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PERSPECTIVES AND NOTES

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Ethical management of wildlife. Lethal versus nonlethal control of white-tailed deer

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Abstract

Calls for ethical management of wildlife in the international conservation community are increasing. However, it is not clear what this actually entails. Using a case of lethal (hunting) and nonlethal control (fertility control) of "chronically abundant" large herbivores such as white-tailed deer in rural and suburban areas of the United States we show what different ethical values and commitments may lead to in terms of management preference. The values looked at are humane treatment of deer, not killing them and allowing them a natural life. In terms of deer welfare, fertility control might be, overall, better than lethal control; in terms of naturalness, lethal control may have the edge. However, this conclusion is tentative. There are insufficient studies on the welfare effects of different control methods, and the specificities will also make a difference. In conclusion, there is no simple or single answer as to what constitutes "ethical management" of deer populations. Different values can be prioritized, and different ethical approaches adopted (e.g., "respecting rights" or "best consequences.") A better understanding of what is at stake ethically could help both in designing further research and in making transparent and well-informed decisions.

KEYWORDS

animal ethics, fertility control, hunting, rights, welfare, wildlife management, wildness

1 | INTRODUCTION

Calls for management of wildlife with a view to ethical concerns are increasing (Decker et al., 2019; Dubois et al., 2017). However, very different ideas of "ethical management" of wildlife exist (Gamborg, Palmer, & Sandøe, 2012; Hampton, Warburton, & Sandøe, 2018) making decision-making for wildlife professionals complicated and controversial. One example of this is the management of white-tailed deer (*Odocoileus virginianus*) in the United States, where, as we will suggest, different management approaches rest on important, but potentially conflicting, ethical concerns.

Perceived "excess" or "chronically abundant" white-tailed deer have become a major challenge for natural resource managers and city councils in urban, suburban and public park settings in the United States, as ornamental landscaping makes these areas inviting, while predators are few (Hadidian, 2015). Traditionally, deer populations have been managed by lethal control in the form of sport hunting with guns or bows, or sharpshooting to obtain targeted culls (Urbanek, Nielsen,

Davenport, & Woodson, 2012). Evidence suggests that local deer densities can be reduced using regulated hunting, in combination with culling by sharpshooting (Williams, Denicola, Almendinger, & Maddock, 2013). However, in some high-density human population locations, hunting is not practically or legally possible (Kilpatrick, Spohr, & Chasko, 1997). Moreover, concerns have been voiced, notably in terms of animal welfare or community attachment to local deer populations, that hunting is unethical (Kirkpatrick & Turner, 1997), and in some cases stakeholders may prefer fertility control over lethal control (Urbanek, Nielsen, Davenport, & Woodson, 2015).

As an alternative to hunting, fertility control—in terms of surgical sterilization of does and pharmaceutical fertility control—has made advances (Cohn & Kirkpatrick, 2015). Surgical sterilization is an irreversible way of controlling fertility, requiring veterinary involvement. Evidence of efficacy of this method in population reduction is not conclusive; other deer may move in from outside, and sterilization is expensive and difficult to use on a larger scale (Boulanger & Curtis, 2016). While acknowledging that research on effectiveness of surgical sterilization is ongoing, we will not consider this option further.

The second strategy involves pharmaceutical fertility control as immunocontraception. These contraceptives work by inducing immune responses to different aspects of the reproductive system: GonaCon™ prevents does from undergoing fertility cycles, and porcine zona pellucida (PZP) prevents egg fertilization while leaving deer fertility cycles unaffected. These methods have been promoted by a number of animal welfare organizations and local communities, primarily on the grounds that they are more *humane* or *less cruel* than the lethal alternatives—and so, they presumably imply, are ethically preferable. For instance, The Animal Welfare Institute maintains that "Immunocontraception is a tool that can be used...to resolve conflicts while avoiding the cruelty of lethal control" https://awionline.org/awi-quarterly/2012-winter/caught-crosshairs-effective-immunocontraception-faces-political-fire. The Humane Society of the United States (HSUS) has been involved in wildlife contraception studies for more than two decades. Although the HSUS believes contraceptive agents will prove environmentally, physiologically, and behaviorally benign, it nonetheless considers contraception to be a major intervention into natural processes which should be applied judiciously (Grandy & Rutberg, 2002). This looks like a view that, despite a hesitation about intervening in nature, takes contraception to be a response to deer overpopulation that is ethically superior to lethal methods of control. Opposition to fertility control is primarily based on the argument that fertility control is likely to prove too expensive and relatively ineffective (Asa & Moresco, 2019)—though both these points have been contested (Gionfriddo et al., 2009; Rutberg, 2013).

Rather than offering a systematic review of the evidence currently available (see e.g., Asa & Moresco, 2019), this brief perspective aims to develop our thinking about what would count as ethical management of population size in white-tailed deer. The focus here is on three key concerns at stake, which we take to be humane treatment of deer, not killing them, and allowing them a natural life. Whereas fertility control is clearly superior in terms of avoiding killing it is less clear how it fares in terms of the other concerns.

2 | HUMANENESS UNDERSTOOD AS BEST OVERALL DEER WELFARE

Humaneness can be interpreted in different ways. Often the focus is on avoiding or reducing the infliction of suffering on animals. Here, we understand humaneness more broadly as the aim to bring about best overall welfare for the deer being managed (ignoring here effects on other species), including deers' positive experiences, not just avoiding suffering. Thus, we understand welfare in terms of deer *subjective experience*: how deer actually experience the implementation and outcomes of a practice, in terms of pain, pleasure, frustration, and so on. Working out how to bring about best welfare in deer management requires comparisons between the welfare outcomes of different practices.

Fertility control may create welfare problems when applied, especially where application requires repeated capture. A single dose of GonaCon, hand-administered by injection, can make a doe infertile for a minimum of 1 year and up to 4 years (Miller, Gionfriddo, Fagerstone, Rhyan, & Killian, 2008). PZP can be administered by dart in time-release pellets, and does not require boosters for several years (Rutberg, Naugle, Turner, Fraker, & Flanagan, 2013). GonaCon can also be administered to male deer, where it results in "immunological castration." The application of either form of fertility control may cause deer fear and pain; although less so in the case of PZP which does not require capturing and restraining the deer.

The *effects* of fertility control may also negatively impact welfare, though these effects are somewhat controversial and more speculative. In the case of PZP, female deer continue to cycle, and male deer continue to mate with them, leading to a 2-month extended rutting season (Miller et al., 2008). Possibly, this constant activity is problematic for deer welfare; but while often advanced, this claim has proven hard to substantiate (McShea et al., 1997), although an extended rut is likely to be physically draining for male deer. In the case of the use of GonaCon

on male deer—although based on limited observation—there seems to be compromised libido and abnormal antler development (Killian & Miller, 2000). Furthermore, treated males have significantly lower weight and higher levels of infectious and parasitic lesions (Curtis, Richmond, Miller, & Quimby, 2008) which seems very likely to result in lower welfare. It is also possible that both forms of fertility control could deprive deer of possible *positive* experiences. If female deer receive GonaCon they do not cycle at all; there is no mating behavior (except for nonvaccinated individuals) which may lead to deprivation of rewarding mating experiences (assuming that mating experience is rewarding). Both PZP and GonaCon mean that female deer lose likely positive experiences from tending to offspring, and both forms of fertility control mean that deer that may have had good lives never come into existence (though the goodness of these lives will depend on resource availability and population density). Besides these welfare costs, both forms of fertility control may have welfare *benefits* in averting potentially negative experiences from pregnancy, birth, and lactation, which are physically draining and risky. Finally, if fertility control is ineffective, deer populations may become dense. When this occurs, negative welfare effects from competition for resources can result, potentially leading to starvation—particularly excess winter mortality when populations are too high (Riley et al., 2003). This may itself lead to reduced individual fertility and fawn survival (Rutberg, Naugle, Thiele, & Liu, 2004).

Lethal control raises different welfare concerns. There is no need to capture and restrain deer for treatment, and deer can continue mating and reproducing as normal while management proceeds. Assuming the balance of experience from these activities is positive, there is no loss of positive reproductive experience. Hunting itself is generally carried out subject to various restrictions, which vary between states but are typically placed on methods of taking, equipment used, possession and bag limits, seasons, and areas to hunt in (Messmer, George, & Cornicelli, 1997). If hunting bags are appropriately set, hunting may not affect the structure of deer populations, though if not, population structures are likely to be influenced here too. Moreover, where does are hunted, it might be thought that loss of particular relationships between the hunted doe and other deer may cause distress, although there is no published research investigating this.

A widely accepted welfare concern from hunting concerns cases where hunted deer are not killed cleanly and quickly. Using professional sharpshooters makes clean kills more likely; but sports hunters may not be so effective (Doerr, McAninch, & Wiggers, 2001). Data from a British study suggests that 7% of deer shot were not killed outright (Aebischer, Wheatley, & Rose, 2014). Hunter education is required in many US states to gain permission to hunt deer, but this can be carried out online, and may not affect accuracy in the field. The type of hunting weapon may also make a difference (Stormer, Kirkpatrick, & Hoekstra, 1979) as bow hunting, in particular, seems to increase the risk of a slow and painful death. As with fertility control, if hunting fails to reduce populations sufficiently, there may be welfare costs for deer competing over scarce resources; conversely, if population is reduced sufficiently, there will be benefits for remaining deer. Alongside welfare concerns about possible wounding are concerns just about killing (independently of any pain or suffering caused). The concern about killing may also be regarded as a welfare issue, as under normal circumstances, being killed robs the animal of something fundamentally important to it: the ability to enjoy the good things of life, that is, its future good welfare (Haynes, 2016). However, it remains controversial whether killing alone should count or not when thinking about welfare (Kasperbauer & Sandøe, 2016). We will return to the concern about killing in the context of proposed animals' rights in the last section of the paper.

In sum, the "humaneness equation" between fertility control and hunting is likely to differ from case to case. There is still lack of sufficient data and some scientific uncertainty with respect to welfare issues raised both by the impacts of fertility control on deer populations and the likelihood of deer wounding in lethal control (Hampton, Hyndman, Barnes, & Collins, 2015; Tuyttens & Macdonald, 1998).

3 | NATURALNESS

As noted, stakeholders have claimed that naturalness or wildness is an important value in deer management (Urbanek et al., 2015). Like welfare, naturalness can mean different things. In this context, the most likely meaning is being *free from human control in terms of the ability to perform species-specific behaviors*.

Fertility control means that deer no longer perform a number of normal behaviors. In the case of GonaCon, this includes fertility cycles, rutting, mating, reproduction and bringing up offspring; while in the case of PZP, rutting and mating is "unnaturally" extended, while reproduction and bringing up offspring is absent. In addition, fertility control exerts human intentional control over aspects of deer lives and behaviors *all the time*, not just episodically, and even when they are nowhere physically near people. Compared to an unmanaged population, the use of fertility control is a pervasive intervention into natural deer behavior and relationships.

In terms of disturbing deer natural behavior, the impact of lethal control is more episodic and less

pervasive over time than fertility control, although under heavy hunting pressure social relationships between adult does may be disrupted, as it has been seen with red deer (Jedrzejewski, Spaedtke, Kamler, Jedrzejewska, & Senkewitz, 2006), and thus could be seen as pervasive. One other observed change is that hunted deer may increase their mean home ranges during the hunting season, although this does not seem to occur with sharpshooting. (Williams, DeNicola, & Ortega, 2008).

One further public concern about naturalness, specifically in hunting, is that lethal control causes "unnatural death" (Urbanek et al., 2015). In surveys, this worry made people more likely to accept fertility control—despite its obvious "unnaturalness" in many other ways, and despite the possibility that, at least in some forms, hunting could potentially mimic "natural" (but currently missing) predation. However, in judging impacts of both fertility control and regulated hunting or sharpshooting on "naturalness," we have to consider how far deer life is already in many ways—directly or indirectly—affected by humans; their movement is already influenced by humanly created infrastructure (e.g., green corridors, fences) and they are frequently exposed to human activity (e.g., dog walkers or cars). In urban/suburban areas there is no baseline of completely "untouched" populations. So the broader question is whether a deer population constantly managed by fertility control is less "unnatural" than a (heavily but intermittently) lethally controlled population.

4 | ETHICAL PRIORITIES

Evidently, numerous values are at stake in managing deer populations. We have considered a subset of three: humane treatment, not killing deer and a natural life. In terms of deer welfare, fertility control might be, overall, better than lethal control; in terms of naturalness, lethal control may have the edge. However, this conclusion is tentative. There are insufficient studies on the welfare effects of different control methods, and the specificities will also make a difference.

More generally, two things should be acknowledged. First, the values of welfare and naturalness are clearly widely supported, but they do not fully capture the way in which the killing of wild animals is regarded by some as ethically problematic, especially on views where sentient animals are thought to have rights, and that this may significantly shape ethical priorities. Evidence shows that killing healthy animals in different forms of hunting has long been a concern, but also comes through in other situations where control over animals is imposed. A case in point is the zoo practice of culling healthy "surplus" animals as a management tool; while approved by the European Association of Zoos and Aquaria, this practice is increasingly ethically controversial (Gunasekera, 2018; Pierce & Bekoff, 2018) and there are major cultural and legal differences regarding killing of animals across Western countries.

From ethical positions that aim at bringing about best overall consequences rather than protecting rights, costs of management initiatives may also play an important role: resources should be marshalled to achieve best outcomes, in terms of welfare, natural behavior, and conservation more generally. From these perspectives, the goal may be to use scarce resources set aside for wildlife management in the most effective way possible, and this may tend to favor lethal control, since this is frequently cheaper than fertility control.

In conclusion, there is no simple or single answer as to what constitutes "ethical management" of deer populations. Different values can be prioritized, and different ethical approaches adopted (e.g., "respecting rights" or "best consequences.") Better understanding of what is at stake ethically could help both in designing further research and in making more transparent and well-informed decisions.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

AUTHOR CONTRIBUTIONS

C.G. wrote the first draft of the article, while C.P. took the lead in several rounds of rewriting and P.S. was actively involved in commenting and rewriting.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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