MISSION STATEMENT FOR ATE SCIENCE AND RESEARCH: ATE is a trailblazing elephant research programme that contributes to knowledge of large mammal socioecology, provides a basis for public understanding and concern for elephants and their ecosystems, and communicates information enhancing conservation in the Amboseli ecosystem and for regional and global elephant populations.
Introduction

In October 2016, the Amboseli Elephant Research Project entered its 45th year. We would like to firstly thank all the ecosystem partners who have enabled AERP to become the longest continuous elephant research project in the world; the people living in the Amboseli basin who continue to tolerate elephants; the Maasai Communities who work to conserve many species; the Kenya Wildlife Service, its Directors, Wardens and rangers over many years; our ecosystem partners in conservation and anti-poaching - Big Life, Lion Guardians, AWF, IFAW, the Amboseli Baboon Project, and Amboseli Ecosystem Trust; the Government of Kenya, which has granted research clearance from the start of the project alongside a number of collaborating Kenyan institutions; and the lodges (Ol Tukai, Tortilis, Amboseli) and hotels (Serena) which have provided logistical support.

I. Elephant Monitoring

(a) Population and Ecology

As 2016 finishes, Kenya and the Amboseli ecosystem could be heading for a very dry year to come. Rainfall across the ecosystem has been lower than normal with a total of 288mm for the calendar year of 2016, compared to an annual average of 340mm. However, 2015 rains were actually high for November and December and thus the total for the 2016 rainfall year was 467mm (Oct 2015 – Sept 2016; Figure 1), suggesting that the consequences of the very poor short rains for grass growth and water availability won’t be felt until later in the dry season of 2017.

Figure 1: Rainfall for the rain years 2015 and 2016 compared with the 45 year mean

![Rainfall graph]

We continue to classify the total Amboseli elephant population from regular observations of known individuals, most of which have been born into identified families. This population consisted of 1658 individuals (898 females, 757 males) at the end of December 2016. The age distribution (Figure 2) shows the continuing post-drought population recovery from 2009 mortality, with birth peaks at 4-5 year intervals.
(b) Survival

The average to good rainfall over the past several years has meant that elephant food has been abundant within the areas protected from over-grazing by livestock. As a result, elephants have continued to produce calves at record rates (62 females, 59 males in 2016), and calves born in the last 5 years have had excellent survival of over 80-90% during their first, most vulnerable, years of life (Figure 3). The elephants in Amboseli can be considered as one of Kenya’s most successfully protected and healthy populations with an average rate of increase of 4.0% per annum since 2011. As a result of these high birth rates and excellent survival many adult females are now accompanied by three surviving calves. We expect this population growth to stabilise as competition from recovering wildlife (wildebeest and zebra) and livestock populations increase ecological competition for elephants.
There were only 21 deaths recorded in the year 2016, of which nine were of known family individuals who died of natural causes. Five of the deaths were due to human intolerance, while a further five were caused by humans but the motive was unknown. Only one carcass with tusks removed was located. The presence of Big Life Foundation and KWS anti-poaching patrols continue to minimise poaching-related deaths on the Kenya side of the border.

(c) Social dynamics

Our monitoring of individuals over time has generated significant understanding of the nature of elephant family units, and especially provided insights into how families grow and decline in size over time, and when young males disperse from families to join other males in bull areas or to disperse from the ecosystem entirely. These insights have been graphically represented in a visualisation over the 45 years of the study:
Elephants were found in an average group size of 14 (SD ±18.7) individuals over the rainfall year 2015-16 (Figure 4). All-female-calf groups tended to be smaller (12.6 ± 9.7, max size = 64) than were groups that contained both adult males and females (28.1 ± 26.9, max size = 153). Males were typically observed in small bull groups of ~2 (1.8±1.9) individuals with a maximum size of 18 independent males travelling together. As is typical for Amboseli elephants, the largest groups were seen in December and January, especially after the good short rains of 2015-16. Very low amounts of rain during the 2016 long rains (Mar-Jun) coincided with smaller than average groups especially for May, when groups over 30 are typically common.

Figure 4: Average elephant group size plotted against monthly rainfall for 2015-16.

II. Conservation Activities

(a) Distribution and Ranging

As the Amboseli elephant population has grown over time, and the Conservancy movement has taken off outside the Park, more elephants from the protected area of Amboseli National Park have been able to move into these safe havens, which now have food and water for elephants except in the driest periods. As a result several well-known families have become “resident” in the Selenkay Conservancy, while improved security in the cross-border region in recent years has enabled some families to spend more time in Tanzania (Figures 5 & 6).
Figure 5: The primary areas used by family units within the Protected Area of Amboseli National Park in the Wet (a) and Dry (b) seasons of 2016.

Figure 6: Recent range expansion illustrated by two families during 2012 tracking (see ATE Collaring Report 2014). Tracks of VA (Vicky) show range expansion in Selenkay and of MB into Tanzania.

The collaring data, along with our sightings of these families in and out of the National Park, illustrate the vital importance of corridors and dispersal areas over the larger ecosystem. Elephants are now using these parts of what was their pre-1976 range because of good food availability and human tolerance, as also shown by telemetry studies conducted by SFS-IFAW and aerial count data from Jonah Western (ACP). By contrast, the areas used by elephants near Kimana Sanctuary have become isolated by farms and fences, as well as very low tolerance among the agro-pastoralists in those areas, resulting from high levels of raiding (Big Life Foundation). A similar loss of routes and reduced elephant tolerance is becoming apparent in the
Kitenden area, which is a vital corridor for elephants moving between wet and dry season home ranges and for movement between Amboseli and Kilimanjaro. Planned fencing (by Big Life) will mitigate some of the crop raiding issue, but reduced space for pastoralist and wildlife movements and the continued overlap between livestock and elephants remains another part of the human-elephant interface that requires careful management (see also Figure 7).

III. Research Collaborations and Dissemination

a) Overview of on-going research

Our research theme as we go into our 45th year of continuous population monitoring is to focus on how individual ranging and social and reproductive strategies shape elephant population dynamics. These behavioural patterns confer resilience and flexibility on elephant populations, and are important for Amboseli, for Kenya and for elephant populations across Africa that face myriad threats and changes to their landscapes from intensified human activities. Our vital and active monitoring team (Katito Sayialel, Norah Njiraini) has been locating and observing elephants across the ecosystem in 2016. They continue our long-term population monitoring, documenting family dynamics, independent males, and building our dataset on lifetime reproductive success for individuals.

A UK-based PhD student (Victoria Boult) continues to develop her individual agent-based model for the Amboseli elephants using our long-term data. This model will eventually allow us to implement scenario-based modelling to explore the effects of range loss or infrastructure development on elephant movements, reproductive rates and population structure. During Vicky Boult’s visit in May 2015, she met the Big Life team at Mbirikani to explain the aims of the project and how we might use this model to support their efforts. We hope that before completion of her studies she will make another visit when we will be able to showcase the models to the KWS team. Her PhD should be completed in 2018-19, and she hopes to continue researching remote modelling of larger landscape effects on elephant populations.

ATE’s Senior Research Scientist, Dr Vicki Fishlock, is hoping to launch our new large-scale study in early 2017 on how elephants use social and ranging strategies to buffer against anthropogenic risks. In the meantime Vicki has been working on communication tools such as the visualisation and a new database to house the AERP long-term dataset, which will make it easier for the project to share our rich dataset with collaborators. We expect to begin field-testing the new database in July 2017, after almost two years of data audit and construction.

Our new landscape of risk study was supposed to begin in September 2016, but has been delayed by the unavailability of the immobilisation drug M99 that allows us to fit collars. The new study will deploy ten collars in a paired within-family design to allow us to assess: (i) dispersal, risk and survival in adolescent males in a poorly understood phase of their life history; and (ii) leadership and risk avoidance strategies in females.

b) Dissemination

We work to disseminate the results of our scientific findings, so that the Amboseli elephant population can act as the baseline for understanding population dynamics across Africa. These data are increasingly vital given the catastrophic declines in savannah elephant numbers in Tanzania, Mozambique, Zimbabwe and Angola documented
by the Great Elephant Census in 2016. Our data have contributed to modelling ivory harvest potentials (Lusseau & Lee, 2016) relevant to the debates rejecting the continuation of the DMM at the CoP17 of CITES (October 2016), to the African Elephant Coalition’s (AEC) CITES proposal for uplisting of all elephant populations to Appendix I, and to the arguments against the live trade (Lee et al. 2016) among the other CITES proposals. ATE was proud to be able to support our colleagues (KWS, IFAW, KWCA) at CoP17 through the attendance of our US Executive Director Dr Betsy Swart and Director of Science Prof. Phyllis Lee.

Recent 2016 scientific publications by the ATE team and allied researchers were:


IV. Activities with Stakeholders and Communities
a) Stakeholder engagement

2016 was an extremely challenging year in the Amboseli ecosystem for communities and conservation partners. Nine people were killed by elephants and 16 elephants killed in retaliatory attacks. ATE continues to play an active role as technical advisors to Big Life Foundation and to KWS who are the principal agencies managing the human-wildlife interface. In December 2016 ATE attended the first Human Wildlife Conflict Committee meeting, convened by Amboseli Ecosystem Trust in association with KWS. As a result of that meeting, ATE, along with Lion Guardians and Big Life, is in the process of developing protocols to deal with serious incidents in an effort to prevent retaliatory attacks, which spread Big Life and KWS resources thinly across the ecosystem and result in further injuries and fatalities to humans and wildlife. The next step is for AET to bring these protocols to community meetings for discussion and agreement.

ATE is assisting Big Life and Save the Elephants in their monitoring of the elephant “Tim” who has been collared in an attempt to manage crop raiding behaviour as well as anti-poaching protection, given his large tusks. We are working with STE intern Ryan Wilkie to discuss how indications from the first three months of collaring (the last quarter of 2016) might direct future operational decisions. We have provided life history data on Tim and his social companions. Ryan will be full time in Amboseli from January 2017 and we will continue to support him and Big Life in this work. We also continue to work with Big Life to harmonise elephant mortality data for KWS, to identify elephants that have been treated for injuries or illness and where possible provide follow up information on treatment outcomes to KWS vet teams.
The Borderlands Conservation Initiative was relatively inactive in 2016, but is being reinvigorated with input from ACC, ACP, LCAOF, BLF and AET. We continue to participate fully and look forward to more BCI actions in 2017.

In April 2016 ATE Director Cynthia Moss attended the KWS Elephant Strategy meeting in a two-day workshop and attended the KWS Ivory Burn in Nairobi National Park.

**Training, sensitisation and filming**

ATE provides training in elephant behaviour, biology, growth, ageing and sexing to our collaborators within the ecosystem and for range country biologists and conservation managers from Africa and Asia. Training events for 2016 were:

- June: Big Life Rangers training (part of our on-going undertaking to provide all Big Life teams with experience in elephant biology and behaviour to assist with their duties)
- October: Training pilots for aerial census with BLF

Government of Kenya visitors hosted by ATE in the field:

- Jan 2016: Director of Public Prosecutions, Keriako Tobiko
- Feb 2016: Cabinet Secretary for Tourism, Najib Balala
- June 2016: Ghanaian delegation from Ministry of Lands and Natural Resources, Pre-CITES fact-finding on elephants

**Supporting authorised filmmakers**

- National Geographic: elephants and climate change
- CNN, Inside Africa: elephants and poaching
- NTV Wild: elephants of Amboseli

**b) Consolation Scheme**

Our consolation scheme, which addresses the loss of cattle, sheep-goats, and donkeys as a result of interactions with elephants outside the protected area of Amboseli National Park paid out a total of 375,000 KSh in 2016. By comparison with 2015 with 22 events, the number of events (30) has increased substantially. While part of this increase could be due to greater dispersal away from the protected area of the National Park, i.e. more elephants distributed over a larger area of the ecosystem, it is likely that greatly increased livestock numbers coupled with a very dry long rains exacerbated the overlap between elephant and livestock needs for forage and water and caused a greater number of livestock deaths. This programme remains vital to sustaining some tolerance of elephants among Maasai pastoralists even when they experience livestock losses caused by elephants. The negative interactions between elephants and livestock were concentrated in the south, with fewer in the north and west (Figure 7).
c) **Scholarships**

ATE fosters livelihood development among young men and women by funding secondary and university students from the Group Ranches surrounding Amboseli National Park. During 2016 we sponsored four girls and one boy in primary school. Two of our primary school girls did very well in their Kenya Certificate of Primary Education and got into good district schools for their Secondary education. We also sponsored one girl in secondary school who also performed very well in her Kenya Certificate of Secondary Education. She is waiting to be admitted in university. We also funded eight university and technical institution students from the Maasai communities. These scholarships again build capacity across many different areas of learning and professional training for members of the Maasai communities who share their lives with the elephants.

*Cynthia Moss, Director*

*Phyllis Lee, Director of Science*

*March 2017*
List of Abbreviations
ACC  African Conservation Centre
ACP  Amboseli Conservation Programme
AERP  Amboseli Elephant Research Project
AET  Amboseli Ecosystem Trust
BLF  Big Life Foundation
IFAW  International Fund for Animal Welfare
KWCA  Kenya Wildlife Conservancies Association
KWS  Kenya Wildlife Service
LCAOF  Liz Claiborne Art Ortenberg Foundation
SFS  School for Field Studies