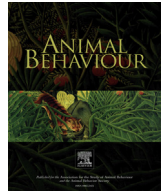




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Special Issue: Conservation Behaviour

Conservation behaviour: continued application, development and expansion



Humans have been observing animals for thousands of years, managing some species so extensively as to have led to domestication, yet increasingly affecting innumerable species through human activities. Animal behaviour and wildlife management became more formalized fields in the past 100 years, while conservation crystalized in the 1980s. At the end of the past century, conservation behaviour was recognized as a specialized discipline (Clemmons & Buchholz, 1997). Conservation behaviour uses knowledge gained through the study and practice of animal behaviour to facilitate the solution of conservation problems. Numerous edited volumes, books and review articles have ensued discussing its potential applications, limitations, and successes (e.g. Angeloni, Schlaepfer, Lawler, & Crooks, 2008; Berger-Tal et al., 2011; Berger-Tal & Saltz, 2016; Blumstein & Fernández-Juricic, 2010; Candolin & Wong, 2012; Caro, 2007; Curio, 1996, Festa-Bianchet & Apollonio, 2003).

As with all aspects of conservation biology, behaviour is not expected to operate alone or in a vacuum but rather in conjunction with all the other tools available to conservationists and wildlife managers (Blumstein & Fernández-Juricic, 2010). All the elements are in place for the successful implementation of conservation behaviour: (1) the need to find answers on how to manipulate the short- and medium-term behaviour of species is becoming more pressing due to the rate of spread of human activities; (2) many practitioners are already using animal behaviour observations in the field or in captivity to guide their management efforts; (3) the new generations of graduate students appear to have an intrinsic interest in doing animal behaviour research with strong ties to conservation biology; and (d) industry is becoming more aware of the tools that conservation behaviour can offer to solve some human–wildlife conflicts.

Some publications have challenged the success and impact of conservation behaviour as a discipline (e.g. Angeloni et al., 2008; Caro, 2007), but others have highlighted the benefits of understanding basic aspects of the behaviour of animals to predict (and ultimately manipulate) their responses to different social, ecological and environmental conditions (Buchholz, 2007). Although the conversation about the impact of conservation behaviour is certainly healthy, we think that a useful approach is to explore the future of the discipline from the perspective of the specific empirical questions as well as the theoretical gaps that need to be addressed. In other words, it is essential that we engage in the discussion of *key hypotheses and predictions* in this discipline that we *need to test* and develop to *enhance conservation* efforts. With this in mind, we prepared this special issue with the input of an

excellent group of researchers who have made strong contributions to conservation behaviour. We strived to have representatives of both academia as well as governmental agencies because the expectations and needs may be different.

The first goal of the special issue is to look ahead at the challenges awaiting conservation in which behaviour could play a role. Conservation problems are exploding in pace with human population growth and anthropogenic alterations to ecosystems across the globe. Following up on his plenary address at the 2014 Animal Behavior Society meeting in Princeton, NJ, Macdonald provides a wide-angle view on some of the major issues, and he uses carnivores as case studies for how behaviour might assist. Historically, the focus of conservation has had a strong terrestrial bias, but increasingly realization has grown on the need to maintain viable marine habitats. To complement Macdonald's terrestrial focus, Brooker et al. consider behavioural approaches to marine conservation with an emphasis on marine fishes.

A second goal of this special issue is to examine the theory and tools allied with behaviour that might benefit conservation initiatives. It is clear that we have neither the resources nor the expertise to tackle each wildlife conservation issue individually, but rather we need to determine commonalities among problems and apply knowledge based on known and, most probably, as-yet-formulated behavioural theory and tools to solve these problems. Scientific approaches to problem solving often require large sample sizes in controlled experiments, but such options may not be available for conservation issues. Thus, Garamszegi reviews statistical approaches that are beneficial to the data sets common in conservation behaviour studies. Another contribution by Nowacek et al. discusses the applications for conservation behaviour and technology to marine mammals, and primarily cetacean conservation.

In order for animal behaviour to benefit conservation, the science must be applicable. Blackwell et al. examine human–wildlife conflict in the forms of animal–vehicle collisions and carnivore depredations to illustrate how theory and practice can merge to evaluate viable solution sets. The need to apply knowledge provides impetus to revisit what we know and to unearth what we do not. Habituation is one of the simplest forms of learning and its occurrence is commonly invoked as the reason mitigations of human–wildlife conflicts fail. Blumstein explores how habituation can be prevented or invoked to aid conservation. Furthermore, he urges the development of a 'natural history' of habituation. Individual variation in behaviour (e.g. plasticity, see Foster & Sih, 2013) influences the occurrence of habituation as well as perhaps the most

insidious of problems caused by wildlife, disease susceptibility and transmission. Thus, managing disease and disease risk is a ripe and meaningful arena for conservation behaviour as explored by Hoverman and Searle.

Editing this issue provided us the opportunity to discuss with many people (the authors of the seven papers along with others who unfortunately did not have the time to participate) the multiple facets of conservation behaviour, from theory to implementation. We learned a few things that are worth sharing with those interested in thinking about the (near) future of conservation behaviour.

- (1) Academics who are interested in conservation can benefit greatly through conversations with practitioners. In our own work, we have found that such discussions have affected how we formulate behavioural questions and how we interpret behavioural observations. The interaction reduces the silo effect that can occur so easily with academics. Interestingly, when one reaches out to conservation practitioners, they have numerous theoretical questions that have yet to be answered in the literature. Engaging in these conversations informally or formally can drive theoretical advances that can have immediate application to wildlife management and conservation (Angeloni et al., 2008). For example, through the recent workshops of the Conservation Behavior Committee at the Animal Behavior Society annual meetings, academics had the opportunity to interact with conservation practitioners to understand and try to resolve conservation issues often centred in the region of the current meeting.
- (2) The interchange between academics and conservation practitioners works well as a two-way street. Developing new platforms (e.g. lists of academics with interest in volunteering their time to help conservation endeavors, <http://www.animalbehaviorsociety.org/web-final-download/Committees/ABSConservation/Mentor.html>) and making them available to practitioners may promote dialogue and prevent trying novel management techniques that are unlikely to work. There are situations in which management strategies may be developed based on incorrect generalizations from the literature (i.e. develop a repellent that the target species cannot perceive, see Blackwell et al.'s paper). Double-checking the biological basis of proposed solutions can only enhance the impact of conservation behaviour, in many cases, possibly leading to narrowing down necessary empirical studies.
- (3) The need for funding in conservation behaviour is imminent. We understand that funding bodies have their agendas set by stakeholders (i.e. basic versus applied research). Yet one way of encouraging transformative (rather than incremental) science to tackle major questions is to support multidisciplinary research (e.g. Ledford, 2015). Many of the papers in this special issue make a strong case for interdisciplinarity in the context of conservation behaviour. Consequently, we see an opportunity for multi-agency collaborations along with matching funds from federal and private sources to fund research programmes that will advance the basic understanding of behavioural processes but with a direct application to conservation (e.g. the National Science Foundation–Gates Foundation BREAD programme is an example of some aspects of this collaboration). It is our hope that funding bodies will expand greatly into this exciting type of initiative.
- (4) A mechanistic approach is informative to behaviourists and vital to conservationists. One of the novel contributions that conservation behaviour can make is the identification of the mechanisms driving behavioural responses under changing social, ecological and environmental conditions. This is not new (e.g. Blumstein & Fernández-Juricic, 2004), but we think

that the more the mechanistic approach is considered, the greater the need for using (and developing) conservation behaviour principles. The key argument is that novel management strategies are sometimes developed through a trial-and-error approach that may lead to successful outcomes under a restrictive set of conditions (i.e. animals respond to a novel stimulus under high light conditions but show little to no response under other ambient light levels). Understanding the physiological, sensory and behavioural mechanisms behind such responses could allow practitioners to tweak the stimulus so that animals respond under a wider range of conditions.

- (5) The study and practice of conservation behaviour can lead us to uncharted territory. Once the mechanisms behind behavioural responses are identified, there is still considerable work to do, for example, on full applications to minimize human–wildlife conflicts. Although there are some good case studies (reviewed in Buchholz, 2007), there may not be enough learned lessons to draw general approaches. We see this as an untapped opportunity rather than an obstacle, because it can encourage (1) more communication between academics and practitioners already invested in finding a solution to a problem, (2) the integration between biology and other fields (e.g. engineering) to logistically implement the solution in the short term and (3) the development of new technologies (and consequently new job opportunities).

We hope that the papers in this special issue challenge current and future animal behaviourists to study problems relevant to conservation, to consider how behavioural constructs can be applied to solving conservation problems and to formulate new theory and approaches based on outcomes of these applications. We thank the authors in this special issue for their thoughtful contributions.

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Guest Editors

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