

Study: Ancient whale swam hundreds of miles up African river

March 17 2015, by Geoffrey Mohan, Los Angeles Times



James G. Mead excavating the whale specimen in the "Open Pit Turtle Mine", Williams' Flat Loperot, Kenya, Summer 1964. Credit: James G. Mead.

A 22-foot beaked whale that apparently took a wrong turn up an African river about 17 million years ago may offer clues to the climate-change forces that shaped human evolution.

Lost for more than 30 years, the fossilized beak and jaw bone help determine that the East African Plateau probably began rising no earlier than 17 million years ago, according to a study published online Monday in the journal *Proceedings of the National Academy of Sciences*.

That geologic upheaval in an area known as the cradle of humankind is believed to be responsible for the gradual conversion of dense, humid forests into more sparsely treed grasslands that made upright locomotion on two feet advantageous to evolving human ancestors.

"The whale is telling us all kinds of things," said study co-author Louis Jacobs, a paleontologist at Southern Methodist University in Dallas. "It tells us the starting point for all that uplift that changed the climate that led to humans. It's amazing."

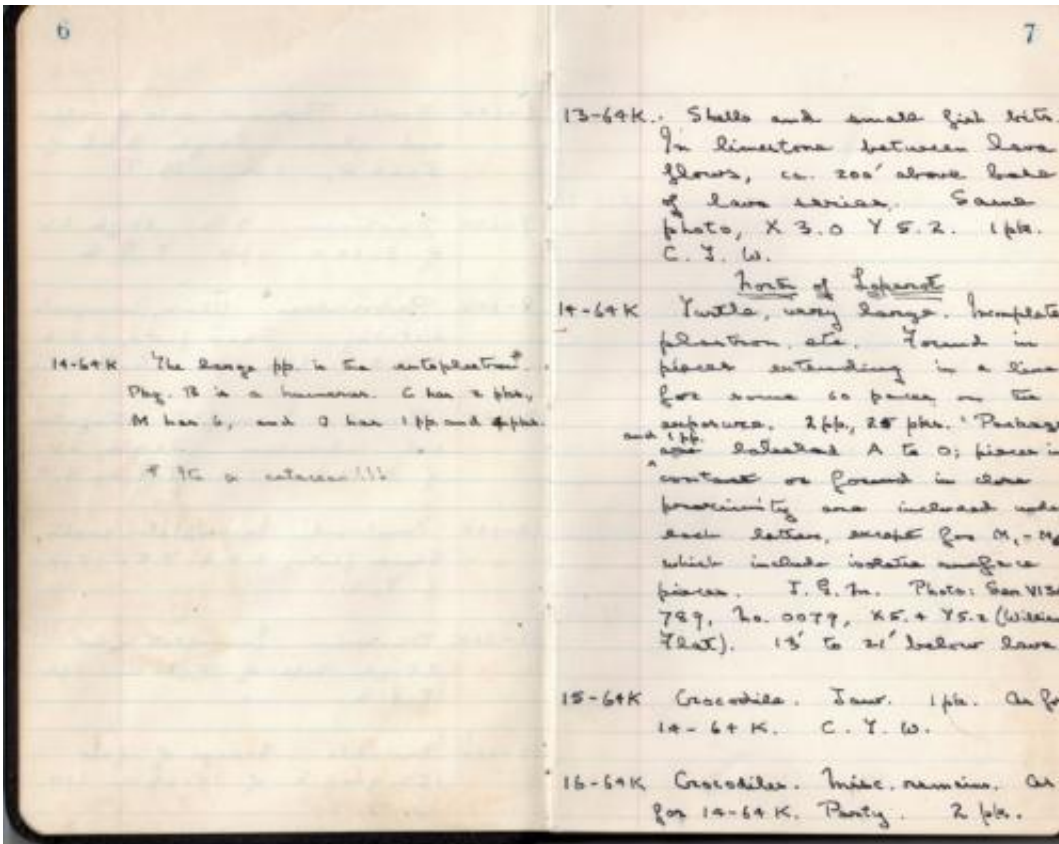
Jacobs had been searching for the specimen since 1980, when he was head of paleontology at the National Museums of Kenya. He had read about the 1964 find, by James G. Mead of the Smithsonian Institution, in a 1975 research paper.

Every time Jacobs visited Harvard, Washington or Nairobi, he would try to find it.

"It was protected by a plaster jacket, so you couldn't really see it," he said. "I suspect nobody knew what it was. It was just kept in the collections there."

Finally, just before another trip to Kenya in 2011, a collections official at Harvard located the fossil, sheathed in the protective jacket, Jacobs

said.



The original fossil catalogue from the Harvard Loperot Expedition in 1964. In the field the fossil specimen (14-64K) was mistakenly considered to be a turtle and later corrected to be a whale. Credit: Bryan Patterson

Jacobs had the specimen scanned and analyzed, then contacted Henry Wichura, a structural geologist at the University of Potsdam in Germany, who had been studying plateau region, trying to determine when it started rising. He had found evidence that rivers and lava had flowed east from high points on the plateau at least 13 million years ago.

"What was missing was geological evidence of the onset" of uplift,

Wichura said. "That doesn't exist in this area, not in the normal geological sense."

That's because the area is being shaped by multiple forces. A hot spot in Earth's mantle has been pushing up a wide area of East Africa, while rifts from tectonic forces have been fracturing the crust. That doesn't bode well for fossils in sedimentary rocks.

The researchers used Mead's original field notes to pinpoint where the fossil had been excavated, and at what elevation - more than 2,000 feet above modern sea level. Then they looked up incidents of whales swimming upriver from the sea.



A 17 million-year-old whale fossil stranded far inland in Kenya now sheds light on the timing and starting elevation of East Africa's puzzling tectonic uplift, says paleontologist Louis Jacobs, Southern Methodist University, Dallas, who

rediscovered the fossil. Credit: Southern Methodist University

"That river had to be a large river with a low gradient and it had to swim a long way up," Jacobs said.

No whale had swum to anywhere close to such an elevation. Even the Antarctic minke that took the longest known detour, more than 600 miles up the Amazon and its tributary, the Tapajos, reached an elevation of little more than 3 feet above the Atlantic Ocean. A [humpback whale](#), dubbed Humphrey, twice swam a more modest 82 miles up the Sacramento River in California. Freshwater dolphins have been found at elevations of more than 300 feet in Peru.

Those detours or strandings occurred in relatively deep river systems that fell by a maximum of 1.1 inches per mile, the study found.

Based on the [sea level](#) and shape of the African coast at the time, the whale would have traveled 372 to 559 miles from the Indian Ocean, bringing it to an elevation of 78 to 121 feet, according to the study. So, the area must have risen at least 1,935 feet to reach its present elevation, the authors estimate.

The whale bone was found in a thick layer of sediment beneath a lava flow dated to 17 million years old, according to the study. Around it were mammal fossils that date to a period when Africa and Eurasia were joined.

"We knew it had to be after the big exchange between Eurasia and Africa, when elephants left Africa, and when carnivores and various kinds of hoofed animals came in," 23 million years ago, Jacobs said. Because the fossil was located closer to the border of the 17-million-year-

old basalt flow, researchers concluded that uplift could not have started any earlier.

Fossil and geologic evidence correlate that uplift with a long-term drying of the local climate, which changed a humid forest into grasslands with more widely spaced trees. Scientists theorize that this kind of environmental pressure favored primates that could straighten their back and walk longer distance on two feet, leading to the radiation into species that led to modern humans.

The chances that one such modern human, Mead, would find a fossilized bone from an errant marine mammal, buried under the desert, are astonishingly slim. "It's an amazing thing," Jacobs said. "But there it is."

Although such a find so far inland may seem to defy logic, "there is really no better answer that I can see than the one they present," said Eric M. Roberts, a geologist at James Cook University in Australia who studies the same region.

Roberts cautioned that recent work in the rift zone where the fossil was discovered suggests older fossils may have been mixed up in younger sediments. Although there is no evidence that this occurred, he added, "it is something that must be considered since the original site is still unknown."

More information: "A 17-My-old whale constrains onset of uplift and climate change in east Africa," by Henry Wichura et al.

www.pnas.org/cgi/doi/10.1073/pnas.1421502112

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