Naturalistic exhibit for zoo elephants

How it is possible and why it matters

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Introduction

I brought together methods to make zoo exhibits for elephants as naturalistic as possible. Despite animal destructive tendencies, it is possible to make very natural replica of natural habitat. It can also be used for to rhinos, bears, apes and other big animals. This paper comes from sadness which I experienced many times in many zoos, being forced to look at very bad exhibits. I decided to bring together best examples of exhibits worldwide, and suggest a few more realistic ideas. I hope that this ultimately helps zoos to educate and inspire the public and generate support for conservation. Zoological gardens, due to their popularity, are important part of conservation strategy worldwide, despite justified criticism of bad zoos and priority of in situ conservation.

Esthetic side of exhibits

Elephants are among the most charismatic animals and are threatened with extinction. Although they were kept in captivity for millennia, and in zoos for centuries, until very recently the conditions of captive elephant keeping were very inadequate. Only in the last few years, zoos begin to improve and rebuild their exhibits to allow elephants to breed. I want to point another, overlooked aspect of zoo exhibits – their esthetics and naturalness.

Why naturalistic exhibits are important?

Zoo elephant population has no significance as insurance population or source of reintroduction. Instead, education is put forward as a reason of keeping elephants, and most important message is habitat destruction threatening elephants. Therefore, either elephant exhibit has strong conservation message, or it makes no sense to keep elephants at all. The more naturalistic exhibit is, the more effective is the message. Best zoo exhibits for other species create feeling of awe about the beauty of natural ecosystem and strong passion to help it.
Naturally, it is possible to educate about habitat protection without showing habitat at all, and education can concern other matters. Still, there is a strong reason to replicate natural habitat.
Elephants are the best examples of advocate and umbrella species – ones whose conservation protect habitat of other lifeforms, too. Secondary reason of naturalistic exhibit is public-relations – pleasant surroundings are perceived that zoo makes animals happy.

Current state of exhibit

Unfortunately, current elephant exhibits are not naturalistic. Most of them consist of earth or sandy surface, dead tree trunks and stones, pool and balls or other toys. I will demonstrate that much more is possible.

Comparison to gorilla keeping

Keeping of elephants in 2006 resembles keeping gorillas and other great apes in 1970. At that time, apes were kept on sandy or concrete surface with dead tree trunks, ropes and artificial toys. It was wrongly believed that anything else will be destroyed by apes or endanger their health. During 1970-2005, zoo curators, year by year, introduced more and more natural elements. The result is exhibits like Bronx Zoo “Congo Gorilla Rainforest” presenting gorillas in lush vegetation and fairly close approximation of African rainforest. Elephant exhibiting can follow the same road – only faster.

No trade off

Every zoo exhibit must fulfill several different functions: provide space for animals, fulfill their biological needs, be secure, have adequate technical facilities for husbandry, and be convenient for keepers working in. Naturalistic appearance is additional point to these above. I would stress as strongly as possible that naturalistic look will not compensate for shortcomings in other aspects of exhibit, for example the lack of space. And it should not be treated as a form of competition to them. The last I would advocate is bad, old exhibit decorated with plants and termite mounds to look nice. This would be total misunderstanding of what a zoo should be.

Finding how natural habitat looks

To recreate natural habitat, one should first know how it looks. This is deceptively simple, but I noticed that exhibits in zoos, apparently, were often built without knowing that. Many zoo people never visited Asian rainforest or African savanna. I recommend strongly seeing them before trying.
Fortunately, albums and internet (especially Google graphics) contain lots of good pictures of tropical nature reserves. Any zoo keeper trying to recreate natural habitat should use them to learn how trees and bushes grow, how termite mounds in India look like, what is the color of rivers and dried ground in Africa, etc. Otherwise, more widely traveled visitors (and holiday in Kenya or Thailand are available for average Westerner) would not recognize the point or be put off by zoo vision of jungle or tropics.

It is also worth remembering that elephants live, or lived in the past, in many different and often visually dramatic habitats. Succulent shrub of South Africa, semi-desert in Namibia, reedy wetlands in North India, karst hills is South China are all dramatic elephant habitats worth restoring in zoos. Simple notion that Asian Elephants habitat is rainforest and African savanna elephant is savanna, hides great diversity of landscapes.

Indoor exhibits – general considerations

In temperate climate, elephants spend long time indoors. Despite natural space limitations, such exhibit can be naturalistic and attractive. Currently best examples of naturalistic indoor exhibit are Rotterdam, Dresden and Leipzig. I will show that one can go further than that.

Indoor exhibit should contain a common hall designed for group spending time together, as well as separable stalls for bull and eventual sick animals. Keeping group together, instead of separate stalls, is currently considered the best solution.

Elephants should have access to both indoor and outdoor exhibit all day (and night) and all year, except cleaning hours and extremely bad weather. This is important. In particular, I noticed that elephants display swaying stereotypies most often in front of closed doors.

Basic elements: natural floor surface

Elephants should be kept on soft surface to prevent foot problems, which commonly cause of illness and death in captivity. Important practical consideration is ensuring good draining and prevents compacting. Sand or earth are both useful.

Sand or earth are good for replicas of savannah. Rainforest ground would be optimally recreated by surface of dead leaves or at least bark chips. It would be interesting if some zoos tried it and published experiences. To my knowledge, only Basel zoo keeps Asian Rhinos on bark chips, while leaves are wholly untested as surface of any “pachyderms”. There is possibility of decay and mold, but hiding food inside would be good enrichment.

Barriers

Good barriers for containing elephants are sloping moats, or poles combined with strong metal rope, or closely spaced poles. Poles can be disguised as tree trunks, termite mounds etc. Several zoos successfully use glass as a barrier.

From esthetic point of view, I much recommend moats, rope, poles or glass as a barrier. I don’t recommend metal railing or tall lumps of rock. Latter are very visually disruptive, even if in theory rock is natural material and rope is not. Steep-sided moats are also not to be used, as it is already well publicized, that ca 11% of elephants in European zoos died from falling into steep-sided moats.

If water moats is practical, it can contain submerged fence, allowing that visitor side of the moat has water vegetation and shallow bank.

I strongly recommend not choosing one type of barrier, but using several different barriers on one exhibit. Dry moat, rope or glass can be used in different parts. It allows the best mixture of different views (close, distant, from above etc).

Basic furnishings

Dead tree trunks are common in elephant exhibits, successful and are nothing new. I would recommend many of them. Also, tree trunks are good to hide or distract attention from barriers, service doors etc.

Elephants are commonly kept with rocks. Here I would advise using much less of them. Rocks are overused in zoos, and easily make exhibit to look sad and hostile. I recommend no or few rocks and these much smaller than elephants. They can contain cracks to hide food as enrichment.

Naturalistic pool

Pool is obligatory item in elephant enclosure. It should look naturalistic, with slight sloping and uneven side. There is no reason of regular stairs or white bottom like human swimming-pools.

Live plants

Live plants are displayed in several zoos (inside and outside Berlin Zoo, Singapore Zoo) being protected by combination of thick ropes and poorly visible electric wires. Such combination is effective for years in these zoos. It allows to present elephants on a backdrop of lush vegetation. Compared to that, plants growing on balcony above elephants are only moderately interesting. Several zoos separate plants with thick metal stockade (e.g. Berlin Tierpark) or rocks (e.g. Heidelberg outdoors). These exhibits, in my opinion, are less visually pleasant than rope and wire, despite that rock is theoretically fully natural.

Choice of plants

Choice of plant species is important. For some reason, many zoos plant a mix of tropical plants which neither structurally, nor by species, resemble natural habitat. Example is Berlin Zoo, which exhibits fine South American bromeliads with Asian elephants.

Second important consideration is choice of plants which grow fast and produce lots of green mass to fill the environment with greenness. I don't recommend e.g. slow growing trees, palms or bananas as a cover of bare walls (but see below). Very effective (and underused) are e.g. thick bushes, some creepers or climbing plants and "elephant grass" – several species of tall reeds found in South Asian and African swampy areas. All above plants can cover a large area of bare wall, grow fast and are characteristic elements of ecosystems of Asian rainforest and African dry woodland.

Trees growing inside enclosure

Live trees can grow inside elephant enclosure, if their trunks are protected by thick wooden "tube" up to ca 5m. This works on outside paddock in Berlin Zoo, even in bull paddock. I recommend tall trees indoors, too (e.g. Ficus, or palms). Better protection for the tree would be, however, naturalistic replica of tree bark. This is also scratching post for elephants.
Especially interesting Asian plants are strangler figs or banyan (Ficus). They have extremely interesting pattern of connecting trunk-like roots, which can make it good exhibit. They are tough and common as potted plants (and artificial replicas are also common) as well as characteristic species in their native ecosystem.

Banyan wall

Giant net of interconnecting trunks/roots of Ficus could make also artificial cover of exhibit wall. One advantage is that it contains a lot of holes, which can be used as environmental enrichment to hide food in.

Artificial trees

Artificial trees exist e.g. in Rotterdam and Warsaw. Although less decorative, rich artificial vegetation is better than nothing. Especially, if exhibit has too much space wall to cover or hard surface with no possibility for real vegetation to root.

Termite mounds

Termite mounds are common both in Africa and Asia. Fake termite mounds are good for scratching, as well as for hiding food items. They can also be used to cover service doors or protection of trees (sometimes, real termite mounds grow next to trees). It is important to know appearance of mounds build by termites in different regions. East African savanna mounds are often rusty-red misshapen stalagmites. Asian rainforest mounds are short, cold grey heaps with flat side extensions. Internet search in Google Graphics provides lots of pictures of real-life mounds to replicate.

Painted wall

Wall painted with natural habitat is used in some American zoos. As always, panoramas should show real habitat, not imagination of person who never seen real rainforest or savanna. It is easy to make kitschy painting, so be careful.

Levers and mobility sensors

This is untested idea, but one which can contribute very much to elephant welfare. Generally, elephants learn easily. Perhaps, they can be allowed to decide themselves if they want light, or food (which type?), or shower, or enrichment. Perhaps, elephant can be provided with levers or buttons which allow animals themselves to operate food dispenser, enrichment etc? Normally, keeper is somehow forced to decide for elephant what to provide, and can guess if it is what animal wants or not.

If levers or buttons are destroyed by elephant, alternative is cheap mobility sensor. This electronic device is used e.g. to switch light when a person enters a room or garden. Such devices can be fixed above, or put into concrete boxes and allow elephants to switch them on without touching anything they might destroy.

I have very limited experience with giving captive animal a choice of things, but noticed that even so primitive species as water turtle has clear “moods” and preferences if it wants to rest, eat, stay in water or go for a walk in a given moment. Person giving animal possibility to express a choice helps it a lot. Even in a simple thing what food to eat in a given day.

Acoustic enrichment

Sound is important for animals but strangely overlooked enrichment. While humans like listening to music, and zoo exhibits often play recordings of wildlife sounds for visitors, few zoos realized that animals can benefit from sound enrichment. Playing tape-recorded sound should be very easy to test and implement.

Playing elephant sounds was tried in zoos with surprising results – elephants sometimes got agitated and aggressive, other times ignored it. Music or wildlife sound can be interesting.

One study concerned playing different sounds to captive gorillas. It showed that apes liked sounds, but, interestingly preferred classical music than jungle sounds, even if human keepers believed that latter were more appropriate. Similar experiments can be tried with elephants.

Music or other sounds can be also used to cover disruptive noise of visitors or prevent elephants from becoming bored and then over-agitated by any outside noise.

Mixed-species exhibits

Birds can be kept in inside indoor exhibit. Whenever I visit a high hall of elephant house in a zoo, I cannot stop thinking of small cages given to large tropical birds, like hornbills or parrots. There are many attractive bird species in elephant habitat, and many of them are of conservation concern (hornbills, parrots, ibises etc). They should benefit from living above elephant heads. Dresden Zoo has free-flying birds in jungle hall with elephants. Some of these escaped though doors though which elephants go to outside exhibit, although these doors were often left wide open. Darkened passage way, hanging chains or bits of plastic can be used to prevent this. Zurich Zoo has variety of African birds in house for black rhinos and pygmy hippos. One consideration is to put bird perches so that falling excretement will not land on elephants favorite resting spot or in food.

Another interesting mix would be free-flying butterflies in elephant house.

If a zoo is lucky to have very spacious and tall exhibit, primates could possibly be introduced, living on trunks and branches above elephant heads. Some macaques or gibbons could be useful.

Birds and primates should both have separate room, possibly with feeder and resting area, where they can be closed.

Outside enclosures

Most methods for inside exhibits can be used outside – only to larger and better scale. Best method to create a new outside exhibit would be, actually, to fence a natural area and retain as much of original vegetation as possible. Such exhibits are best, even if e.g. European oaks or pines don't resemble native tropical plants. Too many exhibits start with bulldozing everything on a site. In addition, following elements are possible:

Non-edible plants

This is untested idea and it would be interesting if some zoo tried it and published results.
It is possible that elephants would not destroy some unprotected plants. Especially good candidates would be harsh species like some tough dune grasses, pampas grass, thorny evergreen bushes or Pterocarya tree, which is inedible. No zoo to my knowledge has tried it, although in Dresden I seen thorny evergreens living outside the moat apparently within reach of elephant trunks. I would recommend first giving cut branches or plants to elephants, and eventually planting live ones afterwards. Perhaps larger area planted at once would survive better, or at least less strong barrier, like thorny branches, can be used.

Unfortunately, there is no list of inedible plants for decorating animal spaces. There is a list of poisonous plants, and of food plants, but not inedible plants. It would be interesting, if some zoo collected such a list and published it.

Mixed-species exhibits in outside enclosures

Deer and antelope were kept with elephants e.g. in Heidelberg. They were provided own "safety" paddock. I would recommend variety of ungulates.

Hamadryas baboons were successfully kept in Boras, Sweden. They also had their own safety rocks. Other primates would be very interesting. Arboreal primates could live on trees or climbing installations on elephant paddock. Looking at the very limited cages for primates, I always wonder if it would be possible to keep them with ungulates. For some reason, except baboons and Barbary macaques, few other species were tried.

Possible other, untested combinations are many. Small burrowing animals, like jackals, ground squirrels or mongoose could be worth trying. Hyrax is interesting possibility on exhibits containing rocks, due to it's relatedness to elephants despite very different size.

Visitor area

Visitor area can contain all plants which elephants would destroy. It is best if visitor area is visually connected to animal area – no sharp contrast. Similar vegetation is good, as are tree trunks or streams crossing between visitor and animal area.

Additional considerations

I want also to recall some important and well established points in creating animal exhibits, which are still often overlooked. Don't let zoo architecture to dominate animals. Buildings should be unobtrusive, despite that architects like to express themselves. Remember sight lines – don't put in front of visitor view doors, gates and other artificial elements, and block visitors from looking across the exhibit at each other. Avoid concrete and huge rocks – elephants nearby don't make them better. Avoid kitsch – if zoo workers are not artists, hire them.

Education

Zoo educational displays are often superficial and can be improved. There is lots of interesting facts about elephants, which I never seen explained in zoos. E.g. tree species totally adapted to seed dispersal by elephants and other largest herbivores. Similar adaptations in South American plants believed to be relic adaptation to mastodons and giant sloths. Role of elephants in shaping vegetation community. Infrasound communication. Differences between ca 30 sounds of elephants. History of elephant keeping in Asia and it's current state. Role of elephants in mythologies. Elephant seasonal migrations. Details of elephant conservation, including elephants as umbrella species, wildlife corridors and anti-poaching strategies. All these topics are rarely offered to public.

Many zoos exhibit elephant skulls or skeletons. This is potentially dubious, as elephants are known to react to bones and skulls of their dead, which is sometimes postulated to be a form of burial. Therefore bones in seeing and smelling distance could potentially stress elephants. It would be interesting to check it.

Extension to other species

Above methods of exhibit design can be easily used for other animals. Rhinos, hippos, bears and primates also suffer in unnatural zoo exhibits because of belief in their destructive tendencies. Exhibits of these mammals could be much more natural-looking, too.