

Most Zoos Don't Deserve Elephants

Late in 1975, when employed as design coordinator for Seattle's Woodland Park Zoo, I recommended that elephants should be deleted from the Zoo's master plan. In my opinion Seattle had neither the climate nor the funding to meet their needs. My view was that the two elephants at the Zoo, one female Asian and one female African, should go to some place warmer with more space and better facilities. The response was almost entirely abusive. School kids wrote me hate mail in a campaign obviously coordinated by their teachers. A mother made a very angry phone call demanding to know why her child should be denied the chance to see elephants at the Zoo. A city councilor suggested that if I raised the topic again it would be Hancocks rather than the elephants who would be leaving town. "I personally cannot imagine an urban zoo without elephants," she said (Hinterberger, 1976).

The idea of removing the elephants from the local zoo, no matter how miserable their existence, has traditionally been seen as ridiculous by most people. "How can we call this place a Zoo if it doesn't have an elephant?" is a general view commonly held across the history of urban zoos worldwide, and, considering the conditions in which zoo elephants have typically been maintained, has been surprisingly resilient. Howletts Zoo in the UK comments

that a decision not to keep elephants would be "high minded but difficult in view of the elephants' enormous popularity with the public" (Howletts, 2005).

The history of Jumbo, the big male elephant shipped to Barnum's circus in 1882, after time at the Jardin des Plantes in Paris and at London Zoo, reveals many of the paradoxes and dilemmas of elephants in zoos. Captured as a baby, his mother probably shot, sold to various institutions, never given proper care, put on display as a monstrous curiosity, reduced to a novelty ride, moved almost constantly from place to place, and haggled over by his owners in life and after death, Jumbo was both belittled and adored by the crowds that paid to see him (Hancocks, 2001). People wanted to see the massiveness of his form, yet saw too the superiority of their own kind. Awed by his size, they were simultaneously emboldened by their audacity in holding captive such a creature; humbled by his great hulk, they were nonetheless prideful of having human control over this giant. Jumbo satisfied the curiosity of all, the vanity of many, and the ego and greed of a few.

In some ways the tenacity in wanting to keep elephants in the zoo is fathomable, even predictable. The elephant is one of the most traditional zoo animals. London Zoo curator Desmond Morris (1966) surveyed British television viewers for their Top Ten animals and, not surprisingly, the chosen

list included the elephant. When Yale psychologist Stephen Kellert (1989) surveyed Americans on their most-liked animals, the elephant was the only wild exotic creature that made the list. In both polls the preferential factors were bigness, intelligence, esthetics, danger, and cultural and historic relationships.

Walt Whiman's *Song of Myself*, self-published in 1855, proposed that, "A mouse is miracle enough to stagger sextillions of infidels." But for all we might admonish people to stir their imagination and learn to see tiny creatures as marvelous, people are more readily impressed by massive size. The British poet and visionary William Blake in 1803 wrote *Auguries of Innocence* as a passionate cry for a higher understanding of life and nature. He urged people "To see a world in a Grain of Sand, and a Heaven in a Wild Flower." But applying that degree of imagination is too daunting for most people, at least without chemical assistance. Most people get more excited about seeing an elephant in a zoo than looking at any frog or butterfly or iridescent beetle, no matter how wonderful such tiny creatures might be. The scale and power of an elephant is an instant and undeniable thrill. Its sheer bulk is awesome, and its strength is astonishing.

We should not be surprised, then, that zoos persist in wanting elephants. They are perhaps the most impressive creatures in the world's warehouse of oddities, and are

certainly a most appealing creature. Cynthia Moss (1988) describes them as "intelligent, complicated, intense, tender, powerful, and funny."

Perhaps the elephant is not the strangest of all living things (I think that is either slime mold, cuttlefish, or perhaps the Chihuahua) but it may be the most inexplicable. Eyes of disconcerting awareness peer out from its massive head, like those of a child trapped inside a monster. So much about the elephant is contradictory. Its trunk is packed with muscles of astonishing force, yet used with startling delicacy. Built like a truck, it appears from the results I have seen of painting demonstrations in several zoos and from what I have heard on CDs by the Thai Elephant Orchestra, to have a delicate sensitivity for the aesthetics of painting and music; a view shared by professional art critics and music reviewers (Wolk, 2005. Mayell 2002. Scigliano 2002). The world's biggest land animal, it delights in being fully submerged in deep water. So respected by all other wild animals that adult elephants have no natural predators or enemies, they have nonetheless throughout their history with humans so many times been beaten even to the point of collapse. (Lewis, 1978)

Poet John Donne, writing in 1612, called it "Nature's great masterpiece (and) The only harmless great thing." Yet, patient and accommodating as a sheepdog, and despite all the amazement and affection that elephants inspire,

their history in zoos is replete with accounts of deprivation and hardship. In numerous instances soldiers have been hired to shoot zoo elephants gone mad in their incarceration (Hancocks, 1971. Lewis, 1978). George 'Slim' Lewis, with thirty years experience in training elephants, made the observation, "all well-trained performing elephants are well-scarred elephants" (Lewis, 1978). Douglas Chadwick documents an elephant trainer's comment that keepers "have to just plain beat some elephants in a last-ditch effort to establish control..." (Chadwick, 1992). Less and less, but even today, some zookeepers beat the elephants in their care, and no professional zoo association in the world requires any written record or inquiry when this occurs.

Wretched and persistent health problems are commonplace, too. Indeed, it would be a laborious task to locate more than a few zoo elephants in excellent physical, social, behavioral and psychological condition. Most of them stoically lead lives of loneliness, physical pain, depression, foot rot, and inactivity, occasionally interspersed for some of them with outings to the back of the barn accompanied by men with pick-ax handles.

A shift in public perception about elephants in zoos seems, fortunately, to be underway. In 2004, when Ron Kagan, director of Detroit Zoo, declared his belief that the elephants at that zoo should be relocated to a

sanctuary with larger spaces and in a warmer climate he, too, attracted some abusive reactions, but he also received support from local politicians as well as strong encouragement from people and media around the world. Certainly, Dr Kagan prepared the ground for his announcement much more carefully than I did for mine in 1975, and he more wisely made certain that he had the required political support before making his announcement public. It is, however, revealing that the Detroit Free Press (McDiarmid, 2004) announced, "The decision to send them away comes amid **a nationwide push to provide better care for elephants.**" (Emphasis added).

Another example suggests that this push for better care is not restricted to North America, as evidenced in the response by the British media to a Review of the Welfare of Zoo Elephants in Europe (Clubb and Mason, 2002) commissioned by the UK's Royal Society for the Prevention of Cruelty to Animals from the Animal Behaviour Research Group at the University of Oxford's Department of Zoology. The Review addressed many factors critical to the wellbeing of elephants in zoos, including rates of reproduction, maternal rejection, maternal infanticide, mortality of babies, foot health, weight problems, and lack of space and exercise opportunities. Many zoo professionals have rejected this report. John Lehnhardt, animal operations director at Disney's Animal Kingdom, describes it as

"massively flawed" (Lehnhardt, 2005). An alleged mistake in one of the statistics in this 245 page document, regarding longevity of elephants in zoos compared to the wild, has generated agitation among zoos. If this eventually proves to actually be a correct analysis by Ros Clubb and Georgia Mason, one hopes that zoos will then take a more patient and positive look at the findings of the Review. But even if it does indeed prove to be a statistical error, it does not warrant the unseemly haste by the zoo profession to discredit and abandon the entire document (Hutchins, 2004).

The RSPCA's Review proposed that all breeding and importation of elephants should cease until factors responsible for poor welfare have been empirically investigated. This recommendation attracted much public attention. "Zoos must not keep elephants, demands report by RSPCA" was one of the more subdued headlines, in *The Independent*, one of the most literate of the British broadsheets (McCarthy, 2002). An article in the *Evening Standard*, London's most widely read tabloid, was more caustic. It referred to a photo in one of the national broadsheets showing a zoo elephant that appears to be smiling for the camera, his mouth open "as though in a guffaw," his great flat foot raised "as though to shake our hands." But the elephant performs this apparent clowning, said the article, only because "his two keepers ... prod him with an ankus to urge him to perform his tricks, and ... to

make him respond, not willingly, but with obedience." The article pointedly comments that a zoo is "a place, it is so often argued, of conservation, education and research..." (Sewell, 2002).

This sort of journalism admittedly tends to generate more heat than light, but it is noteworthy that just a few years ago such criticisms about zoos and their elephants never appeared in newspapers, even though, ironically, conditions have generally improved markedly in the past decade. Similar censures, however, are now increasingly heard. Public disquiet about keeping elephants in captivity is intensifying. The views expressed by Seattle City Councilor Phyllis Lamphere, who in 1976 could not imagine an urban zoo without an elephant, are in sharp contrast with the opinions expressed in early 2005 by Chicago alderman George Cardenas, who called for Lincoln Park Zoo to close its elephant exhibit and ship its lone last occupant to an elephant sanctuary (Harriman, 2005).

Most of the public criticism about standards of elephant care in recent years has been directed towards circuses, but zoos are increasingly now also under scrutiny. Throughout the winter of 2004-2005, the media in Anchorage, Alaska carried a large number of reports and comments about a lone African elephant, Maggie, who has been living in The Alaska Zoo since 1983 without previously generating public concern. A poll by the local KTUU

television station revealed 51% in favor of sending Maggie elsewhere, and 45% for her remaining at the Zoo (NBC, 2005). It is remarkable that such a poll was even considered.

A couple of decades ago the media began to focus on wretched zoo conditions for polar bears. Many zoos have since abandoned this species, especially across Europe. Can we expect similar results with elephants?

Different Points of View

We know too little about how to manage elephants. New information is required if zoos are to provide for their needs more accurately: to discern between what is beneficial and what is damaging, what is merely useless tradition or hearsay and what is measured and proven. The pros and cons of existing practices need to be calibrated. Currently, standards and methods vary immensely from zoo to zoo. Many keepers are either virtually self-taught, or carry out routines and apply techniques passed from one transient keeper to another.

The prevalence of inadequate conditions for captive elephants is shameful, especially when compared to the zealotry of zoos to own them. Despite this, I fear it is hopeless to respond simply that zoos should never keep them, for the determination by so many in society to keep

elephants in zoos under almost any circumstances ensures that the problems cannot be wished away. Moreover, as Cynthia Moss pointed out, after spending more than thirty years studying elephants in Africa, life for elephants in the wild is frequently one of anguish, often ended in horrible ways through human action, whereas in very good captive conditions elephants might by comparison think themselves in some sort of paradise (Moss, 2002). Can we, though, create conditions to compare favorably with a secure existence in a good wild habitat?

The best beginning point for this exercise, I propose, before we even start to consider any sort of details of management or design, would be the development of a new sensibility towards their captive care. At present it seems as if something like a siege mentality prevails. A clandestine atmosphere prevails in too many zoos, with many of the dangerous hallmarks of a secret society, and training sessions are often shrouded in mystery. Even though more than half of AZA zoos have protected contact programs for their elephants, many elephants continue to be managed in an atmosphere of subjugation: the ankus remains in common use, as a tool of control and as a symbol of traditional maintenance regimes based on domination and fear. What is labeled as obedience for most elephants in many zoos around the world is, I fear, often only dread;

that, and a sense of helplessness learned from punishments and restrictions.

In 2000 Laurie Pond, the then new manager of animal programs for Zoos Victoria, began applying a fundamental change in approach to the care of two Melbourne Zoo elephants suffering mental and physical anguish. Since their arrivals from the wild in 1977 and 1978 they had lived lives of almost constant stress, deprivation and boredom. Pond introduced key changes, creating diverse opportunities for the elephants' mental stimulation and physical activity. Above all, his new approach focused upon "building strong affectionate and enduring relationships between keepers and elephants" (Stroud, 2001). The changes brought surprisingly quick results. Peter Stroud, then curator at Melbourne Zoo, notes, "Within a month the changes in the daily regime were clearly affecting the animals' demeanor" (Stroud, 2005). Today, these elephants are alert, active and, I feel certain, much happier creatures.

In 2002 I was invited to prepare a paper with the title "Some Zoos Don't Deserve Elephants," for presentation at the 2003 Symposium, 'Never Forgetting,' at Front Royal, Virginia. (I have modified that paper for this chapter, and changed the title, which is now more precisely, "Most Zoos Don't Deserve Elephants.") In preparation for the paper I asked Pond for his views on whether zoos deserve elephants.

His response was to rephrase the question, asking why we should assume that elephants deserve zoos? He believes that elephants don't deserve the abuse routinely inflicted upon them in zoos, nor the inadequate attention to their needs.

Pond reminded me that Barbara Woodhouse, a guru of dog keeping who had a popular worldwide television show in the 1970s, repeatedly reminded her viewers that there are "no bad dogs." He suggests that the same is true for elephants. If there are "bad elephants," he says, "then we have surely made them that way." His view is that if zoos did not habitually impose restraints upon them, we would find ourselves "dealing with a different animal" (Pond, 2002).

A similar perspective is manifest at two elephant facilities in North America. ARK 2000, a sanctuary operated by Pat Derby and Ed Stewart, co-founders of the Performing Animal Welfare Society, is located in California, and The Elephant Sanctuary, founded by Carol Buckley and Scott Blais, is in Tennessee. Each of these facilities maintains several African and Asian elephants, in paddocks hundreds of times larger than found in any zoo, of greatly varying topography, furnished with bodies of deep water. Derby states that "reprimands are never used in the day to day care of the elephants" (PAWS, 1999) and Buckley notes "at no time do we command our elephants or force them against their will" (TES, 2005). Each of these sanctuaries manages their elephants in a free contact system, with staff moving

freely in and amongst the elephants at all times, never resorting to chains, hooks or the ankus. The animals in many ways enjoy a life that, to use Cynthia Moss's words, must be very like some sort of paradise for them.

Conversely, many zoo professionals approach the management of elephants from a platform of dominance and control. An anonymous reviewer of my first draft of this paper began a four-page lecture to me on "training theory" by advising that I needed to understand that "all animals learn through a combination of reinforcement and punishment," and that "one cannot exist without the other." The ankus, I was informed, "is a tool that is used to teach, guide and direct the elephant into the proper position or to reinforce a command with a physical cue" (Anonymous, 2005). This approach seems to be considered generally acceptable and proper within the profession; the debates swirl not around the concept but about the niceties between meanings of words such as "discipline" versus "punishment." It brings to mind the spins and twists of US officials debating the differences between describing whether people detained in such prisons as those at Cuba's Guantanamo Bay or Iraq's Abu Ghraib were subject to "interrogation" or to "torture."

The philosophies and attitudes of elephant caregivers such as Pond, Stewart, Derby, Buckley, Blais and just a few others I know of in zoos, notably Gail Laule, Ellen Leach,

and Colleen Kinzley, are unusual. More typically, elephant keepers regard elephants as potentially very dangerous animals who must be rigorously controlled. Although no serious injuries or fatalities have occurred at either of the two elephant sanctuaries in Tennessee or California, elephant keeping in zoos is assuredly a most dangerous occupation. Elephants killed fifteen keepers in US zoos between 1976 and 1991 (Lehnhardt, 1991). Between January 1990 and September 1994 elephants killed a further five keepers in AZA institutions, and inflicted serious injuries upon 27 others (TES, 2004).

Perhaps these depressing statistics are why one hears many zoo personnel routinely describe elephants as "untrustworthy" or "unpredictable." There is, however, clearly no social evolutionary benefit to elephants for carrying such characteristics. Describing elephants in such terms is merely an excuse for our ignorance. If we could instead come to recognize that elephants are not inherently "unpredictable," and that "untrustworthy" elephants are actually the products of mismanagement, we could then see that there is no sense in continuing to apply such control and domination techniques as chaining, prodding, hooking and beating.

The problems that we need to resolve for zoo elephants are many and pervasive. They include sometimes very harsh treatment, but also loneliness, cold, stress, obesity,

inadequate diets, gross inactivity, stereotypic behaviors, and, most challenging, the lack of long-term natural social structures.

Fit and healthy.

Wild elephants are characteristically active beings, usually roaming for more than two thirds of every twenty-four hour day (Eltringham, 1982). The large majority of zoos, by contrast, historically kept their elephants chained for at least two-thirds of each day (Taylor and Poole, 1998) and sometimes, especially for male elephants, for twenty-four hours every day of the year (Lewis, 1978). Just a little over ten years ago a survey found that elephants were kept chained for 16 to 18 hours a day at a majority of US zoos (Galloway, 1991). Today, the AZA says that chaining is an acceptable method for only temporary restraint (AZA, 2001) and the EAZA nominates a maximum of three hours a day (EAZA, 1997). These recommendations can be viewed as a liberal shift in policy; even so, we must hope to see a day when time spent in chains is recognized as an unbearable frustration for a big animal so adapted to such long periods of daily activity, and that chaining an elephant in a zoo will be regarded as inappropriate as chaining a gorilla, a lion, or a rhinoceros.

Much of the considerable amount of time in which wild elephants are active is spent walking. Asian family groups

routinely cover up to nine kilometers a day (Reimers et al, 2001) and twelve kilometers for African herds (Wyat and Eltringham, 1974). This constant activity exercises joints and ligaments, maintains muscle tone, burns fat, and ensures good blood flow. It also creates constant shifts in exposure to varying landscapes and a consequent inevitable richness in experiences and visual change. The great distances are, however, directly the result of elephants' requirement for vast quantities of food. The typical wild diet for both African and Asian elephants consists mainly of much low-nutrient vegetation, and they can spend more than 90% of their waking time gathering food (Eisenberg, 1980).

Zoo elephants, by contrast, enjoy very little exercise. This is not only due to the eradication of any need to search for food but also to being kept in small areas, and, in some zoos, to excessive periods of chaining. In addition there is little motivation for them to be active in small spaces devoid of stimulus or interest. The resultant lack of exercise is a major factor in the prevalence of foot problems among zoo elephants, such as overgrown nails, split nails and soles, and abscesses (Roocroft and Oosterhuis, 2001). Asian elephants seem especially prone to foot problems in zoos; bone infections that develop from chronic diseases of the pad are a principal concern. Persistent foot problems have on

occasions resulted in amputation or euthanasia for zoo elephants (Boardman et al, 2001).

The size of zoo enclosures is very much smaller than wild ranges. For many species in zoos the amount of space is not a critical problem if the enclosure offers an appropriately rich and complex environment. But elephants are big animals that simply must walk considerable distances each day, not just in the mindless plodding circles when giving rides, but long distance walking as both a physical and mentally stimulating exercise. Female zoo elephants are 31% to 72% heavier than their wild counterparts, probably as a result of high fat content in their diets and lack of exercise (Clubb and Mason, 2002, Table 10). Inactivity, moreover, leads not only to obesity, but also to arthritis, joint problems and other common disorders in zoo elephants (West, 2001).

The shape of zoo enclosures and the complexity of their landscape and furnishings are therefore particularly significant design factors. Configurations of enclosure layout can be devised to encourage exploration, and specific components within the space can stimulate activity. Multifaceted and variable (but also large) spaces are one of the important keys to "behaviorally flexible, fit and competent (zoo) animals" (Forthman et al, 1995).

Hygienic facilities for wallowing in mud and for bathing in dust or loose soil, although not easy to design

or to maintain, should be considered essential. It would be best if the elephants could be allowed the exercise of making their own wallows (Roocroft and Oosterhuis, 2001). Scratching posts are required, and would be even more useful if they doubled as exercise equipment to be demolished or pushed to the ground. Variation in substrates might have psychological as well as practical benefits, and in any case should provide opportunities for deep digging, maybe in areas of soft substrate regularly salted with minerals as incentive and reward. Concrete and asphalt substrates, anyway, should be rejected.

Water is invariably given insufficient attention in enclosure design. The AZA (2001) recommends that zoo elephants should have access to water while outdoors, "such as a pool, waterfall, misters/sprinklers, or wallow that provides enrichment and allows the animals to cool and/or bathe themselves". This is not sufficient. One could literally meet these guidelines by providing only a spray of mist. Eisenberg (1980) notes that water is an intensely integral part of daily life for wild African elephants. It would help if we came to regard elephants as almost essentially amphibious creatures. For an animal that can swim thirty miles (Jones, 1999), and appears to find besotted pleasure in wholly submerging itself in water, we are merely tinkering with minimalist measurements in our current requirements.

Moreover, the changing character of water can be more creatively and usefully exploited than typically happens in zoo design. Water that falls from different heights and in varying quantities; that sprays, crashes, seeps, trickles, mists, splashes, meanders or rushes; that forms just muddy ground, or shallow puddles, fast rivulets or meandering streams, bathing pools or deep lakes, all combines to provide a wide number of options for different interactions. The EAZA (1997) states that elephants must have day access to a pool one meter deep. I propose instead that a pool deep enough for complete submersion, allowing elephants the pleasure of buoyancy and taking the weight off their feet, should be considered a basic requirement for zoo elephants.

The consideration of water raises thought of its uselessness when it freezes, and the enormous difficulties of trying to cater for elephants in a cold climate. Across Europe and North America, where most zoo elephants live, it is estimated that cold wet weather or near freezing conditions confine elephants to indoor quarters (and thus greatly reduced exercise opportunities) for up to 80% of the days during five months of the year (Lindburg, 1998).

Elephants are such lovable beings they deserve nothing but the best, and should at least have all the things they would wish for themselves. But even within human-imposed standards of lesser criteria, the demands of providing

suitably large, complex, changeable, and challenging environments for intelligent animals of such enormous bulk and strength as elephants are beyond the capacity of most zoos. It is a problem that requires resources and commitment well beyond those currently being applied. Indeed, whether we can satisfactorily provide designed environments for the needs of all big strong intelligent animals is still open to question. Cetaceans in aquatic parks, bears and chimpanzees in zoos, and pigs in intensive farming facilities, are examples of such species that routinely suffer inadequate lives in poorly designed spaces. It is disturbing that simply providing zoo elephants with a sufficiently appropriate big space to encourage good levels of activity has so rarely been considered.

It is also probable that many zoo elephants are not provided with well-balanced diets. More research on this would be very useful. In the wild, elephants consume a very wide range of vegetation including leaves, stems, bark, roots, twigs, herbs, flowers, and fruits (McKay, 1973. Sukumar and Ramesh, 1995). The typical zoo diet, however, consists basically of hay, with a smaller proportion of produce, some commercial concentrate feed, and vitamins and mineral supplements. Only a small number of zoo elephants have occasional access for grazing and browsing (Taylor and Poole, 1998). Branches and leaves are sometimes offered as

a supplement, but most zoos cannot obtain fresh browse for several months of the year.

The activity involved in feeding is as important for zoo animals as the nutrition it provides. Asian elephants often laboriously dig out roots, and African elephants exert much time and energy tearing food from trees. Whereas wild elephants spend up to 80% of their waking hours foraging (McKay, 1973) feeding activity for zoo elephants is only about 35% (Taylor and Poole, 1998). The deficit of foraging opportunities is suspected to contribute to stereotypic behaviors in many species in captivity (Carlstead et al, 1991), and may be especially so for elephants. Zoo elephants consume about twice as much in an hour as wild elephants because their food is readily available and requires no manipulation (Kurt and Schmid, 1996).

The manner in which food is presented to zoo elephants is thus critical. Fixing fresh browse at various heights that requires stretching and hard pulling could encourage some natural feeding behaviors. Other techniques to encourage other beneficial behaviors could include the securing of big posts or dead trees (which could also be dressed with securely fastened leafy branches) in such a way that they would with exertion be pushed over. Holding fixtures could be engineered to allow them to be reset upright. Other devices could be programmed to present food

at irregular intervals, or in varying locations, and thus promote exploration.

Shrubs, grasses, and, in particular, large trees play an integral part in the life of a wild elephant: they should be considered essential components of zoo enclosures. Enclosures should be large enough to maintain grass growth over a significant percentage of the area. Sadly, allowing elephants access to live vegetation requires replacement of the plants at regular intervals. This vexatious problem demands some creative attention. Perhaps we first need to see that the value of the well being of an elephant is worth the investment of live vegetation for periodic consumption, manipulation, and destruction.

Islands of vegetation and other environmental features located within the paddock also help to ensure that the animal space is not simply an empty and undefined area. If the vegetation in these islands is sufficiently dense and tall this will not only provide shade to the interior of the paddock on very warm days, providing comfort and helping to avoid sunburn (preferably, I suggest, at least 30% of the enclosure should have dappled shade between the hours of about 11:00 a.m. and 3:00 p.m. during summer months), but also will define specific spaces that increase spatial cognition and enhance visual interest by alternately revealing and hiding views. Because of their

bulk, elephants take a long time to warm up or to cool down (Poole and Taylor, 1999). Enclosures therefore need to have open sunny areas as well as shade; the latter, in the majority of zoos, ideally provided by deciduous trees to allow winter sunshine into the enclosure. Such micro-environmental differences encourage movement and exploration.

The interrelated predicaments of foraging, mental stimulus, physical activity and comfort for zoo elephants are so challenging, and yet so important, they should not be addressed as isolated design problems within individual zoo exhibit projects. I propose that either the World Zoo Association, or perhaps a combination of AZA, EAZA and ARAZPA, form a task force of elephant ethologists, zookeepers, landscape architects, structural engineers, and environmental enrichment experts to explore novel and practical solutions that can be used as guidelines and design rules for all elephants in all zoos.

Management

Enclosure design directly affects quality of life for zoo elephants. It has to allow ways to present fresh foods that are challenging and appealing for the elephants; must integrate a diversity of mud wallows, soft substrates, varying topography; include trees and grasses; and provide deep and shallow water bodies for splashing, paddling and

swimming, as well as other water features that entice interest and activity. Comfortable temperatures, places to relax, to easily lie down and to comfortably get back on their feet, opportunities for long walks, an abundance of different types of exercise, and all the other aspects of spacious natural habitats that provide satisfaction and interest for elephants must be assured.

But in addition to providing new standards, there are traditional aspects of zoo life that must be eradicated. Zoos can provide safety from the dangers wild elephants face from human hunters: they should also ensure sanctuary from all human abuse. Elephants should not have to suffer the painful feet and teeth problems, arthritic joints, anemia, and enteritis that characterize poor zoo conditions, and never should become morose and overweight through inactivity. I propose we regard it as equally plain that humans should never hit elephants, never deliberately cause them any pain, and never keep them in solitary confinement, divorced from contacts with other elephants.

It was noted earlier that elephants can be dangerous. The main factor that makes elephants so attractive to zoos, their strength and very bigness, means that even in play they can inadvertently inflict great damage to frail human bodies. Further, many elephants degraded by a life of tension and punishment have inflicted deliberate injury upon human trainers. A relatively recent response to all

this has been the adoption of a system of management called 'protected contact' (PC).

Behaviorists Gail Laule and Tim Desmond in 1989 started designing a management system for enhancing keeper safety and for effectively training elephants for routine husbandry and veterinary protocols (Desmond and Laule, 1991). The "protected contact" system that they devised was predicated on positive reinforcement, and the willing cooperation of the elephant.

Zoos in North America have moved rapidly in recent years to adopt protected contact as a management system for elephants, and it is now employed by more than half of all AZA zoos. Initially conceived and designed to address the two fundamental objectives of keeper safety and elephant welfare, it seems to have been accepted by many zoo managers more enthusiastically as a defense against legal liabilities than as a means of protecting elephants from potential abuse. One unfortunate aspect of this perspective is that AZA recommendations (2001) permit zoos to use the ankus even in protected contact. This opposes the original criteria of a system based upon positive reinforcement only, that prohibited physical punishment and aimed to ensure the optimal care of elephants for daily management, husbandry, and veterinary procedures (Laule, 2005).

The job of elephant keeping is remarkably similar to parenting. Raising kids and caring for elephants are each

enormously demanding. Success or failure in either one can set the course for a life of confusion and stress, or of confidence and wellbeing. Although good parenting is one of the most important tasks for any human, for both the child and for the society he or she will live in, no formal training is required for the job, and it is never considered in any school curricula. Most people learn to parent by doing. Failure or success relies not only on techniques, however, but also equally as much upon the parent's disposition. Exactly the same, I posit, is true for elephant care. The similarities between humans and elephants, both long-lived, perceptive, intelligent, strongly social species, with many years of infancy and learned behaviors, makes them equally susceptible to acting like unpredictable thugs if they are subjected to prolonged deprivations, especially during their formative years of development.

When I was director of Woodland Park Zoo, between 1976 and 1985, like almost all zoo directors I had no experience or training in managing elephants, but I supported and encouraged the notion of only using positive encouragement, and of abolishing the practice of chaining overnight. Happily, staff veterinarian James Foster was a strong advocate of progressive care strategies for the elephants (and indeed for all the species in our care). Today, elephants at Woodland Park Zoo are managed in a protected

contact system, but during my tenure, as with all zoos of the time, a "free contact" system was employed. In this environment, the establishment of an enlarged staff crew who shared my dislike for using force or hooks was encouraging. I gave approval for staff to take the elephants for walks around the grounds, so that the entire park could become their exercise yard. One Asian elephant, Bamboo, although she was then a teenager, was the best candidate for these activities; she always interacted safely and calmly with visitors inside or outside the exhibit area.

After my departure many changes were introduced. A circus-trained consultant, Allen Campbell, was hired to prepare the elephants for a move into a new exhibit area. The keeper crew, which had included two female keepers, became an all male group. Campbell, who was killed in 1994 by a circus elephant in Honolulu, reintroduced all-night chaining for the Seattle elephants. Keepers began to apply what some staff considered "illogical" punishments, with hooks and other handling techniques now introduced and used in a manner that appeared to them to be "harsh." Bamboo, who had been the calmest of the elephants, began attacking her new handlers. She has been shipped out of Woodland Park Zoo, and now lives at Tacoma Zoo with other elephants also considered dangerous (Andersen, 2005).

Approached with the proper spirit, the difficult tasks of elephant keeping or of human parenting may allow an occasional mistake to be accepted as unintentional. In an atmosphere of affection and assurance a zookeeper or a parent might be forgiven small errors of judgment. An atmosphere of mistrust, however, causes the spirit to shrink and wither, and generates hostility. When fear is omnipresent an elephant, or a human, may exploit an opportunity to wreak fatal revenge.

I am convinced there is never any justification to hit a child. One reason is that they are so much smaller than you are. I am also certain that it is equally wrong to hit an elephant. One reason is that they are so much bigger than you are.

It makes no sense to bully an animal that can so easily overpower you. That strategy may win only a Pyrrhic victory. We should imagine the day when picking up an ankus is recognized as an admission of defeat. Admittedly I have never worked directly with elephants, and some will claim that my beliefs are naïve, but I remain adamant that the concept of punishment is alien to an elephant. This statement is violently disputed by zoo elephant managers who approach their task as a matter of training and dominance. I am loudly and often informed that wild elephants often punish each other.

Consider, then, how different zoo elephant management protocols might be if the observations of Joyce Poole were accepted as paramount. Poole reports from her decades of study in the field that African elephants "do not discipline their young," nor is discipline "natural in elephant society (and) therefore something that an elephant can understand." She states, "I have no idea how this myth was started, but I have never seen calves 'disciplined.' Protected, comforted, cooed over, reassured, and rescued, yes, but punished, no. Elephants are raised in an incredibly positive and loving environment. If a younger elephant, or in fact anyone in the family, has wronged another in some way, much comment and discussion follows. Sounds of the wronged individual being comforted are mixed with voices of reconciliation" (Poole, 2001).

Aggression has been noted as quite common between zoo elephants (Adams, 1981). This may be because aggression towards zoo elephants has itself been quite common. Although Poole has never seen discipline or punishment administered to calves by adult wild elephants, the ankus can be applied indiscriminately in zoos even to baby elephants.

At Woodland Park Zoo in 2001, Hansa, just a few months old, was allowed by her keepers to play with a rubber tub used for bathing. When the same tub was used for feeding and she tried to play with it, the baby was struck with the

ankus. Similar mixed messages were delivered when she attempted to play with a water hose. Sometimes she was allowed to play with it, at other times she was punished. This baby elephant was observed being smacked with an ankus at least eleven times in one week (Scigiliano, 2002).

Later, when Hansa was eighteen months old, she was beaten with an ankus more severely, for eating dirt. When news of this became public the Zoo's deputy director Bruce Bohmke defended the application of blows as within guidelines: "It was appropriate," he said. Jane Garrison, a local animal welfare campaigner, noted, "Elephants in the wild are not reprimanded by their mothers for eating dirt" (Heckman, 2002).

Attitudes of dictatorial control lead to the view that punishment is permissible. In that spirit, beating is easily justified. Approval by administrators adds security. A willingness to hit leads sooner or later to desensitization by the antagonist, making it possible to apply increasingly harsh punishments. And although beating induces temporary submission it can also stimulate delayed aggression. Manifestation of such hostility by the elephant is then used as justification for further punishment. It is a detestable cycle, and only the humans involved can break it. Stop the punishments and you go a long way to stopping the reasons for them.

Changes in approach towards zoo elephant management will, I suggest, help to create improved elephant welfare (plus a safer working environment.) Aggressive postures and an arrogant spirit, even in protected contact, combine to create stress that can eventually manifest itself in poor health. Attitudes of abundant affection and high regard, on the other hand, can lead to positive results.

As with so many other aspects of elephant management, there is pressing need for objective studies of the disadvantages and advantages of free and protected contact and other related methods. Changes in attitude, though, need not await such investigation, and can be applied immediately, and without risk.

Social Problems.

We can expect and hope to find practical design solutions for problems of inactivity for zoo elephants. Also we can be optimistic that zoos will fund more elephant research. And we may yet see changes in attitudes. But there remains an elemental problem of such magnitude that it alone makes it impossible for most zoos to keep elephants. It is such an overarching need for elephants, and one so very difficult to satisfy, that I was tempted to place it at the beginning of this chapter. On reflection I decided to present other problems first; ones that, while

pressing and difficult, can nonetheless be corrected by all zoos with elephants in their care.

A resolve to deal with the problems of exercise and diet, punishment and discipline, and the development of more caring attitudes, might well gain impetus in the near future. I would like to encourage those changes. The matter of satisfying elephants' social needs, however, is daunting.

Life-long social bonding in stable families is perhaps the most fundamental and irrevocable aspect that characterizes elephant life in the wild (Moss and Poole, 1983. Sukumar, 1989. Douglas-Hamilton, 1972). To be able to even consider meeting this enormous challenge will demand levels of commitment and resources beyond anything currently applied to the care of zoo elephants.

Cynthia Moss and Joyce Poole, especially, have clearly demonstrated that adult African elephants and their young offspring in nature enjoy a close and steadfast family life with extensive gregarious connections to relatives at many social levels (Moss and Poole, 1983). Most likely the same is true for Asian elephants. The astonishing sophistication of elephant communications offers a clue to the importance of their social interactions. Female African elephants, for example, can distinguish the vocalizations of at least one hundred elephants from at least fourteen families (McComb et al, 2000). Female elephants spend their entire lives

within the close bonds of their family. This degree of stability and the depth and complexity of the family's social interactions are completely at odds with the social conditions in most zoos.

Family units in the wild average about six to eight animals for Asian elephants, and for Africans about four to twelve individuals, in mixed groups of females and young, including pre-pubescent males (Sukumar, 1989. Douglas-Hamilton, 1972). A small number of zoos, notably Emmen Zoo in the Netherlands, Howletts Zoo in the UK, and Disney's Animal Kingdom in Florida, manage family groups of more than a dozen elephants, but the more typical number in most North American and European zoos is a single female Asian or two female African elephants (Schulte, 2000. Clubb and Mason, 2002, Tables 11 and 12).

The age structure for wild elephant populations tends to follow a bell curve, with a small percentage above the age of 45 curving down to about 30% under the age of five (Kurt, 1974). The age graph of North American and European zoo populations tracks a quite different line. It shows an almost complete absence over age 45, with a bulging curve bellying out between ages 15 and 34 and a rapid depression of the curve below 15 years of age to less than 2% (Schulte, 2000. Clubb and Mason, Figure 5, 2002,).

The mixed age structure within elephant herds is important because elephants acquire many skills from

others, such as how to forage, where to find water, and how to care for their young. Zoo elephants may not need to learn how to find a water hole during a drought, yet the opportunity for elephants to gain maternal skills remains crucial if zoos are to maintain social groups successfully. This opportunity, however, is almost absent in zoos.

Social bonds between females in wild family units are formed vertically, from mother to daughter to granddaughter. Most zoo elephants have been captured in the wild or taken from elephant camps and do not share close levels of familial relatedness (Clubb and Mason, Figure 2, 2002). A study of four unrelated female elephants that had been together since one or two months of age in a Sri Lankan elephant orphanage found no well-defined bonds between them (Poole et al, 1997). Nonetheless, some zoo females do form close associations with specific individuals. They show much stress and agitation when their social partner is removed and a very high level of interaction if they are reunited after an enforced absence. These zoo relationships, however, are characteristically between a pair of females rather than, as in the wild, among several members throughout the herd.

Very few pregnant zoo elephants have seen or been involved in caring for an infant. In the wild, all the females in the family group take a great interest in the infants that are invariably present (Lee, 1987). Wild

elephants give birth within the herd, receiving close attention and assistance from experienced females (Moss, 1988). The exact opposite characterizes the zoo situation, where females are often removed from the group and sometimes chained by all four feet when birth is considered imminent (Schmidt, 1998). The lack of experienced mothers in zoos may be a significant factor in the high incidence of infant rejection and infanticide among zoo elephants (Kurt and Mar, 1996).

Zoo groups are much smaller than in the wild, typically composed of females of similar ages, most of whom have never given birth. The importance of learning maternal skills is underscored in an evaluation of two groups of eight Asian zoo elephants imported from the wild at very early ages. One of the groups went to a zoo that housed an old female, and they remained in that zoo. All the elephants in this group successfully raised young. Of the second group, five individuals were relocated to other zoos at least once. All those in this group discarded, attacked or killed their young (Kurt and Hartl, 1995).

Relocating zoo elephants is a common occurrence (Schulte, 2000). Usually the separations are permanent, although sometimes the relocations are only temporary, for breeding. In 1997 Chai, a particularly good-natured female at Seattle's Woodland Park Zoo, was shipped to Dickerson

Park Zoo, in Springfield, Missouri, to be mated with a stud male.

After three days on a truck Chai arrived exhausted, entering an early estrus period, hungry, nervous and probably disoriented. Dickerson Park staff could have chosen to assist her acclimation. Instead they set out almost immediately to establish control. They prodded her with ankuses, and, worse, in different and more sensitive contact points than the keepers used at Woodland Park. Stressed and confused she resorted to an action completely out of character for her: she swung her head at the lead keeper. The keepers decided to counter what they described as "aggressive behavior," and thus repeated the cues. Chai fell into the trap, and swung her head again. It was the signal to start beating her with ax handles. The trainers had the comfort of knowing not only that this was customary procedure at their zoo, but also pre-approved by Woodland Park Zoo management for them to use on Chai if they deemed it necessary. One attendee reported that the pounding lasted at least an hour. A Dickerson Park Zoo spokesperson says the beating lasted 'only' about five minutes in an hour-long training session (Scigliano, 2002). US Department of Agriculture officials investigated complaints and found that the beating Chai had endured was abusive. They imposed a fine and instructed Dickerson Park Zoo to immediately

instigate a protected contact management system (Heckman, 2002).

Chai did not rebel again after this incident. She did, however, show new signs of stress and for the first time in her life began swaying and shuffling in classic stereotypic patterns. These behavioral distortions continued after her return to Seattle. Docents and staff explained to the public that they were caused by the swaying motion of the truck during the long drive from Missouri, or something she learned from another elephant at Dickerson Park, or, that old familiar zoo line, she was anticipating going inside to be fed. Visitors often simply smiled; "Oh look. She's dancing!" Their misinterpretation was never observed to be corrected by any zoo staff or volunteers (Scigliano, 2002).

Relocations of zoo elephants have been increasing in recent years. Separating elephants from a family unit causes enormous stress, for both young and adult animals, and can affect a young elephant for the remainder of her life (Kurt, 1995. Poole, 2000). In Europe, babies have it seems been separated from mothers and shipped to other zoos or circuses when only a few days old (Clubb and Mason, Table 14, 2002). The AZA recommends that the minimum age for removing a female calf should be three years, the minimum age for weaning in the wild. But considering the strength and complexity of the social bonds between mother and calf, one must question not only whether this figure is

just too arbitrary but also whether separation can be acceptable in any circumstances. It is an especially unnatural occurrence for female elephants. In the wild they lose each other only through death.

The unanticipated removal of an individual from within a socially bonded group is a source of deep stress not only for elephants but also for many other intelligent social species, including primates, dolphins and killer whales. Altered feeding and sleeping patterns after such deprivation are common among elephants, as are increased searching behaviors and vocalization interspersed by periods of energy-conserving depression. The behavioral and physiological changes can persist to such an extent they indicate not just loss but a deep sense of grief (Moss, 1988. Newberry and Swanson, 2001). The trauma inflicted upon separated elephants is of such duration, such intensity, and such depth that it would seem to be warranted only for very exceptional circumstances. Yet in Europe about two-thirds of all captive born elephants have been separated and relocated, some of them more than once. In not one instance was the calf transported in the company of its mother (Clubb and Mason, Table 14, 2002).

The commitment to maintain elephants as stable multi-generational groups is imperative, but is beyond the physical and financial capacity of most zoos. Certainly, I cannot imagine that any more than a very small number of

zoos can provide conditions that suit elephants well. Perhaps people in the western world who wish to see elephants should expect to select from only those few zoos that can dedicate the space and resources for managing large and stable herds in spacious and complex environments in appropriate climates. (Maybe one facility in southern California and one in Florida for North America; one perhaps in the warm climate of Spain for Europe; and one in Queensland for Australia and New Zealand.)

Not being able to see elephants in the local zoo would be an inconvenience for humans, but it could mean a massive improvement for zoo elephant standards and welfare. Taking into account the relatively small amount of resources that zoos have traditionally applied to elephant needs, my sad conclusion is that not only some zoos but, in truth, *most* zoos either will not pay or cannot afford to create proper conditions for elephants, and thus don't deserve them.

David Hancocks, Melbourne 2005.

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Bibliography:

Adams, J. (1981). Wild Elephants in Captivity. Center for the Study of Elephants, California.

Andersen, P. (2005). Cranky elephant packing up trunk. Seattle Post-Intelligencer, January 14.

Anonymous. (2005). Peer Review of Hancocks' paper 'Some Zoos Don't Deserve Elephants,' presented at Front Royal Symposium Never Forgetting, March 20, 2003.

AZA. (2001). American Zoo Association Standards for Elephant Management and Care. Washington DC.

Boardman, W. S. J., Jakob-Hoff, R., Huntress, S., Lynch, M., Reiss, A. and Reite, M. (2001). The Medical and Surgical management of Foot Abscesses in Captive Asiatic Elephants: Case Studies, The Elephant's Foot. Editors, B. Csuti, E. L. Sargent, U. S. Bechert. Iowa State University Press.

Blake, W. (1803). Auguries of Innocence. Poems. (1863). Editor, D. G. Rosetti. www.classicauthors.net

- Carlstead, K., Seidensticker, J. and Baldwin, R. (1991). Environmental enrichment for zoo bears. Zoo Biology 10:3
- Chadwick, D. H. (1992). The Fate of the Elephant. Clays, St Ives, UK.
- Clubb, R. and Mason, G. (2002). A Review of the Welfare of Zoo Elephants in Europe. RSPCA. www.rspca.org.uk
- Desmond, T. J. and Laule, G. (1991). Protected contact elephant training. Proceedings AAZPA Annual Conference. AAZPA, Wheeling, West Virginia.
- Douglas-Hamilton, I. (1972). On the Ecology and Behavior of African Elephants. Ph. D. Thesis. University of Oxford.
- EAZA. (1997). European Association of Zoos and Aquaria Recommendations for Elephant Husbandry. Amsterdam, The Netherlands.
- Eisenberg, J. F. (1980). Ecology and Behavior of the Asian Elephant. Elephant Supplement 1.
- Eltringham, S. K. (1982). Elephants. Blandford, UK.
- Fernando, S. B. U. (1989). Training Working Elephants, Animal Training. UFAW, Potters Bar, UK.
- Forthman, D. L., McManamon, R., Levi, U. A. and Bruner, G. Y. (1995). Interdisciplinary issues in the design of mammal enclosures. Captive conservation of endangered species. Editors, E. F. Gibbon, Jr., J. Demarest, and B. Durrant. State University of New York Press. Albany, NY

- Galloway, M. (1991). Update on 1990 Chaining Survey. Proceedings 12th International Elephant Workshop. Syracuse, NY.
- Hancocks, D. (1971). Animals and Architecture. Evelyn, London.
- Hancocks, D. (2001). A Different Nature. University California Press.
- Harriman A. (2005). Pack up elephant exhibit, alderman asks zoo. Chicago Sun-Times. May 10.
- Heckman, C. (2002). Zoo's treatment of elephants too harsh. Seattle Post-Intelligencer. July 3.
- Hinterberger, J. (1976). Elephants sacred cows to Ms Lamphere. Seattle Post-Intelligencer. January 21
- Hutchins, M. (2004). Better off dead than captive bred? AZA Communiqué. June.
- Howletts. (2005). Howletts Wild Animal Park. www.totallywild.net. March.
- Jones, S. (1999). Almost Like a Whale. Doubleday, London.
- Kellert, S. R. (1989). Perceptions of Animals in America, Perceptions of Animals in American Culture. Editor, R J Hoage, Smithsonian Institution Press.
- Kurt, F. (1974). Remarks on the Social Structure and Ecology of the Ceylon Elephant. IUCN Publications 32.
- Kurt, F (1995). The Preservation of Asian Elephants in Human Care. Animal Research and Development 41.

Kurt, F. and Hartl, G. B. (1995). Asian Elephants in Captivity - A Challenge for Zoo Biological Research. Research and Captive Propagation. Finlander, Furth, Germany.

Kurt, F. and Mar, K. U. (1996). Neonatal Mortality in Captive Asian Elephants. Zeitschrift fur Saugetierkunde 65.

Kurt, F. and Schmid, J. A. (1996). A Comparison of Feeding Behavior and Body Weight in Asian Elephants. First International Symposium on Physiology and Ethology of Wild and Zoo Animals. Berlin.

Laule, G. (2005). Personal communication. March 11.

Lee, P. C. (1987). Allomothering among African Elephants. Animal Behaviour 35.

Leach, E. (2002). Personal communication. November 5.

Leach, E. (2005). Personal communication. March 11.

Lee, P. C. and Moss, C. J. (1986). Early Maternal Investment in Male and Female African Calves. Behavioral Ecology and Sociobiology 18.

Lehnhardt, J. (1991) Elephant handling: A problem of risk management and resource allocation. Proceedings AAZPA Regional Conference. Wheeling, West Virginia.

Lehnhardt, J. (2005) Peer Review of Hancocks' paper 'Some Zoos Don't Deserve Elephants,' presented at Front Royal Symposium Never Forgetting March 20, 2003.

Lewis, G. and Fish, B. (1978). I Loved Rogues. Superior, Seattle.

- Lindburg, D. G. (1998). Coming Out of the Cold: Animal Keeping in Temperate Zone Zoos. Zoo Biology 17.
- Mayell, H. (2002). Painting elephants get online gallery. National Geographic News. June 26.
www.nationalgeographic.com
- McCarthy, M (2002). Zoos Must Not Keep Elephants, Demands Report by RSPCA. The Independent, London, October 23.
- McComb, K., Moss, C., Sayialel, S. and Baker, L. (2000). Unusually Extensive Networks of Vocal Recognition in African Elephants. Animal Behavior 59.
- McDiarmid, H. Jr. (2004). Detroit Zoo to Free Elephants. Detroit Free Press, November 20
- McKay, G. M. (1973). Behavior and Ecology of the Asiatic Elephant in Southeastern Ceylon. Smithsonian Contributions to Zoology 125.
- Morris, R. and Morris, D. (1996). Men and Pandas. McGraw-Hill, New York.
- Moss, C. J. and Poole, J. H. (1983). Relationships and Social Structure of African Elephants, Social Relationships: An Integrated Approach, Editor, R. A. Hinde. Blackwell Scientific, Oxford.
- Moss, C. J. (1988). Elephant Memories. University of Chicago Press.
- Moss, C J (2002). Presentation at PAWS Banquet, May 10, Sacramento.
- NBC (2005) Newsbreak, KTUU Channel 2, Anchorage, Alaska. February 11.

Newberry, R. and Swanson, J. (2001). Breaking Social Bonds. Social Behaviour in Farm Animals. Editors, L. J. Keeling and H. W. Gonyou. CAB International, Wallingford UK.

PAWS. (1999). Everything You Should Know About Elephants. Performing Animal Welfare Society, Galt, California.

Pond, L. (2002). Personal communication. August 10, 15.

Poole, J. H. (2000). Impact of Capture and Removal of Elephants on Family Groups. Presentation at CITES Conference, Nairobi.

Poole, J. H. (2001). Keynote Address at Elephant Managers Association 22nd Annual Conference, Orlando, Florida.

Poole, T. B., Taylor, V. J., Fernando, S. B. U., Ratnasoorlya, W. D., Ratnayeke, A., Lincoln, G., McNeilly, A. and Mantatunga, A. M. V. R. (1997). Social Behavior and Breeding Philosophy of a Group of Asian Elephants at the Pinnawala Elephant Orphanage, Sri Lanka. International Zoo Yearbook 35.

Poole, T. and Taylor, V. J. (1999). Enriching the Environments of Asian Elephants: Can Their Behavioral Needs be Met in Captivity? Proceedings Fourth International Conference on Environmental Enrichment, Edinburgh.

Reimers, M, Schmidt, S, and Kurt, F. (2001). Daily Activities and Home Ranges of Asian Elephants. Abstracts of the International Elephant and Rhino Research Symposium, Vienna.

- Roccroft, A. and Oosterhuis, J. (2001). Foot Care for Captive Elephants. The Elephant's Foot. Editors, B. Csuti, E. L. Sargent, U. S. Bechert. Iowa State University Press.
- Schmidt, J. (1998). Hands Off, Hands On: Some Aspects of keeping Elephants. International Zoo News 45.
- Schulte, B. A. (2000). Social Structure and Helping Behavior in Captive Elephants. Zoo Biology 19.
- Scigliano, E. (2002) Love, War and Circuses. Houghton Mifflin, Boston.
- Sewell, B. (2002) Horrors elephants won't forget. Evening Standard, London, November 4.
- Stroud, P. and R. Kudeweh. (2001) Redevelopment of the Melbourne Zoo Elephant Management Program. Proceedings, ARAZPA Conference, Sydney, Australia.
- Stroud, P. (2005) Personal communication. March 10.
- Sukumar, R. (1989). The Asian Elephant. Cambridge University Press.
- Sukumar, R. and Ramesh, R. (1995). Elephant Foraging, A Week with Elephants. Proceedings International Seminar on the Conservation of Asian Elephants. Editors, J. C. Daniel and H. S. Daty. Oxford University Press.
- Taylor, V. J. and Poole, T. B. (1998). Captive Breeding and Infant Mortality in Asian Elephants: A Comparison between Twenty western Zoos and Three Eastern Elephant Centers. Zoo Biology 17.

- TES. (2004). Rebuttal to Michael Hutchins' 'Zoo vs. Sanctuary.' September. The Elephant Sanctuary, Hohenwald, Tennessee www.elephants.com
- TES. (2005). The Elephant Sanctuary website, www.elephants.com Hohenwald, Tennessee
- West, G. (2001). Occurrence and Treatment of Nail and Foot Abscesses, Nail Cracks, and Sole Abscesses in Captive Elephants, The Elephant's Foot. Editors, B. Csuti, E. L. Sargent, U. S. Bechert. Iowa State University Press.
- Wolk, D. (2005). Eccentric Elephants. Seattle Weekly, Feb 2-8
- Wyat, J. R. and Eltringham, S. K. (1974). The Daily Budget of the Elephant in Rwenzori National park, Uganda. East Africa Wildlife Journal 12.