Underaddressed animal-welfare issues in conservation

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Abstract: Much progress has been made improving animal welfare in conservation over the past two decades. However, several glaring knowledge gaps remain where animal welfare concerns exist but animal welfare studies have not been performed in politically sensitive contexts. We use examples from Australia to identify four such issues lacking meaningful analysis; the absence of animal welfare oversight for operations designated as “management” (as opposed to research), the lack of consideration for the animal welfare impacts of biological agents that are used to control invasive animals, the paucity of studies to examine the welfare of animals that are hunted recreationally, and the scarcity of studies to examine the animal welfare impacts associated with Indigenous wildlife use. We suggest how animal welfare science may be applied to these sensitive topics and provide

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examples of studies that have effectively addressed animal welfare concerns in similarly contentious contexts. For discussions of animal welfare in conservation to be evidence-based, courageous research is required in the four key areas of missing science that we have identified.

Introduction

Over the past two decades, the attention devoted to animal welfare in conservation and wildlife management has increased markedly (Kirkwood et al. 1994; Dubois et al. 2017). Many recent values-based ethical critiques have been published that oppose or support conservation practices and that purport to address animal welfare (e.g., Beausoleil et al. 2018; Hampton et al. 2018b; Wallach et al. 2018), but few present animal-based data and are therefore not instructive for scientific assessment or refinement of practices (Hampton et al. 2016a). Other studies have presented empirical animal welfare data but have focused disproportionately on certain practices, notably culling (Bradshaw & Bateson 2000; Hampton & Forsyth 2016). While recognizing the value of this body of work, we have decided to reflect on the studies that haven't been done in this field. That is, the practices for which there seems to be an absence of data or of healthy scientific debate.

In an ideal world, a large pool of independent scientists would study animal welfare issues in conservation and would report on every industry and context that affects animals. However, at present, animal welfare scrutiny comes largely from donor-funded advocacy groups (e.g., RSPCA Australia 2002) and government-funded departments that are often charged with providing assessment or regulation of practices they also promote (e.g., the Australian Government and kangaroo harvesting) (Commonwealth of Australia 2008). This arrangement has led to the existence of several politically sensitive issues that have “fallen through the cracks” (Cattet 2013) and will be the focus of this discussion, using examples from Australia.

Animal Welfare Oversight and Operational Management Programs

Animal research activities worldwide are typically required to be performed with oversight from animal welfare committees such as Institutional Animal Care and Use Committees (IACUCs; USA), Animal Care Committees (ACCs; Canada) and Animal Ethics Committees (AECs; Australia and New Zealand). These committees aim to ensure that animal use is ethically justifiable, compliant with relevant legislation, and often impel researchers to report the observed frequency of adverse animal welfare events (e.g., capture injuries) to their animal welfare committee (McMahon et al. 2012). In an unusual contradiction, wildlife management activities that are undertaken from an *operational* standpoint are not subject to the same animal welfare scrutiny as research (Hampton 2017). Large numbers of animals are affected by operational management programs. For example, commercial harvesting and culling can affect millions of animals (Hampton et al. 2018a). Operational activities are often guided by procedural documents (specified inputs) but rarely involve any formal oversight from animal welfare committees or monitoring of the outcomes for animals (Hampton et al. 2016a). Indeed, no reporting requirement for adverse animal welfare event frequency exists for most conservation operations (Hampton et al. 2017). Absence of monitoring is contrary to a knowledge-based ethic (Warburton & Norton 2009) and results in many management operations generating sub-optimal animal welfare outcomes without anything being learnt to guide refinement for future programs.

A pertinent example of the discrepancy in animal welfare standards between research and operations is the use of neuro-muscular blockers (NMBs) for chemical immobilization of feral donkeys (*Equus asinus*) for operational 'Judas' animal control programs in north-western Australia (Woolnough et al. 2012; Fig. 1). NMBs immobilize animals via paralysis rather than sedation/anaesthesia. As such, they exert no effects on the central nervous system, hence animals

are conscious during immobilization, and can feel pain and stress (Van Ballenberghe 1989). NMBs have a low therapeutic index, meaning that overdosing is difficult to avoid and when it occurs, can lead to asphyxia and death (Delvaux et al. 1999). For these reasons, NMBs are associated with severe negative animal welfare impacts and have not been widely used for wildlife immobilization for several decades (Arnemo et al. 2003). Many examples of animal welfare legislation prohibit the use of neuromuscular blocking agents without anaesthesia (National Research Council 2003; Wells 2011). Many authors explicitly recommend against their use as immobilizing agents in valued species such as moose (*Alces alces*; Arnemo et al. 2003). NMBs are illegal to use in conscious animals in research in Australia (Commonwealth of Australia 2013) but they continue to be used to immobilize conscious feral donkeys in wildlife management operations (Woolnough et al. 2012), generating animal welfare impacts that are likely to be considerable but are undocumented.

Another example is the use of leg-hold jaw traps for operational lethal control of dingoes/wild dogs (*Canis lupus dingo* or *Canis lupus familiaris*) in Victoria, Australia, whereby traps need only be checked every three days (72 hours; Victorian Department of Environment and Primary Industries 2013). In strong contrast, the international recommended minimum standard for checking soft-jaw traps for research projects is daily (Iossa et al. 2007), with many research programs checking every 6 hours (McGregor et al. 2016) or even 2 hours (Newsome et al. 2013). We contend that undesirable, but unquantified, animal welfare impacts are likely to be currently occurring at large scales due to the lack of oversight for such operational conservation activities.

We are aware of few examples of conservation agencies that have animal care committees providing oversight for their management activities. One notable example is the Parks Canada Agency, which requires all management actions, including hyperabundant species control programs, to be overseen by their animal care committee (T. Shury, pers. comm.). For conservation agencies to

assure stakeholders that animal welfare concerns are being prioritized, some form of oversight, such as that developed by Parks Canada, should be considered.

Biological Control

Infectious biological control (“biocontrol”) agents have been of worldwide importance in the management of invasive plants and animals. Nowhere have they been used as extensively for control of vertebrate animals as in Australia, namely for control of European rabbits (*Oryctolagus cuniculus*) (Cooke & Fenner 2002). More recently in Australia, koi herpesvirus has been proposed for the control of carp (*Cyprinus carpio*) (McColl et al. 2014; Becker et al. 2018). In clinical settings, the animal welfare impacts of infectious diseases have been well-understood for decades (Franco et al. 2012) and experimental studies that intentionally infect laboratory animals with pathogens have faced heavy animal welfare scrutiny (MacCallum 2010). However, this concern has not extended to wild animals and there is a surprising absence of consideration for the welfare outcomes of biocontrol agents in conservation. Despite recognition of the animal welfare concerns raised by biocontrol agents, in most cases there are insufficient data available assessing these impacts for them to be considered in detail (Henzell et al. 2008).

Animal welfare impacts are generally assessed by the intensity and duration of suffering they induce at an individual animal level (Mellor & Littin 2004). For the consequentialist assessment of techniques, it has been argued that welfare assessment should also be based on the number of animals affected (Kirkwood et al. 1994; Warburton et al. 2012). Infectious biological agents are invariably chosen for their capacity to be self-propagating, so unlike most other lethal wildlife control techniques (shooting, trapping, baiting etc.) they continue to impose welfare impacts long after they are released or deployed. Of course, infectious agents may disappear from populations if animal densities fall below a minimum threshold required for agent transmission, if population-level

immunity is developed (Becker et al. 2018), or if key genetic mutations occur in the disease agent (Grevstad 1999). But if the infectious agent does establish itself in a population, animals from each subsequent generation can be affected, adding to the biological agent's aggregate animal welfare impact. A pertinent example of the long-term animal welfare impacts of biocontrol can be seen in the history of European rabbit control in Australia.

Strains of myxomatosis and rabbit calicivirus (rabbit hemorrhagic disease; RHD) have been released in Australia for rabbit control. Myxomatosis was accidentally released from a research facility in 1950, a first strain of RHD was released in 1995 and a modified RHD strain was released in 2017 (Barnett et al. 2018). Both agents may infect rabbits at the same time or predispose rabbits to infection with the other (Barnett et al. 2018). RHD causes physiological and behavioral change (e.g., fever) prior to death (equated to suffering) of a duration of around 12 hours (Cooke & Fenner 2002) while myxomatosis may cause durations of suffering of 2–4 weeks (Barnett et al. 2018), although the virus has evolved considerably since 1950 (Kerr et al. 2017). The intensity of suffering associated with these viruses is assumed to be considerable (Saunders et al. 2010), especially for myxomatosis (Sharp & Saunders 2011) which causes subcutaneous swellings around the face, often leading to blindness (Fig. 1). Recognition of these welfare impacts led to rejection of a proposal to introduce myxomatosis into New Zealand in the 1980s (Norbury 2001).

Even if society has a fundamental change of heart and decides that invasive animals are no longer undesired (i.e. “given their citizenship” as proposed by some ethical positions opposed to wildlife killing) (Wallach & Ramp 2015), biocontrol agents cannot be turned off or discontinued as other control methods can be. This possibility is not just hypothetical. Legislation has recently been introduced in one Australian national park to legally shift wild horses (*Equus caballus*) from being seen as an undesirable invasive animal to a desired “heritage” animal (Wahlquist 2018). The

changing perception of the dingo, an animal that was introduced to Australia ~5000 years ago, from an introduced pest to a conserved native animal (Hyttén 2009), is typical of such societal changes. Given the dynamic nature of contemporary animal ethics and the rapid rate of change in human attitudes towards animals in post-industrial countries over the past two decades (van Eeden et al. 2017), it would be naïve to think that popular opinions are unlikely to change regarding the mass killing of wildlife.

This is not to say categorically that infectious biological agents shouldn't be used. We recognize the enormous benefits they have produced for conservation (Pedler et al. 2016) and agriculture (Cooke et al. 2013). If the consequentialist ethic that is most commonly applied to conservation (Nelson et al. 2016; Hampton et al. 2018b) identifies sufficient benefits (biodiversity, economic) to offset the animal welfare costs, then a decision to release biological agents may be ethically justified (Henzell et al. 2008). We contend though, that without explicit assessments of animal welfare, the information necessary for informed ethical debate is incomplete.

Recreational Hunting

Hunting (as distinct from commercial harvesting) is popular worldwide as a recreational pursuit, for subsistence, and for cultural practices. In Australia, recreational hunting is applied to a wide range of animal species, including deer (Fig. 1), waterfowl and feral pigs, using a wide range of methods (shotguns, dogs, archery, rifle stalking) (Bengsen & Sparkes 2016; Hampton et al. 2018a). However, in Australia (and elsewhere), hunting is also increasingly being proposed as a professional wildlife management tool. This movement has seen slogans such as “hunting for conservation” appear (Treves et al. 2018) and simultaneously, political lobbying to allow hunters access to national parks (Howden 2014). In some national parks in Australia, control of invasive animals is attempted exclusively by allowing recreational shooters access (e.g., hog deer (*Axis porcinus*) in Wilsons

Promontory National Park) (Game Management Authority 2017). There has been some recent scientific examination of the efficacy of recreational hunting for reducing the abundance of invasive animals (Bengsen & Sparkes 2016). However, there have been few studies to assess the animal welfare impacts of recreational hunting outside of deer stalking (Bateson & Bradshaw 1997; Bradshaw & Bateson 2000) and estimation of the frequency of non-fatal wounding for waterfowl shooting (Noer et al. 2007) and deer bowhunting (Pedersen et al. 2008).

Techniques that are commonly used for recreational hunting are likely to impose considerably higher animal welfare impacts than professional harvesting or culling methods. These recreational hunting techniques include the use of archery (“bowhunting”) (Nixon et al. 2001), shotguns and muzzle-loading firearms (Boulanger et al. 2006), pursuit through use of dogs (“hound hunting”) (Bradshaw & Bateson 2000), the use of knives as a killing method for feral pig hunting (Massey et al. 2011) and long-range shooting (Johnston 2017). Many adverse animal welfare events are associated with recreational hunting, notably non-fatal wounding. Reported rates of non-fatal wounding for shotgun hunting of birds are often 10–25% (Norton & Thomas 1994). For deer rifle hunting, these rates are typically 10–20% and may exceed 25% for bowhunting of deer (Nixon et al. 2001). In comparison, professional culling techniques for species such as kangaroos (*Macropus* spp.) frequently achieve rates of non-fatal wounding approaching zero (Hampton et al. 2018b). Despite these outcomes, the animal welfare implications of other historically used techniques such as muzzle-loading firearms and hound hunting have not been examined, with suggestions that their “traditional” nature should make them exempt from scrutiny (Gregory 2005). It is important to note that assessing animal welfare impacts and justifying (or opposing) those impacts are separate tasks. Without quantifying animal welfare outcomes for hunting methods, any attempts to ethically justify their use will be incomplete. Regardless, most ethical systems do not consider traditionalism to be a strong defense for poor animal welfare outcomes. This rationale has justified the widespread

cessation of such traditional practices as toothed jaw traps (banned in over 80 countries) (Iossa et al. 2007).

The use of dogs to pursue game in recreational hunting also warrants some consideration (Godwin et al. 2013). Dogs are widely used in recreational hunting to locate, flush, hold or retrieve game animals but are also sometimes used to kill or injure hunted animals (Massey et al. 2011; Descovich et al. 2015). Methods used to kill wildlife that rely upon extended periods of pursuit followed by imprecise killing methods are often deemed to impose undesirable animal welfare impacts (Sharp & Saunders 2011). There is increasing awareness of the effects of domestic dogs on wildlife (Hughes & Macdonald 2013; Doherty et al. 2017; Twardek et al. 2017) and it would be consistent with expectations of contemporary society (van Eeden et al. 2017) to extend this scrutiny to the use of dogs in hunting. Like bowhunting, the role of dogs in hunting has been defended on the grounds of traditionalism (Bateson & Bradshaw 1997) but we are unaware of many studies to measure their animal welfare impacts.

Indigenous Wildlife Use

Few issues are more sensitive than those that surround the livelihoods of Indigenous people in post-industrial countries, particularly in Australia. It is therefore unsurprising that, when animal welfare and Indigenous livelihoods intersect, there has been a conspicuous lack of scientific scrutiny (Thiriet 2007). However, many traditional and contemporary activities performed predominantly by Indigenous Australians warrant attention from an animal welfare perspective. Foremost among these is hunting, and hunting techniques used for species not commonly hunted by non-Indigenous Australians. This issue has been notoriously avoided by scientists and animal welfare advocacy groups (Thiriet 2007). There have been very few animal welfare studies to document outcomes from

Indigenous hunting or suggest refined field methods, and only a few authors have published studies discussing the ethical dimensions of this type of hunting (Thiriet 2004, 2006; Thiriet & Smith 2013).

Dugong (*Dugong dugon*) hunting is perhaps the most well-known example of an Indigenous hunting activity that has produced ethical debate (Marsh et al. 2004), media attention (Dingle 2012) and speculation surrounding animal welfare outcomes (Thiriet & Smith 2013), but to date, no published animal-based welfare studies. This is surprising for several reasons: large numbers of dugong are hunted annually, the species is critically endangered (Marsh et al. 2004), recent changes to animal welfare legislation in some Australian states do not exempt Indigenous hunting (Flint et al. 2017), and current killing methods include drowning (Thiriet & Smith 2013), a process widely accepted to have undesirable animal welfare impacts (Ludders et al. 1999; Iossa et al. 2007). Given the relative simplicity of performing validation studies of physical killing methods for restrained large marine animals (Mörner et al. 2013; Work & Balazs 2013; Hampton et al. 2014; Flint et al. 2017), this seems a curious oversight on the part of Australian scientists and funding agencies. This issue is vexing for Australia (Thiriet & Smith 2013) because the Australian government publicly criticizes the animal welfare impacts of other nation's marine mammal hunting practices (e.g., Japanese whaling) (Gales et al. 2008).

Indigenous hunting practices are also regularly used for recently introduced species. For example, feral cats (*Felis catus*) are sometimes hunted in arid areas for conservation and food (Taylor 2015). The hunting of feral cats by Indigenous Australians has been promoted as a conservation tool (Brann 2015; Wahlquist 2015) despite an absence of animal welfare investigation into how hunted cats are pursued or killed. Feral cats are largely nocturnal species and are tracked through desert sand during hot days until they become exhausted (Paltridge 2005). Blunt trauma is then repeatedly applied to unrestrained animals using metal rods in a process that is unlikely to

render animals immediately insensible (Taylor 2015; Fig. 1). As for the use of dogs in hunting, methods that rely upon extended pursuit followed by imprecise killing methods are considered to produce poor animal welfare outcomes (Sharp & Saunders 2011). While the hunting of feral cats by Indigenous Australians has been associated with positive media coverage (Brann 2015), the animal welfare impacts imposed on the cats (though currently unquantified) are likely to be considerable given the described method of hunting.

The traditional nature of Indigenous hunting activities has been proposed as a reason for which they should not be subjected to animal welfare scrutiny (Thiriet 2006). However, as for recreational hunting, assessment of animal welfare impacts and their justification should not be conflated. We contend that these activities, like all others, warrant scientific scrutiny rather than the historical strategy of avoidance (Kymlicka & Donaldson 2014). This way, the animal impacts can be understood and the hunting methods potentially refined. Despite Indigenous hunting being traditionally considered a “political quagmire” (Kymlicka & Donaldson 2014), or consigned to the “too-hard basket” (Thiriet 2007), assessment of its animal welfare outcomes is not without precedent. For example, collaborative research efforts in North America have led to considerable refinement of whale hunting methods used by Indigenous groups such as the Makah of the Pacific Northwest of the USA (O'Hara et al. 1999). Even relatively simple research efforts, such as developing reliable killing methods (Flint et al. 2017) can lead to improvements in animal welfare outcomes for hunted animals. Given how easily killing methods could be developed and validated for species such as dugongs and feral cats, we suggest that this research should be prioritized.

Conclusion

The focus of this essay has been to demonstrate that there is a discrepancy in the animal welfare scrutiny that has been devoted to some conservation activities versus others. It would be naïve to

write this paper without reflecting on why the afore mentioned studies have not been performed.

We acknowledge that any brave researcher attempting to tackle these issues may face considerable resistance. Regulators proposing to add additional layers of animal welfare oversight to operational conservation activities are likely to make themselves unpopular with wildlife managers. Scientists arguing that biological agents impose incomparably high animal welfare impacts are unlikely to be warmly received by farmers or agricultural support agencies. Recreational hunting lobby groups are notoriously suspicious of animal welfare scrutiny. Researchers attempting to collect empirical animal welfare data from Indigenous hunting activities are likely to be treated with distrust from understandably wary Indigenous groups. However, we strongly encourage wildlife researchers to proactively address these fields in the most delicate ways possible.

We have shown there are some enduring animal welfare issues in conservation that have not been addressed. It should not be assumed that scrutinizing these practices will necessarily lead to their cessation or reduce their social license (Hampton & Teh-White 2018). This would be to confuse our argument for scientific evaluation with advocacy opposing these practices (Treves et al. 2018). Indeed, if more animal welfare information was available for these neglected issues, the data generated could inform ways to refine techniques to make them less harmful (O'Hara et al. 1999); as per the axiom “you can only improve what you can measure”. This would have the added benefit that evidence, and not supposition, could then be used to defend or oppose contentious practices (Hampton & Teh-White 2018). For example, animal welfare studies have been employed during contentious feral camel (*Camelus dromedarius*) culling operations (Hampton et al. 2016b) to improve procedures and to ensure that societal expectations are met (Hampton & Teh-White 2018). For the under-addressed issues that we have identified, the absence of such studies, and the suspicious cloak of secrecy associated with the gaps where this missing science should sit, may well threaten the future social license of these activities more than the data that they would produce.

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Figure 1. Examples of under-addressed animal welfare issues in conservation: use of neuro-muscular blockers for telemetry collar fitting of a conscious wild donkey in an operational program (top left) (photo by J.O.H.), a European rabbit infected with the biocontrol agent myxomatosis (top right) (photo by C. Rouco), recreational hunting for sambar deer (bottom left) (photo by C. Davies), and Indigenous hunting of a wild cat (bottom right) (photo by S. van Leeuwin).

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