



<https://elephant-specialists.org/>

Statement on Exhibition of Elephants in Captivity

For the purpose of this statement, “exhibition” refers to circuses, zoos, tourist facilities, temples, and elephant safari operations. In these situations, elephants endure conditions that are inadequate to meet their needs, as they lack essential components of wild ecosystems and inhibit expression of natural behaviours.

Scientific and experiential evidence indicates that the use of elephants as performers, riding objects, and exhibit specimens can be physically and psychologically detrimental to these highly intelligent, sensitive, and self-aware animals. Confinement, restraint, travel, harmful training practices, exhibition, isolation, noise, performing, and exposure to the public while living in unnatural environments can adversely affect elephants’ health and welfare.

For the following reasons, based on fact and science, ESAI opposes the confinement of elephants in captive environments for exhibition.

Elephants are extremely intelligent animals, with multifaceted physical, social and spatial needs. Elephants are large-brained mammals who display complex cognitive capabilities¹, great intelligence², sentience³ and empathy, with the ability to understand the intentions and emotions of others^{4,5}. Elephants are also self-aware.⁶ Along with dolphins, great apes and humans, they can recognise themselves in a mirror, implying a sense of self.⁷ Elephants form and use tools⁸, and solve problems by insight. They have a sense of death and mourn dead family members. Elephants can recognise up to 200 other elephants by their voices⁹, and they can determine the ethnicity, gender and age of humans from acoustic cues.¹⁰

Elephants live in unusually large social networks, with a highly organized structure involving strong family bonds that can last a lifetime.^{11,12} Relationships among females radiate out from the mother-offspring bond through family, bond group, clan, and sub-population, and among independent adult males through male groups of kin and non-kin¹³. They form alliances and coalitions with other elephants and can work together to solve problems.¹⁴ Elephants have a highly developed communication system using all their senses in a wide range of tactile, olfactory and visual signals, seismic and acoustic communication.¹⁵

Elephants are adapted to living in a variety of landscapes and walking long distances. Home range sizes have been shown to extend to 10,000 square kilometres or more for African elephants and to 400 square kilometres or more for Asian elephants.^{16,17} They have exceptional long-term memory

Established in 2020, Elephant Specialists Alliance International (ESAI) is a global alliance of elephant specialists that represents a range of disciplines, from conservation science and veterinary medicine, to animal welfare, care, and management. Together, we work to provide the best possible fact-based information and scientific evidence to protect wild elephants from capture and export to ex-situ destinations and to end the exploitation of elephants in captivity.

and mapping skills to locate food and water over vast distances and time periods¹⁸, with matriarchs referred to as “repositories of social knowledge”.¹⁹ Elephants’ daily activities involve intellectual and cognitive challenges that depend on space: locating and manipulating a wide variety of food, remembering locations of water and seasonal food items, searching for mates, and avoiding potential danger.

These many highly regarded qualities conflict with the inadequate physical and social conditions found in captive environments, resulting in compromised welfare with long lasting detrimental psychological and physical effects.^{20,21}

Elephants are not a domesticated species.

Captive-held and wild-living individuals are behaviourally and physiologically identical. Because elephants have never been selectively bred over generations by their human captors, their genetic makeup is the same as wild elephants and so are their needs, behavioural responses, and neurology.^{22,23} Hence, captive environments, with their inherent limitations, remain unsuitable for elephants because they fail to meet their complex physical, social, and psychological needs.

Elephants’ social relationships are vital to their welfare.

Mother-daughter bonds form the core of elephant society.²⁴ Females stay with their natal herd and their mother for the entirety of their lives.^{25,26,27,28} These bonds are crucial for the upbringing of a young elephant who has much to learn, including what to eat; how to make tools²⁹; auditory³⁰, tactile, and olfactory communications³¹; social abilities and how to function in elephant society; mothering and allomothering skills³², and much more. In captivity, the mother-daughter bond maintains its strength and importance, even after years of separation.³³ Non-kin females in the wild³⁴ and in captivity³⁵ may also choose to form relationships which may include strong bonds.

It is not only female offspring for whom the mother-offspring bond is essential: male calves naturally remain with their mother and family until adolescence and separate from them only gradually.³⁶ As males become independent from their natal families, they form relatively stable associations with preferred other males, where they exchange information and assess potential reproductive competitors.³⁷ Adult males may choose to join female groups when they are sexually active³⁸ or occasionally to simply renew social bonds.³⁹

In captive situations, mother-offspring bonds and relationships formed between non-related female and male elephants are often disrupted when one elephant is transferred to another facility for breeding or management purposes. Given the importance of elephants’ social bonds, mothers and their female offspring should not be separated, and male offspring should not be prematurely taken from their mothers. Bonds between non-related elephants should also remain undisturbed. (Also see ESAI’s [Statement on the Separation of Captive Born Elephant Calves from their Mothers.](#))

Keeping an elephant solitary is harmful.

Keeping an elephant alone, without other conspecifics, is harmful to health and welfare.⁴⁰ Research involving other mammalian species has shown that social deprivation can cause profound and lasting psychological effects in animals, including self-mutilation, disturbance in perception and learning, total apathy and withdrawal symptoms, anxiety behaviour, aggression, and compromised cognitive processes.^{41,42,43,44,45} There are indications of similar problems in single captive elephants, including self-mutilation, anxiety, stereotypies, and aggression.⁴⁶ Humans simply cannot

replace the social environment necessary for elephants' health and well-being, therefore, elephants should not be held alone unless it is unavoidable for medical reasons.

Traumatic events or treatment related to captivity can have long-lasting impacts.

Elephants possess excellent long-term memory,^{47,48,49} and past adverse events are known to shape behaviour. For example, elephants in Gorongosa National Park, Mozambique, were slaughtered in large numbers during that country's civil war (1995-2006). Today, the elephants are extremely wary of humans; they respond defensively by fleeing or attacking.⁵⁰ Bradshaw states that wild African elephants, who are under siege due to poaching, habitat loss, and social breakdown from poaching, display symptoms associated with human Post Traumatic Stress Disorder (PTSD), including "abnormal startle response, depression, unpredictable asocial behaviour, and hyper-aggression."⁵¹ Similarly, Shannon states that fundamental social skills and key decision-making abilities that are essential to living in complex societies could be significantly altered in the long-term by anthropogenic disruption (e.g., culling or translocation or separation from family members), and that this may persist for decades after the disturbance was experienced.⁵²

The majority of captive elephants were captured in the wild⁵³, meaning they would have experienced traumatic events during capture, such as separation from their families; witnessing the deaths of family members during culls; the stress of capture, human handling, and transport; and introduction to unknown captive environments. Elephants' capacity for long-term memory and the importance of social bonds provide ample reason to presume that traumatic events related to capture can have lasting effects on behaviour and psychological well-being. In addition, where the mother and other family members are absent, a growing calf will lack crucial socialisation and learning opportunities required for normal psychological and social adjustment, the ability to deal with adverse situations, and the development of adequate coping strategies.^{54,55,56,57}

Captive born elephants can also experience significant trauma.⁵⁸ Asian elephant calves bred for use in tourism are separated from their mothers at a premature age and forcefully trained to submit to people.⁵⁹ Usually they will not be reunited with their mothers. In other situations, inexperienced mothers often reject and may even harm their infants. Captive mothers have killed their calves, an aberrant behaviour unseen in free-living elephants. A management response in some captive situations is to take calves away from their chained mothers immediately after birth and then later re-introduce them. The long-term effects of this practice are unknown. Finally, calves are often born into dysfunctional elephant groups where social dynamics are unstable and may include aggression between conspecifics.

Although female elephants may naturally live with unrelated females on occasion, in captive situations non-kin females are generally housed closely together in small compounds, even though they may not be compatible. In roughly 50% of analysed cases involving African elephants in European zoos⁶⁰, the relationship between non-related females was shown to be either agonistic or indifferent. Confining non-compatible conspecifics together in close proximity may cause chronic stress, with negative physiological⁶¹ and cognitive⁶² consequences.

Most elephants in captive situations have experienced varying degrees of trauma which can potentially have lasting physical, behavioural, and social consequences.

Captive environments do not meet elephants' complex physical needs.

The restrictions that captivity imposes on an animal's behaviours are increasingly recognised as being deleterious to cognitive development, normal social development, and, later in life, on reproduction and health.⁶³ Captive living conditions differ drastically from those for which elephants are adapted. Over millions of years, elephants have evolved to be on the move in expansive home ranges, as they travel with their family groups. Elephants' musculoskeletal system and feet are an adaptation for walking long distances.⁶⁴ Walking for health reasons is vital for humans and other animals, not only physically but for development of the brain.⁶⁵

In captive environments, outdoor spaces for elephants are orders of magnitude smaller in size than elephants' natural ranges and may offer limited access to natural substrates on which to walk. Indoor spaces are even smaller than those outdoors and may contain hard substrates such as concrete⁶⁶. In areas that experience cold weather, elephants may spend most of their time indoors and possibly chained during that time. The tethering or chaining of elephants is meant to immobilize and control the animal. Chaining can be temporary or continuous. Elephants in traveling shows may spend up to 23 continuous hours on chains⁶⁷, including during transport and at performance venues. Captive elephants used in tourism in Asia, when not working, spend most of their time on chains between 2m and 15m long.⁶⁸

In general, captive elephants have extremely limited space and opportunity for exercise and generally little to no incentive to do so. Exercise is not only important for muscle development, welfare and physical health;⁶⁹ voluntary exercise can increase levels of brain derived neurotrophic factor (BDNF) and other growth factors, stimulate neurogenesis, increase resistance to brain insult and improve learning and mental performance.⁷⁰ Lack of movement and poor substrates are also associated with serious health problems (see below).

In an unpublished study by Joyce Poole, she found evidence to show that the physical conditions of captivity cannot allow for full expression of elephants' natural behaviours, thus compromising welfare.⁷¹ For adult females housed without juveniles or calves, 43% (N=308) of behaviours documented in free-living elephants were likely to occur in captivity, but half of this number would occur only in limited contexts. For adult females housed with immatures, 56% (N=330) of behaviours documented in situ were likely to be expressed in captivity, though 22% of these would only be expressed in limited contexts. Of the 266 behaviours displayed in situ by adult males, only 37% were likely to occur in captivity, and a good number of these only in limited contexts.

In sum, captive environments simply cannot approximate the spatial and environmental conditions necessary for the health and welfare of elephants.

Elephant health problems in captive conditions.

Serious health problems and often a decreased life span in captive-held elephants are well documented.^{72,73} Captive elephants may suffer arthritis, osteoarthritis, hernia (*Hernia perinealis*), swelling of the knee joints (*Bursitis praepatellaris*), skin calluses (*Tyloma olecrani*), and abscesses.⁷⁴ Blackleg (bacterial inflammation with necrosis) and foot problems, such as pathological lesions in the pads and nails, split nails, abscesses, torsion, ulcerations, and overgrown cuticles, are common in captive-held elephants because of inactivity and lack of access to natural substrate to keep foot pads and nails supple and naturally trimmed.⁷⁵ Musculoskeletal impairments are one of the major health issues in captive-held elephants, including degenerative joint disease, low bone density⁷⁶,

and ensuing lameness⁷⁷. Although the causes of these problems can be varied, they all indicate poor husbandry systems.⁷⁸

Captive elephants are also subject to infectious diseases. A highly fatal haemorrhagic disease, the Endotheliotropic Elephant Herpesvirus (EEHV) occurs in both Asian and African elephants in captive situations, with some cases found among Asian elephants in their natural range countries. The disease particularly devastates neonatal and weaning-age elephants in captivity.⁷⁹ Tuberculosis (TB) is a pervasive problem in captive elephants. The human variant is transmitted by humans to elephants, and an elephant can infect other humans and elephants on close contact, indicating two-way transmission.^{80,81} Most occurrences of human TB in zoos have been discovered in Asian elephants, although there is some evidence that it occurs in African elephants as well.^{82,83} It has been identified as a major cause of disease and death among captive elephants in several Asian countries and is believed to be on the increase due to lack of nutrition, reduced immunity, and overwork.^{84,85,86,87} Recent studies worryingly suggest that human tuberculosis may have begun to spill over into wild elephant populations in Asia⁸⁸, and possibly in Africa⁸⁹, posing a threat to their health.

Harsh training and management practices harm elephants.

The use of coercive training to control elephants includes trainers relying on the bullhook (also called the ankus), a device resembling a fireplace poker with a sharpened metal tip and hook at the end, to dominate and control elephants. For the bullhook to be effective an elephant must be taught to associate the device with pain, otherwise it means nothing to them.⁹⁰ During the breaking/training process, elephants are restrained and often subjected to the severe pain the hook can inflict.⁵⁹ The elephant learns that the only way to avoid pain is to submit. As long as an elephant fears the bullhook, the mere presence of the device is enough to subdue this large animal. Where handlers have unrestricted physical access to the elephants, such as during training, performances, and routine handling, they constantly reinforce their dominance by using the bullhook to strike, jab, or hook the elephant in sensitive areas of their bodies. The long-term and lifelong negative impact of subjecting wild animals to coercive training should not be underestimated.⁹¹

Abnormal repetitive behaviours are ubiquitous in captivity.

Animals kept in conditions where they cannot perform behaviours typical of their species causes psychological suffering.⁹² It is known that wild animals in captivity, particularly when chained⁹³, may develop abnormal behaviours, with a particular problem being stereotypic behaviour. Stereotypies are repetitive, seemingly functionless actions. In elephants they typically involve repeated rocking from side to side, swaying, and head bobbing. The presence of stereotypic behaviour is generally acknowledged to be an indicator of poor welfare.^{94,95,96} Stereotypic behaviours are related to life-threatening health problems, including foot disease.⁹⁷ The causes of stereotypic behaviour are varied. Chaining and other restrictions are often the source, but deprivation of social environment and contact have also been shown to be dominant causes.^{98,99}

General conditions in captivity are stressful for elephants, which negatively affects health and welfare.

Captive life is unnatural for elephants and can result in continual low-level stress. Some factors that may have a negative impact on elephant welfare include inadequate and unnatural social and physical environments; lack of retreat possibility; high noise and light levels; frequent and long periods on chains; and climate conditions that may differ significantly from the animals' natural

environment. In addition, captive elephants have limited or no freedom to make meaningful independent choices about their daily activity or social companions and no significant level of autonomy over their lives, both of which are necessary for their welfare¹⁰⁰; their absence compounds the stress factors already noted.

Conclusion

Elephants are not suited to any form of captivity, with or without training, as no captive facility can fulfil the basic biological, social, spatial, cognitive and intrinsic requirements of elephants.

Reference Endnotes

-
- ¹ Byrne R.W., Bates L.A. & Moss C.J. 2009. Elephant cognition in primate perspective. *Comparative Cognition & Behaviour Reviews*, 4:65-70. <http://dx.doi.org/10.3819/ccbr.2009.40009>
 - ² Poole J. & Moss C. 2008. Elephant sociality and complexity In: Wemmer C. & Christen C.A. (Eds) *Elephants and Ethics*. Johns Hopkins University Press, Baltimore. pp.69– 100.
 - ³ Blattner C.E.2019. The recognition of animal sentience by the law. *Journal of Animal Ethics*, 9(2):121-136 <https://www.jstor.org/stable/10.5406/janimaethics.9.2.0121>
 - ⁴ Bates L.A., Lee P.C., Njiraini N., Poole J. H., Sayialel K., Sayialel S., Moss C. J. & Byrne R.W. 2008. Do elephants show empathy? *Journal of consciousness Studies*, 15(10-11):204-225
 - ⁵ Bates et al 2008, *ibid*.
 - ⁶ Plotnik J.M., de Waal F. & Reiss D. Self-recognition in an Asian elephant. *PNAS*, 103 (45) 17053-17057. <https://doi.org/10.1073/pnas.0608062103>
 - ⁷ Plotnik J.M., de Waal F.B.M., Moore III D. & Reiss D. 2010. Self-recognition in the Asian elephant and future directions for cognitive research with elephants in zoological settings. *Zoo Biology*, 29:179-191.
 - ⁸ Hart B.L., Hart L.A., McCoy M. & Sarath C.R. 2001. Cognitive behaviour in Asian elephants: use and modification of branches for fly switching. *Animal Behaviour*, 62:839-847.
 - ⁹ McComb K., Moss C., Sayialel S. & Baker L. 2000. Unusually extensive networks of vocal recognition in African elephants. *Animal Behaviour*, 59:1103-1109.
 - ¹⁰ McComb K., Shannon G., Sayialel N. Moss C. 2014. Elephant can determine ethnicity, gender, and age from acoustic cues in human voices. *PNAS*, 111 (14) 5433-5438. www.pnas.org/cgi/doi/10.1073/pnas.1321543111
 - ¹¹ Sukumar R. 2003. *The Living Elephants*. Oxford University Press.
 - ¹² Wittemeyr G., Douglas –Hamilton I. & Getz W. M. 2005. The sociology of elephants: analyses of the processes creating multitiered social structures. *Animal Behaviour*, 69:1357-1371.
 - ¹³ Moss C.J. and Poole J.H. 1983. Relationships and social structure of African elephants. In: R.A. Hinde (Ed.) *Primate Social Relationships: An Integrated Approach*. Blackwell Scientific, Oxford.
 - ¹⁴ Plotnik.J.M., Lair R., Suphachoksakun W. & de Waal F.M. 2011. Elephants know when they need a helping trunk in a cooperative task. *PNAS*, 108 (12) 5116-5121. <https://doi.org/10.1073/pnas.1101765108>
 - ¹⁵ <https://www.elephantvoices.org/elephant-communication/why-how-and-what-elephants-communicate.html>
Accessed on 2 March 2021.
 - ¹⁶ Ngene S., Okello M.M., Mukeka J. Muya S., Njumbi S. & Isiche J. 2017. Home range sizes and space use of African elephants (*Loxodonta africana*) in the Southern Kenya and Northern Tanzania borderland landscape. *International Journal of Biodiversity and Conservation*, 9(1):9-26.
 - ¹⁷ Williams C. & Qureshi Q. 2008. Ranging and habitat selection by Asian elephants (*Elephas maximus*) in Rajaji National Park, North-West India. *Journal of the Bombay History Society*, 105(1):145-155.
 - ¹⁸ Polansky L., Kilian W. & Wittemyer G. 2015. Elucidating the significance of spatial memory on movement decisions by African savannah elephants using state–space models. *Proceedings of the Royal Society B*, 282: 20143042. <http://dx.doi.org/10.1098/rspb.2014.3042>
 - ¹⁹ McComb, K, CJ Moss, SM Durant, L Baker, and S Sayialel. Matriarchs as repositories of social knowledge in African elephants. *Science*, 292 (2003): 491-94.
 - ²⁰ Jacobs, B. 2020. The neural cruelty of captivity: Keeping large mammals in zoos and aquariums damages their brains. *The Conversation*, September 24, 2020. <https://theconversation.com/the-neural-cruelty-of-captivity-keeping-large-mammals-in-zoos-and-aquariums-damages-their-brains-142240>
 - ²¹ Clubb R. & Mason G. 2002. *A Review of the welfare of Zoo Elephants in Europe*. RSPCA Report, University of Oxford.

-
- ²² Kurt F, Mar KU. 2003. Guidelines for the management of captive Asian elephants and the possible role of the IUCN/SSC Asian Elephant Specialist Group. *Gajah*, 22:22–30.
- ²³ Roots C. *Domestication*. Greenwood Press; 2007.
- ²⁴ Moss C. 1988. *Elephant Memories: Thirteen years in the life of an elephant*. Elm Tee Books, London.
- ²⁵ Poole J. 1996. *Coming of Age with Elephants*. Hodder & Stroughton, London.
- ²⁶ Moss 1988, *ibid*.
- ²⁷ Wittemeyer G., Douglas-Hamilton I. & Getz W. M. 2005. The sociology of elephants: analyses of the processes creating multitiered social structures. *Animal Behaviour*, 69:1357–1371.
- ²⁸ Sukumar 2003, *ibid*.
- ²⁹ Kurt F. & Garaï M.E. 2007. *The Asian Elephant in Captivity*. Foundation Books. Cambridge University Press India Pty. Ltd.
- ³⁰ McComb K., Reby D., Baker L., Moss C. & Sayialel S. 2003. Long-distance communication of acoustic cues to social identity in African elephants. *Animal Behaviour*, 65:317–329.
- ³¹ <https://elephantvoices.org/elephant-communication/chemical-communication.html>
- ³² Vidya T. N. C. 2014. Novel behaviour shown by Asian elephant in the context of allomothering. *Acta Ethologica*, 17:123–127. <https://doi.org/10.1007/s10211-013-0168-y>
- ³³ Fahey, R. 2020. Granny never forgot you! Adorable moment elephant touches trunks with her daughter and granddaughter at German zoo after 12 years' separation. *Mail Online*, 26 August 2020. <https://www.dailymail.co.uk/news/article-8658913/Adorable-moment-elephant-touches-trunks-daughter-German-zoo-12-years-separation.html>
- ³⁴ de Silva S. & Wittemyer, G. 2012. A comparison of social organization in Asian elephants and African savannah elephants. *International Journal of Primatology*, 33:1125–1141.
- ³⁵ Garaï M. 1992. Special relationships between female Asian elephants (*Elephas maximus*) in zoological gardens. *Ethology*, 90(3) <https://doi.org/10.1111/j.1439-0310.1992.tb00832.x>
- ³⁶ Poole & Moss. 2008. *ibid*.
- ³⁷ Goldenberg S.Z., de Silva S., Rasmussen H.B., Douglas-Hamilton I. & Wittemyer G. 2014. Controlling for behavioural state reveals social dynamics among male African elephants, *Loxodonta africana*. *Animal Behaviour*, 95:111–119. <http://dx.doi.org/10.1016/j.anbehav.2014.07.002>
- ³⁸ Poole J.H., & Moss C.J. 1981. Musth in the African elephant, *Loxodonta africana*. *Nature*, 292:830–831.
- ³⁹ Moss & Poole. 1983, *ibid*.
- ⁴⁰ Kurt F & Garaï M.. 2001 Stereotypies in captive Asian elephants - a symptom of social isolation. Scientific Progress Reports. in: *A Research Update of Elephants and rhinos*. Proceedings of the International Elephant and rhino Research symposium, Vienna June 7-11,2001.57-63.
- ⁴¹ Dawkins M. S. 2008. The Science of Animal Suffering. *Ethology*, 114(10):937-945. <https://doi.org/10.1111/j.1439-0310.2008.01557.x>
- ⁴² Matsumoto K., Cai B., Satoh T., Ohta H.Watanabe H. 1991 Desipramine enhances isolation-induced aggressive behavior in mice. *Pharmacology Biochemistry & Behavior*, 39(1):167-170.
- ⁴³ Washburn D. A. & Rumbaugh D. M. 1991. Impaired performance from brief social isolation of rhesus monkeys (*Macaca mulatta*): A multiple video-task assessment. *Journal of Comparative Psychology*, 105(2):145–151. <https://doi.org/10.1037/0735-7036.105.2.145>
- ⁴⁴ Haney C. 2018. The psychological effects of solitary confinement; A systematic critique. *Crime and Justice*, 47:365-416.
- ⁴⁵ Stowe J. R.,Liu Y., J. Curtis J. T., Freeman M.E. & Wang Z. 2005.Species differences in anxiety-related responses in male prairie and meadow voles: The effects of social isolation. *Physiology & Behavior*, 86:36 –378.
- ⁴⁶ C.M. Doyle, personal communication, November 4, 2020.
- ⁴⁷ Rizvanovic A. 2012. *Olfactory discrimination performance and long-term memory in Asian elephants* (*Elephas maximus*). Thesis. Linköpings University, Sweden.
- ⁴⁸ McComb K., Moss C., Durant S.M., Baker L. & Sayialel S. 2001. Matriarchs as repositories of social knowledge in African elephants. *Science*, 292:491-494.
- ⁴⁹ Dale, R.H.I. 2008. The spatial memory of African elephants (*Loxodonta africana*): Durability, interference, and response biases. In: Innis N.K. (Ed.), *Reflections on Adaptive Behavior: Essays in Honor of J.E.R. Staddon*, MIT Press, Cambridge, MA. pp.143-169. Available from: http://digitalcommons.butler.edu/facsch_papers/339
- ⁵⁰ <https://www.elephantvoices.org/studies-a-projects/the-gorongosa-elephants.html> Accessed on 2 March 2021.
- ⁵¹ Bradshaw G.A., Schore A.N., Brown J.L., Poole J.H. & Moss C.J. 2005. Elephant breakdown. *Nature*, 33: 807.
- ⁵² Shannon G., Slotow R., Durant S.M., Sayialel K.N., Poole J., Moss C. & McComb K. 2013. Effects of social disruption in elephants persist decades after culling. *Frontiers in Zoology*, 10:62. <https://doi.org/10.1186/1742-9994-10-62> .

-
- ⁵³ Thitaram C. 2012. Breeding management of captive elephant (*Elephas maximus*) in range countries and zoos. *Japanese Journal of Zoo & Wildlife Medicine*, 17(3):91-96.
- ⁵⁴ Poole & Moss. 2008, *ibid*.
- ⁵⁵ Sheldrick D. 2009. The rearing and rehabilitation of orphaned African elephant calves in Kenya. In: D.L. Forthman, Kane L.F., Hancocks D., Waldau P.W. (Eds.) *An Elephant in The Room: The Science and Well-being of Elephants in Captivity*. Cummings School of Veterinary Medicine's Center for Animals and Public Policy, Tufts University, pp.208-212.
- ⁵⁶ Lee P.C. & Moss C.J. 1999. The social context for learning and behavioural development among wild African elephants. In: Box H.O. & Gibson K.R. (Eds.) *Mammalian Social Learning: Comparative and Ecological Perspective*. Cambridge University Press, Cambridge, pp 102–125.
- ⁵⁷ Greco B.J., Brown T.K., Andrews J.R.M. Swaisgood R.R. & Caine N G. 2012. Social learning in captive African elephants (*Loxodonta africana africana*). *Animal Cognition*, 16:459–469.
- ⁵⁸ Rizzolo J.B. & Bradshaw G.A. 2016. Prevalence and patterns of complex PTSD in Asian elephants (*Elephas maximus*). Proceedings of Asian elephants in culture and nature. *International Conference on Asian Elephants in Culture & Nature*, Sri Lanka. pp.291-297.
- ⁵⁹ Schmidt-Burbach J. & Hartley-Backhouse L. 2019. *Elephants. Not Commodities*. World Animal Protection.
- ⁶⁰ European Elephant Group (EEG) Database. Accessed on 28 February 2020.
- ⁶¹ Romero L.M. 2004. Physiological stress in ecology: lessons from biomedical research. *TRENDS in Ecology and Evolution*, 19(5):249-255. <https://doi.org/10.1016/j.tree.2004.03.008>
- ⁶² Bondi C.O., Rodriguez G., Gould G.G., Frazer A., & MOrilak D.A. 2008. Chronic unpredictable stress induces a cognitive deficit and anxiety-like behavior in rats that is prevented by chronic antidepressant drug treatment. *Neuropsychopharmacology*, 33:320-331.
- ⁶³ Knight J. 2001. Animal data jeopardised by life behind bars. *Nature*, 412:669.
- ⁶⁴ Poole J. & Granli P. 2009. Mind and movement: Meeting the interests of elephants. In: Forthman D. L., Kane L. F. & Waldau P. F. (Eds.) *An Elephant in the Room: The Science and Well-being of Elephants in Captivity*. Cummings School of Veterinary Medicine's Center for Animals and Public Policy, Tufts University, pp.2-21.
- ⁶⁵ Cotman C. W. & Berchtold N.C. 2002. Exercise: a behavioural intervention to enhance brain health and plasticity. *Trends in Neurosciences*, 25(6):295-301.
- ⁶⁶ Poole & Granli. 2009. *ibid*.
- ⁶⁷ Iossa G., Soulsbury C.D. & Harris S. 2009. Are wild animals suited to a travelling circus life? *Animal Welfare*, 18: 129-140.
- ⁶⁸ Schmidt-Burbach J., Ronfot D. & Srisangiam R. 2015. Asian elephant (*Elephas maximus*), pig-tailed macaque (*Macaca nemestrina*) and tiger (*Panthera tigris*) populations at tourism venues in Thailand and aspects of their welfare. *PLoS ONE*, 10(9): e0139092.
- ⁶⁹ Holdgate M.R., Meehan C.L., Hogan J.N., Miller L.J., Soltos J., Andrews J. & Shepherdson D.J. 2016. Walking behavior of zoo elephants: Associations between GPS-measured daily walking distances and environmental factors, social factors, and welfare indicators. *PLoS ONE*, 11(7): e0150331. <https://doi.org/10.1371/journal.pone.0150331>
- ⁷⁰ Kurt F & Garai M. 2001. Stereotypies in captive Asian elephants- a symptom of social isolation. Scientific Progress Reports in: *A Research Update of Elephants and Rhinos*. Proceedings of the International Elephant and Rhino Research Symposium, Vienna June 7-11,2001. pp.57-63.
- ⁷¹ Poole, J.H. Unpublished data
- ⁷² Clubb R., Rowcliffe M., Lee P., Mar K.U., Moss C. & Mason G.J. 2008. Compromised survivorship in zoo elephants. *Science*, 322:1649.
- ⁷³ Clubb & Mason. 2002. *ibid*.
- ⁷⁴ Kuntze A. 1989: Arbeitsbedingte Krankheitsbilder: Hernia perinealis, Bursitis praepatellaris und Tyloma olecrani bei Zirkuselefantinnen. *Verh. Ber. Erkr. Zootiere*, 31:185.
- ⁷⁵ Wendler P. 2019. *Foot health of Asian elephants (Elephas maximus) in European zoos*. Dissertation Vetsuisse faculty, University of Zürich.
- ⁷⁶ Saddiq H. M. U., Ali R. H., Amjad M. T., Jaleel S., Ali S. M., Fatima N & Ullah S. 2020. Post-mortem examination of a female elephant suspected of having Degenerative Joint Disease: A case report. *Advances in Animal Veterinary Science*, 8(10): 1009-1012. <http://dx.doi.org/10.17582/journal.aavs/2020/8.10.1009.1012>
- ⁷⁷ Lewis K. D., Shepherdson D. J., Owens T. M. & Keele M. 2010. A survey of elephant husbandry and foot health in North American zoos. *Zoo Biology*, 29:221-236.
- ⁷⁸ Wendler P., Ertl N., Flügger M., Sós E., Torgerson P., Heym P.P., Schiffmann C., Clauss M. & Hatt J-M. 2020. Influencing factors on the foot health of captive Asian elephants (*Elephas maximus*) in European zoos. *Zoo Biology* 39(2):109-120. <https://doi.org/10.1002/zoo.21528>.
- ⁷⁹ Reid C.E., Hildebrandt T.B., Marx N., Hunt M., Thy N., Reynes J.M., Schaftenaar W. & Fickel J. 2006. Endotheliotropic elephant herpes virus (EEHV) infection. *Veterinary Quarterly*, 28(2):61-64.

-
- ⁸⁰ Ong B.L., Ngeow Y.F., Abdul Razak M.F.A., Yakubu Y., Zakaria Z., Mutalib A.R., Hassan L., Ng H.F. & Verasahib K. 2013. Tuberculosis in captive elephants (*Elephas maximus*) in Peninsular Malaysia. *Epidmiology & Infection*, 141:1481-1487.
- ⁸¹ Mikota S. and Maslow J.N. 2011. Tuberculosis at the human-animals interface: An emerging disease of elephants. *Tuberculosis*, 91:208-211.
- ⁸² Mikota S., Larsen R.S., & Montali R.J. 2000. Tuberculosis in elephants in North America. *Zoo Biology*, 19:393-404.
- ⁸³ Mikota and Maslow. 2011. *Ibid.*
- ⁸⁴ Angkawanish T., Wajjwalku W. & Sirimalaisuwan A. 2010. Mycobacterium tuberculosis infection of domesticated Asian elephants, Thailand. *Emerging Infectious Diseases*, 16(12):1949–1951.
- ⁸⁵ Ong B.L., Ngeow Y.F., Razak M.F., Yakubu Y., Zakaria Z., Mutalib A.R., Hassan L., Ng H.F. & Verasahib K. 2013. Tuberculosis in captive Asian elephants (*Elephas maximus*) in Peninsular Malaysia. *Epidemiology and Infection*, 141(7): 1481 – 1487.
- ⁸⁶ DNPWC. 2011. *Nepal Elephant Tuberculosis Control and Management Action Plan (2011-2015)*. Department of National Parks and Wildlife Conservation, Ministry of Forests and Soil Conservation, Government of Nepal, Kathmandu, Nepal.
- ⁸⁷ De Vries L. 2014. *An Elephant is not a Machine. A Survey into the Welfare of Private Captive Elephants in Sauraha, Chitwan National Park, Nepal*. Animal Nepal, Kathmandu.
- ⁸⁸ Zachariah A., Pandiyan J. & Madhavilatha G.K. 2017. Mycobacterium tuberculosis in wild Asian elephants, Southern India. *Emerging Infectious Diseases*, 23(3):504–506.
- ⁸⁹ Kerr T.J., de Waal C.R., Buss P.E., Hofmeyr J., Lyashchenko K.P. & Miller M.A. 2019. Seroprevalence of Mycobacterium tuberculosis Complex in free-ranging African elephants (*Loxodonta africana*) in Kruger National Park, South Africa. *Journal of Wildlife Diseases*, 55 (4): 923–927.
- ⁹⁰ Whittaker, Margaret, Active Environments. Testimony letter sent to California Sen. Lara. March 1, 2016.
- ⁹¹ Draper C. & Turner, D.. 2016. The use of wild animals in performances. Born Free Foundation and ENDCAP. https://issuu.com/bornfreeuk/docs/performing_animals_report_2016
- ⁹² Dawkins M.S. 1988. Behavioural deprivation: A central problem in animal welfare. *Applied Animal Behaviour Science*, 20:209-225.
- ⁹³ Gruber T. M., Friend T.H., Gardner J.M., Packard J.M., Beaver B. & Bushong D. 2000. Variation in stereotypic behaviour related to restraint in circus elephants. *Zoo Biology*, 19:209-221.
- ⁹⁴ Dantzer R. 1986. Behavioral, physiological and functional aspects of stereotyped behavior: A review and re-interpretation. *Journal of Animal Science*, 62:1776-1786 <http://jas.fass.org/content/62/6/1776>
- ⁹⁵ Mason G. J. 1991. Stereotypies: a critical review. *Animal Behaviour*, 41:1015-1037.
- ⁹⁶ Mason G. J. & Latham N. R. 2004. Can't stop, won't stop: Is stereotypy a reliable animal welfare indicator? *Animal Welfare*, 13: S57-69.
- ⁹⁷ Wendler. 2020, *ibid.*,
- ⁹⁸ Vanitha V., Thiyagesan K. & Baskaran N. 2016. Prevalence of stereotypies and its possible causes among captive Asian elephants (*Elephas maximus*) in Tamil Nadu, India. *Applied Animal Behaviour Science*. 174:137-146. <https://doi.org/10.1016/j.applanim.2015.10.006>
- ⁹⁹ Kurt & Garai. 2001, *ibid.*
- ¹⁰⁰ Clubb & Mason. 2002, *ibid.*