Introduction

All of the World Is a Laboratory

Michael K. Stoskopf

Most scientists understand that distilling a meaningful message to fit a very short time at the podium is a greater challenge than preparing or delivering hours of discourse on a topic. A similar challenge is trying to write an introduction for a volume dealing with topics as important to science as the discussions that appear in this issue of *ILAR Journal*. In the very brief descriptions below, I have tried to select words that are meaningful and will inspire everyone who picks up this issue to read it carefully, to use the information it contains, and to keep it in their thoughts as they go about their daily efforts to advance science.

The articles herein take readers back to an arena of science that perhaps has been neglected in recent years. The topic was inspired in many ways by the development of the preceding issue conceived by philosopher Lilly-Marlene Russow and titled *Behavioral Research Outside the Laboratory*. Both issues have similar goals—to encourage scientists to think "outside the box" (i.e., beyond the confines of the commonly accepted definition of the traditional laboratory).

My eagerness to assemble an issue devoted to addressing questions faced by field scientists and the members of institutional animal care and use committees (IACUCs[1]) who attempt to evaluate these types of studies is undoubtedly based on a number of philosophical ponderings and observations. Tantamount, of course, is the scalar concept of "the world as a laboratory." To ponder this concept, it is logical first to define "science."

I recently began to notice that an increasing number of my colleagues have become intrigued with the definition of science and its often narrow focus, compared with the pedagogical "Five Steps." It appears that the first three steps I learned as a middle school science student (Observe, Identify a Problem, and Gather Data) have nearly disappeared from the accepted scientific process. Only the last two steps (Form a Hypothesis, and Test the Hypothesis) seem to be recognized as scientific activities that are worthy of funding. One colleague whom I personally admire even goes so far as to accept as science only the testing of a *null* hypothesis. I tend to fall in with the camp that believes this narrowing is less than beneficial to the large concept of science.

The common requirement to concoct premature or artificial hypotheses to garner support for important work is a burden that observational and field scientists have carried for many years now. Added to this burden has been the challenge of addressing rules (or, more often, interpreting rules) of scientific conduct that are based on a very narrow perspective of scientific research. In this issue, Daniel Mulcahy goes right to the heart of this matter as he asks and provides insight into the very controversial question, "Does the Animal Welfare Act Apply to Free-ranging Wildlife?" (Mulcahy 2003a). Members of IACUCs and wildlife scientists alike will find the article challenging and informative because the author sets the argument and provides guidance for broad application of the act to wildlife research.

Among the particular issues that seem to generate more focused attention than others when IACUC committees are asked to evaluate field research, the issue of trapping is likely one of the most challenging. Roger Powell and Gilbert Proulx prodigiously review the state of the art in capturing wild animals for research (Powell and Proulx 2003). In the landmark article titled "Trapping and Marking Terrestrial Mammals for Research: Integrating Ethics, Standards, Techniques, and Common Sense," they provide an overview of trapping techniques—the basis for the nascent science of developing appropriate standards for trap application—and present a call for further generation of data to refine and support appropriate humane trapping standards.

To be fair, IACUCs are challenged with the need to address a dizzying array of research with regard to the proper use of animals in research. It is difficult at best for members to be familiar with the many unofficial guides to research conduct frequently cited by field scientists to justify their work, particularly when the IACUC membership does not include an experienced field researcher. Informed IACUC members could argue with reason that few of these resources are regularly reconsidered or updated, many are

Michael K. Stoskopf, D.V.M., Ph.D., Diplomate, American College of Zoological Medicine, is Professor of Wildlife and Aquatic Medicine and Environmental and Molecular Toxicology, Director of the Environmental Medicine Consortium, Director of Veterinary International Programs, and Chairman of Marine Sciences Council for North Carolina State University, Raleigh, North Carolina.

[1]Abbreviation used in this Introduction: IACUC, institutional animal care and use committee.

uneven in their attention to humane treatment issues, and most are readily accepting of highly questionable techniques on the basis of historical usage or expediency. Only rarely are these guides subject to input or evaluation by a body of scientists independent of the group they serve. Nevertheless, publications are improving, and their very existence helps to illuminate the void in "mainstream" care and use guidelines.

There is a great need for a thorough and careful assessment of these issues by an independent panel of scientists with broad understanding both of the issues of appropriate animal use in research and of the vagaries and limitations of field research. Indeed, such a project would fit well with the scope and expertise of ILAR. In the meantime, however, responsible IACUC members should be aware of possible resources for evaluating the appropriateness of a proposal, just as they should be aware of their limitations. Examples of these resources include the following: *Guide for the Care and Use of Agricultural Animals Used in Agricultural Research and Teaching* (FASS 1999); *Guidelines to the Use of Wild Birds in Research* (Ornithological Council 1999); *Animal Care and Use Guidelines* (ASM 1998); and *Guidelines for Use of Live Amphibians and Reptiles in Field Research* (ASIH/AFS/AIFB 2001).

The unfortunate result of the inconsistencies and information void in field research issues as they relate to IACUC deliberations is the potential failure to take full advantage of available opportunities to expand our understanding of important scientific issues. David Jessup addresses this matter in a very meaningful way in his article, "Opportunistic Research and Sampling Combined with Fisheries and Wildlife Management Actions or Crises Response" (Jessup 2003). He explains the value of dovetailing scientific inquiry with responses to natural disasters and, perhaps more important, routine wildlife management actions. His suggestions on how to address IACUC concerns to make such science possible are well thought out, and he offers feasible solutions.

The realm of fisheries and aquaculture research, certainly another challenge for any IACUC, is discussed in Russell Borski and Ronald Hodson's "Fish Research and the Institutional Animal Care and Use Committee" (Borski and Hodson 2003) These experienced fisheries and aquacultural researchers identify a number of important basic issues in which procedures suitable for controlled bench research that use only a few animals not only are inappropriate but also are impossible with current technologies when applied to large aquatic systems. Many of the themes in their article (e.g., animal counts, predictions of catch, and adjustments of technique to address changing field conditions) parallel the terrestrial issues addressed elsewhere in the issue.

Clearly there are broad themes to the challenges IACUCs face to provide appropriate treatment of field research that spans the vast majority of diverse field research projects. Also on the subject of field research and fish, Daniel Mulcahy provides valuable insight into the appropriate assessment of surgical procedures conducted on fish in field settings in his article, "Surgical Implantation of Transmitters into Fish" (Mulcahy 2003b). The recommendations and suggestions of this experienced field surgeon should enlighten and be useful to IACUC members and field scientists alike.

William Swanson addresses the need for inter-institutional cooperation and communication in IACUC deliberations, in addition to the issue of research in very remote sites, which cannot be inspected (Swanson 2003). The type of work he describes in "Research in Nondomestic Species: Experiences in Reproductive Physiology Research for Conservation of Endangered Felids" involves highly endangered species in situations where the research can arguably blend with a concept of clinical service on an ecological scale.

Karen Goodrowe's discussion of IACUC issues for research conducted in the setting of zoological parks and aquariums emphasizes the very important need for standardization of basic definitions (e.g., "invasive") (Goodrowe 2003). With IACUCs from institutions with diverse missions and perspectives seeking to work together, a disturbing potential for miscommunication and inconsistency can retard or derail scientific progress, even when the goal of that work is to benefit the animals being studied.

It is particularly fitting that a 50-year history of ILAR appears in this issue. Thomas Wolfle chronicles the genesis of the organization, from the shifting acronyms to the many talented people who have driven and shaped it; and he recounts the broad perspective on science that formed its foundation. From this history, it is evident that the concerns of scientists working outside traditional laboratories belong or, perhaps more poignantly, must be addressed in the journal of an organization whose name includes the word "laboratory."

Each contributor to this important journal issue has given careful consideration to some very challenging questions, which should be of interest to every scientist involved in animal research. Each of them has generated a key and important work that will benefit the future of research on free-ranging species. Field-based science is indeed important to humankind and to the future of the planet. Hopefully, researchers and IACUC members across the country will include this issue of *ILAR Journal* on their reference shelves, and it will help them work together to facilitate better field research in the future.

References

ASHI/AFS/AIFB [American Society of Ichthyologists and Herpetologists, American Fisheries Society, and American Institute of Fisheries Biologists]. 2001. Guidelines for Use of Live Amphibians and Reptiles in Field Research (http://199.245.200.110/pubs/herpcoll.html).

ASM [American Society of Mammologists]. 1998. Animal Care and Use Guidelines (http://www.mammalsociety.org/committees/index.asp).

Borski RJ, Hodson RG. 2003. Fish research and the institutional animal care and use committee. ILAR J 44:286-294.

FASS [Federation of Animal Science Societies]. 1999. Guide for the Care

and Use of Agricultural Animals Used in Agricultural Research and Teaching. 1st rev ed. Savoy IL: Federation of Animal Science Societies (http://nersp.nerdc.ufl.edu/~iacuc/agrules.htm).

Goodrowe KL. 2003. Programs for invasive research in North American zoos and aquariums. ILAR J 44:317-323.

Hampshire VA, Russow L-M, eds. Behavioral Research Outside the Laboratory. ILAR J 44:185-221.

Jessup DA. 2003. Opportunistic research and sampling combined with fish and wildlife management actions or crisis response. ILAR J 44:277-285.

Mulcahy DM. 2003a. Does the Animal Welfare Act apply to free-ranging animals? ILAR J 44:252-258.

Mulcahy DM. 2003b. Surgical implantation of transmitters into fish. ILAR J 44:295-306.

Ornithological Council 1999. Guidelines to the Use of Wild Birds in Research (http://www.nmnh.si.edu/BIRDNET/GuideToUse/index.html).

Powell RA, Proulx G. 2003. Trapping and marking terrestrial mammals for research: Integrating ethics, performance criteria, techniques, and common sense. ILAR J 44:259-276.

Swanson WF. 2003. Research in nondomestic species: Experiences in reproductive physiology research for conservation of endangered felids. ILAR J 44:307-316.

Wolfle TL. 2003. 50 Years of the Institute for Laboratory Animal Research (ILAR): 1953-2003. ILAR J 44:324-337.