

# Incorporation of the Principles of the Three Rs in Wildlife Research

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**Summary** — The Canadian Council on Animal Care (CCAC) is scheduled to publish *Guidelines on the Care and Use of Wildlife* on its website <http://www.ccac.ca> in January 2003.<sup>1</sup> The underlying ethical basis of all CCAC guidelines and policies requires adherence to the concept of the Three Rs of Russell and Burch (*reduction, refinement and replacement*). However, the development of these guidelines raised particular challenges in implementing this ethical concept. Where the aim of field studies is to understand the ecology, ecophysiology or behaviour of wildlife, replacement by a non-animal method, or even replacement of one species with a less sentient species, may not be an option. On the other hand, the humane treatment of wild vertebrates for research is both an ethical and a scientific necessity. Traumatized animals may exhibit abnormal physiological, behavioural and ecological responses that defeat the purposes of the investigation and may have an impact on the local ecosystem. Assessment of what constitutes humane treatment is often a challenge in wildlife research, as it may differ in different contexts. Animal care committees are useful in this respect, as they focus on the ethical implications of the research through requiring practical steps to be in place prior to the study. In addition, the guidelines outline a process for reporting outcomes of research to assist in improving welfare outcomes for study animals.

**Key words:** *animal care committees, ecosystem, Three Rs, wildlife.*

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The Canadian Council on Animal Care (CCAC) is responsible for overseeing the use of animals in research, teaching and testing in Canada. Participation in the CCAC programme is mandatory for academic institutions, as failure to adhere to CCAC guidelines and policies may lead to suspension of funding for research programmes and/or institutions by the federal granting agencies. The care and use of Canadian wildlife is regulated through provincial, territorial and federal legislation; nevertheless, some agencies have adopted animal care guidelines, including those of the CCAC, and have established internal committees that oversee the care and use of wildlife for research, management and operational procedures. Many of these government and private sector agencies are keenly interested in and/or are currently participating in the CCAC programme in order to provide public accountability for their work.

## CCAC Guidelines on the Care and Use of Wildlife

The development of CCAC *Guidelines on the Care and Use of Wildlife* was initiated in 1996, through a peer-review process. The guidelines were developed

in response to needs identified by the scientific community, local animal care committees (ACCs), CCAC Assessment Panels and the Canadian Association of Zoo and Wildlife Veterinarians (CAZWV). The guidelines were also developed as a revision of Chapter XXII, Vol. 2 of the CCAC *Guide to the Care and Use of Experimental Animals* (1).

The guidelines were developed by the CCAC *ad hoc* subcommittee on wildlife and drew substantially on the work of the American Society of Ichthyologists and Herpetologists (ASIH), Animal Behavior Society (ABS)/Association for the Study of Animal Behavior (ASAB), the Ornithological Council (OC) and the Wildlife Society, where relevant to the Canadian context.

The guidelines were subject to two rounds of peer review. The first draft was reviewed by 56 experts, including federal and provincial wildlife directors and national and international experts (including societies representing the interests of investigators: Canadian Society of Zoologists, Ornithological Council, American Society of Ichthyologists and Herpetologists, American Society of Mammologists and others working with wildlife such as the CAZWV). As for the development of any CCAC guidelines, the *Guidelines on the Care and Use of Wildlife* were also subject to a more widespread second draft review through the CCAC website.

<sup>1</sup>Note added in proof: the Guidelines were published in 2003 (ISBN: 0-919087-39-6).

Canada has a diverse population of wild species; therefore, the guidelines are necessarily broad and are limited to basic principles that will assist investigators, wildlife managers and ACCs in the development and review of protocols and Standard Operating Procedures. Additional recommendations for the various species groups have been developed in conjunction with the more general guidelines and will be published on the CCAC website beginning in Spring 2003.

### Definition of wildlife

For the purposes of the CCAC *Guidelines on the Care and Use of Wildlife*, "wildlife" refers to both free-ranging and captive wild vertebrates, including amphibians, reptiles, birds and mammals. This includes all introduced and indigenous species, as well as domestic animals that have become feral. The guidelines extend to the consideration of free-ranging wildlife or wild-caught animals that have not been habituated to captivity.

### Ethics on the use of wildlife

In 1999, the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) held a Conference on *The Use of Wildlife for Research* (2). The Conference recognised that, "Although most countries have ethical guidelines for research involving human subjects and other sentient animals, ethical issues concerning field research have received much less attention, despite evidence of community concern. Albrecht (3), discussing the ecological ethic to guide wildlife research, has concluded that the Three Rs (*reduction, refinement and replacement*, as outlined by Russell & Burch; 4) are not particularly appropriate for the context of research on Australian wildlife. He proposed a redefinition to address the issues of loss of wildlife, the current number of threatened species and ongoing threats to habitat. Part of the difficulty in using the Three Rs as a basis revolves around ecocentric versus individualist stances (placing priority on the integrity of ecosystems or on individual animals, respectively). In this context, Callicott (5) emphasised the irreconcilability of the need to cause some level of pain and/or distress to individual animals in order to benefit the ecosystem as a whole.

Kirkwood (6) has written that a more constructive approach, at least where conservation science is concerned, is to base decisions on careful consideration of the "balance" of conservation benefits and potential welfare costs and, where, on the basis of this, the decision is taken to proceed, to promote careful attention to the Three Rs. The CCAC sub-committee on wildlife, in the development of

*Guidelines on the Care and Use of Wildlife* concluded that the CCAC *Ethics of Animal Investigation* (7) applies equally to wildlife used for research, teaching and testing as it does to laboratory animals — the underlying ethical basis of all CCAC guidelines and policies requires adherence to the Three Rs. However, a modification of approach was needed in some instances, in particular, to balance concern for the individual animal with concern for the ecosystem.

According to the CCAC, adherence to the Three Rs means as follows.

#### *Replacement*

Animals may be used only if the researcher's best efforts to find a replacement by which to obtain the required information have failed.

The CCAC *Guidelines on the Care and Use of Wildlife* encourages formal reporting of results from wildlife studies, and literature review prior to initiating a study, to ensure that animals are not used unnecessarily.

In the context of field studies to understand the ecology, ecophysiology or behaviour of wildlife, replacement by a non-animal method, or even replacement of one species with a less sentient species, will likely not be an option. Replacement of a rare or threatened species with a more common species is desirable in terms of conservation impacts; however, it will not affect the welfare implications of the work, as the replacement species is likely to be closely related and of a similar sentience. In addition, research involving endangered or threatened species may be necessary in support of the species conservation or the habitat (8).

#### *Reduction*

The fewest animals appropriate to provide valid information and statistical significance should be used.

Good study design is the primary means of minimising the number of animals required to demonstrate experimental outcomes in field studies, as in laboratory-based animal studies. However, field studies often require larger samples than laboratory studies to overcome environmental variation and intrinsic host variability that cannot be controlled in the study. Prior statistical evaluation of sample size is necessary, even when sources of variation can only be estimated roughly. Familiarity with the literature on similar studies regarding sample size and study design is equally important. Animal use can also be minimised by better sharing

of data and publication of results in generally accessible formats. The CCAC *Guidelines on the Care and Use of Wildlife* recommends that, if possible, studies should be designed so that specimens are used for multiple purposes, or so that they can be combined with samples from additional field studies to maximise the use of specimens. This also includes the collection of biological and genetic samples for archiving whenever possible, providing that this does not increase the concomitant level of pain and distress for the animal.

### Refinement

The most humane, least invasive techniques must be used.

The refinement of animal care and use guidelines is a continuous process. It became evident in the generation of these guidelines that investigators frequently adopt practices that are believed to improve animal welfare. These practices are often based on anecdotal evidence, largely unpublished, but passed on through informal training or informal discussions. The CCAC *Guidelines on the Care and Use of Wildlife* recommends that investigators use opportunities to publish refinement techniques to improve welfare outcomes for study animals. Investigators are also encouraged to share their best practices with the CCAC, so that these can be subject to peer review and incorporated into the species-specific recommendations, as regular updates.

Minimising pain and/or distress should be a priority in consideration of options for the care and use of wildlife. Traumatized animals may exhibit abnormal physiological, behavioural and ecological responses that defeat the purposes of the investigation and may have an impact on the local ecosystem. For example, a large ungulate, weakened through the stress of prolonged chase, may be an unusually easy prey for a local carnivore, disrupting the herd dynamics and potentially leaving younger animals vulnerable, as well. The animal's physical and psychological well-being should always take precedence over considerations of cost and convenience. In addition, refinement should aim for the use of techniques that have less potential to impede normal behaviours. Tagging, including the use of radio transmitters, if not appropriately sized, can interfere with the usual movement of the animals. Schneider *et al.* (9), for example, described behavioural changes caused by tagging dolphins that were so dramatic that observations of tagged animals were not representative of the behaviour of untagged conspecifics. Even apparently benign techniques, such as placing coloured leg bands on male finches, can have an influence on sexual selection by females and hence the reproductive success of banded males (10).

### Ethical review

A number of authors have identified the need for a sustained discourse on ethical issues associated with wildlife research and management (e.g. 11–13). As a first step, any proposed study must be subject to an evaluation of the scientific merit or of the conservation goals and benefits (14). Reviews of proposed studies by ACCs can then consider the benefits of the study against the welfare costs to the animals. The responsibilities of an ACC are defined in the CCAC *Policy Statement: Terms of Reference for Animal Care Committees* (15), and the elements that should be contained in a protocol are outlined in the CCAC *Guidelines on Animal Use Protocol Review* (16).

All studies involving the use of wildlife for research, management, teaching and/or testing should be described within a protocol and must be approved by an ACC prior to commencement of the work. Studies on wildlife in the field and in captivity may include a wide range of invasiveness and involve species that vary greatly in their response to humans. The CCAC requires investigators to assign categories of invasiveness to their protocols (17). A suggested list of categories of invasiveness for procedures involving wildlife has been developed for these guidelines.

The controlled parameters for studying test subjects in a laboratory setting do not form a good model for conditions likely to be encountered in field studies. When evaluating protocols for studies that are to take place in the natural habitat of the animal, ACCs should recognise that conditions may require different approaches and procedures than those in a laboratory environment. In particular, ACCs need to recognise that experimental protocols may have to be modified during the experiment, often on short notice, based on factors such as prevailing environmental conditions. Nonetheless, threshold limits should be established within a protocol (maximum chase times, maximum temperature etc.) so that the impact of the procedures to be conducted can be minimised.

In reviewing a protocol involving wildlife, ACCs must ensure that:

- the project has merit, either by evidence of peer review for scientific merit (research projects); for pedagogical merit (teaching projects); or by evidence of other evaluation of the goals (e.g. responsible sustained management, reduction of human hazards, etc.);
- investigators and other animal users involved have the necessary training and experience to perform the procedures described in the protocol (CCAC *Guidelines on Institutional Animal User Training*; 18);
- all animals to be used in a study will be treated in a manner that provides for their physical and

psychological well-being for the duration of the study;

- adequate physical and personnel resources will be available for the duration of the study;
- pain and/or distress concomitant to the study, in so far as it can reasonably be determined, will be minimised both in intensity and duration; and
- any animal experiencing severe, unrelievable pain and/or distress inflicted as a result of the study will be euthanised as soon as possible.

Protocols should be submitted for complete review at least once every four years. In the interim years, a renewal form is required yearly that includes any minor changes to the original protocol, the number of animals required in the upcoming year, and a progress report for the past year. The progress report should include:

- summary of progress to date;
- list of species and numbers used (including any unintentional capture etc.);
- results of post mortems carried out on unplanned mortalities;
- details of carcass disposal; and
- recommendations to improve the well-being of animals and/or outcomes of the study.

In general, the welfare impacts of methods used in field-based wildlife research have not been subject to much formal or objective assessment. The progress report, aside from supplying statistics that the local ACC is required to report to the CCAC, should also assist in educating the ACC and should permit further development and understanding of good welfare practices in field-based research.

## Conclusion

The development of the CCAC *Guidelines on the Care and Use of Wildlife* has provided a challenge in incorporation of the *Principles of Humane Experimental Technique*, as described by Russell & Burch. Replacement of field-based studies is viewed as difficult, as non-animal methods are largely irrelevant. Well thought-out experiments are likely to have a lower impact on the ecosystem. For example, fewer animals need to be captured, and there should be a lower incidence of by-catch. Investigators are encouraged to plan well and to make the

best use of the animals captured, providing that there is no concomitant increase in the level of pain and/or distress for the individual animals. It is likely that the greatest impact can be achieved at the level of refinement. Well-trained personnel, using up-to-date techniques and taking measures to ensure that pain and distress are minimised will have the most effect. In addition, improvement of ways to share best practices between investigators will have the most impact on subsequent field studies.

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## References

1. Canadian Council on Animal Care (1984). *Guide to the Care and Use of Experimental Animals 2*. Ottawa, ON, Canada: CCAC.
2. Mellor, D. & Monamy, V. (1999). *The Use of Wildlife for Research: Proceedings of the Conference held at the Western Plains Zoo, Dobbo, NSW 26–27 May 1999*, 128pp. Glen Osmond, SA, Australia: ANZCCART.
3. Albrecht, G. (1999). A case for and some consequences of employing an ecological ethic to guide wildlife research. In *The Use of Wildlife for Research: Proceedings of the Conference held at the Western Plains Zoo, Dobbo, NSW 26–27 May 1999* (ed. D. Mellor & V. Monamy), pp. 115–118. Glen Osmond, SA, Australia: ANZCCART.
4. Russell, W.M.S. & Burch, R. (1959/1992). *Principles of Humane Experimental Technique*. London: Methuen. 238pp. Reprinted by UFAW, Potters Bar, Herts, UK.
5. Callicott, J.B. (1989). In *Defence of the Land Ethic: Essays in Environmental Philosophy*, 325pp. New York: SUNY Press.
6. Kirkwood, J.K. (2000). Refinement in research for wildlife conservation. In *Progress in the Reduction, Refinement and Replacement of Animal Experimentation* (ed. M. Balls, A-M. van Zeller & M.E. Halder), pp. 1221–1228. Amsterdam, The Netherlands: Elsevier Science B.V.
7. Canadian Council on Animal Care (1989). *Policy*

- Statement: Ethics of Animal Investigation*. Ottawa, ON, Canada: CCAC.
8. Gott, M. (1999). Wildlife research in the field: welfare aspects of an essential discipline. In *The Use of Wildlife for Research: Proceedings of the Conference held at the Western Plains Zoo, Dobbo, NSW 26–27 May 1999* (ed. D. Mellor & V. Monamy), pp. 28–33. Glen Osmond, SA, Australia: ANZCCART.
  9. Schneider, K., Baird, R.W., Dawson, S., Visser, I. & Childerhouse, S. (1998). Reactions of bottlenose dolphins to tagging attempts using a remotely-deployed suction-cup tag. *Marine Mammal Science* **14**, 316–324.
  10. Burley, N., Krantzenberg, G. & Radman, P. (1982). Influence of colour-banding on the conspecific preferences of zebra finches. *Animal Behaviour* **30**, 444–455.
  11. Kirkwood, J.K. (2000). Interventions for the conservation or welfare of wild animals. In *Veterinary Ethics* (ed. G. Legood), pp. 122–138. London, UK: Continuum.
  12. Johnston, D. & Read, A. (2004). *Tagging Marine Mammals Ethics and Ecological Field Experimentation*, in preparation.
  13. Lunney, D. (1999). Is ethics opposed to science? A wildlife zoologist's viewpoint. In *The Use of Wildlife for Research: Proceedings of the Conference held at the Western Plains Zoo, Dobbo, NSW 26–27 May 1999* (ed. D. Mellor & V. Monamy), pp. 119–128. Glen Osmond, SA, Australia: ANZCCART.
  14. Kirkwood, J.K. (2001). Dealing with Conservation and Welfare Conflicts in Wildlife Management. In *Veterinary Conservation Biology: Wildlife Health and Management in Australia* (ed. A. Martin & L. Vogelnest). Australian Veterinary Association, Kingston, ACT.
  15. Canadian Council on Animal Care (2000). *Policy Statement: Terms of Reference for Animal Care Committees*. Ottawa, ON, Canada: CCAC.
  16. Canadian Council on Animal Care (1997). *Guidelines on Animal Use Protocol Review*. Ottawa, ON, Canada: CCAC.
  17. Canadian Council on Animal Care (1991). *Policy Statement: Categories of Invasiveness in Animal Experiments*. Ottawa, ON, Canada: CCAC.
  18. Canadian Council on Animal Care (1999). *Guidelines on Institutional Animal User Training*. Ottawa, ON, Canada: CCAC.