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An interest-based rights ethic for wildlife management and applications to behavioral training

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Abstract

The growing field of conservation and wild animal ethics has the potential to guide practitioners facing difficult management decisions. Drawing from previously established rights frameworks, we explore an applied ethic for wildlife managers and conservationists, outlining when there can be ethical justification and moral obligation to intervene with wildlife. To demonstrate the use of this ethical framework, we apply it specifically to the emerging field of behavioral training in wildlife management. We use a series of case studies to illuminate how ecological context is fundamental to ascertain when there is ethical justification for behavioral training under the framework, and conclude with practical considerations for implementation. Our work explains how a rights-based ethic emerges from both biological principles and fundamental philosophical concepts, and illustrates how it could serve as a useful guideline for wildlife management.

KEYWORDS

animal behavior, behavioral enrichment, conservation, conservation ethics, wild animal ethics, wildlife management

1 | INTRODUCTION

In managing interactions between humans and nature (Soulé, 1985), conservationists and wildlife managers are frequently faced with ethical dilemmas (Ferraro et al., 2021; Nelson et al., 2021; Wallach et al., 2018). While conservation and wildlife management are informed by empirical data, ethical beliefs are often used to motivate action and guide decision making (Nelson et al., 2021; Vucetich et al., 2021; Wallach et al., 2018). As humans increasingly alter and consume resources shared with other living beings (e.g., through global climate change or local habitat destruction), mitigating human impact is becoming progressively difficult and ethically fraught. Given the inherent complexity of conservation and wildlife management, the applied field of conservation ethics has arisen to help navigate emerging ethical dilemmas (Ferraro et al., 2021).

Historical approaches to wild animal ethics have adopted 3R guidelines (reduce, refine, and replace) which were initially developed for handling laboratory animals (sensu Russell et al., 1959). More recently, a 9R approach has been suggested, which recognizes the need for additional guidance when working with wild animals (Curzer et al., 2013). While this framework addresses some of the most obvious concerns of working with wild animals, it is not based on any rigorous ethical theory, leaving little guidance for navigating complicated situations. Other works aimed at guiding practitioners have emphasized the need to minimize harm (Dubois et al., 2017; Soulsbury et al., 2020);

however, they are also not typically rooted in an ethical framework (Ferraro et al., 2021; Nelson, 2021).

Recently, several philosophers and conservationists began putting forth a philosophically explicit framework titled Compassionate Conservation (Meyer et al., 2021; Rohwer & Marris, 2019; Wallach et al., 2018), which encourages practitioners to consider the individual animals rather than defaulting to populations or communities in conservation decision making. Compassionate Conservation is a virtue ethic in which the morality of actions is determined by the embodiment of a particular virtue, rather than the consequences of the action (Hursthouse & Pettigrove, 2018). The framework has been met with resistance by practicing conservationists and ecologists who find it does not provide specific guidance for the many challenging issues that arise when implementing wildlife management schemes (Brittain et al., 2020; Coghlan & Cardilini, 2021; Rohwer & Marris, 2019) and does not align with the field's primary focus on the outcome of actions (i.e., consequentialist ideals; Ferraro et al., 2021; Hayward et al., 2019; Meyer et al., 2021; Oommen et al., 2019). As such, we offer an alternative approach, which like Compassionate Conservation encourages conservationists to consider individual animals, but is more aligned with consequentialist thinking (Sinnott-Armstrong, 2019) and can provide some prescriptive recommendations for action.

We explore an interest-based ethical framework for working with wild animals using animal rights theory, as revised by Julius Kapembwa (2018). By applying an established ethical framework to applied conservation scenarios, we show how this framework can (1) help identify when humans have caused harms to individuals, (2) motivate conservation action to remedy these harms, and (3) help conservationists recognize obligations humans may have to individuals, which could prompt more creative and moral solutions in conservation. We focus specifically on wild animals, or animals that are primarily free-living and non-domesticated (though the framework could also be applied to domesticated animals). We examine the potential of interest-based rights for three reasons. First, this approach can be founded in biological and ecological principles (Box 1). Second, rights-based approaches for humans are intuitive and fundamentally ingrained in Western society, which currently drives large-scale conservation efforts. Third, conservation action is typically rooted in consequentialist motivation (i.e., the morality of actions is determined by the consequences of those actions). Rights-based ethical theories can be built into a consequentialist framework, with morality determined by the outcome of the action relative to the rights at hand (Pettit, 1988; Sinnott-Armstrong, 2019). Importantly, interest-based rights are not by definition inviolable (sensu Tom Regan's Animal Rights Theory), and we do not suggest inviolable rights for wildlife in this framework.

BOX 1 Biological principles and ethical assumptions

All ethical frameworks begin with starting assumptions. We have derived our ethical assumptions from biological and evolutionary principles.[a]

Biological principles	Ethical assumptions
Fitness: Survival × propagation of genes into successful progeny[b,c,d,e]	Individuals have an interest against mortality
Metazoans produce nerve and muscle cells that respond to negative stimuli[f,g,h]	Individuals have an interest against morbidity
Reproduction, and nerve and muscle tissue are ubiquitous across metazoans	The rights of nonhuman animals apply to all individuals that might meet the threshold of interests

[a]The set of biological principles above only applies to metazoans, but as biological knowledge about non-metazoans expands, individuals of those other taxa could be considered as having interests.
[b]Darwin (1859).
[c]Mendel (1866).
[d]Haldane (1932).
[e]Dobzhansky (1937).
[f]Lipscomb (1985).
[g]Schram (1991).
[h]Morris (1993).

Given many conservationists and wildlife managers may be unfamiliar with how a rights-based approach is ethically justified, we begin by describing an established rights-based framework and explaining how the rights of individuals arise from interests held by those individuals. We then discuss the interests of wild animals, which we suggest can be derived from biological principles, and the corresponding rights associated with those interests. With interest-based rights established, we demonstrate how to determine which wildlife interventions may be ethically justified

and when such interventions may be morally obligated under this framework.

To explore how conservationists and wildlife managers can use this framework in practice, we apply it to the subfield of behavioral training in wildlife management. Behavioral training is a subset of conservation behavior (Blumstein & Fernández-Juricic, 2004; Griffin et al., 2000) that modifies how animals interact with and respond to other entities (Box 2), typically driven by the goals of the conservation program to bolster population viability. We use several existing cases as examples of moral and immoral intervention under the framework, and we conclude with practical ethical guidelines for conservation and wildlife management. While we apply this rights-based framework explicitly to behavioral training, it may be adopted to other forms of wildlife intervention. As with any other ethical framework, it will not wholly eliminate instances where practitioners must grapple with hard decisions, but rather provides parameters for making those decisions, and in doing so, fills existing gaps in the field of conservation and wild animal ethics.

2 | WHEN IS THERE ETHICAL JUSTIFICATION AND MORAL OBLIGATION TO INTERVENE WITH WILDLIFE?

2.1 | Interest-based rights and corresponding obligations

Interest-based theories, or theories that maintain that individuals have interests that require moral consideration, are employed in common ethical frameworks

BOX 2 Behavioral training, definition, and forms

Behavioral training: Any form of human intervention that alters how an animal individual interacts with other biotic or abiotic entities, lasting beyond the duration of the intervention. Behavioral training can roughly be broken down into two main categories of behavioral manipulations: deterring and attracting. This is not a comprehensive list of definitions and applications of behavioral training, nor are the forms necessarily mutually exclusive.

Deterring

(1) Direct exposure

Definition: Subjecting individuals directly to a habitat, human structure, food, or other species

Applications: Inducing avoidance through experience or selection; within or across generations respectively

Example: Steindler et al. (2020)

(2) Aversion

Definition: Using simulated cues to indirectly expose individuals to a habitat, human structure, food, or other species

Applications: Inducing avoidance through temporary unpleasant experience

Example: Moseby et al. (2012)

Attracting

(1) Artificial conspecific attraction

Definition: Replicating communication cues of conspecifics to manipulate the movement of individuals

Applications: Altering habitat use, spatial distribution, dispersal of individuals

Example: Sandra James et al. (2015)

(2) Sociality

Definition: Creating familiarity and/or hierarchical roles between individuals of the same species

Application: Translocation or reintroduction of species with social structure inherent in population dynamics

Example: Shier (2006)

(3) Foraging

Definition: Restoring the ability to find specific food resources

Application: Reintroduction of individuals reared in captivity

Example: Kreger et al. (2005)

including Jeremey Bentham's utilitarianism and Tom Regan's animal rights (Wenar, 2020). An interest-based moral-rights approach posits that all individuals with interests have positive or negative rights commensurate to those interests (Figure A and Box A in Supporting Information). Positive rights are those which require another individual (an obligor) *to take action* for the rights-holder, and therefore impose a positive obligation. Negative rights are those which require another individual *not to do something* for (or to) the rights-holder, and therefore impose a negative obligation (see Supporting Information for more detailed explanation and examples; Wenar, 2020).

Following previously established animal rights frameworks (Kapembwa, 2018; Kapembwa & Wells, 2016), we focus on the interests of an individual against mortality and morbidity with corresponding rights to life and health, respectively. We suggest these interests can be derived from biological principles (Box 1). This framework does not necessitate explicit taxonomic lines that categorize species by whether they have interests against mortality and morbidity (e.g., based on perceived intelligence, or ability to feel pain, or utility to humans), but applies to all individuals that might have these interests. We recognize that other biological principles may inform the interests of animals and there may be other interests ascribed to animals than those discussed here. With continued understanding of animal biology, these interests could only become clearer. (It should be noted, our paper only explores the interest-based rights of individuals; however, it is possible that rights could also belong to ecological collectives such as species and populations, given collective interests. It is the job of ecologists and ethicists together to ascertain what those collective interests may be.) Our application of this framework does not grapple with the moral agency of nonhuman animals, but rather follows the precedent of Johannsen (2019), Rawls (1972), Regan (1983), and others by assuming only humans have moral agency and therefore ethical responsibilities (i.e., duties). Further justification of this position can be found in the Supporting Information.

As in most rights-based frameworks, there is no obligation to do that which is impossible to do. This stems from Immanuel Kant's principle "ought implies can," and is a widely accepted principle in moral frameworks (McConnell, 2018; Wenar, 2020). We acknowledge that "impossible" can be highly subjective. In the context of conservation and wildlife management, in which the means and resources available to practitioners are always limited, every intervention with every individual would be classified as "impossible." But, simply because intervening with every individual would be truly impossible does not absolve a practitioner from intervening at all. Impossibility does not invalidate the existence of the right. However, when intervention is truly impossible or reaches a point of impossibility, there is no longer a moral obligation to intervene.

2.2 | Rights and duties between humans and wildlife

Specific to human–wildlife interactions, this interest-based rights framework considers the negative duty of the obligor (humans) to not interfere with the claim right to life of the rights-holders (wild animals). In other words, wild animals have interests against mortality and morbidity (Box 2), and therefore have the right to life and health. Thus, moral agents (humans) are obligated to not cause increased morbidity or mortality to those individuals (Kapembwa & Wells, 2016). This is a negative right, or a right which generally obliges inaction rather than action. Human activities can unintentionally cause harm to wild animals and thereby violate the claim rights of those wild animals (e.g., through land use; Box A in Supporting Information).

Although the claim rights of wild animals are all negative rights with negative duties, Kapembwa and Wells (2016) argue that a positive duty emerges when a negative claim right is violated. The interests protected by those negative rights ultimately invert the negative right to an emergent positive right, which requires humans to take action and amend the violation of the negative claim right (Figure A and Box A in Supporting Information). This emergent duty and the corresponding right are particularly important when considering duties to wild animals because many rights violations perpetrated by humans against wild animals are unintentional. Indeed, by implementing an interest-based rights framework, conservationists may be able to identify both intentional and unintentional harms caused to wildlife that require remedying.

We also emphasize that interest-based rights are not by definition inviolable. This is a critical point, as all rights-based frameworks are often conflated with popularized animal rights frameworks, which claim there are no circumstances in which it is morally acceptable to violate any individual animal's rights. There are undoubtedly circumstances in which the rights of wild animals will come into conflict when trying to determine if a conservation action is ethically sound. We hold that all actions should attempt to avoid violating the claim rights of any individual—a proposition that will require creative solutions. Yet in certain cases, the duties corresponding to one individual's right may not be compatible with the duties corresponding to another individual's right

(Waldron, 1989), and individual animal lives may need to be sacrificed. Rights frameworks are often hierarchical, and there are ways forward in these scenarios, such as prioritizing certain rights or duties over others. One possible solution might be to prioritize an emergent positive right over a claim right. Typically, negative duties to wild animal claim rights require the obligor not to interfere, but in those instances of conflicting rights and the precedent of emergent rights, an intervention that rectifies the initial violation would be required (see Section 3.3.2, below). We acknowledge that in an applied ecological and ethical scenario, adhering to such a hierarchy may not be possible in practice. Further work is necessary to grapple with an interest-based rights framework in cases where rights come into conflict and result in moral residue (Batavia et al., 2020). For the purpose of this first foray, we explore how a rights-based approach helps navigate and implement many conservation and management schemes while promoting creative, ethical solutions.

3 | APPLYING INTEREST-BASED RIGHTS TO BEHAVIORAL TRAINING

3.1 | Behavioral training

Animal behavior, or how animals interact with their biotic and abiotic surroundings, is an important component of successful wildlife management (Anthony & Blumstein, 2000; Burt, 1943; Gaynor et al., 2020; Sutherland, 1998; Tobias & Pigot, 2019). Behavior can determine habitat use, food acquisition, mate selection, and movement, all of which influence individual survival and reproductive success (Festa-Bianchet & Apollonio, 2003). While wildlife managers have long recognized the importance of behavior within conservation designs (Burt, 1943), behavioral training of animals (Box 2) has more recently emerged as a way to directly manipulate behavioral traits (Berger-Tal et al., 2016; Edwards et al., 2021; Griffin et al., 2000; Rowell et al., 2020). Behavioral training is founded in widely accepted ecological theory (Berger-Tal et al., 2011; Bolles, 1970; Chivers & Smith, 1995; Domjan & Galef, 1983; Dukas, 1998; Edwards et al., 2021; Griffin et al., 2000; Kelley et al., 2003); however, there has been little to no dialog about the philosophy or ethical implementation of these practices.

In general, the purpose of behavioral training in wildlife management is to functionally recover lost interactions or to establish new interactions within an ecological community, specific to the target outcomes (Box 2). Target outcomes can include increasing the size and reproductive success of populations, but manipulating interactions through behavioral training can have cascading effects on population dynamics, communities, and major ecosystem processes (Atkinson et al., 2017; Ovadia & Schmitz, 2002; Schmitz, 2008). While perfect replacement in time and space of any particular trait would be a rare, if not impossible, phenomenon (Lawton & Brown, 1994; Rosenfeld, 2002; Schiel, 2006), manipulating behaviors through training can have a significant impact on the successful management of wildlife and ecosystems (Berger-Tal et al., 2016).

3.2 | Ethical justification and moral obligation for behavioral training

Humans become implicated in a violation of a wild animal's claim right whenever human activity has created more vulnerability to morbidity or mortality for an individual than that which previously existed. This violation creates a positive duty to ameliorate the harm that is a result of this exacerbated vulnerability (Kapembwa & Wells, 2016). Following this framework (Figure A in Supporting Information), there is both ethical justification and moral obligation to undertake behavioral training in wildlife management in cases of human interference, when the interference leads to the emergence of positive claim rights. Of note, defining harm (i.e., what constitutes more vulnerability to morbidity or mortality for wild animal individuals) may not be simple (Palmer, 2020), but such a qualification requires a quantitative ecological assessment and is beyond the scope of this paper. As demonstrated in our case studies below, there are circumstances in which the harm is evident and clearly necessitates human action.

3.3 | Case studies

In the following case studies, we explore contexts in which behavioral training for wildlife management is already taking place. We use the interest-based animal rights framework to determine when intervention by management teams is ethically justifiable, and subsequently offer a guideline for ethical implementation. Our goal is not to provide rigid moral law, but rather to explore a practical ethical toolkit for practitioners when considering the use of behavioral training in management interventions.

3.3.1 | Re-establishing migration pathways

Ecological context

Migrations are seasonal, round-trip movements of groups of individuals between discrete areas (Dingle, 1996). This

movement is often necessary for survival or reproduction (Avgar et al., 2014), yet migratory populations are in decline due to migration pathway disruption, livestock encroachment, human encroachment, or over-hunting (Harris et al., 2009). In a now-famous ecological experiment, conservationists taught migratory behaviors to captive whooping cranes whose species was being driven to extinction in the United States by sport hunting. To train a new migration pathway, conservationists hatched and reared individual cranes using "parent" crane-puppets, which induced imprinting and following behaviors (Horwich, 1989; Lishman et al., 1996; Urbanek & Bookhout, 1992). When the individuals were older, the cranes followed behind the human-operated crane-puppets in ultralight aircraft to new overwintering grounds. The cranes returned in the summer months without continued human intervention, and the training of new migratory routes was considered hugely successful (Ellis et al., 2001).

Ethical consideration

Human-induced loss of migratory pathways can lead to mortality or increased morbidity because animals migrate to prevent starvation, avoid predators, or to find mates. In instances where humans have interfered with migratory routes, or disrupted populations to an extent to which individuals cannot migrate on their own, behavioral training may be a useful tool. In the whooping crane example, conservationists were able to restore migratory behaviors to a population that had been decimated directly due to human interference (i.e., hunting). Once the birds were mature enough to migrate, migratory behaviors were "taught" through techniques that did not cause mortality or increased morbidity to the cranes. Under an interest-based rights framework, this was a straightforward ecological context in which humans were obligated to intervene and the behavioral training of whooping cranes was ethically justified.

It should be noted that migration is inherently risky for wild animals, even in absence of human interference. For instance, during annual wildebeest migrations, over 6000 individuals drown while crossing the Maasai Mara (Subalusky et al., 2017). In the case above, when teaching the whooping cranes to migrate, inherent risks of migration could not be avoided (e.g., attack from golden eagle predators; Lishman et al., 1996). We suggest that as long as the mortality rate of the population is not above that which would be expected in a nonhuman induced migration, the risk of mortality to any given individual during the behaviorally trained migration would not violate the claim rights of those individuals.

3.3.2 | Invasive species mitigation

Ecological context

Invasive species are individuals introduced into a new geographic range in which they are not endemic, create a self-sustaining population, and spread considerable distances (Simberloff et al., 2011). In some cases, these species can have a disproportionate impact on the new ecological community (Ricciardi et al., 2013). Of note, we recognize the term "invasive species" is itself contentious, given its divisive connotation (Wallach et al., 2020); however, these species have yet to be clearly redefined using more neutral language, and therefore, we employ this term for clarity. The cane toad (*Rhinella marina*) is one such invasive species and was introduced to Australia in the 1930s as a biocontrol predator for cane beetle pests in agricultural fields (Department of Agriculture Water and the Environment, 2005). The cane toad was unsuccessful in reducing the beetle pests, but instead rapidly spread across the continent. The cane toad has a unique predator defense, an ability to secrete fatal toxins through glands on its back, which has led to the precipitous decline of reptiles and small mammals throughout its introduction range (Jolly et al., 2016; Letnic et al., 2008; Price-Rees et al., 2010; Woinarski et al., 2011). Coordinated measures to control the spread of the cane toad through virus release or lethal targeting at its tadpole stage have been futile. The Australian Government currently recommends killing cane toads by spraying with aerosols, or hitting them with a blunt object followed by quick decapitation (Sharp et al., 2011).

After 85 years of exposure to the cane toad, behavioral acclimation and morphological adaptation have already occurred in affected species without human intervention. For example, red-bellied blacksnake predators now have a higher level of toxin resistance, and in some populations, also have smaller heads with limited gape-widths that render predation attempts impossible (Phillips & Shine, 2004, 2006). Additionally, birds such as crows and kites have altered their hunting strategies to avoid the toxin-secreting glands on the cane toad (Beckmann & Shine, 2011). Yet, acclimation or adaptation is not universal across species affected by the introduction, as evident with the northern quoll.

Behavioral training has been attempted with the northern quoll to induce aversion toward cane toads (Indigo et al., 2018; Jolly et al., 2018). During a precipitous population decline, individual quolls were removed from their native range and placed on cane toad-free islands. As part of later efforts to reintroduce quolls to their native range, individuals from these islands were recaptured and given food consisting of dead, sub-lethal juvenile toads laced with nausea-inducing chemicals.

Upon release, quolls that were aversion-trained in this manner survived significantly longer than untrained quolls (Jolly et al., 2018) and in some cases, their offspring also avoided cane toads (Cremona et al., 2017; Ward-Fear et al., 2016; Webb et al., 2015).

Beyond captive-training efforts, wildlife managers are dropping cane-toad sausages from helicopters ahead of the toad invasion front, which are laced with a similar nausea-inducing substance. The goal of sausage-dropping is to inoculate native populations of would-be cane toad consumers before the toads arrive, particularly because the head of the invasion front is typically composed of larger, deadlier individuals. By training wild animals not to consume cane toads before they arrive, wildlife managers might buffer native populations of predators (Indigo et al., 2018; Parke, 2018).

Ethical consideration

The unintended consequences of introducing cane toads in the 1930s continue to violate the negative claim rights of many native wild animals. Therefore, humans have a positive duty to intervene and there is ethical justification to undertake behavioral training. Behavioral training thus far has met target outcomes, but has also involved the killing of cane toads for meat to use in aversion training. Under a rights-based framework, the label of the cane toad as "immigrant," "invasive," "non-native," or "introduced" does not in itself justify the violation of the cane toad's own negative claim rights. These individuals have the same interests in avoiding mortality and morbidity, and therefore the same rights. As such, the negative claim rights of the cane toad are the same as any other wild animal. If the collection of cane toads for behavioral training leads to mortality or morbidity for the cane toads, the behavioral training infringes on their negative claim rights.

However, as long as additional vulnerability to mortality or morbidity is not being created for those individual cane toads, using cane toad meat in aversion training would be morally permissible. In future iterations of aversion training, wildlife managers could instead collect cane toad meat from "natural" instances of mortality, such as remains from bird predation or roadkill (but importantly, see below on human–wildlife conflict). It is worth noting that alternatives to using cane toad meat could include olfactory and visual cue avoidance training, which mimic the cane toad but do not involve violating the claim rights of cane toads. The guidelines provided by this rights-based framework require humans to repair the increased mortality and morbidity without infringing on the rights of the toad.

There may be times when rights come into conflict and it is impossible to create a solution that does not infringe upon the rights of some individuals, especially in situations that involve invasive species. As mentioned above, one possible solution would be to prioritize the emergent positive right—which arises from a rights violation and requires intervention. Thus, it is possible that if absolutely no other solution can be found which does not infringe upon the rights of the cane toad, and in order to rectify the initial violation to the native species, a sacrifice (Soulsbury et al., 2020) of the invasive species may be morally justified. Again, this is simply one possible way forward in an uncommon scenario of conflicting rights that has no other possible solutions available.

The ecological consequences of the cane toad introduction raise an additional ethical question: if populations have evolved traits which functionally reduce vulnerability for individuals to such a degree that any vulnerability due to the human action has been absolved, are humans still obligated to intervene? Under this ethical framework, the positive obligation of humans would no longer exist (e.g., red-bellied black snakes and kites, above). However, the possibility for future adaptation within populations does not absolve humans of their present positive obligation to individuals. Evolution by natural selection, as occurred in the red-bellied black snake (Phillips & Shine, 2004), requires that some individuals do not survive to reproduce over multiple generations. When humans introduce vulnerability for individuals within a population, they are still obligated to intervene because obligations are to individuals and not to populations or species. Allowing indirect artificial selection to proceed in wild populations would not be morally permissible under this framework.

Finally, there is an important lesson to be learned from previous biocontrol measures when implementing behavioral training: it is critical to understand and account for the possible consequences of changed behavior. The release of the cane toads as a biocontrol led to the violation of many animals' claim rights. When restoring resilience to morbidity and mortality, behavioral training schemes must carefully consider the ecological context of the intervention and the possible ecological consequences.

3.3.3 | Species reintroduction

Ecological contexts

Species reintroduction programs aim to return captive-raised or translocated animals to historically occupied areas (Beck et al., 1994). Reintroduction is not as simple as release and let-live, because newly introduced individuals often shift predator–prey dynamics within the target ecological community or are naïve as to how to interact with existing abiotic structures. Captive-raising

or captive-breeding programs can increase the number of individuals in a population, but those individuals can miss critical development processes shaped by their environment, including anti-predator defenses (Carthey & Banks, 2014; Sih et al., 2010). Behavioral training of anti-predator responses and general avoidance techniques can increase the success of reintroduction programs (Blumstein et al., 2019; Griffin et al., 2000). As part of pre-release protocols in conservation efforts, behavioral training with prey and predator animals has been heavily researched and implemented.

Antipredator training of prey typically takes two (not mutually exclusive) forms: mimicking the predator with physical, olfactory, or auditory cues and associating the cue(s) with a negative experience (Alonso et al., 2011; Shier, 2016), or in situ exposure to predators (Blumstein et al., 2019). One such example of cue training is with captive-bred *Athene noctua* or little owl. Prior to reintroducing individuals of the locally endangered species, wildlife managers used a mix of cues to train anti-predator behavior (Alonso et al., 2011): a taxidermic predatory bird "flown" overhead as a visual cue with an auditory conspecific alarm call played on a speaker. Upon release, trained individuals were depredated less than untrained individuals (Alonso et al., 2011). In situ exposure to predators arose as an alternative to cue training because cue training is labor intensive and may not be effective long term, as laboratory and artificially manipulated contexts cannot give individuals a perfectly realistic predation experience (Blumstein et al., 2019). One such example of in situ exposure is with bilby reintroduction. Following the human-driven introduction of cat and fox predators in Australia, captive-bred bilbies were introduced to cat predators at low densities. The goal was to have prey learn "true" cues from predators in unmanipulated environments and allow for selection against individuals who did not quickly learn about predator cues. After a few generations of exposure, surviving bilbies were reintroduced into native habitat (Blumstein et al., 2019).

Rather than train the captive prey prior to introduction, wild predators may instead be taught to avoid those prey individuals. This is highlighted with recent research on the Southern Corroboree Frog and its avian predator (Umbers et al., 2020). To understand the risks to reintroduced frogs, and to possibly deter avian predators, researchers deployed clay models of the frogs. Attack rate by avian predators on the clay models declined between the first and second deployments, indicating the predators had learned from their fruitless encounter with the clay models (Umbers et al., 2020). By training wild predators with clay models in areas ahead of reintroduction, it could be feasible to improve post-release survival of the frog species. For our ethical consideration, it is important to note that it is not clear from this research whether attack attempts on the clay models resulted in mortality and morbidity to the avian predators.

The reintroduction of captive-raised predators provides similar challenges with missing developmental experiences; these individuals can lack the ability to capture wild prey (Carthey & Banks, 2014). Training reintroduced predators to successfully hunt wild prey is much less common; however, predators cannot reasonably be reintroduced without an ability to obtain food. Wildlife managers have previously trained black-footed ferret predators (Vargas & Anderson, 1999) and are actively researching the possibility with captive tigers (Fàbregas et al., 2015).

Ethical consideration

We recognize the depth of the predator–prey ethical debate and the consternation it brings both for ethicists concerned with overall animal well-being and for conservationists attempting to implement policies. Here, we build off the framework put forth by Kapembwa (2018) which asserts that humans are not morally obligated to intervene in predator–prey dynamics, and in many cases, intervention is not morally permissible. This nonintervention stance arises from the liberty rights predators have to feed themselves or their offspring, and their claim rights against mortality and morbidity. Further, since only humans are moral agents, predators have no moral responsibility to their prey under this framework (Figure A in Supporting Information). This framework thus remedies the tension between predator–prey relationships and animal rights. However, given humans are duty-bound to interfere when they have directly contributed to the vulnerability of an animal (Kapembwa & Wells, 2016), there can be instances in which humans are required to interfere in predator–prey dynamics.

In the case of captive prey individuals that have been kept isolated from predators, humans have created vulnerability by minimizing the prey's antipredator defenses. Behavioral training of antipredator responses and avoidance techniques (Blumstein et al., 2019; Griffin et al., 2000) helps restore behaviors that would have otherwise developed. In such cases, humans have an ethical justification and moral obligation to conduct behavioral training. We want to emphasize that this is not concomitant justification for captive-raising or captive-breeding programs, only the behavioral training that occurs prior to release. Our assessment does not include the mortality and morbidity of individuals in captivity and during the release process, which can include problems due to improper care and stress (Soulsbury et al., 2020).

The ethical ramifications of the ecological contexts for reintroducing predators are more complicated, for in

doing so, there will be prey individuals whose vulnerability to morbidity and mortality will be increased. However, by this framework, if humans have caused increased vulnerability for predator individuals by extirpating them from their natural environment, humans are morally obligated to rectify that harm. Humans are not morally culpable for the actions of the predator species after the reintroduction, and predators are not moral agents (see Supporting Information). While this may be seen as an indirect violation of the claim rights of the prey species, interfering in any capacity with historical predator–prey dynamics would violate the liberty rights of the predator (Figure A and Box A in Supporting Information). In this vein, if a predator has lost its ability to hunt due to human activity, whether captive-breeding or otherwise, and behavioral training would restore that ability, there may be instances in which it is ethically permissible to train the predators to hunt. This, again, rectifies the enhanced morbidity humans have inflicted on these individuals.

Under this framework, in situ behavioral training of prey as a pathway for artificial selection would be immoral (Edwards et al., 2021; Moseby et al., 2016; Rowell et al., 2020). Facilitating depredation of captive or otherwise predator-naïve prey to their predators, particularly when humans are responsible for the exacerbated vulnerability of prey to that predator in the first place (i.e., in the case of introduced cats and foxes), does not satisfy humans' moral obligation to rectify the human-caused vulnerability. We implore practitioners to seek out creative solutions (i.e., fake predators, fake prey killings, manipulated cues, etc.) to instill the necessary fear of predators, without violating the right-to-life of individuals. Again, under this current framework, humans are obligated to individuals, not to species.

3.3.4 | Human–wildlife conflict

Ecological contexts

Human–wildlife conflict can be loosely defined as any human–wildlife interaction event resulting in a negative outcome for either humans or wildlife (Bhatia et al., 2019; Peterson et al., 2010). The negative outcome for humans can range from damage of property to loss of life, while a negative outcome for wildlife is typically defined as loss of life or severe physical injury (Carter et al., 2012; Kissui, 2008). Food aversion behavioral training, or conditioned taste aversion, is a nonlethal method used to deter wildlife from foraging within urban systems or agricultural fields (Baker et al., 2005). In doing so, humans do not experience damage to property, and wildlife are buffered from retaliatory killings. For example, at an isolated military post in North America, black bears were routinely taking meals-ready-to-eat (MREs) from campsites (Ternent & Garshelis, 1999). The bears were conditioned to humans and would not respond to noise, rubber bullets, or high-pressure water. Rather than kill the bears, the soldiers laced the MREs with a nausea-inducing chemical and left them for bears to forage. This chemical food aversion training was effective in reducing bear consumption of MREs for the 2 years following, but dissipated over time (Ternent & Garshelis, 1999).

Examples of conflict between human transportation and wildlife are abundant, usually culminating with structural barriers that limit wildlife movement and block access to resources (Forman et al., 2003). In a Canadian national park, individuals of an endangered population of grizzly bears were frequently being hit by cargo trains while foraging at profitable sites along the tracks (St. Clair et al., 2019). Researchers noticed an anecdotal pattern that individuals who had negative, but not fatal experiences with trains, survived longer and expressed more vigilance behaviors around train tracks. This led wildlife managers to implement an experimental "warning system" for wildlife that flashed lights and produced a loud bell sound when a train approached. The goal of this aversion-based mitigation was to startle the bears and induce a temporary unpleasant experience, while still providing access to profitable foraging sites around tracks without "eliminat[ing] mortality completely." Work to determine the efficacy of this warning system as behaviorally based mitigation is ongoing (St. Clair et al., 2019).

Ethical consideration

In ecological contexts where human activities result in conflict between humans and wildlife, behavioral training may be a useful tool to help rectify the rights-violations perpetrated by humans. Using nausea-inducing chemicals to aversion-train black bears is perhaps the most clear-cut example of morally permissible behavioral training under this framework. The bears are minimally disturbed and the human–wildlife conflict is resolved.

Behavioral training of grizzly bears to avoid train strikes is also a straightforward example of morally permissible behavioral training. The warning system does not involve mortality or morbidity to the bears beyond an unpleasant, temporary startle. We would, however, challenge the assertion that the goal should not be to eliminate mortality completely, for the authors state that some mortality allows for artificial selection (St. Clair et al., 2019). Train-strike events would be violations of the bears' claim right to life, and therefore humans would be morally responsible to address this violation. An alternative deterrent that might completely eliminate

mortality would be the creation of physical barriers, but doing so would undoubtedly cause additional rights violations against individuals of many species by infringing upon movement across the landscape. Under this framework, behavioral training with the warning system would be the most ethical approach to rectify exacerbated vulnerability from trains.

4 | ETHICAL BEHAVIORAL TRAINING IN PRACTICE

We do not set inviolable rules with this framework, but rather suggest that when practitioners have identified human-caused violations of the claim rights of wild animals and an intervention may be used to successfully rectify the violation, then humans are morally obligated to intervene (Figure 1). Using the above case studies and this ethical framework, we provide six practical considerations following an interest-based rights framework that can be used in considering future forms of behavioral training.

4.1 | Implement behavioral training to rectify human-induced morbidity and mortality

The moral obligation to undertake behavioral training with wild animals stems from the violation of the claim rights of these individuals, through both direct and indirect human action that causes an increase in morbidity or mortality. Therefore, behavioral training should be an intervention that directly addresses the effects of human interference and aims to restore any lost resilience to mortality and morbidity of those individuals, respecting the emergent right. Such guidance allows wildlife managers to fulfill the moral obligation to individuals.

4.2 | Know the limitations

There is no obligation to do that which is impossible to do (McConnell, 2018). The extent to which humans have altered ecological interactions and increased morbidity or

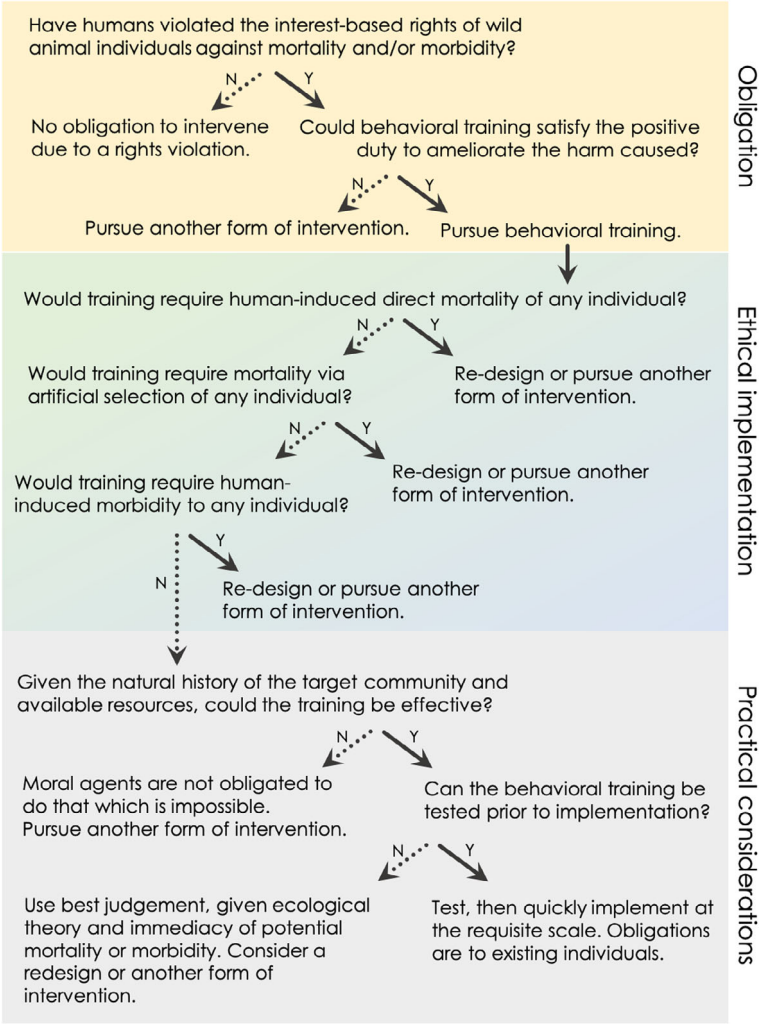

FIGURE 1 Decision tree for implementing ethical behavioral training. Ethical implementation begins by establishing human obligation to intervene and whether behavioral training can satisfy that positive duty. If so, behavioral training should be designed in a manner that does not perpetuate rights violations or generate new rights violations. Finally, behavioral training should be practically implemented according to the natural history of the target community and available resources. This decision tree could be modified and applied for other forms of wildlife intervention

mortality of individuals is too temporally and spatially large to ever fully amend. Therefore, we do not claim that humans are morally responsible for restoring every instance of increased morbidity or mortality under this framework, for we hold we cannot be held responsible for that which we cannot do. Yet the practical implication of the duty to restore the claim rights of individuals which humans have violated does require us to attempt rectification in particular circumstances, subject to practical and epistemic limitations.

4.3 | Understand the natural history and ecological theory

Before attempting an ecological manipulation through behavioral intervention, it is critical to know the natural history of the target community (Berger-Tal et al., 2011). This knowledge can ensure the success of the behavioral intervention and reduce the likelihood that the intervention will cause unintended harms elsewhere in the ecological community. An intervention is only successful if trained individuals can generalize information by using it in new contexts; contexts that undoubtedly change over the course of an individual's lifetime. Complete knowledge of natural history includes a thorough literature review, ground observations, consideration for species' functional roles and ontogenesis of the target species, and engagement with local people and practitioners (Bartholomew, 1986; Greene, 2005; Marin et al., 2017).

It is equally critical to understand whether, and how, behavioral intervention will propagate throughout the population (Danchin & Wagner, 2010; Mery et al., 2009). Considering the form of behavioral transmission is both practical and ethical. From a practical standpoint, if behavior is not transmitted from trained to untrained individuals, managers would need to invest in training every individual until resiliency to mortality or morbidity is restored (but see Section 4.2, above). Given the magnitude of this investment, practitioners may consider alternative interventions (Figure 1). From an ethical standpoint, the form of behavioral transmission (or lack thereof) may disproportionately impact some members of the population. For example, in the absence of horizontal transmission (behavioral transmission among existing individuals), training a subset of prey individuals would shift the relative fitness of these individuals and indirectly place untrained individuals at a greater risk of predation. This exacerbated vulnerability would extend the positive obligation to intervene with the untrained individuals. Additionally, this ethical framework does not consider nonidentity dilemmas (i.e., future individuals); the duty to rectify rights violations applies only to existing individuals. Vertical spread (behavioral transmission across generations) is evolutionarily required for the existence of future individuals of the species, but vertical spread does not absolve humans from their positive obligation to intervene.

4.4 | Design interventions with minimal long-term harm

All implementations of animal behavioral training should first and foremost minimize long-term harm to the participants. Given that the claim rights of these individuals have already been violated, it is the practitioner's duty to both try to restore lost resilience to morbidity and mortality, as well as not cause any additional morbidity or mortality. Therefore, as a general rule, individuals should never be sacrificed during the behavioral training and any threats to life should be minimized (e.g., using replicas of predators rather than actual predators, simulating danger to help instill appropriate response cues, etc.). For the same reasons, already captive animals should be prioritized in training schemes over wild animals, as the capture of wild animals can be stressful, and at times lethal (Arnemo et al., 2006; DelGiudice et al., 2005). For a guideline on the capture and holding of wild animals, we refer to Soulsbury et al. (2020).

4.5 | Test interventions prior to implementation

Even with extensive knowledge of natural history, behavioral training schemes are not guaranteed to work. Indeed, given the context dependency of ecological interactions, all well-designed experiments are going to be system specific. Therefore, we suggest that training schemes are first tried on a small population to ensure success. While under this framework, we have a moral obligation to resolve human-induced vulnerability for all individuals, there is a practical and ethical element to conservation that requires practitioners to ensure success before large-scale implementation. If the intervention does work, however, we maintain that it is our moral duty to implement the scheme to rectify the rights violations committed against individuals.

4.6 | Intervene quickly, as obligations are to individuals

The positive obligation of humans to restore lost resilience to morbidity and mortality applies to individuals,

not to species. Therefore, under an interest-based rights framework, humans are obligated to intervene as soon as they are aware of caused vulnerability to mortality and morbidity, and are confident in an ethical intervention. Practical implementation of behavioral intervention should meet the above criteria before broad application, but should not use the above criteria as cause for intentional stalling action. For example, in the case of restoring antipredator behaviors in naïve prey, artificial selection is not morally permissible under this framework because it does not mitigate existing vulnerability, only potential future mortality and morbidity. Artificial selection requires multiple generations for prey to re-establish their antipredator traits (Anton et al., 2020). Waiting for "nature to right itself" is neither practical for the practitioner concerned with the ecosystem, nor ethical for any conservationist following this framework.

5 | CONCLUSIONS

Conservation practitioners have long subscribed to certain dogmas, including a predominant concern with the propagation of populations, species, and ecosystems (Nelson et al., 2021). Here, we explore a different approach, one that considers the interests of individuals when implementing wildlife management or conservation schemes, often compatible with consequentialist goals of bolstering populations. This approach can be used to help identify the mortality and morbidity humans have caused individuals, and motivate conservation action to remedy these harms. Additionally, we hope to reframe conservation ethics in a way that does not ignore the importance of collectives, but also considers the rights of individuals. We do not see these goals as necessarily mutually exclusive, but suggest that by recognizing the rights of the individuals that make up the populations, species, and ecosystems, we may find creative solutions to protect both individuals and collectives.

While we focus on behavioral training as a sub-field in which to explore the practicality of this framework, it may be generalizable to all fields of wildlife management and conservation. As illustrated in our case studies, practical implementation requires robust prior knowledge and theory-informed predictions about the ecological context of any intervention, because it changes the baseline assumptions required for ethical justification. Moving forward, an interest-based rights ethical approach could serve as a practical guideline for the full breadth and depth of conservation and wildlife management. This is not to say that this framework is a panacea for all dilemmas facing practitioners, but rather provides an entry point for those who may subscribe to interest-based rights to wrestle with difficult problems.

Widely implementing an interest-based rights approach faces its own challenges; adoption would require shifts in perspective for many conservationists who have been trained rather dogmatically to value species and ecosystems (Nelson et al., 2021). But such a shift has already begun to take place (Wallach et al., 2018, 2020), and continued work at the intersection of ethics and conservation may push this perspective forward. Another challenge lies in the fact that the rights of individuals will sometimes come into conflict and conservationists will have to navigate ethically difficult scenarios where an interest-rights-based framework currently does not provide sufficient guidance. While continuing to flesh out an interest-based rights framework may help minimize the number of these cases, the goal of an ethical framework is not to necessarily help conservationists avoid all ethical controversies (Ferraro et al., 2021), but rather provide robust and logically sound guidance in determining the most ethical course of action—guidance that this interest-rights-based framework provides. Additionally, we suggest that in the vast majority of scenarios, applying an interest-based rights framework helps conservationists recognize the rights of the individuals involved, minimize harm to all individuals, and implement creative solutions even when the rights of individuals come into conflict. Creating effective conservation schemes can be a massive undertaking: an interest-rights-based framework can be an important tool for ensuring they are implemented ethically.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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