

## Assessing Northern Botswana's Elephant Populations

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According to the Botswana Department of Wildlife and National Park's 2006 estimates, there are 152,184 elephants in northern Botswana. However, because the area in question is extensive, the estimate is based on extrapolation from an understandably limited survey effort, leading to considerable imprecision. Statistically, we know that the actual number of elephants in northern Botswana may lie somewhere between 118,000 and 186,000—a rather wide margin. Thus, if we count more or less elephants next year, will we know whether the population is actually growing or declining? The answer, it seems, is, “Not really.”

The Conservation Ecology Research Unit (CERU) from the University of Pretoria has developed a novel method to monitor elephant populations, the Rapid Elephant Population Assessment (REPA). Rather than an estimate of elephant numbers, REPA provides information on the demography of populations—the age of individual elephants, birth and death rates, and the population growth rate. To collect this information, we survey breeding herds from a helicopter and take digital images of the herds at a known distance, measured with an infrared range finder. With this data, we calculate the length of elephant backs and deduce ages based on models that we have developed. Then, we calculate reproductive rates by assessing the age differences between cows and their calves and age specific survival rates by analyzing age distributions. Finally, we calculate the rate at which we expect the population to grow or decline.

Additionally, when REPAs are conducted at the same site a few years apart or when used in conjunction with precise count data, we can also gain insights as to the *reason* behind population change. For example, if we know a population is declining, REPA can tell us if it is because of unnaturally high death rates, possibly induced by illegal poaching, or because birth rates are declining, perhaps in response to a decrease in food, water or spatial resources.

In September 2008, CERU conducted REPAs in Chobe National Park and Moremi Wildlife Reserve in northern Botswana and made some interesting observations. Professor Rudi van Aarde reports, “Flying over and around Chobe, we noted very few calves under the age of three. On the other hand, when we surveyed Chobe in 2003, individuals three and under made up 13% of the population.” Though analysis is not yet complete, it appears that population growth in Chobe may be slowing; a finding that supports our recent paper that reports that the population is stabilising.



In contrast to Chobe, green fodder is plentiful in areas of Moremi, part of the Okavango Delta. The

demographic profile we noted in Moremi is completely different to that in Chobe—nearly every breeding herd we surveyed had at least one calf less than a year old. My recent analysis of elephant population demographics across Africa suggests that when food resources become strained, for example in drought years or when competition for food increases, elephant populations respond primarily by having fewer calves and subsequently with reduced survival rates. This may explain the lack of young calves in Chobe.

All of this excites CERU MSc student Pieter Olivier who says that in northern Botswana, we may be witnessing functional elephant metapopulation dynamics—occupied and unoccupied habitat patches, asynchronous dynamics (i.e. differences in growth rates in different areas), long-term possibility of local extinction and re-colonization, and dispersal between habitat patches. To assess the last point, PhD student Theresia Ott has been analyzing elephant movement with satellite-tracking data. “We collared six elephants in Namibia’s Caprivi Strip in 2006, and so far these elephants have moved through Angola, Zambia, and Botswana, indicating an extensive range for the metapopulation and possibly explaining the apparent stabilization of numbers in Chobe.”

Metapopulation dynamics are exciting to see because these results suggest that expanding connectivity between protected regions may mitigate elephant impact in confined areas. Given large enough areas, the need for elephant “management” should dissipate, leaving nature to mediate the large-scale balance between elephants and other plant and animal species.