Enhancing Zoo Elephant Welfare

Sep. 10, 2013 — A ground-breaking study announced today revealed that analyzing the daily lives of zoo elephants -- ranging from when and how they are fed to how they spend their time both at night and during the day -- provides new, scientifically based information that zoos can use to improve the welfare of their elephants. "*Using Science to Understanding Zoo Elephant Welfare*" is the largest and most comprehensive, multi-institution study ever conducted to collect and assess data on the welfare of any species in North American zoos.

Representatives of the 27-member study team, which includes independent consultants, zoo professionals and faculty from three universities, presented results from the three-year, independent study today at the national Association of Zoos and Aquariums (AZA) annual meeting attended by zoo professionals from throughout North America. The study is funded by an $800,000 leadership grant from the federal Institute of Museum and Library Services (IMLS) awarded to the Honolulu Zoo Society and administered by Kathy Carlstead, Ph.D. Study team members and dozens of research assistants from widely varied disciplines developed quantitative measures to assess elephant welfare indicators. A sample of the volumes of data collected included: 110,000 pages of medical records, 2,700 hours of video, 6,135 serum samples, 7.8 million GPS data points and 6,571 fecal samples collected from 40,000 pounds of elephant dung.

"Previous to this study, there had not been a large-scale, scientific assessment of zoo elephant welfare in the North America. Although elephant welfare has been a topic of public interest, the lack of available data on this specific population made it difficult to differentiate fact from opinion," said Cheryl Meehan, Ph.D., the study's consulting project manager. "This study gives a broad look at the lives of zoo elephants, and the outcomes provide both the science-based information necessary to inform conversation as well as actionable items that zoos can use to continue to enhance management of elephants."

She added that: "The results reported today are at the population level and do not address any specific zoo or any specific elephant."

The study team identified six welfare indicators, including some perceived issues for zoo elephants such as body mass, behavior, and reproduction. It then considered a wide range of management factors that can influence an elephant's welfare, such as housing, exercise and social groupings. The study took a novel approach in quantifying these factors from the perspective of each individual elephant, which allowed researchers to capture the complexity and variability within the zoo population. Analyzing data and identifying correlations allowed the team to determine which factors are most strongly associated with each welfare indicator. Researchers presented the most significant study findings on welfare indicators, including:

- **Foot and joint health:** The majority of zoo elephants (61%) reviewed in 2011 had no reported foot problems. For elephants with some foot problems in 2011, 64 animals had physical examinations in 2012 and of those 13 no longer exhibited foot problems.

- Also, 75% of elephants examined in 2012 had no joint problems.
- The study found that the continuation of foot problems from 2011 to 2012 as well as overall joint health was associated with the amount of time spent on hard surfaces (concrete or stone). It was identified that incremental changes in time spent on hard surfaces can have measurable impacts on joint health, such that10% (2.4 hours) reduction in time spent on concrete or stone is correlated with a 63% reduction in the likelihood of joint abnormalities.
- Another correlation showed that as elephants advance in age, they are more prone to experience foot and joint problems.

- **Body condition scores:** Researchers evaluated 240 elephants for body condition using a physiologically validated 1-5 scoring scale -- with "3" being ideal. 74% were rated a 4 or 5, which indicates an animal is overweight. Only 4% scored a 1 or 2, which indicates it is underweight. "In the coming months, zoos will be provided with posters of the body condition scoring system. This tool will help increase awareness of how elephants in ideal body condition should appear, and will allow elephant care staff to measure progress toward improving body condition when needed." said Dr. Meehan.
  - The study found a correlation between improved body condition and increasing an elephant's time being exercised; and providing more frequent meals throughout the day; and having unpredictable timing of the number of feedings during the day.
- **Walking:** By tracking elephants wearing elephant-size GPS anklets, the study found that elephants with higher walking rates were also likely to have:
  - softer substrates (grass, sand or rubber) to walk on during the night;
  - an increased number of social partners;
  - enrichment programs that are more structured and monitored; and
  - an opportunity to experience more available space at night.
- **Recumbence** (when elephants lie down): Asian elephants had higher rates of recumbence than Africans. In both species, elephants that spent more time on softer substrates during the day and with a number of different social groupings, and outdoors were likely to spend more time lying down.
- **Behavior:** The study found that elephants spent the largest part of their days and their nights eating followed by resting or standing. It also found that a majority (approximately 2/3 of the population) exhibited some stereotypic behavior, which is defined as unvarying and repetitive behaviors such as swaying or pacing; however, the team identified several factors that are correlated with a decrease in the likelihood of stereotypy. The findings provide direction for zoos that are actively trying to reduce the performance of these behaviors by their elephants. For example lower rates of stereotypy performance were more likely when elephants:
  - experienced more available space for greater amounts of time;
  - interacted more with animal care staff;
  - had choices between indoor and outdoor areas over night;
  - had strong positive social bonds with other elephants, and
  - spent more time with young elephants.
- **Ovarian cyclicity** (the regularity of female reproductive cycles). Zoo professionals have long known that some female elephants of reproductive age in the zoo population do not cycle regularly. This study provided new insights into this issue by identifying factors that correlate with cyclicity status and which can be addressed through changes in management practices. For Asian females, an increased likelihood of regular cycling is associated with spending more time with male elephants. African females are more likely to cycle regularly when they have more social experience; participate in 14-hours per week of staff-led exercise; and when there are more frequent and diverse enrichment opportunities. Those with higher than

ideal body condition were less likely to have regular cycles.

"The study produced incredible data that, for the first time, provides zoos with scientifically based assessments that identify which aspects of elephant management correlate strongly with welfare indicators," said project team member Mike Keele, former chair of the elephant TAG/SSP and former director of elephant habitats at Oregon Zoo. "There's great value in linking science to zoos' elephant management practices because it can be used daily to enhance the welfare of elephants in the care of zoo professionals."

The study team praised the 70 AZA-accredited zoos, zoo directors, and zoo elephant care staff and veterinarians, who participated in the research by providing videos, serum samples, health examination information and other details about their elephants. Dr. Meehan said that a zoo's involvement in the voluntary study demonstrates a commitment to improved understanding of elephant welfare and its relation to management and care.

"This study represents a snapshot in time of this population of elephants. It increases our understanding of zoo elephant welfare and provides information that will support elephant programs as they further develop their practices. We see this project as a significant achievement in fostering partnerships between scientists and zoo professionals that share the common goal of enhancing the welfare of zoo animals," said Dr. Meehan. "While we haven't answered all of the questions about elephant welfare, we are excited that the study can benefit zoos and their elephants.

"We are proud to have developed a successful research model that can potentially be applied globally to the assessment of zoo animal welfare across species," she added.

Following today's presentation, the study team plans to do additional data analysis and expects to publish the outcomes in peer-reviewed, scientific journals in the months ahead.

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