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TAPHONOMIC STUDIES OF ELEPHANT MORTALITY IN ZIMBABWE

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ABSTRACT: In an effort to develop guidelines for paleoecological interpretations of mortality among extinct proboscideans, the author has been gathering data on demography of drought-killed elephants and those culled in Zimbabwe's National Parks since 1981. Included here are preliminary figures on average ages of animals in cull and die-off samples as well as some preliminary information on age distributions. Culled elephants provide invaluable scientific data in addition to the revenue obtained from sale of elephant ivory, skin and meat.

The most important goal of my research on the natural mortality of African elephants (Loxodonta africana) in Zimbabwe was to provide some analogues for paleoecological interpretations of mortality among extinct proboscideans such as mammoths (Mammuthus sp.) and mastodons (Mammut sp.).

Due to severe drought in Zimbabwe, local populations of elephants in some parts of the country have suffered unusually heavy die-offs. Fortunately the proportion of animals dying from drought is not significant compared to the total population. In Hwange (formerly Wankie) National Park, the largest wildlife preserve in the country, elephants that spend the dry season (May-November) in the western Kalahari sands suffer from water scarcity every year, since there are no permanent sources of surface water there. In 1982-1983 nearly 30% of about 2,000 elephants died from dehydration and starvation. In one locale alone, over 200 have died. This locale is called Shabi Shabi and is a dry (fossil) stream channel in Kalahari sands. Within the channel are the skeletons of 70 elephants that died in 1982 and 1983, while dozens more are scattered in the surrounding scrub and woodland. Thirty-three carcasses and skeletons lie within 200 m of each other. This assemblage of bones, carcasses, body parts, tusks, and tusk fragments could certainly qualify to be called a modern-day elephant graveyard. I have been periodically re-visiting and examining the bones for weathering deterioration, scatter and breakage due to trampling or scavenging and natural burial in the sands. Other locales in Zimbabwe also contain large numbers of bones, and these too are being monitored. In 1983-1984 fewer animals seem to have died, but the total is still excessive when compared to years of normal rainfall. There were very few mortalities in 1985 and 1986.

There are currently far more elephants in Hwange than there were when the land was declared a wildlife preserve in the 1920's. Aerial counts in 1982 recorded over 20,000 animals, and the counts in 1983 were somewhat greater. The area of the Park is 14,620 km^2, and most of this land never had permanent natural surface water. The soils in the north and south are shallow and

easily eroded. A far greater part of the Park is covered by Kalahari sands, which support woodland and scrub.

For comparison with records of natural mortality I gathered data on the age distribution of live populations of elephants. A rich body of data has been made available to me by ecologists of the Zimbabwe Department of National Parks and Wildlife Management. These data come mostly from culling operations conducted over the past two decades to reduce elephant numbers when the habitat carrying capacity has reached its limits. In-depth studies of herd composition, individual health, population statistics, and other ecological topics are on-going. In addition, ecologists have also been engaged in studies of live animals, using radiotelemetry. These studies provide extremely important contributions to our knowledge of elephant demographics in southern Africa.

Between 1981 and 1986, about 10,000 animals were killed in Hwange National Park. During culls, whole herds are destroyed by rifle fire, and the carcasses are butchered by a succession of teams who salvage skins, most of the muscle meat, ivory, organs for study, and lower jaws to determine age. Table 1 presents figures of average ages of animals in cull and die-off samples, and some preliminary information on age distributions. In the first year of the drought die-off, animals between 2 and 8 years old were most affected. In the second year, however, more animals died that were less than 2 years old. Also note that in live herds in Hwange more than half the animals are younger than 8 years old.

TABLE 1. AVERAGE AGES OF ANIMALS IN CULL AND DIE-OFF SAMPLES

n	SAMPLE	MEAN AGE	MID-RANGE	MODAL AGE	RECRUITMENT	% under 8 yrs	% under 12 yrs
473	1981 cull	11-12 yrs	27 yrs	4-6 yrs	4%	53%	68%
1967	1983 cull	11-12 yrs	29 yrs	4-6 yrs	13%	56%	66%
173	1982 die-off	6-7 yrs	20 yrs	2-4 yrs	8%	85%	93%
43	1983 die-off	8-9 yrs	29 yrs	0-2 yrs	57%	72%	74%
216	'82-'83 comb.	6-7 yrs	29 yrs	2-4 yrs	17%	82%	90%

Improved criteria for determining the ages of elephants are being developed by Colin Craig and Mike Jones of the Department of National Parks (publication is in prep.). Important differences from the classic Laws (1966) and Sikes (1971) criteria are: (1) there are twice as many age classes and (2) ages determined in years-since-birth are usually younger when compared to those assigned by Laws (1966) to any particular state of tooth eruption and wear. When the new criteria are published, it will be a simple matter to determine which Laws' age is equivalent to a "new" age. Note that the ages in the Table are not directly comparable to ages published by other researchers who have used the Laws (1966) criteria.

CONCLUDING REMARKS

In addition to collecting data on elephant demography and improving the criteria for age determination in elephants, this study shed new light on bone distribution after death and rate of bone deterioration, aspects of which were discussed in the studies of Behrensmeyer and Hill (1980), Conybeare and Haynes (1984), Haynes (1983), and Shipman (1981). Bone concentrations of elephant die-offs are not "elephant cemeteries" (Anonymous, 1951), since elephants do not go to these places to die, but to survive.

A source of Zimbabwe's revenues is tourists to the National Parks who view elephants and other animals. Sale of elephant parts from culled animals also provides significant funds. Budgetary cuts are hurting efforts to improve or sustain research and maintenance projects in the parks. I hope that personnel in other African countries who are studying elephants are as highly motivated and as dedicated as those in Zimbabwe.

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