The ethics of lethal methods

Over a decade ago, in a thoughtful essay, Farnsworth and Rosovsky (1993) asked if ecologists should have an ethic for field experimentation and whether this should involve regulation or be self-imposed. Ideally, we should self-regulate our field activities, realize that not all questions are equally important or morally legitimate, and support the idea that the ethics of ecological experimentation needs to be an open topic among ecologists. Unfortunately, this is not the current state of affairs.

A recent article published in *Ecology* (Sillett *et al.* 2004) involved the shotgun removal of songbirds from adjacent territories over a span of 3 years. One might expect that such an invasive and destructive experimental treatment would be applied to extremely important theoretical, ecological, and conservation questions; however, there was no mention of the conservation value of this study. It is difficult to find value in an approach to science and ecology that destroys the very things (animals and their habitats) that we are desperately trying to preserve, in a time of extreme human pressure on natural systems.

We need to practice what we collectively preach if we are to effectively promote conservation ecology to policy makers and the general public. Farnsworth and Rosovsky (1993) suggest that science for the sake of science is no longer a good excuse for "anything goes". Sillett and colleagues should have self-regulated and engaged in more creative ways to address their hypotheses. Because we have shown that we cannot self- regulate, federal and state regulations to protect animals from certain wasteful activities have had to be instituted. In this instance, the university's animal use and care committee and the peer review process should have recognized this research activity as wasteful. It is a pity that all these safety nets failed.

We need to do a better job of self-regulation as well as engaging in an examination of our ecological ethics. If journals such as *Ecology* had refused to publish research of questionable ethical value, perhaps shotgun ecology would have ended in the 1950s. This is long overdue, and in fact was overdue when Farnsworth and Rosovsky (1993) published their essay, which should be required reading for all field biologists!

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Farnsworth EJ and Rosovsky J. 1993.The ethics of ecological field experimentation. *Conserv Biol* **7**: 463–72.

Sillett TS, Rodenhouse NL, and Holmes RT. 2004. Experimentally reducing neighbor density affects reproduction and behavior of a migratory songbird. *Ecology* **85**: 2467–77.

Authors' reply

The issue of killing wild animals for scientific purposes, particularly charismatic taxa such as birds, has often polarized conservation-minded citizens. This subject has been extensively debated among systematists (see Remsen 1995), but has received little attention in ecological journals. Nevertheless, lethal methods are sometimes required as part of sound, scientifically rigorous ecological research. We support such research if it conforms to established ethical standards (eg those of the Ecological Society of America), meets legal requirements (eg approval of the appropriate Institutional Animal Care and Use Committee and the US Fish and Wildlife Service), is peer-reviewed, and addresses relevant scientific questions.

Since the 1930s, a central goal of population ecology has been to understand the processes that control species' abundances. As we state in the first sentence of our 2004 *Ecology* paper (Sillett *et al.* 2004), the identification of regulatory mechanisms and the strength of density dependence is critical to managing, and thus conserving, natural populations. Yet, after decades of research, we know surprisingly little about the factors that determine the abundance of nearly all plant and animal species. This is due, in part, to the scarcity of experimental manipulations of population density. One of the most urgent avian conservation issues is the decline of migratory bird populations. Experimental population studies are therefore fundamental to understanding the ecology of these species.

Objections to lawful, limited, and humane killing of animals for science reflect a failure to distinguish between the fundamental unit for conservation, the *population*, and the individual animal. We agree with Remsen (1995) that such attitudes also indicate "a lack of awareness of the extent and causes of natural mortality". Although individuals are important, especially in endangered species, confusion over appropriate conservation units is counterproductive. We are confident that the great majority of our colleagues and fellow citizens recognize the profound difference in importance to conservation between the limited scientific sampling of a common songbird species, as we did in our 2004 study, and events that are truly invasive and destructive for songbird populations, such as large-scale deforestation of breeding habitat. No scientist relishes killing animals for research. We would have preferred capturing and relocating birds, but this was not possible because adults could not be reliably captured early in the breeding season, because of the difficulty of maintaining insectivorous songbirds in captivity for months at a field site, and because we observed that individuals released even many kilometers from their territories returned to those sites within hours. Consequently, permanently removing birds was the only practical and humane

way to reduce population density in our study.

In conclusion, we believe that where appropriate, ecological experiments on a wide range of organisms should continue to manipulate population density and structure so that we can better understand complex ecological processes. Such research is of fundamental importance in predicting how species will respond to future environmental perturbations. The state of our science and our ability to conserve natural populations depend on it.

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Remsen JV Jr. 1995. The importance of continued collecting of bird specimens to ornithology and bird conservation. *Bird Conserv Int* **5**: 145–80.

Sillett TS, Rodenhouse NL, and Holmes RT. 2004. Experimentally reducing neighbor density affects reproduction and behavior of a migratory songbird. *Ecology* **85**: 2467–77.

The dangers of scientific consensus

Historically, the greatest scientists were great precisely because they broke with the consensus. This is important to remember when discussing global warming and other environmental issues. Such issues are always contentious, because they share two characteristics: they are technically complex and highly emotional. Can you think of a single environmental issue that isn't both?

Advocates for dramatic action on climate change often base their appeal on the authority of scientific "consensus". For example, "A majority of climate scientists, including 99 of the world's Nobel Prize winners, have signed a petition for the world's leaders to act immediately to reduce greenhouse gas emissions". When experts disagree, we naturally assume the majority is likely to be correct. This is a reasonable way to make sense of legitimate scientific uncertainty, but we should remember two points.

First, science, unlike the race for homecoming queen, is not a popularity contest. While most unlikely in the climate change debate, scientific "consensus" may be overturned by a single experiment. When new results emerge and peers repeat them consistently, the old consensus crumbles. The scientific method is the foundation of modern science. We use it to distinguish reality from fantasy and truth from propaganda. Appeals based on authority are especially suspect. For example, the Catholic Church once condemned as heretics those who did not subscribe to their preferred model of the universe – that the Earth, not the sun, was at the center.

Here's an irony: our knowledge of the world advances when we learn that something we believed to be true turns out not to be. For example, Aristotle asserted that heavier objects fall faster than lighter ones. This was the conventional wisdom for over 2000 years. Galileo tested this theory by dropping different objects from certain heights and rolling balls down inclined planes. From these experiments he formulated the law of falling bodies.

Here's the second point. Policy controversies involve trade-offs among competing values. Responsible policy makers know that environmental quality is only one of several important and competing values. Just as people on fixed budgets must choose between buying medicine or more heat, societies must choose between competing goods and values (eg more open space, safer roads, or more funding for education). These trade-offs are inescapable, and it is irresponsible to pretend they don't exist.

Some activists claim that "the science tells us" we must follow a particular course of action. Those who dissent are attacked as heretics, individuals with suspect motives, industry flunkies, or simply reactionaries. Global warming is such a potentially important issue that it should not be hijacked by ideology of any stripe. Recall the Russian experience under Lysenko. His pseudo-scientific theories of plant genetics were used to justify creating the "New Soviet Man". They set back Soviet science by at least a generation.

We count on science to help us assess whether the problems we're told exist are in fact real, and whether the solutions offered will do any good. With limited resources, choices must be made. Science can help to identify the trade-offs, but does not tell us how to choose between them. Human values, not science, are required to rank the outcomes.

The global warming debate involves complex scientific theories supported by some good evidence. As our knowledge increases, we'll be better able to choose a responsible course of action. We should resist being stampeded into public policies with huge immediate costs and few, if any, benefits.

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