

Foreword

Shortly after being asked to write this foreword, I was sidelined by upsetting news: the tree frog Toughie, the last known representative of *Ecnomiohyla rabborum*, had died at the Atlanta Botanical Garden. The extinction of a species is always hard to understand and difficult to come to terms with. It is one of those moments when we wish we could turn back time, make other decisions, and choose options that would lead to a viable outcome. In this case the extinction of Rabbs' fringe-limbed tree frog was personal to me, since Joseph Mendelson and his colleagues had named the species for me and my wife, Mary. We had lost Toughie, we had lost our species, and it seems we are continuing to lose the fight against the chytrid fungi that are decimating amphibians worldwide.

In a time when some are questioning society's need for zoos, Toughie's story perfectly illustrates the need for zoos, aquariums, and botanical gardens to be conservation organizations, the subject of this wide-ranging volume. The last few individuals of Rabbs' fringe-limbed tree frog had been collected in 2005 from the canopy of a cloud forest in central Panama when it was realized the species was in peril from a chytrid fungal epidemic. Efforts to breed the final survivors failed owing to our lack of knowledge. Researchers discovered that in the wild, tadpoles in their tree-hole abodes would nibble on the father frog's back, gathering essential nutrition. For this species, such knowledge came one step too late: the last female died in 2009, rendering extinction a certainty. Experts at the Atlanta Botanical Garden and Zoo Atlanta cared for Toughie and his fellow frogs and extended their lives as far as possible, but in this case vital knowledge of the species did not come in time.

There are many other species in states of peril, as documented by the Red List of endangered species of the IUCN, the International Union for Conservation of Nature. There is much more research to be done, more care to be given, and more education to impart. The contributions in this volume illustrate some of the critical work being done in and by zoological institutions around the globe to prevent the extinction of more species and to educate the public about their conservation.

Here, forty-eight authors document and illustrate the transformation of zoos and aquariums from entertaining menageries to conservation institutions. They describe the history of such places, current undertakings in conservation for several species such as gorillas in the wild as well as in institutional facilities, and future prospects for such institutions to change further to more effectively counter the increasing tide of extinctions.

The beginning of conservation activities by American institutions is rightly attributed to William Hornaday of the New York Zoological Society, who orchestrated the salvage of the American bison. Nowadays, as the Wildlife Conservation Society, this organization has projects and programs in more than sixty countries around the world. Here readers can also learn about the origins, missions, and operations of more recent institutions with distinctive conservation programs, such as the Arizona-Sonora Desert Museum, the Monterey Bay Aquarium, and the Phoenix Zoo.

This volume speaks of the conflicts in the operating agendas of many institutions as they grapple with providing for the welfare of the individual animals kept in zoos and aquariums and for the welfare/conservation of their species in the wild. The science involved in adequately providing for both individual and species welfare is reviewed in several chapters, and the ethical questions of keeping wild animals in captivity are explored in other sections of this book. Clearly shown is the cooperative nature of meaningful conservation activities, involving not just fellow zoological institutions but wildlife societies, government agencies, professional organizations, and caring communities. The One Plan Approach to species conservation, in situ and ex situ, of the Conservation Breeding Specialist Group of the Species Survival Commission/IUCN that is described in the chapter by Kathy Traylor-Holzer and her coauthors obviously depends on such cooperation.

One finds interesting contrasts given on the prospective futures for the physical structures that house the animal ambassadors in these institutions. On one hand, there is advocacy for returning aquariums from giant immersion experiences for people back to smaller containments that allow more intimate connections between visitors and the animals displayed. In regard

to the simulation of the natural environments of the terrestrial species a zoo chooses to keep, there is advocacy for deconstructing enclosures so the spaces become actual sanctuaries. If space is limited, there are nevertheless utopic conceptions such as the Zootopia in Denmark where the visitors will not be discernible to the animals at all, as described in the last chapter by Ben Minteer. Such settings will also convey the importance of the integrity of ecosystems to the flourishing of most species.

Many authors of the thirty chapters explicitly or implicitly welcome other views on the challenges of these institutions' becoming more substantial conservation organizations. In this regard, readers might find enlightening perspectives from twenty-two other authors who have responded very briefly to the question posed by the Center for Humans and Nature: "How can zoos and aquariums foster cultures of care and conservation?" The answers come from conservation leaders in zoos, a sensitive architect, a champion for the seas, and a compassionate ecologist. And in this volume it is good to have the affirmative perspective of Rick Barongi, a principal in assembling the third version of the World Conservation Strategy of the World Association of Zoos and Aquariums.

My own institution has fostered knowledge of the genetics of small populations, but it also has seen to the development of conservation psychology as a means to influence and better the attitudes and behavior of visitors and people generally in respect to a sustainable relationship with the natural world and its diversity of life forms. Here Susan Clayton, coauthor of the first text on conservation psychology, and Khoa D. Le Nguyen explore the potentials for this approach.

In sum, it is encouraging to have the authors in this volume inform us on how to deal with the manifest threats to the existence of other species. However, the ultimate threat leading to the extinction vortex for populations and species is us, the human species. Further, most members of our species have become more separated from the natural world in urban concentrations, and thereby appreciation of and concern for the diversity of life have been diminished. Thus I hope there will be a following complementary volume on environmental conservation as behavior expected of all peoples. A means to effect such an embrace of responsibility is to inform and educate the visitors to our institutions so that they not only become practitioners of conservation in their own lives, but also spread the concern for the existence of all other life to friends and neighbors and acquaintances. Visitors to zoos, aquariums, botanical gardens, nature centers, and natural history museums make up a tenth of the people on the planet. The reformulated

ark envisioned by many in this book can certainly also embark on changing the outlook and behavior of zoo visitors and supporters to achieve a sustainable relationship with the natural world and all its species. A concluding chapter by Adrián Cerezo and Kelly Kapsar dwells on this enormous charge in the context of sustainable development, as outlined in Agenda 2030 of the United Nations. For zoos and aquariums, I see this as a charge to transform their visitors and communities into responsible and respectful global citizens who care for all life.

Finally, I say many thanks for the first step in this charge given by Ben Minter, Jane Maienschein, and James Collins in assembling and editing the thoughtful essays in this volume. It is the beginning of moving beyond the ark!

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