Supplemental Information

International media cover

A Google search yielded over a 100 media articles on the mass die-off of elephants in Botswana and we list some of them here:

- [https://www.telegraph.co.uk/news/2020/07/01/hundreds-elephants-die-mysteriously-botswana-prompting-fears/](https://www.telegraph.co.uk/news/2020/07/01/hundreds-elephants-die-mysteriously-botswana-prompting-fears/)
- [https://www.livescience.com/elephant-mass-deaths-botswana.html](https://www.livescience.com/elephant-mass-deaths-botswana.html)
General references to the importance of poaching


https://doi.org/10.1093/conphys/cox067.


**Poaching and human-elephant conflict in Botswana**

Reference documents illustrating that poaching of elephant and human-elephant conflict has been intense in northern Botswana.

Buchhotlz E, Fitzgerald L, Songhurst A, McCulloch G, Stronza A. 2019a. Overlapping landscape utilization by elephants and people in the Western Okavango panhandle:


**Buchholz E, Redmore L, Fitzgerald LA, Stronza A, Songhurst AC, McCulloch G.**


https://doi.org/10.1371/journal.pone.0178840.

**Pozo RA, Cusack JJ, McCulloch G, Stronza A, Songhurst A, Coulson T. 2018.** Elephant space-use is not a good predictor of crop-damage. *Biological Conservation* **228**:241–251


Droughts


The role of diseases

There are few published records of die-offs of elephants due to factors other than poaching. These often are due to viral and bacterial diseases (Grobler et al., 1995; Azeem et al., 2020). For instance, in South Africa’s Kruger National Park, the encephalomyocarditis (EMC) virus (EMCV-1; van Sandwyk et al., 2013) caused the death of at least 64 elephants during 1993-1994. Apparently, it coincided with an outbreak in rodent numbers (Grobler et al., 1995).

High rodent numbers in an area where elephant densities are high, may provide the ingredients for such a die-off. As yet, we have no evidence of such an outbreak in the Seronga area. We can posit other infectious candidates such as the West Nile and Shuni viruses (Azeem et al., 2020), elephant endotheliotropic herpesvirus (EEHV) which is an infectious type of herpes virus found in elephants (Richman et al., 1999), hepatitis (Basson et al., 1971; McCully et al., 1971), or an unlikely outbreak of tuberculosis (TB) due to slow disease progression and/or chronic infection (Obanda et al., 2013; ADS Bastos, 2020, pers. comm.).

Anthrax caused by *Bacillus anthracis* is an indigenous and endemic disease in sub-Saharan Africa (Hugh-Jones & de Vos, 2002) that we cannot rule out as a cause of these die-offs. In Etosha National Park, frequent outbreaks of anthrax apparently steer the demography of the elephant population (Lindeque, 1988). Outbreaks of anthrax mainly affect elephants during the end of the dry season (Lindeque & Turnbull, 1994). During the 2019 drought, 100 elephants died of anthrax in an area 150 km south of the present area (https://africanelephantjournal.com/). In the same year and at the end of the dry season, media reports indicated that the drought caused the death of 200 elephants in Hwange National Park.
(Zimbabwe) along a part of its eastern border with Botswana. At least another 100 elephants
died from anthrax and at the end of the dry season in Botswana’s Chobe National Park.
However, in all cases other species were affected as would be anticipated for a multi-species
pathogen (ADS Bastos, 2020, pers. comm.)

Botswana: pathogen, poison or a perfect storm? *African Journal Wildlife of Research*
50:149–156 [https://doi.org/10.3957/056.050.0149](https://doi.org/10.3957/056.050.0149).

Basson PA, McCully RM, de Vos V, Young E, Kruger SP. 1971. Some parasitic and other
natural diseases of the African elephant in the Kruger National Park. *Onderstepoort

Grobler DG, Raath JP, Braack LEO, Keet DF, Gerdes GH, Barnard BJH, Kriek NPJ,
Jardine J, Swanepoel R. 1995. An outbreak of encephalomyocarditis-virus infection in
free-ranging African elephants in the Kruger National Park. *Onderstepoort Journal of
Veterinary Research* 62:97–108.


Lindeque M. 1988. Population dynamics of elephants in Etosha National Park,
S.W.A/Namibia. PhD dissertation, University of Stellenbosch.


McCully RM, Basson PA, Pienaar JG, Erasmus BJ, Young E. 1971. Herpes nodules in
the lung of the African elephant [*Loxodonta africana* (Blumenbach, 1797)]. *Onderstepoort
Journal of Veterinary Research* 38:225–236.
Sources of aerial survey data


[https://doi.org/10.1007/s11273-015-9440-4](https://doi.org/10.1007/s11273-015-9440-4).
The debate about fences


