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Zoo Animal Rotation: *New Opportunities from Home Range to Habitat Theater*

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ABSTRACT

American zoos are beginning to develop facilities around the concept of "**animal rotation**," wherein animals move through multiple enclosures in a simulation of "home range". Multiple species can occupy the same enclosures consecutively. This concept greatly increases spatial and behavioral opportunities for the animals and brings an important "discovery" component to the visitor experience. This new rotation concept could revolutionize the way zoo animals are managed and displayed.

INTRODUCTION

As observers of zoo trends, we are always interested in useful innovations, particularly those which combine cross-discipline collaboration in conservation biology, behavioral enrichment, operant conditioning, education and exhibit design. Such breakthroughs are especially exciting when they benefit both the animals and the visiting public. We believe that the **zoo animal rotation concept** discussed by this panel will be the most important advance in zoo exhibit design since the introduction of "landscape immersion" (Jones et al, 1976, Coe 1985) twenty years ago. Recent data and observations by my fellow panelists, a scientific observer and an animal keeper which will be presented after this paper, help to reinforce our enthusiasm.

We define zoo animal rotation as the regular, controlled movement of individual or groups of animals through a series of enclosures by means of training and habituation.

ROOTS OF ZOO ANIMAL ROTATION EXHIBITS

It is widely known by students of wild animal behavior that animals utilize different areas of their habitats at different times and for different purposes. E. O. Wilson (1950: 256) termed the composite mosaic of these special use areas **"home range"** (also see Burt 1943).

Animals are frequently creatures of habitat and many species can be said to "rotate" from use area to use area in a more or less repetitive sequence, depending of course upon weather and season. These habits are well known to hunters. Hediger (1950) goes on to note that although in captivity the area available to the animal is greatly reduced, many species tend to

continue this pattern of selective area use. For example, an animal may always bask in the morning in one place, always defecate in another and habitually sleep in a third area, all within the same greatly reduced area. Spatial limitation usually results in greatly reduced movement by the animal and an overall impoverishment of its opportunities and choices.

Further examination of natural wild animal behavior shows that some mixed species can co-occupy the same area **concurrently**. For example a deer, squirrel and thrush can rotate through their daily cycles, often sharing the same area with little or no interaction. Many species seem to seek out the company of certain other species and thus share benefits such as greater collective ability to warn of predators. Zoos dating back to Hagenbeck (1909) have displayed selected mixed species concurrently in the same habitat. This presents a more interesting picture to the public and increases stimulation to the animals. There is also greater risk of injury and disease transmission.

In nature, different types of incompatible animals can also occupy the same space **consecutively**. For example, the deer, squirrel and thrush share their woodland edge habitat with cougar, fox and hawk, although not usually at the same time. This concept is occasionally seen in zoos. The Denver Zoo rotates hyenas in their lion exhibit at night. Circuses commonly rotate many species of animals through the central ring.

In zoos, these movements, from the simplest to the most complex, are controlled by training. The idea of designing animal displays around the systematic use of animal rotation was first developed, to my knowledge, by this author and his associations in collaboration with Tim Desmond and Gail Laule of Active Environments, Inc.

TYPES OF ANIMAL ROTATION EXHIBITS

1. **Traditional Single Species, Two Areas**. Most commonly zoo animals rotate between night quarters and day quarters. This rotation benefits the animals by giving them greater opportunities than would be available in a single area.

2. **Single Species, Two or More Areas**. This concept is exemplified by the Thai Elephant Forest Exhibit at Woodland Park Zoo (Jones 1989) where the animals' outdoor area is linear and complex, resembling a miniature "home range". A far more complex example is found at Zoo Atlanta (Coe 1985) where multiple troops of the same species (gorilla) rotate through a series of outdoor and indoor habitats. This facility will be presented in detail by Ms. Lucas whose presentation follows mine.

Another variation on this concept would be to rotate a number of individual species between night quarters, off-exhibit activity areas and display areas so as to maximize the activity of animals on display and add variety to each animal’s life.

3. **Concurrent Multiple Species, Two Areas**. This is the common mixed species zoo exhibits where, for example, giraffe, zebra, antelope and ostrich rotate from separate night quarters to a common daytime habitat.

4. **Concurrent Multiple Species, Multiple Areas**. The same compatible group of mixed species could rotate as a group through a number of separate interconnected habitats. This could resemble a small part of the annual migration on the Serengeti Plain or a mixed species herd marching to a waterhole.

5. **Combination Single and Mixed Species Rotation**. A mixed species group could occupy a particular area and be conditioned to accept the passage of a different semi-compatible species through their area. For example, it may be possible to condition a mixed species ungulate group to accept the passage of a group of white rhinoceroses.

In yet another case, most of the above examples could double by having separate nocturnal populations duplicate the combinations enacted with the diurnal species. This would be perfect for zoos wishing to extend their visitor hours as the Singapore Zoo has done.

6. **Consecutive Multiple Species, Multiple Areas**. Ms. Petiniot will presently discuss the case of the Toledo Zoo Great Ape Exhibit, where gorillas, chimpanzees and orangutans can rotate consecutively through a variety of indoor and outdoor habitats. Mr. Walczak will later present the concept of the Louisville Zoo's Island Exhibit where species as different as gibbon, orangutan, tapir, babarusa and tiger can consecutively rotate through an interconnected series of exhibits.

ADVANTAGES OF ZOO ANIMAL ROTATION

1. **Advantages to the Animals**. Two of the greatest problems for zoo animals are boredom (loss of occupation) and lack of exercise. As the next two papers will show, animals that regularly rotate through or between several habitats display greater activity levels. Exploratory and territorial behaviors are greatly increased. This is heightened by the keepers hiding treats throughout each new area before the animals enter.

Elephants, in particular, would benefit from the increased exercise gained by long walks through interconnected, linear habitats.

2. **Advantages to Zoo Visitors**. A trip to the zoo could become much more like a walk in the wild. Features of animal behavior such as biological rank (Hediger 1950) and dominance at food trees and waterholes could be safely reenacted. Visitors would also see more active and better conditioned animals. Most visitors would be pleased to note that new exhibits are "... more like nature."

3. **Advantages to Animal Husbandry**. As behavioral consultant Gail Laule notes (1995), animals which are well trained in one area, for example going from one exhibit to another on command, are usually trained also in other areas, such as actively cooperating in veterinary procedures. The ability to rotate animals allows some display areas to be rested or fallowed, allowing plantings to recover. Toledo Zoo staff found that great apes which are rotated frequently do far less damage to exhibit furnishings than they do in traditional static displays. Similarly, animals can be rotated between more heavily "armored" foreground displays and more "soft" and natural background exhibits.

The American Zoo and Aquarium Association's (AZA) Species Survival Plans (SSP) have resulted, in some cases, in the potential to produce more valuable offspring of highly endangered species than there is available housing. Animal rotation allows larger numbers of individuals healthy "exercise periods" on display, while more of their time is spent in less costly off-exhibit areas.

DISADVANTAGES OF ANIMAL ROTATION

1. Simply put, the more complex the system, the more things can go wrong. Also, while a very rudimentary level of animal training is needed in traditional exhibits, an organized program of training is needed for the more complex rotation exhibits. And, while such a program clearly facilitates all types of animal care and provides increased levels of behavioral enrichment, it does require more staff. Exhibits which are developed for multiple species must be designed to contain the strongest or most agile among the animal users. This can increase construction cost. For this reason, rotating animals with similar containment requirements such as small antelope, ostrich, zebra, cheetah, hyena and wart hog, would be more cost-effective than including species such as primates in that particular rotation sequence.

2. Rotating animal species through exhibits can raise concerns over potential disease transmission similar to those encountered in present mixed species exhibits. Presumably they would be countered in much the same way. Animals selected for rotation should be disease free or have similar disease tolerances. The risk of injuries could be higher than in static, single species displays because of higher levels of activity and stimulation. On the other hand, activity and stimulation should reduce confinement stress and increase physical and mental fitness.

FUTURE DIRECTIONS

As zoos become more dependent upon the entertainment market for operating revenue, many will see rotation exhibits as ways to increase visitor appeal. Others, responding to humane concerns to give the animals "more room" and greater behavioral enrichment will find the rotation concept beneficial. While most North American zoos may begin adopting these concepts gradually, new zoos being conceived both here and abroad may develop comprehensive, integrated programs of animal management and display centered upon the rotation concept. Imagine Asian tourists with cameras flashing as elephants trumpet and thunder down to a twilight water hole; displacing zebra and ostrich ("habitat theater"). Picture yourself peering from your tent in a simulated safari camp as hippo graze past in the moonlight. Envision walking through a large enclosure of free flying tropical birds, when a noisy flock of macaws flies just overhead, circles twice and departs. These examples of animal rotation and many more will be changing the way we experience zoos in the twenty first century.

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