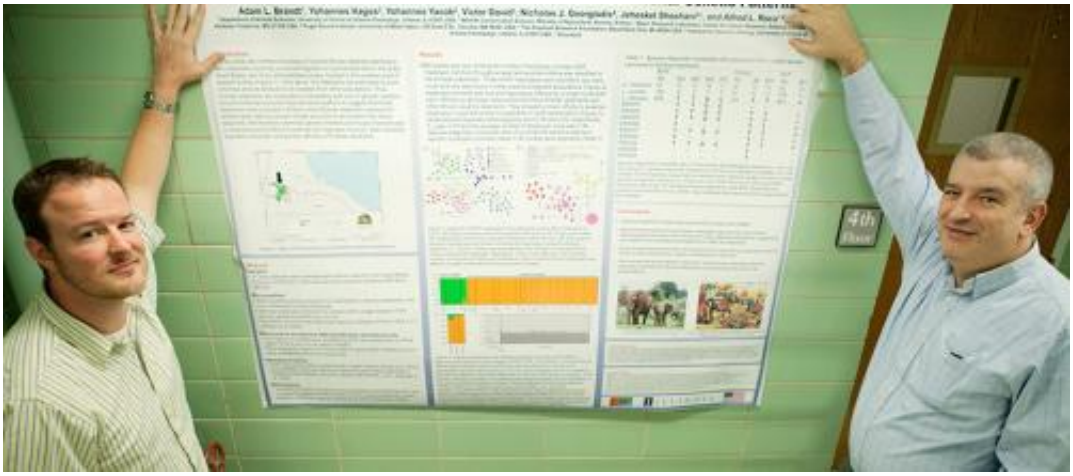
War elephant myths debunked by DNA

January 9 2014, by Claire Sturgeon



First author Adam Brandt, left, shown with Professor of Animal Sciences and IGB member Alfred Roca.

Through DNA analysis, Illinois researchers have disproved years of rumors and hearsay surrounding the ancient Battle of Raphia, the only known battle between Asian and African elephants.

"What everyone thinks about war elephants is wrong," said Alfred Roca, a Professor of Animal Sciences and member of the Institute for Genomic Biology at the University of Illinois at Urbana-Champaign, who led the research published in the *Journal of Heredity*.

After Alexander the Great's premature death, his vast kingdom was divided among his generals. "Being generals, they spent the next three

several centuries fighting over the land in-between," Roca said.

The Battle took place in 217 B.C. between Ptolemy IV, the King of Egypt, and Antiochus III the Great, the King of the Seleucid kingdom that reached from modern-day Turkey to Pakistan.

According to historical records, Antiochus's ancestor traded vast areas of land for 500 Asian elephants whereas Ptolemy established trading posts for war elephants in what is now Eritrea, a country with the northern-most population of elephants in East Africa.

In the Battle of Raphia, Ptolemy had 73 African war elephants and Antiochus had 102 Asian war elephants, according to Polybius, a Greek historian who described the battle at least 70 years later.

"A few of Ptolemy's elephants ventured too close with those of the enemy, and now the men in the towers on the back of these beasts made a gallant fight of it, striking with their pikes at close quarters and wounding each other, while the elephants themselves fought still better, putting forth their whole strength and meeting forehead to forehead," said Polybius in The Histories.

"Ptolemy's elephants, however, declined the combat, as is the habit of African elephants; for unable to stand the smell and the trumpeting of the [Asian] elephants, and terrified, I suppose, also by their great size and strength, they at once turn tail and take to flight before they get near them."

Over the years, there has been a lot of speculation about Polybius's account.

"Until well into the 19th century the ancient accounts were taken as fact by all modern natural historians and scientists and that is why Asian

elephants were given the name Elephas maximus," said Neal Benjamin, an Illinois veterinary student who studies elephant taxonomy and ancient literature with Roca. "After the scramble for Africa by European nations, more specimens became available and it became clearer that African elephants were mostly larger than Asian elephants. At this point, speculation began about why the African elephants in the Polybius account might have been smaller. One scientist, Paules Deraniyagala, even suggested that they might even have been an extinct smaller subspecies."

In 1948, Sir William Gowers reasoned that Ptolemy must have fought with forest elephants that fled from larger Asian elephants, as Polybius described. Since then, the idea has been cited and re-cited in many papers.

Until now, the main question remained: Did Ptolemy employ African savanna elephants (Loxodonta africana) or African forest elephants (Loxodonta cyclotis) in the Battle or Raphia?

"Using three different markers, we established that the Eritrean elephants are actually savanna elephants," said Adam Brandt, a doctoral candidate in Roca's laboratory and first author of the paper. "Their DNA was very similar to neighboring populations of East African savanna elephants but with very low genetic diversity, which was expected for such a small, isolated population."

The markers also revealed that these Eritrean elephants have no genetic ties to forest or Asian elephants, as other authorities have suggested.

For mitochondrial DNA (mtDNA), the genetic information is passed from mother to offspring, and is not transmitted by males. Female elephants stay with their natal herd while the males disperse to mate with different populations. Thus, the mtDNA would be a telltale sign of

whether there had been forest or Asian elephants in the Eritrean population at one time.

"In some sense, mtDNA is the ideal marker because it not only tells you what's there now, but it's an indication of what had been there in the past because it doesn't really get replaced even when the species changes," Roca said. "The most convincing evidence is the lack of mtDNA from forest elephants in Eritrea."

Roca and Brandt hope their findings will aid conservation efforts.

"We have confirmed that this population is isolated and may be inbred," Brandt said. "This population will require habitat restoration and preservation to minimize the possibility of human conflict. That's really the issue—not having a place to go."

Brandt said that future conservation efforts could even establish a connecting habitat between the Eritrean population and their closest relatives, the East African savanna elephants, to provide an influx of genetic diversity. But, he admits, that's a "pretty lofty ambition."

Still, there's hope.

"From what I read, the Eritrean government is pretty committed to conservation," Roca said. "They are planning to establish a large number of wildlife conservation areas, and one of the things at the top of their list is the elephants."

More information: The paper "The Elephants of Gash-Barka, Eritrea: Nuclear and Mitochondrial Genetic Patterns" was published in the *Journal of Heredity* and is available at jhered.oxfordjournals.org/content/105/1/82

Provided by University of Illinois at Urbana-Champaign