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## RESILIENCE IN EAST AFRICAN LANDSCAPES (REAL) PROJECT IN AMBOSELI

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This research report has been created for people in Amboseli, Kenya. This report gives information about the Resilience in East African Landscapes (REAL) project, and the work of REAL researchers Esther Githumbi, Rebecca Kariuki and Anna Shoemaker.

## What is the REAL Project?

The REAL project began in 2014 and ends in 2017. The REAL project members are a group of academic researchers working at seven universities across Europe<sup>1</sup>. The main purpose of the REAL project is to train twelve PhD students to do research on human-environmental interactions in East Africa. The REAL project also has 10 associate partners at institutions in East Africa and Europe<sup>2</sup>. The REAL project is funded by the 'European Union', through a program called the 'Seventh Framework Programme' for research, technological development and demonstration under grant agreement number 606879.

## Who are the REAL PhD students working in Amboseli?

**Esther Githumbi** is about to complete her PhD in Environmental Geography at the University of York. Esther is Kenyan and with a background in environmental conservation and natural resource management, she has been involved in palaeoecological studies of wetlands since 2011.

**Rebecca Kariuki** is an ecologist from Kenya. She is studying Environmental Geography at the University of York, UK and has worked for several years in East African savanna ecosystems such as Maasai Mara, Laikipia and the Mt Kenya region.

**Anna Shoemaker** is studying archaeology at Uppsala University in Sweden. Anna is originally from Canada, and has been involved in archaeological projects in East Africa since 2011.

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<sup>1</sup>Uppsala University (Sweden); Stockholm University (Sweden); University of York (United Kingdom), University of Warwick (United Kingdom), University of Cologne (Germany), University of Ghent (Belgium), and L'École des Hautes Études en Sciences Sociales-CNRS, Paris (France).

<sup>2</sup> Joost Fontein (British Institute in Eastern Africa, Kenya); Christian Thibon (L'Institut Français de Recherche en Afrique, Kenya); Thomas Bignagwa (Institute of Resource Assessment, University of Dar es Salaam, Tanzania) ; David Mburu (Department of Agriculture and Technology, Kenyatta University) ; Stephen Rucina (Palynology Department, National Museums of Kenya) ; Kennedy Mutundu (School of Social Science, Mount Kenya University) ; Jeff Worden (Northern Rangeland Trust, Kenya) ; Damien Vilot (Bayer CropScience, Bayer East Africa) ; Göran Wiklund (U&We, Sweden); David Western (African Conservation Centre).

## Environmental History of Amboseli

By Esther Githumbi

The environmental history of the Amboseli is important to us for understanding the environment in which past communities lived. People make decisions about where to settle based on the environment such as the availability of water, productive soil or enough land that provides pasture. There are different ways of finding out the state of the past environment and in this instance I used plant micro and macro fossils from swamp sediment to develop records of change. Sediment cores from Esambu, Kimana, Ormakau and Enkongou were retrieved and processed for pollen, macro charcoal, loss on ignition (LOI), particle size analysis (PSA), magnetic susceptibility and geochemical profiles.

The pollen tells us what plants were found in the landscape at a particular time and from that we can guess what the climate was that could support the vegetation that we observe. The charcoal tells us if there were fires in the landscape, the size of the fires (from the amount of charcoal counted), and the frequency of fires (from how often we observe the charcoal). Loss on ignition measures the amount of organic matter in the soil and this tells us about the amount of plant matter that was available in the environment and so one can estimate whether it was a dry or wet period. Finally the particle size analysis approximates the amount of sand, silt and clay which can be used to understand periods of soil erosion. The sediment records were radiocarbon dated meaning we are able to estimate the age of the sediment core and the oldest date was ~5000 cal yr BP.

The data tells us that over the last 5000 years, Amboseli has mainly been dry. There have been periods of increased rainfall but also periods of severe drought. The main sources of water have been the swamps and the water from the swamps comes from the underground springs. The amount of water underground is controlled by rain on Mt. Kilimanjaro which then flows down and influences the water table across the Amboseli landscape.

Because of the nature of the work I do, I was not able to spend a lot of time in Amboseli speaking with the people; instead I took samples of the soil from the swamps which have increased our understanding of the environment in which people have lived over the last 5000 years. I am very happy to have had the opportunity to carry out this work and to have been welcomed and allowed to visit the swamps, I hope the little information provided by this work is useful for current and future generations and if anyone would like to learn more about this kind of work they are very welcome to contact me. Thank you to everyone who helped to make this work possible.

## **Social-ecological modelling research in Amboseli**

*By Rebecca Kariuki*

Amboseli is a semi-arid landscape located in southern Kenya. It includes the Amboseli National Park and other areas surrounding the park. It is predominantly home to the Maasai community that has practiced pastoralism in the area for many years. However, other immigrant communities such as the Kamba and Kikuyu from Kenya and the Chagga from Tanzania are also found in Amboseli. The average annual rainfall in Amboseli is  $350\text{mm}\text{yr}^{-1}$  making pastoralism the most efficient land use type as rainfed agriculture is unsustainable. Pastoralists in Amboseli move their livestock from one place to another following the changing patterns of rainfall. Generally, they move their livestock from dry season grazing areas, which are mainly located near swamps, to temporary wet season grazing areas. These movements ensure that livestock has enough fodder throughout the year and diseases are avoided.

I am interested in understanding how pastoralists in Amboseli use their land, what makes them to change (or not) from one land use type to another and the impacts of different land use types on livestock and wildlife numbers as well as on pastoralist's income. To understand these interactions, I have developed a model which simulates land use changes in Amboseli in five simulation steps. The first model step involves designing the Amboseli landscape using the average amount of grass in Amboseli per year and the average density of households, livestock and wildlife in the area. The second step simulates the growth of grass in the landscape created in the previous step. Simulation of grass growth is dependent on rainfall. When rainfall is high, there is more grass and when rainfall is low, there is less grass. The third step simulates grazing by livestock and wildlife on the grass grown on the second step. The fourth step involves calculation of the potential income from each land use practiced by a pastoralist in his/her parcel of land. The calculation is based on the following factors: amount of rainfall received, available grass, distance to permanent water sources, distance to roads, number of households in the area and the land tenure type. In the final step, each

pastoralist selects the land use type that has the highest income. Additionally, the average livestock and wildlife numbers associated with the selected land use type are calculated and the model is updated.

For me to select the main environmental and socio-economic factors that make pastoralists to change from livestock grazing land use to another land use type, I carried out interviews with pastoralists from Amboseli. I did the interviews in January and February 2016 and spoke with pastoralists in Kimana, Namelok, Olgulului/Olorashi and Kuku group ranches. As I was interested in long term land use changes, I spoke with elderly local community experts who told me the history of land use changes as best as they could remember. Based on their perceptions of land use change, most pastoralists felt that the main reasons for land use change in Amboseli included rainfall patterns, pasture and water availability, land ownership, socio-economic development and human population growth. Additionally, through the interviews, I learned the thresholds of each factor in driving the decisions by pastoralists to change (or not) their land use type.

From the model, pastoralists whose land is located near permanent sources of water are likely to change from livestock grazing to irrigated agropastoralism in event they do not get adequate income from pastoralism alone. Where pastoralists get benefits from wildlife conservation they are likely to practice livestock grazing with conservation activities. While the model is a representation of the real environment, it does not take into consideration all the factors that make pastoralists in Amboseli to change (or not) from pastoralism to other livelihoods. This is because it is impossible to include all of them without complicating the model. However, as a social-ecological modeler, I endeavour to make a model that is as informative as possible and is not complicated.

Learning about Amboseli from the pastoralists I talked with has taught me the importance of the knowledge from local communities. This indigenous knowledge coupled with modelling work can be used to inform the management of natural resources and in making conservation policies. I am currently writing about my work in Amboseli as a thesis. I intend to publish the thesis chapters as independent papers later in the year and will

make them available to different stakeholders in Amboseli in 2018.

Spending time in Amboseli and interacting with people has made me appreciate the dynamic interaction between people and nature in Amboseli. Many thanks to my research assistants: Daniel Letee, John Lembakuli and Rebecca Muthoni; for their help, hard work and commitment during field work. I am also very grateful to all my interviewees for their kindness and patience during the interviews and for their valuable insights on Amboseli. Many thanks for the support from John Parit of Olive Branch in Amboseli and Koikai Oloitiptip, Benson Leyian and Daniel Mwato of African Conservation Centre (ACC). Your help has gone a long way in improving my knowledge of Amboseli.

## Archaeological research in Amboseli

By Anna Shoemaker

I am working in Olgulului/Olarashi group ranch. I spent most of 2015 doing archaeological research here. I worked with a team of people including Samuel Ntimama, John Mbakuli, Sainepune, and Raphael and Alice Musere. I try to understand what life was like for pastoralists living in Amboseli in the past from the things they left behind. I am interested in learning about pastoralists in the past because having livestock in Amboseli today is becoming more difficult. Some reasons why are because there is not as much land or water available to pastoralists today, and livestock are being valued less and less. Livestock and pastoralists are important in Amboseli for maintaining a healthy environment. Also, caring for livestock is important to Maasai people, to their sense of identity and heritage.

As an archaeologist, I look all over the landscape for old things made by people in the past. While doing research in Amboseli, we found many old things like pieces of pots, arrowheads, blades, and jewelry made of iron, beads made of glass and ostrich egg shell, cowry shells, grinding-stones, sharpening stones, stones made of obsidian, and even a stone for playing Bau. We also found mulwas that are very old. We dug into these mulwas to try and learn about how long ago people lived here, and how living in Amboseli was different 100 years ago, even 400 years ago compared to living in Amboseli today.

It was also very important for me to talk to elders living in Amboseli, to learn from men and women about Amboseli's past. From learning the stories of things from the past, I came to understand that pastoralists in Amboseli are in many ways self-sufficient. They can live for many days on the milk, blood, and meat of their animals, and know very much about the uses of plants growing in the basin. People know how to care for their animals, and when and where to take them to get water, pasture, salt, and medicines in Amboseli. This knowledge has been successful at maintaining people and their livestock in Amboseli for a long time.

But I also met with many elders who explained to me where the Kisongo in Amboseli used to get items not made in the basin, and what they used to trade for them. I learned that many of the things that people in Amboseli had in the past like pottery, iron, cowry shells, and beads came from Chagga and Kamba and Arusha people. I have learnt that non-pastoral communities living on Mt Kilimanjaro, like the Chagga, but also the Kamba people living elsewhere have been important to pastoral communities in Amboseli.

When people think about how best to prepare pastoralists in Amboseli for the future, many tend to think of Amboseli and the pastoralists here as if they are living on an island. I learned one example of why this thinking is not helpful. When I was looking for old mulwas in Olgulului/Olarashi, I found that many mulwas are located next to rivers. Rivers like Kitenden and Naiperra that used to have a lot of water flowing in them. In the past people could live here in the wet season and dig ilumbwa or enturore oo'Ichorroi. But now, the water that once flowed in the rivers into Amboseli is being used by people upstream. It is difficult for a herder living in Madaba to negotiate with farmers in Tanzania, or to negotiate with the Tanzanian government. It is difficult for a herder living in Madaba to find a compromise where some water can still flow downstream into Olgulului/Olarashi. It is better when we think how to manage Amboseli's environment for pastoralists in future years, we should think about how to manage the resources not just in Amboseli but also on Kilimanjaro, so everyone can benefit.

Another thing I have learnt is that some researchers who are trying to understand issues affecting herders in Amboseli focus on the conflict and competition between herders and farmers in Amboseli. But, I have found that while people in the past did have conflicts (including cattle raiding), they also had many friendships and alliances. Herders in Amboseli relied on farmers on Kilimanjaro to get things like iron, pottery, beads, and bananas. Farmers on Kilimanjaro relied on herders in Amboseli to access things like livestock, milk and salt. There was a lot of trade happening between Amboseli and Kilimanjaro communities in the past because the resources in Amboseli are so different from the resources on Kilimanjaro, and the resources on Kilimanjaro

are so different from the resources in Amboseli. It has been good to have communities producing different things living near each other, because they have helped each other get the things they don't have.

I have even learnt that in the past when there is drought or disease, when the cows die, and the Maasai in Amboseli are suffering they can go and get food from farmers on Mt Kilimanjaro. If someone even lost all of their animals in the past, they could go live with the Chagga and learn to farm and survive.

There are challenges that herders and farmers in Amboseli are facing now because of competition over land and water. However, if we look at the history of relationships between farmers and herders in Amboseli and surrounding areas, we can see that there was a lot of cooperation. Even today we can see many farmers and herders cooperating in Amboseli and buying and selling goods to each other. We see people who were once herders become more invested in farming. I think many things have changed in Amboseli over the last couple of centuries. Irrigation farming in Amboseli is something that is pretty new. But farmers and herders are not strangers to each other, and they were not strangers in the past.

There are many ways to tell the history of Amboseli. As an archaeologist, I am trying to tell a history of Amboseli from the things that myself and my research team found on the landscape. In 2018 I will publish a book about all that I have learned from my archaeological research in Amboseli. I hope you find that I have captured the history of Amboseli well. Much of what I have learnt has been taught to me from the people I work with and the people I have had conversations with in Amboseli. I thank you for sharing your knowledge



Rebeccas' research assistants interviewing pastoralists in Amboseli in January 2016.



Archaeologists at work in Amboseli, 2015.