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Perspective

# Conservation potential of apex predator tourism

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ABSTRACT

In recent decades, public interest in apex predators has led to the creation and expansion of predator-focused wildlife tourism. As wildlife tourism has become an increasing topic of study for both social and biological scientists, researchers have debated whether these activities serve conservation goals by providing non-consumptive values for wildlife. Discussion of predator tourism requires additional recognition of predator-specific biological and ecological characteristics, consideration of human safety concerns, and mitigation of human-wildlife conflict. By reviewing tourism activities centered on both aquatic and terrestrial predators from diverse taxa (sharks, crocodiles, and big cats), we evaluate the potential benefits and conservation challenges associated with predator tourism. Our review suggests that positive conservation outcomes are possible, but not assured given historical, cultural, and ecological complexities. We explore some of the factors which determine whether tourism contributes to conservation outcomes, including (1) effective protection of animals and habitats, (2) avoidance and mitigation of human-wildlife conflict, (3) quality of associated educational interpretation and outreach, (4) collaboration with local stakeholders, and (5) use of generated funds to advance conservation goals. Our findings suggest tourism is most likely to support predator conservation and/or recovery when the industry has both public and political support and under conditions of effective regulation focused on management, monitoring and enforcement by local, national, and international bodies.

## 1. Introduction

The conservation value of wildlife tourism, both potential and actual, is debated and remains controversial. While wildlife tourism is a complex industry (see definitions Table 1), supporters argue that it can lead to animal and habitat protection, as well as positively shaping the attitudes of locals and tourists (Higginbottom, 2004). Existing literature suggests that wildlife tourism that is well-regulated and performed responsibly, even when not designed to conform to all academic definitions of ecotourism, can generate revenues which lead to increased valuation of wildlife and the environment (Chardonnet et al., 2002; Tisdell, 2003). Although this makes tourism attractive as a potentially "self-funding" conservation strategy, there is concern about negative impacts on wildlife behavior and health from tourism activities (e.g. physiological stress, alteration of animal behavior, reproductive impacts) and questions about the extent to which significant public attitudinal changes occur and manifest as conservation benefits (Tisdell and Wilson, 2005).

Wildlife tourism presently plays an important role in funding the operation of public protected areas, generating some portion of many protected area budgets, driving political support and funding from governments interested in increasing tourism, and spurring the creation of private wildlife reserves (Buckley, 2009, 2010; Bruner et al., 2004). Tourism operations can also serve as *defacto* monitors and deterrents for illegal or environmentally harmful activities, such as poaching or illegal harvest of natural resources (e.g., Mossaz et al., 2015). However, a global meta-analysis of wildlife tourism from 251 case studies concluded that as many as 36% of all wildlife tourism programs were unsustainable due to negative impacts on target species, usually resulting from large numbers of poorly-regulated or managed tourists (Krüger, 2005). Though 63% of operations were classified as sustainable (i.e., not resulting in the long-term destruction or degradation of utilized

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**Table 1**
Key definitions of tourism-related operations.

| Term | Definition | Citations |
|---|---|---|
| Ecotourism | Tourism that is ethical, nature-based, educational, and sustainable both environmentally and socio-culturally (with many definitions expecting that it be a net positive for conservation and communities, rather than simply non-damaging). | Fennell, 2001; see also: Goodwin, 1996; Blamey, 1997; Donohoe and Needham, 2006; Diamantis, 1999; Buckley, 2003 |
| Sustainable tourism | Tourism that does not, over time, degrade the natural resources on which it relies or the communities in which it occurs. | Butler, 1999; see also: Hardy et al., 2002; Liu, 2003 |
| Wildlife tourism | Tourism advertised and focused on sightings of and encounters with one or more wildlife species. | Shorthand for "tourism with wildlife" |
| Nature tourism | Tourism advertised and focused on experiences with the natural world and natural landscapes, which may or may not include wildlife species. | Shorthand for "tourism related to natural systems including landscapes and wildlife" |
| Predator tourism | Tourism advertised as and focused on sightings of and encounters with one or more predator species. | Shorthand for "tourism with predators" |
| [Species] tourism | Tourism advertised as and focused on sightings of and encounters with specified species. | Shorthand for "tourism with [species]" |
| Conservation benefits | For the purpose of this paper, measurable concrete contributions to wildlife conservation, including funding for conservation initiatives and increased protection for species, their habitat, or their prey species. | |

wildlife resources), only 18% were found to have made measurable positive contributions to conservation (Krüger, 2005). Moreover, negative impacts on wildlife can be difficult to confirm or predict, as they may not be immediate, obvious, or easily detectable without long-term behavioral or physiological data (Sorice et al., 2003; Williams and Ashe, 2007). While tourism has potential to conserve wildlife, it also has the potential to actively work against conservation by exacerbating human-wildlife conflict or leading to sub-lethal and even lethal consequences for participating animals (Burns and Howard, 2003; Newsome et al., 2015).

Large predators in particular pose special challenges for the design of sustainable wildlife tourism, as many carnivores are intrinsically vulnerable to anthropogenic stressors, and predator population densities tend to be relatively low. In some cases, exposure to human disturbance may impair predator species from performing ecosystem functions or drive them into more marginal habitat (Nevin and Gilbert, 2005; Bejder et al., 2006). Moreover, predators may represent a real or perceived threat to human safety or livestock, resulting in the intentional elimination of predators to reduce human-wildlife conflict (Treves and Karanth, 2003). Though ranchers have reported greater willingness to tolerate predator depredations on livestock without retaliating if they derive financial benefits through payments for stock loss or from tourism (Romanach et al., 2007), in some cases payments have done little to incentivize increased tolerance for carnivores, and do not adequately respond to public concerns about human safety (Patterson et al., 2004; Zimmermann et al., 2005).

Predator tourism may be more likely than other wildlife tourism to positively influence tourist attitudes, given that predators are often viewed negatively. However, this relationship remains largely untested, and the self-selection of the tourist pool could limit potential attitudinal impacts among those predisposed to view predators negatively. Of course, the attention garnered by large predators may also lead to participation in predator tourism by individuals who otherwise have little environmental awareness or interest, potentially engaging them with conservation to a greater degree.

The impacts of predator tourism are further complicated in the case where food rewards or provisioning are used to attract carnivorous species for viewing. The sustainability and safety of these practices is hotly debated, and there is the possibility that provisioning may create risks to human safety, ecological instability, and legal liability for operators or governments (Newsome et al., 2015; McDougal, 1980; Walpole, 2001; Orams, 1995; Burns and Howard, 2003).

Whether predator tourism operations successfully contribute to overall conservation strategies likely depends on the selection of appropriate species and habitats, the ecological and biological resilience of wildlife, the engagement and support of local communities, environmentally responsible behavior (both voluntary and mandated) by tour operators and tourists, minimization of human-wildlife conflict, and effective management.

Here we present three case studies which explore the potential for tourism activities to positively impact predator conservation, and discuss the importance of thoughtful regulation of predator tourism (Fig. 1). We chose to focus on rapidly growing and in-demand examples of predator tourism operations from a range of habitats (marine, riverine/estuarine, terrestrial), taking place with species from diverse taxa (fish, reptile, mammal). Using these examples, we explore some of the factors which determine whether tourism contributes to conservation outcomes and subsequently offer recommendations for policymakers, operators, and researchers intended to improve the social and ecological outcomes of predator tourism.

## 2. Case studies

### 2.1. Case study 1: sharks (Fig. 1A)

Sharks are among the world's most iconic predators, with a fearsome reputation built around the 1975 blockbuster movie *Jaws*, which has shaped public perception and policy responses to sharks through the present day (Neff, 2015). In reality, sharks represent a very small threat to human life, but despite low risks, threats to human safety are a primary frame for reporting and public discourse about shark bites, leading to misperceptions about how dangerous sharks are (Neff, 2015; Muter et al., 2013).

While the primary source of shark mortality is commercial fisheries (Dulvy et al., 2014; Oliver et al., 2015), sharks are also targeted in recreational fishing, which represents a threat to shark populations in some parts of the world—in the United States, it has surpassed commercial shark fisheries in scale (Shiffman et al., 2014). Recreational fishermen's motivations for fishing are often related to the size, power, and reputation of sharks (Shiffman and Hammerschlag, 2014). Sharks are also targeted by culling programs in beach tourism destinations aimed at reducing population size to decrease actual or perceived risk of shark bite, though recently there has been public resistance to these practices (Dudley and Cliff, 2010; Crossley et al., 2014; Dulvy et al., 2014). Alongside the substantial impacts of commercial fisheries, these practices have led to significant population declines for many species (Dulvy et al., 2014; Oliver et al., 2015), though sharks have historically received little concern from the public due to their negative reputation (Neff, 2012, 2015; Vianna et al., 2012).

Shark tourism is a global industry generating significant socio-economic values to many countries (Gallagher and Hammerschlag, 2011), and the economic value of sharks in tourism has been used as an argument in favor of shark conservation (Vianna et al., 2011; Gallagher et al., 2015; Haas et al., 2017). However, there are few cases in which