

Nature's great masterpiece

We think we know a lot about elephants, but much of it is half-truths or myths. The world's most studied elephants, at the Amboseli National Park in Kenya, are helping us nail down real knowledge. **Liz Else** talked to **Cynthia Moss**, the former *Newsweek* reporter who set up the project four decades ago

After nearly 40 years at the Amboseli Elephant Research Project, what do we really know?
One thing we can say with confidence is that elephants live in a very complex social system. The core is the family unit, made up of related females and their offspring. But what the Amboseli study showed is that there are layers of relationships between the families resulting in bond groups, clans and sub-populations. DNA analysis has helped us understand how the females in these layers are related.

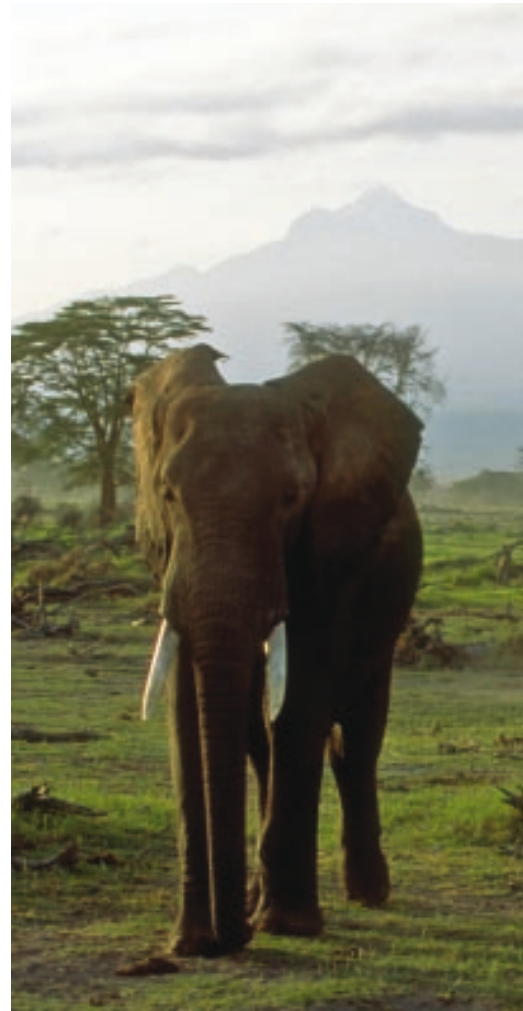
How did you find this out?
Years of recording who spends time with whom for both individuals and families has revealed the multi-tiered nature of this social

system. Also, one of my colleagues, Karen McComb, examined the pattern of those associations using "playback" experiments. She played the contact call of one elephant to her family, to close associates in her bond group, and to other less familiar elephants. The very different reactions to the call – indicated by moving towards the speakers, ignoring the calls, or nervously bunching – confirmed the structure as we described it. It was striking.

So you track individual family groups?
Yes, but actually our research concentrates on following individuals over time, not just families. We now have a unique database of over 2500 individual elephants who lived and died at Amboseli, and we also know the month and year of birth, and birth mother for most of them. This data is gold for those interested in individual lifetime experience and success.

How cooperative and flexible are elephants?
So much so it was a surprise, even to us. Joshua Plotnik and colleagues at Emory University in Atlanta, Georgia, recently reported elephants were as good as chimps at cooperation in an adapted chimp experiment in which two animals can bring a platform bearing food within reach only if both simultaneously pull on the ends of a rope.

And we have found how flexible elephants can be. They live in a "fission-fusion" society. For example, depending on environmental conditions, an adult female and her calves might leave the larger group for days or weeks. At other times, she and her family might join others to form a huge group of 300 to 400 elephants. During the terrible drought in 2009 when over 400 of our 1500 elephants died, those that moved to new areas coped



well. Others that were less flexible lost many members. There is great variety between families and individuals – that's one of the things I find so fascinating about elephants.

Did they grieve for the dead?
Yes, although they were on the point of death so they didn't have much energy to do it. I saw what happened to the tight-knit family of 40 led by matriarch Echo. After she died, the family broke into five subunits. One daughter would not leave the area where Echo's body was. Other times when an elephant dies, they go to the carcass, check it, stroke and turn the bones. We still don't know why, but they apparently recognise a carcass and even bones as those of elephants because they show no interest in other animals' remains.

So grieving is not myth, but the response of intelligent creatures?
Yes. From my observations, I think they are

MICHAEL SETBOURN



PROFILE

In 1972, Cynthia Moss and colleagues set up the Amboseli Elephant Research Project, part of the Amboseli Trust for Elephants, Kenya. Their scientific compilation, *The Amboseli Elephant: A long-term perspective on a long-lived mammal* was published recently (University of Chicago Press) after 11 years in the writing



Until recently, Amboseli's bull elephants were relatively free from poaching

So living a long time is crucial for elephants?

You probably aren't going to be a successful male unless you do. Bull elephants continue to grow throughout their lives. The older, the bigger, and bigger males are more successful at mating and siring calves. Older females are much more experienced and wiser than the younger ones. Crucially, they are much better at recognising the danger of three lions rather than one. We've just published a paper in the *Proceedings of the Royal Society B* emphasising the adaptive value of age.

What's left to discover?

A lot. A huge part of the elephant world depends on odour but we know little about it. We know they have a very good sense of smell but it's very hard to capture all that's going on in a wild ecosystem. Empathy is another area where we have clues but know little. One day, Joyce Poole saw a family approach an electric fence, and when a young elephant reached out for the wire, an older female looked alarmed, waiting for it to get zapped. Her posture and blinking eyes showed she was wincing. But to know more, we'll need better experiments we can do in the wild, which is a great challenge.

The poet John Donne described elephants as Nature's great masterpiece. Do you get that?

Yes. I first came to Africa in 1967 and fell in love with elephants. I spent time with pioneering researcher Iain Douglas-Hamilton, and after that I wanted nothing more than to start my own project. Finally in 1972 came the chance to study the Amboseli elephants. For the first three years I worked with a proper biologist, Harvey Croze, but then continued on my own.

You do leading research - without qualifications

I have an undergraduate philosophy degree and an honorary doctorate, that's it. But with doing the research and writing five books about Amboseli, including the latest scientific one, it feels like I've been doing a 40-year PhD!

What of the future? Is poaching gaining hold?

The local Maasai have rarely turned to ivory poaching, but life is changing. Middlemen offer as much as 8000 shillings for ivory. At that price, one elephant could equal several years' salary. The trade is fuelled by a huge, rapidly growing middle class in China that wants ivory as a status symbol because it used to be owned only by the nobility. We face a major task trying to stop the trade. ■

very intelligent. Two of our researchers, Dick Byrne and Lucy Bates, write in our new book that the elephant brain is the largest of all land mammals, with an encephalisation quotient – which shows the cost to the animal of so large a brain – ranging between 1.3 and 2.3. This is comparable to that of apes, but not in the range of dolphins or humans. It is by no means an absolute measure of brain power, however, so there is a great deal to find out. For example, why do elephants have the von Economo neurons, which are also found in humans, great apes and certain whales?

What about musth?

Early on in the research, my colleague Joyce Poole and I discovered what musth was about. Musth is a time when bull elephants become very aggressive as their testosterone levels raise tenfold. The many musth characteristics, including a particular walk, dribbling strong urine, or secreting from facial glands, are a

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kind of honest advertising. It tells other males that the musth male is in very good condition, surging with hormones, and willing to fight to the death. To females, he's advertising that he's very healthy and would be a good father.

Do these fired-up bulls father all the calves?

About 85 per cent of calves were fathered by males in musth – but no male under 25 ever fathered a calf. It's the males in their 40s and 50s that do most of the mating and fathering.

Yet hunters kill older elephants?

Tragically yes. Hunters always say, we only kill old males no longer of value to the population. We showed that this was wrong. The big males are the ones important for breeding.

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