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International consensus principles for ethical wildlife control

Sara Dubois,[1,2]* Nicole Fenwick,[1] Erin A. Ryan,[1] Liv Baker,[3,4] Sandra E. Baker,[5] Ngaio J. Beausoleil,[6] Scott Carter,[7] Barbara Cartwright,[8] Federico Costa,[9] Chris Draper,[10,11] John Griffin,[12] Adam Grogan,[13] Gregg Howald,[14] Bidda Jones,[15,16] Kate E. Littin,[17] Amanda T. Lombard,[18] David J. Mellor,[6] Daniel Ramp,[4] Catherine A. Schuppli,[2] and David Fraser[2]

[1]British Columbia Society for the Prevention of Cruelty to Animals, 1245 East 7th Avenue, Vancouver, BC V5T 1R1, Canada
[2]Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada
[3]College of the Environment, Wesleyan University, Middletown, CT 06457, U.S.A.
[4]Centre for Compassionate Conservation, School of Life Sciences, University of Technology Sydney, NSW 2007, Australia
[5]Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, Recanati-Kaplan Centre, Tubney House, Abingdon Road, Tubney, Oxfordshire OX13 5QL, U.K.
[6]Animal Welfare Science and Bioethics Centre, Institute of Veterinary Animal and Biomedical Sciences, Massey University, Private Bag 11–222, Palmerston North, 4442, New Zealand
[7]Detroit Zoological Society, 8450 W 10 Mile Road, Royal Oak, MI 48067, U.S.A.
[8]Canadian Federation of Humane Societies, 30 Concourse Gate, Nepean, ON K2E 7V7, Canada
[9]Universidade Federal da Bahia, Salvador, Bahia, Brazil
[10]Born Free Foundation, Broadlands Business Campus, Langhurstwood Road, Horsham, RH12 4QP, U.K.
[11]University of Bristol, Bristol, City of Bristol, BS8 1TH, U.K.
[12]Wildlife Protection Department, Humane Society of the United States, 1255 23rd St NW, Washington, D.C. 20037, U.S.A.
[13]RSPCA UK Wildlife Department, Wilberforce Way, Southwater, West Sussex, RH13 9RS, U.K.
[14]Island Conservation, 2161 Delaware Avenue Suite A, Santa Cruz, CA 95060, U.S.A.
[15]RSPCA Australia, P.O. Box 265, Deakin West, Canberra, ACT 2600, Australia
[16]Faculty of Veterinary Science, University of Sydney, Sydney, NSW 2006, Australia
[17]Regulation & Assurance Branch, Ministry for Primary Industries, P.O. Box 2526, Wellington, New Zealand
[18]Department of Biological Sciences, University of Cape Town, Rondebosch, Cape Town 7700, South Africa

Abstract: *Human–wildlife conflicts are commonly addressed by excluding, relocating, or lethally controlling animals with the goal of preserving public health and safety, protecting property, or conserving other valued wildlife. However, declining wildlife populations, a lack of efficacy of control methods in achieving desired outcomes, and changes in how people value animals have triggered widespread acknowledgment of the need for ethical and evidence-based approaches to managing such conflicts. We explored international perspectives on and experiences with human–wildlife conflicts to develop principles for ethical wildlife control. A diverse panel of 20 experts convened at a 2-day workshop and developed the principles through a facilitated engagement process and discussion. They determined that efforts to control wildlife should begin wherever possible by altering the human practices that cause human–wildlife conflict and by developing a culture of coexistence; be justified by evidence that significant harms are being caused to people, property, livelihoods, ecosystems, and/or other animals; have measurable outcome-based objectives that are clear, achievable, monitored, and adaptive; predictably minimize animal welfare harms to the fewest number of animals; be informed by community values as well as scientific, technical, and practical information; be integrated into plans for*

*email sara.dubois@ubc.ca
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systematic long-term management; and be based on the specifics of the situation rather than negative labels (pest, overabundant) applied to the target species. We recommend that these principles guide development of international, national, and local standards and control decisions and implementation.

Keywords: animal welfare, human-wildlife conflict, justification, management, policy, values, vertebrate pest control

Principios del Consenso Internacional para el Control Ético de la Vida Silvestre

Resumen: *Los conflictos entre los humanos y la vida silvestre son tratados comúnmente al excluir, reubicar o controlar letalmente a los animales con el objetivo de preservar la salud pública y la seguridad, proteger la propiedad o conservar a otros ejemplares valiosos de vida silvestre. Sin embargo, las poblaciones de vida silvestre declinantes, la falta de efectividad de los métodos de control para obtener los resultados deseados y los cambios en cómo las personas valoran a los animales han disparado un reconocimiento extendido por la necesidad de estrategias éticas basadas en evidencias para manejar dichos conflictos. Exploramos las perspectivas sobre y las experiencias internacionales con los conflictos entre humanos y vida silvestre para desarrollar los principios para un control ético de la vida silvestre. Un panel diverso de veinte expertos se reunió durante dos días en un taller y desarrolló los principios por medio de un proceso de participación facilitada y discusiones. Los expertos determinaron que los esfuerzos para controlar a la vida silvestre deberían comenzar en donde sea posible alterando las prácticas humanas que ocasionan el conflicto humano-vida silvestre y desarrollando una cultura de coexistencia; deberían estar justificados por la evidencia de los daños significativos que afectan a la gente, la propiedad, el sustento, los ecosistemas y otros animales; deberían tener objetivos medibles basados en resultados que son claros, alcanzables, monitoreados y adaptativos; deberían minimizar los daños al bienestar animal para el menor número de animales: deberían estar informados por los valores comunitarios así como la información científica, técnica y práctica; deberían ser integrados a los planes para el manejo sistemático a largo plazo; y deberían estar basados en las especificidades de la situación en lugar de las etiquetas negativas (plaga, sobreabundante) aplicadas a las especies objetivo. Recomendamos que estos principios guíen el desarrollo de los estándares internacionales, nacionales y locales y controlen las decisiones y su implementación.*

Palabras Clave: administración, bienestar de los animales, conflicto entre humanos y animales silvestres, control de plagas de vertebrados, justificación, normas, valores

Introduction

Human–wildlife conflicts are addressed by nonlethal or lethal means through exclusion, trapping, hunting, poisoning, or otherwise destroying animals. Sometimes these approaches have inadvertent effects on nontarget animals and ecosystems. Control can be directed at native wild animals, introduced wild animals, and feral individuals and populations of domesticated species. However, declining populations of many wildlife species and increases in the kind and number of human–wildlife conflicts in urbanizing areas raise serious questions about traditional wildlife control actions. Lethal control, in particular, often generates disagreements over whether control is necessary and how it should be applied.

Opposition to wildlife control often stems from changing societal attitudes toward animals and from concerns that commonly used control actions are inhumane, ineffective, or not based on scientific evidence (e.g., Littin et al. 2004; Artelle et al. 2013). Moreover, many jurisdictions have limited regulatory oversight of wildlife control measures, including those used by the public and by commercial pest control businesses. Given this situation, there is now widespread acknowledgment of the need for ethical and evidence-based approaches to wildlife control (e.g., Cowan & Warburton 2011).

For over a decade, governments, academics, and animal protection organizations have proposed approaches to guide ethical decision making in wildlife control (Jones 2003; Humane Vertebrate Pest Control Working Group 2004; Littin et al. 2004; PestSmart 2014; Hadidian 2015). However, the different approaches, plus a lack of standards in many jurisdictions, show a clear need for broadly based guidance that incorporates international perspectives (Littin & O'Connor 2008). During a 2-day workshop in 2015, 20 experts from academia, industry, and nongovernmental organizations from 5 continents convened to build on previous work and develop the first international principles for ethical decision making in wildlife control. Through facilitated engagement, including discussions, presentations, and group work, the experts agreed to an interdependent and step-wise set of 7 principles for managing human–wildlife conflict: modify human practices when possible, justify the need for control, have clear and achievable outcome-based objectives, cause the least harm to animals, consider community values and scientific information, include long-term systematic management, and base control on specifics of the situation.

Modifying Human Practices

Human–wildlife conflicts arise from human activities (e.g., creation of new food sources, alteration or occupation of habitat, or introduction of species into new areas [Redpath et al. 2013]) and should be prevented and mitigated by altering human practices wherever possible and by developing a culture of coexistence. As the human population grows, it occupies space to the exclusion of wild animals and thus causes changes in the distribution and abundance of other species and of food and habitat. Thus, many species have declined (Ripple et al. 2015) and others have expanded, for example, after being introduced into new ecosystems or after limits to recruitment are relaxed (Long 2003). Therefore, a first response to human–wildlife conflict should be to focus on how human behavior has affected the ecosystem and to address the root causes of conflict rather than only the problematic outcome. Where vulnerable human populations have limited resources, reducing conflicts may also require empowering and improving conditions for people.

In Brazil, for example, as human development and agriculture expand, the frequency and variety of human–wildlife interactions have grown, and wildlife is adapting to living in human-dominated landscapes (Marchini & Crawshaw 2015). For instance, marmosets (*Callithrix kuhlii*) have adapted to the urban landscape by living in parks, city squares, and forest fragments (Rodrigues & Martinez 2014). They have entered houses when exploring new environments to search for food and seek protection from predation (Goulart et al. 2010). Many such conflicts have been caused by people feeding animals in gardens or buildings, the result of which is the animals became habituated and aggressive toward people (Goulart et al. 2010; Rodrigues & Martinez 2014). As with other conflicts with food-conditioned animals, ongoing control would be costly, ineffective, and in opposition to other values. Hence, altering human behavior is an obvious first step, although some form of wildlife control may also be needed in the short term for animals that have already learned unwanted behavior.

A long-term education-based process, based on preventive action and increased tolerance, is also necessary to move toward a culture of greater coexistence with wildlife (Ramp & Bekoff 2015). Such a culture could result in some control actions being unnecessary, particularly where the wildlife-induced harms are relatively insignificant.

Justification for Control

The need for wildlife control should be justified with evidence that substantial harm is being caused to people, property, livelihoods, ecosystems, and/or other animals. Potential benefits of wildlife control include protecting the health and safety of humans and domesticated animals, protecting wild animal populations from excessive competition or disease, restoring disturbed ecosystems, and protecting target animals, for example, by moving threatened individuals to safe habitat. Other benefits include preventing damage to crops and buildings, protecting livestock and hunted wildlife, and preventing fear or annoyance caused by animals. Whatever the reason for control, the seriousness of the perceived problem should be considered and an objective evaluation of the effects of no control actions being undertaken should be conducted.

Justifying control requires reconciling perceived and real harms and conflicting values. Since the 1970s, the increasing abundance of native deer in United States and Canadian urban areas has led to damage to gardens and other nuisance behavior (Decker 1987), and lyme and chronic wasting disease risks have heightened the desire for control in the eastern United States. Decisions to control urban deer have generally been based not on biological carrying capacity (Rutberg 1997) but on "cultural carrying capacity" (i.e., the maximum number of animals people will tolerate in an area; Ellingwood & Spignesi 1986). However, assessments of overabundance are subjective (DeNicola et al. 2000), and cultural carrying capacity can be altered through increased tolerance, education, and preventive measures. There are communities that have decided that nuisance behavior and minor damage caused by urban deer are not sufficient justification to warrant killing. In some cases the visible presence of deer has become a source of community pride (e.g., Pinawa.com. 2016).

Clear and Achievable Outcome-Based Objectives

The desired outcome of a wildlife control action should be clear, achievable, monitored, and adapted based on lessons learned.

Ethically defensible decisions to control wildlife require clear objectives and sound evidence that the proposed methods can achieve the objectives. Too often these requirements are not met. For example, eradication of an unwanted population sometimes fails to achieve the intended ecological benefit (e.g., Bergstrom et al. 2009). Culling animals to reduce numbers in the long term may prove ineffective (Walsh et al. 2012), especially if the level of killing is insufficient to manage recruitment when a species is mobile or prolific or if other factors (habitat, food availability) are not addressed (e.g., Pennycuik et al. 1987).

The objectives of wildlife control should be specific, measurable, and outcome-based, where the outcome relates to the desired reduction of harm—such as reducing

crop loss, preventing transmission of a vector-borne disease, or increasing an endangered species population—rather than simply reducing the number of target animals (Clayton & Cowan 2010). An understanding of population size, demography, ecology, behavior, and reproductive capacity, and the effectiveness of the chosen action are required to judge the likelihood of success. Monitoring is critical and often over-looked (Clayton & Cowan 2010), and wildlife control should be rooted in an adaptive-management framework (Warburton & Norton 2009).

In the case of introduced species, people's objectives may differ. People may wish to restore an ecological system to its pristine state or to reverse the major effects of introduced species, or they may value a rich and functioning ecological system even if introduced species are present. Moreover, eradication may be impossible in large continental systems once a species has become integrated and widespread. In such cases, failed eradications can be costly in terms of animal welfare (Cowan & Warburton 2011) and public support of control programs. Clarity about the desired outcome, the feasibility of success, and how success can be monitored is needed in each case.

Control of Eurasian badgers in the United Kingdom illustrates the need for this principle. Because badgers are hosts for bovine tuberculosis (TB), many farmers advocate culling badgers to protect cattle (NFU 2013; Batters 2015). However, a large-scale field experiment showed that badger culling would not reduce TB in cattle and could exacerbate the situation (ISG 2007). Nonetheless, the British Government later approved 2 pilot badger culls to test the effectiveness, humaneness, and safety of controlled shooting of badgers. Although monitoring confirmed that the pilot culls failed to meet both the effectiveness and humaneness objectives (IEP 2014), no lessons appear to have been learned because the culls have continued and may be expanded (Natural England 2016).

Animal Welfare

Control methods should predictably and effectively cause the least animal welfare harms to the least number of animals. Opposition to wildlife control often arises because of animal welfare concerns related to the methods used, especially the potential for suffering of target and nontarget animals. Control methods differ widely in the type, extent, and duration of harms caused, and these harms vary according to species, age, sex, social organization, and other factors. Some methods cause direct harm to the target animals such as acute stress and injury from live trapping; prolonged fear, thirst, and hunger from relocation; and pain and suffering before loss of consciousness after application of lethal methods. Harms may also include indirect effects on nontarget animals such as starvation of dependent young, disruption of social groups, and disruption of ecological systems.

To apply the method causing the least welfare harm, systematic scientific evaluation of the possible harms is required (e.g., Sharp & Saunders 2011; Beausoleil & Mellor 2015). Brush-tailed possums in New Zealand were introduced from Australia and have negative conservation and economic impacts (Lawton et al. 2010); thus, they are the focus of widespread and ongoing management programs that use toxins and other lethal and nonlethal methods (Warburton et al. 2012). Using a scientific framework based on the five-domains model (Beausoleil & Mellor 2015), Fisher et al. (2010) evaluated the relative welfare impacts of toxins used to control possums. All toxins evaluated caused some moderate harm to possums that lasted several minutes. Cyanide had the lowest welfare impact, sodium fluoroacetate had intermediate harm, and cholecalciferol and anticoagulants had the greatest harm. Thus, anticoagulants and cholecalciferol—commonly used toxins—pose greater risks to possum welfare and should be the least preferred options. However, ongoing development and evaluation of methods are needed because methods that cause the least harm at a given time may be superseded by less harmful methods in the future.

Some may assume nonlethal methods cause less severe harm than lethal methods, but this is not always the case. Although exclusion and short-distance relocation may cause relatively mild and short-lived negative effects on some animals, relocation can result in severe welfare problems and even death if animals cannot secure shelter, food, water, safety, and territory in the new environment. For example, European moles are territorial and require an underground feeding-tunnel system to survive. If a mole is released into the territory of another mole, it is likely to be killed, and if it is released into unoccupied habitat it may be unable to establish a network of feeding tunnels quickly enough to survive (Baker & Macdonald 2012).

The predictability (repeatability) of the welfare outcome and effectiveness (rate of welfare outcome success) are important criteria in decision making. Both typical effects and worst-case scenarios need to be considered when evaluating the welfare effects of a proposed method. In addition, methods that result in the least welfare harm when used by knowledgeable and competent professionals may be more harmful when used by untrained individuals. Therefore, methods available to the public should cause the least suffering if used without specialized training.

Social Acceptability

Decisions to control wildlife should be informed by the range of community values alongside scientific, technical,

and practical information. Decisions on whether and how to control wildlife usually involve balancing benefits and harms. Scientific and technical information can inform decision making, for example, by clarifying the potential benefits, the consequences of acting or failing to act, and the types of (and likely variation in) harm to target and nontarget animals. Nonetheless, decisions regarding wildlife control inevitably involve human values, which differ from person to person and across communities. For example, different people assign different weights to protection of property or livelihoods, to native species, and risks to human safety. People also differ in how they prioritize harms to affected animals such as suffering and loss of life.

This diversity of interests calls for an open process of community engagement informed by the relevant science, a transparent approach often overlooked by some government and academic research (Brook et al. 2015). An ethical review process with proper governance and resources, similar to that used by animal ethics committees when assessing the acceptability of scientific research involving animals and people, could be a way to include scientific and technical expertise while ensuring community values inform decisions (Warburton & Norton 2009).

The case of Little Penguins on Middle Island in Australia illustrates the value of including social acceptability in decision making (Warrambool City Council 2016). The island, managed by a local council, is a tourist destination for people wishing to visit the penguin colony. When foxes predated the penguins, controversial lethal control methods (shooting, fumigation) were applied, but penguin depredation continued because new foxes crossed to the island during low tide (King et al. 2015). Then, through a collaborative community effort, Maremma guard dogs were deployed and the island was temporarily closed to visitors. Subsequently, the penguin population increased, the dogs themselves became a source of interest and community pride, and tourism on the island during the nonbreeding season was boosted (King et al. 2015). The success of this program resulted from a combination of scientific and practical information and strong support from the community, local council, businesses, and volunteers.

Systematic Planning

Decisions to control wildlife should be integrated into a program of long-term systematic management. If control actions are used on an ad hoc basis without being integrated into a systematic, long-term management program, any benefit is likely to be short lived and control actions may be used repeatedly without achieving a sustainable solution (Clayton & Cowan 2010). This is particularly problematic if control actions carry substantial animal welfare or other costs. For example, low-level culling of abundant or prolific animals can amount to senseless killing if populations rebound quickly.

To prevent unnecessary harm, decisions to control animals should be integrated into a plan for systematic long-term maintenance of the desired outcome. Examples include preventing access by target animals once they have been removed from a building, controlling garbage after habituated animals have been removed, and establishing biosecurity plans that limit boat access to islands that have been cleared of an introduced species. Long-term planning can also help prevent inappropriate decisions from being made during a crisis and can identify research needs for development of appropriate alternative actions.

Systematic, long-term planning is a necessary component in the management of elephants in South Africa. Before a mid-1990s moratorium, culling was used as a management tool despite its being controversial, both scientifically and ethically. After consulting a broad spectrum of stakeholders, a scientific assessment of elephant management was published (Scholes & Mennell 2008) and subsequently underpinned the development of the Norms and Standards for Elephant Management (DEA 2008). This included a decision tree that managers are legally required to follow before culling can take place with options including no intervention, contraception, translocation, habitat manipulation, and culling. The decision tree starts with a required adaptive-management plan; thereby, it promotes outcomes that integrate scientific evidence, management requirements, and social norms (Biggs et al. 2008). Managing elephant habitat, rather than culling, appears to be the best strategy for minimizing habitat and resource damage (van Aarde & Jackson 2007).

Decision Making by Specifics Rather than Labels

Decisions to control wildlife should be based on the specifics of the situation, not negative labels applied to the target species. When animals are labeled with terms such as *introduced*, *abundant*, and *pest*, broad approaches to control are sometimes advocated and little attention is paid to the specifics of the case. Wildlife control should not be undertaken just because a negatively labeled species is present.

Abundant and introduced animals can alter ecosystems and balances among native species (e.g., Mack et al. 2000), especially when animals are introduced onto small islands (Blackburn et al. 2004). However, many introduced species have integrated innocuously into local environments in ways that have attracted little scientific attention precisely because they are unremarkable (e.g., Gonzales et al. 2008; Tustin 2010). Other introduced species may even provide an ecological replacement for extinct species (e.g., IUCN 2013). Thus, instead of

applying control actions arbitrarily because of how a species has been categorized, ethical decisions for wildlife control require an examination of need, benefits, animal welfare, and other factors outlined in the other principles.

Animals assigned labels with negative connotations often receive less welfare consideration than valued species. In Canada, for example, wolves categorized as overabundant are targeted in bounty programs to mitigate livestock conflicts (Proulx & Rodtka 2015) and culled when caribou populations decline from habitat loss (Hervieux et al. 2014). Apart from the ineffectiveness of these programs, the welfare cost and selectivity of the control methods are highly problematic; some wolves are poisoned with strychnine even though this contravenes national animal welfare guidelines (Proulx et al. 2015). Because vertebrate animals of similar cognitive and emotional complexity can be expected to have similar capacities for suffering (Mellor et al. 2009), there is no reason consideration of animal welfare should depend on how a species has been categorized or the potential detrimental effects of the animal's presence or behavior.

Strictly speaking, the seventh principle is redundant if the other 6 have been addressed. However, because negative labels are sometimes used to justify arbitrary control actions, the seventh principle serves as a check that decisions are indeed based on comprehensive analysis of the concerns and outcomes rather than simply reflecting a negative label applied to the animals.

Discussion

Although some of the principles here have been described previously (Jones 2003; Humane Vertebrate Pest Control Working Group 2004; Littin et al. 2004; PestSmart 2014; Hadidian 2015), no one work included all 7 principles. Furthermore, because previous work generally represents only one country or one organization's position, ours is the first international consensus on such principles.

The principles can be captured in a list of 7 questions that can be asked in sequence when decisions about human–wildlife conflicts are made, and they can be used to ensure that the principles are followed: Can the problem be mitigated by changing human behavior? Are the harms serious enough to warrant wildlife control?

Is the desired outcome clear and achievable, and will it be monitored? Does the proposed method carry the least animal welfare cost and to the fewest animals? Have community values been considered alongside scientific, technical, and practical information? Is the control action part of a systematic, long-term management program? Are the decisions warranted by the specifics of the situation rather than negative labels applied to the animals?

In the past, wildlife control has been a battleground for conflicting but ill-informed proposals between, for example, those who advocate culling without evidence that it will solve the problem and those who insist on nonlethal methods without evidence that these will incur a lower welfare cost to the animals or achieve the desired outcome. The principles proposed here are intended as a framework that can be used to put wildlife control on a rational, evidence-based footing. They should lead to wildlife control decisions that are seen widely as ethical, where *ethical* means all relevant concerns—including need, benefits, feasibility, and costs to people and animals—are taken into account.

The approach recognizes the legitimacy of human concerns but includes the values of the broader community and the concerns of those most affected by the target wildlife. Thus, cultural carrying capacity is seen as a legitimate factor in decisions, while recognizing that, unlike biological carrying capacity, it may vary among communities and be altered through education and by cultural change.

The inclusive approach proposed here should help reduce the controversy and opposition that control actions have often created, for example when control of introduced animals is proposed by some people purely on conservation grounds and opposed by others purely on animal welfare grounds (e.g., Perry & Perry 2008). Applying the principles represents a consequentialist approach to ethics—in the sense of weighing the different outcomes of control actions—so it could still be opposed by those who seek to base decisions on inherent rights such as the right of landowners to protect property at any cost to animals or the right of animals to live without any form of human interference (Taylor 2009).

These principles could be applied in many ways. They could be incorporated into international standards such as those of the World Organisation for Animal Health (OIE 2015) and thus inform the development of national standards for the many nations that lack them. The principles could also be incorporated into regulations and decision making by local governments and land managers, into guidelines for research, and into standards and accreditation programs for commercial animal-control businesses that want to identify their methods as ethical.

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