Pityusic Islands are similar to those in the Pacific,[11] although no endemic birds have been found in the former. Large-sized species disappeared, mainly ground-dwellers. Likewise, seabirds diminished considerably, although without reaching the point of extinction.

By the end of our last field season (October 1992) we had obtained a remarkable stratigraphic sequence at Es Pouàs: A level containing the middle-sized tortoise was found beneath a layer of flowstone 4 m below the reference level. The flowstone is now being dated at the University of Reading in England, and will allow us to establish the chronology of the extinction event separating the 2nd and 3rd faunistic episodes. The causal mechanisms underlying this event remain our main challenge.

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Paleoanthropological Exploration in the Manonga Valley, Tanzania

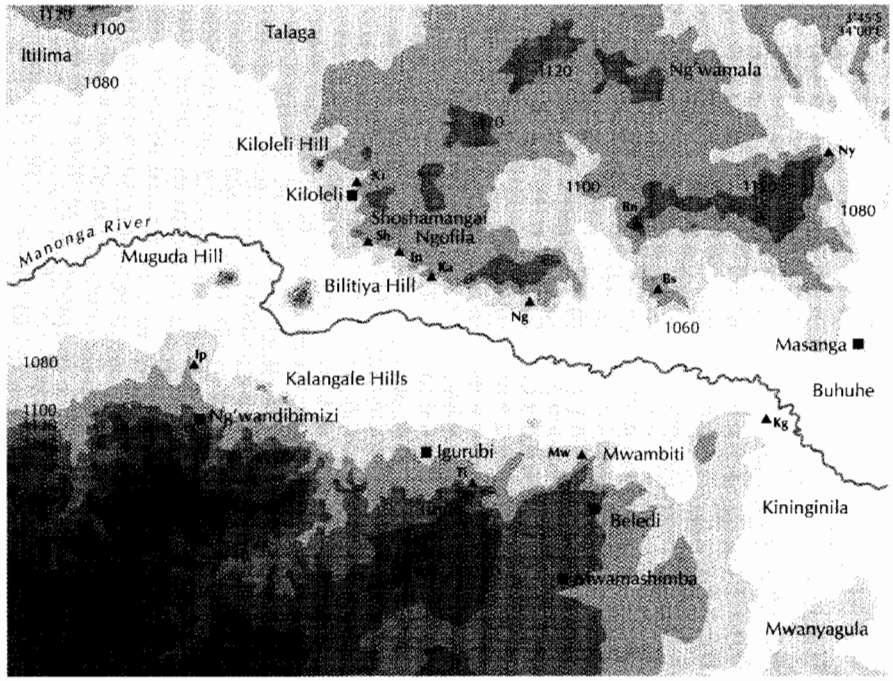
Terry Harrison

THE WEMBERE–MANONGA Paleontological Expedition (WMPE), which I directed, has begun preliminary geological and paleontological investigations in the previously unexplored Manonga Valley of north-central Tanzania (Figures 3&4). Although fossils were originally discovered in the Manonga Valley during the late 1920s, few paleontologists and geologists have visited the area subsequently, and as a result the extensive and richly fossiliferous exposures have remained almost entirely unexplored. The 1990 and 1992 seasons have shown that the area promises to yield important new evidence concerning the evolutionary history of mammals and environments in Africa during the late Miocene and early Pliocene (5 million to 6 million years ago).[1,2]

Today, the Manonga Valley, on the southernmost edge of the Serengeti Plains, is a semiarid patchwork of open grasslands and eroded badlands,

TERRY HARRISON, associate professor, Department of Anthropology, New York University, New York, NY 10003.

Figure 3.
Manonga Valley and the key fossil sites (triangles): Bs, Beredi South; Bn, Beredi North; In, Inolelo; Ip, Ipembe; Ka, Kalitu; Kg, Kininginila; Ki, Kiloleli; Mw, Mwambiti; Ng, Ngofila; Ny, Nyawa; Sh, Shoshamagai; Ti, Tinde. The research area depicted is 56 × 42 km.



interspersed with occasional stands of stunted trees and acacia thickets (Figure 5). The region is sparsely populated by the Sukuma people, who live largely by cattle and goat herding and by small-scale cultivation, principally of maize and cotton. From geological and paleontological evidence we know, however, that the area was quite different at the close of the Miocene.

Warping of the basement rocks,

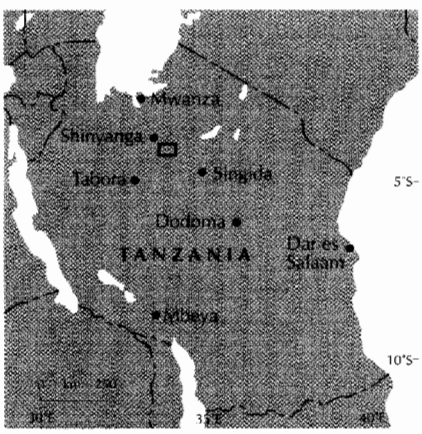


Figure 4.
Research area in north-central Tanzania (see Figure 3 for details of the inset).

associated with continued expansion of the southern end of the Gregory Rift Valley, produced a shallow, but extensive lake basin in the Manonga region. Evidence from geomorphology and the known distribution of exposed sediments, indicate that the lake would have covered >10 000 km^2 (which today would rank it as Africa's 6th largest lake) (Figure 6). During the early part of the Pliocene, ~5 million years ago, tectonic activity formed the Eyasi graben (a depressed segment of the crust of the Earth bounded on at least 2 sides by faults) to the northeast of the Manonga Valley, which caused this lake to drain, and led to the eventual development of the modern-day Wembere–Manonga drainage system.

Figure 5.
Members of the Wembere–Manonga Paleontological Expedition prospecting for fossils in the Manonga Valley.
PHOTOGRAPH COURTESY OF E HARRIS

The fine calcareous lake sediments and fluvial deposits preserve rich concentrations of bones and teeth of mammals and other vertebrates that lived in and around the lake during the late Miocene and early Pliocene. Erosion of these sediments has been active since the mid-Pliocene, and fossils have been exposed on the surface by weathering processes. Although we have explored only 75 km^2 of the Manonga basin (~5% of the estimated extent of the fossil-bearing outcrops in the Manonga Valley), we found 29 productive paleontological localities, that, in the course of 2 seasons, have yielded >3000 fossil mammal remains.

....A great deal remains to be explained about the course of events and the context of hominid evolution in Africa ....Significant advances in our understanding of the problems can be achieved through the exploration...of promising new localities, such as those in the Manonga Valley.

The fauna is diverse, including a variety of small to medium-sized antelopes, several species of primitive elephantids, pigs, giraffids, hexaprotodont hippos (including a large form, as well as what appears to be a closely related pygmy variety), rhinos, 3-toed horses, a saber-toothed cat, and a large species of monkey.

Based on inferences of diet and habitat preference, the general structure of the mammalian community strongly suggests that the Manonga Valley was much wetter and more heavily vegetated during the late Miocene than it is today, probably with the lake fringes dominated by areas of dense woodland and gallery forest. As so few sites of this age are represented in sub-Saharan Africa (the mammals from the Manonga Valley are the oldest so far recorded from Tanzania), detailed studies of the fossils have provided a wealth of new information on the phylogenetic relationships, paleobiology and ecology of African mammals.

Only 200 km southwest of the fossil-hominid–bearing localities of Olduvai Gorge and Laetoli in northern Tanzania, the Manonga Valley offers tantalizing promises of fossils that relate to human origins. Even though paleoanthropologists have been diligently piecing together a more and more complete picture of human evolution over the past 4 million years, the hominid fossil record prior to 4 million years remains sparse. At present, a single lower jaw fragment and some isolated teeth from Lukeino and Lothagam in northern Kenya, dated at 5 to 6 Ma, provide the only evidence of early hominids much older than 4 million years. The possible recovery of fossil hominids from the Manonga Valley would, therefore, contribute significantly to our understanding of the anatomy and paleobiology of the earliest stages of human evolution.

However, there is more at stake here than merely extending the human lineage back in time a million years or so, or being able to lay claim to the discovery of the earliest human ancestor. According to many paleoanthropologists, 5 million to 6 million years ago may be close to the point in time during which the human lineage diverged from the other African hominoids.[3,4] By discovering the remains of the earliest members of the human lineage (or perhaps even more intriguing, the remains of the antecedent of the last common ancestor of humans and the African apes), and by analyzing the fauna associated with them, we may be able to advance some new hypotheses concerning the ecological factors and adaptive consequences associated with the initial differentiation of the hominids.

Figure 6.
Reconstruction of the extent of the lake in the Manonga Basin during the late Miocene and early Pliocene.

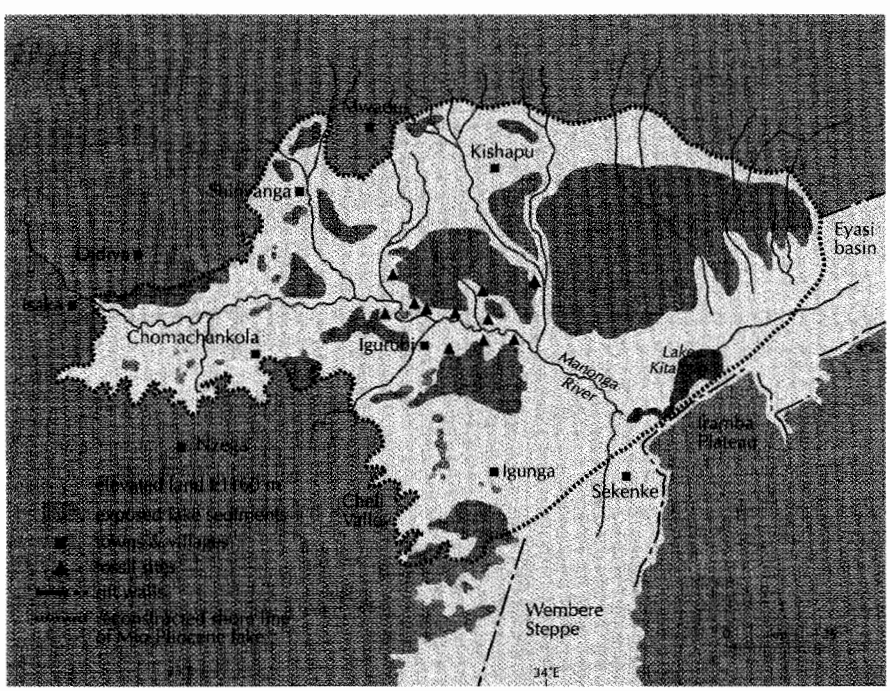


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Figure 7.
Silhouette of a dehorned rhinoceros in the northern Namib desert. Dehorning is a radical new conservation measure first adopted by Namibia in 1989 to protect its critically reduced population of black rhinos.
JOEL BERGER

lowing for their help and advice: Peter Andrews, Eric Baker, William Bongo, Eric Delson, Sarah Donelson, Alan Gentry, Bereket Haileab, Eugene Harris, Terri Harrison, Clifford Jolly, Christine Kiyembe, John Krigbaum, Amandus Kweka, Meave Leakey, Michael Mbago, Charles Msuya, Todd Olson, Varsha Pilbrow, Charles Saanane, Bill Sanders, Kathlyn Stewart, Simon Waane, and the staff of the National Museums of Tanzania in Dar es Salaam. The regional and district development directors and cultural officers in Tabora and Shinyanga regions welcomed us into their administrative areas, took a keen interest in our research, and helped us in innumerable ways. I am also grateful to the Tanzanian Commission for Science and Technology and to the Unit of Antiquities for permission to conduct research in Tanzania.

Horns, Hyenas, and Black Rhinos

Joel Berger &
Carol Cunningham

As recently as 25 years ago ~65 000 black rhinos inhabited the region from the Sudan and Ethiopia to Angola, South Africa, and Mozambique. Today, ~2500 (3%) remain; there is but 1 unfenced population with >100 animals left—that in Namibia's northern Namib Desert. The failure of conventional tactics to protect rhinos led 3 countries—Namibia, Zimbabwe, and Swaziland—to attempt a radical new measure, dehorning (Figures 7,10A&B). Horn removal has been viewed as a last-ditch conservation measure. In Namibia, where dehorning first began in 1989,[6] there were 2 principal goals: to reduce incentives to kill rhinos by completely devaluing them; and to divert enforcement efforts from areas where chances of capturing poachers were low to areas where such efforts would be more productive. The effectiveness of dehorning as a conservation tactic has been queried at multiple levels. Biologically, the major questions are: Do horned individuals have advantages over hornless ones? Can hornless mothers defend their calves from dangerous carnivores? Because dehorning projects have attempted to remove horns from all animals in an area, the first question is generally moot. The second is not. Here we summarize interactions

JOEL BERGER, professor, and
CAROL CUNNINGHAM, research biotechnician, Program in Ecology, Evolution, and Conservation Biology, University of Nevada, Reno, NV 89512.