Demographic status of elephants in the Samburu and Buffalo Springs National Reserves, Kenya

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Abstract

Individual based demographic records of the elephants utilizing Samburu and Buffalo Springs National Reserves were collected from 1998 through 2003 and indicate that this elephant population was increasing at an average rate of 4.6% per year. Although the majority of carcasses were not found, known sources of mortality include disease, injury, and predation by lions and humans. Poaching did occur during the study period, however the population is increasing and thus our findings indicate ivory poaching has limited impact on the demographic status of these elephants. This population is part of the Samburu/Laikipia MIKE Site and thus its status is relevant to CITES ligislation.

Key words: African elephant, CITES, demography, MIKE, poaching

Résumé

Les records démographiques individuels des éléphants dans les réserves naturelles de Samburu et Buffalo Springs furent accumulés de 1998 jusqu'à la fin de 2003 et indiquent que la population augmente d'environ 4.6% par an. Bien que la majorité des carcasses n'ont jamais été trouvées, les sources connues de mortalité comprennent la maladie, la blessure, et la prédation par lions et les humains. Le braconnage a été pratiqué pendant la période de l'étude, or la population est en croissance. Ainsi nos conclusions indiquent que le braconnage d'ivoire n'a qu'un impact limité sur le statut démographique de ces éléphants. Cette population fait partie du site Samburu/Laikipia dans le programme MIKE (Monitoring Illegal Killing of Elephants) et donc son statut est pertinent à la législation de CITES.

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Introduction

Long-term monitoring of known individuals offers the most comprehensive method for recording the demography of an animal population. Our study of individual elephants in the Samburu and Buffalo Springs National Reserves in Northern Kenya began in 1997 with the intention of recording elephant social behaviour and demography (Wittemyer, 2001). More recently, our study site was incorporated within Kenya's system for Monitoring the Illegal Killing of Elephants (MIKE), instituted under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In consequence our data assumed a wider relevance within the framework of this international treaty.

This paper presents information on the elephant demography of a core area within the Samburu/Laikipia MIKE Site (Fig. 1) where we have identified over 900 elephants as users of these reserves since September 1997. Although identified in one sub-area, these free-ranging elephants constitute 18% of the approximately 5400 elephants counted in the aerial census of 2002 within the Samburu and Laikipia districts (Omondi *et al.*, 2002). The Samburu and Buffalo Springs National Reserves cover an area of approximately 320 km^2. Elephants using the area are free ranging and Global Positioning System (GPS) radio-tracking data collected from fourteen elephants collared within the study area demonstrate that over 90% of their range lies outside the two reserve boundaries and covers in total approximately 27% of the Laikipia/Samburu MIKE Site (Fig. 1).

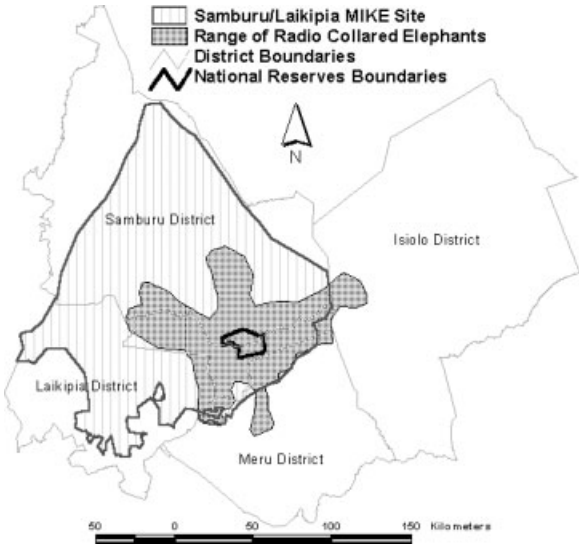

Fig 1 The range of fourteen radio-tracked reserve elephants, District boundaries, and National Reserve boundaries in relation to the Samburu/Laikipia MIKE site

Our demographic method of monitoring individuals (Douglas-Hamilton, 1972; Moss, 1996) supplements standard MIKE methodologies for measuring elephant mortality, and contributes independent data to the wider ongoing MIKE studies of the Kenya Wildlife Service within this MIKE site. When carried out over extended periods this method has been shown to be an effective way of monitoring birth and mortality and detecting outbreaks of disease, starvation and human predation (Douglas-Hamilton, 1972; Weyerhaeuser, 1981; Moss, 1996).

Methods

The Save the Elephants research team has comprehensively monitored demographic changes in the population using the Samburu and Buffalo Springs National Reserves from 1998 to 2003 and every elephant is individually identified (Wittemyer, 2001). Established routes were patrolled weekly, and all individuals encountered were recorded along with new births. Elephants missing from their family units (excluding subadult males) or absent from the study area for more than 2 years were recorded as dead.

Because births and deaths can go undetected among infrequently observed elephants, the demographic data presented in this paper have been estimated by using a subset of the total known population. This subset includes individuals observed in at least 3 months of every year, amounting to 59% of the known cows and calves and 57% of the known bulls. Male elephants between the ages of 15 and 20 years were particularly infrequent visitors to the reserves; accordingly, the majority of these individuals were excluded from the analysis. This age class appears to be highly migratory, rarely staying within the study area for more than a few months.

Results

The reserves' population increased each year, averaging a 4.6% growth rate per annum over the 6 year study. The number of births fluctuated greatly between years, varying from nineteen in 1998 to 75 in 2003 (Fig. 2). Such fluctuation in births is typical of elephant populations (Laws, 1969; Douglas-Hamilton, 1972; Moss, 2001). The greatest growth rate occurred in 1999 2 years after the high rainfall associated with the 'El Nino' phenomena (coinciding with elephants' 22 month gestation period), and the lowest occurred in 2002 in relation to a severe drought in 2000. Recorded births are also seasonal, correlated with monthly rainfall ($R^2 = 0.578$, $P = 0.0041$), as has been recorded in other savannah populations (Laws, Parker & Johnstone, 1975; Hall-Martin, 1987).

Births exceeded deaths throughout the study period (Fig. 2). The average annual mortality was 2.6%. The greatest number of individual deaths occurred in the youngest (0–5 years) age class, but the oldest age class (over 30 years) had the greatest average annual mortality

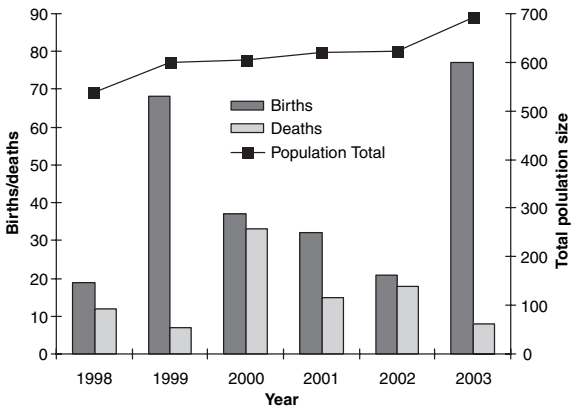

Fig 2 Annual population – total, births, and mortalities

Table 1 Deaths presented by age class from 1998 to 2003 and the average annual mortality per age class

Age class	Males	Females	Unknown	Total deaths	Total individuals	Annual mortality (%)
0–5	20	11	11	42	336	2.1
6–15	4	5	0	9	198	0.8
16–30	11	7	0	18	133	2.3
Over 30	10	16	0	26	126	3.4

Table 2 Causes of mortality (disease was not tested for but prescribed to carcasses symptomatically)

Cause of death	Total	Subadult	Adult ♂	Adult ♀
Carcass not found	59	30	10	19
Disease	12	6	4	2
Predation (Lion)	10	10	0	0
Human	9	1	6	2
Injury/drowning	3	2	1	0
Unknown	2	2	0	0

of 3.4% over 6 years (Table 1). The greatest mortality recorded over the 6-year study coincided with the short but severe drought of 2000 (Fig. 2). Known causes of death were disease, predation by lions and humans, and injury, but the majority of deaths were unspecified as the carcasses were not found (Table 2).

Discussion

By monitoring births and deaths of known individuals, we show that the Samburu elephant population is increasing (Fig. 2). Our results are consistent with aerial census data (Omondi *et al.*, 2002), and similar upward trends are reported in most elephant populations in Kenya and Tanzania (Blanc *et al.*, 2003) occurring since the ivory trade ban of 1989. The relatively high rate of increase may relate to climatic conditions during the study, particularly the 'El Nino' weather phenomena of 1997 that produced the greatest rainfall since 1961 in the study area. However, a short, severe drought also occurred during the study period. Because the study area is in a semi-arid ecosystem, elephant reproduction is seasonal and correlated with rainfall.

Average mortality, at 2.6% per annum, was generally low (Table 1). However, over 11% of males older than 30 years in Samburu were lost in 1 year, and 24.4% (n = 10) died during the study. As few males are thought to be over 45 years of age, these deaths are unlikely to result from old age. Older females experienced similar rates of loss at 18.8% over the study period. Matriarchs of family units seemed particularly vulnerable accounting for 47.8% (n = 11) of breeding female mortalities. The death of a family unit's matriarch is likely to have important social and fitness impacts on survivors (Moss, 1988; McComb *et al.*, 2000). Calf deaths were often associated with times of nutritional stress (dry seasons). Lions were responsible for 23.8% (n =10) of recorded calf mortalities, four of which were observed alone prior to their death (Table 2).

Of 95 recorded deaths (Table 2), nine were confirmed to be caused by humans although only two deaths were clearly the result of poaching for ivory (these carcasses were found with bullet holes and their tusks had been removed). Distinguishing between poaching and human–elephant conflict as the cause of death in the remaining carcasses was not possible, as individuals with human inflicted wounds (spear and bullet holes) were found with tusks in the carcass or observed with injuries prior to their death. Over half (n = 5) of confirmed human related deaths were individuals from the oldest age class. However, only 37.9% (n = 36) of carcasses were located, the majority of which were calves. Elephants with spear and bullet wounds have been observed in the study area numerous times, including individuals within family units that had recently lost individuals. Such wounds suggest that some individuals recorded as 'missing' were likely dead as a result of conflict with people. Furthermore, poaching events occurred outside the protected reserves during the study period. Although these individuals could not be identified, it is likely some of these carcasses were those of individuals recorded 'missing presumed dead' from the study population, making the number of illegally killed individuals greater than reported here.

Because of the importance of tourist traffic, the wildlife authorities offer a high level of surveillance and the elephants are currently well protected within the study site. Elsewhere in the Samburu/Laikipia MIKE Site there is less patrolling. With births exceeding deaths we conclude that in our central study area there was little impact of ivory poaching on the population from 1998 to 2003. This contrasts with the heavy mortality reported during the 1970s in the Samburu area caused by ivory poaching (Ottichillo, Kufwafwa & Stelfox, 1987). Although our study area is only a segment of the whole, the monitoring of known individuals provides a sensitive early warning

system that would detect any serious increase in poaching. Current recording of carcasses within the entire MIKE site by the Kenya Wildlife Service and analysis of the causes of death will give a broader picture of mortality trends throughout the ecosystem and set a base line for measuring poaching impact in the future.

Acknowledgements

We thank the Office of the President of the Republic of Kenya and the Kenya Wildlife Service for permission to conduct this research, and the donors of Save the Elephants who provided the research centre and infrastructure from which this monitoring took place. We are grateful to the Samburu and Isiolo County Councils for allowing us to work in Samburu and Buffalo Springs National Reserves, and to their wardens for cooperation in the field. The Fulbright Fellowship Program, National Science Foundation, Lincoln Park Zoo and the International Elephant Foundation provided additional funding for this work.

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(Manuscript accepted 2 April 2004)