

# In the footsteps of prehistoric elephants

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<http://mleisa1.wordpress.com>

Seven-million-year-old footprints from the Arabian Desert provide the oldest known evidence of how elephant ancestors interacted socially.

The Mleisa 1 site in the United Arab Emirates features exceptionally long trackways of a single herd of at least 13 elephant individuals. The herd walked through mud and left footprints that hardened, were buried, and then re-exposed by erosion. Analysis of trackway stride lengths reveals the herd contained a diversity of sizes, from adults to a young calf, making this the earliest direct evidence of social structure in prehistoric elephants ever discovered.



Reconstruction of the Mleisa 1 prehistoric elephants by Mauricio Anton.

An international team from Germany, France, the United States, and the United Arab Emirates published the study in *Biology Letters* on February 22, 2012. Primary author Faysal Bibi is a researcher at the Institut International de Paléoprimatologie, Paléontologie Humaine : Évolution et Paléoenvironnements in Poitiers, France, and the Museum für Naturkunde in Berlin, Germany. Co-authors are Brian Kraatz, assistant professor of anatomy at Western University of Health Sciences; Nathan Craig, assistant professor of anthropology at Pennsylvania State University; Mark Beech, Abu Dhabi Tourism & Culture Authority; Mathieu Schuster, research associate, Université de Strasbourg, France; and Andrew Hill, professor of anthropology, Yale University.

“Basically, this is fossilized behavior,” says Bibi, “This is an absolutely unique site, a really rare opportunity in the fossil record that lets you see animal behavior in a way you couldn’t otherwise do with bones or teeth.”

Not only were the prehistoric elephants herding, but a 260m-long trackway of a solitary male at the same site indicates they also differentiated into solitary and social groups, and that these might have been sex-segregated just like in elephants today. In living elephants, adult females lead the herds while males disperse at sexual maturity and come back only to mate; such behavior is also suggested at the Mleisa 1 site.

“The Mleisa 1 fossil trackways are the most extensive ever recorded for mammals,” said William Sanders, a paleontologist at the University of Michigan who was not involved in the study. “Bibi et al.’s analysis is an exemplary and comprehensive example of what can be garnered from ancient footprints.”

Mleisa 1 is one of the largest trackway sites in the world, covering an area of 5 hectares. Though the site had been known for some time, it was only when the scientists photographed it from the air that its significance became clear.

“Once we saw it aerially, it became a much different and clearer story,” Kraatz said. “Seeing the whole site in one shot meant we could finally understand what was happening.”

Co-author Nathan Craig used a camera-mounted kite to take hundreds of aerial photos that were then digitally stitched together to form a highly accurate photomosaic of the site [viewable here: <http://gigapan.org/gigapans/78542> ].

Mleisa 1 is one of many fossil sites of the Baynunah Formation, a sequence of mostly river-deposited sands that is widely exposed over the Al Gharbia region of Abu Dhabi Emirate. Most Baynunah sites have yielded fossilized bones showing a diversity of animals lived in the Arabian Peninsula in the late Miocene Epoch, between 6 and 8 million years ago. The Baynunah rocks and fossil indicate that at this time, a river system came across the Arabian Peninsula through what is today the United Arab Emirates. The freshwater ecosystem supported a thriving African-like fauna during that time. The river subsequently dried up and those animals disappeared with that river system, including the elephant ancestors whose prints are preserved at Mleisa 1. The Baynunah Formation sites in Abu Dhabi Emirate are the only such fossil sites known from this time period from the entire Arabian Peninsula.

"The trackways are visually stunning," says co-author Andrew Hill. "It is quite obvious to anyone, without any technical knowledge, that these are the footprints of very large animals, and to learn that they are over 6 Ma old presents a visitor with the sensation of walking back in time, across a Miocene landscape where elephants might have strolled by just a little time before."

**The Baynunah Paleontology Project** proceeds as a collaboration between the Yale University Peabody Museum of Natural History and the Abu Dhabi Tourism & Culture Authority<sup>1</sup>.

#### **Additional Information and Media:**

The Mleisa1 Trackway Site Press Page, which features the full article, supplementary information, high-resolution images, and author biographies: <http://mleisa1.wordpress.com>

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