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Evidence of early butchery of giant lemurs in Madagascar

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Abstract

We report here definitive evidence of butchery, most probably associated with hunting, of giant extinct lemurs by early human settlers in Madagascar. Specimens of *Palaeopropithecus ingens* and *Pachylemur insignis* from two sites in southwestern Madagascar, Taolambiby and Tsirave, show classic signs of butchering. We compared these to the bones (also from Taolambiby) of butchered *Propithecus verreauxi*, a lemur still living in the region. The characteristics of the tool-induced extinct-lemur bone alterations (sharp cuts and chop marks near joints, oblique cuts along the shafts, spiral fractures, and percussion striae) suggest skinning, disarticulation, and filleting. Conclusive evidence of megafaunal modification by humans in Madagascar was limited previously to a few hippo and elephant bird bones and one extinct aye-aye tooth. New evidence comes not from archaeological sites, but from specimens collected in the early 1900s, without stratigraphic records, at "subfossil" sites (i.e., sites renowned for their late Pleistocene or Holocene fossils, often lacking human artifacts). Whereas these are hardly the most ideal samples for analysis of this kind, careful scrutiny of the characteristics of the cut marks has allowed us to document butchery beyond any reasonable doubt. One bone with definitive cut marks has been dated to the very earliest part of the human period in Madagascar. Continued, careful research on the bones in subfossil collections is warranted.

Keywords: Madagascar; Hunting; Butchery; Cut marks; Chop marks; Subfossil lemurs; *Palaeopropithecus*; *Pachylemur*; *Propithecus*

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Introduction

The role of human hunting in the extinctions of the giant lemurs of Madagascar is the subject of intense debate (Burney, 1999). The coexistence of humans and megafauna on Madagascar is incontrovertible, and most, if not all, of the megafaunal extinctions occurred after humans colonized the Great Red Island (Burney et al., 2004). The global synchroneity of human arrival and megafaunal decline, and the naïveté of the fauna at first contact, have been invoked as evidence that hunting by humans was the primary cause of megafaunal extinction (Martin, 1967, 1984; Walker, 1967a). Large body size and diurnal habits would have made the megafauna easy hunting targets for humans. However, the dearth of direct evidence for butchery at archaeological sites in Madagascar and the absence of a game-dependent Stone Age culture (Dewar and Wright, 1993) argue against a human overkill (or "Blitzkrieg") hypothesis (Dewar, 1984). Indeed, the pattern of extinction speaks against Martin's (1967, 1984) prediction of a rapid extinction wave, since many species survived the advent of humans by at least a thousand years (Burney, 1999; Burney et al., 2004). And, whereas there is recent folk memory of the existence of megafauna (Godfrey, 1986; Burney and Ramilisonina, 1999) and even of rituals associated with their killing (Molet, 1951; Haring, 1979), the conspicuous absence of their skeletal remains from archaeological sites spanning the last 1000 years bears testimony to a culture that did not depend on megafaunal hunting for its subsistence. Instead, giant lemurs and other megafauna may have succumbed to natural or human-induced habitat modification or to diseases introduced by humans or their commensals (Humbert, 1927; Mahé and Sourdat, 1972; Dewar, 1984; MacPhee and Marx, 1997; see review by Burney, 1999). Indeed, a key factor contributing to megafaunal extinctions worldwide may be slow reproductive rates, not large body size per se (Johnson, 2002; see also Dewar, 1984).

To date, direct evidence of butchery of giant lemurs in Madagascar is sparse. Battistini and Vérin (1967) suggested that perforations on two *Archaeolemur* skulls may be direct evidence of human hunting, but their published drawings are inconclusive. Walker (1967a) similarly attributed a frontal fracture on the skull of an *Archaeolemur majori* from Andrahomana in southeast Madagascar (BMNH M7374) to human agency, but radiocarbon dating has since shown this specimen to precede the human period (3975 ± 53 ^{14}C yr BP; P.S. Martin, pers. comm.).

Several specimens of megafauna at subfossil sites in southwest Madagascar (Lamboharana, Itampolo, Ambolisatra/Andolonomby) show evidence of human modification. At Lamboharana, Guillaume Grandidier (1902, 1928) discovered pierced incisors of *Daubentonia robusta*, which appeared to have been worn as charms (see also MacPhee and Raholimavo, 1988). A human modified *Aepyornis* tibiotarsus from Itampolo has been dated to the early human period (1880 ± 70 ^{14}C yr BP; Burney, 1999). Neither of these provide evidence of butchery, but rather indicate postmortem utilization of the bones or teeth. Informative as these artifacts may be as elements of the material culture of the early human settlers of Madagascar, they do not offer any insight into hunting or butchering practices.

However, Grandidier (1905) and MacPhee and Burney (1991) described human-modified hippo bones from Lamboharana and Ambolisatra/Andolonomby. These bones date to the early human period (including a femur dated at 2020 ± 300 ^{14}C yr BP, another at 1740 ± 50 ^{14}C yr BP, and a third at 1970 ± 90 ^{14}C yr BP) and show chop marks that were apparently made when the bones were "green," and thus comprise evidence for megafaunal butchery (see Landon, 1996 for similar evidence of butchery in North America). Nevertheless, these sparse data are insufficient to fully support Martin's hunting hypothesis (MacPhee and Burney, 1991).

Although direct evidence of human hunting is slim, indirect evidence of early large-scale megafaunal hunting is found in the pollen records of Madagascar. On the basis of pollen of introduced plants (such as *Cannabis*) in sediment cores, we know that humans arrived in Madagascar by ca. 2000 years ago (Burney et al., 2004). Human arrival is followed almost