

LET THEM BE ELEPHANTS! HOW PHOENIX ZOO INTEGRATED THREE ‘PROBLEM’ ANIMALS

BY HILDA TRESZ AND HEATHER WRIGHT

Introduction

The Phoenix Zoo is currently housing three female wild-born Asian elephants (*Elephas maximus*) who came to us from other organizations with a variety of health and behavioral problems, some of which have been exasperated since arriving at our facility. Each of these elephants has had a troubled past and they were labeled as ‘problem animals’. The Phoenix Zoo, through various circumstances, acquired Indu in 1998, Reba in 1999, and Sheena in 2000.

Let them be elephants!

In 2003 the zoo’s management decided to re-evaluate husbandry and training methods in order to improve the elephants’ well being. The zoo hired Alan Roocroft, an expert in elephant behaviors, to assist in designing our new program. With staffing changes in late 2003 and early 2004, the new program was started and a new practice of elephant care at our facility began. The focus shifted from simply exhibiting elephants to providing a complex interactive exhibit where these animals could be introduced and live together as a herd. Before we could even think of introducing these animals, we had to address their aggressive tendencies. As is well known, wild female elephants in the same social group do not exhibit serious aggression towards one another. Our elephants, however, came from three different ‘groups’ and had little intention of becoming friendly with each other. The first step was to try increasing all other natural behaviors, such as foraging and exercise, and see if the elephants would continue exhibiting these behaviors, which should increase the chance of a successful introduction. By taking the elephants’ natural, individual and current exhibit history under consideration some changes had to be made. We decided to alter their exhibit, modify husbandry and training techniques, and change up feeding schedules as well as the presentation of diet to enrich their everyday lives.

Materials and methods

The animals

Indu was born in Thailand in 1965. She has bad teeth, recurrent hip and temporal abscesses, and occasional tail abscesses. Her feet are in good condition. She is very good with calves, but occasionally shows aggression towards adult cows. She has also shown occasional aggression towards keepers.

Reba was wild-born around 1970. Her origin is unknown. She has recurrent foot abscesses on her front left foot. She shows signs of arthritis in her left shoulder and is currently on medication. Reba has a history of aggression towards both keepers and conspecifics. She is highly intelligent, yet unpredictable.

Sheena was born in India around 1971. She has recurrent abscesses on her left hip. Sheena has a history of aggression towards keepers, though that behavior has not shown much since she arrived in Phoenix. She has, however, historical aggression toward conspecifics. Sheena has a tendency to 'shut down' when confused or scared.

All of these animals have injured people in the past and one had previously killed one of her caretakers.

The exhibit

The animals were housed individually. The exhibit is about 0.48 hectares and includes a pool (15 m × 24 m), an elevated concrete island (9 m × 24 m) as a visual barrier, a wallow, a shower and one scratching post. The entire exhibit is enclosed by a three-meter-high reinforced gunite wall that slopes outward at a 60 degree angle.

Since December 2002, the animals were kept separated due to aggression toward one another and were rotated on exhibit. While one individual was on exhibit the other two were kept in the holding facilities also separated from each other. This method gave our elephants the opportunity to spend some, but not enough, time in a larger area where they could travel and forage for a longer duration. Keeping our elephants separated also collided with our visitor program and its message. Visitors often believed that Phoenix Zoo owned only one elephant due to our inability to exhibit more than one animal at a time.

Behavioral management changes

1. Foraging behaviors were altered by **eliminating bulk feeding on ground level**. Instead **elevated hay, browse and puzzle feeders** were installed to increase foraging time.
2. We started **equally rotating elephants**. Additional barriers were added to the elephant barn in order to decrease chances of elephants injuring each other while unsupervised, allowing for equal rotation for each elephant on exhibit overnight.
3. Holding area substrate was changed by adding a **two-foot-deep** (0.6 m) **layer of sand**. With at least one elephant being held off exhibit at all times, it was felt that improving the substrate in the holding area was imperative.
4. **New wallow**.
5. **Scratching post**.
6. **Sandstone boulders** were added to give the elephants natural substrates to scratch on. Sandstone is a softer stone that will wear as they rub on it.
7. **Large mounds of dirt** were added, creating barriers, encouraging walking and exercise, and softening the ground in an attempt to reduce foot stress.
8. Four large elevated **mechanical feeders** were designed and installed on exhibit. Each feeder is a climate-controlled area with fans and misters. Each has two feeding stations that can be raised or lowered by keepers off-exhibit.
9. Elevated and ground food **puzzle feeders** were installed for distributing hay and pellets **in the two holding yards** as well.
10. Keepers regularly **exercise the elephants** by asking them to walk from one part of the exhibit all the way to the other end while reinforcing the behavior.
11. **Training scope was decreased** to basic medical and husbandry behaviors and 'performance' behaviors, such as front and hind leg stands, were eliminated.

12. **Healthcare was revised.** Our previous veterinarian (Dr. Curtis Eng) and one of the keepers (Steve Koyle) attended the First European Elephant Management School [see *IZN* 53 (2), 94–98] in 2004 for further education on footwork, healthcare and training. Alan Roocroft visited the zoo periodically to teach the keepers the correct methods of foot care, and followed up on the program frequently.

The studies

Three separate studies were conducted gathering as much information as possible regarding basic elephant behaviors via **detailed time budgets**. Two of the studies were conducted by a combination of keepers, the zoo's Behavior Observation Team (BOT) volunteers and the coordinator. Observers viewed the elephants from the front of the exhibit. During evaluation of the data, any base behaviors that occurred less than 1% regularly were eliminated from the study. Digital pictures and video footage were taken for documentation purposes. A third study, completely separate from the others, was conducted on the elephants and their aggression. The elephant staff created an aggression scale and documented every aggressive act.



Using a scratching post. (Photo: Margaret Martinez)

Purpose of the studies

1. The purpose of the first study (referred to as Foraging Study) was to see if the environmental changes would make a difference in the animals' lives, in particular regarding foraging time, aggression, and stereotypic behaviors.
2. The purpose of the second study (referred to as Social Study) was to see if the behavioral changes would influence our elephants to exhibit increased species-appropriate behaviors and would help lead to a successful introduction.
3. The purpose of the aggression study was to see if all of the management changes would decrease the frequency and intensity of aggression exhibited by the elephants.

Behavioral study I (foraging study)

- A. The base study was conducted from 28 May 2004 through 27 July 2004.
- B. The study was conducted on two separate occasions:
 - From 28 July 2004 through 30 September 2004.
 - From 14 July 2005 through 1 August 2005.

Data was collected under the method of focal animal sampling with a fixed scheduled format, four times a day for ten minutes. Data was evaluated by calculating the percentage of duration of each behavior.

Behavioral study II (social study)

The base study was conducted from:

1. Phase I – 16 April through 12 July 2005. (Animals were fed from different kinds of small enrichment devices such as carrot and pellet puzzle feeders and metal hay feeders; feeding from the ground was completely eliminated with exception of browse.)

2. Phase II – 13 July through 2 August 2005. (Animals were fed from the four electric feeders and all available smaller puzzle feeders.)

3. Phase III – 3 August to 18 September 2005 (when test ended). (Animals were introduced.)

Data was collected under the method of instantaneous time sampling with a fixed scheduled format, every 30 seconds up to three hours per day. Scheduled hours were from 7.30 a.m. through 10.30 a.m. (The observation time varied according to the availability of the observers and the temperature, so it was sometimes limited to 1–2 hours.) Data was evaluated by calculating the percentage of frequency of each behavior.

Aggression study

A. The base study was conducted from 1 January 2003 through 31 December 2003.

B. The study was conducted from 1 January 2004 through 31 December 2004.

All aggression was noted during daily routines with the elephants. The total number of aggressive acts was noted as well as the intensity.

Table 1 shows the scale used to score the aggression from the elephants.

Table 1. Aggression Scale

0	–	No aggression
1 (a)	–	Head up / open mouth directed towards keeper
1 (b)	–	Stalked keeper
1 (c)	–	Blew or exhaled in ‘frustration’
2	–	Pressed head into mesh/bars towards keeper
3 (a)	–	Charged gate(s)
3 (b)	–	Rammed mesh
3 (c)	–	Trunk extended horizontally towards keeper (not ‘thrown’)
3 (d)	–	Charged other elephant(s)
3 (e)	–	Charged miscellaneous object
4 (a)	–	Charged keeper (may include ramming the mesh)
4 (b)	–	Threw trunk out towards keeper
4 (c)	–	Swept trunk under bars towards keeper
4 (d)	–	Threw object(s) towards keeper
4 (e)	–	Climbed bars
4 (f)	–	Headstand
4 (g)	–	Kicked feet towards keeper
5	–	Intense extended aggression (could include any combination of the above)

Results

Foraging study (Total minutes: 5,562)

Feeding from the ground was completely eliminated. Foraging behaviors via enrichment devices increased from 9.3% to 37.9% overall.

Locomotion overall remained virtually the same (from 13.0% to 13.2%). Individually, Reba's locomotion increased from 13.5% to 17.7%, while Indu (15.2% to 9.3%) and Sheena (10.0% to 5.6%) spent less time locomoting.

Overall standing behaviors decreased from 22.2% to 17.6%. Even though Reba demonstrated more inactive behaviors (15.6% to 23.3%), Indu displayed a notable decrease in inactivity (19.5% to 8.4%). Sheena remained approximately the same (32.7% to 33.4%).

Swaying remained the same overall (21.2% to 21.0%). Although it significantly decreased with Reba (33.8% to 10.1%), and in Sheena's case almost completely ceased (4.7% to 0.0%), Indu increased her swaying behavior (23.4% to 27.6%).

Grooming behaviors did not take up too much of the animals' time and eventually were eliminated. Of the three elephants Reba accounted for most of the grooming behavior.

By the end of the foraging study, observations revealed significantly more foraging behaviors, and fewer aberrant and/or aggressive behaviors. Based on a decrease of the latter behaviors, we initiated the next phase of the evaluation.



Two of the elephants foraging side by side from an elevated feeder. (Photo: Heather Wright)

Social study (Total minutes: 18,426)

After the introduction, foraging increased overall (30.1% to 42.9%) with Indu showing a marked increase in manipulation of the feeder (26.7% to 60.0%) while Sheena decreased foraging (25.5 to 22.0%).

Locomotion increased from 12.6% to 14.9%). While Indu remained approximately the same (14.6% to 14.0%), Sheena increased her behavior (10.6% to 15.8%).

Inactive behaviors decreased from 29.7% to 22.4% overall. Sheena decreased standing from 40.8% to 30.3% and Indu from 24.4% to 14.3%.

Aberrant behaviors decreased overall from 11.5% to 8.9%. Indu's swaying behaviors reduced by almost 18.0% to virtually zero (0.8%), while Sheena increased her swaying behaviors from 3.7% to 16.9%.

During the social study grooming activities exceeded 1% again simply due to longer periods of observation. During the base study they reached 3.9% and during the introduction decreased to 1.2% overall.

Aggressive social behaviors and non-aggressive social behaviors comprised such an insignificant part of the elephants' activities that these behaviors were eliminated from the study. No major aggression occurred during the introductions.

Aggression study

All three animals were observed for aggression. Sheena, however, did not exhibit enough aggression to warrant being included.

Reba: 2003 – 134 acts of aggression, 3.79 average intensity. 2004 – 139 acts of aggression, 3.09 average intensity.

Indu: 2003 – 28 acts of aggression, 3.42 average intensity. 2004 – 7 acts of aggression, 1.42 average intensity.

Discussion

Prior to the changes in the behavioral management program, the Phoenix Zoo had three 'problem' elephants who were exhibited in an inadequate environment with a very poor activity budget.

Our staff was inefficiently trained and followed traditional elephant management techniques. By educating ourselves and by bringing in a consultant with a new point of view, we were able to shift our way of thinking. Feeding from the ground provided only a short period of time for foraging activities, and for the rest of the day our animals were bored most of the time. Having the elephants locked in the barns and kept on concrete floors generated further boredom and also various foot problems. Their troubled pasts, boredom and health problems led to further aggression toward keepers and their conspecifics.

By the end of the 'foraging study', foraging behaviors increased from 9.3% to 37.9%. After the introduction of the new feeders we had expected even a somewhat higher volume of foraging activities. The lack of increase is explained by all three individual animals' different behaviors: while Indu and Sheena spent a great deal of time foraging, Reba usually ate much faster and then looked into other activities she could do, such as grooming behaviors, or spent a considerable amount of time in inactive behaviors.

Locomotion overall remained the same. While Indu and Sheena were locomoting less, Reba increased her behaviors. A possible explanation for this could again

be that Reba forages faster and thus spends considerably more time wandering around the exhibit than the other two females.

Inactive behaviors decreased from 22.2% to 17.6%.

While aberrant behaviors overall seemed to remain the same, when we compared the three animal's behaviors together we found that by the time the study ended Sheena's swaying reduced from 4.7% to virtually nil and Reba's from 33.8% to 10.1%, while Indu increased swaying from 23.4% to 27.6%. Self-directed behaviors were under 1% for all three animals and were eliminated from the study.

These changes enabled us to make the decision that it was time to try introducing at least the two subordinate animals together. The theory behind this was that our elephants (with a proven increase in natural elephant behaviors) would continue acting more like elephants by using their available resources and therefore act less aggressively toward one another.

After the introduction foraging behaviors increased further, from 30.1% to 42.9%, strengthening our theory that elephants will spend most of their time foraging if resources are provided. Aggressive behaviors toward conspecifics were so insignificant that they were eliminated from the study. Considering the aggressive past of these animals, we expected a higher rate of aggression. Indu, however, was completely ignoring Sheena most of the time and was foraging from the electric feeders instead.

Non-aggressive social behaviors also did not reach 1% and were eliminated from the study. We did not anticipate that these animals would be overly friendly during the introduction, as they came from very different backgrounds and were completely unrelated.

The decrease in inactive behaviors from 29.7% to 22.4% can be explained by the increased foraging and locomotion (12.6% to 14.9%), and the fact that we now had two elephants together who interacted.

Finally, aberrant behaviors such as swaying further decreased overall from 11.5% to 8.9% during the second study. However, during the introduction Sheena started to sway more (3.7% to 16.9%) due to being nervous. Indu, on the other hand, reduced her swaying from 18.0% to 0.8%.

In looking at the elephants' aggression levels, it was observed that positive improvements have been made since the changes in management techniques. Reba's total number of aggressive acts did not change much, from 134 acts in 2003 to 139 acts in 2004, but the intensity dropped from an average of 3.79 in 2003 to 3.09 in 2004. Indu has shown the most dramatic improvement. She went from 28 aggressive acts in 2003 to 7 in 2004. The average intensity dropped from 3.42 in 2003 to 1.42 in 2004. Sheena has not shown enough aggression to warrant being included.

The Phoenix Zoo staff feels that the behavioral management changes we made resulted in significant positive improvements in our elephants' behavior. They seem to be healthier, more relaxed and less aggressive, and are spending more of each day foraging, locomoting and interacting with each other just as their wild counterparts would. We feel we were able to restore the dignity of being elephants to our elephants!

Hilda Tresz and Heather Wright, Phoenix Zoo, 455 North Galvin Parkway, Phoenix, Arizona 85008, U.S.A.
