

*Short Communication***USING SPECIES-SPECIFIC PROTOCOLS FOR THE WELFARE ASSESSMENT OF ELEPHANTS IN THE SKOPJE ZOO**

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Received 4 February 2022; Received in revised form 16 March 2022; Accepted 6 April 2022

**ABSTRACT**

Providing good animal welfare standards is very important for wild animals in captivity, especially in zoos. Therefore, the aim of this study was to perform a welfare assessment of elephants in the Skopje Zoo using species-specific protocols. Two specific protocols were used for the welfare assessment and were combined for a more unified approach. These protocols focused on the assessment of the elephant's day-time behaviour, including Qualitative Behaviour Assessment (QBA), as well as the following sections: nutrition, physical health, environment, behaviour and management. Data was collected from the Asian and African elephants that were housed together, in the Skopje Zoo. Both species were observed for three consecutive days, during which time QBA was performed and they were observed on their daytime behaviour. Feeding (42% African, 34% Asian elephant) and anticipatory (35% African, 22% Asian elephant) behaviour were predominantly observed daytime behaviours of both elephants, as well as stereotypic behaviour (30%) of the Asian elephant. Concerning the QBA, 'uncomfortable' (296 Asian, 234 African elephants) and 'relaxed' (271 Asian, 280 African elephants) were the most dominant descriptors for both elephants. The collected data indicated that the elephants were in good physical health. Regular feeding enrichment, as well as environmental enrichment was recommended. There is room for improvement concerning the management practices of the elephants.

**Key words:** animal welfare, behaviour observation techniques, zoo animals, elephants**INTRODUCTION**

Some species of animals appear to show poorer welfare in captivity than those in the wild (1). For this reason, it is very important to be able to assess the welfare of animals in captivity, especially in zoos. Elephants have complex behaviours and need for social interactions, as well as need for an extensive and enriched environment (2, 3). In the wild, they have complex social structures consisting of related individuals (4, 5, 6), while in

zoos elephant groups often consist of randomly grouped individuals with numbers below the recommended for breeding facilities (5, 7). All of this leads to a difficulty in maintaining their welfare in captivity (2, 3), which may result in stereotypic behaviour and health concerns (2, 3, 8, 9). Due to these reasons, it is important to be able to assess the welfare of captive elephants in zoos. While there are a number of welfare assessment protocols for animals in zoos (3, 10, 11) for the most accurate results it's probably best to use species-specific protocols. Since 2018, Skopje Zoo has housed an Asian (*Elephas maximus*) and an African elephant (*Loxodonta africana*) that, according to available information, have never had their welfare assessed. Therefore, the aim of this study was to assess the welfare of the two housed elephants in the Skopje Zoo and identify which practices are satisfactory according to recommended standards and which have room for improvement.

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## MATERIAL AND METHODS

Welfare assessment was done on the African (*Loxodonta africana*) and Asian (*Elephas maximus*) elephant that were housed together in the Skopje Zoo (Fig. 1).

Prior to being in the zoo, the elephants were circus animals captured in the wild. Two protocols, the Development of a behavioural welfare assessment tool for routine use with captive elephants (12) and the EAZA's animal welfare framework for zoos and aquariums (13), were combined to create a more

unified protocol that was used for the welfare assessment. This protocol contained the following sections: nutrition, physical health, environment, behaviour and management. Each of these five sections had a number of questions that, depending on the assessment, were scored as acceptable/questionable/unacceptable. Husbandry guidelines (14, 15) were used as a reference base for good animal welfare for the elephants. A more detailed assessment of elephant behaviour was performed by observing their daytime activity and performing a Qualitative Behaviour Assessment (QBA) (Table 1).



**Figure 1.** The elephants in their indoor (left) and outdoor (right) enclosure

**Table 1.** Definition of terms for behaviour assessment (Ethogram) used in the study are defined below. The category of each behaviour is given, along with the term used to describe that behaviour, and the definition of each term

Category	Behaviour	Description
Sleep/Rest	Lying rest	Lateral recumbency, no other behaviours are being performed
Anticipatory	Anticipating	Standing alert, often near (within two elephant body lengths) of gates or enclosure bars prior to an event (e.g., feeding, moving inside, etc.)
Stereotyping		<b>Repetitive behaviour with no obvious purpose. May include but is not limited to the following:</b>
	Head bobbing	Repetitive vertical movement of head
	Swaying/Weaving	Side to side or back and forth repetitive swaying of the body
	Trunk tossing	Vigorous swaying of trunk from side to side
	Head pressing	Pressing head up against an object with no obvious purpose
	Pacing	Walking repeatedly along the same route in an unvarying, repetitive pattern
	Leg swing	Standing still repeatedly swinging one front leg back and forth
	Foot lifting	Standing still repeatedly lifting one foot in the air
	Rocking	Rocking back and forth transferring weight from hind to front legs
	Tusk banging	Repetitive banging or rubbing of the tusks on objects (e.g. enclosure bars or logs)
	Bar biting	Chewing or gnawing on enclosure bars

Category	Behaviour	Description
<b>Comfort</b>		<b>Any self-maintenance or grooming behaviour. May include but is not limited to:</b>
	<b>Wallowing</b>	Lying down and rolling in mud
	<b>Rubbing</b>	Rubbing the body against an object
	<b>Rolling</b>	Lying down and rolling in dirt or sand
	<b>Scratching</b>	Scratching the body with trunk or foot - this can include using the trunk to scratch/feel gently around the skin, eye or ear
	<b>Scratching with tool</b>	Scratching the body with a tool, e.g. branch or stick
	<b>Throwing straw on self</b>	Throwing soft objects such as grass or straw onto the body using the trunk
	<b>Dust bath</b>	Spraying mud, dust or sand on the body
	<b>Water bath</b>	Spraying water on the body
	<b>Wallowing</b>	Hitting of own body with tail or trunk, appears to be a means of removing an insect or other irritant
<b>Digging</b>	Using foot to displace substrate	
<b>Social/affiliative</b>		<b>Any positive or neutral interaction with another elephant. May include but is not limited to:</b>
	<b>Leaning</b>	Leaning on another elephant
	<b>Standing</b>	Standing underneath or standing above another elephant
	<b>Trunk-mouth</b>	Putting the trunk in the mouth of another elephant
	<b>Touching</b>	Touching another elephant with the trunk in a non-aggressive manner
	<b>Tail</b>	Holding the tail of another elephant with the trunk or underneath a leg
	<b>Trunk-trunk</b>	Intertwining of trunks between two elephants
	<b>Approach</b>	Moving in a non-aggressive manner, within one body length of another elephant
	<b>Climb</b>	Placing at least one foot on top of another elephant - usually one that is lying down
	<b>Offer food</b>	One elephant pushes a pile of food towards another elephant, looks like an offering of the resource
	<b>Trunk lifting</b>	Trunk is outstretched and raised towards an approaching individual
	<b>Sitting on an elephant</b>	Sitting in a crouched position on top of another elephant which is in lying rest
	<b>Rubbing elephant</b>	Rubbing the body against another elephant
<b>Playing with an elephant</b>	Engaging in active play with another elephant, including head-to-head sparring, trunk wrestling, mounting, chasing, and rolling on one another. Does not include behaviours observed following an antagonistic encounter or as part of courtship	
<b>Urine and faecal inspection</b>	Inspection of the urine or faeces of another elephant	
<b>Interaction with environment</b>		<b>Investigating or interacting with things in the environment (other than food). May include but is not limited to:</b>
	<b>Play with an object</b>	Throwing or kicking debris or an object around in a playful interaction
	<b>Object manipulation</b>	Examination or manipulation of an object with the trunk and/or foot
	<b>Environmental investigation</b>	Investigating things in the environment (other than food) with the trunk - looks like the individual may be 'sniffing' at the ground or objects
<b>Keeper interaction</b>	Any interaction between the individual and members of the animal keeping team	
<b>Eating/Foraging</b>	<b>Eating</b>	Manipulation (including breaking up of food stuffs using the trunk or foot) and consumption of food
	<b>Foraging</b>	The process of searching for and collecting food stuffs using the trunk and/or foot - may include kicking up grasses, shaking the food in the trunk or beating against the leg

Category	Behaviour	Description
<b>Agonistic behaviour</b>		<b>Any negative social behaviour</b>
	<b>Tusking</b>	Poking or jabbing at another elephant with the tusk
	<b>Charge</b>	Moving towards conspecific with the head held high, pace usually quickens as individual gets closer to the conspecific, can lead to pursuit of conspecific
	<b>Mock charge</b>	Moving at a fast pace towards conspecific for more than three steps, contact does not occur
	<b>Chase</b>	Follows on from 'charge' behaviour leading to the pursuit of an individual
	<b>Lunge</b>	Thrusting body towards a conspecific in an aggressive manner taking less than three steps. If more steps taken then reclassify as 'Charge/Mock charge'
	<b>Bite</b>	Biting a conspecific's body, trunk or tail
	<b>Kick</b>	Strike out or hit an elephant or object with a foot in a seemingly aggressive manner - note object may include enclosure bars or kicking of sand towards another elephant
	<b>Strike</b>	Hitting another elephant with the trunk or tail
	<b>Push</b>	One elephant forces or pushes against the body (usually the rump) of another elephant, resulting in the elephant that is being pushed moving at least two steps
	<b>Contact displacement</b>	Movement of an individual resulting in conspecific leaving its location (within 10 s) caused by physical contact between individuals such as push or nudge
	<b>Non-contact displacement</b>	Movement of one elephant towards the other, resulting in conspecific leaving its location (within 10 s) no physical contact occurs between elephants
	<b>Stand off</b>	Two elephants standing facing in opposite directions with foreheads pushing against each other
	<b>Smack</b>	Hitting the trunk on the floor in an aggressive manner, may be accompanied by a 'snort'
	<b>Tail pulling</b>	Pulling a conspecific's tail with trunk
	<b>Aggressive display</b>	Facing a conspecific in an aggressive posture, head bobbing up and down or side to side, ears wide and flapping
	<b>Trunk dominance</b>	Placing trunk over the top of conspecific, mouths usually close together. Individual actively tries to place trunk in a higher position than conspecific to assert dominance
	<b>Food stealing</b>	Taking food from another elephant using trunk or another part of the body
<b>Locomotion</b>		<b>Moving across the enclosure to get to another specific location</b>
	<b>Walk</b>	Individual moving across the enclosure to get to another specific location at a walking pace. Only one foot is removed from the ground at any one time.
	<b>Run</b>	Individual moving across the enclosure to get to another specific location at a running pace, more than one foot in removed from the ground at any one time
<b>Excretion</b>		<b>Elimination of bodily fluids</b>
	<b>Urination</b>	Elimination of urine from the body
	<b>Defecation</b>	Elimination of urine from the body
<b>Vocalisation</b>		<b>Sound emission</b>
	<b>Trumpet call</b>	Emitting a loud alarm call
	<b>Rumble</b>	Emitting a low frequency rumble call

An ethogram (12, 16) was used when assessing the daytime activity of the elephants. They were directly observed for three consecutive days from 08:00 h to 16:00 h. This time was divided into four intervals: 8:00-10:00 h, 10:00-12:00 h, 12:00-14:00 h, and 14:00-16:00 h. In each of these four intervals, the elephants were observed for a minimum of 5 minutes for their daytime activity. All ethogram-observed behaviours were written down into a

data sheet and recorded as either state behaviours or event behaviours. QBA was assessed using descriptors and a visual analog scale (1-125 score) for each descriptor and later summarised to create a scoring from 4 to 500 for each descriptor. It was assessed during a one-minute observation in each of the four intervals for three days. The collected data were processed in *Microsoft Office Excel* and presented as descriptive results.

## RESULTS

Concerning their daytime activity, from state behaviours, feeding behaviour predominated the most (34%) with the Asian elephant, followed by anticipatory behaviour (22%). Similar results were noted with the African elephant, with both behaviours being even more pronounced (feeding 42%, anticipatory 35%), while from the event behaviours the most dominant was the stereotypic behaviour (30%) in the Asian elephant (Fig. 2).

Concerning the QBA, descriptors such as *uncomfortable* (296) and *frustrated* (291) were predominant in the Asian elephant, but also the descriptor *relaxed* (271). This was similar with the African elephant with descriptors such as

*relaxed* (280) and *content* (228) being the more dominant, while the descriptor *uncomfortable* (234) was also high in value.

The most acceptable practices were from the section *nutrition* (50% of practices were acceptable). They received a well-balanced diet, but the feeding was lacking in enrichment. The section with most unacceptable practices was *management* (43% of practices were unacceptable). There were no protocols in place for most management practices. The most questionable practices were from the section *physical health* (57% of practices were questionable) (Fig. 3). The elephants were in good physical condition; however, veterinary checkups were very rare and there were no medical records for each individual.

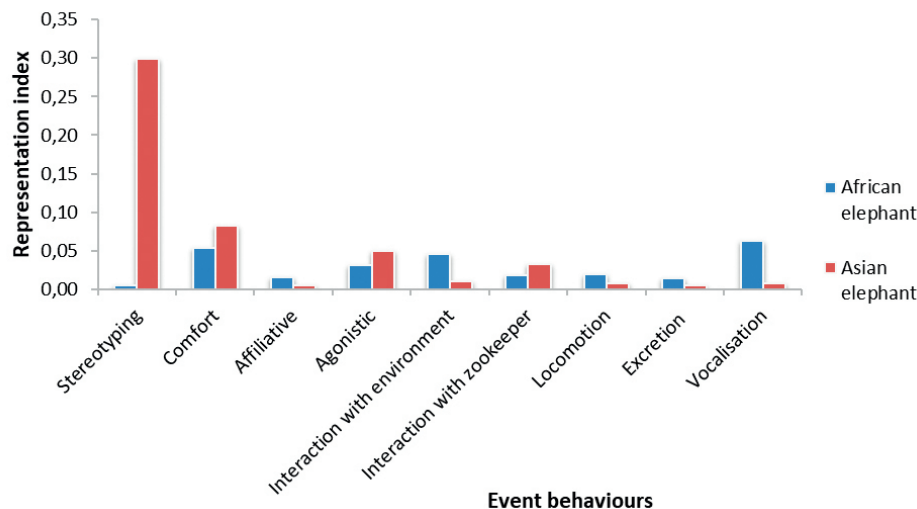


Figure 2. Observed event behaviours in both individuals for all three days

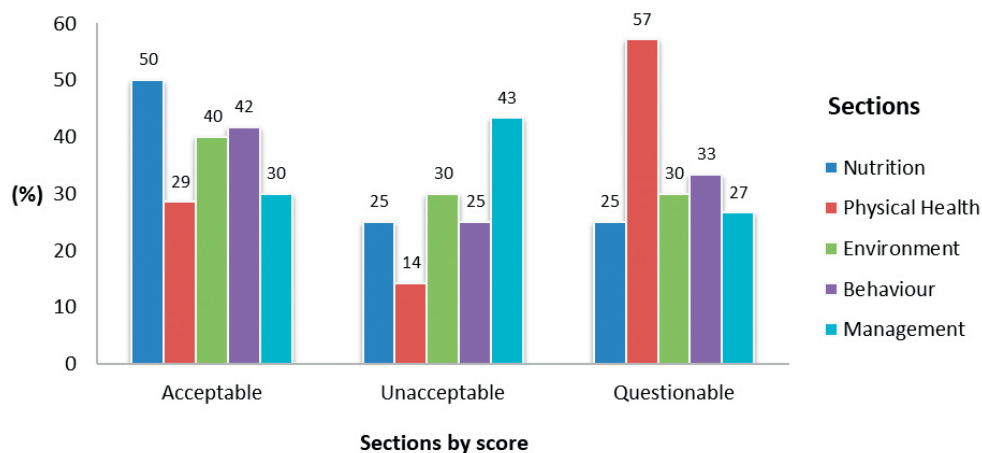


Figure 3. Scoring of the five sections

## DISCUSSION

In this study we were able to identify which practices are satisfactory according to recommended standards and which have room for improvement. Concerning their daytime activity, both elephants spent the majority of their time feeding and performing anticipatory behaviour (Fig. 2). Anticipatory behaviour was manifested in the form of waiting in front of the door so they can enter/exit the enclosure, or waiting in front of the fence for treats and attention from the zookeepers. However, the Asian elephant also spent the majority of her time (>30%) exhibiting stereotypic behaviour in the form of *head bobbing* and *swaying*. This is probably due to lack of environmental enrichment (17), social enrichment (18) and the need for foraging (2, 19). Harris M. et al. (8) concluded that Asian elephants stereotyped for 11.6% of the time compared to 3.8% for the African elephants during the day-time. They also concluded that elephants that had been in a circus stereotyped during the day-time significantly more than elephants which had not been in a circus (8). These factors might also have an effect for the high percentage of stereotyping in the Asian elephant.

Concerning the QBA, the Asian elephant seemed *uncomfortable* and *frustrated* while performing stereotypic behaviour, but she also seemed *relaxed* in her environment. The African elephant seemed *relaxed* and *content* in her environment as well, but she also seemed *uncomfortable* while performing anticipatory behaviour. These results are due to the fact that multiple observations were conducted and therefore two extremes of two opposing states are present, which is the opposite of what would have been obtained during a single observation of the elephants.

The elephants in the institution were well fed with a balanced diet; however, feeding enrichment is recommended such as scattering the feed to encourage foraging and also using puzzle feeders (2, 14, 19, 20). The elephants were in good physical condition; however, regular veterinary check-ups are necessary and written medical records with a detailed medical history for each individual (14, 20). It is also recommended to provide the animals with a more enriched environment such as mud wallows, trees, sand mounds, variation of substrates, browse piles, large rocks, rubber balls etc. (14, 20). Both individuals are of different species so housing them together is not recommended due to multiple species differences (20). Furthermore, they were housed in a number that doesn't fit housing standards

for elephants in zoos (14, 20). It is recommended that social groups consist of minimum three females, two males or three elephants of mixed gender (20). Concerning the management of the institution, there is a necessity for implementing certain management protocols such as protocols for emergencies, enrichment, transportation, euthanasia, hand rearing etc. (14, 20).

## CONCLUSION

Welfare assessment was performed on the Asian (*Elephas maximus*) and African elephant (*Loxodonta africana*) in the Skopje Zoo for three consecutive days. The collected data indicated that there is room for improvement concerning the management practices of the elephants. Proper management protocols need to be written and implemented, such as protocols for emergencies, enrichment, transportation etc. The animals were well fed, in good physical condition and received daily training. Elephants are intelligent species with a very complex behaviour repertoire so feeding enrichment as well as environmental enrichment are recommended for the improvement of their welfare. Preventive medicine is very important, therefore, written medical records should be kept for each individual and regular veterinary check-up should be conducted.

## CONFLICT OF INTEREST

The authors declare that they have no potential conflict of interest with respect to the authorship and/or publication of this article.

## ACKNOWLEDGMENTS

The authors cordially thank Skopje Zoo for allowing them to conduct this research and for showing the initiative to go one step further towards improving the welfare of these animals. They also thank the staff at the zoo, which cooperated with the authors, provided the conditions for the research and adjusted their work to carry out the necessary observations.

## AUTHORS' CONTRIBUTION

ED did research on the protocols, prepared the necessary methodology for the study and conducted the research and interviews. MK worked on preparing

the methodology, contacted the zoo, and oversaw the implementation of the methodology as well as the execution of the research. VI helped with the preparation of the methodology and gave their critical review for the implementation of the methodology and the research. KI gave critical review on the research.

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**Please cite this article in press as:** Dobrikj E., Ilieski V., Ilievska K., Kjosevski M. Using species-specific protocols for the welfare assessment of elephants in the Skopje Zoo. *Mac Vet Rev* 2022; 45 (2): i-viii. <https://doi.org/10.2478/macvetrev-2022-0019>