increasingly turn to the field of environmental ethics. Focussing on examples of human and animal interactions in nature-based wildlife tourism settings, this chapter reviews literature at the intersection of tourism, ethics and animal studies. It then examines a set of ecocentric principles designed to guide the interactions between tourists and wildlife. The principles aim to refocus relations to recognise the intrinsic value of animals, and the need for informed moral reasoning and obligation by people. The guiding principles also stress the interconnectedness between humans and animals, and the need for ethical self-reflection by managers and tourists alike.
Empirically, the chapter draws on case studies from Fraser Island in Australia and the Vatnsnes peninsula in Iceland. Both regions contain significant nature-based wildlife tourism attractions. Dingoes are one of many tourist attractions on Fraser Island while seals are the predominant attraction on the Vatnsnes peninsula. Both regions are rural and have small resident human populations; approximately 200 on Fraser Island and 600 on the Vatnsnes peninsula. They are also remote locations, situated several hours travel from the nearest capital city. These cases illustrate both the need, and the tools, to re-evaluate the way humans interact with animals in wildlife tourism settings.

Author: Burns, G. L.
Year: 2017
Title: Searching for resilience: Seal-watching tourism as a resource for community development in Iceland
Editors: A. A. Lew and J. M. Cheer
Book Title: Tourism resilience and adaptation to environmental change: Definitions and frameworks
Publisher: Routledge
Pages: 69-85
Abstract: Icelandic culture, from its modern complexities to the very basics of continued existence of people on this northern island country, epitomises resilience. Iceland was settled in approximately AD 870 and over the last thousand years has represented "a case of an apparent near miss" in terms of human survival. Despite adversities wrought by volcanic eruptions, severe weather events, famine and plagues, Icelandic society has endured.
Based on ethnographic research, this chapter presents a case study of wildlife tourism in a rural region in northwest Iceland. Human and seal residents of Húnaþing vestra have a long history of interactions in which their shared social-ecological system has demonstrated resilience. These interactions have involved humans hunting seals as a resource for subsistence and commercial gain, and seal prominence in Icelandic folklore. Exploring the history of these interactions demonstrates both change and adaptation over time.
More recently, establishment of The Icelandic Seal Center in 2005 served to provide Húnaþing vestra with a unique tourism brand, at a time when rural communities across Iceland were experiencing declining populations and competing to attract the tourist dollar. The addition of wildlife tourism has added a third actor, the tourist, to the existing system and interactions with, and attitudes toward, seals as a resource have changed again as a consequence. Despite lack of formal planning for tourism in Húnaþing vestra, the residents, the tourists and the seals must find a way forward. This chapter demonstrates how examination of the literature and case studies of ethics and responsibility in wildlife tourism can help create a path to move beyond sustainable tourism and toward resilience for this community of people and wildlife.

Authors: Burns, G. L., Óqvist, E. L., Angerbjörn, A., and Granquist, S.
Year: 2018
Title: When the wildlife you watch becomes the food you eat: Exploring moral and ethical dilemmas when consumptive and non-consumptive tourism merge
Editor: C. Kline
Book Title: Animals, food, and tourism
Publisher: Routledge
Pages: 22-35
Abstract: In the context of wildlife tourism, human experiences with other species are often divided into the binary categories of consumptive and non-consumptive interactions. This chapter explores moral and ethical issues inherent in tourism experiences where tourists both watch and eat the same species. Human and non-human animals have a long, complex, and essential history of interactions, in which the relationships formed vary temporally, spatially, and culturally. Tourism is just one of the many ways humans engage with other animals, and in the context of tourism, human interactions with other animal species are no less broad and complex. The chapter includes two case studies examining whales and tourists, and seals and tourists, in Iceland. One critical difference between whales and seals can be found in the history of human–wildlife interactions in Iceland, namely the importance of seals for subsistence.

Authors: Burton H., and van den Hoff, J.
Year: 2002
Title: Humans and the Southern Elephant Seal *Mirounga leonina*
Journal: Australian Mammalogy
Volume: 24
Issue: 1
Pages: 127-139
Abstract: Southern elephant seal (*Mirounga leonina*) populations appear remarkably unaffected by interactions with humans. They are very tolerant of close human presence whilst they are ashore for pupping, mating and moulting. Their behaviour in close proximity to helicopter operations suggests disturbance of moulting male *M. leonina* is minimal. There is no evidence that *M. leonina* have been affected by persistent organic pollutants; and few *M. leonina* have been reported as having been injured or killed by interactions with fishery gear. The number of prey species common to their diet and commercial fisheries in the Southern Ocean are few; but one commercial squid species, *Martialia hyadesi*, accounted for as much as 94% of the biomass consumed by *M. leonina*. Two harvested commercial squid species (*Mar. hyadesi* and *Todarodes filippovae*) were found in the stomachs of *M. leonina*; and some other squid species (*Alluroteuthis antarcticus, Brachioteuthis spp., Gonatus antarcticus, Histeoteuthis spp., Kondokovia longimana, Moroteuthis ingens, Mor. knipovitchi, Pholidoteuthis boschmani* and *Psychroteuthis glacialis*) have potential as commercial catch too. There is cause for concern if a future directed fishery for any of these species escalates or the by-catch of *Mar. hyadesi* and *T. filippovae* in the Illex and Nototodarus fisheries increase. There is also concern if fin-fish fisheries expand and take more of those species already taken by both *M. leonina* and fisheries. These species are benthic (*Notothenia squamifrons*), benthopelagic (*Dissostichus eleginoides* and *Champsocephalus gunnari*) and, perhaps most importantly, the pelagic myctophid species (e.g., *Electrona carlsbergi*).

C

Authors: Campbell, R. A., Chilvers, B. L., Childerhouse, S., and Gales, N. J.
Year: 2006
Title: Conservation management issues and status of the New Zealand (*Phocarctos hookeri*) and Australian (*Neophoca cinerea*) sea lion
City/State: -
Institution: Alaska Sea Grant College Program
Report Number: Report No. AK-SG-06-01
Abstract: The two antipodean sea lion species are the rarest sea lions in the world. They are relatively similar in abundance and share common conservation management concerns. Recovery from commercial sealing in the eighteenth to twentieth centuries and ongoing interactions with commercial fishing activities are primary concerns. However, there are marked differences in distribution (number of breeding colonies) and life history traits, in particular the variation in breeding cycles and population genetic structure. According to the authors, these factors must be taken into consideration in addressing management concerns and are reflected in the current management actions being taken for both species in regard to interactions with commercial fishing activities.

Author: Cassini, M. H.
Year: 2001
Title: Behavioural responses of South American fur seals to approach by tourists – a brief report
Journal: Applied Animal Behaviour Science
Volume: 71
Issue: 4
Pages: 341-346
Abstract: Cassini studied the responses (retreats, threats, attacks or leaving the rookery) of South American fur seals *Arctocephalus australis* to tourist approaches at a non-reproductive, continental colony of located in Cabo Polonio, Uruguay (34°24′S, 53°46′W). Fur seals tolerated relatively close distances to humans, but a strong response of the animals was elicited when tourists crossed a threshold of 10 m. The attitude of the tourist was also important. Calm people were able to approach the colony without almost any disturbance. These results suggested that, with a minimal control of visitor's behaviour, the impact of tourism on this colony would be low.

Authors: Cassini M. H., Szteren, D., and Fernández-Juricic, E.
Year: 2004
Title: Fence effects on the behavioral responses of South American fur seals to tourist approaches
Journal: Journal of Ethology
Volume: 22
Issue: -
Pages: 127-133
Abstract: Animals that breed in coastal colonies, such as pinnipeds, usually attract tourism, which can negatively affect their resting and breeding behaviour if not managed properly. One strategy to reduce human disturbance is to set up fences, but little is known about their local effectiveness. The purpose of this study was to assess the behavioural responses of South American fur seals (*Arctocephaalus australis*) towards tourist approaches before and after the implementation of fences in Cabo Polonio colony (Uruguay). Cassini and colleagues found that human disturbance levels were similar between years and that the presence of a fence reduced (1) overall fur seal responses to tourists by 60%, (2) the most intense behavioural responses (threat, attack, leaving the colony) by more than half, (3) the responses to large tourist groups (>2 people), which were the most disturbing, (4) the responses to closer (<10 m) tourist approaches, and (5) the responses involving more intrusive tourist behaviours (running, shouting, hand waving). Overall, the authors showed that after the erection of the fence not only human–wildlife interactions were reduced but also the most stressful fur seal behavioural responses. Although further studies are necessary, these results suggest that the implementation of fences can be a simple and affordable means of minimising human disturbance effects on pinnipeds at local levels (e.g., within colonies), particularly if combined with other strategies (e.g., changes in tourist attitudes).

Author: Cate, J. R.
Year: 2013
Title: The effects of tourism on the behaviour of the New Zealand fur seal (*Arctocephalus forsteri*)
Academic Department: School of Biological Sciences
University: University of Canterbury
Thesis Type: Doctoral thesis
Abstract: The demand by ecotourism for easily accessible wildlife encounters has increased the need for regulations to minimise negative effects of tourism on towards marine mammals. High levels of human interaction could have serious consequences for recovering populations of New Zealand fur seals (*Arctocephalus forsteri*). By monitoring behavioural shifts in reactions to human disturbance, the aim of this study was to determine how disturbance by tourism is affecting the behaviour of the New Zealand fur seals. Fur seal breeding colonies, haul-outs, and a pup nursery were studied on New Zealand's South Island to determine the level of disturbance. Data collected in this study can be used towards improving monitoring regimes to mitigate negative effects of anthropogenic disturbance. Cate first used behavioural observations to assess a seal's behaviour in response to different types of tourist activities. Next, she examined changes in New Zealand fur seal behaviour as a result of visits to colonies by tourist boats. To quantify the response of fur seals to tourist boats, experimental boat approaches were conducted using a before, during, and after instantaneous scan sampling method at two breeding colonies (one with high vessel traffic and one with none). Impact of noise was also investigated using a loud speaker to mimic local harbour tours. Lastly, behavioural observations on seal pups at a nursery were conducted comparing pup behaviour in the presence and absence of tourism along with variable intensities of tourist behaviour. Cate's observations suggest that seal behaviour was significantly different between sites with and without tourist visits. The type of tourism had a significant effect on the behavioural state of seals, with animals more active when there were people walking in the colonies. There were also signs of habituation in some of the study colonies. Since each colony varied in the type of tourism it experienced, it is possible that it is not only the level of tourism that is important but also the type of tourism that has a significant role in eliciting short-term behavioural shifts. Observations from a tour boat revealed an increase in the percentage of seals reacting when vessels were close to the shore. This distance effect was overridden and reactions were greater, however, when tours included commentary via an external speaker. The effects of both distance and noises were significantly different between colonies with high and low levels of tourist visits. Due to the overlap of peak tourist visits with fur seal breeding season, these animals are at their most vulnerable when companies are in peak operation. Finally, as with adults, pup behaviour was also significantly affected by tourism presence. Periods of inactivity and awareness increased in the presence of tourists, which is indicative of disruption of "play" and movement towards more vigilant behaviour. Despite the significant effects of tourist visits Cate found in this study, there was large variation in the degree of responses in different populations of the fur seal. This variation is thought to be due, in part, by the level of desensitisation, especially at locations with high or continual tourism pressures. This study also provides evidence that fur seal pups subject to human disturbance will alter their behaviour, shifting from active (when people are not around) to inactive and more aware (with increased disturbance). The results presented suggest such visits are not without consequences and that animals can be disturbed by human interactions. Therefore, measures should be taken at all seal colonies used in tourism ventures to mitigate any negative long-term effect on the fur seal populations.

Author: Cater, C.
Year: 2010
Title: Any closer and you'd be lunch! Interspecies interactions as nature tourism at marine aquaria
Journal: Journal of Ecotourism
Volume: 9
Issue: 2
Pages: 133-148
Abstract: Marine aquaria continue to be popular tourist attractions, and while not ecotourism *per se*, they are clearly nature-based, and fulfil parallel tourist needs for interaction with animals. In recent years, some of these facilities have recognised that visitors desire an experience that goes beyond the visual and entertainment encounters that categorise the majority of their offerings, for example, the '*Animal Adventures*' programme at Sea World™ on Australia's Gold Coast. However, these interactions open up a whole new realm of performance management for these organisations, coordinating a range of actors from tourists, wildlife trainers, and the animals themselves. This paper examines why tourists are seeking such encounters, and shows how these interactions are contextualised and given meaning in tourist narratives, situated within an emerging social science discourse on embodiment. Observations suggest that society's over-anthropomorphising of the animals in question brings particular opportunity for dissonance. The broader significance of animal–human relations is explored through this interface, as are the implications for sustainable nature tourism in the future. There is potential here for a more enlightened approach to animal tourism, and a more nuanced categorisation of these activities in the literature.

Authors: Cisneros-Montemayor, A. M., Townsel, A., Gonzales, C. M., Haas, A. R., Navarro-Holm, E. E., Salorio-Zuñiga, T., and Johnson, A. F.
Year: 2020
Title: Nature-based tourism in the Gulf of California and Baja California Peninsula: Economic benefits and key species
Journal: Natural Resources Forum – A United Nations Sustainable Development Journal
Volume: ahead of print
Issue: -
Pages: -
Abstract: Ecotourism can incentivise social and environmental benefits through marine conservation, in parallel with efforts to better manage fisheries, coastal development, and other human pressures. In Mexico's Gulf of California and Baja California Peninsula (GCBP), marine ecosystems support tourism activities in many communities, but to date there have been no region-wide studies to estimate their benefits or identify key species. Based on data collected in this study, each year nature-based marine tourism in the GCBP results in 896,000 visits, US$518 million in expenditures and at least 3,575 direct jobs from formal operations. In interviews with operators, over 40 species groups were named as important; sea lions, whale sharks, whales, and marlin were the highest ranked, highlighting the importance of ecosystem-wide health for nature-based tourism sustainability. Local employment and the ability to make economic and conservation goals compatible were noted by operators as significant opportunities provided by nature-based marine tourism; challenges included pollution and declines in ecosystem health, a lack of infrastructure, poor resource management policies, and high operating costs. As nature-based marine tourism expands, a wider transition to true ecotourism, a focus on equitable benefits and collaboration between stakeholders and a cross-scale and ecosystem approach to management will be vital for achieving potential sustainable social, ecological and economic benefits.

Author: Clack, G.
Year: 2016
Title: The impact of tourism on harbour seals and their abundance around Iceland
Academic Department: Faculty of Business and Science
University: University of Akureyri
Thesis Type: Master of Resource Management: Coastal and Marine Management
Abstract: The harbour seal population in Iceland is currently in decline and many factors could be contributing to this. Currently there is insufficient evidence to show exactly what is causing this. In the first part of this project, population count data from around the Icelandic coastline and more locally from around Vatnsnes and Heggstaðanes peninsulas, was analysed to look at abundance changes between the years 2008 and 2015. The results from this project showed that between some areas there has been a decline in the abundance of seals from 2011 to 2014. Overall, the total number of seals has not significantly changed between years on Vatnsnes and Heggstaðanes but the abundance of the seals is not uniform around the coastline. Leaving out areas with a very small number of seals (one to three) would cause significant bias to the results of population counts. Distribution changes of the seal population at some sites could be related to increasing tourism. Tourism is fairly new to Iceland and therefore the effect of wildlife watching on the Icelandic seal population is largely unknown. In the second part of this project the effect of tourism will be studied; this is focussed on harbour seal (*Phoca vitulina*) behaviour within Miðfjörður from a seal watching boat that operates from Hvammstangi and this behaviour data was compared to data collected in 2010 and 2011 from the same boat. The results from this show that vigilance and flushing of seals increased as the distance to the boat decreased and the amount of time the boat stopped and the day of the year also had an effect. The compliance to the voluntary code of conduct was assessed using these data and it was found on average the boat complied 70% of the time with all guidelines in the code of conduct. These results will provide a basis on which to compile management and conservation plans for the seal population locally and nationally. It is important to investigate both seal abundance and the effect of tourism as they could both have an impact on each other.

Authors: Corral, C. T., Szteren, D., and Cassini, M. H.
Year: 2018
Title: Short- and long-term changes in the intensity of responses of pinnipeds to tourist approaches in Cabo Polonio, Uruguay
Journal: Applied Animal Behaviour Science
Volume: 201
Issue: -
Pages: 111-116
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. The authors 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. They found that people's attitude and distance of approach

influenced the animals' behaviour. The responsiveness of the pinnipeds almost tripled after two decades. Corral and colleagues 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.

Author: Cowling, M.
Year: 2013
Title: Management of seal tourism in New Zealand – Tourism and the New Zealand fur seal in the Bay of Plenty
Academic Department: Ecology, Faculty of Engineering and Science
University: Victoria University
Thesis Type: Masters by Research
Abstract: Pinniped (seal, sea lion and walrus) tourism is an expanding industry, popularised due to the playful and interactive nature of seals. The industry can have positive outcomes for pinnipeds, through education and the promotion of conservation issues, or negative outcomes, such as causing the animals to abandon sites. The impact of tourism on pinnipeds needs to be minimal for the industry to be considered sustainable. Within New Zealand, pinniped tourism principally targets the New Zealand fur seal (*Arctophoca australis forsteri)*, a recovering species which is increasing in number around New Zealand's coast as it recolonises parts of its former range. One of these regions is the Bay of Plenty, in New Zealand's North Island, where tour operators take customers to view and swim with the seals. This study investigated human-seal interactions during both seal viewing and seal-swim activities, primarily in the Whakatane region of the Bay of Plenty. The major aim of this study was to evaluate the effects of tourism on the seals and to assess and make recommendations for the sustainability of the industry. It also aimed to determine whether a range of variables influenced seal response during tourism activities, including: location, colony size, sex/age classes, time of day, duration of stay, distance, month and stage in the breeding season. Seal-swims were usually observed from on board a licenced marine mammal tour vessel (n = 16 seal-swims), and controlled approaches were conducted from on board an independent research vessel (n = 68 surveys). Video footage of seals in the absence of vessels was taken from a land vantage point to collect control seal behavioural data (n = 15 surveys).
Seal behaviour (interaction, neutral, avoidance) was monitored at 1-minute intervals, during 16 seal-swim events over a four-months period (December 2011 to March 2012), which included a 6-week seal pupping period. Overall, 54% neutral behaviour was observed during seal-swims, followed by 41% interaction and 5% avoidance. The duration of the swim affected seal response, with interaction in seals peaking at six minutes into the swims, before declining sharply. The number of seals interacting with swimmers decreased as the number of seals in the water increased. The stage in the breeding season also affected seal response to swimmers: seal interactions peaked in December and were significantly higher during the breeding season in comparison to the non-breeding season. Compliance of tour operators to regulations and permit conditions was also recorded during tourism encounters. Of the seven Marine Mammal Protection Regulations examined; there was 100% compliance with six regulations and 94% with one. And of the four Marine Mammal Permit Conditions tested, there was 100% compliance with three and 81% with one condition.
Seal behaviour during controlled boat approaches was recorded at 1-minute intervals at a breeding site and several non-breeding sites during a five-months period (December 2011 to March 2012). Control video footage revealed that in the absence of a vessel New Zealand fur seals (excluding pups) spent 65% of their time resting, 16% alert, 6% upright, 9% grooming, 4% in the water and 1% on other activities. In the presence of vessels (measured on board

during controlled approaches), the seals spent 61% of their time resting, 8% alert, 8% upright, 5% grooming, 17% in the water and 1% on other activities. In the presence of a vessel, seals spent the same percentage of time resting but significantly less time alert and more time in the water, than in the absence of a vessel. The variables month, distance, minute and time of day were identified as important influencing variables on seal alert and rest behaviour. Seal behaviour was also influenced by the sex and age class of the seals, with pups being the most alert age class, especially when the vessel was 10-20 m away. Males and pups were more likely to shift behaviour than females and juveniles. Seals shifted behaviour more often in the presence of fewer seals and when the boat was closer to the seals.
Overall, the study found that seal-swims in the Whakatane region of the Bay of Plenty were not having a negative impact on the seals in the water, and were likely to be sustainable. This is based on the assumptions that the high levels of compliance observed in this study are maintained and tourism traffic does not change significantly in the future. Results of controlled boat approaches indicated that the overall behavioural budget of New Zealand fur seals in the presence of vessels did not differ negatively from the control behavioural budget. However, operational factors such as distance of the vessel and duration of stay did influence seal behaviour. In the event that boat traffic or the number of permitted vessels increases in the future, it was recommended that further monitoring of pinniped-focused tourism interactions should be implemented. It was also recommended that tour operators and the general public do not approach seals by boat any closer than 20 m and that the development of a site-specific voluntary code of conduct may be beneficial to the seals. This study demonstrated that monitoring the impacts of wildlife tourism can be particularly site and time specific. It is recommended that the approaches trialled in this study be adopted to monitor other wildlife tourism activities at small, establishing sites.

Authors: Cowling, M., Kirkwood, R., Boren, L. J., and Scarpaci, C.
Year: 2014
Title: The effects of seal-swim activities on the New Zealand fur seal *(Arctophoca australis forsteri*) in the Bay of Plenty, New Zealand, and recommendations for a sustainable tourism industry
Journal: Marine Policy
Volume: 45
Issue: -
Pages: 39-44
Abstract: Wildlife tourism (including pinniped tourism) offers people the opportunity to see wildlife in their natural environment. It can provide positive outcomes for the animals, through improved resources for conservation, or negative outcomes, such as inducing the animals to move away. This study assessed the impacts and sustainability of a novel but growing tourism industry, swimming with seals, based on interactions with New Zealand fur seals (*Arctophoca australis forsteri*) in the Bay of Plenty, New Zealand, between December 2011 and March 2012. The behaviour of all seals in the water (interaction, neutral, and avoidance) was monitored at 1 min intervals, during 16 seal-swim events. Seals mostly ignored the swimmers (54% of records), some interacted with swimmers (41%); seals rarely avoided the swimmers (5%). Interactions peaked in frequency at 6 min into the swims, then declined. They occurred most frequently during December, corresponding with the pupping period when juvenile seals—the age class most likely to interact—are excluded from breeding areas and so spend much of their time in the water. Compliance of tour operators to regulations was also monitored during seal-swim activities and the industry was found to be highly compliant. The results suggest the activities monitored had minimal impact on seals in the water, and are likely to be sustainable in relation to seal conservation. Tourism can be site and time specific, and it is

recommended that approaches such as those trialled here be adopted to monitor other wildlife tourism activities to ensure their sustainability. According to the authors, further research needs to examine potential impacts of the tours on seals ashore.

Authors: Cowling, M., Kirkwood, R., Boren, L. J., Sutherland, D., and Scarpaci, C.
Year: 2015
Title: The effects of vessel approaches on the New Zealand fur seal *(Arctophoca forsteri*) in the Bay of Plenty, New Zealand
Journal: Marine Mammal Science
Volume: 31
Issue: 2
Pages: 501-519
Abstract: Animals that establish new sites near the edge of the species' range may be vulnerable to disturbance as they are low in numbers and are not tied to the sites. Pinniped distributions world-wide are changing as many species are recolonising areas of their former ranges and establishing new colonies. Little research is available on the impact that vessel presence may pose on pinnipeds at such sites. This study documents responses of New Zealand fur seals to vessels in the Bay of Plenty, New Zealand, at a recently established breeding colony. Fur seal behaviour at the breeding location was recorded in the presence of vessels. GLMM and GAM analyses revealed that fur seal responses varied with month, time of day, duration of vessel exposure, and the distance to the vessel. Age and sex of the seals, and the number of seals present also influenced fur seal response. Fur seals at this site became disturbed when vessels approached to the 10–20 m distance category, and a precautionary minimum approach distance of 50 m has been suggested. This research provides direction for monitoring and minimising impacts of vessels on fur seals, especially where new sites are being colonised.

Authors: Curtin, S., and Garrod, B.
Year: 2008
Title: Vulnerability of marine mammals to diving tourism activities
Editors: B. Garrod and S. Gössling
Book Title: New frontiers in marine tourism: Diving experiences, sustainability, management
City: Oxford
Publisher: Elsevier
Pages: 93-113
Abstract: Tourists are increasingly seeking out interactions with marine mammals, including various cetacean species (whales, dolphins and porpoises) and pinnipeds (sea lions and seals). In the wild, such encounters usually occur within the context of a scuba-diving session or, increasingly, as part of a specialist ‘swim-with’ boat tour. During such tours, participants are often equipped with snorkel, mask and fins, and then dropped into the water alongside the animals. A number of negative effects on the behaviour and physiology of marine mammals are thought to result from these activities and, in some parts of the world, many regulations and codes of conduct have been introduced in an attempt to regulate such interactions. For example, in some instances the use of ‘mermaid’ lines is required. Mermaid lines are ropes of approximately 15 m length which are trailed out in the water behind the tour boat, along which divers are stationed at regular intervals. These enable swimmers to remain in contact with the vessel for safety reasons. They also make their movement more predictable, allowing the marine mammals to carry out the encounter more on their own terms. This book chapter aims to review the scientific evidence on the vulnerability of free-ranging marine mammals to diving activities and assess the adequacy of the management policy response. Conclusions and

recommendations for the improved management of interactions between human divers and marine mammals are provided.

Authors: Curtin, S., Richards, S., and Westcott, S.
Year: 2009
Title: Tourism and grey seals in South Devon: Management strategies, voluntary controls and tourists' perceptions of disturbance
Journal: Current Issues in Tourism
Volume: 12
Issue: 1
Pages: 59-81
Abstract: Although grey seals are relatively common in Britain, their numbers elsewhere are believed to be decreasing, and some populations in Europe are listed as endangered by the IUCN. This case study focusses on the impacts of seal tourism on a colony of seals on the South Devon coast in the United Kingdom, the effectiveness of current management policies and tourists' perceptions of the voluntary controls adhered to by tour operators. To monitor impacts, covert observations of the site were undertaken on 60 designated survey days in the summer of 2006, while a survey of tourists taking part in wildlife cruises to the site was conducted during the same period. The observations found that the voluntary codes had reduced disturbance from operators; however, there were still disturbances, mainly from private vessels. The results of the survey showed that tourists were aware of their potential impacts upon the wildlife, and were generally supportive of the voluntary codes in place. Therefore, if an honest explanation and interpretation of the potential impacts of seal tourism are provided, it may encourage a protectionist predisposition in wildlife tourists and render the compliance of voluntary codes a highly satisfactory tourist experience rather than a negative one.

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Authors: Dans, S. L., Crespo, E. A., and Coscarella, M. A.
Year: 2017
Title: Wildlife tourism: Underwater behavioral responses of South American sea lions to swimmers
Journal: Applied Animal Behaviour Science
Volume: 188
Issue: -
Pages: 91-96
Abstract: This study aims to describe the type of interaction between sea lions and swimmers, during tourist trips, at a small colony in Northern Patagonia, Argentina. Specifically, Dans and colleagues examined if sea lions would show agonistic behaviours towards people, or behaviours that possibly poses a danger, and to identify which interaction may lead to such behaviour. Underwater sea lion behaviour was recorded by videotapes, and important behavioural sequences were determined by two-event sequences analysis. The study found that during the resting period, sea lions swim around and observe the swimmer most of the time, and vice versa. During the pupping period, sea lions breathe more frequently during these behavioural sequences. During both seasons, the sequences including bites as the target behaviour were significant (Adjusted residuals z-scores larger than 1.96 at the $p < 0.05$ level). These sequences consisted mainly in a sea lion allowing a swimmer to touch it and then biting him/her and a sea lion allowing a swimmer to touch it and then going away. The authors argue that even though these bites did not lead to cutting wounds, they represent possible risk of

injuries. According to the authors, the findings support the recommendation of no allowance of physical contact, or at least no seeking physical contact actively.

Authors: Delport, T. C., Asher, A. J., Beaumont, L. J., Webster, K. N., Harcourt, R. G., and Power, M. L.
Year: 2014
Title: *Giardia duodenalis* and *Cryptosporidium* occurrence in Australian sea lions (*Neophoca cinerea*) exposed to varied levels of human interaction
Journal: Parasites and Wildlife
Volume: 3
Issue: 3
Pages: 269-275
Abstract: *Giardia* and *Cryptosporidium* are amongst the most common protozoan parasites identified as causing enteric disease in pinnipeds. A number of *Giardia* assemblages and *Cryptosporidium* species and genotypes are common in humans and terrestrial mammals and have also been identified in marine mammals. To investigate the occurrence of these parasites in an endangered marine mammal, the Australian sea lion (*Neophoca cinerea*), genomic DNA was extracted from faecal samples collected from wild populations ($n = 271$) in Southern and Western Australia and three Australian captive populations ($n = 19$). These were screened using PCR targeting the 18S rRNA of *Giardia* and *Cryptosporidium*. *Giardia duodenalis* was detected in 28 wild sea lions and in seven captive individuals. Successful sequencing of the 18S rRNA gene assigned 27 *Giardia* isolates to assemblage B and one to assemblage A, both assemblages commonly found in humans. Subsequent screening at the *gdh* and β-giardin loci resulted in amplification of only one of the 35 18S rRNA positive samples at the β-giardin locus. Sequencing at the β-giardin locus assigned the assemblage B 18S rRNA confirmed isolate to assemblage AI. The geographic distribution of sea lion populations sampled in relation to human settlements indicated that *Giardia* presence in sea lions was highest in populations less than 25 km from humans. *Cryptosporidium* was not detected by PCR screening in either wild colonies or captive sea lion populations. These data suggest that the presence of *G. duodenalis* in the endangered Australian sea lion is likely the result of dispersal from human sources. Multilocus molecular analyses are essential for the determination of *G. duodenalis* assemblages and subsequent inferences on transmission routes to endangered marine mammal populations.

Authors: Denkinger, J., Quiroga, D., and Murillo, J. C.
Year: 2014
Title: Assessing human-wildlife conflicts and benefits of Galápagos sea lions on San Cristobal Island, Galápagos
Editors: J. Denkinger and L. Vinueza.
Book Title: The Galapagos Marine Reserve, social and ecological interactions in the Galapagos Islands
City: New York
Publisher: Springer
Pages: 285-305
Abstract: Human–wildlife interactions shape perceptions and the conservation of wildlife populations. San Cristobal Island is the main fisheries port in the Galápagos archipelago and hosts one of the largest sea lion colonies. Local tourism and the population have grown drastically over the past decade and so does human impact on Galápagos sea lions. The authors analyse human perceptions of the endemic and endangered Galápagos sea lion, using interviews and behavioural observations of sea lions' responses to humans.

There is overall agreement that sea lions should be protected, but some fishers do not share this view nor are compliant with protection efforts. Direct anthropogenic impacts in the form of sea lion entanglements in fishing gear and debris (nylon, plastic), diseases, and fishers' aggressions toward sea lions have substantially increased in the past 2 years. Sea lions are highly tolerant to human presence, but they flee when approached at distances closer than 4 m. Injuries and death of sea lions caused by humans increased dramatically over the last 5 years. To improve conservation, it is essential to investigate the dynamics and challenges of human–sea lion interactions on San Cristobal. Socioeconomic activities influence these perceptions, and possible reasons explaining the different attitudes toward these animals are shaped not only by economic interests but by the symbolic and political context in which these positions take form.

Author: Dibbern, J. S.
Year: 2010
Title: Fur seals, whales and tourists: A commercial history of Deception Island, Antarctica
Journal: Polar Record
Volume: 46
Issue: 3
Pages: 210-221
Abstract: Deception Island in the South Shetland Islands was the site of some of the earliest commercial activity to be carried out in the Antarctic with the early 19th century hunting of Antarctic fur seals. Almost a century later it was the site of the most extensive anchorage for the reconstructed ships and ocean liners utilised as non-pelagic whale processing factories. Deception Island was also the site of what is the only successful land-based commercial activity in Antarctic history. The Hektor whaling station operated in Whalers Bay from 1912 until 1931. By the later part of the 20th century Deception Island had become a regular stop for the increasing Antarctic tourist cruise industry. Its commercial history has spanned nearly the entire human history of the continent. This paper presents that span from the earliest discoveries and their economic effect through the whaling period to the present and the onset of ecotourism in present Antarctica.

E

Authors: Egger, A. C., Desmond, J. M., Dunster, M. R., and Nuthmann, T. R.
Year: 2015
Title: Outlook on a species: Evaluation of public outreach and educational strategies regarding conservation efforts of the New Zealand sea lion
City/State: -
Institutions: Department of Conservation, New Zealand Sea Lion Trust, and Worchester Polytechnic Institute
Abstract: Due to a rapid population decline, the New Zealand sea lion is listed as "nationally critical". The Department of Conservation and New Zealand Sea Lion Trust developed educational outreach material to promote education on the New Zealand sea lion, with limited success. Using a public survey and interviews with stakeholders and educators, this project aimed to identify possible improvements to educational strategies and assess public knowledge and perception regarding the sea lion. Based on the study findings, the authors proposed that the Department of Conservation and New Zealand Sea Lion Trust implement interactive educational programmes in primary schools, develop a Facebook page, publish a research blog, post new beach signs, redesign their sea lion pamphlet, and create an activities fair station.

Authors: Engelhard G. H., Baarspul A. N. J., Broekman M., Creuwels J. C. S., and Reijnders P. J. H.
Year: 2002
Title: Human disturbance, nursing behaviour, and lactational pup growth in a declining southern elephant seal (*Mirounga leonina*) population
Journal: Canadian Journal of Zoology
Volume: 80
Issue: 11
Pages: 1876-1886
Abstract: Engelhard and colleagues studied lactation behaviour in relation to pup growth in southern elephant seals (*Mirounga leonina*) at Macquarie Island, and compared harems in areas of high and low human presence to determine if there is an effect attributable to human activities, including scientific research. Pup weaning mass, a known correlate of first-year survival, was positively influenced by suckle bout durations during early and middle lactation and by maternal aggression during late lactation; no other behavioural variables were associated with weaning mass. In the area of high human presence, the authors observed from a distance the behaviour of mother-pup pairs directly before, during, and after visits to harems by other researchers. Alertness was raised threefold in the presence of people but quickly returned to pre-disturbance levels after their departure; there were no significant short-term effects on other behavioural variables. In the areas of high and low human presence, the authors observed the undisturbed behaviour of the seals in the absence of other people. No significant differences in any behavioural variables examined were found, indicating no long-term changes in behaviour resulting from human presence. Human disturbance therefore appears not to have significantly contributed to the population decline observed at Macquarie Island, but the conclusion requires caution given the fairly low power of our analyses.

Authors: Engelhard G. H., van den Hoff J., Broekman M., Baarspul A. N. J., Field I., Burton H. R., and Reijnders P. J. H.
Year: 2001
Title: Mass of weaned elephant seal pups in areas of low and high human presence
Journal: Polar Biology
Volume: 24
Issue: -
Pages: 244-251
Abstract: On sub-Antarctic Macquarie Island, Engelhard and colleagues examined pup weaning mass of southern elephant seals in relation to human presence. Pup weaning mass was previously found to be positively associated with first-year survivorship. Weaned pups were weighed in a remote area, Middle Beach, and in an area of relatively high human presence, Isthmus East. The areas were reasonably similar in beach topography, wind and surf conditions, numbers of seals present per kilometre of coastline, and numbers of males and females present in harems. For a sub-sample of measured pups, data on the respective maternal size were collected using photogrammetry. Both male and female weaned pups on Middle Beach were significantly heavier than those on Isthmus East. Estimated length of mothers was significantly higher on Middle Beach. In proportion to their own size, mothers in both areas produced weaners of similar mass, indicating no direct effect of human disturbance on the efficiency of lactation. It remained unclear whether the area differences in maternal and pup size were due to natural or human-related factors.

F

Author: Fink, S.
Year: 2017
Title: Loss of habitat: Impacts on pinnipeds and their welfare
Editor: A. Butterworth
Book Title: Marine mammal welfare: Human induced change in the marine environment and its impacts on marine mammal welfare
City: Cham, Switzerland
Publisher: Springer
Pages: 241-252
Abstract: Pinnipeds around the world have been affected by habitat loss as a result of climate change and anthropomorphic activity, such as marine and coastal development. In addition to the physical reduction of available habitat, pinnipeds are impacted by secondary effects of habitat loss, such as disease and changes in prey availability. The impacts of global climate change are thought to be the most wide reaching, with changes in the availability and stability of sea and pack ice habitat expected to be most significant for at least 11 ice-associated species. Potential impacts on pinniped welfare occur as a result of changes in distribution and migration patterns, increased pup mortality, reduced foraging success, and decrease in body condition. Reductions in survival due to increased storm activity, increased exposure to disease and parasites, and human development have also been observed.

Authors: French, S. S., González-Suaréz, M., Young, J. K., Durham, S., and Gerber, L. R.
Year: 2011
Title: Human disturbance influences reproductive success and growth rate in California sea lions (*Zalophus californianus*)
Journal: PLoS One
Volume: 6
Issue: 3
Article: e17686
Abstract: The environment is currently undergoing changes at both global (e.g., climate change) and local (e.g., tourism, pollution, habitat modification) scales that have the capacity to affect the viability of animal and plant populations. Many of these changes, such as human disturbance, have an anthropogenic origin and therefore may be mitigated by management action. To do so requires an understanding of the impact of human activities and changing environmental conditions on population dynamics. French and colleagues investigated the influence of human activity on important life history parameters (reproductive rate, and body condition, and growth rate of neonate pups) for California sea lions (*Zalophus californianus*) in the Gulf of California, Mexico. Increased human presence was associated with lower reproductive rates, which translated into reduced long-term population growth rates and suggested that human activities are a disturbance that could lead to population declines. The authors also observed higher body growth rates in pups with increased exposure to humans. Increased growth rates in pups may reflect a density dependent response to declining reproductive rates (e.g., decreased competition for resources). The results highlight the potentially complex changes in life history parameters that may result from human disturbance, and their implication for population dynamics. French and colleagues recommend careful monitoring of human activities in the Gulf of California and emphasise the importance of management strategies that explicitly consider the potential impact of human activities such as ecotourism on vertebrate populations.

G

Authors: Goldsworthy, S. D., Shaughnessy, P. D., McIntosh, R. R., and Page, B.
Year: 2007
Title: A population monitoring and research program to assist management of the Australian sea lion population at Seal Bay Conservation Park, Kangaroo Island
City/State: Adelaide, SA, Australia
Institution: South Australian Research and Development Institute
Date: November 2007
Abstract: Seals are the premier tourism attraction on Kangaroo Island and they underpin a regional multimillion dollar tourism industry. Its centrepiece is the Australian sea lion population at Seal Bay Conservation Park.
Monitoring of the trends in abundance of the population has been undertaken by the Department for Environment and Heritage (DEH) for over 30 years. Analyses of these data and the methodological basis of the surveys were not reviewed until recently, and determined that the population had been in decline for at least 20 years. This decline is continuing.
This report aims to provide stakeholders with details of the monitoring and research programme required to support the sustainable use of the Australian sea lion population at Seal Bay on Kangaroo Island. The report covers five topics including: a historical summary of research and monitoring of the sea lion colony; an evaluation of the current status of the population; a detailed appraisal of the ongoing management needs of the sea lion population in terms of population status, trends and demography, as well as targeted research programmes; what an ongoing population management programme should comprise of and what it would cost; and potential funding sources to support such a programme.
The report recommends that sustainable use of the Australian sea lion population at Seal Bay should underpin the broader management objectives of the Seal Bay Conservation Park if it is to remain a sustainable tourism destination. A population monitoring and research programme should be implemented that includes: 1) long-term monitoring of pup production, pup mortality and vital demographic rates, and 2) targeted projects that address specific data gaps and management needs. This programme requires strong scientific leadership and management to ensure that results and methodologies are regularly reported upon and reviewed. Access restrictions, which presently impede monitoring and research activities at Seal Bay need to be reviewed.
For the population monitoring and research programme to be effective, long-term recurrent funding will need to be secured. Options for cost-recovery from visitor fees and tourism operator licence fees should be investigated because alternate sources of funding are unlikely to be adequate to meet the real costs of population monitoring and research. Donations and sponsorships options should be investigated to supplement the costs of population monitoring and targeted research programmes.

Authors: Goldsworthy, S. D., Shaughnessy, P. D., McIntosh, R. R., Kennedy, C., Simpson, J., and Page, B.
Year: 2008
Title: Australian sea lion population at Seal Bay and the Seal Slide (Kangaroo Island): Continuation of the monitoring program Island
City/State: Adelaide, SA, Australia
Institution: South Australian Research and Development institute
Date: July 2008
Abstract: Seals are one of the premier tourism attractions on Kangaroo Island and they underpin a regional multimillion dollar tourism industry. Its centrepiece is the Australian sea

lion population at Seal Bay Conservation Park. The aims of this project were to ensure that continuity in monitoring of the Seal Bay Australian sea lion population be maintained, until the resources required to implement an ongoing research and monitoring programme can be secured.
Pup production for the 2007 breeding season at Seal Bay was estimated to be 260 (± 95% CL 254-272), based upon a range of methods including, twice-weekly surveys of new pup births and deaths, the total number of tagged (micro-chipped) pups, mark-recapture methods using the Petersen estimate and surveys of pups in Pup Cove.
A survey was also undertaken of pup production at the Seal Slide population of Australian sea lions using a capture-mark and count method in conjunction with the Petersen estimate. The estimate of pup production for the 2007 breeding season at this colony was 16 (± 95% CL15-18).
This report provides additional evidence of the ongoing decline in the Seal Bay Australian sea lion population. The current rate of this decline is estimated to be between 3.3-4.5% per 18-month breeding season. This rate of decline would see the population more than halve within 24-32 years. Although there is corroboration in this result from the estimates of pup production over the last four breeding seasons and from a model of the Seal Bay population, both the time-series of pup production estimates and the demographic factors upon which the population model were developed are limited. As such there is a high degree of uncertainty in the actual and current rates of decline, and in the expected trajectory of the population into the near future. This provides significant challenges for State and Commonwealth threatened species managers, managers of the Seal Bay Conservation Park, and the Kangaroo Island regional tourism industry.
The absence of ongoing funding to support a population monitoring and research programme remains a critical issue for the future management and sustainability of Seal Bay. Such support is needed to ensure that the status and health of the population is adequately monitored; that the population decline is arrested; and that threatening processes are identified, monitored and managed.

Authors: Gong, M., and Heal, G.
Year: 2014
Title: Why do people care about sea lions? A fishing game to study the value of endangered species
Journal: Environmental and Resource Economics
Volume: 59
Issue: -
Pages: 503-523
Abstract: Previous research proposes that human beings are motivated to protect endangered species for various reasons: consumptive use value, non-consumptive use value, non-use value, and intrinsic value. However, it has been difficult to tease apart these values at the behavioural level. Using an innovative fishing game, Gong and Heal study an important trade-off between one kind of use value (monetary value) and one kind of non-use value (existence value) of the endangered Steller sea lion (*Eumetopias jubatus*). In the fishing game, players make repeated decisions on how much pollock to harvest for profit in each period in a dynamic ecosystem. The population of the endangered sea lion depends on the population of pollock, which in turn depends on the harvesting behaviour of humans. The data show that in general, people responded to the financial value (as a tourist resource), but not the existence value, of the sea lion by cutting down commercial fish harvesting to keep more sea lions in the ecosystem. However, not all people behaved the same regarding the existence value. Females displayed a higher existence value than males, as did people who reported stronger pro-environmental

attitudes than those with weaker pro-environmental attitudes. The findings have multiple implications on public opinion elicitation and public policy design.

Author: Granquist, S. M.
Year: 2016
Title: Ecology, tourism and management of harbour seals (*Phoca vitulina*).
Academic Department: Department of Zoology, Faculty of Science
University: Stockholm University
Thesis Type: Doctoral thesis
Abstract: In cases where human and wildlife are co-using the same geographical areas and resources, management issues often get complex and stakeholder conflicts are common. The Icelandic harbour seal (*Phoca vitulina*) population is rapidly decreasing, but direct culling of seals still occurs. At the same time seals are becoming an important resource due to increased interest in wildlife watching. Despite the complicated management situation, the Icelandic harbour seal population is one of the least studied pinniped populations in the world. Mapping the typical haul-out pattern is an important foundation for further studies. In paper I of the thesis, haul-out behaviour of harbour seals was investigated and a seasonal haul-out pattern was detected with the maximum number of seals hauling out during summer. A bimodal distribution curve was found during the summer time, suggesting that pupping period occurs in late May to early June, while moulting occurs in late July to early August. Tidal state, air-temperature and wind-speed affected the haul-out boots. Today, the main reason for culling harbour seals in Iceland is to reduce harbour seal predation on salmonids, despite limited knowledge on the effect of seal predation on salmonid populations and salmon angling. The diet of harbour seals that haul out in the estuary area of Bjargós and Ósar in NW-Iceland was therefore investigated using hard-part (paper II) and DNA metabarcoding analysis (paper III). Both methods showed that the main prey species were sand eels, flatfishes, gadoids, herring and capelin, while salmonids were not an important prey in this area. Based on these results, culling of harbour seals in the area is not likely to have a positive effect on salmonid angling. These results have crucial management implications, especially in the light of the severe decline in the Icelandic harbour seal population. Potential effects of seal watching tourism on the harbour seal population must also be considered in management plans. In paper IV, Granquist investigated the effects of land based seal watching on seal behaviour and found that spatial distribution and vigilance was affected by tourists. Calm tourist behaviour had less effect, meaning that disturbance could be reduced if tourist behaviour is modified. In paper V, this line of investigation was followed by analysing knowledge transfer from academia to the tourist industry and a model was presented where a synergy effect of working interdisciplinary is hypothesised. Finally, in paper VI, the effect of signage on tourist behaviour was studied. Empirical testing showed that teleological information is more effective than ontological in terms of modifying general tourist behaviour. In this thesis, Granquist presents new knowledge on behaviour and diet of harbour seals, as well as new empirical findings on tourist behaviour in wildlife tourism settings. Further she explores interdisciplinary management approaches for seal watching tourism. The findings presented in this thesis have an important value within academic research in environmental, life and social sciences and the knowledge can be applied in several areas of harbour seal management in Iceland and elsewhere.

Authors: Granquist, S. M., and Nilsson, P-Å.
Year: 2016
Title: Who's watching whom? – an interdisciplinary approach to the study of seal-watching tourism in Iceland
Journal: Journal of Cleaner Production
Volume: 111
Issue: Part B
Pages: 471-478
Abstract: Due to increasing interest in wildlife tourism, there is a growing need to consider the balance between use and protection of wildlife. Mutual exchange and acceptance of research results between different academic disciplines, such as wildlife ecology and tourism research, has until recently been scarce. Absence of discipline-independent guidance on the management of wildlife tourism, in combination with a lack of knowledge-transfer from academia to society regarding how human impact can be reduced, may contribute to unintended disturbance of wildlife. The authors present a methodology, where use and protection constitute equal importance within wild animal watching, by showing how a synergetic gain of combining knowledge from different academic disciplines may occur and be implemented in order to decrease potential human disturbance on harbour seals (*Phoca vitulina*). Further, they suggest that improved transferal of interdisciplinary research from academia to industry increases understanding of the wildlife tourism industry and has the potential to change tourist behaviour and hence minimise disturbance of wild animals. Granquist and Nilsson exemplify this possibility by combining results from two case studies derived from biology and tourism research. The aim of both was to study potential human disturbance on harbour seals (*P. vitulina*) during land based seal-watching. The combined findings indicate that more attention should be paid to understanding and communicating the types of tourist behaviour likely to cause distress.

Authors: Granquist, S. M., and Sigurjonsdottir, H.
Year: 2014
Title: The effect of land based seal watching tourism on the haul-out behaviour of harbour seals (*Phoca vitulina*) in Iceland
Journal: Applied Animal Behaviour Science
Volume: 156
Issue: -
Pages: 85-93
Abstract: The effect of land-based seal watching on the haul-out pattern of harbour seals (*Phoca vitulina*) was investigated between June and August of 2008–2010 on Vatnsnes, NW Iceland. The results showed that the behaviour and spatial haul-out pattern of seals was affected by the tourists. In 2009 the seals were more likely to be vigilant during periods when tourists had access to the area, compared to a period when tourists were not allowed in the area. Also, in 2010 the likeliness of the seals being vigilant increased as the number of tourists in the area increased. In addition, seals were more likely to be vigilant when tourists behaved in an active way. During the post weaning period, which coincided with the peak of the tourist season, a significantly higher proportion of seals hauled out on the skerry located farthest away from land, compared to a skerry closer to land. Seals also preferred to haul out further away from land when the number of tourists in the area increased. Single tourists and couples behaved more passively compared to families and tourist groups of more than two adults. All tourist group types were significantly more active in an approaching zone than in the seal watching zone. Education of tourists, for example through a code of conduct built on these results, is advisable to minimise disturbance of seals in the area.

H

Author: Heaney, W. J.
Year: 2018
Title: Remote camera technology and its role in grey seal haul-out assessment
Academic Department: College of Life and Environmental Science
University: University of Exeter
Thesis Type: Masters by Research in Biological Sciences
Abstract: Remote cameras can permit non-invasive monitoring of marine species and habitats. Using automated time-lapse cameras in combination with human observations and an infrared visitor counter, this project collected data on the daily maximum number of grey seals (*Halichoerus grypus*) hauled-out and daily numbers of visitors at a major grey seal haul-out location in Cornwall, south west England between August 2013 and December 2017. This project assesses the uses of data captured by time-lapse cameras to quantify seasonal patterns of grey seal haul-out abundance and how haul-out patterns might be influenced by environmental conditions, as well as quantifying counts of pups (as pup positive days) during the grey seal pupping season. Using this knowledge, the project combines data from human-led surveys with time-lapse cameras to quantify the effects of human disturbance at a grey seal haul-out.
The peak in grey seal haul-out abundance occurred in March and April with median daily maximum grey seal haul-out counts of 103 seals (± 52.00 IQR, range 52 to 188) and 83 seals (± 46.00 IQR, range 25 to 239) respectively. The largest range in daily visitor numbers occurred in April (range 23 to 743) coinciding within the peak period in grey seal abundance but the peak period for visitor numbers at the site occurred in August in 2014 and 2015 with median daily visitor counts of 381 (± 102.00 IQR, range 77-471). Grey seal white-coated pups were observed on a total of 99 days during three seasons of monitoring (2013, 2014, 2017) with the highest number of pup positive days occurring in September (median 15 ± pup positive days 4.00 IQR) and October (median 13 pup positive days ± 2.50 IQR) each year. 'People on cliff' disturbances were more likely to disturb grey seals into the sea than other stimuli and as such, reduced the number of grey seals hauled-out on the beach during a disturbance event. This project concludes with a discussion of the potential impacts of disturbance at the haul-out site, with the findings highlighting the value of using time-lapse camera technology in effectively monitoring a pinniped population for a prolonged period and the implications of disturbance and the need for management action.

Authors: Henry, E., and Hammill, M. O.
Year: 2001
Title: Impact of small boats on the haulout activity of harbour seals (*Phoca vitulina*) in Métis Bay, Saint Lawrence Estuary, Québec, Canada
Journal: Aquatic Mammals
Volume: 27
Issue: 2
Pages: 140-148
Abstract: The impact of small boats on harbour seal haul out behaviour was studied from May to August 1997 in Métis Beach, Canada. The number of seals hauled-out increased throughout the summer and was affected by air temperature, tide, and wind direction. Disturbances most often were caused by kayaks and canoes (33.3%), motorboats (27.8%), and sail boats (18%). Numbers of seals hauled-out decreased after a disturbance, except during the molting period when seals seemed more reluctant to enter the water. The most severe reaction was seen with the approach of kayaks-canoes with a flushing response of 86% compared to 74% by motor

boats and 0% by sail boats. While animals were hauled-out, they spent over 70% of their time resting and comfort behaviour and 11–34% of their time in alert behaviour. Increases in alert behaviour by seals occurred during a disturbance, but changes were quite subtle.

Authors: Holcomb, K., Young, J. K., and Gerber, L. R.
Year: 2009
Title: The influence of human disturbance on California sea lions during the breeding season
Journal: Animal Conservation
Volume: 12
Issue: 6
Pages: 592-598
Abstract: California sea lions (*Zalophus californianus*) occupy 26 islands in the Gulf of California (GoC), Mexico. Although human presence is prohibited on these islands without a government permit, the law is not enforced and tourism to the islands is increasing. Tourists, along with local fishermen, often come ashore to get close to the animals, which may disrupt behaviours critical for reproduction. In this paper, Holcomb and colleagues report the results of an experimental study on the behavioural effects of human disturbance on California sea lions in the GoC. To document effects, they recorded sea lion behaviour immediately before and in 10-min intervals for up to an hour after experimental human disturbance. The results showed few behavioural responses of sea lions to human disturbance. Adult females and juveniles demonstrated immediate responses, but these were not consistent between years, apparent an hour after disturbance, or evident across other age and sex classes. These results suggest that California sea lions may be resilient to human disturbance and a possible flagship species for ecotourism, but further studies of the physiological and population-level effects of human disturbance are needed.

Authors: Hoover-Miller, A., and Armato, P.
Year: 2018
Title: Harbor seal use of glacier and terrestrial haul-outs in the Kenai Fjords, Alaska
Journal: Marine Mammal Science
Volume: 34
Issue: 3
Pages: 616-644
Abstract: Harbor seals, *Phoca vitulina*, use diverse haul-out substrates including ice calved by tidewater glaciers. Numbers of seals at glacial and terrestrial haul-outs on the south eastern Kenai Peninsula, Alaska, were assessed using aerial, vessel, and video surveys. Mean annual abundance at glacial and terrestrial haul-outs differed temporally. From 2004 to 2011, numbers of seals counted during the molt increased 5.4%/yr at glacial haul-outs and 9%/yr at terrestrial haul-outs while numbers of pups increased 5.0%/yr at glacial sites and 1.5%/yr at terrestrial sites. Numbers of seals without pups counted during pupping increased 7.96%/yr at glacial sites and 5.1%/yr at terrestrial sites. Results indicate that pupping and molting locations are not equivalent and population monitoring during the molt does not necessarily reflect habitat association of pupping seals. Ratios of pups to total seals counted during pupping and the subsequent molt were used to contrast habitat use. Low proportions of pups at terrestrial haul-outs, relative to most glacial haul-outs, indicate an overall preference for pupping in glacial haul-outs. High proportions of pups at most glacial sites (during pupping and molting) suggest reduced use of tidewater glacier habitats by nonbreeders and molting seals. Results suggest more seals associate with glacial haul-outs than currently estimated.

Authors: Hoover-Miller, A., Bishop, A., Prewitt, J., Conlon, S., Jezierski, C., and Armato, P.
Year: 2013
Title: Efficacy of voluntary mitigation in reducing harbour seal disturbance
Journal: The Journal of Wildlife Management
Volume: 77
Issue: 4
Pages: 689-700
Abstract: Marine and coastal tourism has rapidly expanded worldwide in the past two decades, often occurring in once secluded habitats. In Alaska, tourism near tidewater glaciers has attracted millions of visitors and increased the presence of ships, tour vessels, and coastal development. Although sustainable tourism, resulting from balanced effects on wildlife and client satisfaction, is a goal of most tourism operators, it is not always achieved. Voluntary compliance with viewing guidelines and codes of conduct have been encouraged, but few assessments have the longitudinal scope to evaluate long-term changes in impacts on wildlife and the ability of vessel operators and kayak guides to sustain lower impact operating practices over time. This study assessed vessel and kayak visitation and resulting impacts on harbour seals in the Kenai Fjords National Park, southcentral Alaska. The authors obtained observations from 2002 to 2011, using remotely controlled video cameras located near Aialik and Pedersen Glaciers in the Kenai Fjords National Park. Overall, disturbance was associated with 5.1% of vessel sightings, 28% of vessel interactions (vessel observed within approx. 300 m of seals), 11.5% of kayak sightings, and 61% of kayak interactions. Results demonstrated that voluntary changes in operations significantly reduced vessel and kayak disturbance of seals by 60–80%. Even with prior establishment of operating guidelines, tour vessel captains were able to further reduce their effect on wildlife with more careful operations. Rapid growth of guided kayak excursions that occurred during this study caused greater disturbance to seals than motorised vessels but guide trainings helped reduce disturbances. Diminished impacts of motor vessels and kayakers persisted across years although effects of kayaks were less consistent than motor vessels, which reflected greater variability in inter-annual spatial use patterns by kayakers. Long-term monitoring, including assessments of wildlife responses to vessel and kayak operations, combined with two-way communication with vessel operators and guides, enhanced the effectiveness of mitigation and facilitated adaptive adjustments to mitigation protocols over time.

Authors: Huddart, D., and Stott, T.
Year: 2020
Book Title: Adventure tourism: Environmental impacts and management
City: London, UK
Publisher: Palgrave Macmillan
Abstract: This book presents a comprehensive overview of the environmental impacts of various types of adventure tourism and how these can be best managed. This volume follows on from the authors previous textbook – *'Outdoor Recreation: Environmental Impacts and Management'* and continues the aim of developing a deeper understanding of how tourist numbers impact the environment and to provide practical solutions to these problems. Combining their own first-hand experience and research with extensive literature review the authors present several popular adventure tourism destinations from across the globe, including the Arctic, the Himalayas, Africa, Australia and Scotland as case studies. Chapters cover the particular challenges faced by each region: including impacts on animals and birds; the spread of invasive plant species and diseases; trail impacts on vegetation; impacts on geological, historical and archaeological sites and pollution and waste issues. A discussion

and evaluation of the possible management actions for minimising these impacts and how outdoor recreation tourists can be regulated concludes each chapter.

J

Authors: Jackman, J., Bettencourt, L., Vaske, J., Sweeney, M., Bloom, K., Rutberg, A., and Brook, B.
Year: 2018
Title: Conflict and consensus in stakeholder views of seal management in Nantucket Island, MA, USA
Journal: Marine Policy
Volume: 95
Issue: -
Pages: 166-173
Abstract: With recovery of seal populations after their near extirpation from the coastal waters of Massachusetts, USA, controversy has emerged over seal-fishery interactions. To assess stakeholder attitudes toward management of seal-fishery conflicts and marine mammal protection, questionnaires were administered to the general public, on-site anglers, and tourists on Nantucket Island. All three groups agreed that the interests of the ecosystem should be the top management consideration and supported marine mammal protection. Opposition to lethal management was found among all groups, with tourists most opposed, followed by the public and on-site anglers. While non-lethal management received more support than lethal management, some support for leaving seals alone was found, particularly among tourists. No differences were found among stakeholder groups for non-lethal methods of seal management, with the exception of the scenario of using non-lethal methods to reduce population levels. These findings suggest that management of seal-fishery conflicts must respect ethical and ecological concerns to promote co-existence.

Authors: Jansen, J. K., Boveng, P. L., Dahle, S. P., and Bengston, J. L.
Year: 2010
Title: Reaction of harbour seals to cruise ships
Journal: The Journal of Wildlife Management
Volume: 74
Issue: 6
Pages: 1186-1194
Abstract: The largest aggregations of harbour seals (*Phoca vitulina*) in Alaska, USA, haul out on floating ice in tidewater glacial fjords. Seals use these fjords in peak numbers during the critical periods of pupping, breeding, and molting when visits by tour ships also peak. Documented and suspected declines of harbour seals in fjords with rising vessel traffic underscore the need to better understand possible impacts, particularly in areas where ship visits have risen substantially in the past two decades. Jansen and colleagues examined the interruption of haul-out bouts of harbour seals due to approaching cruise ships in Disenchantment Bay, Alaska. They conducted observations from cruise ships and focussed on disturbance of seals as evidenced by seals flushing into the water from the floating ice on which they rested. The authors investigated rate of flushing in relation to vessel distance, approach angle, group size, and seal type (mother, pup, or other). Using a survival-regression analysis, they found that the risk of disturbing harbour seals increased when ships approached within 500 m; seals approached as close as 100 m were 25 times more likely to enter the water than seals 500 m from a ship. Seals were four times more prone to enter the water when ships were approaching directly rather than passing abeam. Seals responded similarly regardless of group

size or seal type. Energetic models indicated a potential to disrupt energy balance and cause thermal stress in disturbed pups if they spent >50% of their time in ice-chilled water. Studies at non-glacial sites suggest that pups spend 40–70% of their time in the water. Voluntary guidelines for approaching seals in Alaska recommend that cruise ships approach ≥91 m (100 yards), a distance at which the authors show 90% of seals would flush into the water. The findings indicate a need to develop regulations to maintain a 500 m separation between cruise ships and seals in all Alaskan glacial fjords.

Authors: Jansen, J. K., Boveng, P. L., Ver Hoef, J. M., Dahle, S. P., and Bengston, J. L.
Year: 2014
Title: Natural and human effects on harbor seal abundance and spatial distribution in an Alaskan glacial fjord
Journal: Marine Mammal Science
Volume: 31
Issue: 1
Pages: 66-89
Abstract: Tidewater glacial fjords support the largest populations of harbour seals (*Phoca vitulina richardii*) in Alaska and are a prime destination for tour ships. Chronic disturbance from ships, however subtle, could impact long-term population stability. Jansen and colleagues examined variation in abundance and distribution of harbour seals on floating ice in Disenchantment Bay, Alaska, a tour ship destination for over a century with near daily visitation by ships in the spring/summer over the last decade. Counts of seals by aerial transect showed a sharp decline in May, prior to pupping and the first ships arriving; counts rebounded by the end of June remaining high until August. Seal distribution and abundance peaked in 5–7 tenths ice cover; total area of ice cover showed no effect. Despite regular flushing of seals by ships, the authors found no broad-scale patterns in seal abundance and distribution that could be explained by ship presence. They cannot rule out mechanisms of long-term disturbance, difficult to detect and that might explain notable differences with other, similar sites. Population declines at disturbed glacial sites and the still rising popularity of vessel-based tourism indicate a need for individual-based studies on how seals respond to the dynamics of glacial ice environments and human-caused stresses.

Authors: Johnson, A., and Acevedo-Gutiérrez, A.
Year: 2007
Title: Regulation compliance by vessels and disturbance of harbour seals (*Phoca vitulina*)
Journal: Canadian Journal of Zoology
Volume: 85
Issue: 2
Pages: 290-294
Abstract: To prevent harassment, the US National Oceanic and Atmospheric Administration formed a buffer zone around marine mammals. The buffer zone varies by species listing status and by geographic area. Nevertheless, the extent to which vessels comply with these buffer zones is unknown. Johnson and Acevedo-Gutiérrez chose harbour seals (*Phoca vitulina* L., 1758) as a case study to describe compliance with the buffer zone. They conducted land-based observations from Yellow Island, Washington State, in a geographic area where the buffer zone is 91m, to estimate vessel distance from hauled-out seals and to assess seal response. They recorded 85.7% of kayaks, 57.1% of stopped powerboats, and 4.6% of passing powerboats violating the buffer zone. The study found that seals were disturbed by kayaks and stopped powerboats at distances >91m from the haul-out sites but not by moving powerboats ≤91m from the sites. Thus, compliance of the buffer zone varied with vessel type and activity. The

authors suggest that a larger buffer zone for vessels lingering around the haul-out sites and enforcement of the buffer zone will minimise seal disturbance.

Authors: Johnson, W. M., and Lavigne, D. M.
Year: 1999
Title: Mass tourism and the Mediterranean monk seal: The role of mass tourism in the decline and possible future extinction of Europe's most endangered marine mammal, *Monachus monachus*
Journal: The Monachus Guardian
Volume: 2
Issue: 2
Pages: 1-30
Abstract: Mass tourism has been implicated in the decline of the Mediterranean monk seal (*Monachus monachus*) since the 1970s, when scientists first began reviewing the global status of the species. Since then, the scientific literature, recognising the inexorable process of disturbance and loss of habitat that this economic and social activity has produced along extensive stretches of Mediterranean coastline, has consistently identified tourism as among the most significant causes of decline affecting this critically-endangered species. Despite apparent consensus on this point, no serious attempt has been made to assess the tourist industry's role, or to acknowledge and discuss its moral and financial responsibility, in the continuing decline and possible future extinction of *M. monachus*. In view of this, the authors undertook a review of existing literature to identify specific areas in which tourism has impacted the Mediterranean monk seal. The results provide compelling evidence that mass tourism has indeed played a major role in the extirpation of the monk seal in several European countries, that it continues to act as a significant force of extinction in the last Mediterranean strongholds of the species, and that the industry exerts a generally negative influence on the design and operation of protected areas in coastal marine habitats. There are compelling reasons to conclude that unless the tourist industry can be persuaded to become an active and constructive partner in monk seal conservation initiatives, it will eventually ensure the extinction of the remaining monk seals in the Mediterranean.

K

Authors: Karamanlidis, A. A., Dendrinos, P., Tounta, E., and Kotomatas, S.
Year: 2004
Title: Monitoring human activity in an area dedicated to the protection of the endangered Mediterranean monk seal
Journal: Coastal Management
Volume: 32
Issue: -
Pages: 293-306
Abstract: Mediterranean monk seal populations have declined significantly and survive in subpopulations dispersed throughout their original distribution. The National Marine Park of Alonnisos, Northern Sporades is the first marine protected Area committed to the protection of the species in the Mediterranean. A Monitoring and Awareness Project has been implemented in the area from 1993 to 2000, the results of which have produced a detailed profile of the human usage pattern of the Park and pointed out a remarkable reduction of illegal activities in the area. The pattern of human usage has enabled the monitoring team to adjust their efforts in the Park over time and provided important baseline data for future management. According to the authors, the combined monitoring and awareness efforts have contributed significantly to

the conservation of the Mediterranean monk seal by successfully protecting pupping sites and reducing human-induced mortality of the species in the area.

Authors: Karpovich, S. A., Skinner, J. P., Mondragon, J. E., and Blundell, G. M.
Year: 2015
Title: Combined physiological and behavioral observations to assess the influence of vessel encounters on harbor seals in glacial fjords of southeast Alaska
Journal: Journal of Experimental Marine Biology and Ecology
Volume: 473
Issue: -
Pages: 110-120
Abstract: Most studies examining disturbance of seals define disturbance as entry into the water. However, behaviour alone may not be an accurate indicator of the timing, magnitude, or physiological cost of disturbances. This study examines changes in harbour seal heart rates in response to two levels of vessel disturbances; 1) 'incidental traffic' defined as presence of vessels in the area while seals were hauled out; and 2) 'experimental disturbance' defined as direct vessel approaches to seals until the seal entered the water. Incidental traffic resulted in a 4 bpm $vessel^{-1}$ increase in heart rate while seals were hauled out. Mean incidental traffic during haul outs was 0.26 (range 0 to 8.95) vessels, and small vessels caused the largest increase in heart rate. Experimental disturbances resulted in a 5 bpm increase in heart rate upon initiation of vigilance, defined as the head-lift behaviour. In-water heart rate was significantly lower after an experimental disturbance compared to other water entries, suggesting that seals shift to an energetically conservative mode in response to disturbances. During the haul out following an experimental disturbance, seal heart rate was significantly higher than other haul outs, suggesting that there is an added energetic cost of disturbance. Also, sex, mass, current and previous haul-out duration, in-water duration, day of year, hour of day, ambient temperature, and light level were found to have significant influence on harbour seal heart rates; demonstrating that a complex assortment of factors affect heart rate and careful consideration of these factors must be included in disturbance studies. Whereas previous findings have shown that vessel encounters alter seal behaviour, this study presents evidence that encounters have energetic and physiological consequences while the seals are hauled out and these consequences persist for some time after the water entry behaviour. Accordingly, exposure of harbour seals to increased vessel traffic may result in altered behaviour, increased energetic expenditures, and increased exposure to stress, negatively affecting the health, condition, and reproductive success of harbour seal populations that reside in glacial fjords.

Authors: Kelly, C., Glegg, G. A., and Speedie, C. D.
Year: 2004
Title: Management of marine wildlife disturbance
Journal: Ocean & Coastal Management
Volume: 47
Issue: 1-2
Pages: 1-19
Abstract: Concerns have been raised about the status and health of a range of marine species including bottlenose dolphins *(Tursiops truncatus)*, basking sharks *(Cetorhinus maximus)* and grey seals *(Halichoerus grypus)* in UK waters. Harassment and disturbance from increasing inshore leisure traffic and the public have been determined as possible threats to these marine species. Moreover, the legislative framework is perceived to be less effective in conserving key species than it could be, and hard to enforce. This study utilised a multi-method, case study approach to examine the extent of human disturbance to a range of marine wildlife in inshore

waters around the South West peninsula. Furthermore, the study explored people's knowledge and perceived suitability of the existing legislation. The findings showed a low level of reported incidents and a lack of awareness of marine protection legislation amongst all sectors. Confusion over the roles, responsibilities and reporting process was also identified. The authors recommend a large-scale promotion of the provisions of existing legislation, along with a more integrated approach between organisations involved in the management of the marine environment. Furthermore, they highlight the availability of a range of management options including codes of practice and education.

Authors: Kent, C. S. P., and Crabtree, B.
Year: 2008
Title: The effectiveness of an established sanctuary zone for reducing human disturbance to Australian sea lions *(Neophoca cinerea)* at Carnac Island, Western Australia
Journal: Tourism in Marine Environments
Volume: 5
Issue: 1
Pages: 29-42
Abstract: This study investigated the effectiveness of a recently established sanctuary zone on Carnac Island, Western Australia in decreasing human disturbances to Australian sea lions *(Neophoca cinerea)*. Various methods of recording behaviours were also tested to clarify their adequacy for identifying human disturbances. Observations conducted between March 2005 and September 2006 (98 observations over 16 days) determined that a wireless camera was effective for monitoring sea lions unobtrusively, and instantaneous and continuous observations were both generally effective in monitoring degrees of human disturbance. The findings also showed that the sanctuary zone was ineffective in that sea lions hauled out more often in the adjacent recreational zone, although the sanctuary was established based on previous observations. It was concluded that sea lions are more likely to haul out where environmental aspects along a beach are suitable. Because environmental conditions are changeable over time, a fixed sanctuary zone will only help in decreasing impacts when conditions are suitable in that zone. Kent and Crabtree recommend that for future sanctuaries to be effective they should include entire stretches of useable beach.

Authors: Kirkwood, R., Boren, L., Shaughnessy, P., Szteren, D., Mawson, P., Hückstädt, L., Hofmeyr, G., Oosthuizen, H., Schiavini, A., Campagna, C., and Berris, M.
Year: 2003
Title: Pinniped-focused tourism in the Southern hemisphere: A review of the industry
Editors: N. Gales, M. Hindell and R. Kirkwood
Book title: Marine Mammals: fisheries, tourism, and management issues
City: Collingwood, Vic.
Publisher: Csiro Publishing
Pages: 257-276
Abstract: This book chapter aimed to prompt better practices in pinniped-focussed tourism and reduce the potential negative impacts of the industry, and support its sustainability. The authors collected data on locations and trends in tourist numbers at pinniped sites in the Southern Hemisphere (locations included Australia, New Zealand, Ecuador, Peru, Chile, Argentina, Uruguay, Brazil, Antarctica and Sub Antarctic islands, Namibia and South Africa). Moreover, they discussed issues of tourist impacts and guidelines for tourism approaches. According to the authors, this chapter is set out geo-politically rather than by species as they examine the topic from the human, rather than the species perspective. The chapter reviews the industry, outlines regulations and guidelines pertaining to the industry, with the specific goal

of providing management-related advice. The authors argue that as pinniped-focussed tourism continues to grow, regulations and guidelines will need to be implemented to ensure the sustainability of the industry. These need to consider safety, approach behaviour, minimum approach distances, tour guides experience and seal breeding status and habituation.

Authors: Kovacs, K. M., and Innes, S.
Year: 1990
Title: The impact of tourism on harp seals *(Phoca groenlandica)* in the Gulf of St. Lawrence, Canada
Journal: Applied Animal Behaviour Science
Volume: 26
Issue: 1-2
Pages: 15-26
Abstract: This study investigated the impact of tourism on the behaviour of female harp seals *(Phoca groenlandica)* and their pups during the whelping seasons of 1986 and 1987 in the Gulf of St. Lawrence, Canada. The behaviour of seals during and after tourists' visits was compared with behaviour observed at undisturbed sites. The findings showed that nearly all elements of mothers' and pups' behaviour were significantly impacted by the presence of tourists. Female attendance was remarkably reduced and those females that remained with their pups when tourists were present spent significantly more time alert and less time nursing their pups. Pups were more active during tourists present, altering location more frequently and resting less. Pups also spent significantly more time alert and engaged in agonistic behaviour. Young seals frequently displayed a freeze response when tourists approached to within 3 m or touched pups– such behaviour was observed only in this context. The level of disturbance was affected by pup age and tourist behaviour. After the tourists departed, most females returned to their pups immediately and behaviour characteristic of undisturbed situations usually resumed within one hour.

Author: Kucey, L.
Year: 2005
Title: Human disturbance and the hauling out behaviour of Steller sea lions (*Eumetopias jubatus*)
Academic Department: Department of Zoology, Faculty of Science
University: University of British Columbia
Thesis Type: Master of Science thesis
Abstract: There is considerable interest in assessing and mitigating disruptive effects of humans on the behaviour of marine mammals, especially for species with uncertain or decreasing population trends. Steller sea lions (*Eumetopias jubatus*) have been under intensive study throughout their range over the past few decades in an attempt to identify the causes of a large population decline in the Gulf of Alaska and Aleutian Islands. Consequently, disturbance due to scientific research has also increased at rookeries and haul outs. The purpose of this study was to determine if there were measurable short-term effects of human disturbance on the numbers of Steller sea lions using terrestrial sites. Numbers and composition of sea lions were documented for 2-3 week periods in southeast Alaska and British Columbia during summer (n=8 sites) and winter/spring (n=6 sites). They revealed considerable daily variation in numbers of sea lions hauled out within and among study sites that was related in part to prevailing environmental conditions. However, counts could not be corrected to account for environmental influences on the total numbers of sea lions using haul outs. Hauling out trends were examined for pre- and post-disturbance periods across multiple sites over two seasons. Predetermined research disturbances occurred to collect scats at the haul outs, and to brand

pups at the rookery. Three methods were explored to assess local population recovery that addressed both quantitative and temporal aspects of sea lions returning to the study locations. Disturbances resulted in significantly fewer sea lions using haulouts during the post-disturbance period. Variation in the numbers of animals using the haulouts increased following the disturbance, but rates of change in daily numbers did not differ significantly between periods. Six of ten disturbed sites reached full recovery (100% of the pre-disturbance mean) on average 4.3 days after the research disturbance. To determine if individual behaviour was affected by disturbance, sea lions arriving on shore were followed to determine normal patterns of interactions and behaviour. Significant differences were noted in hauling out behaviour between animals that remained on land and those that returned to the water. Sea lions that returned to the water exhibited higher rates of behaviour and interactions with other animals during the week that followed the disturbance. Seasonal differences were also noted in the rates of behaviour and interactions that may be indicative of certain times of the year when sea lions are more sensitive to human presence and disturbance. Increasing levels of human-sea lion contact are expected as more and more people visit the remote coastal habitat of Steller sea lions. Future studies are needed to assess the influence of disturbance on sea lion redistribution within a critical recovery period, as well as to determine the physiological effects that sea lions experience with repeated human disturbance. Disturbance studies are an important aspect of conservation initiatives because they can help guide policies and establish restrictions to protect wild populations from human intrusion.

Authors: Kucey, L., and Trites, A.W.
Year: 2006
Title: A review of the potential effects of disturbance on sea lions: assessing response and recovery
City/State: -
Institution: Alaska Sea Grant College Program
Report Number: Report No. AK-SG-06-01
Abstract: Human intrusion within areas of sea lion habitat is increasing worldwide, leading to concerns about disruption of distribution and daily activities of sea lions. Sea lion responses to disturbance can be quantified by recording changes in behavioural patterns, documenting numbers of animals on shore before, during, and after the disturbance, or by measuring physiological stress of individual animals. However, assessing recovery is not so straightforward, as highlighted by an example from a study of the short-term effects of disturbance on Steller sea lions. Recovery is generally recognised as a return to an original state or normal condition, but is often operationally defined as a percent-return to pre-disturbance numbers or behaviours. Simple interpretation of disturbance effects can be easily confounded by concurrent natural seasonal changes in behaviours or haul-out patterns, or by daily variability in numbers of animals present that can be attributed to weather, tidal cycle stage, and other factors. Overall, a range of recovery criteria needs to be simultaneously applied when assessing the effects of human disturbance on sea lion populations. Insights gained from research on the effects of disturbance on Steller sea lions may help guide the development of studies undertaken on other species of sea lions.

L

Author: Labrada-Martagón, V.
Year: 2017
Title: How biological data has contributed to management plans in the Bay of La Paz: Los Islotes sea lion rookery as case of study
Conference Name: NAAFE Forum 2017
Conference Location: La Pax, Southern Baya California, Mexico
Abstract: Los Islotes is the southernmost breeding site of the California sea lion (*Zalophus californianus*) in Northern hemisphere and represents one of the most important economic activities for the city of La Paz, Mexico. The increasing tourism activity grew without any control until researchers and organisations started to be concerned about the perturbation to the reproductive and haul-out patterns of the sea lion. The International Conservation Program of The Nature Conservancy funded a research project, with the goal to determine the effect of tourism activities on the behaviour of sea lions, in order to help design regulations to assure better use and conservation of the site. The nature and intensity of tourism activity and the effects to the sea lion behaviour were determined based upon monthly sampling over a one-year period (May 2000-April 2001). The main result was that perturbations occurred mostly in autumn and winter coinciding with the highest frequency of tourism, large number of male sea lions, increasing suckling behaviour of pups, and unfavourable environmental conditions for haul-out, such as high tide level and strong winds. Researchers, service tourism providers, and governmental personnel collaborated and participated in workshops organised by the regional office, CONANP-SEMARNAT, in order to develop a regulation plan with a buoy system and zoning specifications for tourism activities. Some of the former management strategies are in current force in conservation management plans in the area. Current needs for conservation physiology studies relative to changes in tourism and fishing activities were also discussed.

Authors: Labrada-Martagón, V., Aurioles-Gamboa, D., and Martínez-Díaz, S. F.
Year: 2005
Title: Natural and human disturbance in a rookery of the California sea lion (*Zalophus californianus*) in the Gulf of California, Mexico
Journal: Latin American Journal of Aquatic Mammals
Volume: 4
Issue: 2
Pages: 175-185
Abstract: Los Islotes is the southernmost breeding site of the California sea lion (*Zalophus californianus californianus*) in the Northern Hemisphere and represents one of the principal tourist attractions for the city of La Paz, Mexico. The tourism has been growing without control and could be the cause of perturbation in the reproductive and haul-out patterns of the sea lion. The aim of this study was to determine the effect of tourism activities on the behaviour of sea lions, in order to help design regulations to assure better use and conservation of the site. The nature and intensity of tourism activity and sea lion behaviour were determined based upon monthly sampling over a one-year period (May 2000-April 2001). Tourist activity was higher during autumn and winter, with visits by “panga” boats being the most numerous. A total of 112 disturbances were recorded, the majority of which being non-anthropogenic causes. A quarter of disturbances were triggered by human activity within 20m of the rookery and with harassment reaction (animals going into the water) in 32% of the anthropogenic disturbances. Principal component analysis (PCA) described the conditions under which disturbance was generated (74% of the variation explained). Using three factors (47% of the total variation) the major contributing variables were month, tidal level, relative humidity, Beaufort number, total

number of boats and number of powerboats and sailboats. In Los Islotes, the perturbation occurs mostly in autumn and winter coinciding with the highest frequency of tourism, large number of adult and subadult males and unfavourable environmental conditions for haul-out, such as high tide level and strong winds. The lowest number of disturbances occurred in summer, during the breeding season of the sea lion. Most of these, however, were caused by human activity.

Authors: Lalas, C., and Bradshaw, C. J.
Year: 2001
Title: Folklore and chimerical numbers: review of a millennium of interaction between fur seals and humans in the New Zealand region
Journal: New Zealand Journal of Marine and Freshwater Research
Volume: 35
Issue: 3
Pages: 477-497
Abstract: In New Zealand, the increase in range expansion and numbers of New Zealand fur seals *(Arctocephalus forsteri Lesson)* has prompted many people to comment on their impacts on the marine and coastal environments. In this review Lalas and Bradshaw have shown anomalies in the understanding of the abundance and distribution, interactions with humans, and effects on the marine and coastal environments of New Zealand fur seals in New Zealand. The distribution resulting from the present pattern of re-colonisation differs from the perception of their distribution before decimation by humans. The authors hypothesise that the pristine distribution was temperate rather than subantarctic. According to the authors, previously published records which have recorded changes in the abundance and distribution of the species are shown to be wanting. The most controversial management issue is interaction with commercial fisheries where the authors conclude that neither of the extreme options, culling of seals nor closure of some fishing grounds, is justified. Other issues addressed include tourism, *te tikanga Maori o mahinga kai* (the customary use of wildlife by Maori), and impact of fur seals on the coastal environment. According to the authors, there is a need for a better understanding of the interactions with humans and the impacts on the New Zealand environment. The authors suggest that the current management policy should remain unchanged until the current paucity of information on the degree of interaction between humans and fur seals has been addressed.

Authors: Le Boeuf, B. J., and Campagna, C.
Year: 2013
Title: Wildlife viewing spectacles: Best practices from Elephant seal (Mirounga sp.) colonies
Journal: Aquatic Mammals
Volume: 39
Issue: 2
Pages: 132-146
Abstract: Wildlife viewing spectacles that are accessible to the public are very popular, raise revenue, create awareness, contribute to livelihoods, and often support conservation. When spectacles are in the commons, they are vulnerable to depletion and ruin. The aim of this study was to identify best practices that provide access to the animals without disturbing them. Le Boeuf and Campagna examine spectacles where thousands of people may view thousands of wild animals at predictable times and locations. The authors describe the viewing programmes at three distinct sites where elephant seals (*Mirounga sp.*) breed: Piedras Blancas and Año Nuevo in California, and Península Valdés in Argentina. They compare the viewing operations with regard to resources, mission and accessibility, and the relationship between colony growth

and viewer number, and then they report on the quality of the viewing experience. For best practices, Le Boeuf and Campagna state that they drew on 67 years of summed field research on these animals by both of them and with their familiarity with viewing programmes at these sites. The authors conclude that five practices reduce viewer impact and improve the viewing experience: (1) restricting visitor numbers and access to the animals; (2) monitoring impact of viewing on the animals and their habitat; (3) encouraging fundamental research of the animals on site; (4) utilising trained volunteer guides to interpret the attraction when possible; and (5) requiring independent oversight of commercial operations. According to the authors, all wildlife viewing operations could benefit from adherence to these practices when applicable. At their best, wildlife viewing spectacles are a showcase for sound conservation management and provide an inspirational experience that, for many, is akin to visiting the most sacred cultural places of humankind.

Authors: Lelli, B., and Harris, D. E.
Year: 2006
Title: Seal bounty and seal protection laws in Maine, 1872 to 1972: Historic perspectives on a current controversy
Journal: Natural Resources Journal
Volume: 46
Issue: 4
Pages: 881-924
Abstract: Modem predator management balances preservation and conservation with the desire to exploit natural resources. Seals (marine predators) arouse controversy because humans and seals both consume fish. To comprehend the foundation of current stakeholder positions regarding seals, Lelli and Harris examined the history of seal legislation in Maine from 1872 to 1972, which included two bounty periods as well as limited legal protection. The authors analysed the stakeholder interests that affected Maine legislation and compared them to similar influences at work in a modern context, the Canadian Atlantic Seal Hunt. According to the authors, this history and analysis can provide lessons for seal management elsewhere.

Authors: Lewis, T. M., and Mathews, E. A.
Year: 2000
Title: Effects of human visitors on the behavior of harbor seals (Phoca vitulina richardsi) at McBride Glacier Fjord, Glacier Bay National Park
City/State: Alaska
Institution: University of Alaska Southeast, Biology Department, Resource Management Division
Date: February 2000
Abstract: Icebergs calved from tidewater glaciers in Glacier Bay, Alaska, serve as haul outs for 5000-8000 harbour seals (*Phoca vitulina richardsi*) during the spring pupping and summer molting seasons. Visitors seek these very same locations during the summer tourist season for purposes of experiencing wilderness, taking photographs, and viewing glaciers and wildlife. Harbour seals are most sensitive to human disturbance when hauled out during pupping and molting, and repeated disturbances of hauled out seals increases the chances of mother/pup separations and possibly decreases the overall fitness of individuals. The potential for human disturbance of harbour seals increases as tourism grows in Glacier Bay, part of the Federal National Park Service (NPS).
This report provides the findings of a study which aimed to: 1) determine the numbers of harbour seals that use McBride Fjord during the pupping season, 2) monitor the amount and type of human use in the inlet during this time, 3) determine if seal behaviour was changed by

human activities, 4) and determine visitor compliance with the Marine Mammal Protection Act (MMPA) harassment regulations and the effectiveness of the National Marine Fisheries Service (NMFS) distance recommendations.

Research was conducted at McBride Glacier Fjord. Harbour seals use the waters in and around McBride Inlet to haul out on icebergs from the calving tidewater glacier. An island reef approximately 1 mile from the glacier face also serves as a haul out for a small number of harbour seals at low tide, although the majority of seals in McBride haul out on drifting icebergs. Observations of seals from an approximately 50 m high knoll located on the south side of the inlet, 1 mile from the glacier face took place between 11 May and 22 June, 1998 for a total of 37 days.

The findings showed the following:

1) Humans visited McBride Inlet on 20 of the 37 (54%) days studied. Harbour seals were disturbed on 18 of these 20 (90%) visitor use days and 15 out of 18 (83%) of these disturbances occurred after the first pup was observed in the inlet.

2) The time of parturition, nursing, weaning and mating is critical for the reproductive success of harbour seal populations.

3) Repeated disturbance of harbour seals during the pupping and nursing periods in McBride Inlet indicates that current levels of visitor education and/or enforcement by the Federal National Park Service (NPS) are inadequate for preventing disturbances and that a majority of visitors to the inlet are violating the MMPA.

4) Most visitors monitored in McBride Inlet (93%) disturbed hauled out seals; kayakers disturbed the largest number of seals overall.

5) The average number of seals disturbed was 7.6 per encounter. The average percent disturbance was 73% per encounter. The average rate of disturbance was 41.4 seals per hour and pedestrians had the highest disturbance rate (84.4 seals/hr).

6) The numbers of visitors to McBride Inlet are likely to increase, considering that Glacier Bay National Park is increasing in popularity and McBride Glacier is the only tidewater glacier left in Muir Inlet. There are currently no restrictions on numbers of visitors to McBride
Inlet, nor are there any seasonal closures of this inlet.

7) Despite educational programmes by Glacier Bay National Park Visitor Centre and kayak rental and guiding concessionaires, the majority (59%) of visitors do not comply with the NMFS's 100 yard minimum approach distance to hauled out seals, and in many cases the 100 yard minimum distance is insufficient to prevent behavioural disturbances to seals.

8) The NMFS is concerned with and responsible for upholding the Marine Mammal Protection Act's prohibition of marine mammal harassment and the NPS is mandated to uphold federal regulations. Yet there is no known enforcement of these regulations designed to minimise disturbance by either the NPS or the NMFS. At McBride Inlet, the MMPA was violated in 27 out of the 29 encounters observed.

9) The NPS's ¼ mile minimum approach distance for harbour seals hauled out on ice in Johns Hopkins Inlet during molting could not be realistically maintained by vessels entering a fjord ½ mile wide with seals on ice spread throughout the inlet.

The authors recommend that McBride Glacier Fjord be closed to all vessel traffic for six weeks (from 15 May through 31 June) to protect the majority of the new born pups and their mothers from potentially detrimental disturbances. They also suggest that visitors be allowed to leave their vessels at the mouth of the inlet and walk in along the south shore to view the glacier. Moreover, they indicate that further monitoring of seals and visitors at McBride Inlet is crucial to test the effectiveness of current visitor education programmes on minimising seal disturbance, particularly during the early summer pupping and August molting seasons.

Authors: Lorden, R., Sambrook, R., and Mitchell, R. W.
Year: 2012
Title: Residents' and tourists' knowledge of sea lions in the Galápagos
Journal: Society & Animals
Volume: 20
Issue: -
Pages: 342-363
Abstract: This study examined knowledge of sea lions (*Zalophus wollebaeki*) for both residents and tourists on San Cristobal Island in the Galápagos, a famous nature tourism destination. Participants (N = 281) obtained through convenience and snowball sampling answered questionnaires about their knowledge of sea lions. Participants with higher education received higher overall scores, but participants' education and age influenced answers on only a few questions. Residents and tourists obtained comparable overall scores, exhibiting extensive knowledge of sea lion behaviour and life history. Whether participants were residents or tourists influenced answers to several questions, but when only participants with 13 years of education or more were examined, few differences in answers remained between residents or tourists. Participants' broad knowledge of sea lions may be attributed to the items of knowledge tested, participants' motivations for travel to the Galápagos, and the fact that sea lions are an engaging and ubiquitous animal.

Authors: Lovasz, T., Croft, D. B., and Banks, P.
Year: 2008
Title: Establishing tourism guidelines for viewing Australian Sea Lions *Neophoca cinerea* at Seal Bay Conservation Park, South Australia
Editors: D. Lunney, A. J. Munn and W. Meikle
Book Title: Too close for comfort: Contentious issues in human-wildlife encounters
City: Mosman, NSW, Australia
Publisher: Royal Zoological Society of New South Wales
Pages: 285-292
Abstract: The establishment of approach distances between tourists and wildlife is a beneficial tool for resource managers involved with wildlife tourism. Such guidelines are especially useful at locations with high tourism activity and possibly dangerous wildlife, but need to be based on research to ensure an evidence-based balance between tourist experience and wildlife protection. At Seal Bay Conservation Park (SBCP), large numbers (>100,000 annually) of tourists regularly interact with a breeding colony of Australian sea lions *Neophoca cinerea*, which has been listed as threatened under the EPBC Act. To determine guidelines for approach distances Lovasz and colleagues experimentally subjected individuals and groups of sea lions to approaches by one to ten pedestrians to measure the distance at which the animals reacted and the type of behaviour displayed during that reaction. These trials were conducted on both the beach where tourists are allowed access with guides, as well as in areas that are usually undisturbed by human activity. The findings showed that at the current recommended minimum approach distance of 6 m, 28% of sea lions on the tourist beach and 51% of sea lions in other areas displayed an alteration in behaviour and some displayed aggressive behaviour. Based on these findings, the authors recommend that SBCP managers increase the approach distance to 10 m.

M

Author: Marschall, S.
Year: 2015
Title: Interpretation in wildlife tourism: Assessing the effectiveness of signage to modify visitor's behaviour at a seal watching site in Iceland
Academic Department: University Centre of the Westfjords, Faculty of Business and Science
University: University of Akureyri
Thesis Type: Master's thesis
Abstract: Marschall evaluated the effectiveness of signage to change visitor's behaviour to mitigate negative effects on wildlife at a seal watching site on Vatnsnes, NW-Iceland. 2440 visitors were observed and their behaviour recorded from July to September 2014. To examine whether type of information has an impact on behaviour, visitors were provided with either teleological (instructions with explanations) or deontological (instructions without explanations) signs, while no signs were provided for the control group. For the analysis, regression analysis and χ 2-tests were utilised. Moreover, the proportion of visitors reading the signs was investigated (1081 observations). The findings showed that most of the time visitor's behaviour improved with having signs and that sometimes the teleological signs were more effective than the deontological ones. Nevertheless, group type often had a considerable impact on the behaviour, with families having the most intrusive behaviour in comparison to singles, couples and other groups. 37.7 % (more than a third) of the visitors did not look at the signs and 42.6% stopped at the sign for more than three seconds. The author concludes that it is recommended to utilise teleological signs because they are at least as effective as deontological signs and in some cases they are more effective. Although signage had a positive influence on visitors' behaviour, additional management approaches are presented because it is not clear whether signage on its own is sufficient in reducing disturbance on the seals. The thesis discusses potential improvements of the signs' design.

Authors: Marschall, S., Granquist, S. M., and Burns, G. L.
Year: 2017
Title: Interpretation in wildlife tourism: Assessing the effectiveness of signage on visitor behaviour at a seal watching site in Iceland
Journal: Journal of Outdoor Education and Tourism
Volume: 17
Issue: -
Pages: 11-19
Abstract: The effectiveness of interpretive signage as a means of modifying visitor behaviour to reduce negative impacts on wildlife was tested empirically at a seal watching site on Vatnsnes peninsula in North West Iceland. From July to September 2014, the actions of 2440 visitors were observed and their behaviour recorded. To test the importance of how interpretive information is presented, signs with either ontological (instructions without explanation) or teleological (instructions with explanation) information were positioned along the path towards the site. A control group, to which no signs were provided, was also observed. The results show that the majority of the tested behaviour was influenced when signs were present and that under some conditions teleological signs were more effective than ontological. The type of visitor group was found to significantly influence behaviour, with families having the most intrusive behaviour compared to singles, couples or other groups. The findings of this study contribute to a better understanding of how interpretative signage can modify tourist behaviour to facilitate sustainable wildlife tourism. The use of teleological signs for managing wildlife

tourism activities is recommended because they are more effective than ontological signs in terms of modifying the general visitor behaviour. In addition, signage and other management strategies should address the different needs and responses relevant to the nature of the tourist group visiting the site. Special focus should be placed on families when signs are designed because this group type showed the highest probability of causing disturbance at the site.
In this paper the authors show that interpretation through signage can be a useful tool for sustainable development and management of wildlife watching. They recommend the following when designing interpretive signs:

- Visitors should be provided with teleological, rather than ontological, information.
- Signs should include illustrations with informative text.
- The information provided should take care to address families because they show the most intrusive behaviour.
- Information should be offered in multiple languages, as appropriate, to make information accessible to the greatest number of visitors.
- The content of the information should include practical information about wildlife protection, take home messages and comparisons between wildlife and humans to enable visitors to more readily establish a psychological connection with the wildlife. Although signage has many advantages, other methods for conveying information, such as guided tours with educated guides, are suggested as a way of supplementing signs.

Authors: Mathews, E. A., Jemison, L. A., Pendleton, G. W., Blejwas, K. M., Hood, K. E., and Raum-Suryan, K. L.
Year: 2016
Title: Haul-out patterns and effects of vessel disturbance on harbor seals *(Phoca vitulina)* on glacial ice in Tracy Arm, Alaska
Journal: Fishery Bulletin
Volume: 114
Issue: 2
Pages: 186-202
Abstract: Tidewater glacial fjords are an important habitat for breeding harbour seals *(Phoca vitulina)* that rest, give birth, and nurse pups on icebergs. These fjords also attract tour vessels that possibly disturb seals. In May and June during 2001–2006, Mathews and colleagues documented seal abundance, pupping phenology, and vessel–seal interactions in Tracy Arm, a glacial fjord in south-eastern Alaska. The authors utilised randomised observations to detect the frequency at which seals entered the water in the presence and absence of vessels, and they estimated the reaction distances of seals to approaching vessels. The findings showed that mean daily vessel counts varied from 10.2 (2001) to 2.0 (2006) (range: 1–33). Power and tour and vessels were the most common types of vessels, but seals were most sensitive to kayaks and cruise ships. The likelihood of a seal entering the water were higher when vessels were present (>2 times) or within 100 m (3.7 times), and when a pup was present (1.3 times). The baseline, undisturbed, rate of seals entering the water was 0.06 (95% CI: 0.05–0.08) per 10 min. Seal births occurred during 30 May–25 June and peaked (4–8 per day) during 7–13 June. The maximum pup count (408) was observed on 24 June. According to the authors, harbour seal fitness in Tracy Arm may be reduced by vessel disturbances during breeding and pupping.

Author: Matthews, L.
Year: 2017
Title: Harbor seals (*Phoca vitulina*) reproductive advertisement behavior and the effects of vessel noise
Academic Department: Department of Biology
University: Syracuse University
Thesis Type: Doctoral Thesis
Abstract: Harbour seals (*Phoca vitulina*) are a widely distributed pinniped species that mate underwater. Similar to other aquatically mating pinnipeds, male harbour seals produce vocalisations during the breeding season that function in male-male interactions and possibly as an attractant for females. Matthews investigated multiple aspects of these reproductive advertisement displays in a population of harbour seals in Glacier Bay National Park and Preserve, Alaska. First, she looked at vocal production as a function of environmental variables, including season, daylight, and tidal state. Vocalisations were highly seasonal and detection of these vocalisations peaked in June and July, which correspond with the estimated time of breeding. Vocalisations also varied with light, with the lowest probability of detection during the day and the highest probability of detection at night. The high probability of detection corresponded to when females are known to forage. These results are similar to the vocal behaviour of previously studied populations. However, unlike previously studied populations, the detection of harbour seal breeding vocalisations did not vary with tidal state. This is likely due to the location of the hydrophone, as it was not near the haul out and depth was therefore not significantly influenced by changes in tidal height. Matthews also investigated the source levels and call parameters of vocalisations, as well as call rate and territoriality. The average source level of harbour seal breeding vocalisations was 144 dB re 1 μPa at 1 m and measurements ranged from 129 to 149 dB re 1 μPa. Analysis of call parameters indicated that vocalisations of harbour seals in Glacier Bay were similar in duration to other populations, but were much lower in frequency. During the breeding season, there were two discrete calling areas that likely represent two individual males; the average call rate in these display areas was approximately 1 call per minute. The harbour seal breeding season also overlaps with peak tourism in Glacier Bay, and the majority of tourists visit the park on a motorised vessel. Because of this overlap, the author investigated the impacts of vessel noise on the vocal behaviour of individual males. In the presence of vessel noise, male harbour seals increase the amplitude of their vocalisations, decrease the duration, and increase the minimum frequency. These vocal shifts are similar to studies of noise impacts on other species across taxa, but it is unknown how this could impact the reproductive success of male harbour seals. Finally, Matthews looked at the role of female preference for male vocalizations. Using playbacks of male vocalisations to captive female harbour seals, she found that females have a higher response to vocalisations that correspond to dominant males. Females were less responsive to subordinate male vocalisations, which had a shorter duration and a higher frequency. Given that male harbour seals decrease the duration and increase the frequency of vocalisations in the presence of noise, it is possible that these vocalisations become less attractive in noise.

Author: Martinez, A.
Year: 2003
Title: Swimming with sea lions: friend or foe? Impacts of tourism on Australian sea lions, *Neophoca cinerea*, at Baird Bay, S.A.
Academic Department: -
University: Flinders University of South Australia
Thesis Type: Honours Thesis
Abstract: This study contains two major parts to determine the impacts of 'Ocean Ecotours' on a colony of Australian sea lions (*Neophoca cinerea*) on Jones Island (Baird Bay; South Australia), and the participating tourists. Firstly, it tries to determine any attitude changes of the tourists towards the sea lions and secondly, it investigates the impact tourism has on the sea lions' behaviour. 'Ocean Ecotours' is at present the only tour operator in South Australia that takes tourists out to swim with Australian sea lions. Since this tourist destination is between the exploration and involvement stage, the first two stages of Butler's tourist area life cycle, it offers an excellent opportunity to collect data on the positive and negative consequences of tourism early in the development of this site. This study was carried out from November 2002 to May 2003. During this time 28 observations of the sea lion colony were performed. Of these observations 20 were conducted while a tour was scheduled and eight on days with no tour. The observation method was either from the tour boat 'The Investigator' or independently from a canoe anchored outside Jones Island. To detect any changes of behaviour the sea lions were observed in three time intervals, one hour before the tour, during the tour (usually an hour) and one hour after the tour. Sea lion locations and behaviours were recorded as were the activities of the tour operator and tourists. No significant behavioural changes were determined for the animals on the beach. There was also no correlation between the number of tourists in the water and the number of sea lions interacting with them. However, individual animals did show reactions like looking up, sitting up and moving further up the beach due to loud noise from the tour operator's dinghy and tourists. After the swimming interaction with the sea lions the tourists were given a survey to complete. The aim was to see if the tourists had gained any additional knowledge about Australian sea lions and if their attitude towards them had changed. Positive attitude changes could be important to the conservation of the Australian sea lions and their marine environment. The evaluation of the survey showed that tourists joining the tour did not gain any concrete information about the Australian sea lion and their marine life and the tour did not significantly change the tourists' attitude towards making specific contributions to environmental conservation. However, the tour did create an emotional connection for the tourists towards the sea lions.

Authors: Mertz, E. M., and Bester, M. N.
Year: 2011
Title: Vagrant southern elephant seal and human disturbance in Mossel Bay, South Africa
Journal: South African Journal of Wildlife Research
Volume: 41
Issue: 2
Pages: 224-228
Abstract: An opportunistic observational study on human disturbance of a vagrant southern elephant seal that was hauled out on a tourist beach in Mossel Bay, South Africa, is presented. Incidences of pedestrians ignoring signage and the demarcation barrier around the seal raise questions about the management of such haul out events, public safety and the effects of disturbance.

Author: Miller, N.
Year: 2017
Title: Seal appeal: A naturalist's guide to gray seal interpretation
Academic Department: Nicholas School of the Environment
University: Duke University
Thesis Type: Master of Environmental Management
Abstract: Gray seals (*Halichoerus grypus*) have provided economic opportunity as well as a new channel through which to educate the public about the importance of marine mammal conservation. Currently, there are five seal cruise businesses in Cape Cod and Nantucket that ferry visitors, eager to view and learn about marine wildlife, to and from gray seal haul outs. This study aimed to design products that would assist interested seal cruise businesses incorporate interpretation into their operations. The first of two products presented in this study comprises of a new digital guide which is divided into three sections and offers materials and techniques for seal cruises to achieve such integration. The second of the two products is a literature review of the history of sealing and seal conservation in New England from the colonial era to the present day. According to Miller, both products are the result of extensive research utilising different sources such as peer-reviewed literature, historical literature, academic textbooks and government reports. Furthermore, interviews with seal cruise operators were conducted to learn how they present information to visitors.

N

Authors: National Seal Strategy Group, and Stewardson, C.
Year: 2007
Title: National assessment of interactions between humans and seals: fisheries, aquaculture and tourism
City/State: Canberra, Australia
Institution: Australian Government Department of Agriculture, Fisheries and Forestry
Date: 2007
Abstract: In February 2003, the Marine and Coastal Committee (MACC) of the Natural Resource Management Standing Committee identified the need to address the growing issue of human and seal interactions, with a view to developing a strategy to mitigate adverse impacts on Australian seal populations and the fisheries, aquaculture and tourism sectors. The MACC established a small inter-government working group, the National Seal Strategy Group (NSSG), to develop a National Strategy. This assessment report provides background scientific information to support the development of the National Strategy to address interactions between humans and seals. It focuses only on seals breeding in continental Australia (i.e., Australian sea lion, *Neophoca cinerea*, Australian fur seal, *Arctocephalus pusillus doriferus*, and the New Zealand fur seal, *Arctocephalus forsteri*), and their interactions with fisheries, aquaculture and tourism.
Many fur seal populations appear to be recovering from over-harvesting during the late eighteenth and nineteenth centuries (although this is not evident in Australian sea lion populations), and there has been significant growth in our commercial fishing industries, marine finfish aquaculture, and seal-focused tourism. It is therefore likely that seal–human interactions will increase in these sectors, hence the need for a National Strategy. The challenge facing government and industries is how to minimise adverse interactions to protect seals, while, at the same time, maintaining sustainable and profitable business opportunities.
In Australian waters, current population estimates are 11,000 Australian sea lions, 92,000 Australian fur seals and 57,000 New Zealand fur seals. Seals are opportunistic feeders taking

a variety of prey, particularly fish, squid and octopus. There is potential overlap between the species targeted by commercial fisheries and the prey species of seals.

Seals are protected under Australian Government and state Government legislation. All seals in Commonwealth waters are protected (as listed threatened and/or marine species) under the *Environment Protection and Biodiversity Conservation Act 1999*, which is administered by the Department of the Environment and Heritage. State government conservation and/or fisheries agencies are responsible under state legislation for seals on land, and in waters up to 3 n. miles off-shore, while the Australian Government is responsible for seals outside state coastal waters and within the Australian Economic Exclusion Zone.

Humans and seals interact in a number of ways. These interactions may affect the seal, the human, or both. In the fisheries sector, quantitative and independent data on the nature and extent of interactions between fisheries and seals is limited. Available data suggests that interactions are most evident in the gillnet fisheries, the southeast trawl fishery, and pot and trap fisheries. Interactions that are detrimental to fishers include damage/loss of gear, damage/loss of catch, disturbance of fishing operations, and potential injury or inter-specific transmission of disease. Interactions that are detrimental to seals include injury or harassment, fatal entanglement and modified behaviour (seals associating food with humans). Illegal shooting of seals by some fishers in certain fisheries, and entanglement in fisheries-related debris such as discarded and derelict nets, bait box straps, monofilament nets and nylon ropes, are also of concern.

In the aquaculture sector, quantitative and independent data on the nature and extent of interactions between aquaculture farms and seals is also limited. Available data suggests that interactions are most evident at the salmonid farms in Tasmania and southern bluefin tuna farms in South Australia. Interactions that are detrimental to fishers include loss of valuable stock, damage to gear, increased costs through the need to protect stock disturbance of fishing operations, and potential injury or inter-specific transmission of disease. Interactions that are detrimental to seals include injury and fatal entanglement in anti-predator nets, illegal killing of seals, and modified behaviour of individual seals due to habituation to a predictable food source. Attempts to mitigate interactions have had variable degrees of success, with the protection of farmed fish with physical barriers potentially the most effective option.

In the tourism sector, quantitative and independent data on the nature and extent of interactions between tourists and seals is limited. Available data indicates that large visitor group size, noise, and a desire to ‘get close to wild animals’ may result in tourists unintentionally disturbing seal populations. For seals, this can lead to interference with feeding, socialising or breeding; mortalities and injuries; and/or displacement from optimal habitat. Other concerns include an increased risk to the safety of humans with regard to seal attacks (particularly when swimming or diving with seals); the possible inter-specific transmission of disease; and a potential increase in the feeding of seals, which could change seal behaviour.

This document represents the first step in the development of the National Strategy. In reviewing human-seal interactions, documenting current management practices, and identifying the key issues, the NSSG will consult further with key stakeholder groups to formulate a strategy to mitigate adverse impacts on Australian seal populations and the fisheries, aquaculture and tourism sectors.

Authors: Newsome, D., and Rodger, K.
Year: 2008
Title: Impacts of tourism on pinnipeds and implications for tourism management
Editors: J. Higham and M. Lück
Book Title: Marine wildlife and tourism management: Insights from the natural and social sciences
City: Wallingford
Publisher: CAB International
Pages: 182-205
Abstract: In this book chapter, Newsome and Rodger attempt to provide insights into visitor expectations and attitudes and the effects of tourism at breeding and haul-out sights. This chapter also explores the relative significance of boat-based, land-based and swim-with activities along with current perspectives as to how pinniped tourism should be investigated and managed.

Authors: Niemi, M., Auttila, M., Valtonen, A., Viljanen, M., and Kunnasranta, M.
Year: 2013
Title: Haulout patterns of Saimaa ringed seals and their response to boat traffic during the moulting season
Journal: Endangered Species Research
Volume: 22
Issue: 2
Pages: 115-124
Abstract: Conservation of the critically endangered ringed seal *Phoca hispida saimensis* population in Lake Saimaa in Finland requires broader knowledge of the behavioural ecology of this subspecies. Understanding Saimaa ringed seal haul-out patterns and their response to boat traffic is important for designing sustainable tourism guidelines and land use. Responses of unidentified seals to small outboard motor boat traffic were studied during the moulting season. The median distance at which the seals responded to an approaching boat was 240 m. GPS-phone tags were utilised to study both seasonal and circadian haul-out behaviour patterns of individual seals (n = 8) during the open-water season. The average post-moulting haul-out duration was 6 ± 5 h (SD), with a maximum of over 26 h. The seals spent more time hauled out at night (between 21:00 and 06:00 h) after the moult. The time spent hauled out and the haul-out frequency declined from early summer to autumn. An individual seal had an average of 13 haul-out sites, which were an average of 2.5 km apart. Almost half of these haul-out sites were located in the core 50% of the individual seals' home ranges. The high level of site fidelity points out the need to determine suitable haul-out areas and to develop measures for protecting the main resting sites of this endangered population. Moreover, guidelines for seal watching should be developed in order to reduce the potential disturbance caused by increasing tourism on Lake Saimaa.

Authors: Nomokonova, T., Losey, R. J., Iakunaeva, V. N., Emel'ianova, I. A., Baginova, E. A., and Pastukhov, M. V.
Year: 2013
Title: People and seals at Siberia's Lake Baikal
Journal: Journal of Ethnobiology
Volume: 33
Issue: 2
Pages: 259-280
Abstract: This study aimed to explore Baikal seal hunters' views of, and engagement with, Baikal seals. Nomokonova and colleagues conducted interviews with 11 Baikal seal hunters (most of whom are Buriat) in addition to the wife of one of these individuals. The findings showed that seals are an integrated part of local people's traditions, skills, knowledge, and sensory experiences, and one of the channels through which people relate to the lake itself. This article: 1) outlines the basic life cycle of Baikal seals; 2) briefly describes how these animals are experienced by the local public and tourists visiting the region; 3) describes how seals are named, categorised, and described by local hunters, which shows some of the ways in which these animals are intimately known and experienced; 4) details how seals figure in local cosmologies, and how they interlink people with the landscape; and 5) finally, reviews the archaeological record of seal representations in this region, which provides an indication of the broader cultural importance of these animals among the ancient societies of the Baikal region.

O

Authors: Óqvist, E. L., Granquist, S. M., Burns, G. L., and Angerbjörn, A.
Year: 1980
Title: Seal watching: An investigation of codes of conduct
Journal: Tourism in Marine Environments
Volume: 13
Issue: 1
Pages: 1-15
Abstract: Seal watching is a type of wildlife tourism that is becoming increasingly popular worldwide. Behavioural changes caused by the presence of tourists could lead to negative consequences for seal welfare and may impact reproduction and survival. Thus, regulating seal-watching activities to ensure future conservation and protection is crucial. Codes of conduct or guidelines for how to behave around animals are one approach to manage wildlife watching and are often quicker and easier to implement than laws. Codes explaining the repercussions for wildlife if the code is not adhered to appeal to the moral obligation of tourists and by that increase incentives to act in an appropriate way. This study aimed attention at analysing the content of codes of conduct for seal watching. Codes of conduct (n = 33) accessible on the internet during the time of study were analysed. The findings showed that in various areas where seal watching takes place there are no guidelines or regulations. The content and detail of the codes differed and the information was often lacking to provide sufficient protection of seals. Few of the codes were developed in cooperation with researchers or affirmed that the content was based on research. Moreover, most of the codes did not describe the consequences for wildlife if a code of conduct was not adhered to. According to the authors, more research on seals and the tourists watching them is necessary to better comprehend the impacts of tourism and how disturbance could be minimised. Meanwhile, establishing an international code of conduct (with local additions) based on existing knowledge in the field may be one option to increase protection and ensure conservation of these animals. According to the

authors, the findings presented in this study may support the development of such a code of conduct.

Author: Øren, K.
Year: 2017
Title: Haul-out behaviour of walruses (*Odobenus rosmarus*) monitored by camera stations – potential disturbance by tourist visitations
Academic Department: Department of Arctic and Marine Biology, Faculty of Biosciences, Fisheries and Economics
University: The Arctic University of Norway
Thesis Type: Master in Biology thesis
Abstract: The rapid growth of tourism in Polar Regions stimulates a need for investigating potential impacts on targeted species and sensitive areas, such as walrus (*Odobenus rosmarus*) haul-out sites. This study examines effects of tourist visitations on haul-out dynamics and site use by walruses in Svalbard, Norway. Camera stations were established at five traditional walrus haul-out sites that experience variable levels of tourist visitation. The cameras took one photograph each hour, throughout June-November from 2007-2015 (three sites) and 2010-2015 (two sites). A total of 66,365 images were analysed in this study. The number of walruses on shore, and % sea ice cover was estimated for each image. Additionally, the presence/absence of tourists, boats and polar bears (*Ursus maritimus*) was recorded. A loglinear regression model was run on residuals from an ARIMA model fitted to the time series. Site use by walruses was sometimes restricted by sea ice cover, but walruses were also absent (or present rarely) at some sites, despite a lack of sea ice. Tourists and boats did not disturb walrus haul-out behaviour significantly ($p>0.05$) at any of the study sites. Additionally, most polar bear visits were not associated with any detectable disturbance. However, polar bears did significantly disturb walrus herds at Andréetangen ($p=3.47^{-5}$) and Storøya ($p=1.52^{-5}$) in some years. These disturbances were likely associated with predation attempts on calves. Given the increasing number of calves in Svalbard, and the high numbers of bears on shore during increasingly longer ice-free seasons, such disturbances are likely to increase in the future.

Authors: Øren, K., Kovacs, K. M., Yoccoz, N. G., and Lydersen, C.
Year: 2018
Title: Assessing site-use and sources of disturbance at walrus haul-outs using monitoring cameras
Journal: Polar Biology
Volume: 41
Issue: 19
Pages: 1737-1750
Abstract: This study investigated the impact of tourist visitations on site use and haul-out dynamics by walruses (*Odobenus rosmarus*) in Svalbard, Norway. Automated camera stations were set up at five traditional haul-out sites that experience changeable levels of tourist visitation. The cameras took one photograph each hour, all through June–November from 2007 to 2015 (three sites) and 2010–2015 (two additional sites). A total of 66,365 images were examined. The approximate number of walruses on shore, and percentage sea-ice cover was estimated for each image; additionally, the absence/presence of boats, tourists and polar bears (*Ursus maritimus*) were reported. A log-linear regression model was run on residuals from an ARIMA model, fitted to each season of counts from each site. Use of the terrestrial haul-out sites was sometimes restricted by sea-ice cover, but walruses were also absent (or present rarely) at some sites, despite a lack of sea ice. Tourists on land and boats near the haul-out sites (with a single exception) did not disturb walrus haul-out behaviour significantly ($p > 0.05$) at

any of the sites. Moreover, most polar bear visits were not associated with appreciable disturbances. Nevertheless, polar bears did significantly disturb walrus herds at Andréetangen ($p = 0.003$) and Storøya ($p = 0.002$) in some years. These disturbances were likely associated with predation attempts on calves.

Author: Orsini, J. P.
Year: 2004
Title: Human impacts on Australian sea lions, *Neophoca cinerea*, hauled out on Carnac Island (Perth, Western Australia): implications for wildlife and tourism management
Academic Department: School of Environmental Science
University: Murdoch University
Thesis Type: Research Masters with Training (Marine Science)
Abstract: This study aimed to 1) investigate the potential impact of human visitors on Australian sea lions, *Neophoca cinereal* (a protected species endemic to Australia) hauled out on Carnac Island (one of the main sites where people can view sea lions near Perth), 2) consider implications of the results for the management of Carnac Island Nature Reserve, and 3) examine under which conditions tourism and recreation around sea lions can be sustained in the long term. Over a period of four months, Orsini recorded sea lion numbers, rate of return to the site, behavioural response to human presence and incidents of disturbances of sea lions by visitors on Carnac Island. Furthermore, a survey of 207 visitors was conducted.
The findings suggested that there were two main types of human impacts on the sea lions: 1) A particular state of sea lion vigilance induced by low level, but ongoing, repetitive disturbances from human presence, sustained at various approach distances ranging to more than 15 m, vigilance that is different from the behaviour profile observed in the absence of human disturbance. 2) Impacts resulting from incidental direct disturbances of sea lions by visitors from inappropriate human recreational activities or from visitors trying to elicit a more 'active' sea lion response than the usual 'sleeping or resting' behaviour on display; these impacts included sea lions retreating and leaving the beach, or displaying aggressive behaviour.
The impacts on sea lions from these disturbances may range from a probable sea lion physiological stress response to sea lions leaving the beach, a reduction in the time sea lions spend hauling out, and, in the longer term, the risk of sea lions abandoning the site altogether. Recurring instances of visitors (including unsupervised young children) approaching sea lions at very short distances of less than 2.5 m represented a public safety risk.
The findings also suggested that (1) the numbers of sea lions hauled out and their rate of return to the beach did not appear to be impacted by an increase in the level of human visitation; and (2) there seemed to be a high turnover rate of sea lions at the site from day to day, indicating that there are frequent arrivals and departures of sea lions to and from Carnac Island.
The visitor survey showed that many visitors to Carnac Island had a recreational focus that was not primarily directed towards sea lion viewing ('incidental ecotourists'). Even though many visitors witnessed incidental disturbance caused by humans to sea lions, they did not seem to recognise that they themselves could disturb sea lions through their mere presence. Visitors also seemed to have limited awareness of the safety risk posed by sea lions at close range.
Visitors supported the presence of a volunteer ranger on the beach and providing more on-site information about sea lions. Finally, visitors indicated that they greatly valued their sea lion viewing experience. According to Orsini, it is predicted that the continued increase in visitation to Carnac Island from tourism and recreation will cause intensified competition for space between sea lions and humans. Long-term impacts of human disturbances on sea lions are unknown, but a physiological stress response and/or the abandonment of haul out sites has been observed in other pinniped species.

The study recommends implementing a long-term strategy to mitigate disturbance levels of sea lions by visitors at Carnac Island to ensure that tourism and recreation around the animals can be sustained in the long term. Recommendations include measures to control visitor numbers on the island through an equitable allocation system between various user groups, the development of on-site sea lion interpretation, education and awareness programme, setting up a Sea Lion Sanctuary Zone on the main beach, ongoing monitoring of sea lion and visitor numbers and other data, and a system of training and accreditation of guides employed by tour operators.

Authors: Orsini, J. P., and Newsome, D.
Year: 2005
Title: Human perceptions of hauled out Australian sea lions (*Neophoca cinerea*) and implications for management: A case study from Carnac Island, Western Australia
Journal: Tourism in Marine Environments
Volume: 2
Issue: 1
Pages: 129-132
Abstract: Orsini and Newsome's study focusses on visitor perceptions of hauled out Australian sea lions on Carnac Island, Western Australia. The island which is an important haul out (resting) site for the Australian sea lion (a species in need of special protection) is easily accessible by pleasure craft as well as tour boats with many people visiting during the summer (November–April) period. A visitor survey was administered to gather information on visitor expectations of sea lion viewing, perceptions of visitor impacts, the nature of visitor experience, and views on management. The findings showed that up to 80% of visitation to the island was by private boat owners and 73% of respondents expected to view sea lions on the beach. The majority of the respondents believed that their presence did not disturb the sea lions, even though 78% stated that they noticed other people disturbing the sea lions. The survey showed a high degree of visitor satisfaction. Most respondents believed that five metres or less was a safe distance to approach sea lions, in contrast to a recommended approach safe distance of more than five metres advocated by the state wildlife agency. Visitors supported ranger presence and the provision of more information about sea lions. Management recommendations include the introduction of a visitor monitoring plan, the development of a sea lion interpretation programme, increased ranger presence, and a system of training and accreditation for tour guides using Carnac Island.

Authors: Orsini, J. P., Shaughnessy, P. D., and Newsome, D.
Year: 2006
Title: Impacts of human visitors on Australian sea lions (*Neophoca cinerea*) at Carnac Island, Western Australia: Implications for tourism management
Journal: Tourism in Marine Environments
Volume: 3
Issue: 2
Pages: 101-115
Abstract: This study investigates the impacts of human visitation on Australian sea lions (*Neophoca cinerea*) hauled out at Carnac Island Nature Reserve, Western Australia. Male sea lions haul out on Carnac Island's main beach year round, and this is also where tourists and recreational boaters land when visiting from the mainland, therefore coming into close proximity with the sea lions. The findings showed that there was no significant difference in the rate of return of sea lions to the beach between low–moderate and high human visitation seasons. Nevertheless, there was a specific profile of sea lion response to human approaches;

the level of sea lions' vigilance was mainly a function of age (higher in juveniles than in adults) and time of the day (higher in the early part of the day). Remarkably, vigilance levels did not change with the number of humans involved nor with the distance of approach of humans to sea lions. In regard to spatial competition between sea lions and people on the beach, the section of beach where most people landed was the least often utilised by sea lions. This last result, however, was inconclusive, as habitat preference could have been involved in where sea lions chose to haul out. Lastly, recurring incidental observations were made of direct interference of sea lions by humans, including approaches at very close range of less than 2.5 metres, and throwing sand and water at sea lions. Orsini and colleagues recommend the following visitor management actions to mitigate potential impacts of human presence on sea lions: limiting the overall numbers of visitors to Carnac Island's main beach at peak visitation times, establishing stronger ranger presence at the site, and initiating a visitor education and interpretation programme.

Authors: Osinga, N., Nussbaum, S. B., Brakefield, P. M., and de Haes, H. A. U.
Year: 2012
Title: Response of common seals (*Phoca vitulina*) to human disturbances in the Dollard estuary of the Wadden Sea
Journal: Mammalian Biology
Volume: 77
Issue: 4
Pages: 281-287
Abstract: The Dollard area is a main breeding area of common seals, *Phoca vitulina*, in the Dutch Wadden Sea. Seals primarily utilise this area in the birth season. It is at this time that mother and pup pairs are prone to disturbance. Seals in the Dollard lie on sandbanks close to the dyke area which subjects them to various human activities on land and in the coastal waters. The colony of common seals on the sandbanks of the Dollard has increased from 77 individuals in 1993 to 332 in 2010. Observations took place during the pupping and lactation seasons in 2007, 2008, 2009 and 2010. A total of 692 hours of observations were made over four years, and a total of 1,329 potential disturbances were documented. Human activities were more frequent on land than on water or in the air. In total, most disturbances were also recorded as arising from land. Actual disturbances of seals were recorded 344 times; seals were alerted 249 times and seals escaped into the water 95 times. An escape response was observed for 81 of the 1037 (7.8%) recorded land activities, six of the 92 (6.5%) recorded water activities, and eight of the 200 (4%) air activities. These percentages of escape responses did not differ significantly between the land, water and air activities.
The construction of a culvert in the dyke in 2001, and the building up of sand ridges along the water flow towards the culvert, provided the seals with an extra place to haul out. Land activities only affected seals resting on these sand ridges which are at a distance of 50–200 metres of the dyke. Boats have the potential to disturb seals on all sandbanks of the study area. They affected the highest number of seals per disturbance, with up to 117 animals fleeing into the water. Flying at lower altitudes appeared to lead to more disturbances of seals. Thus, the impact of flying at low altitudes (150–300m) justifies further investigation.
Disturbances which lead to fleeing into the water create the potential risk of separating pups from their mothers. This may contribute to the high incidence of orphaned pups found in the Dollard region. Yearly numbers fluctuated between 13 and 24 orphans representing a substantial proportion of the seals born in this area (with highest pup counts of ca. 100). In addition to separation, disturbances may also impact the condition of pups if they occur repeatedly during suckling.

According to the authors, the study findings indicate that disturbance is caused by numerous human activities to a colony of seals utilising sandbanks close to the mainland. As these disturbances pose a risk that pups are impacted in terms of their body condition or become orphaned, efforts should be made to minimise the impacts of human presence.

Authors: Osterrieder, S. K., Kent, C. S., and Robinson, R. W.
Year: 2017
Title: Responses of Australian sea lions, *Neophoca cinerea*, to anthropogenic activities in the Perth metropolitan area, Western Australia
Journal: Aquatic Conservation: Marine and Freshwater Ecosystems
Volume: 27
Issue: 2
Pages: 414-435
Abstract: Tourist-based activities, partially due to their rapid growth, have raised concerns regarding the effects of anthropogenic activities on marine fauna. Documented impacts on pinnipeds in proximity to humans include alterations in site use, behaviour and possibly higher levels of aggression towards people. Impacts differ significantly between populations and sites, therefore demanding separate assessment of human impacts on activity and energy budgets.
Responses of the endangered Australian sea lion, *Neophoca cinerea*, to human visitation were recorded from November 2013 through April 2014. Exposure levels and response types to anthropogenic activities were assessed at two easily accessible locations with different management strategies, Seal (landing prohibited) and Carnac (landing permitted) islands, Western Australia. Exposure levels were measured as both stimulus type (i.e. 'People', 'Paddlers', 'Small', 'Medium', and 'Large vessels', 'Tour vessels', and 'Jet skies'), and people ('Direct', 'Attract', 'Interact', 'View', 'Incidental', 'Water', 'Low-level'), and vessel activities ('Interact', 'Approach/Follow', 'Anchor noise', 'Engine noise', 'Close to beach', 'Moderate/Fast travel', 'Slow travel', 'Transit', 'Drift/At anchor', 'Aircraft noise').
Exposure levels varied significantly between the islands in stimuli types, numbers, duration and minimum approach distances. The immediate behaviours of 'Lift head', 'Interact' and 'Sit' were the most frequent responses. 'Aggressive' and 'Retreat' responses, the highest disturbance levels measured, occurred on Carnac approximately once per day, but rarely on Seal Island. 'Aggressive' behaviour towards 'People' was noticed only on Carnac Island and elicited only by 'People'. 'People', 'Tour vessels', and scenic 'Aircrafts' on both islands as well as 'Jet skis' on Carnac Island had the highest probability of prompting responses. Due to their relatively high visitation at Seal Island, 'Paddle powered vessels', followed by 'Tour vessels' elicited the highest number of responses, compared with 'People', 'Small', and 'Medium vessels' at Carnac Island. The majority of responses occurred when any stimulus type was at short-range (≤10m), and 'People' 'Viewing' *N. cinerea* elicited most. Vessels triggered more responses at larger ranges than 'People'.
According to the authors, to limit close-range access to *N. cinerea*, one possibility is to close the beach at Carnac Island to human visitation and increase the minimum approach distance by vessels and 'People' by setting up marker buoys at least 15m from the shore.

P

Authors: Paéz-Rosas, D., and Guevara, N.
Year: 2017
Title: Management strategies and conservation status of Galapagos sea lion populations at San Cristobal Island, Galapagos, Ecuador
Editor: J. J. Alava
Book Title: Tropical pinnipeds: Bio-ecology, threats and conservation
City: Bocan Raton, FL, USA
Publisher: CRC Press
Pages: 159-175
Abstract: In recent years, public opinion, scientists and environmental groups have played an important role in the environmental and marine policies of all countries. The relevance of marine mammals in general and pinnipeds in particular is not merely based on their biological and economic importance, but also on their role as "charismatic species". This designation has a far-reaching social impact, manifested in the management, which has been granted to their populations. On this basis, the Galapagos National Park (GNP), the institution responsible for the management and conservation of Galapagos sea lions (*Zalophus wollebaeki*), recognised the need to coordinate the efforts of various actors (governmental, academic, non-government organisations and the organised civil society) with the purpose of generating research, monitoring and conservation actions. Thus, the establishment of a vision of regional management for the long-term conservation of the species throughout its entire geographic range is of paramount importance.

Authors: Pagel, C. D., Lück, M., and Orams, M. B.
Year: 2017
Title: The careless fish will be eaten by the shark: The risk, the motivation and the role of social media within close encounters with marine wildlife in Polynesia
Conference Name: 9th International Congress on Coastal & Marine Tourism: Global challenges – local solutions
Conference Location: Gothenburg, Sweden
Abstract: With its diverse range of marine megafauna including cetaceans, sirenians, chelonids as well as many elasmobranch species, Polynesia has a distinctive advantage for marine wildlife tourism and great potential to become a leading destination in the future. Over the past decades wildlife watching has grown and changed from a rare experience to a mainstream tourism activity with tourists demanding greater opportunities to see and interact with animals in their natural environment. Swim-with programmes (SWPs) experience a steady growth in popularity, in which participants interact with marine wildlife in open-water environments, posing a potential hazard to tourist health and safety.
Risk perception is a crucial aspect in adventure and wildlife-focused tourism but while threats to animals involved in tourism activities are widely discussed in literature, potential impacts of wildlife on tourist safety (including being bitten, stung, hit or charged) remain understudied. The basis of this research will deal with motivations as well as an in-depth assessment of tour participants' awareness of potential risks associated with SWPs in the region of Polynesia. As a tool, the Adventure Tourism Process (ATP) by Morgan (2000) will be used to examine motivations and risk perceptions of wildlife tourists with regard on the safety level of the open-water environment, in which the activities are taking place. Further, the involvement of key stakeholders, such as tour operators, will deliver new insights to the nature of risk factors and the experiences with the management of incidents. In this context, a special focus will be given

to the understanding of the function of social media platforms and consumer generated content (CGC) in this particular wildlife tourism segment.
The implementation will be based on a case study approach on three selected sites in Polynesia offering SWPs (humpback whales (*Megaptera novaeangliae*) in Niue, New Zealand fur seals (*Arctocephalus forsteri*) in New Zealand, as well as Galapagos- (*Carcharinus galapagensis*), tiger- (*Galeocerdo cuvier*) and sandbar sharks (*Carcharinus plumbeus*) in Hawai'i) incorporating on-site questionnaire-based surveys of tour participants as well as interviews with stakeholders of SWPs in the region.
The identification of risk factors in the context of close interactions with marine wildlife in Polynesia as well as the proactive involvement of the key stakeholders such as tour participants, operators and policy makers are vital components to formulate and discuss custom-tailored risk management strategies, such as the development of effective wildlife interpretation programmes, which will facilitate the promotion of safety in commercial operations

Author: Parsons, E. C. M.
Year: 2003
Title: Seal management in Scotland: Tourist perceptions and the possible impacts on the Scottish tourism industry
Journal: Current Issues in Tourism
Volume: 6
Issue: 6
Pages: 540-546
Abstract: In Scotland, fisheries organisations have frequently called for culls of common and Grey seals, despite their conservation status and no supporting scientific evidence. This study examined tourists' opinion in West Scotland as to whether seal populations should be reduced to control their increasing numbers. The study also investigates whether such a cull would affect tourist behaviour. A total of 735 interviews were conducted. The study found that on average, 60% of respondents believed that seals should not be regulated and 17% stated that the instigation of a cull would affect their decision to visit Scotland on holiday. In the Highlands of Scotland alone this could represent over £100 million in lost tourism income. According to Parson, a boycott by tourists to the Highlands, as result of introducing seal culls, could lead to a financial loss equivalent to a third of the total value of Scottish fisheries. Tourism is Scotland's main industry and is essential for the economy of rural areas. Any more proposals for seal culls should seriously consider the negative and indirect impacts these culls could have, such as reductions in tourist numbers and tourism income to the region.

Authors: Pavez, G., Muñoz, L., Barilari, F., and Sepúlveda, M.
Year: 2015
Title: Variation in behavioral responses of the South American sea lion to tourism disturbance: Implications for tourism management
Journal: Marine Mammal Science
Volume: 31
Issue: 2
Pages: 427-439
Abstract: Because of the highly predictable patterns of occupancy on land, pinnipeds are one of the main marine resources observed by tourists, which, in sequence, could strongly disturb their behaviour. Pavez and colleagues examined the behavioural responses of the South American sea lion (*Otaria byronia*) to the presence of tourists and its variation according to spatial (breeding vs. nonbreeding sites of the colony), temporal (2012 vs. 2013 austral summer months), and age/sex class (adult males vs. subadult males vs. females) factors, and determined

the relationship between the degree of responses by sea lions and visitation time, tourist behaviour, and the distance of the vessel to the colony. 1,232 boat visits were recorded during 2012 and 2013. Subadult males were the age/sex class most impacted in the breeding site, followed by adult females at the nonbreeding site. More disturbing conduct by tourists, longer visitation time, and vessels closer to the colony lead to greater responses by sea lions. The findings showed that the established minimum distance from the colony is not enforced, causing an adverse response by sea lions. The authors recommend the development of management schemes with the local coastal communities to reduce the effect of ecotourism on the species and enhance the sustainability of this industry.

Authors: Pavez, G., Muñoz, L., Inostroza, P., and Sepúlveda, M.
Year: 2011
Title: Behavioural response of South American sea lion *Otaria flavescens* to tourist disturbance during the breeding season
Journal: Revista de Biologia Marina Y Oceanografia
Volume: 46
Issue: 2
Pages: 135-140
Abstract: Pinnipeds have a high predictability, both spatial and temporal, and tend to be distributed in patches, which permitting tourists easy access to them. However, the presence of tourists may generate a negative impact on the animals. The objective of this study was to evaluate, for the first time in Chile the effect of ecotourism activities on the behaviour of the South American sea lion *Otaria flavescens* during the reproductive season. Pavez and colleagues recorded a total of 44 visiting boats to the reproductive colony of this species on Isla Chañaral. The attitude of the majority of the tourists was a quiet one; however this was followed by moderate and disturbing behaviour. The response of sea lions was mainly to escape, followed by a period of inactive and alert. The response of sea lions was negatively related to the distance at which the boats approached the colony, but was not related to the time boats remained in the colony or the behaviour of tourists. The results show that the South American sea lion is negatively affected by human presence, shown by the escape of individuals from the colony to the sea. Escaping from the colony may generate negative physiological effects on an animal physiological effects on an animal, and ultimately affect the fitness of the individual. The authors suggest that future studies should evaluate changes in behaviour during the reproductive season and in other periods, and the behaviour of sea lions at different ages and sexes, to provide tools to improve the management of tourist activities on the South American sea lion in Chile.

Authors: Pederma-Romano, C., Aurioles-Gambod, D., Valdez, R. A., Brousset, D. M., Romano, M. C., and Galindo, F.
Year: 2010
Title: Serum cortisol in California sea lion pups (*Zalophus californianus*)
Journal: Animal Welfare
Volume: 19
Issue: 3
Pages: 275-280
Abstract: Marine ecosystems are exposed to a wide variety of factors that may produce disturbances in their structure and functioning. The Gulf of California supports fisheries, tourism, intensive agriculture, mining, and more recently, shrimp aquaculture. Under such conditions, animals are forced to cope with several changes in their environment that can contribute to animal welfare problems. Serum cortisol level analysis may be a particularly

useful means of assessing the physiological status of mammals potentially affected by increasing human activity in the Gulf of California, such as the California sea lion (*Zalophus californianus californianus*). In this study, Pederma-Romano and colleagues report for the first time the serum cortisol concentration of free-living, wild California sea lion pups. The analysis was performed in 11 rookeries along the Gulf of California. Two consecutive blood samples (S1 and S2) were obtained from 56 sea lion pups following a capture, handling and anaesthesia regime, and cortisol was measured by radioimmunoassay. Female pups showed higher serum cortisol than males in the first sample. In males, the second sample was significantly higher than the first. Cortisol levels in the two samples of both sexes combined differed between the Southern and Midriff-region rookeries. This information could be useful to assess welfare in wild populations of sea lions and to determine anthropogenic factors in the Gulf of California that may contribute to stress and reduced welfare.

Authors: Petel, T., Giese, M., and Hindell, M.
Year: 2008
Title: A preliminary investigation of the effect of repeated pedestrian approaches to Weddell seals (*Leptonychotes weddellii*).
Journal: Applied Animal Behaviour Science
Volume: 112
Issue: -
Pages: 205-211
Abstract: Repeated exposure to human activity can change the behavioural response of wildlife, having implications for management. Weddell seals (*Leptonychotes weddellii*) breeding close to Antarctic research stations are easily accessible and regularly visited by people. To investigate the responses of Weddell seals to repeated pedestrian approaches, Petel and colleagues tested the effect of regular visitation over a short-time period (<2 h) on the behaviour of lactating seals. Seals showed evidence of rapid habituation, as assessed by the higher proportion of seals that responded, with 67% looking up during the first approach compared to 18% during the 10th approach ($R^2 = 0.398$, $P = 0.050$), and by a decrease in the time spent looking at the approacher with repeated exposure (, $P < 0.001$). The effect of irregular pedestrian activity over a long-time period (approximately 3 weeks) was also examined, with results suggesting that such activity did not result in habituation, rather, adult female seals appeared to become sensitised to people (the majority of seals in both colonies looked up $G_1 = 0.027$, $P = 0.870$). Weddell seal pups observed during the same experiment also failed to display signs of habituation to irregular pedestrian activity, with 47% of pups looking up in the colony subjected to pedestrian activity compared to 10% in the control colony ($G_1 = 5.811$, $P = 0.016$). The implications of these results for managing human activity around breeding Weddell seals are discussed.

Authors: Piechota, C. M., Watson, K. R., and Fuxa, R. J.
Year: 2015
Title: Galápagos sea lion behavior differences in relation to human exposure
Conference Name: Celebrating Scholarship & Creativity Day
Conference Location: Saint John's, NF, Canada
Abstract: This study examined the behavioural differences of the Galápagos sea lion (*Zalophus wollebaeki*) in relation to human presence. The main goal was to determine whether sea lions would be more aggressive as a result of high frequencies of human exposure. Piechota and colleagues hypothesised that sea lions would behave differently in relation to varying rates of human exposure and the authors predicted that there would be more aggressive and interactive behaviours on beaches with higher frequencies of human exposure (as the humans

may disturb the normal behavioural patterns of the sea lions). Data were collected daily at low tide in two-hour intervals. The study took place during July 2014 on Isla San Cristóbal on three beaches near Puerto Baquerizo Moreno, Galápagos Islands, Ecuador. The authors recorded the number of people and sea lions on each beach during each data collection, as well as any observed behavioural characteristics of sea lions. The authors categorised behavioural characteristics of sea lions as aggressive, interactive but non-aggressive, and non-interactive both on terrestrial and aquatic environments. In addition, they accounted for the frequency of interactions in relation to the size of the beach in which data were collected. Results from a Chi-squared goodness of fit test showed that there was a significant difference in the sea lions' behaviour in relation to human exposure ($p < 0.0001$). Further analysis showed that sea lions tend to be more aggressive in response to higher frequencies of human exposure ($p < 0.0001$). Previous studies have shown that high rates of human exposure in sea lion habitats can result in a decrease of sea lion populations. With regards to these results, there should be a consideration for how human exposure can affect the behaviour of sea lions. Tourism in the Galápagos Islands remains prevalent, which can potentially disrupt the natural behaviour of protected species if humans disrupt the animals' natural behaviour.

Author: Purdy, C.
Year: 2015
Title: Barking news story: Media perceptions of the California sea lion
City/State: San Diego, CA, USA
Institution: Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California, San Diego
Date: 1 April 2015
Pages: 213-221
Abstract: A growing California sea lion (*Zalophus californianus*) population close to a large human population in southern California has led to increasing human/sea lion interactions. These interactions range widely from positive impacts on people (e.g. tourism benefits, increased education) and on sea lions (e.g. marine protected areas, rescue efforts) to negative impacts on people (e.g. depredation, attacks, nuisances) and negative impacts on sea lions (e.g. entanglement in fishing gear, intentional killing). How the general public perceives these interactions is an important area of study to inform managers and scientists of the public context for management decisions. This capstone surveyed five southern California newspapers from January 1st 2005 to April 30th 2015 to investigate the topics and tone of news stories about sea lions. Results showed that topic coverage was greatest for tourism/entertainment, general risks to sea lions, and general biology/information, totalling 444 articles of the 792 read. Results also showed that the overall tone of news stories was positive and compassionate (240 articles with sympathetic tones towards sea lions, 176 with positive tones towards sea lions), as compared to 132 with negative tones towards sea lions, despite the full range of both positive and negative interactions occurring in the region. These results suggest that public perception in southern California is overall positive and sympathetic toward sea lions which may foster support for conservation initiatives and hamper the introduction of management actions designed to curtail the growing sea lion population size and the increasing number of potentially negative human-sea lion interactions.

R

Authors: Reeves, R. R., Stewart, B. S., Leatherwood, S., and Folkens, P. A.
Year: 1992
Title: The Sierra Club handbook of seals and sirenians
City: San Francisco, CA, USA
Publisher: Sierra Club Books
Abstract: This companion to the highly successful Sierra Club Handbook of Whales and Dolphins includes the pinnipeds (seals, sea lions, and walruses), sirenians (manatees, dugongs, and sea cows), otters (sea and marine only), and the polar bear. The text offers definitive information on every animal, including physical description, distribution, natural history, and the status of conservation efforts.

Author: Reijnders, P. J. H.
Year: 1980
Title: Management and conservation of the harbour seal, *Phoca Vitulina*, population in the international Wadden Sea area
Journal: Biological Conservation
Volume: 19
Issue: 3
Pages: 213-221
Abstract: The aim of this study was to carry out a population assessment of the harbour seal in the international Wadden Sea area. The findings showed that the populations in the different areas need to be considered as one entity. Hence, conservation and management measurements should be placed in an international context. Due to the low pup production in the Dutch area the survival of a harbour seal population in the Dutch Wadden Sea depends on migration from the adjacent areas as long as detrimental environmental factors, i.e. disturbance and pollution, are not under control.

Authors: Rodger, K., Smith, A., Davis, C., Newsome, D., and Patterson, P.
Year: 2010
Title: A framework to guide the sustainability of wildlife tourism operators: Examples of marine wildlife tourism in Western Australia
City/State: Gold Coast, QLD, Australia
Institution: CRC for Sustainable Tourism
Date: 2010
Abstract: In recent years, growth in the wildlife tourism industry has been significant with an increasing focus on tourism centred on free-ranging wildlife. In Australia, marine tourism including viewing and interacting with coastal and marine wildlife is increasing in popularity. The future potential for increased growth in marine tourism relies upon the diversity and abundance of Australia's marine wildlife. Negative effects of tourism on marine wildlife are difficult to assess as in many cases little is known about the animals or their environment. With the rapid growth in marine tourism the potential for both biophysical and social impacts needs to be recognised. Given the potential impacts and the variable nature of wildlife tourism operations there is a need for a formal auditing and monitoring framework that can identify potential or actual problems and the need for management. This report examines the opportunities and barriers in producing a simple, yet reliable framework to evaluate the knowledge available on visitor satisfaction and expectations, identify key areas of service/product improvement, measure the quality of interpretation programmes, assess the

effectiveness of impact mitigation strategies and also evaluate the application of key performance indicators for monitoring systems for marine wildlife tourism.

Authors: Rodriguez, D., and Bastida, R.
Year: 1998
Title: Four hundred years in the history of pinniped colonies around Mar del Plata, Argentina
Journal: Aquatic Conversation: Marine and Freshwater Ecosystems
Volume: 8
Issue: -
Pages: 721-735
Abstract: Historical records show the area of Mar del Plata (38°05% S:57°32% W, Argentina) as inhabited by extensive seal colonies; the present study describes the evolution of their size and location from the 16th century to the present. Southern sea lion (*Otaria flavescens* Shaw 1800), South American fur seal (*Arctocephalus australis* Zimmerman 1783) and southern elephant seal (*Mirounga leonina* Linnaeus 1758) colonies, which consisted of between 80,000 and 165,000 animals, were subject to no commercial harvest, and only small local catches were performed by transient aboriginal groups. During the second half of the 19th century coastal zones were rapidly colonised by man and by the turn of the century, the pinniped rookeries finally disappeared. Such a dramatic decline was not only due to spatial competition with man, but also to the indirect effect of pinniped over-exploitation in other areas of the south-western Atlantic. No seal colonies were recorded in Mar del Plata during the 20th century until the mid-sixties, when small non-breeding groups of sea lions and fur seals established themselves in the area. The seal rookeries decline in Mar del Plata provides an interesting example of how human activity may severely affect the conservation of pinniped colonies, even with no direct action through massive catches.

Authors: Root-Bernstein, M., Rosas, N. A., Osman, L. P., and Ladle, R. J.
Year: 2012
Title: Design solutions to coastal human-wildlife conflicts
Journal: Journal of Coastal Conversation
Volume: 16
Issue: -
Pages: 585-596
Abstract: Coastal areas can be a challenge for conservation due to multiple competing land uses including development, tourism, and extractive resource use. These multiple land uses often lead to human-wildlife conflicts. Root-Bernstein and colleagues propose that collaboration with industrial designers and architects has the potential to generate innovative and effective solutions to coastal human-wildlife conflicts. Many products for modifying animal behaviour are already used by conservationists, such as barriers, corridors, and model predators. The authors propose that their effectiveness, quality, harmonisation with local values, and integration with the designed human environment can be improved through collaboration with designers and architects. They illustrate this approach with a case study. The authors engaged in an industrial design- conservation collaboration focused on the design of multiple product proposals that would support a range of human-sea lion interactions in public parks and the fish market in Valdivia, Chile. The sea lions in Valdivia are a tourist attraction but also potentially dangerous. Root-Bernstein and colleagues produced images of seven proposed products of varying scales, facilitating a range of different sea lion-human interactions. Such collaborations can be useful for developing products that reduce human-wildlife conflicts and align conservation and management with local values. The authors urge

researchers to publish conservation design proposals as well as tests of existing conservation products' functionality, in order to improve conservation design practice around the world.

Author: Rowe, A.
Year: 2017
Title: Human-sea lion interaction on San Cristóbal Island of the Galápagos Islands, Ecuador
Conference Name: University Presentation Showcase Event
Conference Location: Richmond, KY, USA
Abstract: Humans are commonly interested in animals, whether it be watching them on television, visiting zoos, or interacting with them in the wild. Among the most popular tourism sites for such interactions are the Galápagos Islands in Ecuador. There are several fascinating species on these islands, and sea lions represent the most commonly experienced animals for visitors. Humans and sea lions sometimes try to interact, with potentially disastrous consequences. This study details the kinds of behaviours that occurred in human-sea lion interactions from videotapes made on San Cristóbal Island during the summer of 2008. Sixty-three videos were observed on the Noldus system and then coded to determine the kinds of interactions that occurred. Humans mostly observed and photographed the sea lions, and often moved out of their way; less frequent were contact or attempted contact, teasing, and beating sticks on the ground or water to get sea lions to move away. Sea lions mostly observed people; some tried to initiate play, and some approached or moved away from people. There was little interspecies aggression, though some sea lions barked at them when humans were close. This study provides knowledge of human-sea lion interactions to help conservationists educate residents and visitors on how they should act toward these native animals, thereby avoiding negative interactions.

S

Author: Salter, R. E.
Year: 1979
Title: Site utilisation, activity budgets and disturbance responses of Atlantic walruses during terrestrial haul out
Journal: Canadian Journal of Zoology
Volume: 57
Issue: 6
Pages: 1169-1180
Abstract: Terrestrial haul-out of Atlantic walruses (*Odobenus rosmarus* (L.)) was studied in relation to temporal, weather, and disturbance factors at a site on Bathurst Island, N.W.T., from 24 July to 23 August 1977. Counts at 6-h intervals showed that up to 129 walruses occupied the site between 25 July and 19 August, with strong fluctuations in numbers during this period. Both sexes and various age classes were represented. Numbers hauled out were weakly correlated with ambient temperature, precipitation, and possibly with wind. Walruses on land spent over 90% of their time recumbent and apparently sleeping during ten 24-h watches. There were no consistent patterns of diel variation in percentage of walruses engaged in broadly scaled activities, with the possible exceptions of suckling by young walruses and near-shore feeding by older animals. Walruses on land responded to 27% of 71 local flights by helicopters, to 35% of 31 flights by fixed-wing aircraft, and to none of 6 approaches by boats. Responses recognised were head-lifting, orientation toward the sea, and retreat into the sea; the level of response depended upon distance and altitude of disturbance approach.

Authors: Sayer, S., Allen, R., Hawkes, L. A., Hockley, K., Jarvis, D., and Witt, M. J.
Year: 2019
Title: Pinnipeds, people and photo identification: the implications of grey seal movements for effective management of the species
Journal: Journal of the Marine Biological Association of the United Kingdom
Volume: 99
Issue: 5
Pages: 1221-1230
Abstract: Grey seals (*Halichoerus grypus)* of the northeast Atlantic are protected at designated European Marine Sites (Special Areas of Conservation, SACs) typically during their reproductive periods and in the UK at Sites of Special Scientific Interest (SSSI). As a mobile marine species, grey seals spend other parts of their annual life cycle in non-designated habitat. There is minimal information on individual grey seal movements in southwest England. Citizen science photo identification (PID) showed the movements of 477 grey seals at a regional scale (54 haul-outs up to 230 km apart) for over a decade. Reconstructed movements revealed considerable individual variability. Four SACs were linked to up to 18 non-designated sites and two SSSIs in Cornwall were linked to a maximum of 41 non-designated sites. Observations support the value of existing SSSIs at both the well-connected West and North Cornwall sites. 13 Marine Protected Areas (MPAs) were visited by grey seals from four SACs and two SSSIs in Cornwall. As a mobile species, grey seals could be included in English MPA management plans. According to the authors, the application of functional linkage from SACs and SSSIs, informed by the movements evidenced in this research, could support management efforts. This analysis shows grey seal movements occur across a complex network of interconnected designated and non-designated sites that need to be managed holistically for this species for which the UK has a special responsibility.

Authors: Scarpaci, C., Nugegoda, D., and Corkeron, P.
Year: 2005
Title: Tourists swimming with Australian fur seals (*Arctocephalus pusillus*) in Port Phillip Bay, Victoria, Australia: Are tourists at risk?
Journal: Tourism in Marine Environments
Volume: 1
Issue: 2
Pages: 89-95
Abstract: The public desire to interact with marine mammals has resulted in the development of a billion dollar tourism industry that includes activities such as humans swimming with free-ranging dolphins and seals. This study monitors the behaviour of the seal-swim industry in Port Phillip Bay, Victoria, Australia and is believed to be the first descriptive account of tourists swimming with free-ranging seals. Data were collected on 51 groups of people swimming with seals. These observations were made onboard dolphin/swim vessels ($N = 36$) or a research vessel ($N = 9$) using 1-min scan samples and continuous observations. Results from this study indicated that tour vessels accounted for the majority of human interaction with seals. From a total of 51 swims, two seal-swim strategies were observed: the free swim (53%) and rope swim (47%). The median swim time with seals was found to be significantly longer than dolphin swims. The mean number of swimmers participating in a seal swim was 7.5 and the mean number of boats present during a seal swim was 1.1. The distance maintained by tour vessels from the seal structure significantly increased as boat traffic increased. The results also indicate that operator behaviour was not significantly affected by the presence of a researcher onboard tour vessels. This study examines the behaviour of these tour vessels and possible reasons why these strategies are employed. The study also identifies possible hazards associated with

tourists swimming with seals and the need to develop management strategies to support and protect this industry.

Authors: Schakner, Z., Purdy, C., and Blumstein, D. T.
Year: 2019
Title: Contrasting attitudes and perceptions of California sea lions by recreational anglers and the media
Journal: Marine Policy
Volume: 109
Issue: -
Article: 130710
Abstract: The recovery of California sea lion (*Zalophus californianus*) populations is an environmental success story, but it has created new challenges given their interactions with sport fisherman. Economic losses to the Commercial Passenger Fishing Vessel (CPFV) stems both from the loss of fish, as well as the costs of fuel and time spent traveling to new fishing areas to avoid pinnipeds. Management solutions require a firm understanding of the public's perceptions of an issue. To address this shortcoming, Schakner and colleagues surveyed recreational anglers' perceptions of California sea lions and conducted a content analysis of media coverage of California sea lions in Southern Californian newspapers. They found that as anglers' knowledge of California sea lions increased, their subjective knowledge of the Marine Mammal Protection Act increased as well and they were less likely to advocate the use of lethal removal to manage sea lion issues. Avid fishers were more likely to consider shooting all sea lions as acceptable, and less likely to view controls to restrict human activity from sea lion areas as favourable. Anglers that expressed negative sentiments after an interaction with sea lions while fishing were more likely to view punishing the sea lion favourably, but less likely to view exposing the sea lions to pain as favourable. The content analysis showed that most articles were about tourism and entertainment and the majority of articles focused on negative effects to sea lions. The media's framing might obscure the successful recovery of California sea lions and flame growing management concerns with stakeholders like anglers, dock workers, and marina occupants. The survey showed that among stakeholders, increased understanding of the animals increased understanding of the regulatory context of their recovery and repellents as a socially acceptable means of managing the conflict. Thus, the authors have shown that knowledge among the public and stakeholders will enhance management efforts. Conservation management professionals can influence public attitudes by interacting with the media as well as using communications strategies that highlight the ecological mechanisms behind the conflict as well as the management actions.

Author: Shaughnessy P. D.
Year: 1999
Book Title: The action plan for Australian seals
City: Canberra, Australia
Publisher: Environment Australia
Abstract: There are 10 pinniped species, or seals, regularly recorded in Australian waters. Three of them, the Australian sea-lion, New Zealand fur-seal and Australian fur-seal, breed on the coast of the Australian mainland (including Tasmania) and its nearshore islands. Another three species, the Antarctic fur-seal, Subantarctic fur-seal and southern elephant seal breed on Australia’s Subantarctic islands (Macquarie, Heard and the McDonald Islands). The remaining four species breed in Antarctic waters: the leopard seal, crabeater seal and Ross seal on pack ice, and the Weddell seal on fast ice adjacent to the Antarctic mainland. Elephant seals and leopard seals are frequent visitors to Tasmania. The first five species are eared seals (family

Otariidae) and the last five are earless or true seals (family Phocidae). Only one species is endemic, the Australian sea-lion.

Australia has been interpreted in a broad sense to include the Australian Antarctic Territory, the Australian territory of Heard Island and the McDonald Islands, Macquarie Island (administratively and politically part of Tasmania), as well as mainland Australia and its inshore islands. It also includes the Exclusive Economic Zone, which extends beyond all of the above named areas to 200 nautical miles offshore. When referring to seals on the coast of mainland Australia and its inshore islands, and in nearby waters, the expressions "Australian coast" and "Australian mainland waters" are used. This includes Tasmania, its islands (other than Macquarie Island) and its waters.

In waters up to three nautical miles off-shore and on land where seals haul-out, moult, rest and breed, management of seals is the responsibility of State nature conservation agencies under State legislation. The Commonwealth has responsibility for seals in the waters of the Continental Shelf outside State coastal waters and within the Australian Exclusive Economic Zone (EEZ) up to 200 nautical miles off-shore.

All 10 seal species were assessed against the IUCN Red List Categories (IUCN 1994); these category names are used here in italics. Although the IUCN indicates that the criteria are most appropriately applied to whole taxa at a global scale, only the status of each species in Australia was taken into account, following advice from the Australian Nature Conservation Agency (ANCA).

On the basis of that assessment, one species, the Subantarctic fur-seal, is considered to be *Endangered* in Australian waters because of its small numbers (even though it is increasing). A positive step in the conservation of this species would be the declaration of a marine reserve around Macquarie Island to include the territorial sea to 12 nautical miles as a protected area with minimal human interference (see recommendations by Scott 1994). Such a reserve would provide safe access to the Subantarctic fur seals' terrestrial breeding sites and protect a portion of its feeding grounds.

Another species, the southern elephant seal, is considered to be *Vulnerable*, on the basis of the sharp decrease in its numbers from about 1950 to the mid 1980s. The cause of the decrease is not known.

Neither of these species would fall into a threatened category if considered on a worldwide basis. Of the two, the southern elephant seal deserves attention because of its substantial population decrease since 1950.

The Australian sea-lion is considered to be *Lower Risk, near threatened* because the number of mature individuals is below the limit of 10,000. Three species, the New Zealand fur-seal, Australian fur-seal and Antarctic fur-seal, are considered to be *Lower Risk, conservation dependent* because the cessation of a "habitat specific conservation programme" could lead to each of them qualifying for a threatened category if ready access by humans to breeding sites were permitted during the breeding season. Each of the four Antarctic phocid species, leopard seal, crab-eater seal, Weddell seal and Ross seal, is considered to be *Lower Risk, least concern*.

Authors: Shaughnessy, P. D., Bossley, M., and Nicholls, A. O.
Year: 2017
Title: Fur seals and sea lions (family *Otariidae*) on the breakwaters at Adelaide's Outer Harbor, South Australia
Journal: Australian Mammalogy
Volume: 40
Issue: 2
Pages: 157-161
Abstract: Long-nosed fur seals (*Arctocephalus forsteri*) and Australian sea lions (*Neophoca cinerea*) on the breakwaters at the mouth of the Port River estuary at Adelaide's Outer Harbor were counted from 2004 to 2015. Observed counts were modelled utilising a generalised linear model. The findings showed that fur seal numbers have been increasing since 2011; for sea lions there was a small recognisable annual trend in counts. Counts of fur seals differed seasonally; most annual maxima were in August or September with modelled peak numbers around 9–11 September. The maximum count of fur seals was 79 in September 2015. For sea lions, the model predicts annual peaks in the period 28 August to 19 September. The maximum count of sea lions was nine in September 2009. The haul out sites on the Outer Harbour breakwaters are easily accessible by boats, including pleasure craft. Particularly, the seaward end of the outer breakwater is a popular spot with recreational anglers whose lines are often within a few metres of the seals. Shaughnessy and colleagues propose that a management plan should be developed involving a study of the impact of boat approaches on seals utilising the Outer Harbour area followed by education along with enforcement.

Authors: Shaughnessy, P. D., Briggs, S. V., and Constable, R.
Year: 2001
Title: Observations on seals at Montague Island, New South Wales
Journal: Australian Mammalogy
Volume: 23
Issue: 1
Pages: 1-7
Abstract: New Zealand fur-seals *A. forsteri* and Australian fur-seals *Arctocephalus pusillus doriferus* haul-out at the north end of Montague Island. They were counted from study boats on 82 occasions during nine trips to the island, each of about one week, between November 1997 and November 1998, and in July 1999 and April 2000. The findings showed that highest numbers were recorded between August and October 1998, and more animals were ashore during 1997 and 1998. In this study, the maximum number of *A. p. doriferus* recorded ashore was 540 in October 1998, compared with a little over 300 observed in September 1993. There are reports of a few fur-seal pups on Montague Island. An *A. forsteri* pup born there in the 1999/2000 summer survived for at least four months. However, the island should be considered as supporting haul-out sites rather than breeding sites. A Subantarctic fur-seal *A. tropicali*s and an Australian sea-lion *Neophoca cinerea* were also recorded during the study. Seven juvenile *A. p. doriferus* were observed ashore with manmade debris (straps or portions of a trawl net) around their necks. Fur-seals at Montague Island generate interest because of tourism and interactions with local fisheries. Trends in their abundance need to be monitored annually in March, for which there is a long-term data set, and in October, when they are most abundant.

Authors: Shaughnessy, P. D., Dennis, T. E., Dowie, D., McKenzie, J., and McIntosh, R. R.
Year: 2009
Title: Status of small colonies of the Australian sea lion *Neophoca cinera* on Kangaroo Island, South Australia
Journal: Australian Zoologist
Volume: 35
Issue: 1
Pages: 82-89
Abstract: The status of the Australian sea lion *Neophoca cinerea* at eight sites on Kangaroo Island was assessed using criteria adopted by the National Seal Strategy Group based on numbers of pups counted between 1985 and 2005. Each site was allocated to one of three categories. At the Seal Slide, 1 to 11 pups were born over nine pupping seasons and it is classed as a breeding colony. At four sites (Black Point, Cave Point, Cape Bouguer and North Casuarina Island), small numbers of pups were recorded over two or more seasons, and each is classed as a haul-out site with occasional pupping. At three sites near Cape Bouguer, pups were recorded but each instance was several months after a pupping season began at the large breeding colony at Seal Bay, and pups born there are known to move to other sites. Therefore each of these three is classed as a haul-out site. Because *N. cinerea* is susceptible to mortality from fishery interactions, is strongly philopatric and that small colonies are especially susceptible to extinction, the status of its small aggregations on Kangaroo Island should be taken into consideration when coastal developments are planned and coastal visitation encouraged.

Authors: Shaughnessy, P. D., Dennis, T. E., and Seager, P. G.
Year: 2005
Title: Status of Australian sea lions, *Neophoca cinerea*, and New Zealand fur seals, *Arctocephalus forsteri*, on Eyre Peninsula and the far west coast of South Australia
Journal: Wildlife Research
Volume: 32
Issue: 1
Pages: 85-101
Abstract: The Australian sea lion, *Neophoca cinerea*, and the New Zealand fur seal, *Arctocephalus forsteri* are two seal species that breed on the west coast of South Australia. Shaughnessy and colleagues conducted aerial surveys at intervals of approximately three months between April 1995 and June 1997 to determine the breeding status of sea lions and timing of pupping seasons. Ground surveys between October 1994 and April 2004 aimed at counting sea lions and fur seals, specifically pups. In all, 27 sites were examined. Six new sea lion breeding colonies were documented, at Four Hummocks, Price, North Rocky, Dorothee, West Waldegrave and Nicolas Baudin Islands. All were found or confirmed by ground survey. Pup numbers were equivalent to 12% of the total number of pups estimated in surveys conducted from 1987 to 1992, but primarily in 1990. The sighting of brown pups on aerial surveys of Ward Island, Middle and Western Nuyts Reef supports earlier indications, based on dead pups, that they are breeding colonies. The timing of pupping seasons is not synchronous; estimates are presented for colonies between 1995 and early in 2004, with predictions to the end of 2005. The abundance estimates of sea lion pups highlight the importance of visiting a colony early in the pupping season to determine when pupping begins and approximately five months later when the maximum number of pups is expected. For the New Zealand fur seal, small numbers of pups were recorded at Dorothee, West Waldegrave and Nicolas Baudin Islands, and at Nuyts Reef. These and the previously unknown sea lion breeding colonies on the west coast of South Australia indicate that further colonies may remain to be documented.

Because planning for aquaculture ventures is active in South Australia, it is crucial that the localities and status of sea lion and fur seal colonies be established unequivocally to ensure that the need for Prohibited Area status for islands with breeding colonies and for Marine Protected Areas around them is noted.

Authors: Shaughnessy, P. D., McIntosh, R. R., Goldsworthy, S. D., Dennis, T. E., and Berris, M.
Year: 2006
Title: Trends in abundance of Australian sea lions, *Neophoca cinerea*, at Seal Bay, Kangaroo Island, South Australia
City/State: -
Institution: Alaska Sea Grant College Program
Report Number: Report No. AK-SG-06-01
Abstract: Pups of the Australian sea lion have been counted at Seal Bay for 20 pupping seasons, 1973-74 to 2002-03. Temporal changes in counts of live pups over the course of each pupping season were fitted to Gaussian (normal) curves to determine objectively the date when pup numbers reached their peak. The mean interval between pupping seasons was 532 ± 31 days (i.e., 17.5 months). Maximum counts of live pups for 13 pupping seasons averaged 144 (s.d. 14) from 1985 (from when data quality was adequate) to 2002-03. The data show an annual decrease of 0.77% (exponential slope of regression was –0.0077, $r2 = 0.216$), or –1.14% per breeding cycle (95% confidence limits –2.47% and +0.20%), but this exponential regression was not significant. Maximum pup numbers for each pupping season were correlated with duration of the interbreeding intervals, such that more pups were counted following shorter interbreeding intervals than following longer intervals. This relationship was not significant, but with one outlier removed it became highly significant, suggesting that pup numbers were influenced by the duration of interbreeding interval. A generalised linear model incorporating three predictor variables (year, interbreeding interval, and their interaction) produced a significant model that explained 51% of the variance in pup numbers, and both year and interbreeding interval had a significant negative effect on pup counts. A generalised additive model (GAM) using cubic spline smoothing functions produced a highly significant model with both terms (year and breeding interval) having negative coefficients. Shaughnessy and colleagues conclude that year and duration of the interbreeding interval affect pup counts negatively, but that a significant component of the variance is accounted for by the interaction between year and breeding interval. Their best estimate for the rate of decline in the Seal Bay population is from the exponential regression analysis (i.e., 0.77% per year, 12.6% decline between 1985 and 2002-03). These analyses suggest that the reproductive output of Australian sea lions at Seal Bay has declined over the period 1985 to 2002-03. This decrease is contrary to recent increases of New Zealand fur seals, *Arctocephalus forsteri*, in Australia. The decrease of sea lion numbers at Seal Bay is a cause for concern and deserves further investigation.

Authors: Shaughnessy, P. D., Nicholls, A. O., and Briggs, S. V.
Year: 2008
Title: Do tour boats affect fur seals at Montague Island, New South Wales?
Journal: Tourism in Marine Environments
Volume: 5
Issue: 1
Pages: 15-27
Abstract: This study investigated interactions between fur seals (*Arctocephalus pusillus doriferus and A. forsteri*) and tour boats at Montague Island between November 1997 and November 1998. The fur seals were in four haul-out sites, which are referred to in this article

as colonies. The study was instigated by the management requirement of the National Parks and Wildlife Service of New South Wales to identify impacts of disturbance from tour boats on the fur seal colonies. At each of 84 inspections, distance between the boat and the colony was measured and seal response (or behaviour) was recorded 11 times at 15-second intervals as the boat moved toward the seals. Behaviour of the fur seals ashore was recorded in four categories of increasing disturbance from "Resting" to "Many moving." From analyses utilising multinomial models, the probability of observing a given response by the fur seals and the pattern of the responses as a function of distance from the colony were both influenced by the colony under observation. In general, fur seals' responses were significantly correlated with distance between the study boat and the colony, and with the size of the colony (i.e., number of fur seals visible ashore). In all cases, the probability of the colony remaining in the "Resting" category decreased as the distance between the colony and the study boat decreased. Likewise, the probability of the colony showing the maximum response ("Many moving") increased as the distance decreased. The probability of New Zealand fur seals "Resting" was higher than for Australian fur seals. Tour boats approaching the colonies had a relatively small effect on the fur seals; few or none of them ran to the sea. Based on findings from this study, Shaughnessy and colleagues recommend that the minimum approach distance of tour boats to the fur seal colonies at Montague Island should be 40 m; other recommendations involved how tour boats approach the fur seal colonies. The former has been gazetted as a government regulation and the other recommendations have been incorporated into the license conditions for the tour boats operators.

Authors: Speakman, C. N., Johnstone, C. P., and Robb, K.
Year: 2019
Title: Increased alertness behavior in Australian fur seals *(Arctocephalus pusillus doriferus)* at a high vessel traffic haul-out site
Journal: Marine Mammal Science
Volume: Advance online publication
Issue: -
Pages: 1-14
Abstract: There is a growing concern over the impacts of vessels on marine mammals, and marine mammals in urbanised marine environments are at particular risk of exposure. Port Phillip Bay, Victoria, Australia is one such environment, in which Australian fur seals (AUFS; *Arctocephalus pusillus doriferus*) haul-out to rest, nevertheless little is known about the impacts of vessels on resting seals. Speakman and colleagues utilised remote camera traps to investigate the effect of vessel traffic on AUFS behaviour at a nonbreeding haul-out site. Environmental, temporal, and vessel-related variables were all associated with alterations in AUFS alertness at this site. All vessel types evoked increased alertness above base-line levels (25%), with recreational and commercial motorised vessels associated with a 5.7%–10.8% increase in alertness. Unidentified vessels, government vessel, and kayaks were associated with significantly increased alertness of 21.7%, 46.4%, and 60.7%, respectively, though accounted for only 6.2% of vessel observations. Vessels breaching current approach regulations (<5 m) showed a 32% increase in alertness, significantly higher than non-breach approaches. Partial and complete flushing of the platform was rare, occurring in 1.0% of images analysed. According to the authors, these findings indicate that vessels do elicit a response from AUFS at this haul-out site, and that further monitoring of vessel activity and compliance is required.

Authors: Stafford-Bell, R., Scarr, M., and Scarpaci, C.
Year: 2012
Title: Behavioural responses of the Australian Fur Seal (*Arctocephalus pusillus doriferus*) to vessel traffic and presence of swimmers in Port Phillip Bay, Victoria, Australia
Journal: Aquatic Mammals
Volume: 38
Issue: 3
Pages: 241-249
Abstract: A predominantly unregulated seal-swim industry exists in Port Phillip Bay, Victoria, Australia. This study has recorded four fur seal behaviours in response to the presence of swimmers and vessel traffic to detect the effect of tourism activities on Australian fur seals (*Arctocephalus pusillus doriferus*). Behavioural responses of fur seals to the presence of a total of 135 vessels (recreational = 74 and tour = 61) were gathered on 42 research trips over the peak austral summer tourist period (November 2007 to February 2008). After taking into account all studied variables, vessel distance, the number of swimmers undertaking seal-swim activities, and the number of recreational vessels were found to impact seal behaviour. The findings showed that aggressive behaviour displays by fur seals were influenced by the presence of recreational vessels within close proximity to the study site (< 200 m); haul-out events initially increased as a result of the presence of swimmers undertaking seal-swim activities; and occurrences of fur seals entering the water increased in response to the distance of approaching tourism vessels to the study site. Statistical analyses found no clear indicator affecting the number of threat postures displayed by fur seals. While a weak linear relationship was identified between the indicators (i.e., presence of recreational vessels, presence of swimmers, and the distance of tour vessels) and the three behaviours displayed by fur seals, post hoc tests failed to achieve significantly different means for each of the indicators. According to the authors, this preliminary research into the impact of swim-with tourism upon *A. pusillus doriferus* will provide valuable baseline data for the future. Long-term research into the impacts of this specific tourism industry on fur seal behaviour may ensure wildlife managers develop suitable regulations for seal tourism interactions that promote a sustainable marine tourism industry within Port Phillip Bay.

Authors: Stevens, J., Thyssen, A., Laevens, H., and Vervaecke, H.
Year: 2013
Title: The influence of zoo visitor numbers on the behaviour of harbour seals (*Phoca vitulina*)
Journal: Journal of Zoo and Aquarium Research
Volume: 1
Issue: 1
Pages: 31-34
Abstract: Stevens and colleagues examined the impact of the number of zoo visitors on the behaviour of a group of eight harbour seals at Antwerp Zoo. The seals' behaviour was observed utilising instantaneous scan sampling. Visitor presence at the enclosure was also monitored instantaneously. Furthermore, daily visitor numbers for the zoo were collected. The authors related seal behaviour to both the daily visitor attendance and the number of visitors present during the instantaneous sampling. Both analyses displayed that under increasing visitor numbers, more seals submerged under water. While behavioural changes are clear and it seems the seals were hiding from increasing visitor numbers by diving under water, it remains difficult to assess whether visitors compromise the welfare of seals in captivity.

Authors: Stevens, M. A., and Boness, D. J.
Year: 2003
Title: Influences of habitat features and human disturbance on use of breeding sites by a declining population of southern fur seals (*Arctocephalus australis*)
Journal: Journal of Zoology
Volume: 260
Issue: -
Pages: 145-152
Abstract: In Peru, southern fur seals *Arctocephalus australis* have declined gradually over the past decade, and declined dramatically (72%) due to low food availability during the severe El Niño in 1997–1998. In 1999, seals abandoned some historically important breeding sites. This is particularly alarming because new sites were not colonised. The aim of this study was to examine how habitat features and human disturbance impacted whether sites were currently used, abandoned or apparently not used in the past by fur seals for breeding. Data were collected on 14 variables at 70 potential breeding sites at three guano reserves in Peru. Discriminant analysis showed significant multivariate differences among sites currently utilised for breeding, abandoned sites and unused sites ($F=5.97$, $P<0.00001$), and the model classified 74% of sites correctly. Currently used sites were less likely to have human disturbance and more likely to have offshore islands, stacked rocks, tide pools and abundant shade. Separate discriminant analyses for each reserve produced similar results. Habitat associated with thermoregulation (e.g. shade or pools) may be more important to fur seals in Peru, which breed at lower latitudes and are at greater risk of overheating on land than other populations. Habitat with minimised human access may be particularly important to seals in small populations in which individuals may perceive themselves as more vulnerable due to decreased vigilance and dilution effects. Stevens and Boness reported that seals in this study selected breeding habitat with stacked rocks, which create shade and tide pools for thermoregulation and make human access difficult; but pups might suffer higher mortality in this habitat. The authors hypothesise that fur seals in Peru may display an Allee effect, whereby suitability of habitat varies with population abundance.

Authors: Strong, P., and Morris, S. R.
Year: 2010
Title: Grey seal (*Halichoerus grypus*) disturbance, ecotourism and the Pembrokeshire marine code around Ramsey Island
Journal: Journal of Ecotourism
Volume: 9
Issue: 2
Pages: 117-132
Abstract: In this study, Ramsey Island in Pembrokeshire, UK, is examined in the context of its population of Atlantic Grey Seals. The growth of ecotour boat activity around the island has led to the development of a voluntary code of conduct for relevant stakeholders, defining limits to their behaviour around key species at the site, including grey seals. Semi-quantitative protocols were developed for documenting disturbance and boat behaviour. Data are presented of seal disturbance behaviour at pupping beaches in response to numbers, distance and speed of boats. The findings showed that there is a significant correlation between the intensity of disturbance as measured by a disturbing stimulus index (DSI) and disturbance level. Disturbance is measurable at levels of disturbing stimulus that currently would not breach the code recommendations. The findings are examined for their implications for the seal populations, compliance with the code of conduct and wider definitions of ecotourism. Recommendations are provided for adjustment of the code in terms of boat distance and speed.

The authors emphasise the need for wider stakeholder discussion of whether such common pool resources can be sustainably managed by voluntary measures alone.

Authors: Suryan, R. M., and Harvey, J. T.
Year: 1999
Title: Variability in reactions of Pacific harbor seals, *Phoca vitulina richardsi*, to disturbance
Journal: Fishery Bulletin
Volume: 97
Issue: 2
Pages: 332-339
Abstract: Disturbances to harbour seals, *Phoca vitulina richardsi*, during 1991 and 1992 pupping seasons were observed at Puffin Island, Clements Reef, and Skipjack Island in Washington state. Harassment (≥ one seal entering the water) of seals ashore was common (≥71% of survey days) and mainly caused by powerboat operators approaching to view seals. Recovery (number of seals on a haul-out site returned to pre-harassment levels) following a harassment was less at Puffin Island (19%) than at Clements Reef (54%) and Skipjack Island (45%). Moreover, seals were more vigilant ($P<0.003$) at Puffin Island than at the other two locations. These findings demonstrated that seals at Puffin Island were less tolerant of disturbance than seals at other sites. According to the authors, this could possibly be attributed to a greater ($P<0.05$) percentage of pups ashore (17%) than at Clements Reef (3%) and Skipjack Island (3%). Because of this, the authors expected that powerboats would disturb seals from greater distances at Puffin Island. To test this, Suryan and Harvey utilised a theodolite to determine distance between seals and an approaching vessel at Puffin Island and Clements Reef. However, there was no significant ($P>0.05$) difference in distances at which disturbances occurred. The most noticeable difference in distance of disturbance was between initial and subsequent harassments during a haul-out period. Those seals remaining or returning to shore after a harassment were more tolerant of powerboats, allowing significantly ($P<0.05$) closer approaches than those initially harassed. Seals detected (head raised and oriented toward the potential disturbance) a powerboat at a mean distance of 264 m, and harassments occurred when boats approached, on average, to within 144 m. The findings of this study exemplify the variability in reaction to disturbance and the need for considering these differences for minimising disturbance.

Author: Szanislo, W.
Year: 2005
Title: California sea lion (*Zalophus californianus*) and Steller sea lion (*Eumetopias jubatus*) Interactions with vessels in Pacific Rim National Park Reserve: Implications for marine mammal viewing management
Academic Department: Department of Geography
University: University of Victoria
Thesis Type: Master of Science
Abstract: Sea lion viewing is an integral component of whale watching trips in the Broken Group Islands (BGI), Pacific Rim National Park Reserve (PRNPR). Pinniped viewing has become a management concern in PRNPR and viewing guidelines have been created to prevent potential disturbance by vessels. Effective management of sea lion viewing requires understanding how sea lions react to vessels and subsequently mitigating aspects of vessel activity that cause disturbance. The objective of this study was to evaluate the effectiveness of the Park's Pinniped Viewing Guidelines (PVG) in preventing sea lion disturbance. This was done by determining the kind and level of behavioural response California and Steller sea lions had to vessel activity in comparison to behaviours exhibited in the absence of vessels. Vessel

approaches were controlled for predetermined measures of distance, speed, vessel types and numbers. Analysis included comparing behavioural responses during vessel interactions with behavioural states during scans. Significant change in behaviour was tested for each category of distance, speed, vessel type and number. A total of 160 scan and interaction pairs were sampled during 38 days over two seasons. Thirty-nine (24%) of vessel interactions resulted in disturbance. Variance in behaviours was significant for vessel approaches within 0-25 m (n=79; 38%); vessels approaching 'fast' (n=17; 47%); for motorized vessels under 5 tons (n=107; 30%), and for both one-vessel (n=l13; 23%) and two-vessel (n=18; 39%) interactions. The results of this research demonstrate that PRNPR's PVG are effective in minimising sea lion disturbance in the BGI when vessel operators follow the prescribed approach distance and speed guidelines. Recommendations regarding viewing by various vessel types and numbers are given, as well as suggestions for increasing understanding of sea lion behaviour.

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Authors: Tripovich, J. S., Hall-Aspland, S., Charrier, I., and Arnould, J. P. Y.
Year: 2012
Title: The behavioural response of Australian fur seals to motor boat noise
Journal: PLoS ONE
Volume: 7
Issue: 5
Article: e37228
Abstract: Australian fur seals breed on thirteen islands located in the Bass Strait, Australia. Land access to these islands is restricted, minimising human presence but boat access is still permissible with limitations on approach distances. Thirty-two controlled noise exposure experiments were conducted on breeding Australian fur seals to determine their behavioural response to controlled in-air motorboat noise on Kanowna Island (39u109S, 146u189E). The results show there were significant differences in the seals' behaviour at low (64–70 dB) versus high (75–85 dB) sound levels, with seals orientating themselves towards or physically moving away from the louder boat noise at three different sound levels. Furthermore, seals responded more aggressively with one another and were more alert when they heard louder boat noise. Australian fur seals demonstrated plasticity in their vocal responses to boat noise with calls being significantly different between the various sound intensities and barks tending to get faster as the boat noise got louder. These results suggest that Australian fur seals on Kanowna Island show behavioural disturbance to high level boat noise. Consequently, it is recommended that an appropriate level of received boat sound emissions at breeding fur seal colonies be below 74 dB and that these findings be taken into account when evaluating appropriate approach distances and speed limits for boats.

Authors: Tuneu Corral, C., Szteren, D., and Cassini, M. H.
Year: 2017
Title: Watching wildlife in Cabo Polonio, Uruguay: tourist control or auto-control?
Journal: Journal of Ecotourism
Volume: 16
Issue: 3
Pages: 291-299
Abstract: Cabo Polonio in Uruguay is a famous but unconventional centre for beach vacations, because tourists spend days without running water, electricity and vehicles. There is a continental pinniped colony in Cabo Polonio that acts as secondary attraction, but there is not direct control over tourist visits to the rookery. The aim of this study was to assess visitors'

experience to this pinniped colony. Tuneu and colleagues utilised questionnaires to determine the information utilised by tourists and to analyse their attitudes towards the colony conservation. The authors also conducted direct observations of the tourist-pinniped interactions to validate questionnaires. The findings showed that less than 15% of tourists received information which was provided by local people. The majority of tourists regarded the rookery as an important tourist attraction. There was general agreement about the requirement for wildlife information. In spite of the lack of active supervision, most visitors behaved in a proper manner and adhered to conservation measures. According to the authors, this positive attitude is likely related to the fact that tourists in Cabo Polonio accept the discomfort of living without social commodities and appreciate the closeness to nature. It is predicted that most visitors will have a spontaneous inclination to take care of nature.

Authors: Túnez, J. I., Cappozzo, H. L., and Cassini, M. H.
Year: 2008
Title: Natural and anthropogenic factors associated with the distribution of South American sea lion along the Atlantic coast
Journal: Hydrobiologia
Volume: 598
Issue: 1
Pages: 191-202
Abstract: This study aimed to analyse the characteristics of the Atlantic coast that are associated with distribution, breeding and abundance activity of *Otaria flavescens* at three ecological scales. Túnez and colleagues adopted a research approach that consists in looking at the variables that are associated with the pattern of distribution at regional and landscape scales, rather than following local population in time. The authors utilised bibliographic data of censuses carried out between 1946 and 1997 and a Geographic Information System (GIS) to integrate information proceeding from censuses and different environmental variables. At a regional scale, Túnez and colleagues found that the distribution of breeding colonies did not vary in the period of time analysed and was associated with the pattern of occupation of the coast and the tide width. There was a significant reduction in abundance between 1946 and 1997. In 'north-central Patagonia', the segment of coast with the highest number of sea lions in Argentina, distribution of colonies was associated with islands availability and negatively correlated with places were anthropogenic disturbance was high. At a local scale, breeding colonies were positively associated with slight slope coasts and negatively associated to rocky beaches. The authors identified those characteristics of the coast associated with distribution of breeding colonies of *O. flavescens*, which operate at different ecological and temporal scales.

V

Author: van Polanen Petel, T.
Year: 2005
Title: Measuring the effect of human activity on Weddell Seals *(Leptonychotes weddellii)* in Antarctica
Academic Department: School of Zoology
University: University of Tasmania
Thesis Type: Doctoral thesis
Abstract: Even though guidelines exist for approaches to, and vehicle use (over-snow vehicles, aircraft and watercraft) near Weddell seals *(Leptonychotes weddellii)*, there has been no scientific investigation of the effectiveness of these guidelines in minimising disturbance to the

seals. This study assessed the response of Weddell seals to different types of human activity that the seals are currently exposed to. Van Polanen Petel conducted a series of controlled experiments to measure, (i) the immediate physiological and behavioural responses of lactating Weddell seals (and their pups) to approaches on foot, and the factors impacting the seals' response, (ii) the temporal nature of the seals' response to repeated pedestrian activity and (iii) the immediate behavioural response of lactating cows to over-snow vehicle operations, and the factors that affect their response. Additionally, sound/distance profiles were developed for commonly utilised Antarctic vehicles and the assumed detection threshold of Weddell seals was determined to investigate whether the noise generated by a number of vehicles had the potential to affect Weddell seals.

The findings showed that the majority of lactating Weddell seals and lone pups responded to visits on foot (from 20-5 m from the seals) by becoming alert. The separation distance at which the cows became alert was dependent upon the approach type (a single person or group of people), the distance a cow was from the water, the distance she was from a conspecific, and whether her pup was exposed (i.e. whether the pup was between the approachers and the cow). The relative significance of these factors indicated that the seals perceived pedestrians to be a threat, but that the level of threat was low.

Regular and frequent approaches by a single person to lactating Weddell seals over a short time period (< two hours) produced evidence of rapid habituation. However, irregular approaches over a longer time period (~three weeks), did not result in seals showing any sign of having habituated. The findings indicated that the cows may have already become sensitised to human activity prior to the experiment and that pups became sensitised to pedestrian activity.

Onshore heart rate of the seals in the absence of people revealed a daily periodicity in rate as well as three distinct heart rate patterns during resting behaviour and when the seal was looking in the water, i.e. the seal has its head immersed in water. Intra seal variation in heart rate highlighted the importance of obtaining baseline data at a fine scale (e.g. hourly) before heart rate can be utilised as a proxy for stress in human-wildlife interactions studies. Pedestrian approaches to a lactating seal did not elicit a heart rate response, indicating that the approaches were not considered to be negative stimuli.

Most lactating Weddell seals responded to the operation of over-snow vehicles by becoming alert. Response was dependent upon the distance at which the vehicles were driven, the position of the pups in relation to the cow and the distance the cow was from the water. The relative significance of these factors indicated that the seals perceived the vehicles to be a threat, but that the level of threat was low.

Quantifying the impact of noise on the vocal behaviour of Weddell seals required the development of an assumed detection threshold of the species and sound/distance profiles of the commonly used vehicles in Antarctica. Much of the noise generated by these vehicles at the tested distances and speeds was barely audible to seals. However, there were some instances where the noise would have been clearly audible to seals both hauled out on ice and underwater. These higher noise levels were, nevertheless, still below the noise levels generated by the animals themselves and were therefore not expected to cause physical damage to the seals. Manipulative experiments did indicate that the underwater vocal behaviour of Weddell seals could be affected by continuous Hagglund noise, manifest as a decrease in the calling rate of seals.

This study has shown that the current guidelines utilised in the Australian Antarctic Territory could be improved if the goal of management is to minimise disturbance to Weddell seals. Moreover, the study has shown that the responses of the seals were influenced by a number of factors and that these could be incorporated into visitor and operational guidelines in order to increase their effectiveness and sensitivity.

Authors: van Polanen Petel, T., Giese, M., and Hindell, M.
Year: 2008
Title: A preliminary investigation of the effect of repeated pedestrian approaches to Weddell seals (*Leptonychotes weddellii*)
Journal: Applied Animal Behaviour Science
Volume: 112
Issue: 1-2
Pages: 205-211
Abstract: Repeated exposure to human activity can alter wildlife's behavioural response, having implications for management. Weddell seals *(Leptonychotes weddellii)* breeding near Antarctic research stations are easily accessible and frequently visited by people. To examine the responses of Weddell seals to repeated pedestrian approaches, van Polanen Petel and colleagues examined the impact of regular visitation over a short-time period (<2 h) on the behaviour of lactating seals. Seals showed evidence of rapid habituation, as assessed by the higher proportion of seals that responded, with 67% looking up during the first approach compared to 18% during the 10^{th} approach (R2 = 0.398, P = 0.050), and by a decrease in the time spent looking at the approacher with repeated exposure (x29. 36:078, P < 0.001). The impact of irregular pedestrian activity over a long time period (approximately three weeks) was also investigated, with results indicating that such activity did not result in habituation, instead, adult female seals appeared to become sensitised to people (the majority of seals in both colonies looked up G1 = 0.027, P = 0.870). The findings showed that Weddell seal pups observed during the same experiment also failed to show signs of habituation to irregular pedestrian activity, with 47% of pups looking up in the colony subjected to pedestrian activity compared to 10% in the control colony (G1 = 5.811, P = 0.016). Management implications are discussed.

W

Author: Wilson, S. C.
Year: 2005
Title: The impact of human disturbance at seal haul-outs. A literature review for the Seal Conservation Society
Institution: Seal Conservation Society
Abstract: This paper aimed to 1) review the types of human disturbance at pinniped colonies world-wide and 2) summarise the scientific literature assessing the impact of such disturbance. The types of disturbance described here include tour boats, speed boats, paddle boats (canoes and kayaks), and jet-skis and recreational swim-with activities, including snorkelling and scuba diving, and also aircraft over haul-outs, icebreaking vessels and snowmobile activity. Pinniped haul-out groups considered include non-breeding animals, moulting groups and breeding groups with suckling pups. Apparent signs of seal response to disturbance range from increased alertness and sometimes threat displays to moving towards the water and flushing into the water. Impact on pupping groups includes temporary or permanent pup separation, disruption of suckling, energetic costs and energetic deficit to pups, physiological stress and sometimes enforced move to distant or suboptimal habitat. Impact on moulting groups includes energy loss and stress, while impact on other haul-out groups causes loss of resting and digestion time and stress. Speed powercraft in the vicinity of seal haul-outs create the risk of physical trauma to animals in the water. According to the author, disturbance is considered to occur if the human activity disrupts or alters the animals' normal behaviour. This includes increased alertness or movement on haul-out sites and flushing to the water, which are generally not understood by tourists to be a problem. From a strictly conservation perspective disturbance is only important

if it results in decreased survival, reproductive rate or population shift or decline. Such effects have been documented, e.g. for Hawaiian monk seals, California sea lions in the Gulf of California and harbour seals in Alaska – but are generally not immediately obvious and may need long-term monitoring.

Y

Author: Yaipen-Llanos, C.
Year: 2017
Title: Ecotourism and conservation of South American sea-lions (*Otaria byronia*): A journey for local sustainable development in central Peru
Conference Name: The 9th International Congress on Coastal & Marine Tourism: Global challenges – local solutions
Conference Location: Gothenburg, Sweden
Pages: 96-97
Abstract: South American sea lions are the closest threatened marine mammal species near Lima, Peru. An average of 5,000 sea lions haul out at Palomino Islands (12°34'34.56"S-77°45'35-67"W), a resource acquainted for sustainable development. This work aims to determine if conservation of sea lions can be sustainable with ecotourism initiatives. The assessment of ecotourism sustainability was done through exploratory, observational, and longitudinal field survey analysis during five years. Sea lion population and behaviour, boat density, human attitude and legal frame were considered. Aggressive attitudes towards the sea lions were present in 43% (N=360) of the surveys, with no law enforcement. Population has declined 78% at the minimal peak in 2017. The "swimming with sea lions" programme is unique in South America, but without regulations is taking a toll on sea lions. A new local ecotourism model using this programme also sensitises people by releasing sea lions in the wild after rehabilitation, conducting on-board research, and providing 5% of admission to support a rescue programme. After long-term behavioural, visual and acoustic assessment of sea lions swimming with humans in a programme with regulations, it is evident that the impact can be mitigated with adequate enforcement and education as ecotourism is an alternative tool for sea lion conservation when integrated into a local solution for the global problem of extinction due to human aggression.

Authors: Young, C., Gende, S. M., and Harvey, J. T.
Year: 2014
Title: The behavioural response of Australian fur seals to motor boat noise
Journal: Tourism in Marine Environments
Volume: 10
Issue: 1–2
Pages: 5-20
Abstract: Young and colleagues assessed the effectiveness of harbour seal *(Phoca vitulina)*-related vessel regulations in Glacier Bay National Park. The study findings showed 100% compliance with area closures intended to minimise disturbance to dependent pups, nevertheless dependent pups were still present in the inlet after the area was opened to vessels. Compliance with the 463-metre minimum approach distance regulation by vessels was low (22%), even though 33% of seal–vessel encounters led to disturbance when vessels were still >463 metre from seals. The findings suggest that vessel regulations might be variably effective as a result of noncompliance, biological irrelevance, or environmental factors. According to the authors, MPA regulations should be evaluated to ensure achievement of conservation goals.

New Zealand fur seal (*Arctocephalus forsteri*) on Barney's Rock – Kaikoura, New Zealand

4. ABOUT THE EDITORS

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Yasmine M. Elmahdy is a PhD candidate in the School of Sport and Recreation at Auckland University of Technology, New Zealand. Her current research focuses on sustainable management of marine mammal tourism in New Zealand. Her research interests lie in the areas of marine tourism, ecotourism, wildlife tourism, adventure tourism, and extreme and adventure sports. Her other research interests include gender issues in tourism and sport, and qualitative approaches to research.

Dr Michael Lück

Michael is a professor in the School of Hospitality and Tourism at Auckland University of Technology, New Zealand. He has worked in Germany, Belize, Canada, and Scotland, and is founding co-chair of the International Coastal & Marine Tourism Society (ICMTS). Michael has more than 10 years' work experience in the tourism industry and his research interests include (marine) wildlife tourism, the cruise industry, ecotourism, interpretation and education on wildlife tours, the impacts of tourism, and aviation. He has published in a number of international journals, is founding editor-in-chief of the academic journal *Tourism in Marine Environments*, Associate Editor of the *Journal of Ecotourism* and editorial board member of *Marine Policy*. Michael has edited or co-edited ten volumes on ecotourism, marine (wildlife) tourism, polar tourism, events, and low cost airlines, as well as the *Encyclopedia of Tourism and Recreation in Marine Environments* (CABI), and co-authored the introductory text *Tourism* (now in its 2nd edition, CABI).

Dr Brooke A. Porter

Brooke is an associate professor in the Food and Sustainability Studies Program at Umbra Institute, Italy. She also works as an external fisheries consultant for various organisations and has worked in diverse capacities with NGOs, international aid agencies and educational institutions in Maui, New Zealand, Italy, the Philippines and in Eritrea. Her research focuses on the human dimensions of the fisheries and the marine environment. She serves as a Scientific Adviser to The Coral Triangle Conservancy, an NGO that focuses on reef protection and restoration in the Philippines. She is co-editing a second volume on gender influences in fieldwork with *Channel View* as a follow up to her previous co-edited volume, *Femininities in the Field: Tourism and Transdisciplinary Research*.

Hawaiian Monk Seal (*Neomonachus schauinslandi*) - Ho'okipa Beach, Maui, Hawai'i

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