

SCAR's Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica

Background

1. This Scientific Committee on Antarctic Research (SCAR) Code of Conduct (CoC) provides guiding principles to the scientific community conducting research involving animals. Moreover, this CoC provides the ethical framework and details the responsibilities of Antarctic investigators, institutions, and the animal ethics committees overseeing the research, and outlines individual and institutional accountability. Importantly, the code applies throughout an animal's involvement in research activities, including transport (from capture to processing site, as well as to a laboratory or housing facility), housing/husbandry (this may be from minutes to many months), the procedure the animal is subject to, and provisions for the animal at the completion of their use.
2. This Code of Conduct should be read in concert with Annex II of the Protocol on Environmental Protection to the Antarctic Treaty, which provides guidance on the killing, capturing and handling ("taking") of native fauna and aims to provide guidance on the interpretation of Article 3 paragraph 6 of this Annex. Additional, taxon-specific guidelines also exist^{1, 2, 3, 4}.
3. Specific provisions are not required for other invertebrate taxa (with the exception of cephalopods), except for the general principles of ethical use of animals and very specific requirements in the case of species listed as Vulnerable or a higher endangerment category in the IUCN red lists (<https://www.iucnredlist.org/>). Cephalopods should be treated in ways that are consistent with the guidance in this CoC.

Introduction

4. This CoC was developed in recognition that humans have a moral obligation to respect all living animals and to have due consideration for their capacity for pain and suffering. However, the CoC also recognises that experimental and observational research can require interactions with animals and can be undertaken when there is a reasonable expectation that the results will provide a significant advance in scientific knowledge or be of overall benefit for the species involved, its habitat, its ecosystem, or for the betterment of humanity.
5. This CoC is consistent with the principle of the 3R's principle (Replace, Reduce

¹ Gales, N. J., Bowen, W. D., Johnston, D. W., Kovacs, K. M., Littnan, C. L., Perrin, W. F., Reynolds, J. E. and Thompson, P. M. (2009), Guidelines for the treatment of marine mammals in field research. *Marine Mammal Science*, 25: 725-736. doi:[10.1111/j.1748-7692.2008.00279.x](https://doi.org/10.1111/j.1748-7692.2008.00279.x)

² Sikes, R.S. (2016) Guidelines of the American Society of Mammalogists for the use of wild mammals in research and education, *Journal of Mammalogy*, 97: 663–688, <https://doi.org/10.1093/jmammal/gyw078>

³ Fair, J.M., Paul, E.P. and Jones, J. (eds) (2010) *Guidelines to the use of wild birds in research*. Third Edition. The Ornithological Council. Washington D.C.

⁴ O'Brien CE, Roumbedakis K and Winkelmann IE (2018) The Current State of Cephalopod Science and Perspectives on the Most Critical Challenges Ahead from Three Early-Career Researchers. *Front. Physiol.* 9:700. doi: 10.3389/fphys.2018.00700

and Refine)⁵, recognising the need to use an appropriate number of animals for experimental and other scientific purposes with the aim of minimising numbers (3R's Reduce) whenever practical, in particular, by seeking and encouraging the use of alternative measures (3R's Replace).

6. The CoC encourages the use of procedures that minimise pain, suffering, distress or lasting harm. When unavoidable, these should be kept to a minimum (3R's Refine).
7. Recognising the existence of national animal welfare legislation, this CoC is intended to support and supplement existing legal frameworks. Although this CoC may not supersede national legislation, it brings important information on the specifics of Antarctic wildlife and Antarctic research. One of the unique features, and great strengths, of Antarctic research is that it involves researchers from different nations. For animal research, this means that there are varying degrees of legal responsibilities and requirements for ethics training and even for the nature of work that is permitted. One of the aims of this SCAR CoC is to provide a set of guidelines for all Antarctic research that involves the use of animals. Where no national legislation exists, we strongly urge researchers to adhere to principles in this SCAR CoC.

Code of Conduct

8. The advancement of biological knowledge and the development of improved protection of the health and well-being of humans, animals, and habitat, can require intrusive observation, manipulation, experimentation on live animals, and occasionally killing animals (cf. point 14). This is particularly the case in studies involving fish, where often large numbers of individuals are captured, manipulated and euthanised at the end of the experiment. In contrast, the hands-on use of birds and mammals in Antarctica is principally concerned with the capture, temporary handling and/or restraint (usually a few minutes but possibly a few days to a month), for application of data recording or transmitting devices, blood sampling or light biopsies, and marking temporarily or with permanent ID tags or tattoos. Heavy, invasive experiments or procedures on these taxa, such as those found in biomedical research, are rare in Antarctica, and most of the research on birds and mammals is conducted in the field of ecology, ecophysiology and behaviour, where it usually is important to allow the animal subject to continue to interact with its environment as naturally as possible. As is the case elsewhere and in parallel to mandatory environmental impact assessments, experimentation should only happen once a cost/benefit analysis has been undertaken by an ethical review committee with an independent membership. The benefits must be maximised, and the costs in terms of animal use and suffering must be minimised.
9. Physical ID tags (*eg*, bands applied to highly streamlined penguins' flippers) have been shown to impair survival and/or reproduction, ultimately affecting population growth rates, and compromising the scientific utility of their use. Evaluation of the use of physical ID tags in wildlife research must be considered, in particular the balance between the need for an appropriate sample size for demography studies and the potential impacts.
10. When considering the use of tracking devices to be attached temporarily to

⁵ Zurlo, J., Rudacille, D., & Goldberg, A. M. (1996). The three Rs: the way forward. *Environmental health perspectives*, 104(8), 878-80.

individuals (eg, radio tracking tags, satellite tags, GPS-GSM tags), one needs to consider the weight and size of the tags. There are existing guidelines (eg, devices attached to the back of flying birds should ideally not weigh more than 3% of the bird's body mass); and species-specific evaluation to minimise impact should be undertaken.

11. Procedures should be designed, where practicable, to follow the 3R's principle of Replacement, Reduction and Refinement; noting that "replacement" is often not available in studies that are concerned with the study of the whole animal, especially when studies concern animals moving freely in their environment.
12. The animals used should be of an appropriate species and health, ensuring the minimum number required to obtain scientifically valid results. Power analysis or simulations to estimate the sample sizes necessary to statistically address a question, bearing in mind the feasibility of the experiment in the field, should always be undertaken in advance of any work.
13. Researchers should never fail to treat animals as sentient, and ensure proper care to avoid or minimise discomfort, distress, or pain as ethical imperatives. Investigators should assume that procedures that would cause pain and suffering in human beings could cause pain and suffering in other animals. Investigators also have the responsibility to ensure that they are following best practice and, if not already designed, that their methods are available to the broader research community for peer-evaluation (recommendation to follow the guidelines in PREPARE (<http://journals.sagepub.com/doi/full/10.1177/0023677217724823>) and ARRIVE (<https://norecopa.no/3r-guide/the-arrive-guidelines>)).
14. Surgical procedures with animals that may cause more than momentary or minimal pain or distress should be performed with appropriate sedation, analgesia, or anaesthesia and postoperative analgesia in accordance with accepted veterinary practice. Investigators should consider carefully the use of anaesthesia in their experiment, as such a procedure is not without risk. This should be performed only by trained or experienced personnel.
15. In some cases, diving animals (penguins, seals) naturally have deep apnoeic responses and sedation can prevent them from returning to a normal breathing pattern. Resuscitation procedures, including pharmaceuticals when appropriate, should be available to ventilate the lungs or stimulate recovery in cases of respiratory distress. Expert observers and monitoring equipment should be used to monitor the depth of anaesthesia. Special attention should be paid to thermoregulatory problems during handling of endotherms ("warm-blooded" animals). For example, birds and seals can overheat to death within seconds or suffer from hypothermia. Also, ectotherms/"cold-blooded" animals (such as fish or cephalopods) should be protected from hyper and hypothermia.
16. As seabirds often feed their nestlings by regurgitating food contained in their guts and can spontaneously regurgitate when stressed, specific attention should be paid to accidental suffocation when individuals are handled or confined for research purposes.
17. Animals that would otherwise suffer permanent pain, distress, discomfort, or disablement should be euthanised at the end of an experiment. Evaluation of the use of euthanasia must be carefully considered in the context of the level of future disablement in a given species that has been manipulated for scientific purposes. Diagnosis must be

made on a species-by-species basis and only after consultation with professionals (as ethical permits often request) and people well experienced with the target species. It may also be necessary to consider euthanising offspring that are not independent (*eg*, seabirds that have not fledged and pinnipeds that have not weaned) when their provisioning parents have themselves been euthanised or killed accidentally. To prevent unnecessary euthanasia, this CoC encourages field researchers to publish observations of disabled individuals (*eg*, limb damage, etc.) performing normal activities, especially those actively reproducing. Such observations may provide a more informed framework for evidence-based decision making when considering euthanasia.

18. When animals need to be euthanised for research purposes, this should be performed in a way that minimises stress and pain. This includes minimising the time that animals are held before they are euthanised. For example, fish collected in trawls should be dealt with immediately, unless they are used in chronic studies where fish need to be alive and in good condition.
19. The best possible living conditions (temperature and oxygenation of the water especially) should be maintained, and monitored, for animals held in captivity for scientific purposes. Note that the best possible living conditions sometimes can appear to be counter-intuitive: floors and walls of the holding facility should have no structure that can catch claws, flippers, or wings; low temperature should be maintained to avoid heat stress; provision should be made so that the animal, especially a bird, does not become coated in its own faeces. For aquatic species sustaining the water quality, and the appropriate temperature, oxygen, and salinity levels is important. The presence, sight or smell of other animals can agitate rather than comfort in some cases, and for some species, individuals may be best held in isolation. Enclosure roofs can prevent the sight of aerial predators or passing humans.
20. When working with animals engaged in reproduction, measures must be taken to ensure the protection of the offspring (keeping eggs, pups or chicks warm and safe from predators) and of the nesting/breeding space. Following an experiment, particular attention should be paid to avoid desertion by the parents, especially when working on breeding, colonial birds.
21. Specific attention should be paid to signs of weakness/illness when animals are released after having been handled, and when feasible, released animals should be monitored until they are independently mobile.
22. Personnel should be trained in the proper and humane treatment and concern for animals under their care, as well as receive a minimum level of training in animal welfare legislation and permitting requirements. A culture of care should be established and encouraged. Exchange at international level on ethical issues should also be promoted (cf. Concordat of Openness on animal welfare <http://concordatopenness.org.uk> for an example) and how to communicate about these issues with a large audience.