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Short Communication

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

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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		**Repetitive behaviour with no obvious purpose. May include but is not limited to the following:**
	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 oblivious 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
Comfort		**Any self-maintenance or grooming behaviour. May include but is not limited to:**
	Wallowing	Lying down and rolling in mud
	Rubbing	Rubbing the body against an object
	Rolling	Lying down and rolling in dirt or sand
	Scratching	Scratching the body with trunk or foot - this can include using the trunk to scratch/feel gently around the skin, eye or ear
	Scratching with tool	Scratching the body with a tool, e.g. branch or stick
	Throwing straw on self	Throwing soft objects such as grass or straw onto the body using the trunk
	Dust bath	Spraying mud, dust or sand on the body
	Water bath	Spraying water on the body
	Wallowing	Hitting of own body with tail or trunk, appears to be a means of removing an insect or other irritant
	Digging	Using foot to displace substrate
Social/affiliative		**Any positive or neutral interaction with another elephant. May include but is not limited to:**
	Leaning	Leaning on another elephant
	Standing	Standing underneath or standing above another elephant
	Trunk-mouth	Putting the trunk in the mouth of another elephant
	Touching	Touching another elephant with the trunk in a non-aggressive manner
	Tail	Holding the tail of another elephant with the trunk or underneath a leg
	Trunk-trunk	Intertwining of trunks between two elephants
	Approach	Moving in a non-aggressive manner, within one body length of another elephant
	Climb	Placing at least one foot on top of another elephant - usually one that is lying down
	Offer food	One elephant pushes a pile of food towards another elephant, looks like an offering of the resource
	Trunk lifting	Trunk is outstretched and raised towards an approaching individual
	Sitting on an elephant	Sitting in a crouched position on top of another elephant which is in lying rest
	Rubbing elephant	Rubbing the body against another elephant
	Playing with an elephant	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
	Urine and faecal inspection	Inspection of the urine or faeces of another elephant
Interaction with environment		**Investigating or interacting with things in the environment (other than food). May include but is not limited to:**
	Play with an object	Throwing or kicking debris or an object around in a playful interaction
	Object manipulation	Examination or manipulation of an object with the trunk and/or foot
	Environmental investigation	Investigating things in the environment (other than food) with the trunk - looks like the individual may be 'sniffing' at the ground or objects
	Keeper interaction	Any interaction between the individual and members of the animal keeping team
Eating/ Foraging	**Eating**	Manipulation (including breaking up of food stuffs using the trunk or foot) and consumption of food
	Foraging	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
Agonistic behaviour		**Any negative social behaviour**
	Tusking	Poking or jabbing at another elephant with the tusk
	Charge	Moving towards conspecific with the head held high, pace usually quickens as individual gets closer to the conspecific, can lead to pursuit of conspecific
	Mock charge	Moving at a fast pace towards conspecific for more than three steps, contact does not occur
	Chase	Follows on from 'charge' behaviour leading to the pursuit of an individual
	Lunge	Thrusting body towards a conspecific in an aggressive manner taking less than three steps. If more steps taken then reclassify as 'Charge/Mock charge'
	Bite	Biting a conspecific's body, trunk or tail
	Kick	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
	Strike	Hitting another elephant with the trunk or tail
	Push	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
	Contact displacement	Movement of an individual resulting in conspecific leaving its location (within 10 s) caused by physical contact between individuals such as push or nudge
	Non-contact displacement	Movement of one elephant towards the other, resulting in conspecific leaving its location (within 10 s) no physical contact occurs between elephants
	Stand off	Two elephants standing facing in opposite directions with foreheads pushing against each other
	Smack	Hitting the trunk on the floor in an aggressive manner, may be accompanied by a 'snort'
	Tail pulling	Pulling a conspecific's tail with trunk
	Aggressive display	Facing a conspecific in an aggressive posture, head bobbing up and down or side to side, ears wide and flapping
	Trunk dominance	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
	Food stealing	Taking food from another elephant using trunk or another part of the body
Locomotion		**Moving across the enclosure to get to another specific location**
	Walk	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.
	Run	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
Excretion		**Elimination of bodily fluids**
	Urination	Elimination of urine from the body
	Defecation	Elimination of urine from the body
Vocalisation		**Sound emission**
	Trumpet call	Emitting a loud alarm call
	Rumble	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.

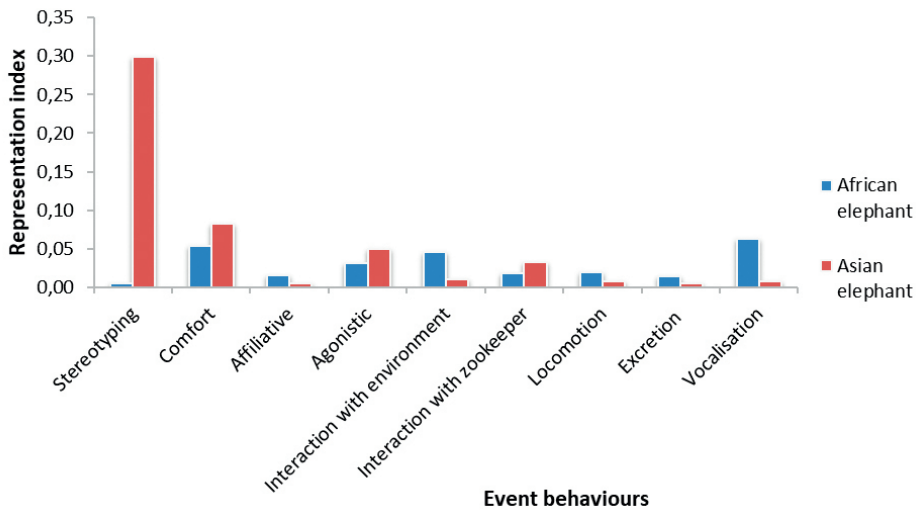

Figure 2. Observed event behaviours in both individuals for all three days

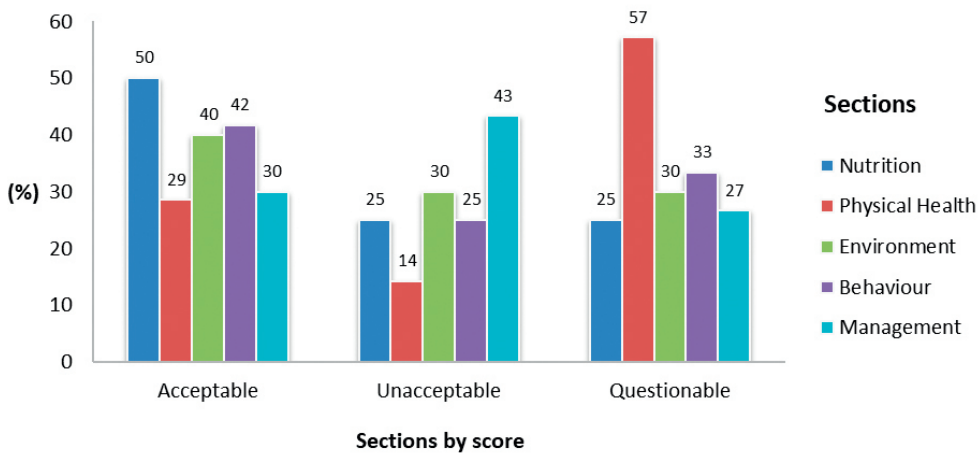

Figure 3. Scoring of the five sections

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 behvaiour, 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, robber 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.

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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.

REFERENCES

1. Schildkraut, R. (2006). Characteristation of positive welfare indices in captive african lions (Panthera leo) [master's thesis]. [New South Wales]: Faculty of Veterinary Science, The University of Sydney.
2. Sjoberg, J. (2011). The effect of extra food simulation on Asian elephants (Elephas maximus) kept at Kolmården Zoo. [Bachelor's thesis]. [Linkoping, Sweden]: Linkopings Universitet, Sweden
3. Veasey, J.S. (2006). Concepts in the care and welfare of captive elephants. Int Zoo Yearb. 40(1): 63-79. https://doi.org/10.1111/j.1748-1090.2006.00063.x
4. Irie, N., Hasegawa, T. (2009). Elephant psychology: What we know and what we would like to know. Jpn Psychol Res. 51(3): 177-181. https://doi.org/10.1111/j.1468-5884.2009.00404.x
5. Rees, P.A. (2009). The sizes of elephant groups in Zoos: implications for elephant welfare. J Appl Anim Welf Sci. 12(1): 44-60. https://doi.org/10.1080/10888700802536699 PMid:19107664
6. Prado-Oviedo, N.A., Bonaparte-Saller, M.K., Malloy, E.J., Meehan, C.L., Mench, J.A., Carlstead, K., Brown, J.L. (2016). Evaluation of demographics and social life events of Asian (Elephas maximus) and African elephants (Loxodonta africana) in North American Zoos. PLoS One 11(7): e0154750. https://doi.org/10.1371/journal.pone.0154750 PMid:27415437 PMCid:PMC4945030
7. Schulte, B.A. (2000). Social structure and helping behavior in captive elephants. Zoo Biol. 19(5): 447-459. https://doi.org/10.1002/1098-2361(2000)19:5<447::AID-ZOO12>3.0.CO;2-#
8. Harris, M., Sherwin, C., Harris, S. (2008). The welfare, housing and husbandry of elephants in UK zoos. Final Report, University of Bristol. DEFRA Science and Research Project WC05007. London: Department of Food, The Environment and Rural Affairs.
9. Webber, C.E. (2017). A comparison of behavioural development of elephant calves in captivity and in the wild: implications for welfare [Dissertation]. [Stirling, Scotland]: University of Stirling.
10. Justice, W.S.M., O'Brien, M.F., Szyszka, O., Shotton, J., Gilmour, J.E.M., Riordan, P., Wolfensohn, S. (2017). Adaptation of the animal welfare assessment grid (AWAG) for monitoring animal welfare in zoological collections. Vet Rec. 181(6): 143. https://doi.org/10.1136/vr.104309 PMid:28487453
11. Jones, C. (2018). Wild planet trust welfare auditing guidance document. EAZA Animal Welfare. c2018 [cited 2018 April 18]. https://www.eaza.net/assets/Uploads/Areas-of-Activity/Animal-welfare/Docs/Animal-Welfare-Assessment-English.pdf?
12. Yon, L., Williams, E., Harvey, N.D., Asher, L. (2019). Development of a behavioural welfare assessment tool for routine use with captive elephants. PLoS One 14(2): e0210783. https://doi.org/10.1371/journal.pone.0210783 PMid:30726232 PMCid:PMC6364905
13. Samelius, V. (2018). Zoo animal welfare assessment: a review of current research and protocols concerning welfare assessment and feasibility of application in a zoo environment [bachelor's thesis]. [Uppsala]: Swedish University of Agricultural Sciences.
14. European Association of Zoos and Aquaria (EAZA) (2020). [Internet]. EAZA best practice guidelines for elephants, 2nd edition. Amsterdam: EAZA. https://www.eaza.net/assets/Uploads/CCC/BPG-2020/Elephant-TAG-BPG-2020.pdf
15. Olson, D. (2002). [Internet]. Elephant husbandry resource guide. American Zoo and Aquarium Association Elephant Taxon Group; Elephant Managers Association; International Elephant Foundation. https://elephantconservation.org/iefImages/2015/06/CompleteHusbandryGuide1stEdition.pdf
16. Finch, K., Sach, F., Fitzpatrick, M., Masters, N., Rowden, L.J. (2020). Longitudinal improvements in zoo-housed elephant welfare: a case study at ZSL Whipsnade Zoo. Animals 10(11): 2029. https://doi.org/10.3390/ani10112029 PMid:33158053 PMCid:PMC7694121
17. Mason, G. Clubb, R., Latham, N., Vickery, S. (2007). Why and how should we use environmental enrichment to tackle stereotypic behaviour?. Appl Anim Behav Sci. 102(3-4): 163-188. https://doi.org/10.1016/j.applanim.2006.05.041
18. Greco, B.J., Meehan. C.L., Hogan. J.N., Leighty, K.A., Mellen. J., et al. (2016). The days and nights of Zoo elephants: using epidemiology to better understand stereotypic behavior of African elephants (Loxodonta africana) and Asian elephants (Elephas maximus) in North American Zoos. PLoS One 11(7): e0144276. https://doi.org/10.1371/journal.pone.0144276 PMid:27416071 PMCid:PMC4944985

19. Björk, K. (2011). The effect of extra feed supply on stereotypic behaviour in Asian elephants (Elephas maximus) [bachelor's thesis]. [Linkoping, Sweden]: Linkopings University, Department of Physics, Chemistry and Biology.

20. AZA. (2012). AZA standards for elephant management and care. Approved March 2011, Revised April 2012. https://assets.speakcdn.com/assets/2332/aza_standards_for_elephant_management_and_care.pdf

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