

## Toward a synthesis of conservation and animal welfare science

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### Abstract

Conservation biology and animal welfare science are multidisciplinary fields of research that address social concerns about animals. Conservation biology focuses on wild animals, works at the level of populations, ecological systems and genetic types, and deals with threats to biodiversity and ecological integrity. Animal welfare science typically focuses on captive (often domestic) animals, works at the level of individuals and groups, and deals with threats to the animals' health and quality of life. However, there are many areas of existing or potential overlap: (i) many real-life problems, such as environmental contamination, urban development and transportation, create problems for animals that involve both welfare and conservation; (ii) research methods from each field are needed to address some of the scientific problems of the other; and (iii) policies and practices targeting either conservation or animal welfare may prove unproductive if they do not take account of both areas of concern. Moreover, scientists in both fields face the common challenge of applying science to guide policy and practice, often to issues that are both empirical and ethical, and often under conditions of uncertainty. There are many cases where communication and co-operation between the fields should lead to better science and better practical outcomes.

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Concern over animals — especially concern over the adverse effects of people on animals — has developed along two fairly distinct lines in modern Western thought.

One of these, which we might loosely term 'animal welfare', focuses on how human actions affect individual animals and their quality of life. A traditional view, which developed rapidly in British culture during the 1700s and 1800s, centred on acts of cruelty and neglect directed toward domestic or captive animals (Harwood 1928). Laws enacted in Great Britain serve to document the concerns and their focus: an 1822 law was designed to prevent cruelty to cattle; a ban on bull-baiting (a cruel sport) was passed in 1835; a law to regulate the use of animals in research was created in 1876; and later provisions served to protect ponies used in mines, to limit the export of horses, and to prevent cruelty to wild animals used for entertainment (Turner 1964). The scope of concern subsequently expanded in the 1900s to include harms caused by institutionalised forms of animal use, especially in industrialised food production.

A second line of thought might loosely be termed 'animal conservation'. The extermination of wild animals in parts of Europe had attracted little response in earlier centuries, but when similar events followed in the New World, they created a sense of alarm. By the 1890s, the great herds of bison in America had been reduced by hunting from many millions down to a few hundred individuals (Hornaday 1889). By 1914, the passenger pigeon had been driven to

extinction from a population estimated in the billions (Conrad 2005). And many other species — wolves, beavers, wild cats and others — had been reduced to a small fraction of their former numbers living on a small fraction of their former range (Paquet & Darimont 2010). Some of these changes were welcomed as part of an economic programme to 'conquer' nature, but as perceptions began to shift, the changes came to be seen more as tragedies. In response, a conservation movement began to form to protect natural populations and ecological systems from damaging levels of exploitation. The movement was clearly present in 1892 with the founding of the Sierra Club, and it achieved legal successes in the New World during the early 1900s (Dunlap 1988), roughly a century after the animal protection movement had achieved the earliest anti-cruelty laws.

Since the 1960s, both the animal welfare and animal conservation movements have increasingly recruited scientific research to help understand problems, identify solutions, and thus act as a guide to action and policy. The scientific study of animal welfare acquired an important champion in 1965 with the publication of the essay, 'The assessment of pain and distress in animals' by ethologist WH Thorpe (1965). Thorpe laid out an agenda for the scientific study of animal welfare. He proposed studying traditional veterinary concerns of disease and injury, together with physiological indicators of stress, behavioural indicators of pain and discomfort, studies of motivation that is thwarted in confinement, and studies of the preferences that animals

show for different environments. The result was a strongly multi-disciplinary field that incorporated elements of veterinary medicine (pathology, epidemiology), stress physiology and animal behaviour, with the empirical work resting on certain value-based assumptions about the moral significance of animals and their quality of life (Fraser 2008). The research ranged from basic to applied. More basic work dealt with broad issues such as how science can shed light on affective states in animals, and the link between stress physiology and health; more applied research tried to understand the preferences, motivations and environmental requirements of various animal species kept for food production and other purposes. A journal specialising in applied animal behaviour, which carried much of the early scientific research on animal welfare, began publication in 1974 (AF Fraser 1974); a seminal book-length introduction to the field was published by Marian Dawkins in 1980; and the journal *Animal Welfare* began publication in 1992.

Conservation biology was visible as a field at least in 1968 with the founding of the European journal, *Biological Conservation*. This was joined in 1985 by the American journal, *Conservation Biology* and the founding of the Society for Conservation Biology. Like animal welfare science, the field was strongly multi-disciplinary with elements of genetics, population biology, biogeography and ecology. It also included a range of basic research on topics such as the interdependence of species and threshold effects in ecological processes, combined with highly applied work on the conservation of specific habitats and species. Moreover, like animal welfare science, conservation biology was also based on certain value-based assumptions, such as the importance of ecological complexity and biological diversity (Soulé 1985).

Despite the similar history of the fields, communication between animal welfare scientists and conservation biologists has been meagre. With a few notable exceptions (eg Bradshaw & Bateson 2000), animal welfare scientists largely ignored conservation biology, and some conservation biologists emphatically distanced themselves from animal welfare. In his agenda-setting essay called 'What is conservation biology?' Michael Soulé (1985) wrote:

"Although disease and suffering in animals are unpleasant and, perhaps, regrettable, biologists recognize that conservation is engaged in the protection of the integrity and continuity of natural processes, not the welfare of individuals. ... Conservation and animal welfare ... are conceptually distinct, and they should remain politically separate."

The result of the above developments is that today we have two fairly separate bodies of science, both rooted in social concern about animals, but viewing animals through two different lenses and addressing different concerns in different ways. Conservation biology is focused on wild animals; it addresses concerns at the level of populations, ecological systems and taxa; and its key topics include biodiversity, extinction, and ecological integrity. In contrast, animal welfare science is focused on captive animals, most of which are domesticated; it addresses

concerns at the level of individuals and groups; and it is concerned about the health of animals, their quality of life and their affective states, especially negative states such as pain and distress (Rawles 1997).

But is this the optimal — or even a viable — state of affairs? In case after case (many of which are described more fully in this volume), we see real-life problems that have implications for both conservation and animal welfare. The use of agricultural pesticides and other chemicals has had profound effects (Littin 2010; Mathews 2010), including the illness and death of individuals and the crash of natural populations. Human transportation systems create major problems for animals including fragmentation and alienation of habitat (Paquet & Darimont 2010) coupled with death and injury of individuals (Forman & Alexander 1998). Structures such as windows, tall buildings and communication towers injure and kill birds (Klem 1990) in numbers that may threaten populations (Anderson 2003). Human actions have led to the spread of animal diseases such as rinderpest, with catastrophic consequences both for individuals and for populations of domestic and wild animals (Blancou 2003; Mathews 2010).

Should these impacts on animals — caused by agriculture, transportation, communication, urban development and virtually all forms of human activity — be classified as conservation problems or animal welfare problems? In some cases — such as agricultural practices that kill and injure abundant rodents — the animal welfare problem is clear but there is relatively little concern for conservation. In other cases — such as the dwindling of threatened populations through reproductive failure — the conservation issue is clear but the implications for animal welfare are only modest. In a great many cases, however, both animal welfare and conservation are clearly involved: animals suffer and die, ecological systems are disturbed, and in extreme cases taxa are threatened with extinction. Indeed, in the words of Paquet and Darimont (2010), "The same human activities driving the current extinction crisis are also causing suffering, fear, physical injury, psychological trauma, and disease in wild animals". Moreover, in a century when the human population will reach levels never before experienced, and when growing prosperity in emerging economies may allow billions of people to exploit the environment to a degree that had formerly been confined to wealthy people and wealthy nations, such impacts on animals will reach levels that we cannot imagine. The results will be of enormous significance for both animal conservation and animal welfare, and to a degree the problems of animal conservation and animal welfare will tend to merge.

Beyond the shared issues, there are also practical reasons why animal welfare and conservation need to be considered together. For one thing, research methods from animal welfare science may be important for solving animal conservation problems, and *vice versa*. Conservationists often trap endangered animals in threatened habitat and release them (or their captive-born progeny) in safe habitat; however, the success rate of these efforts has proven to be

very low (Swaisgood 2010). Possible solutions include handling and housing the animals in ways that minimise stress, together with environmental enrichment designed to prepare captive-raised animals for life in the wild (Braithwaite & Salvanes 2010; Swaisgood 2010). Fortunately, both stress-reduction and environmental enrichment are well researched components of animal welfare science. Similarly, conservation biologists commonly mark animals or implant devices for research purposes, but the data will likely be invalid if the manipulation leaves the animal in pain. Here, again, the identification and mitigation of animal pain is a core element of animal welfare science and it can be applied to problems of conservation research (Walker *et al* 2010).

The same can work in the opposite direction. To date, animal welfare scientists have paid little attention to the welfare of free-living wildlife. However, many routine practices of forestry (Blumstein 2010), agriculture (Mathews 2010), aquaculture (Braithwaite & Salvanes 2010) and pest control (Littin 2010) have severe impacts on the welfare of wild animals. To take just one example, small mammals often reach densities of more than 100 individuals per hectare on agricultural land (Jędrzejewski & Jędrzejewska 1996), and many or most of these animals are killed or otherwise affected by certain agricultural operations, such as ploughing and harvesting (Jacob 2003). Given the 1.4 billion hectares of arable land in the world (FAO 2009), routine agricultural practices almost certainly affect the welfare of a vast number of animals. To mitigate such problems, or even to identify them, will require research methods such as marking, tracking and monitoring the fate of the free-living animals — methods common in conservation biology but not traditionally part of animal welfare science.

The two fields are also kindred spirits at a more philosophical level. Both animal welfare science and conservation biology represent ‘mandated science’ (Fraser 2008) or ‘mission-oriented science’ (Soulé 1985) — fields where the science is, in effect, commissioned in order to guide policies and practices in response to crises or social concerns. Both fields involve a mixture of ethical or evaluative assumptions, together with empirical or functional assumptions (Soulé 1985; Fraser 2008). Both fields are asked to provide advice on practices and policies at times when the science is incomplete and disagreements about the interpretation of the science remain strong. Hence, scientists in both fields face remarkably similar problems in the basic nature and application of their work, and each could learn from the other.

Perhaps the most significant area of potential co-operation falls in the domains of policy and practice. In many cases, measures or policies designed to achieve conservation objectives are likely to fail if animal welfare concerns are ignored, and *vice versa* (Littin 2010). To take one example, when conservation authorities in Italy attempted to eradicate a population of non-native squirrels, a court action by animal protectionists delayed the programme long

enough to allow the species to become too established for eradication to be feasible (Perry & Perry 2008). In cases such as this, awareness of both conservation and animal welfare will be essential for successful intervention. Indeed, although the scientific fields have remained distinct, many citizens in Western society are concerned about both conservation and animal welfare. There is little point trying to solve conservation problems in ways that will be unacceptable for reasons of animal welfare, and likewise there is little point devising solutions to animal welfare problems that will be unacceptable for reasons of conservation. Instead, the research that scientists do, and the advice that they give, need to be informed by an awareness of both goals and both bodies of knowledge.

The papers in this collection should send strong messages to conservation biologists and animal welfare scientists, and to the wildlife managers, animal protectionists and others who translate the science into action. For conservationists, the papers show that many research problems and many practical interventions would benefit from involving animal welfare research and recognising animal welfare concerns. For animal welfare scientists and advocates, the papers call for an expansion of concern to include the vast number of free-living animals whose welfare is adversely affected by human actions.

### Acknowledgements

This collection of papers grew out of an interdisciplinary workshop held in Vancouver. The workshop brought together 30 scientists, roughly half working in animal welfare science and half in conservation biology. Speakers and respondents were identified for seven different application areas: forestry, agriculture, aquaculture, management of invasive species, wild animals in captivity, human-wildlife conflict, and the recreational use of animals. For each topic, speakers and respondents were asked to bring out the links between the fields in their specific area of application. At the suggestion of Professor Michael McDonald, a group also met to develop a ‘consensus statement’ on how scientists need to recognise both areas of concern in their work. This volume of *Animal Welfare* includes papers by six of the speakers, together with the consensus statement.

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