Chimps dig up clues to human past?

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An arid woodland savanna, Ugalla -- where chimpanzees are using digging tools to collect roots, tubers and bulbs -- is thought to be an environment similar to those exploited by the first hominids. Credit: James Moore

One of the keys enabling the earliest human ancestors to trade a forest home for more open country may have been the ability to gather underground foods. Now a team of scientists reports for the first time that in Tanzania our closest living relatives, chimpanzees, are using sticks and pieces of bark to dig for edible roots, tubers and bulbs.

Published the week of Nov. 12 in the online early edition of the *Proceedings of the National Academy of Sciences*, the study documents the use of digging tools among chimpanzees inhabiting the Ugalla region

of western Tanzania. An arid woodland savanna, Ugalla is thought to be an environment similar to those exploited by hominids that eventually evolved into modern humans.

James Moore, a biological anthropologist at the University of California, San Diego, who has been coordinating research at the site since 1989 under the aegis of the Ugalla Primate Project, said the findings are important because they show that digging with sticks is not a uniquely human adaptation and also because they provide additional insights into the role a dietary shift may have played in hominid evolution.

The study is coauthored by Moore with Travis Pickering of the University of Wisconsin-Madison. R. Adriana Hernandez-Aguilar is the first author. Hernandez-Aguilar gathered the field data as part of her dissertation research at the University of Southern California.

Changes in the teeth and jaws of the first chimp-like hominids provide evidence of a dietary change to something requiring heavy chewing some 3 to 4 million years ago, but the nature of the change is hotly debated, Moore said. Nuts and meat, along with what scientists collectively call plants' "underground storage organs" (roots, bulbs and tubers) have all been identified as candidates for foods that enabled australopithecines to succeed in new environments starting some 4 to 5 million years ago. Contemporary hunter-gatherers make extensive use of underground storage organs with the help of digging sticks, but sticks decay rapidly and evidence of their use by hominids is unlikely to fossilize – leading some researchers to focus on meat and hunting because stone points are preserved. The modern chimps of Ugalla, however, may provide clues to an alternative.

"Chimpanzees are not australopithecines, and we can't conclude that if they do something today, our ancestors must have done it then. But, when integrated with research on the fossil and paleoecological record,

modern analogies are useful for investigating our past," Moore said. "In this case, the Ugalla chimpanzees suggest that underground resources were within reach of our ancestors with similar brain size and hand morphology."

The new study demonstrates that "the understanding and capability to exploit these resources were very likely within the grasp of the first chimp-like hominids," Pickering said.

The Ugalla woodland savanna is, like all savannas, characterized by a grass understory. But here, contrary to popular images of a treeless plain like the Serengeti, there are open deciduous woodlands and also thin bands of evergreen woods around streams. During the rainy season, between November and May, Ugalla is lush and green, rich in a variety of resources, Moore said. But then virtually no rain falls between May and October, leaves fall from the trees and resources become harder to find. Unlike the forests where chimpanzees typically live, it is a more marginal habitat and supports only a small, low-density population of the apes.

"Savanna chimps, we would contend," said Pickering, "are dealing with environmental constraints and problems – evolutionary pressures – that our earliest relatives would have dealt with as well in similar environments."

While the researchers did not directly observe the chimps digging with tools, strong circumstantial evidence of the activity was found at 11 different sites in Ugalla. Ten of these sites, with multiple holes in the ground, were directly beneath chimpanzee nests and the other was nearby. Chimpanzees were further linked to these sites through knuckle prints, feces and wadges – chewed-up, spit-out wads characteristic of chimps – of the excavated tubers. No other mammals had left traces.

There were seven tools found at three of the sites. Worn edges and patterns of adhering sediment on the recovered sticks and bark, visible to the naked eye and later confirmed by microscopic analysis, imply their use as implements.

A surprise finding, Moore, Pickering and Hernandez-Aguilar write, was that the chimps only took advantage of the hidden resources during the food-rich rainy season, and not as a fallback in times of scarcity. That observation, Moore said, “challenges our current hypotheses about the role of such foods in hominid evolution and may help reframe the scientific debate.”

Also provocative is the observation that some of the plants the chimps were digging are not used as food by local people but only as medicine.

“Chimpanzees in many parts of Africa are known to consume leaves of several species for medicinal purposes,” said Hernandez-Aguilar, “and it will be interesting if it is confirmed in the future that chimps in Ugalla consume underground storage organs for their medicinal properties.”

The current study, the researchers say, complements the work of Jill Pruetz et al published earlier this year – which documents the use of sticks by another population of savanna chimps, of Fongoli, Senegal, to spear small primates called “bush babies” – and argues for stepped-up conservation and research.

“Two of the key human adaptations, tools to capture and kill animals and to dig up underground storage organs have now been seen in savanna chimps,” Moore said. “It suggests there’s something there, there. As we continue studying chimpanzees in such savanna settings, we hope to come up with further insights into chimpanzee adaptation that inform us about them – and about ourselves."

Source: University of California - San Diego