

Elephant numbers, group structure and movements on privately owned land adjacent to Tsavo East National Park, Kenya

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Abstract

The aim of the research was to study the African elephant *Loxodonta africana* at group and individual level, within private land adjacent to the south-western boundary of Tsavo East National Park, Kenya. The number of elephants sighted per month ranged between 65 and 292 individuals, and almost half of all sightings were of groups of bulls and lone bulls. A photographic identification file was created of 165 individually identified elephants.

Nine known adults had tips or sections of the trunk missing, two had deep slash wounds across the trunks, one had a snare embedded around the trunk, two had a snare embedded around the leg and two died from poisoned arrow. Fewer than half of the identified individuals were re-sighted on two or more occasions. Fourteen identified elephants crossed the national park boundary into private land. The low frequency of re-sightings of identified individuals and the boundary crossings of recognized individuals suggest that this private land is part of a much larger range for the majority of the elephants. The time at which elephants used water points was due in part to conflict with herdsman over access to water.

Additional key words: conflict, photographic identification, water points

Résumé

Le but de cette recherche était d'étudier l'éléphant africain (*Loxodonta africana*) au niveau du groupe et individuellement, dans une propriété privée voisine de la limite sud-ouest du Parc National de Tsavo-est, au Kenya. Le nombre d'éléphants aperçus par mois allait de 65 à 292 individus, et presque la moitié des observations étaient des groupes de mâles ou des mâles solitaires. On a créé un dossier de photos d'identification, et 165 éléphants ont été identifiés individuellement.

Neuf adultes connus avaient la pointe ou une partie de défense manquante, deux avaient une profonde coupure en travers de la trompe, un avait un lacet incrusté autour de la trompe, deux en avaient un autour d'une patte, et deux sont morts empoisonnés. Moins de la moitié des individus observés ont été revus à deux reprises ou plus. Quatorze éléphants identifiés ont franchi la limite du parc vers la propriété privée. La faible fréquence des ré-observations d'individus connus et le franchissement de la limite du parc suggèrent que cette propriété privée fait partie d'un territoire beaucoup plus vaste pour la majorité des éléphants. L'heure à laquelle les éléphants fréquentaient les points d'eau était due en partie à des conflits avec des pasteurs pour l'accès à l'eau.

Mots clés supplémentaires : conflit, identification photographique, points d'eau

Introduction

Elephants play a major role in the Tsavo ecosystem, where they form the largest elephant population in Kenya. The considerable pressures on elephants, other

wildlife and the habitat in this region include loss of habitat when trees are felled to clear areas for settlements, agricultural activities, charcoal making; overgrazing by livestock and subsequent soil erosion (Wijngaarden 1985); electrical fencing (Kasiki 1998);

frequent fires both past and present (Leuthold 1996); and periodic drought. Further pressures include the increasing frequency of snaring for bushmeat, poaching for ivory and rhino horn, and finally the increase and encroachment of the human population (Vogt and Wiesenhuetter 2000). There is a growing need in this semi-arid environment to identify compatible land uses to conserve the habitat and wildlife and to support local communities.

The Tsavo ecosystem (40,000 km²) is a vast semi-arid bushland in southern Kenya, comprising Tsavo East and West National Parks (21,000 km²), Mkomazi Game Reserve in north-eastern Tanzania and private land. Within the ecosystem is Taita Taveta District, located between the two national parks and consisting of private ranches, wildlife sanctuaries, sisal plantations, farming, settlements and ecotourism enterprises. The human population in this region has steadily increased over the past 30 years, from 90,000 in 1962 to 245,000 in 1999 (average population density was 14 people per km²), and has been estimated at 252,000 by 2000 (Vogt and Wiesenhuetter 2000).

Within the Tsavo ecosystem, the elephant population was estimated to be 35,000 in 1967 (Laws 1969). A prolonged drought claimed an estimated 9000 elephants in the 1970s (Corfield 1973). After intense poaching for ivory throughout the 1970s and 1980s the population was reduced to 5363 by 1988 (Olindo et al. 1988). In 1999, 8068 elephants were counted within the ecosystem (Kahumbu et al. 1999). The number of elephants counted outside national park boundaries ranged from 15.5% to 24.3% of totals during aerial counts conducted between 1988 and 1999 (Kahumbu et al. 1999). Many studies have shown that the dispersal behaviour of Tsavo elephants is related to rainfall and the subsequent green vegetation (Leuthold 1977; Wijngaarden 1985; Ottichilo 1986) and the provision of artificial water sources (Spinage 1998).

One region that is an elephant-dispersal area and is possibly a corridor between the two national parks is Rukinga Wildlife Sanctuary (RWS) and Taita Ranch (TR), privately owned land adjacent to the south-western boundary of Tsavo East National Park (TENP) and about 25 km east of the Tsavo West National Park boundary. During aerial counts in 1989, 1991 and 1994, all dry-season surveys, no elephants were sighted in the RWS/TR region; however, in 1988 (dry season) there were 119 elephants, and in 1999 (wet season) 235 individuals were counted (Douglas-Hamilton et al. 1994; Kahumbu et al. 1999).

Objectives

The Tsavo Elephant Research Project began in 1989 and continues today (McKnight 1992, 1996, 2000). Research is based on a photographic file of known individuals, used to monitor their population dynamics. Although the elephants in TENP, south of the Galana River, have been studied for over a decade, very little is known about the elephants outside the national park boundaries. The objectives of this study were to expand the Tsavo East Elephant Research to include a sample of the population of elephants that used land adjacent to the national park and complement the periodic aerial surveys. This study, conducted between July 1999 and November 2001, was approached at two levels: at the population level to survey the number of elephants, group structure and group sizes, and to identify elephant paths across ranch boundaries and the national park; and at the individual level, to create a photographic identification card file of individual elephants in this area to facilitate future research on demography and ranging behaviour and to determine if they were known individuals from TENP (McKnight 1996, 2000). Therefore, two data sets are presented: long-term records of known individuals from within the national park and data collected on elephants sighted in the RWS/TR region.

Study area

The RWS/TR region (750 km²), located in the southern region of the ecosystem, is an arid environment with sporadic and patchy rainfall (fig. 1). The habitat is primarily dense *Commiphora-Acacia-Lannea* bushwoodland (Wijngaarden 1985). For many years, ranch management cut down trees in many areas for livestock *bomas* (circular enclosed corrals formed by interlocking trees), which has created grassland areas. There are numerous scattered waterholes, some scooped out by ranch management. There are 10 reservoir water tanks, open at the top with adjacent open troughs, constructed between 1977 and the 1990s; they are filled from the main water pipeline (Mzima Springs, Tsavo West) for livestock and humans, which wildlife also use. The average height of the tanks is 271 cm and of the troughs 51 cm. During the dry season, the water in these tanks is the only water available for wildlife in the immediate area. During the present research, Taita Ranch had between 4000 and 6000 head of livestock. At the onset of

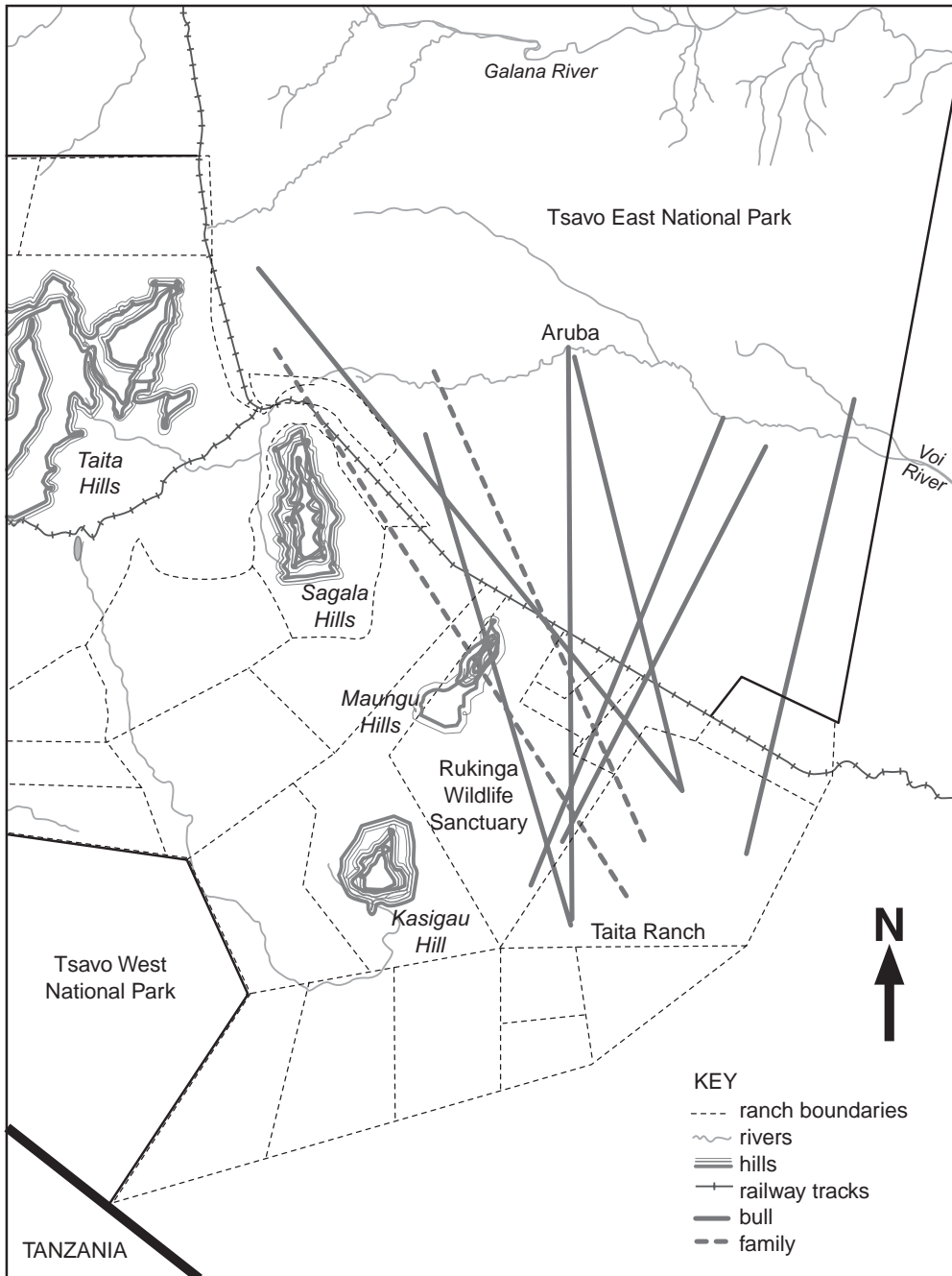


Figure 1. The study area, showing Rukinga Wildlife Sanctuary, Taita Ranch, Tsavo National Parks and the surrounding privately owned land. Solid lines (bulls) and dashed lines (families) indicate extreme points of sightings and boundary crossings for recognized individuals.

the research, RWS was a livestock ranch with approximately 4000 cattle, but by January 2001, all of the livestock and herdsmen had been removed and the area was converted to a wildlife sanctuary.

Methods

Two survey techniques were used to collect data: road surveys and stationary surveys at water points. Once

a month, two vehicles surveyed different locations of the entire study area for seven consecutive days between 0715 and 1300. Each vehicle was stationed at different water sources from 1630 until dark (1900) according to the location of elephant sightings, footprints, amount of dung and water level at waterholes and tanks as found in the morning survey. The elephants were more relaxed if observers were quiet and the vehicle was parked in a relatively open area, some 60 metres from the water source, regardless of the direction of the wind.

Data collection

Data collected during the surveys included date, time, GPS (geographical positioning system) location, group size and composition, age and sex, individual identification (photographs taken), activity (feeding, travelling, mud wallowing, drinking). In addition, the amount of water available was recorded (natural waterholes: full, half-full, all mud; tanks and troughs: empty, filling, half-full, full).

Elephant group composition

A group was defined as an association with all members feeding, resting or moving as a coordinated unit. The elephant groups were divided into four categories: 1) family: females and their offspring; 2) mixed group: family with a potentially reproductive bull (older than 20 years); 3) bull group: two or more bulls in the absence of families; and 4) lone bulls: a single bull with no other elephant in sight.

Identified elephants

As a base from which to start the research in this region, a photographic identification file system was created identical to the system incorporated in the national park (McKnight 1996). Each individual has a card with a photograph and sketch of ears and tusks, noting the following characteristics: 1) tusk: broken, one-tusked, tuskless; 2) trunk: section missing, 'fingers' torn; 3) tail: broken, no hair, half or no tail; 4) ears: tattered, holes, notches, broken, vein pattern; and 5) body: scars, growths. These photographs facilitated re-sighting of individuals and were used to make comparisons with the 748 identified elephants within the national park (McKnight 1996, 2000).

Results

Results of the road surveys showed that only 6.2% of the elephant sightings were during the morning surveys, the remainder being at water points in the late afternoon. Almost all (91.4%) of the elephants arrived at water points after 1700. With the exception of a few bulls, most elephants gathered at the edge of the bush at the water point, especially at the tanks, and then moved through an open area to the water in tight, discretely formed groups. The total number of individual elephants recorded during one month, when the two vehicles were at different waterholes, ranged from 65 (wet season, April 2001) to 292 (dry season, August 2000) (fig. 2).

Group composition and size

Almost half of the 1535 groups sighted were groups of bulls ($n = 361$ groups, 23.6%) or lone bulls ($n = 351$, 22.8%). Groups of females with their offspring accounted for 43.7% of the sightings, while mixed groups accounted for 9.9%. There was a wide range of group sizes for all of the grouping patterns: females with offspring ($n = 671$ groups) had 2–46 individuals and mixed groups ($n = 152$ groups) had 3–196 individuals. Bull group sizes (range 2–28 bulls) tended to be relatively large, with seven groups containing more than 12 bulls and three groups with 24–28 bulls.

Identified elephants and re-sightings

A total of 165 elephants (72 adult males, 43 adult females and 50 offspring) were individually identified with photographs. The frequency of re-sighting identified elephants was relatively small; 37.5% of identified males and 60.5% of identified females were re-sighted on two or more occasions (fig. 3). The re-sighting interval was from the following evening to as long as one year. This was especially true of the bulls in musth. For example, three identified bulls (30–40 years of age) were first recorded when they were in musth and the subsequent sightings did not occur until the following year, at the same time of year, when they were in musth again.

Elephants snared and speared

One of the striking features of the identified elephants in this region is the frequency of trunk injuries: slash

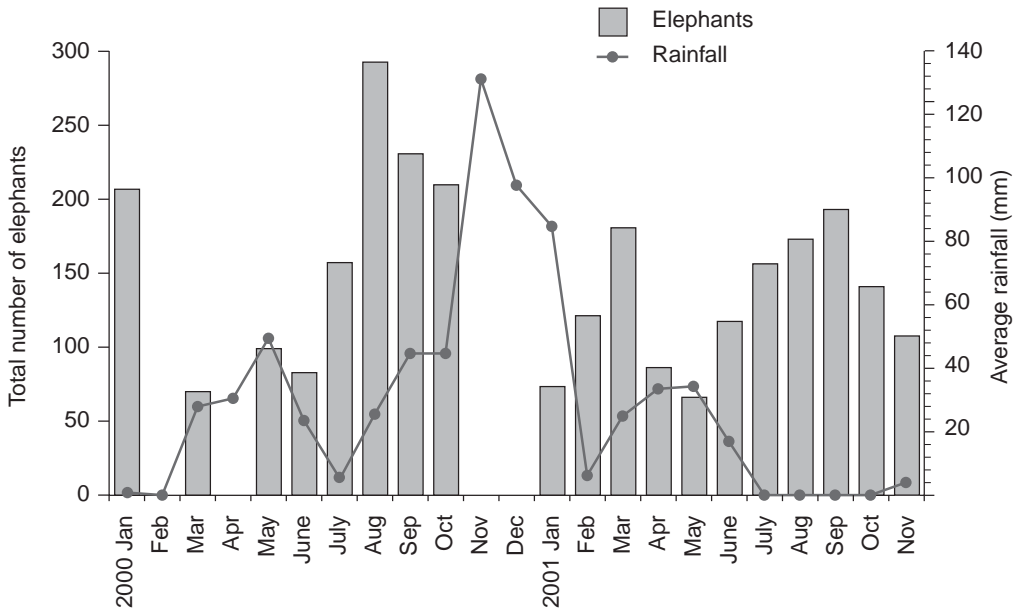


Figure 2. Total number of individual elephants counted per month compared with the average monthly rainfall. Surveys were not conducted in February, April, November or December 2000.

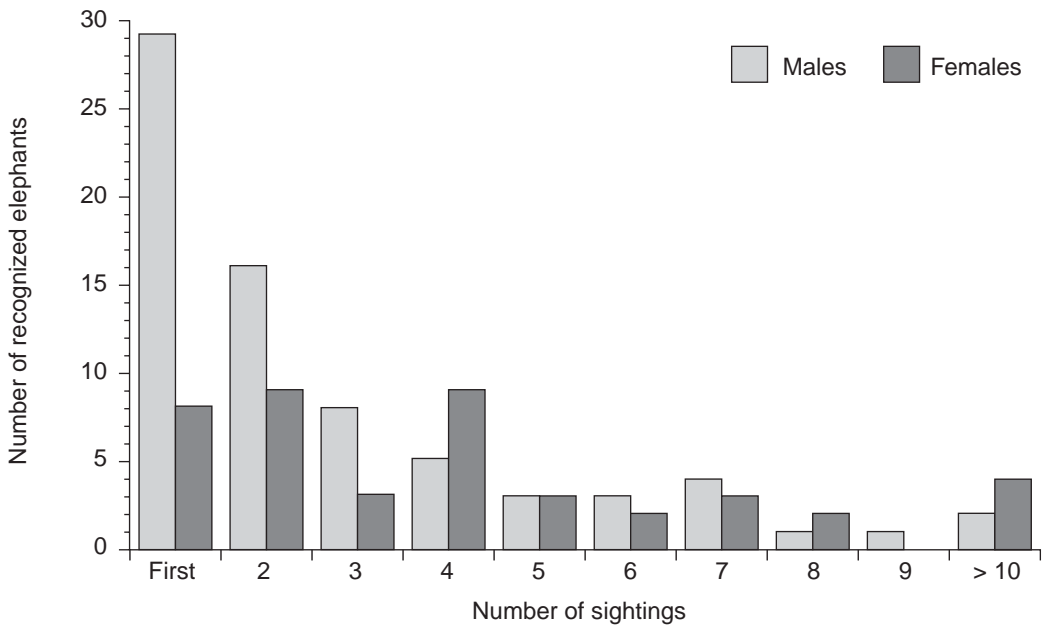


Figure 3. Frequency distribution of the total number of sightings of identified adult males and females.

wounds, the tip of the trunk missing or the ‘fingers’ torn from the tip. Of the identified individuals, seven adult males and two adult females were missing sections of their trunk, which appeared to have been caught in snares. Three were missing a quarter to a

half of the trunk. Two elephants were recorded with a snare wrapped around the leg. One bull (20–25 years old) was missing approximately a quarter of his trunk and also had a snare wrapped around his trunk, mid-way from the damaged tip. Further, an adult male and

an adult female had a horizontal slash wound across the middle section of the trunk that went halfway through it, suggesting a knife or spear wound. These injuries made it very difficult for these elephants to drink, since much of the water sucked into the trunk seeped through the slash wound. During this study, one known bull (20–25 years old) was killed by a poisoned arrow and another bull (15–20 years old) was seriously wounded by a spear and subsequently shot by the Kenya Wildlife Service (KWS).

Boundary crossings

Fourteen known elephants crossed the boundary between the national park and private land. Thirteen individuals (6 bulls and 2 families including 5 offspring), first identified in TENP, were sighted within the study area, and one bull sighted on private land was subsequently sighted in TENP. The average distance between points of sighting for the bulls was 54.5 km (range 45.5–68.4 km). The extreme point of sighting for the two families was 52.3–68.2 km. Although, the boundary crossing routes could not be confirmed during this study, all of these individuals at some point in their movement crossed the Mombasa–Nairobi main road and railway line.

Discussion

Tsavo elephants in the early 1970s (drought years) were mobile and had large home ranges, in some cases extending 3000 km² (Leuthold 1977). Results from the present study suggest that the RWS/TR region is part of a much larger range for these elephants; indicated by the fluctuating number of elephants sighted per month, the relatively low frequency of re-sightings of identified elephants, and cross-boundary movements of known individuals.

The data suggest that many different elephants used this region for the fresh water in the tanks. During the dry season when the waterholes were dry, the only water available for wildlife was in tanks and troughs, which Rukinga Wildlife Sanctuary provided for all. However, in Taita Ranch during the dry season, the only water available for elephants was in one or two tanks and rarely in troughs. A tank had to be at least half full for an adult elephant to be able to reach the water in it. Adult bulls had little difficulty in reaching the water and the older adult females also were generally able to do so, but their offspring could

not reach the water with their trunks. If the trough was empty, individuals younger than 15 years would drink the small amount of water that pooled at the base of the tank or they could not drink at all.

The low frequency of elephant sightings during the day and the time of day when they used the water sources are attributed to lack of visibility due to the thick vegetation and conflict with herdsman in Taita Ranch. Elephants were threatened if they came to the tanks during the day when the herdsman and their cattle were there. In addition, herdsman on occasion set fires near the tanks and natural waterholes at night to keep elephants away from the water sources.

Except for a few bulls, most of the elephants, therefore approached a water point after the herdsman and their livestock were in their bomas for the night.

Boundary crossings

During the 1970s, the results of ranging patterns of six visually identified elephants and radio-collared individuals showed that the majority moved within the national park boundaries (Leuthold and Sale 1973; Leuthold 1977). Leuthold (1977) postulated that the factors that most likely influenced the movements of these elephants at that time included the prolonged drought years of the early 1970s, poaching for ivory, the railway line and main road that acted as a barrier for some elephants and the hunting blocks adjacent to the national park. None of these elephants was recorded within the RWS/TR region, which is not surprising since it was a hunting block until the ban on trophy hunting in 1977.

Most of the elephants that have been observed crossing the railway tracks and the main road have been moving at night, and numerous times elephants have been hit and killed by vehicles and trains (KWS 1999–2001). The sighting of six known bulls and two families originally identified in the national park and subsequently in RWS/TR and one bull first sighted in TR and then in TENP provide empirical evidence that Tsavo East elephants cross the main Nairobi–Mombasa road and railway tracks between the national park and private land.

Elephant paths across national park boundaries to privately owned land have been documented in some areas of Tsavo and most if not all of these paths are thought to be traditional routes that were originally free of human encounter (Leuthold 1977; Kasiki 1998; Low 2000). With the exception in some areas

of livestock ranches, elephants using these traditional routes now must pass close to or through human settlements. Consequently, the frequency of human–elephant conflict during particular times of the year is high (Kasiki 1998).

Bushmeat hunting

The frequency of poaching wildlife with snares and spears for bushmeat throughout Africa (Bowen-Jones and Pendry 1999), in Kenya (Trade Review 2000) and in particular in this region is increasing (Kasiki 1998). Elephants are caught in snares that are set for dikdik, giraffe, lesser kudu, buffalo, impala, zebra and waterbuck (this study; McKnight 1996; KWS 1999–2001).

In addition to the 14 identified elephants in the RWS/TR region caught in snares or speared, an adult giraffe was observed during this study with a snare around its neck and a second giraffe was killed by spears. During one of the road surveys, bushmeat poachers were encountered with a box containing 33 dikdik skulls, 4 kg of wildlife meat, one impala skull and a large torch with a horn attached (a tool bushmeat poachers commonly use to stun wildlife).

Conclusion

There is a growing trend within some areas of the Tsavo ecosystem for groups of private ranches and landowners to combine their land, creating wildlife sanctuaries for tourism, removing snares, and developing conservation-based community enterprises, the aim being to decrease negative effects on the wildlife and the habitat (MGM 1999; CORE-net 2001). The habitat and other wildlife in these areas will benefit from elephants moving through this region. Elephants play a critical role within an ecosystem by creating and expanding waterholes, opening trails for other wildlife (Jarman 1972; Ayeni 1975), dispersing seeds (Muoria et al. 2001; Waithaka 2001) and interacting with woody vegetation. Excluding elephants from regions by fencing and by closing traditional routes between areas by human encroachment could have a negative impact on long-term ecological processes (Waithaka 2001). Elephants moving through areas contribute to animal species and vegetation diversity (Waithaka 2001).

Identifying elephant temporal and spatial grouping patterns and locating the routes they use to cross

national park boundaries and private land will assist KWS in making decisions about providing corridors for elephants to have safe access to their dispersal range and in implementing ways to protect local communities and their crops from elephants.

Mapping the routes, seasonal range and movement patterns of elephants in neighbouring Taita Taveta private land would help landowners and communities make management decisions on land use and implement initiatives to protect the habitat, including providing water, sinking boreholes, fencing, livestock ranching, and addressing conflict issues. A solution to the conflict in Taita Ranch would be to cover the top of the water tanks and allow the elephants to use the natural waterholes.

Future tracking of identified bulls, families and grouping patterns will provide more baseline data to determine if elephants use the southern region of the ecosystem as a corridor between Tsavo East and West National Parks.

Acknowledgements

I thank the Ministry of Education, Science and Technology of the Republic of Kenya (permit number OP13/001/18c/144) for permission to conduct research and Kenya Wildlife Service for affiliation: Dr Richard Bagine (KWS Research), Mr Patrick Omondi (KWS Elephant Programme) and Dr. Samuel Kasiki (Tsavo senior scientist). Earthwatch Institute supported this research and I thank all of the volunteers for their participation. I am grateful to my field assistants: Samuel Chege, Gabriel Matemo and the late Maina Nderi, who were tireless during many long hours of surveys, and the Galla Camp Staff at Taita Ranch. Lesley Bennen and Dr Samuel Kasiki provided helpful comments on the manuscript.

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