

Strategic animal welfare issues: ethical and animal welfare issues arising from the killing of wildlife for disease control and environmental reasons

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Summary

Ethical and animal welfare concerns about the destruction of free-living wildlife for disease control and environmental reasons have historically received little attention from animal welfare scientists, legislators or the public. Nevertheless, all vertebrates can experience pain and distress, regardless of whether they are unwanted pests or not. A wide range of methods is used to kill or otherwise control unwanted wildlife. The animal welfare impacts of most of these methods are not known. The extremely high number of animals being controlled and the potential impacts of this control on their welfare suggest that this is a significant strategic issue that should be considered by the World Organisation for Animal Health (OIE). This is particularly important, given the focus of the OIE on disease control and the requirement for pest control as a part of this process.

Keywords

Animal welfare – Disease control – Ethics – Humane pest control – Pest control – Pest management – Vertebrate pest – Welfare – Wildlife management.

Introduction

Concern for animal welfare has historically focused on the use of animals for farm livestock production, transport, sale and slaughter, and research, testing and teaching. However, innumerable, free-living, wild or feral vertebrate animals are trapped, poisoned, shot, mustered and otherwise killed or managed, because of the harm they cause to humans, other animals and the environment. Yet, little attention has been paid to the animal welfare impacts of this control. In many cases, the methods used to control the animals cause some degree of pain or distress. This pain or distress has not been quantified for most of these methods. In addition, legislation designed to protect animal welfare often excludes pests or pest control. Attitudes towards pests have contributed to this, with pests usually, and rightly in many cases, portrayed in a negative manner. Furthermore, the harm caused by pests is often considered to outweigh any concerns about their control.

Nevertheless, vertebrate wildlife pests are as capable of suffering as their captive counterparts. No one would seriously question the ability of laboratory rats (*Rattus norvegicus*) to experience pain, for instance, and their welfare is heavily protected by legislation. However, the same species in the wild is a serious commensal pest that is usually viewed with distaste. Little or no regard is paid to its welfare.

Four factors suggest that the welfare of wildlife pests is an important strategic issue that needs to be considered by the OIE:

- the scope of this problem in terms of the potential for severe compromise to the welfare of a substantial number of animals – animals which are capable of suffering
- the growing concern for the welfare of wild animals
- the minimal attention paid to the subject so far

– the focus by the World Organisation for Animal Health (OIE) on disease control, which in turn requires the control of wildlife.

In this review, drawing on their New Zealand experience, the authors:

- outline the scope of international vertebrate pest control
- outline attitudes to unwanted wildlife
- review certain legislation requiring and regulating the control of unwanted wildlife
- describe recent initiatives to assess experimentally the animal welfare impacts of vertebrate pest control methods
- discuss the animal welfare and ethical implications of vertebrate pest control
- identify priorities for future work.

Scope

Free-living wildlife are killed or controlled for a variety of reasons related to the protection of the environment and the prevention or minimisation of disease, including zoonoses. The need for such control is undeniable. For example, an irruption (sudden population increase) of ship rats, *Rattus rattus*, caused the extinction of more than six species or subspecies of birds, including three unique subspecies, on Big South Cape Island, New Zealand (10, 113). Wild animals are also controlled as a consequence of human-animal conflict, for example, because of damage caused to the infrastructure, such as roads, drainage and communication links, or unwanted contact with humans, particularly in urban environments. A dramatic example of this conflict comes from the United States of America (USA), where in one year 132 vehicle accidents caused by deer were reported in one county of one state alone, and 1,057 deer carcasses were removed from collisions that had not been reported (1).

The economic cost of the damage caused by pests is likewise significant. In Australia, for example, the annual cost of European rabbits (*Oryctolagus cuniculus*) has been estimated to be between 600 million and one billion Australian dollars (approximately 350 to 600 million Euros) (2). In addition, the annual economic losses caused by feral pigs (*Sus scrofa*) are estimated at Aus\$100 million (about 58 million Euros) (15). A 1999 report put the annual cost of rat damage in the USA at US\$15 per rat per year – a total of more than US\$19 billion (about 14.5 billion Euros) per year, without including the costs of rats to the environment and as vectors of zoonoses (88).

It is impossible to quantify the number of wildlife pests killed on a global scale. Some individual cases include the following: in the United Kingdom (UK) it was reported that 378 registered hunts and unregistered packs killed around 20,000 foxes, hares, deer and mink annually (101), and up to 20 million rats and mice are killed annually (30). During plague episodes, the numbers are likely to be much higher (14). The Wildlife Service of the US Department of Agriculture reported that it killed a total of almost 1.7 million animals in 2003 to control damage to the environment, agriculture and to public health and safety. About 5,000 of these deaths were non-target animals (105). Mason and Littin (66) provide further examples.

Representatives of all vertebrate phyla are subject to control: mammals, birds, fish, reptiles and amphibians. The methods used to kill or otherwise manage unwanted wildlife are, therefore, wide-ranging. Lethal methods include the following:

- shooting
- hunting with bows
- hunting with dogs
- explosives
- electrocution
- traps, nets and snares
- poison baits, injections and gases
- encouraging disease
- the introduction of predators
- fishing
- burrow collapse
- drowning
- methods of preventing lactation so that milk-dependent young die.

Non-lethal methods include the following:

- live capture traps from which animals are later released
- repellents and deterrents
- physical barriers such as exclusion fences
- fertility/breeding control.

Historically, concern for animal welfare has focused on farm animals (their production, transport and slaughter) and the use of animals in research, testing and teaching, rather than on pest animals, although some of the more inhumane pest control methods have been disfavoured. Now, however, the concern that animals be treated

humanely is being extended to pests, as indicated by the following:

- an apparent increase in public concern for pests as sentient animals
- increased interest by non-governmental organisations (NGOs) and animal welfare charities
- in some cases, the development of legislation requiring that pest control methods should be humane.

Concern for wildlife pests

Public concern

Public concern varies with the species of animal in question, personal and cultural backgrounds, and several other factors (16). For instance, a New Zealand trial involving the use of diphacinone (an anticoagulant poison) for cats was halted due to adverse publicity, despite similar anticoagulants being used for other species, including ferrets (*Mustela furo*), rodents, rabbits (*O. cuniculus*), brushtail possums (*Trichosurus vulpecula*) and pigs (*S. scrofa*) (113). A proposed operation to kill koalas (*Phascolarctos cinereus*), which are outstripping their food source on Kangaroo Island, South Australia, has recently caused similar concern.

A recent study on the public perception of the control of brushtail possums in New Zealand clearly illustrates public concern for the welfare of what is considered a serious – if not the most serious – pest in New Zealand. Farmers, indigenous people (Maori) and representatives of animal welfare and animal rights groups were strongly opposed to the use of certain methods of control under any circumstances, on the grounds that they were considered too inhumane. In other cases, humaneness could be weighed against effectiveness, safety and other concerns (77). Similar studies in Australia and New Zealand have shown an acceptance of the need for pest control, but concern that the control must be necessary and/or humane (16, 77).

Concern from non-governmental organisations and animal welfare charities

Animal welfare charities and other NGOs that focus on animals, along with animal welfare charities, tend not to discriminate among animals on the basis of species. Several have policies on humane pest control. The Humane Society of the United States, for example, has draft standards for the licensing of 'wildlife control operators' (42) and guidelines for the humane control of some wildlife pests (40). The Royal Society for the Prevention of Cruelty to Animals (RSPCA) of Australia has a detailed

policy covering the use of traps and poisons for wildlife control (93). The Royal New Zealand Society for the Prevention of Cruelty to Animals (RNZSPCA) also has an animal welfare policy on wildlife and the environment which encompasses wildlife control (92). Loague (60, 61), Oogies (84) and Ben-David (11) describe some NGO attitudes toward pests.

Legislative regulation of pest control

There are legislative obligations in several countries to reduce or avoid the negative impacts of pests on people, animals and the environment, through pest control. There are further obligations to reduce or avoid the negative impacts of the control itself. Indeed, much legislation on the management and control of vertebrate animals is explicitly written to protect the safety of people, animals and/or the environment. Some of these obligations are in the form of regulations which must be followed, while others take the form of conventions or treaties, where there is no legal requirement to comply.

Pest control legislation has two principal aims, as follows.

a) The first aim is to require pest control to be conducted. This includes legislation covering:

- species protection
- biodiversity
- biosecurity
- human health obligations.

b) The second aim is to manage the species being controlled and the methods of control. There are usually provisions for exceptions. For example, restrictions on which species are allowed to be controlled may be waived to protect public health and safety or to prevent serious damage to valuable resources.

Legislation for pest control in New Zealand, Australia, Europe and the UK is outlined below, to provide examples.

New Zealand

New Zealand legislation that covers vertebrate pest control, in particular, both of the aims stated above, includes:

- the Wildlife Act 1953
- the Wild Animal Control Act 1977
- the Biosecurity Act 1993.

Laws which regulate pesticides and/or traps include:

- the Hazardous Substances and New Organisms (HSNO) Act 1996

- the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997
- the Resource Management Act 1991
- the Animal Welfare Act 1999.

The Animal Welfare Act restricts inhumane and inappropriate practices towards animals by requiring people who own or are in charge of animals to meet their physical, health and behavioural needs, and avoid causing or allowing unnecessary or unreasonable suffering. The definition of animal includes the following: any

- mammal
- bird
- reptile
- amphibian
- fish
- octopus
- squid
- crayfish
- lobster
- mammalian foetus
- avian or reptilian pre-hatched young in the last half of development
- marsupial pouch young.

There are two relevant exemptions from the main provisions of the Animal Welfare Act (sections 175, 181), as follows:

- a) hunting and killing by any means, including with the use of dogs, of:
 - animals in a ‘wild state’ (i.e. free-living animals)
 - ‘wild animals’ (as defined by the Wild Animal Control Act)
 - ‘pests’ (as defined by the Biosecurity Act, and including feral cats, dogs, rodents, rabbits and hares, grass carp, koi or European carp, silver carp and mosquito fish and including mustelids that are not held under licence)
 - animals in safari parks
- b) the use of agricultural compounds registered and used in accordance with the conditions or controls specified by the ACVM Act, or hazardous substances approved and used in accordance with the conditions or controls specified by the HSNO Act. Vertebrate pesticides are classified as agricultural compounds and hazardous substances. Animal welfare concerns with vertebrate pesticides are addressed by the ACVM Act.

Nevertheless, anything that falls outside ‘normal’ hunting and killing practices and is considered to cause unreasonable or unnecessary pain or distress could be considered unacceptable under the Animal Welfare Act (76).

Traps are controlled by regulations made under the Animal Welfare Act, as well as requirements in the Act itself. Regulations can be introduced to prohibit or restrict the use of traps and electrical devices (including glueboards, snares and nets, but excluding those used for fish) if they are considered to cause unreasonable pain or distress and if they are unable to be modified to improve humaneness. For example, prohibitions and restrictions can control the sale or use of a particular type or class of trap, the species on which traps are used or the area in which they are used.

Australia

In Australia, animal welfare and vertebrate pest control regulation is subject to State or Territory legislation, as well as Commonwealth (federal) legislation. The situation is largely similar to that in New Zealand, in that there is legislation requiring pest control (such as state wildlife conservation and management acts) and legislation regulating pest control (such as that controlling vertebrate pesticide manufacture and use). Furthermore, vertebrate pest control is often exempted from statutes on the prevention of cruelty to animals or animal welfare, although it is likely that anything considered unreasonable or unusual would not be exempt. Oogjes (84) has reviewed the inclusion of vertebrate pest control in Australian policy and legislation. There are also national and state policies or guidelines on the humane control of wild animals (the *Model Code of Practice for the Welfare of Animals: feral livestock animals* [3] is one example), and further policies which require those planning pest control operations to take the effects on animal welfare into consideration.

One recent initiative is the development of a draft national strategy for humane vertebrate pest control (43), suggesting specific steps to ensure that:

- vertebrate pest control is necessary
- consequent pain and distress are minimised
- the benefits of control are maximised.

In addition, goal 2 of the recently released Australian Animal Welfare Strategy (AAWS) includes the aim to: ‘Promote the development and use of humane and effective methods to control pest animals in Australia’. The AAWS is intended to give direction for the development of policies on animal welfare. It provides a framework for the clarification of roles and responsibilities and the setting of future standards, priorities and strategic goals.

The United Kingdom and Europe

Animal welfare and pest control in Europe is subject to domestic and European Council legislation, as well as any binding international agreements. Pest control is required by legislation, which sometimes regulates it, sometimes not (102). For example, the United Nations 1992 Convention on Biological Diversity requires the control of foreign species which threaten 'ecosystems, habitats or species' (102), and the UK Food and Environment Protection Act 1985 requires the development and use of methods to protect human and environmental health, including safe, effective and humane pest control.

The Habitat and Species Directive, the Council of Europe 1979 Convention on the Conservation of European Wildlife and Natural Habitats (the 'Berne Convention') and the 1979 Directive on the Conservation of Wild Birds (the 'Birds Directive') all require populations to be managed at appropriate levels (which could presumably require the killing of surplus animals). They also allow the limited killing of certain species to solve specific problems (e.g. threats to conservation, public health and safety, or valued resources). These agreements also regulate control methods; for example, by prohibiting certain techniques, such as large-scale or indiscriminate control methods or the use of poison for killing particular animals (102).

European Council Regulation 3254/91 prohibits the use of leghold traps. It also prohibits the importation of skins and manufactured goods of certain wild animal species from countries that use leghold traps or trapping methods which do not meet international humane trapping standards. There are further limitations on vertebrate pesticide use in Europe, including the requirement that certain vertebrate pesticides used in the UK be assessed for humaneness to the target species, as part of the approval process (104).

Review of research

Animal welfare research has not historically focused on pests or pest control. Indeed, the impact on animal welfare of many methods used to kill or otherwise manage unwanted wildlife is not known. Furthermore, animal welfare scientists in general have not focused significant attention on the welfare of pests. Kirkwood *et al.* (53), Gregory (32, 33, 37), Broom (13), Spedding (101) and Littin *et al.* (58) provide a few notable exceptions. There have also been at least two symposia on humane vertebrate pest control (28, 45), in addition to papers in other conference proceedings (4, 87). The ethical implications of pest control have been discussed by Marks (63, 64), Singer (99), Oogjes (84), Eggleston *et al.* (27), Morris and Weaver (70) and Littin *et al.* (58), among others. In the following

paragraphs, the authors review the available information on specific control methods and their impact on animal welfare, including data based on experimental assessments.

Historically, concern about the humaneness of methods used to control unwanted wildlife has focused on leghold traps, and the more inhumane poisons, such as arsenic and strychnine. In Europe, this concern began more than fifty years ago and led to the withdrawal of these methods. Research in Canada was driven by similar concerns (91, 110). Likewise, concern about the impact of the Lanes-Ace toothed leghold trap ('gin trap') on mustelids in New Zealand prompted the introduction of the Fenn trap (48, 51), and the development of a more humane cage trap for mustelids (51). New Zealand research into testing and improving the humaneness and target specificity of existing possum traps, among others, while maintaining desirable features such as trapper safety, began in the early 1980s (e.g. 24, 72, 81, 106, 107, 110, 111, 112, 114, 115, 116). This research has led to the development and use of traps that cause less severe injuries, and which are now favoured by pest control managers (51, 95, 107). It has also contributed to the following:

- the development of international standards for trap efficacy and humaneness (46, 109)
- a New Zealand standard approved by the National Animal Welfare Advisory Committee
- an initiative by the World Conservation Union to develop a single international standard for traps.

The focus on the animal welfare impacts of poisons has not been as strong. Rowsell *et al.* (91) and the Ministry of Agriculture, Fisheries and Food (104) describe experiments assessing the animal welfare impacts of several rodenticides. Kirkwood *et al.* (53) and Sainsbury *et al.* (96) discuss the humaneness of anticoagulant poisons for rodents. Mason and Littin (66) review the humaneness of several rodent control methods. There have been only a few studies specifically intended to assess the animal welfare impacts of vertebrate pesticides. These include studies on the impacts of cyanide (38), brodifacoum (57) and other poisons on brushtail possums (82), and 1080 on foxes (*Vulpes vulpes*) (65). There have also been studies, describing the effects of certain poisons on particular animals, the results of which can be used to assess the animal welfare impacts. For instance, Desheesh (23) and Cox and Smith (22) describe the impact of anticoagulants on rats.

Further research is aimed at improving existing vertebrate poisons or developing novel ones which compromise animal welfare less while still being safer for people and the environment and more target-specific (18, 25, 31, 39,

116). For example, Marks *et al.* (65) describe the amelioration of possible suffering in foxes poisoned with 1080. Cook (18) reports a reduction in behaviour related to anxiety and gastric discomfort in Norway rats (*R. norvegicus*) poisoned with 1080. Further research aimed at making poisons more effective and target-specific (e.g. 31) has obvious advantages for animal welfare (116).

Biological control methods are also being investigated worldwide. The sentiment is often expressed that biological control methods are humane. This cannot be accepted uncritically, but must be assessed on a case-by-case basis. New Zealand researchers are working on the immunosuppression of reproduction and the introduction of parasitic and other disease agents to control, for example, possums (20, 21) and mustelids (50, 62). Studies in New Zealand have also complemented Australian research into rabbit haemorrhagic disease before the illegal introduction of the causative agent (a calicivirus) into New Zealand in 1997 (55, 71, 78). Animal welfare has been and remains an important factor in the selection process for possible biological control options (29, 55). Biological and non-lethal control methods are also being explored in the UK, with similar considerations for animal welfare.

Further literature is available on the other methods used to destroy wildlife. For instance, Gregory explores the animal welfare implications of shooting, hunting, explosives, electrocution, traps, poisons, disease, predators, deterrents and repellents (36, 37).

Impact of pest control on animal welfare

From the literature, it is clear that vertebrate pest control carries inherent risks to animal welfare, to both target and non-target animals. These risks are mainly to target and non-target animals that are killed or injured by the control method, in addition to target or non-target animals that are not directly exposed to the control method but are indirectly affected. This indirect impact occurs through the effect on the environment of these animals, and on the other animals with which they interact, or on which they depend. The animal welfare impacts of any control method depend on the following:

- the capacity of the species to suffer
- the duration of pain, distress or suffering
- the intensity of pain, distress or suffering
- the number of animals affected (see 58).

The duration of suffering is the length of time from the onset of the signs of poisoning until the loss of

consciousness or death. Table I summarises the main features of each method that has implications for animal welfare. It was adapted from Warburton and Eason (113) and includes information from Sadleir (95), Morriss *et al.* (72), Eason and Wickstrom (26), Mason and Littin (66), Gregory (36), and Warburton and O'Connor (116).

In practice, the animal welfare impacts of pest control may be limited by careful application of the method and good quality control (17, 31, 72, 89, 116). This is discussed further below.

Consensus on relative humaneness

Some science-based comparisons have been conducted on the relative humaneness or acceptability of various methods used for the destruction or control of wildlife. Such comparisons are difficult, however, as the way in which control methods are applied can affect their animal welfare impacts, as noted above. On the basis of their own experiments, O'Connor *et al.* (82) suggest that cyanide, particularly encapsulated cyanide, is the most humane poison for controlling brushtail possums. They moreover conclude that 1080 use is acceptable, that phosphorus and cholecalciferol should be used only with adequate justification, and that brodifacoum should only be used if there are extremely good practical reasons. On the basis of experimental studies and several reviews of rodent control methods and their effects, Mason and Littin (66) similarly recommend cyanide and alpha-chloralose for killing rodents, along with other methods that do not require toxic agents, and rank the alternatives. When outlining ways to achieve humane pest control, Gregory (36) suggests the following:

- greater use of non-lethal methods, such as repellents
- replacing traumatic capture methods, such as leghold traps, with humane kill traps
- ensuring that animals shot with shotguns die quickly.

He further suggests the phasing out of inhumane poisons, noting that alpha-chloralose, carbon monoxide and cyanide are relatively humane.

Obviously, the most favoured methods of killing should be those that cause little or no interference with the animal before a rapid death. One method which fulfils this aim is shooting (as long as the animals are not pursued for prolonged periods prior to shooting and are killed quickly). Kill traps, when they cause rapid unconsciousness, might be more favourable than biological control methods. Poisons that cause a rapid loss

Table I
Main features of control methods that have implications for animal welfare

Control method	Factors which affect animal welfare
Traps (restraining)	Injuries and other effects of capture (physiological stress, distress, hypothermia/hyperthermia, starvation) Duration of capture Design and location of trap (affects risk to non-target animals and location of injury) Manner of death (if this occurs) Escape of injured animals
Traps (killing)	Manner of death Impact momentum, clamping force and location of strike (for traps reliant upon concussion/carotid occlusion/strangulation) Design and location of trap (affects risk to non-target animals and effectiveness of trap) Escape of injured animals
Poisons	Mode and duration of action Non-target effects Bait characteristics – size, location, density, presentation, attractiveness, longevity/keeping quality, concentration of poison (affects dose consumed and risk of sub-lethal poisoning) Individual and species differences in age, sex, reproductive condition and other variables
Biological control	Mode and duration of action Individual and species differences in age, sex, reproductive condition and other variables
Shooting	Stress/distress during chase Rifle calibre Accuracy (shooter skill) Escape of injured animals Location of shot Type of projectile/bullet
Use of dogs	Injury to dog Injury caused by dog Stress/distress during chase Restraining or killing method Escape of injured animals

of consciousness or death might be considered more favourable than leghold traps. Leghold traps that only cause very slight physical injury (or none at all) could potentially be more favourable than poisons with a moderate length of action and low-to-moderate severity and more favourable still than poisons which have moderate-to-high severity or are slow to act – but this would depend on the time taken to retrieve animals from the trap, and the method used to kill them. Non-lethal methods may be favourable in several situations, but

cannot be accepted uncritically as better for animal welfare. For instance, the welfare impacts of capture-and-release technologies should be evaluated fully before widespread application (9, 68).

The ethics of killing unwanted wild animals

One approach to ethical consideration is to ask:

- a) whether an action is necessary
- b) whether it is justified.

If the answer to both questions is ‘yes’, then that action can be considered to be ‘ethical’ or ‘ethically correct’. These two questions can, and should, be asked of pest control, just as they should be asked of any other action involving animals.

This is because:

- a) vertebrate pests, at least, are capable of experiencing pain and distress (6, 12, 34, 54, 94, 97), and possibly other mental states that lead to suffering, including fear and extremes of thirst and hunger
- b) pest control involves the actions of people upon animals, regardless of whether those animals are free-living or not, and never or rarely seen by humans, and it has been argued that interference with animals in any situation by humans must be necessary and justified (5, 32, 100).

It has been further argued that some forms of human interference may never be considered justifiable because, for example, they cause harm of an unacceptable nature (5, 13). This premise, too, can be extended to the control of vertebrate pests.

Considering whether pest control is necessary

The ethical obligation to ensure that pest control is necessary has two main implications. First, is it necessary to control the pests at all (33, 64)? Secondly, is it necessary to kill the pests in order to control them?

With regard to the first question, there are several reasons why a decision might be made not to proceed with pest control (58). One very cogent reason is the need for a full understanding of the consequences of beginning control (58). For example, predators may begin to consume threatened native species when their preferred prey has been eradicated as part of a pest control programme, as reported of ferrets following rabbit control in New Zealand (79). Conversely, it could be argued that pest control must

always be undertaken because human understanding of a problem brings with it an obligation to try to solve that problem. Furthermore, if people caused the problem by interfering, then it could be argued that people are therefore responsible for rectifying it (63, 101). It can also be argued that humans are obliged to control pests to protect people, other animals and valued features of the environment (63, 73).

A feasible alternative to pest control, which is being considered for several wildlife vectors of zoonoses, is vaccination. For instance, research in New Zealand has investigated the possibility of vaccinating brushtail possums against bovine tuberculosis (19) and programmes are under way in the USA and Europe to vaccinate wildlife against rabies. Vaccinating livestock to prevent the development of disease could also be considered as an alternative.

If the decision is made to proceed with pest control, then it must also be decided whether killing is necessary, or whether non-lethal methods, such as exclusion, relocation or repellents, would be more suitable. Even if a pest control method that involves killing is used, non-lethal methods should also be initiated, to ensure that all target pests are exposed to pest-control methods, and that other pests do not return to an area in which pest control has already been conducted (66). For instance, immunocontraception could reduce the rate at which pest populations recover between lethal control operations, thereby reducing the required frequency of such operations (116).

Considering whether pest control is justified

A cost-benefit analysis is often used when deciding whether to take a particular action, i.e. that action is considered to be justified if the benefits outweigh the harms. In the case of pest control, the analysis is complicated by the need to take the interests of people, animals and the environment into account, since all three will be affected (58). Moreover, any such decision will also be affected by the context in which the judgement is made, and the value placed upon each of the interests (35, 64, 71, 83, 84, 110). While justification for pest control may be easily accepted in some cases, for instance, where diseases such as rabies or tuberculosis cause suffering to human and animal victims, it may not be so easily accepted in others – for instance, where animals are killed to protect a threatened plant (63, 64, 99), or numerous pest animals are killed to protect a few endangered animals (63, 64).

The culling of iconic species is another challenging area. One recent example is the controversy surrounding the proposed control of koalas on Kangaroo Island, off the coast of South Australia. Animal welfare interests argue that the animals are suffering due to a lack of feed and

should be controlled; environmentalists blame the lack of feed on the reduced amount of land available to the koalas, due to farming. Tourist operators add that visitors do not want to see starving koalas.

Battye (7, 8) suggested that justification on the basis of a cost-benefit assessment (where an action is considered justified if the benefits outweigh the harms) could be considered flawed because it implies that it is justifiable, without restraint, to obtain desired benefits at the expense of some victims (7, 8). Justification for pest control can be strengthened ethically, and biases based upon context and value removed, by making sure that the benefits of the action are maximised and the harms caused are minimised, so that the separation between the benefits and the harms is the greatest that can feasibly be achieved (7, 8). Ethically, therefore, it must be ensured that, as far as possible, all of the anticipated positive impacts of control are maximised and all the anticipated negative impacts are minimised.

The benefits of a control programme include the direct positive outcomes, or primary benefits, and the indirect or secondary benefits. These secondary benefits include opportunities offered by the control itself (e.g. hunting safaris) or use of the by-products (e.g. fur, fibre, antlers). While the need to maximise primary benefits seems unarguable, the pursuit or maximisation of secondary benefits can be argued against (58). For instance, trading in products derived from pest control may subvert such control by making the pest a valuable resource. This would impede the drive for eradication by creating a commercial reason to retain a sustainable population of pests (60, 80, 83). Nonetheless, trading usable products that would otherwise be wasted from the justified control of pests is a benefit that should be considered, in view of the ethical requirement to maximise all benefits.

Minimising harm is an aim that is less easily argued against. However, it is not always possible to minimise harm to people, target and non-target animals and the environment at the same time. For example, humane tools may not be the most effective at killing (110). In any case, harm to animal welfare can be minimised through the following:

- using the most humane control tools practicable in any situation
- researching ways to improve the humaneness of current methods
- developing novel, more humane control methods.

Researching the humaneness of pest control methods

The ethical, and sometimes legislative, requirement to determine and improve the humaneness of pest control

methods requires research involving the testing of pest control methods on animals. The authors suggest that there are several ethical and animal welfare issues unique to this situation (56, 70, 116). These relate to the ethical obligation to try to replace animals in research with non-animal models or less sentient animals, to reduce the number of animals being used and to refine the experiment to minimise suffering. These obligations, known as the 'Three Rs' (replacement, reduction, refinement), must be weighed against the ethical obligation to perform the research.

First, testing for effectiveness is required. Historically, this involved the mandatory use of the lethal dose 50 (LD₅₀) test. However, this can now be replaced by tests involving sequential dosing, such as the 'Fixed-Dose' procedure, the 'Acute-Class' method and the 'Up-and-Down' procedure (see 117).

Secondly, to assess the humaneness of a pest control method, the suffering caused by the method must be evaluated. This normally means that a lethal endpoint, rather than a humane endpoint, is used.

Thirdly, because the suffering must be evaluated, the use of anaesthetics or analgesics, or any other mitigating agents, is normally inappropriate.

A fourth consideration with the use of vertebrate pesticides is that the pesticide often needs to be tested on the target species, rather than on a surrogate.

Progress is being made towards the Three Rs with this research, however (116). For instance, trap testing protocols have been developed to ensure that the minimum number of animals required for a known statistical outcome is used, and computer simulation and mechanical testing are common in trap assessment (116).

Future work

There are several ways forward. A practical way of minimising the negative animal welfare impacts of pest control is to follow certain ethical and practical operating principles closely, such as those given below (58), when considering a control programme:

- the harms, aims and benefits of each control programme must be clear
- control must only be undertaken if those aims can be achieved
- the methods that most effectively achieve the aims of the control programme must be used
- the methods must be applied in the best possible way

- whether or not each control programme actually achieves its precise aim must be assessed
- once the desired aims or benefits have been achieved, steps must be taken to maintain the beneficial state
- pest control methods must be continually improved to cause the least amount of harm and produce the maximum benefit.

The harms, aims and benefits of each control programme must be clear

Harms and benefits must be identified so that they can be minimised or maximised accordingly, and so that the need for the control programme can be determined. This requires a sound understanding of the impact of the pest in each case. For instance, it would be purposeless to eliminate one pest species from an area if that merely allowed another pest to dominate, with equally negative, although possibly qualitatively different, impacts. It must be decided whether the aim is to eradicate, to reduce or to avoid the impact of the pest, as the control method may be different or conflicting in each case (83).

Control must only be undertaken if the aims can be achieved

If the proposed benefits are not achievable, the control programme cannot be justified (64), because the reason for that programme was the projected benefit. The certainty of benefit must be assessed and, even if the harm caused is small, control should not be undertaken if the certainty of benefit is low (41).

The methods that most effectively achieve the aims of the control programme must be used

The method chosen must kill or deter the most target pests with the least harm to non-target animals, people and the environment. This means that the method must be appropriate for the species and the situation (49, 52, 59, 83). The choice will therefore depend on knowledge of which methods can best achieve the aims with the target species in their particular locations. For instance, aerial spreading of 1080 poison to kill possums may be necessary in inaccessible areas, as opposed to manual placement in bait stations for less remote regions.

The methods must be applied in the best possible way

This is achieved by good quality control applied to, for example, the manufacture, selection, operation, placement, maintenance and effective use of devices,

poisons and other components of each control method (47, 49, 51, 52, 69, 98, 116).

Whether each control programme actually achieves its precise aim must be assessed

In reality, control programmes do not always achieve their aims. The success or otherwise of the programme must be carefully determined so that, if necessary, methods can be changed to those that are more likely to achieve the desired aims. The real measure of success is whether a pest control programme reduces the negative impacts of pests, not merely whether the number of pests is reduced (49, 84).

Once the desired aims or benefits have been achieved, steps must be taken to maintain the beneficial state

If this is not done, the control programme and any suffering it causes will be purposeless.

Pest control methods must be continually improved to cause the least amount of harm and produce the maximum benefit

If those responsible for pest control do not continually strive towards a 'gold standard' of zero harm and maximal benefit, the situation will remain as it is now – far from ideal. All incremental steps towards this ideal standard

enhance the ethical credibility of research workers and help to meet the obligations placed upon them by legislation and a concerned public (67). Furthermore, the capacity of any animal to become a pest should be thoroughly researched before it is introduced or before its negative impacts increase to a level sufficient to cause harm. This will help to avoid negative impacts of new pests and related pest-control measures in the future (60).

To help in adhering to these principles, there are numerous practical reports and guides on the choice and effective use of killing and control methods and monitoring. These include advice on the capture or killing of mustelids (47, 49, 51, 52, 69, 90), possums (75, 103), cats (74) and fish (34). Documents that outline pest control strategies may also be useful (85, 86, 108).

There is an obvious need for further research to fill gaps in the knowledge. Mason and Littin (66) recommend research in several important areas, with a focus on rodent control, as does Jones (44), who targets Australian pests. These authors and others (36, 43, 58) reiterate that the consideration of animal welfare impacts should be mandatory when evaluating new and existing control methods and programmes. In addition, research to assess and improve the humaneness of existing techniques, as well as to develop more humane, novel techniques, should be strongly encouraged and well funded. Non-lethal methods, as an alternative to or in addition to lethal methods, should also be investigated and used.

Questions stratégiques concernant le bien-être animal : problèmes éthiques découlant de l'abattage de la faune pour des raisons prophylactiques et environnementales

K.E. Littin & D.J. Mellor

Résumé

Pendant longtemps, les préoccupations d'ordre éthique et de bien-être animal liées à la destruction de la faune sauvage pour des raisons prophylactiques et environnementales ont peu intéressé les scientifiques spécialisés dans le bien-être animal, les législateurs ou le grand public. Pourtant, tous les vertébrés peuvent connaître la douleur et la détresse, qu'il soient ou non des animaux ravageurs. Un large éventail de méthodes est utilisé pour détruire les animaux sauvages indésirables ou pour lutter contre eux. On ignore l'impact sur le bien-être animal de la plupart de ces méthodes. Le nombre extrêmement élevé

d'animales qui en sont la cible et l'impact potentiel de ces mesures de lutte sur leur bien-être donnent à penser qu'il s'agit là d'une question stratégique importante qui mérite d'être examinée par l'OIE (Organisation mondiale de la santé animale). Cela est particulièrement important compte tenu de l'attention prioritaire prêtée par l'OIE à la lutte contre les maladies et de la nécessité de lutter contre les animaux nuisibles dans le cadre de cette action.

Mots-clés

Bien-être – Bien-être animal – Éthique – Gestion de la faune – Gestion des ravageurs – Lutte contre les maladies – Lutte contre les animaux nuisibles dans des conditions décentes – Lutte contre les animaux nuisibles – Ravageur vertébré.



Consideraciones estratégicas en torno al bienestar de los animales: dilemas éticos resultantes del sacrificio de la fauna por motivos de control sanitario o protección ambiental

K.E. Littin & D.J. Mellor

Resumen

Históricamente, los científicos especializados en bienestar animal, así como los legisladores y el gran público, han prestado poca atención a las cuestiones relacionadas con la destrucción de la fauna salvaje en libertad por motivos de control sanitario o protección del medio ambiente. Sin embargo, al margen de su posible condición de plaga indeseable, todos los vertebrados pueden experimentar dolor o sufrimiento. Existen muchos métodos para matar, o controlar de algún otro modo, a la fauna salvaje indeseada, pero en general se desconocen los efectos que acarrearán en términos de bienestar animal. La elevadísima cifra de animales a los que se aplican medidas de lucha y la posibilidad de que estas medidas influyan en su bienestar llevan a pensar que este es un tema de importancia estratégica, digno de estudio por parte de la OIE (Organización Mundial de Sanidad Animal). La cuestión cobra especial relevancia a la luz del papel central que la OIE otorga al control de enfermedades y a la exigencia de luchar contra las plagas como parte de este proceso.

Palabras clave

Bienestar – Bienestar animal – Control de enfermedades – Control de plagas – Control de plagas por medios decentes – Ética – Gestión de plagas – Manejo de la fauna – Plagas de vertebrados.



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