

BUFFALO

Legal Studies Research Paper Series

Paper No. 2014 - 028

Captive for Life: Conserving Extinct in the Wild Species through Ex Situ Breeding

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The Ethics of Captivity, Lori Gruen (ed.), ISBN: 9780199978007
(Oxford University Press, 2014), pp. 193-212.

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Irus Braverman

Are there “fates worse than death,” to use Kurt Vonnegut’s title? Is captivity one such fate? This chapter examines these questions through the lens of conservation biology’s ex situ models of captive management—and captive breeding in particular—for wild animals, and especially for species that have been designated as Critically Endangered or as Extinct in the Wild. Drawing on interviews with leading conservation biologists, the chapter describes the erosion of the distinctions between species management in captivity and conservation in wild nature, often referred to among conservationists as ex situ and in situ conservation. The chapter examines situations in which the extinction, or the near extinction, of a species in the wild is imminent and a captive breeding program is initiated, typically by zoos, to ensure this species’ survival. I also describe the International Union for the Conservation of Nature’s (IUCN) Red List and IUCN’s emerging One Plan approach for integrated management of wild and captive populations.

Because freestanding wilderness areas absent human management are increasingly rare, the binary between wilderness and captivity—and between in situ and ex situ conservation—is somewhat outmoded. In place of these bifurcations, what emerges is a continuum between different (and increasing) levels of management. This chapter considers some of the complex political questions that surface with such an intensified management of life.

Why In Situ versus Ex Situ Conservation?

Initially adopted from other disciplines to indicate the importance of place for the utility of conservation management of plants (Braverman 2014), in the 1980s the *in situ* / *ex situ* terminology gained traction within the emerging science of conservation biology as a convenient replacement for the emotionally loaded terms “nature,” “wild,” and “captivity.” This new terminology has been used broadly by zoo experts, who encounter resistance by both animal rights and animal welfare activists for holding animals in captivity (Donahue and Trump 2006, Jensen and Tweedy-Holmes 2007). In place of the negative associations of the term “captivity,” the term *ex situ* highlights the scientific characterization of this work as part of conservation. In the words of wildlife manager Evan Blumer, former director of The Wilds in Ohio: whereas “the terminology began with this binary of captive versus wild,” it “then got broadened and softened by bringing the Latin into it with *in situ* and *ex situ*” (interview).

The *in situ* / *ex situ* terminology—in its Latin form in particular—also figures prominently in what is arguably the most important legal text on biodiversity conservation: the 1992 Convention on Biological Diversity (CBD)—an international treaty signed by 193 countries. Article 8 of the CBD—entitled “In Situ Conservation”—establishes that “Each Contracting Party shall, as far as possible and as appropriate: (a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity; . . . (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings” (United Nations CBD 1992a). Under the title “Ex Situ Conservation,” Article 9 of the CBD establishes that “Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing in-situ measures: (a) Adopt

measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components” (United Nations CBD 1992b).

Clearly, whereas in situ nature conservation is defined by many conservation biologists as the ultimate goal of conservation, ex situ is constrained in that it must be executed “predominantly for the purpose of complementing in-situ measures,” as mentioned above. This hierarchical understanding of the relationship between in situ and ex situ conservation is not only the law “on the books,” but is also how many conservationists define and experience their work, as I have discovered in the numerous interviews conducted for this project. Such preferential treatment is founded upon the belief that there can, in fact, be a place that is more “inside” nature, which may then be compared with a place that is “outside” of nature by measuring their relative placement on a fixed and linear in situ / ex situ continuum. Put differently, the current definition of conservation still depends on the bifurcation between in situ and ex situ and the prioritization of a predetermined vision of in situ over ex situ conservation.

The effects of the in/ex situ paradigm are apparent in the various definitions by leading conservation organizations. For example, according to IUCN’s Red List definitions, an animal that is Extinct in the Wild is defined as “non-conserved,” even if it still lives in captivity (IUCN 2012a). In the words of Onnie Byers of the IUCN: “Real conservation is [defined as] self-sustaining populations in nature. If a species in total is only in captivity, they call that ‘not conserved’” (interview). Existing conservation practices thus manage nonhuman species differently based on their linear placement along the continuum between “in” and “out” of nature. Is such a linear framework

practical in a messy world that requires careful management decisions? Furthermore, is it ethical?

Zoos as Ex Situ Conservation Institutions

In the 1970s, a system of national and international legal codes came into effect that dramatically limited the ability of zoos to take certain wild animals from their habitats. To survive, zoos needed to find a way to (re)produce animals other than by their translocation from the wild into captivity. In the late 1970s, animal programs—and especially Species Survival Plans and Taxon Advisory Groups—were set up by the Association of Zoos and Aquariums (AZA) to collectively manage their breeding across zoo facilities in the region. The initial purpose of these programs was to create a sustainable population of certain species within zoos. Distributed among zoos across the country, it was unavoidable that managed animal populations would quickly succumb to inbreeding without frequent, carefully planned contraception and transfers for breeding. In order to create such sustainable populations, zoos realized, they must exchange animals between them—effectively establishing an insular ecosystem that I have referred to as “zooland” (Braverman 2012). Animal programs “thus serve as control towers for the movement of zoo animals between accredited zoos” (Braverman 2012, 162).

In 2011, AZA’s animal programs administered 303 species and subspecies. Parallel to the American system, animal programs also came to existence in Europe (European Endangered Species Programme) and Australasia. The World Association of Zoos and Aquariums currently manages eleven taxa on a global scale through Global Species Management Programs (GSMPs) (Dick, interview). In 1995, more than three thousand vertebrate species were bred in zoos and other captive breeding facilities

(Koontz 1995, 132). From a genetic standpoint, however, the task of orchestrating such reproductions and the ethical dilemmas at stake have proven to be considerably more challenging than zoo experts may have anticipated (Braverman 2012, 159–185).

Within the course of just one decade (into the 1990s), the focus of zoo animal programs shifted from sustainability within ex situ populations to the conservation of in situ populations. Accredited zoo animal programs (which, admittedly, encompass but a small minority of zoos in North America, see Braverman 2012) were reconceived as a modern Noah's ark: sustaining threatened species until they could be reintroduced "back into the wild" (Foose 1986). At one time, zoos and aquariums argued that breeding animals in captivity for eventual reintroduction to the wild would become the defining rationale for their continued social relevance and future existence (Reading and Miller 2010).

The interplay between genetics and captive breeding became the foundation for the emergence of conservation biology in the 1980s as the science of modern species conservation. "Among other changes," these scholars note, "conservation biology marked a shift in the management of living collections away from displays only and toward population management designed to sustain genetically diverse, demographically stable, and viable captive populations . . . that were to serve as assurance colonies should wild populations go extinct" (2011, 39; see also Soule et al. 1986; Dickie, Bonner, and West 2007, 224). Christoph Schwitzer, Primate Specialist Group vice chair at the Species Survival Commission of the IUCN and head of research at the Bristol Zoo, says along these lines, "My view on things is that ex situ is a very important tool, and will become much more important in the future for species conservation planning and species

conservation action” (interview). Finally, Paul Pearce-Kelly of the Zoological Society of London remarks, similarly, that “if [many species] are going to survive—not be conserved, but survive—they’re going to need ex situ support” (interview).

Captive breeding has become a recognized strategy of ex situ conservation largely because of its potential to create a captive reserve for endangered or even extinct wild animals. Such insurance or assurance populations—and it is interesting to note that whereas assurance implies *in the inevitable event* that something happens, insurance implies *in case* something happens—are typically bred in zoos with an eye toward their conspecifics in the wild, but with minimal (if any) actual genetic exchange with such wild populations. Increasingly, however, zoo experts are questioning the effectiveness of such isolated ex situ breeding for conservation. Some have argued along these lines that “there are far too many endangered species and not nearly enough space to breed them all in captivity and, in many cases, far too little habitat remaining in which to reintroduce them. In addition, reintroduction programs are difficult and expensive, and they amount to treating the symptoms of species loss rather than the causes” (Hutchins, Smith, and Allard 2008, 515; Snyder et al. 1996). As a result of these realizations, many zoo experts have become wary of the “zoos as arks” metaphor (Soulé et al. 1986), once again focusing on the sustainability of zoo populations within zoos.

The refocus of zoos on the sustainability of zoo animal populations is arguably the reason for the emergence of AZA’s 2010 Action Plan. This plan, which took effect in fall 2012, classifies all AZA animal programs into three categories based on their sustainability within North American zoos: green, which are demographically sustainable for one hundred years at least; yellow, which are potentially sustainable; and red, which

are unsustainable for having less than fifty individuals. Whereas green and yellow programs are prioritized by the AZA for collective management, red programs are to be phased out or, in the zoo experts' language, "bred to extinction." In 2011, there were thirty green, 278 yellow, and 240 red programs (Braverman 2012, 180–181). This plan has potential significant effects on conservation by zoos because, as I have pointed out, "many of the red coded species are not only underrepresented in zoos (*ex situ*) but are also endangered in the wild (*in situ*)" (183). In effect, AZA's new priorities for *ex situ* breeding arguably conflict with the central goal of *in situ* species conservation, where the more vulnerable a species is, it is typically assigned a higher priority. To what extent this plan will in fact redefine the breeding focus of animal programs in North American zoos is yet to be seen. Nonetheless, many—including American and European zoo experts I interviewed for this project—view it as an odd and counterintuitive decision by the AZA.

In recent years, zoo scientists have been calling into question even the focus on isolated sustainability within zoo animal populations. In his 2013 article, "Achieving True Sustainability of Zoo Populations," population biologist Robert Lacy of the Brookfield Zoo points out that "Zoos were once reliant on harvest from the wild to populate their exhibits; in the past few decades zoos proudly and appropriately shifted away from reliance on continued wild collection to breeding of closed populations; perhaps we need now to move to a third era of thinking about the best way to care for species assurance populations" (Lacy 2013, 20). I will soon return to the third era proposed by Lacy, which I see as intimately interconnected with IUCN's One Plan approach. Before doing so, however, I would like to discuss what is arguably a core concept driving the discourse of conservation biology, both inside and outside zoos:

extinction. Within this broad concept, the category that brings out the ethical underpinnings of the various approaches toward conservation and nonhuman animals is IUCN's Red List category of Extinct in the Wild.

Extinct in the Wild

Many conservation biologists would probably agree that the most urgent challenge for conservation is the rapid disappearance of natural habitat and wildlife (Balmford, Mace, and Ginsburg 1998)—specifically, that “25 percent of all mammals, 12 percent of birds and more than a third of amphibians are threatened with extinction” (Holst and Dickie 2007, 23). Kent Redford and colleagues explain along these lines that “Conservation biology was founded with a focus on the *plight of species* by a group of scientists that included representatives of the zoo and botanical garden communities” (2012, 1157; my emphasis). This species-oriented approach defines conservation biology's goal as preventing the extinction of species with an orientation toward crisis intervention. “Extinction was the middle name of conservation biology, and preventing extinctions was seen as the new discipline's major aim,” Redford and others claim in another article (Redford et al. 2011, 39; see also Mace et al. 2008). The extinction paradigm focuses on numerical counts of rare and threatened species, what Michael Soule and colleagues refer to as “manifest demographic or numerical minimalism” (2003). Redford and his colleagues explain that “This trend is still evident in the fact that successful conservation is defined by many conservation biologists with reference to minimum population sizes, minimum areas, and minimally sufficient sets of sites” (2011, 40).

IUCN's Red List is the epitome of conservation biology's focus on extinction and its negative projections. From the Red List's overview: “The introduction in 1994 of a

scientifically rigorous approach to determine risks of extinction that is applicable to all species, has become a world standard” (IUCN 2012b). The Red List classifies taxa into eight categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient, and Not Evaluated (IUCN 1994). A quantitative population viability analysis (PVA) is performed in many cases to estimate “the extinction probability of a taxon or population.” The general aim of this listing system is “to provide an explicit, objective framework for the classification of species according to their extinction risk” (IUCN 1994; for more about PVA’s see Braverman, draft).

Specifically, the Red List defines Extinct in the Wild as follows: “A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.” Schwitzer of the IUCN explains that “there’s a distinction between Extinct, which is basically gone (and we are very, very careful with assigning this status to anything). . . . And then there’s Extinct in the Wild, which simply means that all the animals are in captivity somewhere, whether in a zoo or in a reserve, it doesn’t matter—but it’s not in the wild” (interview).

Currently, the IUCN lists thirty-two species as Extinct in the Wild (IUCN 2013). Père David’s deer is the first example I would like to consider here. According to the IUCN: “The species became Extinct in the Wild due to habitat loss and hunting. The size of the reintroduced population was only 120 in 1993, although it has increased to over 2,000 since that time. . . . The present re-introduced populations are contained within enclosures and are essentially still subject to captive management” (Zhigang and Harris 2008).

Amphibians and partulid snails arguably have the highest number of species representatives on the Extinct in the Wild list. Kevin Zippel, director of IUCN's Amphibian Ark project, tells me in an interview:

When the amphibian extinction crisis came to light and we realized how many species were in such dire need and how relatively few resources they needed to be saved, suddenly the ark metaphor became useful once again. We literally have species that are Extinct in the Wild, existing on the planet only for the very fact that they exist in captivity. . . . We are literally functioning as an ark. But, for me, it is not so much an ark metaphor as it is a fleet of life rafts all around the planet, each working with their own particular species.

Of the thirty-two species listed as Extinct in the Wild, eleven are partulid snails (Figure 12.1). According to the Red List, native partulid species began rapidly disappearing from their habitats in French Polynesia after the intentional introduction of the carnivorous snail *Euglandina rosea* into this area in the late 1980s as a way to control the numbers of the giant African land snail (*Achatina fulica*) that was previously introduced as biological control over “pest” populations. By 1992, few partulid snail species were left on the islands. This genus is currently maintained in captivity in a global breeding program. “It’s not a zoo saving them, not a museum, but it’s all of us working together,” Paul Pearce-Kelly of the Zoological Society of London and coordinator of the Partulid Global Species Management Programme tells me. “You try to make the best you can through a very difficult path that we’re on.” “There’s no question that if one didn’t intervene to the degree we are, there’ll be a lot of species lost, even beyond what there

already is,” Pearce-Kelly continues. “If we have the ability to try and keep things as healthy as possible, then we have the obligation,” he concludes (interview). According to the Bristol Zoo, “Currently twenty *Partula* species have been saved from extinction by zoos and Universities; fifteen are classified as extinct in the wild and five are critically endangered” (NewsWatch 2010).

[Insert Figure 12.1]

Still, many conservation biologists view ex situ breeding first and foremost as a tool for promoting the goals of in situ conservation. The central idea behind these efforts is that once nature is restored, or once a population has strengthened itself, the vulnerable species can be reintroduced “back into the wild.” For example, certain conservation biologists have argued in the context of amphibians that “Maintenance of assurance populations in captivity may be the only route to survival for hundreds of species of amphibian, until a future point where chytrid is, if ever, eradicated from, or controlled in, the environment” (Dickie, Bonner, and West 2007, 224). Robert Loftin argues along these lines: “In cases with truly no alternative to extinction in the wild, taking the remnant into captivity for the purpose of augmenting the population through captive breeding is justified.” “The difficulty,” he adds, “is to discern when this is and is not the case” (1995, 165).

Although the technological capacities for maintaining Extinct in the Wild species in captivity may be available, some have raised concerns about whether those should in fact be used. Just because we can breed animals in captivity for reintroduction, does that mean we should (Reading and Miller 2010, 103)? Is reintroduction just a human endeavor to “redecorate nature,” as Marc Bekoff (2000) has suggested, and as such ought

to be severely limited, if not curtailed? Robert Loftin has argued in response that humans have already redecorated nature extensively through global and local species extinctions and introductions (1995), hence reintroduction is merely a redecoration of a redecoration. The Extinct in the Wild designation surfaces some of the nuanced differences between conservation biologists on the ethical questions regarding the proper relationship between captivity and nature and between ex situ and in situ conservation.

In an interview, Zippel of the Amphibian Ark depicts his model for bridging the existing tensions between the in situ and ex situ approaches, which again clearly prioritizes in situ through its privileged treatment of in situ experts:

The Amphibian Ark [has created] an objective process to evaluate which species needs what kind of help, and uses the expertise of the in situ people to determine that. We don't even involve the ex situ people in species selection. [We] just have the in situ people develop the list: these species need to have assurance populations in captivity, these species need to have head-starting programs, but these ones need to be protected in the field, these ones need research in the field, these ones need mass breeding to counter overcollection. So we've got seven or ten different categories of conservation intervention . . . and then [we] hand them to the ex situ folks.
(interview)

The relationship between experts of ex situ and in situ conservation is, clearly, fraught with tensions and emotions. The case of the California condor demonstrates the heightened emotions at stake in the struggle between captive breeding and extinction. Here is how the episode unfolded, in the words of leading zoo expert William Conway:

I was on the special committee put together by American Ornithological Union and the National Audubon Society some years ago to decide whether it made sense to take condors into captivity. There was a very large and vocal group of critics saying, “No, no, no! Better dead than bred!” Well, we met at length in California, and I wrote much of the program, and we said, “We have no choice: if we leave them out there, they will be dead.” They said, “Fine.” We didn’t agree with that. When we finally got down to twenty-two birds, we took them into captivity.

The Audubon Society opposed placing the condor in captivity. One of its members, bird leader and ornithologist Rich Stallcup, articulated the issues at stake:

But must we still try to conceal the guilt of condor spoilage? Must we burden and demean the doomed skymasters with electronic trinkets, then imprison them in boxes and demand that they reproduce? Or can we just say, “Yes, el condor, we blew it long ago, we’re sorry. Fly, stay as long as you can, and then die with the dignity that has always been yours.”

(Golden Gate Birder 2013)

This approach is very much in line with Tom Regan’s argument that “the general policy regarding wilderness would be precisely what the preservationists want—namely, let it be! . . . Were we to show proper respect for the rights of the individuals who make up the biotic community, would not the community be preserved? And is not that what the more holistic, systems-minded environmentalists want?” (Regan 1983, 363). According to Regan, the requirement that individual organisms be sacrificed for the whole is a type of “environmental fascism” (362). “The rights view is a view about the moral rights of

individuals,” he says. “Species are not individuals, and the rights view does not recognize the moral rights of species to anything, including survival” (359). Similarly, Robert Loftin argues that “Breeding animals in captivity is in some sense breeding the wild out of the animal” (1995, 169) and quotes David Brower: “A [California condor] is only five percent bone and feathers. Ninety-five per cent of condor is place” (178).

In 1986, the Audubon Society filed a lawsuit against the Fish and Wildlife Service’s decision to take the last remaining condors into captivity, claiming that it violated the Administrative Procedure Act, the Endangered Species Act, and the National Environmental Policy Act. Their preliminary request for injunction barring the capture of the wild condor was granted, but reversed on appeal. The United States Court of Appeals in the District of Columbia ruled in 1986: “We believe that the Wildlife Service’s decision to capture the remaining wild condors was manifestly defensible” (*National Audubon Society v. Fish & Wildlife Service*, 801 F.2d 405 [DC Circuit 1986], at 408).

Like David’s deer, the Wyoming toad, and certain partiid snails are thus kept alive in captivity. The California condor, on the other hand, has been reintroduced “back” into the wild “and now we have over 300 and they are breeding in Arizona and California” (Conway, interview). Unfortunately, many similarly threatened species have not fared as well. For example, although all parties agreed at the time that the last remaining Northern white rhinos were insecure in Kenya because of poaching threats, they could not agree on the measures to be taken. “It was an absolutely classic tale of disaster,” IUCN officer Mark Stanley-Price tells me in an interview, lamenting that the inability to bridge the divides between all the concerned parties and officials consigned the Northern white rhino to extinction.

Animal welfare advocates typically adopt a more nuanced approach to the dead-or-bred debate between zoos and animal rights activists. Chris Draper, senior scientific researcher for the Born Free Foundation, defines himself as an animal welfarist. The following is his position on the merits of ex situ breeding. “If there is a justification to do something like that, to really take the last individuals in,” he tells me, “it should be with the view of getting them the hell out of there as quickly as possible” (interview). Although he is focused on the welfare of individual animals (which he assumes to be severely compromised in many captive settings), Draper still sees the point in taking animals into captivity, provided that they are on the brink of extinction, that they can be properly cared for, and that they will promptly be returned to their places of origin. But this is rarely possible, as I show shortly.

Clearly, the debate between extinction and captivity raises difficult questions. “Do we have any responsibility to try to prevent extinction . . . even if doing so in some way mentally or physically ‘harms’ individual animals? How to balance the welfare and rights of individual animals against the value of captive breeding to reintroduction programs and our obligations to sustain populations, species, and ecological communities and processes?” (Norton 1995). Michael Hutchins and colleagues describe this as “issues of individual animal welfare versus overall species and ecosystem conservation” (2003, 964). At times, actions designed to benefit populations will conflict with the interests of individual animals held in captivity (Wuichet and Norton 1995).

Captive—for Life?

For many conservationists, the ethical assessment of captivity depends on the existence of a wild “out there” into which species can be released. It is generally assumed, then,

that while the species might be extinct, its natural habitat, however degraded, continues to exist. But what if the species habitat no longer exists for the last of its specimens to return back to? Are conservationists still ethically obligated to save it, or are they now prohibited from doing so? In the words of Robert Loftin: what happens when animals are “all dressed up but [with] no place to go” (Loftin 1995, 177)? The recent dramatic changes in ecosystems thus raise the following question more urgently than ever before: should humans save nonhuman species that can exist *only* in captivity?

The response of the zoo experts I interviewed for this project was uniform: save them first—you never know what will happen later. In the words of Christoph Schwitzer: “[T]here is an inherent value in saving every single species. I just don’t want my children to grow up without blue-eyed black lemurs, or anything like that—even if it’s some odd frog species, or a mosquito. I want them to be able to experience these, and that’s my motivation” (interview). “It is better to have the species in captivity than not to have it at all,” Robert Loftin argues similarly (1995, 165). “Conditions could conceivably change,” he adds, “more habitat might become available, public attitudes might shift, or environmental contamination might decrease. Unlikely as these scenarios are for some animals, at the very least keeping the biological species in existence in some form, even in a cage, keeps some future alternatives open to some extent.”

Draper disagrees: “There’s no point catching the last individuals into captivity without doing something to restore their habitat in the wild,” He says, explaining that:

Let’s take a hopefully hypothetical situation where there is no polar ice cap on the planet. What do we do with the polar bears that are in captivity at that point? . . . I will be probably ruthlessly honest here and say that it

doesn't matter, because under current management they're not going to breed to sustainable numbers, and they're going to be extinct in captivity anyway. . . . Let's not be distracted by the glitz and glamour of the snazzy captive stuff. For the long run, it's going to be little more than a costly diversion.

The focus on extinction thus pits the pro- and anticaptivity communities against one another, with animal welfarists sitting on the fence. Yet these “crisis” scenarios and solutions are limited in that they are projections in a mode of last resort. Koen Margodt asks along these lines: “Is it better to vanish in the wild than to lead a rich life in captivity? . . . Would it be more desirable to die free rather than to live in captivity?” She responds: “Fortunately, the actual picture is not such a black-and-white one” (Margodt 2010, 30). Similarly, I argue that conservationists can and should find a way around the “bred or dead” dichotomy. Some conservation biologists propose that emerging population management approaches, such as the One Plan approach, are attempting precisely that.

The One Plan Approach

Diseases that increasingly threaten wildlife populations and intensifying effects of climate change have led certain conservation biologists to assert that there is no longer a way around intense wildlife management across the board. “The view that species can be effectively conserved with minimal management simply by creating large areas of natural habitat no longer holds true,” Redford and others have claimed. “Humans will likely never be able to stop managing species in order to maintain the richness and diversity we hold in such esteem” (Redford, Jensen, and Breheny 2012, 1157–1158).

Since 2010, a few scientists at IUCN's Conservation Breeding Specialist Group (CBSG) have been advocating an approach that mitigates the extremities of in situ versus ex situ and extinction versus captive breeding through what they have coined as the "One Plan" approach (for an earlier account, see WAZA 2005). This approach was officially proposed to the IUCN World Conservation Congress and to the European Association of Zoos and Aquaria Conservation Committee in 2012. According to CBSG chair Onnie Byers, "The One Plan approach proposes integrated species conservation planning, which considers all populations of the species—both inside and outside their natural range—under all conditions of management, involving all responsible parties, and engaging all available resources" (interview). Beyond captivating, breeding, and reintroducing animals from species that are on the brink of extinction, the One Plan approach argues for the importance of an integrative management across human and nonhuman populations that brings all the actants and experts around one table.

Population biologists Robert Lacy and Jonathan Ballou are the minds behind metapopulation models that enable such integrative management of populations. Lacy cautions that many of the zoos' "most valued and often irreplaceable breeding programs are not projected to meet demographic and genetic goals designed to ensure that the populations persist." Specifically, he claims that the one-hundred-year goal for sustainable management of zoo animal populations is not only arbitrary but also insufficient, as it does not consider what will happen after those one hundred years are over. Lacy concludes that "our measures of 'sustainability' are measuring success toward goals that are actually counter to true sustainability" (Lacy 2013, 20). Furthermore, Lacy claims that because closed population will always lose genetic diversity, "for zoo

populations to be truly sustainable, they cannot be maintained indefinitely as static, closed populations, but must instead be managed as a dynamic component of a metapopulation that includes wild populations and perhaps also less intensively managed populations in semi-wild environments” (Lacy 2013, 22). Managing ex situ populations alone is not species conservation, Lacy states. “Rather than seeing zoo populations as last resort insurance to prevent species loss when all else fails in the field,” he says, “zoo populations would be managed as an integral component of ongoing conservation success” (2013, 24). The idea, then, is that instead of the previous disconnected units of management for wild and captive populations, a unified and more effective form of management should emerge (for more on this model see Braverman, draft; for other forms of integrated population management see Shea et al. 1998). As Lacy explains in our interview: “No longer can the zoo world operate differently from a national park. The captive populations are most likely not viable on their own . . . and the wild population certainly is not viable on its own, either. We have to be working in partnership because we need each other.”

Such an integrated *inter situ* approach is already taking place on the ground (Braverman, draft). For example, the African penguin has been in steep decline for the last couple of decades—down from several million breeding pairs at the turn of the last century to twenty-five thousand breeding pairs in 2013. This drastic decline, Schwitzer explains, is not only due to overfishing, but also due to global climate change and the resulting changes in ocean currents that have led to an ecological mismatch between the penguins and their prey: the fish have moved east to places where there are no penguin colonies. In Schwitzer’s words

When they nest and have chicks, penguins can only swim for about twenty kilometers to find fish. So if the fish is further away from the nesting colony than twenty kilometers, then the whole system breaks down and the chicks starve, which is what is currently happening. So we are saying: if the mountain doesn't come to the prophet, we need to bring the prophet to the mountain. We are trying to bring the penguins to the fish.

To do so, Schwitzer and others needed to figure out a way to overcome “breeding site fidelity” —namely, a penguin, when it becomes sexually mature, always goes back to where it hatched to start breeding there. Schwitzer presents the most recent solution:

We are taking away these starving chicks from the colonies, we are hand-rearing them in captivity . . . and when they are nice and fat, we chuck them back in, and we bolster the wild population by doing that. But we don't bring them back to where they came from, at least not all of them. . . . They are all banded, with flipper bands, and we can see which one goes where. . . . [E]ventually, we would like to use zoo-bred penguins, at least eggs from penguins in European and North American zoos, and bring [them] back to South Africa, hatch them . . . and then use these to bolster the wild population, too. . . . We want to know that this works, in case the wild population further crashes down. We want to be able to use the several thousand strong zoo population to actually bring that wild population back. (Interview)

Under the One Plan approach, in situ and ex situ conservation projects are codependent and reciprocal; they also enable animal transfers between various sites for

the sake of conservation. As species population management becomes holistic, the lines between in situ and ex situ conservation are effectively blurred. Some conservation biologists believe this to be an inevitable and positive change: “zoos have contributed a set of approaches to species management that are being integrated with those from field conservation to create hybrid forms of species management better suited to present-day conditions” (Redford, Jensen, and Breheny 2012, 1157). According to its proponents, such a flexible negotiation of in situ and ex situ incentives will foster proactive modes of conservation that will eventually relieve the current narrow focus on extinction (for other views, especially ones that caution about the political economical effects of such integrative approaches, see Braverman, draft).

Reassessing In Situ versus Ex Situ

I have shown that the relationship between captive and wild populations is complex, illuminating the problems of bifurcated definitions such as nature/captive and in/ex situ. The intensified management of animal populations in nature reserves as well as in other typically perceived “wild” sites calls into serious question the ability to depict something as purely in situ or ex situ conservation in the first place. Certain conservation experts have proposed, for example, the establishment of extractive reserves (Conway 1999; Redford, Brandon, and Sanderson 1998), which entail designating a natural habitat and managing it for animal production, including surveys of the habitat, the species present, ecological interactions, and the movement of animals in both directions—from the reserve to zoo populations and vice versa—to improve the genetic diversity of the individual populations (Dickie, Bonner, and West 2007, 228). Would such extractive reserves be sites of wild nature or of captivity, of in situ or ex situ?

Hamish Currie of the South African nonprofit organization Back to Africa explains some of the problems that have resulted from the rigid application of what he calls the “old school” definitions of in situ and ex situ. In his words, “There are very few places left that are actually really wild. So whether you like it or not, you have to manage wildlife.” “We still talk ‘in situ,’ and ‘ex situ,’” he continues, but “in fact, . . . in most scenarios you are managing animals” (interview). Currie also points to the disparity between the world of zoo scientists and academics and the realities of animal management in Africa. In his words,

Too many people—too many academics, too many people working in zoos—sort of think ‘well these are captive animals and then there’s the wild.’ They think of this vast continent of Africa where animals are running around, moving vast distances, all the genetic exchange is taking place—and that’s the wild. What they don’t realize is that it’s now being sort of boiled down to smaller and smaller pockets, and within those pockets animals might have to be managed. (Interview)

Zoo expert William Conway provides an even more sweeping critique, this time of the term “original habitat,” which has been used frequently in describing in situ operations. In his words,

the whole business of in situ and ex situ are artificial concepts. . . .

Habitats are moving and changing, climate is changing. Animal populations in the past have been able to adapt to these changes, sometimes. [But] lots of time they couldn’t and became extinct before humans came around. That’s why we don’t have giant sloths and

mammoths. There used to be mammoths 11,000 years ago in the Bronx; 18,000 years ago there were polar bears in the south of France. That's not so long [ago]. So [the term] "original habitat" depends on how original you want to be. . . . [W]e usually apply the same sort of meaning we do to history: history is since we were here, and "original" is the way it was when we remember it. But it doesn't necessarily mean it was here the day of the dinosaurs. So these terms have to be taken with great deal of flexibility. (Interview)

Nature and its implied originality are thus understood by many conservationists to be relative and flexible concepts that greatly depend on human definitions: "Original is the way it was when we remember it," in Conway's words. Nonetheless, others such as Draper insist that, "When I hear about ex situ conservation I think that there needs to be a clear divide between if it happens in Bronx Zoo and Regent's Park; or if it happens in their place of origin." These narratives and many others illuminate the current challenges that conservation practices face in their attempt to adequately consider temporal benchmarks, the nonlinear or immanent nature of ecological complexes, and the criteria by which humans might evaluate emergent or novel ecologies. In one of many examples for such nuanced practices, Soule and colleagues have suggested that the current implementation of environmental laws and policies generally ignores what they call "interspecific effects," mistakenly focusing on recovery goals that are "autecological, short term, and numerically and spatially minimalistic" (Soule et al. 2003)

Conclusion

Until very recently, the existence of the modern has depended on an ideal conception of nature; it relied on the animal's status as wild, exotic, and other (Braverman 2012, 30–49). Moreover, without such a wild, free, and timeless nature, captivity could have no meaning. Indeed, the perception of nature advanced by modern zoos in the latter part of the twentieth century has thus been one of a Nature that is untouched by humans—the ultimate other of the zoo's captivity. Captivity defines the very possibility of nature precisely by being its opposite, without which nature cannot exist. The modern institution of captivity has, in other words, evolved hand in hand with the modern institution of wilderness and alongside the ethics of modern conservation that effectively manage and also exacerbate this divide.

This chapter has drawn on multiple interviews with conservation experts to question the still powerful modern divide between *in situ* and *ex situ* conservation. Prompted by the ecological challenges that face today's world, some conservationists are starting to question the validity of the *in situ* and *ex situ* paradigms of conservation, which lie within the broader schisms of nature versus human and wild versus captive animals. I have discussed current efforts by certain conservation biologists to bridge the *in/ex situ* divide through the One Plan approach. Parallel efforts to bridge *in situ* and *ex situ* conservation are increasingly mushrooming in the conservation world through projects of re-wilding (Lorimer 2013), reconciliation ecologies (Rosenzweig 2003), and “land sharing” versus “land sparing” debates in Europe (Green 2005).

Finally, I have hinted toward the possibility of abandoning the “in” and “out” paradigm that has so characterized modern conservation narratives in favor of an understanding of conservation that focuses on a more dynamic and less predetermined

understanding of ecosystems and populations. Such a holistic model breaks with the bifurcations of modern conservation to offer relational configurations of managing wild life (Braverman, draft). The shift to integrated forms of conservation admittedly triggers a host of novel ethical questions and concerns that go to the very heart of the definition of conservation. Some of the questions raised by conservation biologists and explored in this chapter were: Should we conserve species without a real prospect of releasing them “back”? How will we decide which species to manage for life, and which should be left to “fly” on their own? And, more broadly, what are the emerging motivations and criteria for a more dynamic and relational form conservation?

Acknowledgements

I would like to thank Lori Gruen, Jack Schlegel, and Gregor Harvey for their comments and editorial advice.

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[Fig. 12.1]

Partulid snails at the London Zoo, courtesy of Irus Braverman