

## Welfare indicators for zoo African elephants (*Loxodonta africana*)

### Introduction and objectives of this report

The international zoo community recognizes animal welfare as a key element for proper husbandry and conservation of wild animals in captivity. However, the paucity of scientific knowledge on zoo animal welfare severely hinders the development and evaluation of animal welfare improvement strategies. In dealing with animal welfare, animal caretakers, curators and veterinarians must therefore resort to subjective criteria, mostly variations on the analogy principle, for lack of validated, objective criteria. Although subjective criteria may be helpful as a starting point in some instances and on a local scale, their use is prone to severe pitfalls and cannot be standardized or extended among facilities or institutions.

We propose to build on the framework for the objective assessment of animal welfare in farm animals provided by the Welfare Quality® project, and extend it to zoo animals. This report identifies science-based indicators to quantify each element of welfare in African elephants (*Loxodonta africana*). It also singles out indicators which, despite generalized consensus among professionals regarding their importance, currently lack sufficient scientific evidence to adequately quantify them.

Animal welfare can be defined in a number of different ways, but there is a growing consensus that whatever the definition, it has to include three elements: the emotional state of the animal, its biological functioning and its ability to show normal patterns of behaviour (Duncan and Fraser, 1997; Mendl, 2001). Indeed, it is now widely accepted that an animal's welfare embraces its physical and mental state and that good animal welfare implies both fitness and a sense of well-being. The Five Freedoms developed by the Farm Animal Welfare Council of the UK provided a very useful framework to assess these principles in practice. These freedoms, which represent ideal states rather than actual standards for animal welfare, include: freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury and disease, freedom to express normal behaviour, and freedom from fear and distress (FAWC, 1992). More recently, the Welfare Quality® project built on and extended the Five Freedoms to four principles of animal welfare: good feeding, good housing, good health and appropriate behaviour. Each of these four principles comprises several criteria, with an overall total of 12 criteria (Botreau et al, 2007). Finally, each criterion is assessed through a number of parameters which has been tested for validity, reliability and feasibility, and that are mostly animal-based indicators.

The objective of this report is to suggest a list of indicators to assess welfare in captive African elephants. The report provides a list of animal-based and resource-based indicators grouped according to the four principles of the Welfare Quality® protocol. Animal based indicators may offer advantages over resource based indicators; for example, they should be equally applicable across a wide range of housing conditions. On the other hand, however, there is a number of welfare issues for which no adequate animal-based indicators is available. Furthermore, although animal-based indicators may be the best option to assess welfare, resource based indicators are still needed to select improvement strategies. Therefore, a combination of both types of indicators is warranted. For each indicator, its rationale (e.g. why the indicator has been included in the protocol), its problems and limitations, and the suggested methodology to record it (when applicable) are included. At the end of each indicator, a conclusion is given.

### **Limitations of the report and areas deserving further research**

This report is not intended to provide an overall absolute score for elephant welfare in a given facility. This is due to the fact that adding up scores for different welfare elements is very difficult, as there is no common currency for all welfare problems. For example, there is no science-based criterion to decide whether animal welfare is more compromised by lameness or by the lack of social contact. Therefore, the aim of this report is to provide a set of indicators to identify problem areas in a given facility and monitor progress once improvement strategies have been applied.

As it is also the case in protocols developed for farm animals, this report includes mainly negative indicators, e.g. indicators of poor welfare. Clearly, identifying positive indicators is an area deserving further research.

Some potentially important indicators have not been validated in African elephants. For example, although there are many recommendations on the size of the enclosures, the rationale behind the recommendations is not clear and they seem to be based more on current practice than on good scientific evidence. Validating possible indicators of welfare (particularly in regards to animal-based indicators) is another area that needs urgent attention.

## Good feeding

### Body condition (animal-based)

#### *Rationale*

Body condition is included as an animal-based indicator in several protocols to assess welfare in zoo animals. Both poor body condition and excessive body condition are indicative of a welfare problem, although the latter is likely to be more common than the former in captive elephants. Excessive body condition may increase the risk of lameness and other conditions. Additionally, it may be a consequence of lack of physical exercise. A body condition scoring system has been developed and validated to be used in female African elephants (Morfeld et al., 2014).

#### *Methodological considerations*

Body condition must be assessed by an experienced person at regular intervals.

*Conclusion: poor or excessive body condition should be considered indicative of a welfare problem.*

### Water provision (resource-based)

#### *Rationale*

*Ad libitum* access to good quality water is considered a welfare requirement for all species and several welfare assessment protocols for farm animals include provision of water as a resource-based indicator. Elephants should have access to drinking water from the indoor area and troughs should be cleaned daily. Cold water may cause digestive problems and therefore elephants should have access to water at room temperature.

#### *Problems and limitations*

Ideally, water consumption should be monitored but this may be difficult in practice.

#### *Methodological considerations*

None.

*Conclusion: Ad libitum accesses to clean, good quality as well as clean water troughs are welfare requisites.*

## Good housing

### Enclosure size – outdoors / indoors (resource-based)

#### *Rationale*

African elephants in the wild roam over very large areas. Evidence in many species show that animals kept in small enclosures are more likely to develop physiological and behavioural changes indicative of poor welfare than animals kept in larger enclosures.

#### *Methodological considerations*

None.

#### *Problems and limitations*

Although the amount space available to the animals is obviously important, the quality of the space (e.g. whether there is any sort of environmental enrichment) is likely to be even more important. Recommendations on the minimum space per animal are very diverse. The rationale for such recommendations is not clear and even the highest figures are much smaller than the home range of African elephants in the wild.

*Conclusion: although enclosure size is likely to have an important effect on welfare of captive elephants, at present there is no science-based recommendation on optimal enclosure size.*

### Climatic conditions (resource-based)

#### *Rationale*

African elephants in zoos are often kept in climates that are very different from those of their current areas of natural distribution. On the other hand, however, there is evidence that elephants can adapt to a diversity of climates. Nevertheless, wet and muddy conditions are likely to compromise welfare, as they may increase the risk of feet conditions, for example. Very high temperatures may cause heat stress and sunburn if animals do not have access to shade.

#### *Problems and limitations*

At present there is no precise information on the range of temperatures that is adequate for African elephants and it is very likely that factors such as age and

previous acclimatization have a significant effect of the animals' tolerance to high and low temperatures.

*Methodological considerations*

None.

*Conclusions: damp and muddy conditions should be considered as a welfare problem and the same applies to absence of shade in hot climates.*

## Good health

### Lameness (animal-based)

#### *Rationale*

Feet conditions which oftentimes lead to lameness are common in captive elephants (Rees, 2011). In farm animals, lameness is considered a major welfare problem as it is indicative of pain and may interfere with normal behaviour.

#### *Problems and limitations*

None.

#### *Methodological considerations*

Feet condition and lameness must be assessed by an experienced veterinarian at regular intervals.

*Conclusion: lameness and other feet conditions should be considered indicative of a welfare problem.*

### Skin condition (animal-based)

#### *Rationale*

Skin injuries or presence of debris on the skin have been reported in captive elephants and may be a consequence of disease, rough handling or intra-specific aggression, or inappropriate physical environment. In farm animals, presence of injuries on the skin is commonly used as an indicator of poor welfare.

#### *Problems and limitations*

None.

#### *Methodological considerations*

Skin condition must be assessed by an experienced veterinarian at regular intervals.

*Conclusion: poor skin condition should be considered indicative of a welfare problem.*

## Appearance of faeces (animal-based)

### *Rationale*

The appearance of faeces is important to identify problems that cause diarrhoea or poor digestion. Poor digestion may be particularly important in old elephants that may have dental problems.

### *Problems and limitations*

None.

### *Methodological considerations*

Faeces from all elephants should be observed daily. Both diarrheic faeces and faeces with an excessive amount of undigested material are indicative of problems.

*Conclusion: diarrheic faeces and faeces with an excessive amount of undigested material are indicative of problems.*

## Appropriate behaviour

### Expression of social behaviour

#### Affiliative behaviours (animal-based)

##### *Rationale*

Studies in several species have shown that affiliative behaviours are self-rewarding. Additionally, they may have a buffering effect on stress.

##### *Problems and limitations*

Studies in domestic cattle have shown that social grooming (which is a form of affiliative behaviour) may increase after stressful events.

##### *Methodological considerations*

Affiliative behaviours may be subtle and of short duration and therefore, behavioural observations using continuous recording should be carried out by experienced observers.

*Conclusion: the presence of affiliative behaviours should be considered indicative of positive welfare.*

#### Intra-specific aggression (animal-based)

##### *Rationale*

Intra-specific aggression may lead to injuries and social stress and has been included in several protocols to assess welfare in farm animals. Aggression in captive elephants appears to be relatively common, whereas overt aggression in wild elephants, particularly in females, is rare (Clubb and Mason, 2003).

##### *Problems and limitations*

Some degree of intra-specific aggression may be normal or even unavoidable. Therefore, only "excessive" aggression should be indicative of poor welfare and currently there is no definition of "excessive" intra-specific aggression in African elephants.

### *Methodological considerations*

Aggression may be subtle and of short duration and therefore, behavioural observations using continuous recording should be carried out by experienced observers. Particular attention should be given to periods when animals are confined or when there is the risk of competition for resources.

*Conclusion: despite the problems and limitations already mentioned, we believe that stable groups of African elephants, particularly females, should show very limited amounts, if any, of overt aggression. Therefore, presence of overt aggression should be considered an indicator of poor welfare. Frequent threats between animals should also be considered an indicator of poor welfare.*

### Group size and composition (resource-based)

#### *Rationale*

African elephants, particularly females, have a very developed social behaviour and show strong bonds with other individuals. Disruption of such social bonds has been shown to have very negative effects on welfare. Additionally, there is ample evidence in many species showing that social contact is necessary for good welfare in group-living animals. In domestic social species, being kept in group is considered a requisite for good welfare.

#### *Problems and limitations*

Recommendations on the minimum acceptable group size in captive African elephants vary from 3 to 6, and the rationale for any of these figures is not clear. Group size is not the only factor to consider when assessing animal welfare, as group compositions (e.g. the presence of animals of different ages, at least in female groups) and the compatibility between individual animals are also important.

#### *Methodological considerations*

None.

*Conclusion (I) – Female and young animals: keeping female or young African elephants alone is not acceptable on welfare grounds. At present, there is no scientific rationale to suggest a minimum group size, but keeping animals in very small groups (e.g. groups of 2 or even 3 animals), although obviously better than keeping them alone, is unlikely to provide an adequate social environment for female and young African elephants.*

*Conclusion (II) – Adult males: it is not always possible to keep adult male African elephants in groups. However, even if this is the case, a housing system that prevents adult male elephants from having visual, auditory and olfactory contact with conspecifics should be considered as indicative of a welfare problem.*

## **Expression of other behaviours**

### Stereotypies (animal-based)

#### *Rationale*

Traditionally, stereotypies have been defined as behaviours that are repetitive, invariable, and without any apparent function. More recently, Rushen and Mason (2006) have described them as repetitive behaviours resulting from illness or repeated attempts at adapting to a difficult environment. In general, stereotypies are considered to be indicators of a lack of welfare. This is due to both the circumstances that increase the risk of stereotypies, such as restrictive environments that prevent the expression of normal species specific behaviour, and the fact that some stereotypies have negative consequences for the animal, causing injury or loss of body condition (Mason, 1993).

Stereotypies are well-known in captive elephants, although in at least one study most elephants did not stereotype at all. The most common stereotypy in captive African elephants is weaving.

#### *Problems and limitations*

The relationship between stereotypies and individual welfare is complex, as stereotypies may persist even after the environment in which the animal is kept has been considerably improved. Therefore, the performance of stereotypies must not be taken as a definitive sign that current conditions are sub-optimal.

#### *Methodological considerations*

To assess whether an animal is performing stereotypies it is necessary to carry out behavioural observations at different times, including the period when elephants are kept indoors.

*Conclusion: if a captive elephant starts displaying stereotypies when kept in its current environment, this environment should be considered sub-optimal.*

## Time spent foraging (animal-based)

### *Rationale*

African elephants in the wild are reported to spend up to 60% of their total time foraging. Several studies done at zoos report foraging times that are much shorter (e.g. around 30%). Evidence in several species show reduced foraging time increases the likelihood of stereotypies.

### *Problems and limitations*

Providing enough browse to allow elephants to spend enough time foraging may be very difficult for some zoos.

### *Methodological considerations*

Foraging time should be assessed by behavioural observations throughout the day using scan sampling. This has to be done over several days and at different periods of the year.

*Conclusion: ideally, foraging time in zoo elephants should be similar to that of elephants in the wild (e.g. 60%) and shorter foraging times should be considered indicative of a possible welfare problem. An average foraging time of 30% of the total time has been reported for zoo elephants, and this should be considered the minimum acceptable.*

## Environmental enrichment (resource-based)

### *Rationale*

Environmental enrichment has been shown to have positive effects on welfare in a variety of species. African elephants in the wild may travel long distances to get access to a river where they can take a bath, and bathing is likely to have positive effects on skin condition. Also, wild elephants scratch themselves against trees very often and, again, scratching is likely to improve skin condition.

### *Problems and limitations*

None.

### *Methodological considerations*

None.

*Conclusion: having access to scratching devices and to a properly-designed pool should be considered a requisite for good welfare. The importance of providing browse has been mentioned under "Time spent foraging".*

## Human-animal relationship

### Medical training (resource-based)

#### *Rationale*

If properly done, medical training is likely to reduce the stress caused by veterinary procedures. Additionally, there is evidence in other species showing that training based on positive reinforcement as opposed to punishment has positive effects on welfare and can be considered as a form of environmental enrichment.

#### *Problems and limitations*

Poor training techniques (e.g. training based on punishment or carried out by inexperienced personnel) have negative effects on welfare. Therefore, the implementation of medical training programs *per se* is not necessarily good for the welfare of the elephants, as the effects of training will depend on its quality.

#### *Methodological considerations*

None.

*Conclusion: implementation of medical training programs based on positive reinforcement should be considered as an indicator of good welfare. Training programs based on punishment or carried out by inexperienced personnel should be considered as a welfare problem.*

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