

# JEMA

Journal of the  
Elephant Managers Association



AUGUST 2021

**ELEPHANT  
MANAGERS  
ASSOCIATION**



VOLUME 32, NO. 2



PHOTO: TINA DOW

## Botswana's Mass Elephant Die-off

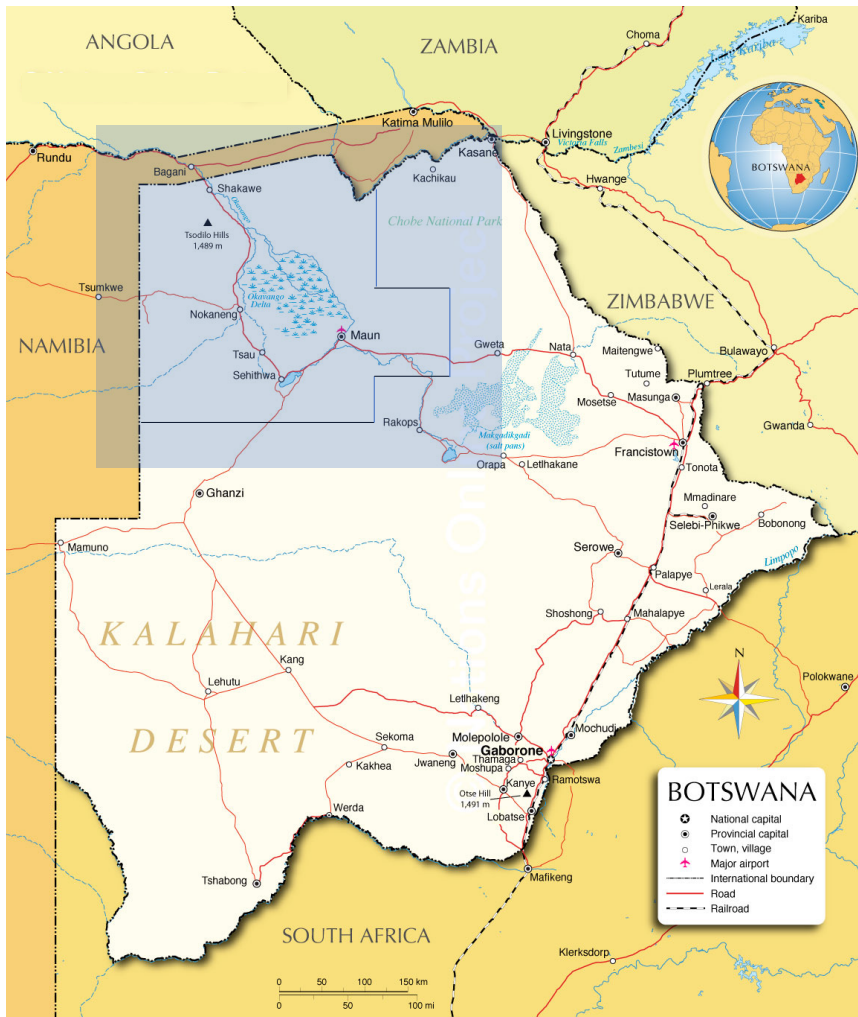
Tina Dow, PhD

EMA Conservation Committee

**In** March 2020, at the beginning of a global pandemic, elephant carcasses were found in the Ngamiland district of northern Botswana. Within three months from the initial report, helicopter-based surveys counted a total of 350 dead elephants. Carcasses of males and females were found by themselves with 70% near water. In some cases, it was as though the animal was walking and just collapsed. Locals would state that some elephants were observed walking in circles with extremely low body condition before death. Due to COVID-related travel re-

strictions, carcasses were not thoroughly examined, and tissue samples not collected; thus, a causative agent was not identified. All animals were found with tusks intact, so poaching was immediately ruled out. In addition, as no scavenger species were found dead, purposeful poisoning from humans was also dismissed. State-released reports speculated that the deaths were due to cyanobacteria contamination in the water.

Cyanobacteria, also known as blue-green algae, produce biotoxins that specifically target the nervous system



MAP COURTESY OF THE NATIONS ONLINE PROJECT

and liver. Algal blooms typically occur during the hot, dry seasons when water levels fall, and concentrations of nitrogen and phosphorus significantly increase. Blooms are unpredictable with exponential bacterial growth occurring under favorable conditions. Light winds traveling over contaminated bodies of water can concentrate algae around the edges, allowing for easy exposure to toxins. Interestingly, livestock producers in the United States found that poisonings usually do not happen in smaller areas of water. As toxicity is dependent on species and amount ingested, there is not enough wave action in these water bodies to allow for congregations of large numbers of bacteria in places where interaction with wildlife would typically occur. In addition, biotoxins are nondiscriminatory. All mammals that come into contact have equal chance of poisoning and death. Symptoms usually appear within 20 to 30 minutes of ingestion and may include weakness, difficulty breathing, development of bloody diarrhea, and convulsions that preclude death. Aerial photos from Botswana did not show any other species affected, including livestock that frequented the same watering spots, suggest-

ing a possible species-specific pathogen.

In late August 2020, 34 dead elephants were found in forests between Hwange National Park and Victoria Falls areas in neighboring Zimbabwe. Post-mortem examinations would find the liver and other organs inflamed. Most elephants were found lying on their stomach indicative of a sudden death. Like with the carcasses in Botswana, the tusks were still intact. The Zimbabwe Parks and Wildlife Management Authorities would later release a statement claiming a suspect bacterial infection was to blame. Later, the Victoria Falls Wildlife Trust would initially identify the cause of death to be from hemorrhagic septicemia due to *Pasteurella multocida*, but later change the culprit to a possible related bacterium. As no definitive pathogen has been identified, speculation of what is causing elephant deaths continue.

Anthrax, an endospore-forming gram-positive rod bacterium, can survive in soil for decades. Infection can be transmitted via inhalation, ingestion, injection, or contact exposure. For elephants, infection is due to ingestion of spores or through biting flies. Once in the body, cells produce exotoxins that inhibit immune cell function and interfere with blood clotting. Like cyanobacteria, anthrax infections usually occur during hot, dry weather. However, unlike blue-green algae blooms, they occur following

heavy rains and subsequent flooding that facilitates spore exposure and dispersal. In Namibia, a country that shares borders with Botswana and Zimbabwe, this occurs in November. Clinical symptoms in affected individuals are dependent on route of infection. Inhalation of spores cause pneumonia and difficulty breathing. Ingestion targets the gastrointestinal tract resulting in colic, anorexia, and bloody diarrhea. Neurotoxic effects include listlessness, convulsions, and paralysis. Although not necessarily considered a true zoonotic disease, as transmission from one affected individual to another only occurs when spores are passed, all species are at risk of contracting this disease. In Zimbabwe, like Botswana, only elephants appear to fall victim to the unknown pathogen. In addition, aerial footage revealed no bleeding around fresh carcasses.

Viruses have been responsible for zoonotic infections resulting in the significant decline of wildlife populations globally. Rabies, a prevalent Lyssavirus found on all continents except Antarctica, has an almost 100% mortality rate. Contracted via injection through bites from infected



PHOTO: TINA DOW

animals or reservoir host species, incubation periods vary from days to months from the initial contact. As with other species, symptoms in the elephant may include anorexia, paralysis of trunk and hind limbs, restlessness, behavior changes, blindness, aggression, and hydrophobia. Similar to other viruses, rabies is highly contagious and zoonotic. To date, no epidemic has been reported in these areas.

Foot and mouth disease (FMD), although highly contagious among livestock, wild ruminants, and nonruminant herbivores, is rarely fatal. Viral infections typically have an incubation period of three to four days, with symptoms lasting upward to 20 days. As its name implies, infections of this type manifests in lesions on oral mucosa and on the skin of the feet. Though several cases have been documented in zoological institutions, wild elephants remain unaffected when outbreaks occur in species found within their range. As such, FMD is considered to be a disease strictly reserved for managed populations only.

Encephalomyocarditis (EMC) virus is a non-enveloped RNA virus that can persist in extreme environments. While it is a regularly occurring virus in rodents that remains subclinical, in species like domestic pigs and some wildlife species (including elephants) the disease can either remain asymptomatic or be fatal causing significant damage to myocardial cells. Several cases in elephants have been documented in managed and wild individuals. In November 2013 at the Reserve Africaine de Sigean in France, an adult female African elephant was found dead. In the days prior, keepers did not notice any preliminary signs that would suggest a deadly viral infection. Upon necropsy, it was noted the individual had ascites and myocarditis, with petechia on mucosa and internal organs. Histological

examination concluded extensive degeneration and necrosis to myocardial cells. From the postmortem results, it was concluded the cow died of EMC. Important to note: an identical viral strain was found in rodents tested within the institution, thus concluding a fecal-oral route of transmission.

For one year beginning in December 1993, Kruger National Park in South Africa experienced an outbreak of EMC that would see 64 elephant deaths, of which 53 were bulls. During necropsy, veterinarians noted lesions related to cardiac failure. It wouldn't be until later that antibodies for EMC would be isolated in frozen blood serum collected from wild elephants almost ten years earlier. Thus, the virus had been around for at least a decade, eliciting an immune response in some but death in others. In both instances with EMC in managed zoo and wild Kruger elephants, there were no indicators that would suggest EMC can be passed from elephant to elephant. This is also supported in other cases of EMC within US zoos wherein the virus did not spread to other individuals housed together. However, in domestic pigs, the virus is known to shed through nasal mucous three to four days preceding death, unknowingly contaminating common areas within shared facilities.

In January 2021, dead elephants once again appeared in Botswana's northern region. As of May, this year's death toll stands at 39. With restrictions now being lifted within the country, carcasses should be more accessible for data collection. As such, many are hopeful that post-mortem examination and biological samples may hold the secret to what continues to kill Botswana's elephants.