

Modeling the impact of reintroductions on source population dynamics of chimpanzees in African sanctuaries



Lisa Faust¹, Ben Beck², Doug Cress³

¹Alexander Center for Applied Population Biology, Lincoln Park Zoo;

²Great Ape Trust of Iowa;

³Pan African Sanctuary Alliance (PASA)

lfaust@lpzoo.org



ABSTRACT

In reintroduction programs it is essential to evaluate how release strategies impact both the reintroduced and source populations. Orphaned great apes in Pan African Sanctuary Alliance (PASA) facilities may serve as source populations, and several PASA members are planning reintroductions using the appropriate IUCN guidelines. This project explores the potential impact of reintroductions on the demography of the source populations in PASA sanctuaries. We use a demographic simulation model that projects future population dynamics of the sanctuary chimpanzee population using current age and sex structure of apes housed in PASA sanctuaries, historic and hypothetical arrival rates into sanctuaries, and species-specific patterns of mortality. We modeled potential reintroduction scenarios varying size, sex, and age structure of reintroduced groups. Our results show that if historic arrival rates continue, sanctuary populations will continue to increase necessitating long-term planning for infrastructure and economic security. Modeled reintroduction scenarios did not significantly decrease population size in the source populations. This has benefits and drawbacks: sanctuary populations will likely remain robust enough to provide individuals for future releases as necessary, but will also demand resources and personnel to support their populations, which will need to be balanced with the resources that PASA members devote to reintroduction projects.

BACKGROUND – PASA SANCTUARIES



PASA, the Pan African Sanctuary Alliance, is made up of 18 member sanctuaries in countries across Africa. These sanctuaries were started over the past three decades in response to the heavy flow of orphaned apes and other primates.

PASA member sanctuaries currently house close to 800 chimpanzees (Fig 1), as well as over 100 bonobos and gorillas. PASA members are “committed to providing the best facilities and care possible to captive African primates in Africa, while working towards the protection and conservation of the species in the wild” (PASA mission statement). Part of this commitment includes evaluating whether reintroductions of PASA animals can significantly contribute to long-term conservation in the wild. Currently 4 PASA programs have ongoing reintroduction components, and several more are studying feasibility for releases of apes in the next 2-5 years.

Our purpose in this study was to examine the dynamics of the PASA chimpanzee population, including:

1. Describing the historic pattern of growth across PASA sanctuaries
2. Using demographic modeling to project potential future trajectories
3. Determining how potential reintroductions might impact the future trajectory.

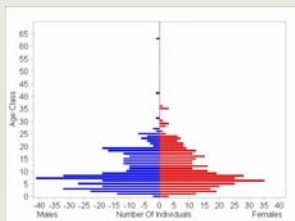


Fig 1. Age structure of chimpanzees in PASA sanctuaries included in this modeling project.

HISTORICAL PATTERNS

We received detailed historic demographic data (individual animal records) from 9 of the 12 PASA sanctuaries housing chimpanzees. We extrapolated data from two additional sanctuaries with large collections using their current population sizes and the assumption that their age structure would be parallel to the overall population. The remaining PASA member housing chimpanzees is primarily a reintroduction project and was excluded from analyses. We consolidated data across sanctuaries into an individual population “studbook” dataset for analysis.

Population size (Sept 2007)	Average annual arrival rate (2000-2006)	Average annual population growth rate (2000-2006)
760 (385 M, 375 F)	56.7	15%

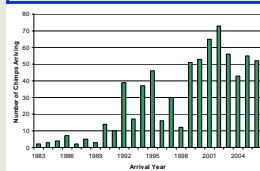


Fig 2. Annual number of arrivals; in addition, 95 individuals have unknown arrival dates.

Median age for the populations is 9 years old, signifying a relatively young population (Fig. 2) for such a long-lived species. For example, based on data for the North American zoo population, the median life expectancy for chimpanzees is 32 and the maximum longevity is 69 years of old (based on a female who is still alive).

POPULATION MODELING

We used ZooRisk, individual-based population modeling software designed for zoo populations, to project future dynamics. To initialize the model, we used the age and sex structure of the PASA population. Because the PASA population is so young that mortality rates are not reliable (or do not exist for the older age classes), we used observed mortality rates from the North American zoo chimpanzee population.

We explored the following model scenarios:

1. **No New Arrivals** – what if no additional orphans arrived?
2. **Current Arrival Rate** – what if the observed rate of 56 chimpanzees/year continued?
3. **Reduced Arrival Rate** – what if arrival rates slowed to 30/yr?
4. **Reintroduction Scenarios** – at least three release events are being planned: 1) 15 individuals planned for July 2008; 2) three Cameroon sanctuaries plan to release 30-50 individuals in 3-5 years; 3) Two additional sanctuaries are still developing release plans. In ZooRisk, we modeled three release events:
 1. In Year 1: 15 individuals (6 males, 9 females) released
 2. In Year 3: Either 30, 40, or 50 chimpanzees released
 3. In Year 8: Either 30, 40, or 50 chimpanzees released

MODEL RESULTS AND CONCLUSIONS

1. Even if all arrivals stopped, sanctuaries will still have to support large populations well into the future.

Although unlikely that no new orphans would need shelter within PASA sanctuaries, this scenario shows that because the population is young and the species has a long life expectancy, population sizes will still be large in the short and long-term. Sanctuary managers will need to plan for long-term housing of these animals, and

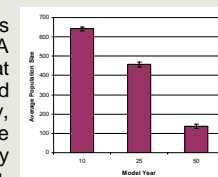


Fig 3. Projected future N for the housing needs that may change as the population ages.

2. If current or reduced arrival rates continue, PASA sanctuary capacity will need to grow significantly

As wild populations of chimpanzees continue to face pressure from logging, bushmeat, and habitat fragmentation, it is possible that the flood of orphaned chimps observed in the past (Fig 2) will continue or, optimistically, lessen somewhat. Even if the rate slows significantly, sanctuary capacity will still need to increase to house new orphans.

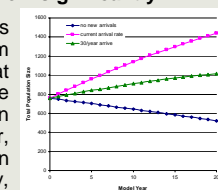


Fig 4. Projected future N under three arrival rates

3. Reintroduction Scenarios do not slow growth if arrivals continue. PASA populations will serve as robust sources for reintroduction in the long-term, if needed.

Because the overall PASA population is so large, harvesting 75-115 individuals over three reintroduction events does not have a large impact on dynamics of the PASA population. Based on these results, in planning for reintroductions, PASA managers should consider:

- **Viability of the reintroduced population:** Given observed/anticipated survival rates and chimpanzee life history, PASA managers should determine the most viable starting population size based on population dynamics and the capacity of the reintroduction site.
- **Creating socially/behaviorally appropriate release groups:** As the PASA population is young, over the next 10 years there will be a variety of young individuals under 30 to select from. PASA managers can focus on forming appropriate cohesive release groups with this young stock population.

Fig 5. Projected future N under different reintro. scenarios

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