

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/258207166>

# Ethics of keeping mammals in zoos and aquariums.

Chapter · January 2010

---

CITATIONS

11

---

READS

13,955

2 authors, including:



[Michael Kreger](#)

Columbus Zoo

22 PUBLICATIONS 266 CITATIONS

SEE PROFILE

# 1

## Ethics of Keeping Mammals in Zoos and Aquariums

*Michael D. Kreger and Michael Hutchins*

### INTRODUCTION

Ethics is about what is right and what is wrong. Rather than focusing on “what is,” which is the realm of science, ethicists focus on “what ought to be” (White 1981). However, when it comes to moral issues, one size does not fit all. Human beings are not moral absolutists; our ethical decisions are complex, and ethical standards often vary with context. For example, while killing a rare animal may represent a loss to biodiversity and may even be against the law, killing a rare animal in self-defense may be considered morally justifiable. Similarly, while a zoo may not be ethically justified in maintaining an endangered wild animal purely for entertainment or profit, many believe that it would be justified for research, educational, or conservation purposes (Hutchins, Smith, and Allard 2003). In bringing wild animals into captivity, important questions are raised that sometimes polarize segments of society and at other times create consensus. When is it morally acceptable to remove an animal from the wild and place it in captivity? Are zoos bleak prisons for wild animals, or are they a comfortable shelter from a potentially cruel and threatening world? Some critics have denounced zoos as exploiters and traffickers of wildlife, while supporters have countered that zoos are champions for wildlife conservation (Mench and Kreger 1996; Hutchins, Smith, and Allard 2003). Animal advocates, philosophers, scientists, conservationists, animal caretakers, and the visiting public are asking difficult ethical questions. There is ongoing debate about what roles zoos should play in society, which species should or should not be exhibited, how animals ought to be exhibited and cared for, and what should be done with animals that are no longer needed for zoo programs.

This chapter will outline some of the ethical concerns associated with keeping and managing wild mammals in captivity. We will describe philosophical differences in ethical perceptions, discuss how ethics affect the conservation mission of zoos, as well as other ethical issues, and address what zoos can do to bridge the ethics gap. We use the term *zoo* to

refer to any professionally managed zoological institution, including aquariums, that holds live wild mammals in captivity. We define wild animals as representatives of nondomesticated species, that is, species that have not undergone generations of selective breeding to emphasize particular traits (artificial selection). Professionally managed zoos are those that are accredited by international, regional, or national zoo associations ([www.eaza.net](http://www.eaza.net); Bell 2001). Examples of international or regional associations include the World Association of Zoos and Aquariums, the European Association of Zoos and Aquaria, and the Association of Zoos and Aquariums (AZA). AZA accredits about 10% of all animal exhibitors in the United States (approximately 214 out of over 2,500 exhibitors) licensed by the U.S. Department of Agriculture (see Lewis, chap. 3b, this volume); however, these include most major metropolitan zoos in the United States and Canada. The Sociedade de Zoológicos do Brasil is an example of a national zoo association.

Almost all these associations require their member institutions to abide by a code of ethics. While such codes vary among associations, institutional missions and good animal care are at the core of the codes. Nevertheless, codes may represent minimum rather than optimum standards or goals. Effectiveness in exceeding codes and standards is often limited by resources (e.g. technical, financial, space). Nonprofessionally managed exhibitors include most roadside zoos, circuses, private animal educators and trainers, wildlife rehabilitation centers, and sanctuaries. The ethics codes, among other professional standards, separate professionally run institutions from nonaccredited facilities.

### ETHICAL PERCEPTIONS

Historically, humans have worshipped animals, hunted them for food or sport, domesticated them, eaten them, worn them, made them companions, and wondered about their and our place in the natural world. Humans have also captured and collected them for amusement or scientific study. The history

of the world's zoos and their justification through time has been reviewed elsewhere (Mullan and Marvin 1987; Mench and Kreger 1996; Bell 2001; Hanson 2002). From the collection of the Egyptian queen Hatshepsut (1490 BCE) through the European menageries of the 1600s, the earliest collections of captive wild animals were private menageries, assembled mostly to satisfy curiosity or as symbols of wealth and power. Beginning in the late 1700s, public recreation, education, and scientific research separated the Western zoological parks from menageries. However, it was not until the late 1900s that conservation—whether through research, species reintroduction programs, genetic management, or educating visitors about species or habitat conservation—assumed a more central role for the metropolitan zoo. Zoos shifted from large collections of many species, often held in small, sterile cages, to smaller collections of fewer species, exhibited in larger, more naturalistic enclosures (Mullan and Marvin 1987; Hancocks 2001; Hanson 2002). Zoos exhibited species to educate the public and cultivate its appreciation of conservation or research programs. Zoos offered their visitors “edu-tainment” through shows, contact areas, and interactive exhibits. They also began to reflect on their reason for being, along with issues related to animal welfare, such as behavior, exhibit design, and nutrition. This process is ongoing and is proceeding slowly as the zoo community continues to debate ethical differences related to meeting the biological needs of individual animals while still meeting institutional missions.

Today there exists a continuum of ethical perspectives, ranging from the abolitionist view of no animal use (including as pets, for food, and in zoos) to the extreme utilitarian view in which humans are free to use animals regardless of the cost to the individual animal. Two prominent ethical philosophies have emerged regarding the keeping of wild animals in captivity: animal rights, the absolutist approach, and animal welfare, a more utilitarian view. Animal rights advocates focus on whether or not animals should be in zoos at all. As cognitive research has indicated the existence of subjective states in nonhuman animals (Griffin 1984; Bekoff, Allen, and Burghardt 2002), animal rights philosophers have argued that animals must be given moral consideration equal or similar to that given humans (Regan 1983). Those who share this perspective have argued that nonhumans should be given moral and legal consideration equal to humans (i.e. “legal personhood”: Wise 2000). In animal rights philosophy, sentience (or the ability to feel pain) is the only characteristic required for full moral consideration. Thus, holding nonhumans in captivity is viewed as “speciesism,” that is, one species (humans) giving less moral consideration to other species based solely on taxonomic status (Regan 1983).

The philosopher Peter Singer also espouses moral consideration for nonhumans but has a less absolute approach. He recognizes that humans utilize animals for a variety of purposes. However, to be morally justifiable, the benefits to humans must far exceed the costs to individual animals (Singer 1990). It would be unusual for animal rights advocates to support keeping wild animals in zoos, even if they contributed to species survival (Regan 1995). Indeed, Regan (1983) has labeled any attempt to usurp the rights of individual animals to save species or ecosystems as “environmental fascism.” In this view, the welfare of individual common animals also trumps

the survival of endangered species and ecosystems. This has caused some to characterize animal rights as anticonservationist or antienvironmental (e.g. Hutchins and Wemmer 1987; Norton 1987; Hutchins 2004b). In general, animal rights advocates oppose zoos because of the belief that any form of human use of animals is intrinsically wrong, especially if it results in any harm whatsoever. In addition, Jamieson (1995) has argued that education of the public and conservation of species can be conducted without keeping animals in zoos, thus questioning the need for zoos. Thus zoos, even nonprofit ones, are seen as exploiting animals for financial gain, while at the same time harming the interests of individual animals that should be allowed to live their lives undisturbed in nature.

Animal welfare has philosophical and scientific components (see Kagan and Veasey, chap. 2, this volume). First, it is based on the assumption that it is ethical for animals to be used by humans. Criteria used to support this ethical decision range from the roles that zoos play in educating visitors and conserving wildlife and wildlife habitat, to arguments that few animals are removed from the wild for zoos; many have been bred over generations and are nearly domesticated; and human managers are providing the animals a better life in captivity than they would have in the wild (a paternalistic attitude: Bostock 1993; Hutchins and Smith 2003). Thus, there are benefits to humans and nonhumans from the existence of zoos. Many definitions of animal welfare have been put forward by philosophers, veterinarians, and applied ethologists, but most share the concept that pain, suffering, and loss of life should be minimized to the extent possible. Some have argued that animal welfare is about how an animal “feels”—in other words, whether it is sentient and has the capacity to suffer (Dawkins 1990; Duncan 1993). This assumes that animals do not simply react to a stimulus, but actually think about the stimulus and react according to their perceptions (Rogers 1994). Zoos must make a moral judgment to determine if an animal's welfare level is acceptable. If it is not, the animal welfare philosophy would insist that behavioral and psychological needs be met. Using the disciplines of ethology, neuroscience, endocrinology, genetics, and immunology, animal welfare science can be used to determine the level of animal welfare by identifying how an animal perceives and responds to environmental stimuli (Mench 1993).

Animal welfare, or quality of life, is enhanced by more than the simple provision of adequate food, water, living space, and veterinary care. However, animal welfare, like animal rights, also is laden with human values (Mench 1993), and has evolved as more information about the needs of animals has been discovered. For example, some early zoo managers believed that barren cages with ceramic tile walls and concrete floors promoted animal welfare, as these facilities were easily cleaned and sanitized, thus reducing the risk of disease (Hancocks 2001). For veterinary procedures, barren cages also appeared to make capture easier and seemed less traumatic to the animals. In essence, early zoos simply wanted to keep the animals alive and, if lucky, to breed them. However, others, such as T. H. Gillespie, director of the Edinburgh Zoo in the 1930s, realized that meeting zoo animals' minimum health and safety needs was simply not enough, and believed that quality of life was also an important consideration. In his 1934

book *Is It Cruel?* he states: “The kind of captivity I am considering must imply good and sufficient food, and such degree of shelter, sunshine, shade, fresh air, room for exercise, and generally, such conditions as are desirable for that particular animal’s welfare—such as it naturally desires” (p. 25). In the 1940s, Heini Hediger, then director of the Basel Zoo, recognized that despite some improvements, zoos were still not meeting the basic biological and psychological needs of captive wild animals. In 1942 he stated: “A fundamental problem of zoo biology is how to neutralize as far as possible all modifying (non-hereditary, externally conditioned) and mutative (hereditary) degeneration phenomena in captivity” (Hediger 1969, 63).

Like Hediger and Gillespie, animal welfarists argue that meeting an animal’s most basic health and safety needs is not enough. For zoos, the goal of maximizing animal welfare is not as easy or straightforward as it may seem (see Kagan and Veasey, chap. 2, this volume; Barber, chap. 3a, this volume). Many compromises must be made between the competing goals of ensuring animal safety and health versus those of providing an interesting and species-appropriate quality of life (Kreger, Hutchins, and Fascione 1997; Kreger and Hutchins 1998). These compromises, however, only need to be made in captivity, which raises the very issue of the ethics of keeping mammals in captivity. For example, some risk of disease or injury may be necessary in order to give captive animals the ability to perform a greater range of normal behaviors. The provision of substrate for burrowing, branches for climbing, water for bathing and interactive play, or social companions substantially increases the risk of disease or injury for zoo animals, but also has the potential to enhance the quality of an animal’s life. Yet precisely how much risk to an individual animal’s health should zoo managers tolerate to ensure that psychological well-being is maximized is an ethical question with no clear answer. Indeed, *quality of life* itself is a subjective term, often interpreted differently among humans. For example, some people are most comfortable living in the city and would be bored or frustrated by rural life, whereas others have strong preferences for rural life. Answers may also vary depending on the specific taxon and individual animals involved (Kreger and Hutchins 1998). In addition, the ultimate goal of modern zoos is not necessarily to maximize longevity or eliminate any risk of pain or suffering (Hutchins 2007).

Zoos have frequently been placed in a defensive position as the media, animal protectionists (particularly animal rights advocates), and some scientists criticize zoos on animal welfare issues (e.g. Jamieson 1985, 1995; Malamud 1998; Clubb and Mason 2002; PETA 2005). These issues range from the causes of injuries or mortality, to animal escapes, to the disposition of surplus animals, to the size of animal enclosures. Indeed, media characterizations of zoo and aquarium animal deaths for a 20-month period (September 2003–May 2005) indicated that while most articles were either dispassionate and objective or sympathetic, nearly a third were either accusatory or attempted to balance the accusatory statements of animal rights activists with sympathetic statements from zoo professionals (Hutchins 2006a). The vast majority of these accusations involved the death of charismatic megavertebrates such as elephants, great apes, dolphins, and big cats.

## ELEPHANTS

Of the terrestrial vertebrates in zoos, perhaps the elephant, the largest land mammal, has attracted the most attention. Criticism of elephants in zoos has come not only from the public, but from some elephant field researchers as well. Given the great body of research conducted on wild elephants, it is no wonder that zoo exhibitions of these biologically complex creatures draw criticism (Wemmer and Christen 2008). A study commissioned by the Royal Society for the Prevention of Cruelty to Animals (Clubb and Mason 2002) has been used by animal protectionists to argue that elephants in captivity live miserable and greatly shortened lives. Zoos have responded by critically examining such reports to determine their scientific veracity, addressing animal welfare concerns, and debating the education and conservation benefits of having elephants in captivity (Smith and Hutchins 2000; Hutchins 2006b). Scientific discussions have examined captive versus wild longevity of elephants (Wiese and Willis 2004), the use of nature as the sole metric for evaluating animal welfare (Hutchins 2004a), spatial needs and complexity in captivity (*ibid.*), appropriate group sizes (Mellen and Keele 1994; AZA 2001), and training methods (Desmond and Laule 1991; Hutchins, Smith, and Keele 2008).

Scrutiny of whether elephants should be in captivity and, if so, how they can be managed to provide for their welfare has resulted in husbandry guidelines and policies developed by a variety of organizations (e.g. AZA, the Elephant Managers Association, International Elephant Association, European Association of Zoos and Aquaria, Australasian Association of Zoos and Aquaria, and the U.S. Department of Agriculture) (Olson 2004; Wemmer and Christen 2008). In the United States, only the Animal Welfare Act (1966 as amended) carries the weight of law (7 U.S. Code 2131-2157). However, these guidelines are often based on experience, not science, and are not always in agreement. A zoo in one part of the world may not meet the standards of a zoo in another part of the world. Some zoos are deciding not to keep elephants, because they cannot meet the standards (Kaufman 2004; Strauss 2005). Other facilities are being renovated to upgrade elephant exhibits, increase living space, and maintain appropriate group sizes (Hutchins, Smith, and Keele 2008). Certainly, research is needed to determine how best to meet elephant welfare needs in captivity.

Even if animal welfare needs of elephants are met in the zoo, is it still ethically acceptable to maintain elephants in captivity? Can animal welfare be compromised if there are other benefits of keeping elephants? These are points of ongoing debate, both within the zoo community and in the public arena. Some critics have argued that captive elephants should not be in captivity, because they contribute nothing to conservation since they are not being bred for reintroduction to the wild. In contrast, zoo elephant advocates maintain that zoo elephants serve as conservation ambassadors for their wild counterparts. By exhibiting live elephants, visitors can be moved or educated to support elephant conservation in the field (Smith and Hutchins 2000; Hutchins, Smith, and Keele 2008). Simply having elephants at the zoo helps attract visitors. In fact, when the Maryland Zoo in Baltimore informed the public that it might have to move its 2 African

elephants to another zoo because of budget shortfalls, the outcry was so great that local business leaders and the governor raised the necessary funds to operate the zoo and keep the elephants (*Zoo News Digest* 2003). In effect, the threat of removing the elephants contributed to rescuing the zoo. Revenue generated from admissions and concessions from visitors who come to see the elephants can then be funneled into zoo-sponsored research and conservation projects. Indeed, between July 2002 and December 2003, AZA zoos either initiated or supported at least 87 such projects that were elephant related (Hutchins, Smith, and Keele 2008). Some of this research is relevant to field conservation. For example, population control is becoming increasingly necessary to reduce human-elephant conflicts (Pienaar 1969), and contraceptive techniques developed at zoos offer a potential nonlethal option for population reduction (Fayrer-Hoskin et al. 2000). Infrasonic communication in elephants was first discovered and studied in zoo elephants (Payne, Langbauer, and Thomas 1986). This knowledge is vital for understanding how wild elephants communicate and coordinate their movements over great distances. Nevertheless, for zoos to be able to use elephants for research or to educate the public, they must have elephants (Smith and Hutchins 2000). The ethical question is, do these benefits to wild elephants justify keeping some individuals in captivity?

### ETHICS AND THE ROLE OF SPECIES CONSERVATION IN ZOOS

One of the missions of zoos is conservation. Conservationists seek to ensure a future for naturally occurring biological diversity (Primack 2002). The term *natural* is used here to distinguish between diversity that has occurred as the result of natural ecological/evolutionary processes (i.e. speciation, colonization, and “natural” extinction), and that which has occurred because of relatively recent human interventions (i.e. introduction of non-native invasive species, human-caused extinctions) (Aitken 1998). Decisions regarding the future of wildlife and their habitats are becoming increasingly complex, particularly as human populations grow, become more affluent, and use more natural resources.

In some instances, the animal rights ethic and the conservation ethic will lead to the same conclusions, and may even result in coalitions between zoological and animal protection organizations. For example, both ethics would consider it wrong for humans to destroy critical wildlife habitat. Both ethics would support conservation training, finding alternatives for communities that market bushmeat, and supporting antipoaching patrols. But when the 2 viewpoints are compared, it is evident that disagreements will arise when the “rights” of individual, sentient animals come into conflict with using zoo animals in efforts to conserve populations, species, habitats, or ecosystems (Hutchins and Wemmer 1987). Even from an animal welfare perspective, many zoo professionals would argue that zoos should prioritize the welfare of the individual animals in the collection over what is good for the herd (with dominant and subordinate animals) or animals used for conservation projects.

Ideological differences between animal rights and conservation ethics are evident in their contrasting view about how

to rescue endangered species. While both ethics favor saving threatened or endangered species or populations, they differ in their reasons for doing so. Regan (1983, 360) argues that we must conserve endangered species “not because the species is endangered, but because the individual animals have valid claims and thus rights against those who would destroy their natural habitat, for example, or would make a living off their dead carcasses through poaching and traffic in exotic animals, practices which unjustifiably override the rights of those animals.” Thus, all sentient animals, regardless of species, rarity, or other considerations, are to be given equal moral consideration. In contrast, proponents of the conservation ethic argue that endangered populations or species should be given special status solely because of their scarcity (Callicott 1986; Norton 1987; Aitken 1998). That is, extraordinary efforts need to be made to preserve rare populations or species, especially when an organism has become scarce due to some action on the part of humans (e.g. as the result of overexploitation, pollution, or habitat loss or alteration).

Modern zoos use animals as conservation tools in many ways. Animals are used to educate visitors, in fund-raising for *in situ* and *ex situ* conservation projects, and for research or reintroduction. Some zoo-based conservation programs involve welfare risks. A good example is the reintroduction program (see Earnhardt, this volume, chap. 22). Reintroduction is an attempt to establish a species in an area that was once part of its historical range, but from which it has been extirpated or become extinct (IUCN 1998). However, the risk to individual animals during reintroduction through morbidity and mortality may be considerable, especially in a program’s early stages (Beck 1995). Reintroduction release candidates must be able to avoid predators, acquire and process food, interact socially with conspecifics, find or construct shelter, move on complex terrain, and orient and navigate in a complex environment (Kleiman 1996). Zoos must decide how to provide animals with the challenges they are likely to encounter in the wild while minimizing potential harm to the release candidates. For example, to teach the reintroduction candidates to fear humans, avoid predators, and shun inappropriate habitat, it may be necessary to provide negative experiences in captivity (Griffin, Blumstein, and Evans 2000).

To ensure that captive-reared black-footed ferret release candidates could recognize and kill their primary food, prairie dogs, they were given the opportunity to hunt and kill live prairie dogs (Miller et al. 1998). While this experience was critical for the success of the reintroduction program, there is no doubt that it violated the “rights” of the individual prairie dogs.

### OTHER AREAS OF ETHICAL CONCERN

How animals are selected for exhibit and how they should be exhibited are also areas of ethical concern. There may be species that are too specialized nutritionally or behaviorally to be maintained in captivity. New multi-institutional studies of the behavioral needs of animals (e.g. Shepherdson, Carlstead, and Wielebnowski 2004; Swaisgood and Shepherdson 2005) have led some zoos to question whether or not they can provide for some animals already in their collections. Should a zoo exhibit an animal whose welfare is compromised simply

by the presence of visitors? During periods of high visitor attendance, gorillas, *Gorilla gorilla*, at the Belfast Zoo displayed more intragroup aggression, stereotypies, and autogrooming (Wells 2005). Similarly, visitor presence increased abnormal behaviors by 30% in lion-tailed macaques, *Macaca silenus*, over the long term and decreased the use of enriched parts of the exhibit (Mallapur, Sinha, and Waran 2005). While the degree that these behavior patterns vary among individuals and across species, this kind of research can be used to make informed management decisions about the ethics and method of exhibiting these species. Thus, zoos should be proactive by examining their collections and determining if they have any species for which animal welfare needs cannot be met, even if it means that they will close exhibits and relocate animals to more appropriate facilities.

Another area of ethical concern is the use of animals in shows, rides, and contact areas (Kreger and Mench 1995; Mench and Kreger 1996). Animals used in educational demonstrations, petting zoos, rides, and shows often interact with their caretakers and the visitors to a greater extent than those placed on exhibit. They may also be housed very differently from animals on exhibit. When does training, handling, or other interactions for such activities compromise or enhance animal welfare, and what kinds of techniques are appropriate? Some zoos have policies regarding how and when animals may be used for such interactions, as well as which individual animals are more suitable for handling by the visitors than others (Kreger and Mench 1995; AZA 2006).

When is the use of animals in entertainment (including on-site shows and television programming) educational, and when is it exploitative and/or harmful to public attitudes? Visitor studies evaluate the effectiveness of animal exhibits, shows, and visitor contact with animals on visitor knowledge and awareness (see reviews in Kreger and Mench 1995; AZA 2003). Some argue that zoos may unintentionally be portraying animals as glorified pets. Visitors simply observing animal caretakers interacting with animals may engender compassion, but they may also develop the misperception that wild animals are tame.

Ethical decisions also must be made about captive population management. Decisions include which animals should be removed from a group and relocated to another zoo for breeding, when to separate mothers from young, how and where to house offspring that are surplus to the genetically managed population (see Carter and Kagan, chap. 21, this volume), and what to do with postreproductive animals. Relocation of favorite animals has attracted media scrutiny and sometimes ignited debates between zoo managers and animal protection groups. While there are animal welfare issues regarding the transport of live animals, the transport of semen from one zoo to another in itself does not reduce animal welfare, but it may deprive the animal of the experience of breeding. The World Association of Zoos and Aquariums' Code of Ethics and Animal Welfare acknowledges the welfare benefits of reproductive behavior, including courtship, pair formation, mother-infant attachment, and socialization of the young (WAZA 2005). There are also potential welfare benefits arising from genetic management (Hutchins 2001). In small, unmanaged populations, animals may become highly inbred. Inbred individuals are known to be at higher risk of con-

genital abnormalities (i.e. birth defects), have lower reproductive rates, and experience higher rates of neonatal mortality (Ralls, Ballou, and Templeton 1988), all of which could diminish welfare.

Sufficient space for maintaining a sustainable and genetically viable population of rare species is often limited in zoos (Soulé et al. 1986). Removal of genetic surplus, postreproductive, unhealthy, or behaviorally incompatible animals is a difficult decision that sometimes must be made for veterinary, population management, or conservation reasons. Relocation to other zoos, sanctuaries, or private individuals is among the first options considered, as is controlling reproduction through contraception programs (Porton 2005; see also Asa and Porton, chap. 34, this volume). Some zoos retain large holding areas to house animals that are no longer needed for breeding or exhibition programs, and some zoo professionals have argued for the establishment of "retirement homes" for such animals (Lindburg and Lindburg 1995). A final alternative is culling surplus individuals (Lacy 1995). There are policies describing when and how this option can be implemented (AZA AWC 2005; WAZA 2005). As the term *euthanasia* implies, the death must be quick, painless, and as stress-free as possible. It should also be a last resort and in conjunction with careful, long-term population planning.

#### WHAT CAN ZOOS DO TO BRIDGE THE ETHICS GAP?

The difficulty with zoo ethics is that there is no consensus across institutions worldwide. There are guidelines for animal welfare, environmental enrichment, euthanasia, and reintroductions, but an ethical framework regarding if and how species should be exhibited has yet to be developed. Perhaps part of the debate lies in differences in institution-by-institution priorities. Will the zoo maintain a collection based on what the visiting public expects to see, or will it focus on species of conservation need? How much risk to animal health is acceptable to improve animal welfare? How much, if ever, should zoos engage in debate or collaboration with animal advocacy organizations, particularly animal rights groups? What are the political and financial implications for the institution? Such issues are frequently discussed at professional meetings. There may be more gray areas than black and white views on how zoos should address ethical issues. However, zoos have recognized this, and are moving forward to address the concerns.

Since zoos cannot exist without a collection of live, captive animals (unless it is a virtual zoo), zoo managers obviously cannot adopt a strict animal rights ethic. However, zoos are finding more common ground with animal welfare advocates. In fact, modern, professionally managed zoos consider themselves to be animal welfare advocates (Hutchins and Smith 2003; Stevens and McAlister 2003; WAZA 2005). The AZA has even developed a national awareness campaign with the goal of portraying zoos to the public as animal welfare and conservation organizations (Mills and Carr 2005). In fact, animal welfare has become one of the most important and provocative facets of zoo management. The AZA Animal Welfare Committee (AWC) was established to ensure that AZA institutions identify animal welfare as a top priority. Its purposes are to

foster a common understanding among AZA members of what animal welfare is, to assist members in their efforts to continually improve the welfare of animals in their care, and to serve as a guide and information resource to member organizations and the public as the AZA and its member institutions engage in cooperative local, national, and international efforts to influence animal welfare issues. ([www.members.aza.org/Departments/ConScienceMO/animalwelfare/](http://www.members.aza.org/Departments/ConScienceMO/animalwelfare/))

One of the projects of the AWC is to coordinate the creation of standardized guidelines for animal care by taxa, drawing on the experience of zoo animal managers and the best scientific information available.

The importance of zoo research in meeting ethical obligations cannot be understated. Physiological and behavioral studies measure cognition, motivation, and stress responses. They can be used to determine animal preferences and identify stressors (Fraser, Phillips, and Thompson 1993; Mench 1993). Some studies ask animals to select their preferred food item, social group, or exhibit furniture. For example, giant pandas, *Ailuropoda melanoleuca*, that were given the option to move between exhibit and off-exhibit bedroom areas displayed less behavioral agitation and had lower cortisol levels (a hormonal indicator of stress) than when they were given access to the exhibit area only (Owen et al. 2005). Zoos must encourage these studies and seriously consider the implications of their results.

There are few systematic efforts to examine the welfare of mammals for most taxa. Perhaps the most research has been conducted on the larger, more charismatic species. However, little attention has been paid to small mammals, including lagomorphs, rodents, and bats. Knowledge of what constitutes “normal” behavior can sometimes be difficult, due to lack of species-specific field behavioral and ecological data as well as differences among individuals of the same species. We agree with Swaisgood and Shepherdson (2005) and Carlstead et al. (1999) that future studies, including those of cognition, stereotypes, and environmental enrichment, should strive to increase sample size (e.g. through multi-institutional studies), use appropriate statistical design, and improve descriptions of methods and behaviors in published literature. Further, Swaisgood and Shepherdson (ibid.) envision the development of a predictive science for enrichment, stereotypes, and animal welfare.

Zoos must make animal welfare a research priority that is just as deserving of support as veterinary, nutrition, or any other type of zoo-sponsored research. Too often, such research is underfunded, if funded at all, and results of the studies are often not applied to day-to-day management. Partnerships have been developed with zoo and university researchers to address animal welfare issues; such partnerships should be supported. Indeed, zoo collections can benefit from the results of ethological and physiological studies in laboratory science, animal science, and wildlife biology.

There are other ways zoos can be portrayed as animal welfare advocates. For example, zoos could provide emergency services to nonzoo animals. Animal care staff can be promoted as animal welfare experts. Many zoos dispatch staff to help rehabilitate wild animals affected by oil spills. Aquariums rescue stranded marine mammals. Zoos could do more lo-

cally. They can provide advice for care of pets or care and rehabilitation of local wildlife. If they cannot temporarily maintain injured local wildlife or unwanted exotic pets, they can provide contact information for those who need it. Zoos can also partner with wildlife sanctuaries and rehabilitation centers to provide technical assistance or adopt nonreleasable animals if they could be used in zoo programs. Moreover, zoos can take a more active role in identifying exhibitors whose animals live in poor conditions, and either mentor their staff to improve animal welfare or advocate for their closure.

If zoos wish to be ethical institutions, they must also defend animal welfare issues outside their own borders. The AZA Board of Directors approved several specific issue-focused policies that affect animal welfare. These include policies opposing the use of some exotic animals as pets and rattlesnake roundups (Mays 2001). As conservation and welfare institutions, zoos must recognize that there are irreconcilable differences between them and certain animal protection organizations. Zoos should enlist conservation organizations to defend science-based wildlife management decisions that may involve controlling wildlife populations, habitat protection and removal of invasive species, and sustainable use—all of which can result in the death of individual animals, but benefit species and habitats.

Zoos and aquariums exist because of public support. They must be able to demonstrate to the public that their management practices are based on sound scientific principles and are compassionate to the animals in their care. Conservation and animal welfare are moral obligations. As stated by the AZA Animal Welfare Committee, animal welfare belongs to each animal; it is not given to them. Zoos affect the degree of that welfare, but must balance it with their conservation objectives. It is hoped that, as zoos consider the future of their collections and the urgency of their missions in a world of diminishing wildlife species and habitats, they will develop an ethical framework that will have a positive affect on the welfare and conservation of their animal ambassadors.

## ACKNOWLEDGMENTS

The authors wish to thank 2 anonymous reviewers for their insight and improvements to this manuscript.

## REFERENCES

- Aitken, G. M. 1998. Extinction. *Biol. Philos.* 13:393–411.
- AZA (Association of Zoos and Aquariums [formerly the American Zoo and Aquarium Association]). 2001 (updated 2003). *AZA standards for elephant management and care*. Silver Spring, MD: American Zoo and Aquarium Association. [www.aza.org/AboutAZA/BrdAppPolicies/Documents/ElephantStandards.pdf](http://www.aza.org/AboutAZA/BrdAppPolicies/Documents/ElephantStandards.pdf)
- . 2003. *Program animal position statement*. Silver Spring, MD: American Zoo and Aquarium Association. [www.aza.org/ConEd/ProgAnimalPosition/](http://www.aza.org/ConEd/ProgAnimalPosition/)
- . 2006. *Recommendations for developing an institutional program animal policy*. Silver Spring, MD: Association of Zoos and Aquariums. [www.aza.org/ConEd/ProgramAnimalrecs/](http://www.aza.org/ConEd/ProgramAnimalrecs/)
- AZA AWC (Animal Welfare Committee). 2005. *Animal welfare*. [members.aza.org/Departments/ConScienceMO/animalwelfare/](http://members.aza.org/Departments/ConScienceMO/animalwelfare/). Silver Spring, MD: AZA Animal Welfare Committee.
- Beck, B. B. 1995. Reintroduction, zoos, conservation and animal

- welfare. In *Ethics on the Ark: Zoos, animal welfare and wildlife conservation*, ed. B. G. Norton, M. Hutchins, E. F. Stevens, and T. L. Maple, 155–63. Washington, DC: Smithsonian Institution Press.
- Bekoff, M., Allen, C., and Burghardt, G. M. 2002. *The cognitive animal: Empirical and theoretical perspectives on animal cognition*. Boston: MIT Press.
- Bell, C. E., ed. 2001. *Encyclopedia of the world's zoos*. Chicago: Fitzroy Dearborn.
- Bostock, S. C. 1993. *Zoos and animal rights: The ethics of keeping animals*. London: Rutledge.
- Callicott, J. B. 1986. On the intrinsic value of nonhuman species. In *The Preservation of Species*, ed. B. Norton, 138–72. Princeton, NJ: Princeton University Press.
- Carlstead, K., Fraser, J., Bennett, C., and Kleiman, D. 1999. Black rhinoceros (*Diceros bicornis*) in U.S. zoos: II. Behavior, breeding success, and mortality in relation to housing facilities. *Zoo Biol.* 18:17–34.
- Clubb, R., and Mason, G. 2002. *A review of the welfare of zoo elephants in Europe*. Oxford: University of Oxford and Royal Society for the Protection and Care of Animals.
- Dawkins, M. S. 1990. From an animal's point of view: Motivation, fitness, and animal welfare. *Behav. Brain Sci.* 13:1–9, 54–61.
- Desmond, T., and Laule, G. 1991. Protected contact elephant training. *Pro. Am. Zoo Aquar. Assoc. Ann. Conf.* 1991:12–18.
- Duncan, I. J. H. 1993. Welfare is all to do with what animals feel. *J. Agric. Environ. Ethics* 6. Suppl. no. 2:8–14.
- Fayrer-Hosken, R. A., Grobler, D., Van Altena, J. J., Kirkpatrick, J. F., and Bertschinger, H. 2000. Immunoneutralization of free-ranging African elephants. *Nature* 407:149.
- Fraser, D., Phillips, P. A., and Thompson, B. K. 1993. Environmental preference testing to access the well-being of animals: An evolving paradigm. *J. Agric. Environ. Ethics* 6. Suppl. no. 2:104–14.
- Gillespie, T. H. 1934. *Is it cruel? A study of the condition of captive and performing animals*. London: Herbert Jenkins.
- Griffin, A. S., Blumstein, D. T., and Evans, C. S. 2000. Training captive-bred or translocated animals to avoid predators. *Conserv. Biol.* 14:1317–26.
- Griffin, D. R. 1984. *Animal thinking*. Cambridge, MA: Harvard University Press.
- Hancocks, D. 2001. *A different nature: The paradoxical world of zoos and their uncertain future*. Berkeley and Los Angeles: University of California Press.
- Hanson, E. 2002. *Animal attractions: Nature on display in American zoos*. Princeton, NJ: Princeton University Press.
- Hediger, H. 1969. *Man and animal in the zoo: Zoo biology*. New York: Delacourte Press.
- Hutchins, M. 2001. Animal welfare: What is AZA doing to enhance the lives of captive animals? In *Annual Conference Proceedings*, 117–29. Silver Spring, MD: American Zoo and Aquarium Association.
- . 2004a. Better off dead than bred. *AZA Commun.* (June): 47–48, 53, 56.
- . 2004b. Keiko dies: Killer whale of *Free Willy* fame. *AZA Commun.* (February): 54–55.
- . 2006a. Death at the zoo: The media, science and reality. *Zoo Biol.* 25:101–15.
- . 2006b. Variation in nature: Its implications for zoo elephant management. *Zoo Biol.* 25:161–71.
- . 2007. The animal rights-conservation debate: Can zoos and aquariums play a role? In *Zoos as Catalysts for Conservation*, 92–104. Cambridge: Cambridge University Press.
- Hutchins, M., and Smith, B. 2003. Characteristics of a world class zoo or aquarium in the twenty-first century. *Int. Zoo Yearb.* 38:130–41.
- Hutchins, M., Smith, B., and Allard, R. 2003. In defense of zoos and aquariums: The ethical basis for keeping wild animals in captivity. *J. Am. Vet. Med. Assoc.* 223:958–66.
- Hutchins, M., Smith, B., and Keele, M. 2008. Zoos as responsible stewards of elephants. In *Elephants and ethics: Toward a morality of coexistence*, ed. C. Wemmer and K. Christen, 285–305. Baltimore: Johns Hopkins University Press.
- Hutchins, M., and Wemmer, C. 1987. Wildlife conservation and animal rights: Are they compatible? In *Advances in animal welfare science 1986/87*, ed. M. W. Fox and L. D. Mickley, 111–37. Boston: Martinus Nijhoff.
- IUCN (International Union for Conservation of Nature). 1998. *IUCN guidelines for re-introductions*. Prepared by the IUCN/SSC Re-introduction Specialist Group. Gland, Switzerland: International Union for Conservation of Nature.
- Jamieson, D. 1985. Against zoos. In *In defense of animals*, ed. P. Singer, 108–17. New York: Harper and Row.
- . 1995. Zoos revisited. In *Ethics on the Ark: Zoos, animal welfare and wildlife conservation*, ed. B. G. Norton, M. Hutchins, E. F. Stevens, and T. L. Maple, 52–66. Washington, DC: Smithsonian Institution Press.
- Kaufman, M. 2004. Seeking a home that fits: Elephant's case highlights limits of zoos. *Washington Post*, September 21.
- Kleiman, D. G. 1996. Reintroduction programs. In *Wild mammals in captivity: Principles and techniques*, ed. D. G. Kleiman, M. E. Allen, K. V. Thompson, and S. Lumpkin, 297–305. Chicago: University of Chicago Press.
- Kreger, M., and Hutchins, M. 1998. Ethical issues in zoo animal care. In *Encyclopedia of animal rights and welfare*, ed. M. Bekoff and C. A. Meaney, 374–75. Westport, CT: Greenwood Publishing Group.
- Kreger, M., Hutchins, M., and Fascione, N. 1997. Context, ethics and environmental enrichment in zoos. In *Second nature: Environmental enrichment for captive animals*, ed. D. Shepherdson, J. Mellen, and M. Hutchins, 59–82. Washington, DC: Smithsonian Institution Press.
- Kreger, M., and Mench, J. A. 1995. Visitor-animal interactions at the zoo. *Anthrozoös* 8:143–58.
- Lacy, R. 1995. Culling surplus animals for population management. In *Ethics on the Ark: Zoos, animal welfare and wildlife conservation*, ed. B. G. Norton, M. Hutchins, E. F. Stevens, and T. L. Maple, 195–208. Washington, DC: Smithsonian Institution Press.
- Lindburg, D., and Lindburg, L. 1995. Success breeds a quandary: To cull or not to cull. In *Ethics on the Ark: Zoos, animal welfare and wildlife conservation*, ed. B. G. Norton, M. Hutchins, E. F. Stevens, and T. L. Maple, 195–208. Washington, DC: Smithsonian Institution Press.
- Malamud, R. 1998. *Reading zoos: Representations of animals and captivity*. New York: New York University Press.
- Mallapur, A., Sinha, A., and Waran, N. 2005. Influence of visitor presence on the behaviour of captive lion-tailed macaques (*Macaca silenus*) housed in Indian zoos. *Appl. Anim. Behav. Sci.* 94:341–52.
- Mays, S. 2001. Public education for rattlesnakes. *AZA Commun.* (April): 12, 15, 53.
- Mellen, J., and Keele, M. 1994. Social structure and behaviour. In *Medical management of the elephant*, ed. S. Mikota, E. L. Sargent, and G. S. Ranglack, 19–26. West Bloomfield, MI: Indria.
- Mench, J. A. 1993. Assessing animal welfare: An overview. *J. Agric. Environ. Ethics* 6. Suppl. no. 2: 69–73.
- Mench, J. A., and Kreger, M. D. 1996. Ethical and welfare issues associated with keeping wild mammals in captivity. In *Wild mammals in captivity: Principles and techniques*, ed. D. G. Kleiman, M. E. Allen, K. V. Thompson, and S. Lumpkin, 5–15. Chicago: University of Chicago Press.
- Mills, K., and Carr, B. 2005. Ride the wave! *AZA Commun.* (February): 7–8.



- Miller, B., Biggins, D., Vargas, A., Hutchins, M., Hanebury, L., Godbey, J., Anderson, S., Wemmer, C., and Oldemeier, J. 1998. The captive environment and reintroduction: The black-footed ferret as a case study with comments on other taxa. In *Second nature: Environmental enrichment for captive animals*, ed. D. Shepherdson, J. Mellen, and M. Hutchins, 97–112. London: HarperCollins.
- Mullan, B., and Marvin, G. 1987. *Zoo culture*. Chicago: University of Illinois Press.
- Norton, B. 1987. *Why preserve natural variety?* Princeton, NJ: Princeton University Press.
- Olson, D. 2004. *Elephant husbandry resource guide*. Indianapolis: Indianapolis Zoo.
- Owen, M. A., Swaisgood, R. R., Czekala, N. M., and Lindburg, D. G. 2005. Enclosure choice and well-being in giant pandas: Is it all about control? *Zoo Biol.* 24:475–81.
- Payne, K. B., Langbauer Jr., W. R., and Thomas, E. 1986. Infrasonic calls of the Asian elephant (*Elephas maximus*). *Behav. Ecol. Sociobiol.* 18:297–301.
- PETA (People for the Ethical Treatment of Animals). 2005. Elephant free zoos. [www.savewildelephants.com/](http://www.savewildelephants.com/). Norfolk, VA: People for the Ethical Treatment of Animals.
- Pienaar, U. De V. 1969. Why elephant culling is necessary. *Afr. Wildl.* 23:180–94.
- Porton, I. J. 2005. The ethics of wildlife contraception. In *Wildlife contraception: Issues, methods and applications*, ed. C. S. Asa and I. Porton, 3–16. Baltimore: Johns Hopkins University Press.
- Primack, R. B. 2002. *Essentials of conservation biology*. 3rd ed. Sunderland, MA: Sinauer.
- Ralls, K., Ballou, J. D., and Templeton, A. R. 1988. Estimates of lethal equivalents and the cost of inbreeding in mammals. *Conserv. Biol.* 2:185–93.
- Regan, T. 1983. *The case for animal rights*. Berkeley and Los Angeles: University of California Press.
- . 1995. Are zoos morally defensible? In *Ethics on the Ark: Zoos, animal welfare and wildlife conservation*, ed. B. G. Norton, M. Hutchins, E. F. Stevens, and T. L. Maple, 38–51. Washington, DC: Smithsonian Institution Press.
- Rogers, L. J. 1994. What do animals think and feel? *ANZCCART News* 7:1–3.
- Shepherdson, D. J., Carlstead, K. C., and Wielebnowski, N. 2004. Cross-institutional assessment of stress responses in zoo animals using longitudinal monitoring of faecal corticoids and behaviour. *Anim. Welf.* 13:105–13.
- Singer, P. 1990. *Animal liberation*. 2nd ed. New York: New York Review.
- Smith, B., and Hutchins, M. 2000. The value of captive breeding programmes to field conservation: Elephants as an example. *Pachyderm* 28:101–9.
- Soulé, M., Gilpin, M., Conway, W., and Foote, T. J. 1986. The millennium ark: How long a voyage, how many staterooms, how many passengers? *Zoo Biol.* 5:101–13.
- Stevens, P. M. C., and McAlister, E. 2003. Ethics in zoos. *Int. Zoo Yearb.* 38:94–101.
- Strauss, R. 2005. The elephant in the room: U.S. zoos struggle with the question of keeping pachyderms in captivity. *Washington Post*, December 28.
- Swaisgood, R. R., and Shepherdson, D. J. 2005. Scientific approaches to enrichment and stereotypies in zoo animals: What's been done and where should we go next? *Zoo Biol.* 24:499–518.
- WAZA (World Association of Zoos and Aquariums). 2005. *Building a future for wildlife: The World Zoo and Aquarium conservation strategy*. Berne, Switzerland: World Association of Zoos and Aquariums.
- Wells, D. L. 2005. A note on the influence of visitors on the behaviour and welfare of zoo-housed gorillas. *Appl. Anim. Behav. Sci.* 93:13–17.
- Wemmer, C., and Christen, C., eds. 2008. *Elephants and ethics: Toward a morality of coexistence*. Baltimore: Johns Hopkins University Press.
- White, M. 1981. *What is and what ought to be done: An essay on ethics and epistemology*. New York: Oxford University Press.
- Wiese, R. J., and Willis, K. 2004. Calculation of longevity and life expectancy in captive elephants. *Zoo Biol.* 23:365–73.
- Wise, S. M. 2000. *Rattling the cage: Toward legal rights for animals*. Cambridge, MA: Perseus Books.
- Zoo News Digest*. 2003. With new attention and funds, zoo can keep elephants, for now. July–December. [www.aazv.org/zoonews2003julydec.htm](http://www.aazv.org/zoonews2003julydec.htm).