



## Survey-based assessment of the frequency and potential impacts of recreation on polar bears



Karyn D. Rode<sup>a,\*</sup>, Jennifer K. Fortin-Noreus<sup>a,1</sup>, David Garshelis<sup>b</sup>, Markus Dyck<sup>c</sup>, Vicki Sahanatien<sup>d</sup>, Todd Atwood<sup>a</sup>, Stanislav Belikov<sup>e</sup>, Kristin L. Laidre<sup>f</sup>, Susanne Miller<sup>g</sup>, Martyn E. Obbard<sup>h</sup>, Dag Vongraven<sup>i</sup>, Jasmine Ware<sup>c</sup>, James Wilder<sup>g</sup>

<sup>a</sup> U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK, USA

<sup>b</sup> Minnesota Department of Natural Resources, Grand Rapids, MN, USA

<sup>c</sup> Department of Environment, Government of Nunavut, Igloolik, Nunavut X0A 0L0, Canada

<sup>d</sup> P.O. Box 1584, Iqaluit, Nunavut X0A 0H0, Canada

<sup>e</sup> All-Russian Research Institute for Environment Protection, Znamenskoye-Sadki, Moscow 113628, Russian Federation

<sup>f</sup> Polar Science Center, Applied Physics Laboratory, University of Washington, 1013 NE 40th Street, Seattle, WA 98105, USA

<sup>g</sup> U.S. Fish and Wildlife Service, 1011 E Tudor Road, Anchorage, AK, USA

<sup>h</sup> Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, Canada

<sup>i</sup> Norwegian Polar Institute, N-9296 Tromsø, Norway

### ARTICLE INFO

#### Keywords:

Arctic  
Expert opinion  
Human-bear interactions  
Human disturbance  
Tourism  
Wildlife viewing

### ABSTRACT

Conservation plans for polar bears (*Ursus maritimus*) typically cannot prescribe management actions to address their primary threat: sea ice loss associated with climate warming. However, there may be other stressors that compound the negative effects of sea ice loss which can be mitigated. For example, Arctic tourism has increased concurrent with polar bears increasingly using terrestrial habitats, which creates the potential for increased human-bear interactions. Little is known about the types, frequency, or potential impacts of recreation. We conducted a Delphi survey among experts who live and work in polar bear habitats, followed by an internet-based survey to which 47 managers, tour operators, community members, and scientists contributed. Participants identified viewing-based recreation as increasing and affecting the largest proportion of bears within subpopulations that come ashore during the ice-free season. Survey respondents suggested that negative effects of viewing, including displacement and habituation, could be reduced by restricting human use areas and distances between bears and people. Killing of bears in defense was associated more with camping or hunting for other species than other recreations, and may be mitigated with deterrents. Snowmobiling was the most common recreation across the polar bears' range, and reportedly caused some den abandonment and displacement. However, respondents estimated that < 10% of polar bears are exposed to most types of recreation and < 50% surmised any negative impacts. Nevertheless, mitigating some of the negative impacts identified in this study may become increasingly important as polar bears cope with sea ice loss.

### 1. Introduction

Worldwide, tourism has experienced nearly uninterrupted growth as an industry and represents 7% of the world's exports in goods and services (UNWTO, 2016) with participation by 12% of the world's population (Kuenzi and McNeely, 2008). Nature-based tourism is the fastest growing tourism sector with annual growth of 10–30%, now comprising 20% of the world tourism market (Kuenzi and McNeely,

2008). Nature-based tourism can provide an economic-basis for conservation and thereby play an important role in contributing to sustainable development (Honey, 2008; Balmford et al., 2009). In addition to direct revenues provided by tourism activities, individuals who recreate in natural areas are 4–5 times more likely to engage in conservation-oriented behaviors (Cooper et al., 2015) confirming that nature-based tourism and recreation can play an important role in generating support for conservation. Effective planning, management,

\* Corresponding author.

E-mail address: [krode@usgs.gov](mailto:krode@usgs.gov) (K.D. Rode).

<sup>1</sup> Current address: U.S. Fish and Wildlife Service, Grizzly Bear Recovery Office, W.A. Franke College of Forestry and Conservation, University Hall, Room 30, Missoula, Montana, USA.

and local participation are important to ensure that tourism provides a net benefit to conservation, including minimizing disturbance to wildlife and nearby people and ensuring that local communities benefit from the revenues (Balmford et al., 2009). Because much of nature-based tourism is focused on opportunities to observe rare, threatened, and charismatic species (Walpole and Leader-Williams, 2002; Harding, 2014) careful attention is needed to managing wildlife-human interactions (Penteriani et al., 2017). Few studies have reported negative effects of nature-based tourism on the population dynamics of large carnivores (e.g., French et al., 2011; Broekhuis, 2018), but the paucity of cases may largely owe to the difficulty of measuring such effects.

In recent years, interest in tourism and adventure travel activities in the Arctic has increased (Stewart and Draper, 2006) as has interest in observing polar bears (*Ursus maritimus*) in the wild due to their vulnerability to climate warming-induced sea ice loss (Lemelin et al., 2010). Polar bears inhabit ice-covered waters throughout the circumpolar Arctic where they prey primarily on ice-associated seals. The remoteness of Arctic sea ice habitats has generally limited their interactions with humans, other than native people. However, as the Arctic has warmed, and ice has melted more extensively and for longer periods, access by tourists has increased. In the mid-1990s it was estimated that 1.9 million tourists visited the Arctic, not including Russia (Johnston, 1995). Since the mid-1990s, in the Svalbard Archipelago, cruise ship landing sites increased 228%, overnight tourist visits increased 350%, and snowmobile use increased 819% (Norwegian Polar Institute, 2016). Cruise ship traffic, including landings by boats and helicopters has also increased in the Russian Arctic and the Northwest Passage of Canada (Aars et al., 2005; Stewart et al., 2013). In Greenland, tourists increasingly visit polar bear habitats when bears are onshore (Boertmann et al., 2009; Obbard et al., 2010: 44) similar to the land-based tourism industry in Churchill, Manitoba, where up to 9000 visitors per year view bears onshore during October–December (ÉcoRessources Consultants, 2011). Polar bear viewing is now occurring in new areas, such as Barter Island, Alaska, USA, where bears congregate at the remains of subsistence-harvested bowhead whales (*Balaena mysticetus*) deposited by Inuit whalers in September each year (DeBruyn and Smith, 2009; Miller et al., 2015). Approximately 2500 visitors per year viewed polar bears at Barter Island in 2015 and 2016, more than the total annual number of visitors associated with all other activities in the adjacent Arctic National Wildlife Refuge (Reed and Duplisea, 2017).

In addition to increased tourism, the human population in Arctic regions increased throughout the 1950s and 1960s and although the total human population within Arctic regions has remained stable in recent years, there continues to be human population growth in Canada, Alaska, and Greenland with highest rates in Nunavut Territory, Canada (Heleniak, 2014). The number of local people engaged in recreation in polar bear habitats has likely increased commensurate with increased population growth. Simultaneous to larger human settlements and increased tourism, the number of polar bears using terrestrial habitats and their duration onshore has increased consequent to summer sea ice loss (Stirling et al., 1999; Schliebe et al., 2008; Cherry et al., 2013; Prop et al., 2015; Rode et al., 2015; Atwood et al., 2016a) resulting in greater overlap between their range and areas of human activity. This has led to increases in reported human-polar bear interactions (Stirling et al., 1999; Schliebe et al., 2006; Obbard et al., 2010) and associated negative consequences for polar bears and humans in some areas (Wilder et al., 2017). For example, killing of polar bears in defense of life and property has increased in some communities in Nunavut (1970s to 2009), Alaska (1988 to 2004) (Dyck, 2006; Schliebe et al., 2006; Obbard et al., 2010) and Churchill, Manitoba (Townes et al., 2009).

These new and increasing human activities have led to heightened concerns about the degree to which recreation may affect polar bears, pointing to an eventual need to manage recreation in polar bear habitats. There is presently a need for better understanding the frequency

and potential impacts of recreation on polar bears, as called for in the circumpolar polar bear monitoring framework (Vongraven et al., 2012), the United States Polar Bear Conservation Management Plan (U.S. Fish and Wildlife Service, 2015), and other international and national efforts to assess polar bear status and threats (COSEWIC, 2008; Polar Bear Range States, 2015). Polar bears have a large circumpolar range and interact with recreationists seasonally in remote areas where recording and reporting of information is often lacking, making it difficult to assess the prevalence and effects of such interactions at the population level.

Even for bear species that are more readily observed, studies typically have focused on only a few recreation types, such as viewing, angling, and responses to trails (Fortin et al., 2016). Black bears (*Ursus americanus*) and brown bears (*Ursus arctos*) have demonstrated spatial avoidance of trails when seasonal recreational use is high (Kasworm and Manley, 1990). Spatio-temporal avoidance was also the most common response of brown bears to multiple recreation types, with associated effects on energetic costs and nutritional intake (Rode et al., 2006a; Fortin et al., 2016). Viewing of black and brown bears and angling in black and brown bear habitat most often occurs at feeding sites (Fortin et al., 2016). In some parts of the polar bears' range, viewing is also focused on feeding bears. In Alaska, recreationists gather to observe polar bears while they feed on the remains of subsistence harvested whale carcasses (Miller et al., 2015), and other forms of recreation may occur where bears are feeding on their typical seal prey (e.g., snowmobile-based tourism in the spring on sea ice in Svalbard; Andersen and Aars, 2007). Tourism has been found to be an important factor affecting population dynamics of some large predators that abandon kills in response to tourists (Broekhuis, 2018). Because polar bears capture seals every 5 days (Stirling and Oritsland, 1995), abandoning a carcass in response to recreation could result in a significant nutritional loss. Polar bears are also viewed where they primarily are fasting during the summer months (Atkinson et al., 1996; Dyck and Baydack, 2004, 2006; Stirling et al., 2004). Polar bears fasting on shore need to minimize energetic expenditure (Pilfold et al., 2016) and therefore may be affected by human intrusions into their habitat in different ways than those with access to food.

As a starting point to better understand the extent to which recreation affects polar bears, we conducted a series of surveys among individuals who live and work in polar bear habitats. Our objectives were to determine the types and frequency of recreational activities across the polar bears circumpolar range and within individual sub-populations, to determine if and how recreation may impact polar bears, to identify management strategies perceived as most useful in mitigating potential effects of recreational activity on polar bears, and to identify research needed to improve efficacy of management. A survey-based approach is a low-cost opportunity to gain insights into perceived impacts based on the first-hand experience and expertise of individuals who work and live closely with a species (White et al., 2005; Can et al., 2014). This approach has been useful in better understanding ecological issues over broad temporal and spatial scales, including a number of studies on patterns of human-wildlife interactions (White et al., 2005; Can et al., 2014; Patyk et al., 2015; Fortin et al., 2016) and in augmenting information where direct measures are limited (Fryxell et al., 1988). This survey-based approach was used, in part, because focused studies on recreation in polar bear habitat are challenging given the remoteness of areas in which recreationists and polar bears interact, the potential wide variety of recreation types that may occur, and potential variation in recreation across the circumpolar range of polar bears.

We defined recreational activities as “those conducted by either visitors or residents for the purpose of pleasure and not as part of subsistence or business purposes”. We recognize, however, that the prevalence of human subsistence activities in polar bear habitats likely made it difficult for survey respondents to have completely excluded these activities. Assessment of the prevalence of recreation in polar bear

Download English Version:

<https://daneshyari.com/en/article/10144311>

Download Persian Version:

<https://daneshyari.com/article/10144311>

[Daneshyari.com](https://daneshyari.com)