

Introduction to the Special Issue on Elephant Biology

We all know of the difficulties facing elephants in the wild, most emanating from human pressures like poaching, habitat destruction and encroachment. If left undisturbed, elephants reproduce quite well. Thus, one might expect that given ample care and opportunity, elephants in captivity also would exhibit a high reproductive rate. Unfortunately, this is not so. Neither the Asian nor African elephant zoo population is, or ever has been, self-sustaining. This is a problem if we intend to continue displaying elephants in zoos. And, there certainly is justification to do so because of the important role they play 1) in educating the public about the need for species and habitat preservation; 2) as a research resource to understand biological mechanisms not easily studied in nature; and 3) as a hedge against extinction in case a catastrophe affects the wild population. They are magnificent creatures that exemplify the wondrous qualities of nature and I, for one, would greatly miss being able to see them up close.

The purpose this special issue is to define the challenges facing elephant managers in today's zoos and highlight recent breakthroughs that offer possible solutions. The first two articles discuss how, without continued importation or an increase in birth rates, both Asian and African elephants will become demographically extinct within only a few decades. Other papers discuss the many and varied problems associated with elephant propagation. First, there are too few bulls because they are dangerous and difficult to maintain. Second, moving females to other zoos for breeding is expensive and can be stressful to both animals and caretakers. Third, females in the population are aging and experiencing problems (uterine fibroids and ovarian cysts as two examples) that prevent conception. And finally, increasing numbers of prime-age females inexplicably are showing a complete lack of reproductive cyclicity.

Throughout this issue, there is a common theme that studies of basic biology are the means to ensure sustainable species management. For example, there now are effective, safe techniques to determine the reproductive status of elephants through ultrasound examinations and hormonal measurements. These technologies have proven invaluable for improving natural mating as well as the recent successful application of artificial insemination. We must continue to develop and refine techniques to guarantee reproduction and the future stability of captive elephants. Once improved, artificial insemination will become an efficient means of maximizing the genetic management of captive elephants, especially if semen can be used from free-ranging

bulls. As artificial insemination becomes more reliable and widely available, a genome resource bank must be developed to manage and store cryopreserved sperm. However, there still remains a major technological gap in the ability to properly handle and process semen for storage. Research efforts should focus on developing this technology to ensure the long-term viability of genetically valuable material.

A major emphasis of the papers in this issue is reproduction, the phenomenon that largely dictates whether a population remains viable. Yet, producing offspring is not enough if the health of the animal is not maintained. Thus, two papers focus on important disease issues related to elephants. The finding that a specific elephant herpesvirus likely is the cause of a significant proportion of mortalities is a major breakthrough. Although it will remain a concern until a vaccine is developed, the recognition of and now treatment for a major killer of young elephants means the elimination of a significant impediment to raising healthy calves. Another disease is tuberculosis, a serious health problem for humans and elephants, made worse because it appears to be zoonotic. So now, in addition to the genetic management of elephants, breeding programs also must consider the potential for disease transmission. This concern extends to both natural and assisted breeding programs; not just bulls, but semen collected for artificial insemination should be pre-screened for potential diseases, like herpes and tuberculosis.

Yet, as important as technology is for aiding breeding or treating disease, it is not the only answer for improving captive management. Elephants in zoos face vastly different challenges in comparison with their free-ranging counterparts, such as unnatural social groupings and enclosure limitations. Thus, this issue highlights studies of elephant communication (e.g., vocal, tactile, chemical) and behavior, discussed in the context of what role they play in the adaptation of elephants to their captive environment and how elephants interact with each other, their handlers, and their surroundings.

In a sense, we have come to a crossroads in the management of elephants in zoos. There is ample evidence to suggest that sustainability of elephants can be achieved if we act now to identify and breed reproductively healthy elephants. Whether we succeed or fail will depend to a large extent on how well the technologies are applied and if research activities are fully integrated to include psychological and physiological assessments. Evaluation of free-ranging elephants might also provide valuable feedback regarding normal biological mechanisms and adaptations that will help us better manage captive elephants. Last, there needs to be continued collaboration between managers and scientists so that the breeding potential of all valuable animals is achieved. Through a concerted effort, the future of elephants in our zoos does not have to be in jeopardy. We can work to make sure that future generations have equal opportunity to view these majestic creatures.

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