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Ex-Situ Conservation Programs: Worthwhile?

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Because most of the audience has been to a zoo, your purchases there most likely funded ex-situ conservation programs we will be describing. This makes it is both extremely relevant and important that you know how successful these conservation measures are, and if they are deserving of continued funding.

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Here are a few helpful definitions before we get into our argument.

Ex-situ conservation is maintaining a species out of the wild. This includes captive breeding, gene and seed banks, zoos and aquariums. (picture on right)

In-situ conservation is maintaining a species on site in their natural habitat. This includes habitat restoration and protected parks. (picture on the left)

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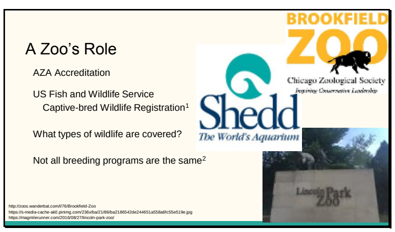

In order to take part in a captive breeding program, a zoo must be accredited by the Association of Zoos and Aquariums (AZA) and hold a Captive-Bred Wildlife Registration under the United States Fish and Wildlife Service (USFWS).[1] These programs must be registered because many of their practices would otherwise be banned under the ESA because they may involve the take or transportation of an endangered animal.

In addition, the USFWS mandates that species must meet certain criteria for the program to be approved. They include: listed as either endangered or threatened by Endangered Species Act, a living specimen, and capable of being bred in captivity. We thought this last stipulation was unusual, considering the program that is being proposed is testing if whether it can be bred in captivity in the first place.[1]

It is also important to point out that not all captive breeding programs have the stereotypical end goal of producing many individuals in captivity to be eventually released into the wild to form a stable population. Captive-breeding programs can have other uses as well, such as breeding for exhibit to limit a zoo’s reliance on taking individuals from the wild, for conservation education purposes, and for research—all have conservation value, but not what will be emphasized in this presentation.[2]

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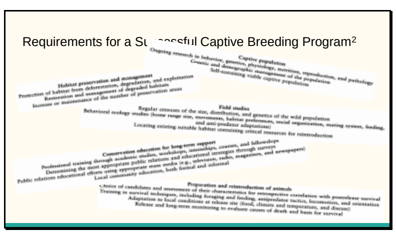

The requirements for a captive breeding program to be successful include: captive population, habitat preservation and management, field studies, conservation education for long-term support, and preparation and reintroduction of animals[2]… did you get that?

That is our point, there are a lot of things that must go right for a conservation program to be effective. Next we will go over criteria for ex-situ conservation programs to be successful in more detail.

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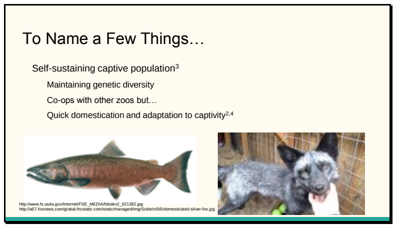

A major hurdle is the ability to maintain a self-sustaining captive population. This is a loaded term with many facets the program must execute, making ex-situ conservation challenging.[3]

The first being maintaining genetic diversity. Preserving the heterozygosity within a population is important because smaller populations—such as those within a captive breeding program due to their low numbers in the wild—often lead to increased homozygosity and inbreeding depression, predisposes entire populations to increased disease susceptibility.[3]

This can be combated with co-ops with other zoos in which a few breeding individuals can be translocated temporarily during breeding seasons, then returned to their original zoo program at the end of the season. Introducing distant individuals to produce offspring increases the gene pool, but this is not easily done. The translocation stress oftentimes causes the introduced individuals to not mate.[3]

Another hurdle is the quick domestication within captivity. With an extreme example, chinook salmon (bottom left picture), after just a few generations of being reared within captivity, show significant reductions in fitness after reintroduction into the wild.[4] Even for species that are not as prolific as the salmon this has been observed. In silver foxes (bottom right picture), Christie et al.'s study revealed after only twenty generations of captive breeding led to domesticated behavior compared to their recently wild predecessors. [2]

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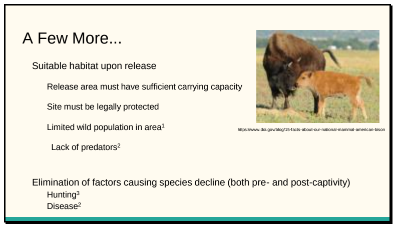

There must also be a suitable habitat upon the release of captive-bred species.

This means that the release area must be able to hold a sufficient carrying capacity. Field studies must be conducted to determine the amount and type of habitat required by a new population. Although essential, field studies can be expensive, so many programs may opt not to do them which can be detrimental in the long run.

The release site must also be legally protected. Unfortunately, one trend caused by the prevalence of captive breeding programs is that ex-situ programs are being seen as a technological fix to population decline. This can divert focus from habitat protection.

Almost counterintuitively there must be a limited wild population at the release site[1]. There a couple of reasons for this, one being that a small wild population can decrease disease transmission, which we will talk about later. In addition, reduced wild population can decrease the occurrence of out-breeding depression because wild and captive bred population would not intermix and breed. Captive bred animals often have inadequate social skills because they are often raised by humans, so introductions between captive bred and wild animals may cause stress. It can also put the wild population at an advantage because the know how to better survive in the wild.

Finally, there must be a lack of predators in the release area[2]. Predation causes many failures of captive breeding programs because often captive-bred animals have reduced predator avoidance skills again because they were raised by humans.

And while it may seem obvious, a major impediment to the success of these programs is the elimination of the original source of the problem that caused the species to decline in the first place.

The purpose behind the hunting of the species can be for food, fur, trophy, and medicines, making the halting of poaching multi-faceted due to the various demographics who may have different uses for the animal.[3]

And for disease, as previously mentioned, inbred animals from small populations can suffer from inbreeding depression, which has been shown to increase disease susceptibility.[2] Wild populations have a natural acquired resistance to pathogens they may encounter in the wild, but when put into a zoo in somewhat close proximity to hundreds of species they may have never historically encountered, their natural immunity is relatively ineffective. Additionally, protocols after an outbreak are extreme for a facility to handle, such as the suggested cleansing requires demolition, soil removal, and euthanizing any infected individuals.[2]

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These programs can also require extensive human intervention before the species can be self-sustaining in the wild. Even the most limited-contact programs require some sort of training, organized into six categories: avoiding predators, acquiring/processing food, interacting properly with other species they would encounter within their new natural environment, finding and constructing shelters or nests, locomotion on complex terrain, and orienting and navigating a complex environment[1]. This was evident in *Wild Ones* by Jon Mooallem, in which the whooping cranes relied on humans to teach them their first migration pathway from the Midwest to Florida.

Programs should also be cost effective[2]. This is because there is only a limited amount of money that can go into conservation, so every penny needs to be used wisely.

On average, captive breeding programs cost half of a million dollars per species per year. Funding of these programs directly compete with in situ conservation. This is a problem because in situ conservation has been shown to help more species for less money because increasing the quality and range of a habitat helps all the species in that area.

I also want to point out that the method of cleansing a diseased facility would be extremely expensive, which may lead to facilities choosing not to obey these guidelines and increasing the spread of the disease[2].

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And despite all of these hurdles, there are two species that are consistently cited as "success stories," which will be argued are not truly that successful, due to the complex nature of captive-breeding programs. The first being the whooping crane. Yes, numbers have increased, which is extremely encouraging. However, it is at the slow rate of approximately only ten birds per year, at the great time investment highlighted in John Mooallem's *Wild Ones.* There is also a massive financial investment, which amounts to $12,000 per bird, per year necessary funding of the program, amounting to $6.1 million dollars spent annually on just this species's program alone[7]. There was even a disease outbreak the program had to contend with, when an equine encephalitis outbreak killed seven of the thirty-nine individuals[7], a huge blow for a growing population and a testament to how fragile these programs are.

Another species that was cited numerous times as being considered one of the most successful captive breeding programs was that of the black-footed ferret. We argue that while this program led to an increase in black-footed ferrets in the wild, it was by no means an overwhelming success.

This is because the program cost $400,000 per ferret that survived and only 90% of ferrets survived that were reintroduced[5]. Inbreeding occurred in one of the reintroduced populations because of this decrease in genetic exchange[6]. One study proposed translocating ferrets to right this problem. However, as we know translocation of species can lead to the spread of disease. And in fact, there was a distemper outbreak in many of the populations of reintroduced black footed ferrets[2].

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The information that we have presented leads us to ask "Where do we go from here?"

Although it seems that we have been bashing on zoos for the majority of our presentation, we are <u>not</u> trying to say all zoos need to be closed. But, we do argue that zoos do need to stop ex-situ conservation and instead allocate funds to other programs where they can be more beneficial.

We also do not think that zoos need to stop all species in captivity. We believe that zoos should continue captive breeding for non-recovery purposes such as for research or exhibition. This would cuts down the number of endangered animals that would need to be taken from the wild.

With this money that would be saved zoos can expand in other beneficial conservation areas. Zoos are very good at and should expand on education programs to increase public interest in conservation, encourage the public to become involved in conservation initiatives, and also to raise money for conservation programs. Zoos would also be able to better fund research and in-situ conservation which most are already taking part in.

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And for any money that could now be allocated outside of zoos, there are some programs already in place that we believe are promising and an efficient use of conservation dollars.

Too often, the decision must be made to protect many smaller plots of land rich in biodiversity versus one large plot. Both have their unique benefits, and perhaps now there would be sufficient funds to protect both types of sites and distinct advantages.

Getting locals involved can only increase the knowledge and appreciation for species and their ecosystems. Allocating funds to provide training and jobs to locals to become wardens in areas with high poaching activity would provide people financial stability and the local endangered species additional protection. And we can’t forget the marine environments, as a major problem in allowing fishermen to switch to better nets, equipment, and TED to reduce bycatch is often the expense. Funding could now be allocated in subsidizing the fishermen's transition to these safer practices.

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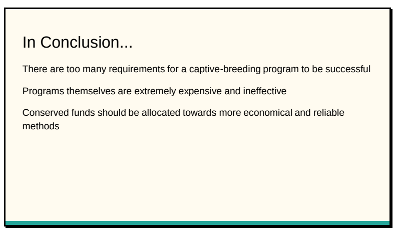

In conclusion, captive breeding programs have too many requirements to be successful and the programs themselves are both expensive and ineffective. We argue that funds should be reallocated to more economical and reliable methods.

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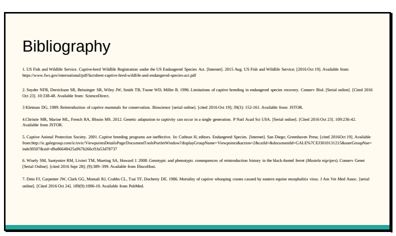

Bibliography

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Thanks for listening! Any questions?
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