Cultural Modifications in an Adolescent Earth-Oven Interment from Fiji: Sorting out Mortuary Practice

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Abstract

The incomplete skeletal remains of a young adolescent (10-12 years of age) recovered from the surface of an earth-oven in Qaranicagi Cave, Site Y2-39, Waya Island, Fiji are used to explore mortuary practices in these islands. Mortuary practices in Fiji are documented in explorer and missionary accounts, and a limited number of excavated burials. Additionally, cannibalism is ethnographically and archaeologically known in the region. Cannibalism appears to be temporally and spatially sensitive, and is only one of a variety of perimortem behaviors. Criteria for the determination of cannibalism in human bone assemblages from Fiji are applied to these remains with limited success. The unique interment of the Qaranicagi Cave skeletal remains may represent cannibalism and the first evidence for transportation of human flesh outside of a village context in Fiji, or it may represent a secondary deposit of portions of a cave burial.

Introduction

Despite controversy, cannibalism among humans continues to attract the attention of the general public and anthropologists. Although various types of cannibalism are distinguished, the practice has been recorded in most regions of the world (Arens 1979; White 1992), most spectacularly for Fiji (Derrick 1968; Rechtman 1992), the regional focus of this paper. In fact, the numerous ethnohistoric and other accounts of cannibalism in Fiji have resulted in the general belief that the custom was rampant and widespread here more than in other regions of the world.

Recently, identification of cannibalism in the archaeological record has been significantly enhanced by the development of specialized bioarchaeological methods, especially for the archaeological record in the American Southwest (e.g., Turner 1993; Turner and Turner 1995; White 1992). Although the number of accounts of cannibalism among the early inhabitants of Fiji is substantial, archaeological claims for cannibalism here remain sparse (DeGusta 1999; Rechtman 1992; Spennemann 1987). While not necessarily discussed as cannibalism per se, human bone does appear in middens and other contexts on islands throughout the Pacific suggesting butchering of humans (Anton and Steadman 1997; Kirch 2000; Poulsen 1987).

This present study demonstrates the continued need for corroborating ethnographic accounts of cannibalism with empirical evidence from the archaeological record. However, our study also highlights the difficulties and limitations of employing analytical techniques for examining possible cases of cannibalism developed in other regions of the world. In this particular instance, a dying fire of an earth-oven in a cave, further underscores the need to develop criteria for unusual contexts. Further, while findings of cannibalism, as in this case, may remain equivocal, such approaches lead to an extraordinary wealth of information about prehistoric mortuary behavior.

The partial skeletal remains of a young juvenile were recovered from an earth-oven in Qaranicagi Cave, Waya Island, Yasawa Group, Fiji Islands. The remains were excavated by one of the authors (E.C.) during the University of Hawaii Archaeology Field School in 2001. These remains represent a secondary burial, as none of the skeletal remains, including the associated epiphyses, was in a natural state of articulation indicating that the remains were devoid of flesh at the time of their final disposition. Detailed description of the remains is made because of the unusual archaeological context of this deposit and the later discovery, in the laboratory, of burned bone and the presence of cut marks. The bone modifications found are then evaluated in the broader context of known Fijian mortuary behavior, including the possibility of cannibalism.

Overview of Fijian Prehistory

Fijian culture history has been divided into a four-phase sequence since Green's (1963) early examination of ceramic change (Table 1). Green's phases are defined predominantly by the proportion and type of ceramic decoration (see Green 1963: Figure 1). The Sigatoka phase marks the first arrival of human colonizers to Fiji and is dated to ca. 700 BC – 100 BC (see also Anderson and Clark 1999). These early populations used the distinctively decorated Lapita pottery, associated with the rapid first colonization of the New Caledonia, Vanuatu and the Fiji-West Polynesia region (Kirch 1997). The characteristic Lapita decorations were quickly abandoned in Fiji (Anderson and Clark 1999), although plainwares and other decorative forms continued. Absence of Lapita decoration and a high proportion of paddle-impressed relief sherds characterize the pottery of the Navatu phase, between ca. 100 BC and AD 1100. Following the Navatu phase, the Vuda phase (ca. AD 1100 to AD 1850) describes assemblages with mostly plain pottery, but also appliqué and incised decorations. The Ra phase, which is the final period

and coincides with European contact in Fiji, begins ca. AD 1850. Ra phase ceramics include increased proportions of incised decorations and additional appliqué forms.

The earliest Fijian populations were likely generalized horticulturalists similar to other colonists carrying Lapita pottery who relied primarily on fish and other marine fauna (Kirch 1997:192-220). Fijian artifact inventories from Sigatoka phase assemblages contain marine fauna procurement implements (e.g., fishhooks), lithic tools (e.g., adzes, hammer stones) and manufacturing debris, as well as items such as shell armbands and other jewelry. Exotic lithics suggest contact with populations beyond Fiji during this time. It is likely that Fijian populations expanded and that settlement shifts occurred during the Navatu phase (Kirch 2000:158). There was also an increasing use of horticulture, especially of taro and yams (Parry 1987:78). By the beginning of the Vuda phase there is evidence for increased aggression in the form of fortified villages throughout Fiji. Much of this protective effort seems to be related to defense of agricultural resources (Field 2004; Parry 1977, 1982, 1987). The first European explorers to Fiji witnessed fortified settlements such as those that began in the Vuda phase. Increasing interaction with foreigners by the end of the Vuda phase, and during the Ra phase likely led to indigenous population collapse as it did in other archipelagos of the Pacific (e.g., Sand 1995; Spriggs 1997).

Qaranicagi Cave Excavations

Qaranicagi cave is on the island of Waya in the Yasawa group of northwestern Fiji (Figure 1). Archaeological work on Waya and several of the other Yasawa Islands documents a cultural sequence some 2700 years old beginning with terminal Lapita assemblages. The cultural sequence roughly follows that of the rest of Fiji with coastal and inland habitations, defensive

settlements (likely appearing in the last 1000 years), and evidence of human interaction and the movement of materials between Waya and the other Fijian Islands (Hunt et al. 1999).

Qaranicagi cave is located approximately 100 m above sea level overlooking Yalobi Bay on the southern coast of Waya and measures roughly 255 m^2 behind the drip line. Test unit 1 (TU 1) was excavated in 1991, and TU 2 and TU 3 were excavated in 2001 (Figure 2) revealing, at greatest depth, approximately 2.6 m of stratified cultural deposits in the cave (Cochrane 2002; Cochrane et al. 2004; Hunt et al. 1999).

Preliminary analyses and radiocarbon dating suggest humans first began using the cave around 700 BC and a continuous human presence up to the very recent past is documented through the deposition of earthenware pottery throughout the cultural sequence. Other artifacts, including stone and shell ornaments, lithic tools and debitage, and historic beads (in the most recent levels) are also present (Cochrane 2002; Hunt et al. 1999). Midden containing the bones of fish, birds, reptiles, and mammals (including humans) was recovered in fluctuating abundance from various levels in the excavations. Preliminary analyses of the Qaranicagi ceramics shows changes over time in various pottery dimensions, including vessel wall thickness, temper content, and vessel diversity (Cochrane 2002, 2004).

The earth-oven feature (Feature 10) with human remains was uncovered in TU 3 near the back of the cave where the ceiling slopes towards the cave floor (Figure 3). TU 3 (1 m^2) was excavated to culturally sterile sediments approximately 2.5 m below the ground surface. Five stratigraphic layers in this unit (including the culturally sterile Layer V) attest to slight changes in the depositional environment over time, but with no evidence of post-depositional mixing of the deposits. Fire-features (e.g., small hearths), stacked one on top of the other, were identified in the deposits. One fire-feature in TU 3, located immediately above the earth-oven feature, was an

ash-filled, shallow basin at the base of Layer II extending to the top of Layer III. Several additional fire-features were also encountered below the earth-oven.

Miscellaneous human bone was recovered from each of the test units. Laboratory examination of the screened faunal material from TU 1 revealed human bone fragments from many of the layers in Level IV (Table 2). Based on the presence of both adult and subadult cranial remains, the minimum number of individuals (MNI) is at least two or three. Many of the bone fragments are blackened from heat exposure and a few exhibit possible cut marks (see Table 2). Human bone fragments were also identified in TU 2 and TU 3, primarily in Layers II and III (Table 3). Included are maxillary fragments and several loose teeth from Levels 6 and 7, and a portion of an adult right ulna from Level 8. Some of these fragments exhibit evidence of burning and possible cut marks (see Table 3). None of these bone fragments was articulated or deposited in any manner that suggests an interment. The MNI represented by the bone fragments from TU 2 and TU 3 is two adults based on different tooth wear in the maxillary molars. The deepest unequivocally human bone fragment in any of the test units is in Layer IV, Level 15. There are no radiometric dates associated with this Level, but Levels 17 and 12 contain charcoal dated (2σ) to 2750-2300 cal. BP and 1270-920 cal. BP, respectively (calibrations performed with Oxcal 3.10). Thus, the human remains from Level 15 were likely deposited between these two age ranges, between approximately 750 BC and AD 650.

Laboratory analysis of the other faunal material from the test units reveals a predominance of fish (e.g., Serranidae, Scaridae, Acanthurid taxa), unidentifiable vertebrate bone, and small mammal remains (e.g., Rattus sp., Pteropus, and one polished Canis tooth). Material identified as medium mammal is sparse: five fragments from TU1, five fragments from TU2, and one fragment from TU3. The fragmentation of the material which precludes more

specific identification also precludes more detailed analysis of possible modifications to the remains.

Feature Description

The top of the feature was encountered 68 cm below the ground surface. The feature was bisected by the excavation, but all contents of the earth-oven were removed by excavating into the sidewalls of the test unit. The basin-shaped earth-oven was approximately 26 cm deep, roughly circular in plan-view, and 70 cm in diameter with internal stratification. The upper four centimeters contained the human remains, concentrated in the horizontal center of the feature within a layer of fine gray ash. Beneath this ash layer, the earth-oven was filled with over one hundred angular, small cobbles of basalt, many broken and friable as a result of intense heating. Wood charcoal, initially found in this layer of oven stones, increased in abundance toward the base of the feature. Accelerator mass spectrometry of wood charcoal from the base of the earth-oven returned a calibrated age range of AD 1190 – 1290 at 2σ (Beta-174986), corresponding to the early Vuda phase of Fijian prehistory. The sediment below the feature, affected by the heat of the oven, was a reddish brown color and individual grains had aggregated.

The earth-oven was created by excavation of a basin-shaped depression in the cave floor (Layer III), which was then filled with wood fuel and stones. Anaerobic conditions near the base of the earth-oven likely contributed to the formation of abundant charcoal while greater access to oxygen near the top of the earth-oven resulted in complete combustion of all fuel and the formation of ash. The human remains were placed within this ash and, given the only slight heat-alteration of some bones, were likely deposited on top of the recently extinguished fire. All of the human bones were fragile and a few were broken during excavation. None of the long bones or

other elements, including the epiphyses, was articulated and none was in any other identifiable orientation.

Fijian Mortuary Practices: An Overview

Ethnographic evidence for Fijian mortuary behavior comes primarily from explorer and missionary accounts recorded in the mid-seventeenth century (e.g., Smythe 1864; Wilkes 1845; Williams 1982). These accounts suffer from various biases, not the least of which is the tendency to record sensational observations rather than mundane ones. Still, these documents provide a picture that can be evaluated in the light of the archaeological record. The complexity of this island group is reflected in the mortuary behaviors recorded: "…there is no uniformity of custom in Fiji, and no description of what is done by any one tribe can be taken as applicable to all the others" (Fison 1881:137).

Cannibalism (addressed below) is the most famous of the mortuary behaviors recorded by interview as well as observation. Other behaviors include the practice, on the death of a chief, of sacrificing the mother, some of the wives, and/or a trusted male associate to be interred with the deceased (Fison 1881; Wilkes 1845; Williams 1982). There was often a concern for the safety of the physical remains of a chief and this necessitated procedures such as burial in secret and/or inaccessible locations (such as caves), or burial beneath the house until skeletonized, followed by removal of the bones to a secret location. The incomplete remains of cannibalized victims may be buried with a deceased warrior or taken as trophies. Commoners and children were often buried beneath the floor of the house, in a specified burial area, in caves (Hocart 1952), or tossed into deep canyons. On one island, artificial "caves" were carved out of the earth for burial of both dying and deceased individuals (Fison 1881:144). Corpse positions ranged from supine and fully extended to tightly flexed and bound, face upwards or face downwards. Chiefs may be

interred in stone coffins; graves may be marked with cairns or outlined in rocks, or unmarked - nearly hidden by carefully removing and replacing the top layer of sod.

The few archaeological excavations of Fijian burials probably do not adequately represent the temporal and spatial variation in mortuary behavior over the archipelago's 2900 years or more of prehistory. However, preliminary patterns indicate that the earliest Fijian burials were simple, single, flexed interments. By at least 1000 years after colonization of the archipelago (Navatu phase) burials were assembled in "cemeteries", and late in prehistory (Vuda and Ra phases) there is archaeological and ethnohistorical evidence for social differentiation in mortuary ritual, burials of multiple individuals, and cannibalism (Hocart 1952; Rechtman 1992).

Archaeological evidence for Fijian mortuary practices begins with the recovery of Lapita-associated skeletons from the Sigatoka phase. These rare, early primary interments were simple and typically flexed. The skeleton from Natunuku [re-dated c. 200 AD (Davidson and Leach 1993; Davidson et al. 1990)] was interred in a crouched posture (Pietrusewsky 1985); the skeleton from Olo, Waya Island (500-700 BC) was flexed on the right side (Pietrusewsky et al.1997). The latter burial, along with several primary interments at Lakeba (Best 1987, 1984), was found near or within midden deposits (Best 1987, 1984; Rieth 1998).

Best (1984:536) describes the secondary burial of a child from Lakeba, which was placed beneath a constructed house mound. The burial consisted of 28 deciduous teeth, 25 cranial fragments, and one section of long bone from a child of about 10 years. The remains were examined by Dr. Philip Houghton of the University of Otago Medical School (New Zealand) who concluded that the "fracturing of these bones must have taken place after all soft tissues had disappeared" (Best 1984:536, Appendix O).

Mortuary practices during the Navatu phase reflect the expanding population of the islands and interments occurred in more "cemetery"-like locations. The Sigatoka Dune complex contained graves identified by large heaps of coral, coral enclosure walls, and earth mounds. Birks (1973) dated the cultural layer associated with the burials (level 2) to 1720 +-80 BP or calibrated AD 120-540 (calibrated with OxCal 3.9 [Ramsey 2003]). Children were under-represented in this complex. Primary interments were typically supine with the knees drawn up or to the side, secondary burials were also noted, and may have included individuals sacrificed to accompany the deceased (Best 1987; Pietrusewsky et al. 1994).

On the islands of Cikobia and Naqelelevu, Sand et al. (2000) noted variation in proto-historic and historic burials. Burials visible on the surface were outlined with coral, or beach rock slabs. Collective burial grounds existed in the past and were associated with large earth mounds with slab walls (Sand et al. 2000:112).

Interments at two locales on Wakaya Island reflect mortuary practices in the late prehistoric (Vuda phase) and historic periods (Ra phase) (Rechtman 1992). Twenty-three burials were recovered from two fortified sites: Korolevu (AD 1300 – 1860) and Delaini (A.D. 1350 – 1825) (Rechtman 1992:206). Primary interments, typically with the lower limbs flexed, as well as secondary deposits of multiple individuals were noted. Missing skeletal elements (attributed to recovery of raw material for tools), cut marks, and extensive burning were noted in some burials. Surface and excavation midden material also included human bone, along with an additional "substantial amount … of human bone … not found in midden context and … not associated with other animal bone, however, considered to be dietary remains" (Rechtman 1992:180).

Prior to the reconstruction of the temple platform Vatanitawake, on the island of Bau, limited excavations of the mound were made and a number of human remains were recovered

(Parke 1993). Twelve supine extended articulated burials were recovered from rectangular graves placed near house posts. The graves were filled with coral sand then covered with soil and in some cases small water-worn pebbles suggesting the individuals were of high rank (Parke 1993:100). Two additional skeletons were found haphazardly placed one on top of the other, in a single grave. There was a layer of white stones in the base of the pit, which was filled with soil. Finally, human bones representing three or four individuals ,were found collected near the north-east end of the mound. None of the skeletons was completely represented, but three skulls were present as well as skeletal remains from two or three piglets and a marine mammal. The presence of iron nails surrounding this deposit suggests the remains were collected from previous burials and then re-deposited, perhaps during renovation or construction of the mound platform. Tradition suggests that this temple mound was used for burial during its final stage of development and that these articulated skeletons, all male, were Tongan victims of the Battle of Kaba fought in 1855. That the temple was used for burial prior to construction of the final stage is suggested by the secondary deposit (Parke 1993:113).

Fijian Cannibalism: Overview of Previous Research

Since the first archaeological work in Fiji (Gifford 1951), material remains have been used to support inferences of prehistoric cannibalism. This is not surprising since the ethnographic record is replete with descriptions of cannibalism (e.g., Derrick 1968). Rechtman (1992) examined 21 ethnographic accounts of cannibalism, spanning 50 years, from many of the Fijian islands. “Cannibalism does not confine its selection to one sex, or a particular age” (Williams 1982:211). Human beings were eaten in connection with building a canoe or temple, launching a canoe, or feastings for tribute. Enemies or commoners were the typical victims, and

the head, hands and intestines were often discarded. The bodies may be cut up and boiled or broiled over the fire or cooked whole in the ground. The abundance of these accounts suggests that the practice likely occurred prehistorically, but even this assertion must be made with caution given the controversial nature of the topic and the collection of these ethnographies by Europeans during an era of colonialism (Rieth 1998:23).

Many of the archaeological excavations and analyses in Fiji were conducted prior to determination of definitive analytical criteria to evaluate claims of cannibalism. Given the controversial nature of the topic, high standards must be maintained in any attempt to identify cannibalism (Rieth 1998), but early excavations can provide a valuable perspective on the problem. Gifford (1951) recovered fragmented and burned human bone from middens at the Navatu and Vuda sites on the northwest coast of Viti Levu (Figure 1). The human bone occurred with other faunal remains in the midden, resulting in the conclusion that "except for fish, man was the most popular of vertebrate animals used for food" (Gifford 1951:208).

Human bone in midden contexts was also found at several different sites on the island of Lakeba (Figure 1) (Best 1984). The sites on this island span Fiji's entire prehistoric sequence; the earliest date (at 2σ) was 840 BC – 660 BC and the latest date, AD 1680. The inference of cannibalism was based on "charring" seen on many of the bones, the small size of most fragments, and the paucity of heads, hands, and feet in the assemblages (Best 1984:534).

More recently, Rechtman (1992) employed analytical techniques specifically for the purpose of identifying cannibalism on human bone fragments from middens and isolated concentrations (no burials are included in his analysis). Human bone fragments from two late sites (AD 1300-1860) on Wakaya Island (Figure 1) were examined for fracture angle and fracture outline in a manner similar to Villa and Mahieu (1991). Rechtman found no statistical

difference (using chi-square) between the Wakaya assemblages and those identified by Villa and Mahieu as the result of cannibalism (but see comments by DeGusta [1999:236]).

Human remains found in midden contexts at the Waya Island Olo site, on the coast below Qaranicagai Cave, were examined for possible cannibalism (Hunt et al. 1999; Rieth 1998). In the Olo assemblage (BC 500 – BC 700), Rieth identified three of six criteria assembled from DeGusta (1999), Turner (1993), Turner and Turner (1992) and White (1992): (1) cut marks, (2) evidence of burning on some of the bones, and (3) *dissimilarity* between the human remains in the midden and a contemporaneous burial (Pietrusewsky et al. 1997). Because the other three selected criteria for cannibalism (percussion marks, perimortem fracturing, and *similarity* between human bone and faunal bone assemblages) were not identified, Rieth (1998:66) concluded that cannibalism could only be suggested in the Olo midden remains. One mitigating factor in this analysis was that the contemporaneous faunal assemblage of fish and small mammals was inappropriate for the comparison of bone modifications.

The most thorough analyses of prehistoric Fijian cannibalism to date are by DeGusta (1999, 2000). He re-examined the skeletal assemblages from Navatu (50 BC – AD 1900) and Vuda (AD 800 – 1800) on the north coast of Vitu Levi following the protocol established by White (1992) at Mancos 5MTUR-2346, southwestern Colorado. DeGusta (1999) demonstrated that the Navatu human midden remains exhibited a comparable or greater degree of modification, including fragmentation, burning, cut marks, and percussion pits, relative to non-human midden remains. Furthermore, the (non-midden) Navatu burials exhibited these characteristics to a much lesser degree. DeGusta concluded that the human bone in the Navatu midden was evidence of cannibalism. In contrast, reanalysis of the Vuda material (AD 800 – 1600) suggested the human midden remains were *not* the result of cannibalism since bone

modifications seen in these remains were statistically indistinguishable from bone modifications in contemporaneous burials (DeGusta 2000). He further suggested that the modifications observed in the Vuda material could be the result of interment beneath houses.

Several ethnographic accounts describe the ritual placement of the bones of cannibalized victims in the forks of trees (e.g., Macdonald 1857:253; Seemann 1862:179; Smythe 1864:73). As the trees continue to grow, the wood encircles the bones. Spennemann (1987) examined 13 bones from a tree-fork trophy collected from the village of Namosi, Viti Levu, to determine if the remains exhibited evidence of cannibalism. The elements consisted of humerus, femur, and tibia fragments representing a minimum of four individuals. Four of the specimens exhibited faint cut marks, and chop marks appeared on two of the specimens. Spennemann (1987:38-39) argued that the faintness of the cut-marks can be attributed to the use of bamboo knives [described in Wilkes (1845:347-348)] and the cooking of whole limbs in earth-ovens causing meat to easily flake off of the bone.

Archaeological evidence provides an independent assessment of the ethnographic record of cannibalism in Fiji. However, early investigations lack the rigor required by modern analyses and so should be viewed with some caution. As Rieth (1998) and DeGusta (1999, 2000) have shown, the application of rigorous, quantifiable, taphonomic dimensions and stringent criteria succeed in producing a much more accurate description of these complex midden assemblages as well as providing stronger evidence for cannibalism. Although the archaeological record is sparse, there is no apparent evidence for cannibalism in the early stages of Fijian prehistory, and the first strong evidence appears only after 50 BC on the island of Viti Levu, during a time of expanding population and settlement shifts.

Methods

Standard laboratory procedures were followed for cleaning and mending of postmortem breaks, and identification of completeness and preservation of the Qaranicagi Cave remains. Because these remains were associated with an earth-oven, all skeletal elements were examined using a hand magnifying (10x) lens and natural bright light, for any possible cultural, as well as environmental taphonomic changes. A dissecting microscope was used for detailed examination of these changes. Bone weathering was evaluated using the Behrensmeyer classification (Buikstra and Ubelaker 1994:98). The number of identifiable bone fragments or specimens (NISP) is shown by skeletal element in Table 3. The NISP was counted prior to any reconstruction (NISP=284) and after all conjoining was completed (NISP=172).

Qaranicagi Cave Burial

All of the skeletal remains represent a single subadult individual; no duplication of skeletal elements is observed (Figure 5). The best-represented skeletal elements include the arm and leg bones, ribs, and portions of the right shoulder (clavicle and scapula) region. The cranium, mandible, most of the vertebral column, ossa coxae, sternum, left clavicle, left scapula, and all hand and foot bones are completely missing. After extensive mending of postmortem breaks, none of the diaphyseal shafts of the long limb bones, with the exception of the left femur, are complete. The extremities of these diaphyseal elements are either damaged or missing, but many of the epiphyses are present. The upper nine ribs (both sides), including the first ribs, are mostly present. Portions of the sixth and seventh cervical vertebrae, and first, second, and fourth thoracic vertebrae are identified, but all remaining vertebrae are missing.

The sex of this individual cannot be determined given the absence of any reliable criteria to accurately determine the sex of subadult skeletal remains (Saunders 1992) and the absence of the skull and ossa coxae. The age of the Qaranicagi skeleton is estimated to be between 10 and 12 years of age, using a variety of indicators, including diaphyseal length and epiphyseal appearance and fusion times (see e.g., Scheuer and Black 2000). Using the diaphyseal length of the left femur and the regression formulae [Talkkä et al. (1962) cited in Krogman and İşcan (1986)] the estimated stature of the Y2-39 skeleton is approximately 4 feet.

Preservation and Taphonomic Changes

The overall preservation of these remains is uniformly fair. While the diaphyseal shafts, composed of dense cortical bone, are intact or can be mended, the spongy, cancellous bone of the medullary cavities is almost completely missing. The extremities of most of the long limb bone shafts are missing or cannot be mended. The external surfaces of many of the bones have a smooth polished (shiny) veneer. Except for two isolated cases of burnt bone, the external surfaces of these bones are ivory-tan (almost bleached) in color. A few of the epiphyses are grey-tan in color, most likely due to their proximity to burnt soil and rocks. The external surfaces of the majority of the bones exhibit postmortem surface changes that are attributable to weathering and other environmental factors (e.g., plant roots, vegetation, and exposure to heat and moisture). Weathering reaches Behrensmeyer stages 1 and 2 in the majority of the bones. Postmortem changes that may represent cultural alteration of bone (e.g., cut marks) will be described separately.

Burned bones

While the majority of the bones are ivory-tan or bleached-white in color, one small rib fragment (possibly the left twelfth rib), measuring approximately 3 cm in length, exhibits charring and burning that is mostly confined to the external anterior surface of this fragment (Table 4, Figures 6 and 7). The affected area is gray-white to dark gray in color. No cracking (transverse or otherwise) of the external surface or warping of the bone is evident. The appearance of this fragment suggests brief exposure to fire or intense heat. Although Rib 11 is missing, Ribs 10, 9, 8, and 7, which would have been anatomically close to the burned rib fragment, do not exhibit any evidence of burning or scorching. However, the external surfaces of some of these ribs exhibit a glossy patina suggestive of exposure to heat.

The posterior left distal humerus, left radius, and left ulna all exhibit longitudinal cracking and flaking of the cortex. The left ulnar diaphysis is slightly whiter in color than the other bones. The left radius is more weathered on the distal end, with longitudinal cracking along the whole length of the diaphysis. The epiphyses appear unaffected. A large area of the posterior left distal humeral diaphyseal cortex is flaking off in layers and there is longitudinal cracking of the shaft.

Two mended fragments represent the right fibula. The proximal one-third of the fibular diaphysis (measuring approximately 8 cm in length) exhibits a smoky brown color (or slight scorching) suggestive of exposure to heat (Figure 8). The discolored region is mostly confined to the external surface, but the naturally exposed medullary cavity at the proximal end also exhibits a similar discoloration. In addition to the discoloration, the external surface of the proximal diaphysis is shiny in appearance. The distal end of the same fibula fragment is not discolored and lacks this glossy appearance.

In summary, five bones of the Qaranicagi skeleton exhibit modifications attributable to fire and heat. A small fragment of the left twelfth rib exhibits the most conclusive evidence of exposure to fire. Discoloration of the right proximal fibula and longitudinal cracking and cortical flaking of the left arm bones also suggest exposure to heat.

Possible Cultural Alteration to Bone

The external surfaces of most of the skeletal elements exhibit postmortem changes. The majority of these changes may be attributed to normal weathering processes and exposure to elements of the environment. However, the external surfaces of several bones, including a rib, both humeri and both femora, exhibit incisions that, because of their pattern and repetitive nature, may represent intentional cut marks (Table 4).

Ribs. A substantial portion of the midshaft region of the right fourth rib is present. A series of more or less regularly spaced, diagonally oriented, distinct cut marks (six - eight in number) are observed on the lateral anterior surface of this bone (Figure 9). This series of incisions spans a distance approximately 3.5 cm in length. The more obvious (and deepest) of these incised marks, which can be seen with the unaided eye, are located at the sternal end of this bone fragment. The remaining marks, which barely scratch the surface of the bone, require a hand lens and bright lighting to see. None of the other ribs exhibits cut marks

Clavicle. A possible cut mark is seen on the superior posterior surface of the right lateral clavicle (Figure 10). The shiny patina evident on the majority of the bones is also seen in the bottom of this defect, which is a fairly wide indentation suggestive of a scrape with one side at a right angle and the other sloping up to the cortex.

Humeri. The posterior surface of the right proximal humerus exhibits at least one small transverse incision visible without magnification (Figure 11). Using a dissecting microscope, it was determined that this incision has a wide, flattish base with sharp sides and sharp edges. Unlike two parallel curvilinear incisions observed inferior to this cut mark, which appear to be vascular in origin, this cut mark is deeper in the center and shallower at the ends. The posterior surface of the left proximal humerus has a single transverse incision at a similar location.

Femora. Multiple faint parallel cut marks are visible on the posterior medial surface of the left femoral neck (Figure 12). Viewed with the dissecting microscope, two groups of at least two incised lines each are evident. The incisions have varying depths suggesting different pressures during the cutting. The margins of the defects are straight and sharp with a 'v' cross-section. One set of marks suggests an initial short cut followed by a cut made with more confidence. The marks range from 274 micrometers to 720 micrometers in length. The most superior of the marks, which is very difficult to see even under magnification, is more scrape-like with a wide shallow depression.

Similar, but less distinct cut marks are observed on the medial surface of the right femoral neck (Figure 13). Under magnification some of these marks are determined to be vascular markings because of their irregular and uneven nature.

Tibia. The incomplete left tibial shaft was reconstructed from at least 17 fragments. Following reconstruction, a perforation measuring approximately 4 × 6 mm in diameter, is observed at the center of the several reconstructed fragments in the mid-shaft region (Figure 14). The edges of the perforation are smooth and weathered suggesting the breakage in this region of the tibia had occurred sometime in the postmortem interval. The aperture may represent the original impact area (percussion pit) that led to the postmortem splintering of this bone. There

are no corresponding marks on the posterior surface of the bone that would be consistent with an animal gnawing on the bone. Under magnification the edges of the defect appear worn; the shiny patina evident on the outer cortex does not extend into the defect.

Vertebrae. The left neural arch of the sixth cervical vertebra, below the superior facet, has two linear marks perpendicular to the process. These are possible cut marks.

Discussion

The disposition of these adolescent skeletal remains from Waya Island, Fiji, is a conundrum. Documented Fijian mortuary practices include the butchering and consumption of all ages and sexes of human beings, butchering corpses for retrieval of "trophies" such as the tree fork bones, sacrifice and burial of living relatives with the deceased, and considerate burial in midden deposits, under houses, in large cemetery mounds, and in caves. There are doubtless many variations of these activities yet to be discovered.

Two scenarios seem possible. The corpse may have been formally deposited in the cave, disturbed by subsequent animal or human activities, and then deliberately re-interred. The presence of other miscellaneous human remains, none of which constitutes a complete skeleton or replicates the composition of the earth-oven assemblage, is consistent with use of the cave for interment and subsequent removal or disturbance of the bones after skeletonization. Fire features made after this could explain the variable evidence for heating/burning/charring in these scattered elements.

The other possible scenario is that selected portions of a butchered corpse were carried to the cave, possibly for consumption, and then deposited on the recently extinguished earth-oven. The process of butchering a human essentially follows that of butchering animals such as pigs or

goats, and several variations have ethnographic documentation in Fiji (Spennemann 1987). The head, hands and feet are removed, followed by the limb segments (upper and lower arms and legs) and then the torso is cut up.

The presence of the epiphyses of many of the long limb bones suggests the body, or at least the limbs, arrived in the cave either entirely fleshed or with at least some cartilage and ligaments remaining intact. The lack of articulation of the epiphyses in the final deposition, however, suggests either the elements were moved after complete skeletonization or that disarticulation occurred within a contained area (like a pot or a wrapping).

The cutmarks on the right fourth rib are at the approximate mid-point of the thorax and if it were the left side, one might think of opening the rib cage to access the heart; however this is the right side. The marks would have occurred from beneath the armpit forward and are in a position for release of the intercostal muscles. The marks may also reflect part of the "quartering" butchering procedure where the upper limb is removed from the torso by cutting muscles and tissue along the vertebrae, medial and inferior to the scapula, and following around under the arm to the sternum and up over the shoulder. The cut marks on the clavicle and the sixth cervical vertebra are also consistent with this procedure.

Cut marks on the proximal humeri are consistent with release of the shoulder capsule. The position of the cut marks on the femoral necks is classic for release of the iliofemoral (anterior) and the ischiofemoral (posterior) ligaments. These cut marks have been called "mortuary cut marks" that reflect efforts to overcome the effects of rigor mortis to position the corpse in a certain way, however, they may also reflect butchering procedures to separate the upper limb from the shoulder and to separate the lower limb from the pelvis. Since the

disarticulation of a corpse is not synonymous with cannibalism, the cut mark evidence would be consistent with either of the proposed scenarios.

The defect on the fragmented left tibia, a possible percussion pit, suggests dynamic loading of the bone shaft. This tibia is also the most fragmentary of the long limb bones (NISP=17 prior to conjoining). If the glossy patina noted on the bones is the result of heating, then it is significant that the patina is not evident on the inner edges of this defect, suggesting the modification occurred after heating and supporting a cannibalistic scenario.

The minimum criteria for identifying probable cannibalism in a human bone assemblage are: intentional bone breakage, cut marks, burning, evidence of dynamic loading (e.g., chop marks, anvil marks), many missing vertebrae, and pot polish (Turner and Turner 1992; White 1992). However, several of these criteria (e.g., pot polish and missing vertebrae), are not applicable to bone assemblages in Fiji or other parts of the Pacific because of differing cooking methods (i.e., roasting in an earth-oven rather than boiling in a pot) and differing preferences (i.e., meat acquisition as opposed to marrow/fat acquisition). These differences prompted the use of a more globally useful finding: that of a dissimilarity between the bone modifications in the assemblage and bone modifications found in primary or "considerate" burials, and/or a similarity between bone modifications in the assemblage and bone modifications in contemporaneous faunal bone middens (DeGusta 2000).

Evaluating all of these criteria, DeGusta (2000:90) proposed "bioarchaeological attributes of Fijian cannibalism." Although based on only two sites, attributes that are "necessary but not sufficient" to indicate cannibalism are: 1) highly fragmented human remains in a midden context; 2) element distribution different from that expected in complete skeletons; and 3) lack of evidence of major non-human modifiers. According to DeGusta (2000:90), attributes that are

indicative of cannibalism are: 1) burning (>10% specimens); 2) cutmarks (>5% specimens); and 3) the presence of peeling. Examining these six attributes relative to the earth-oven interment should help clarify the disposition of these remains.

The Qaranicagi Cave bone assemblage is unique. The remains are recovered from an earth-oven, which could be construed as a midden context, but they are not recovered from the typical notion of midden as a pile of food refuse including a variety of faunal bones, shells, pottery, charcoal, and other items. The Qaranicagi remains are not highly fragmented. The missing elements are the hands, feet, and most of the axial skeleton, a distribution that is inconsistent with a complete skeleton. The Navatu human midden sample was composed of cranial vaults, arms, hands, and legs with no or few fragments from the pelvic girdle, scapula, clavicle and sternum (DeGusta 1999). The evidence for non-human bone modification in the Qaranicagi Cave interment is variable; there are indications of slight weathering, and frequent random striae, such as might result from mechanical abrasion, trampling, roof or wall falls, but no evidence of bite marks or rodent gnaw marks. Given only one of the three “necessary but not sufficient” attributes is present, an inference of cannibalism is not supported.

Evidence for burning and exposure to heat is noted in five specimens in the Qaranicagi Cave bone assemblage. However, only one of these, a rib fragment, may be regarded as carbonized, a second specimen exhibits scorching, while the three remaining specimens do not show discoloration, but rather exhibit cracking and other alterations attributable to heat exposure. Regardless of the degree of burning, the overall frequency of burning in the earth-oven remains is quite low, approximately 2.9% (5/172). Cutmarks are observed on seven specimens (representing six elements) for a frequency of 4.1%. None of the elements exhibits peeling.

Given the absence and low frequency of these three primary criteria, an inference of cannibalism in the Qaranicagi Cave remains is not supported.

Conclusion

Is there an interpretation for the deposition of these skeletal remains that can accommodate this equivocal evidence? Unfortunately, the contemporaneous faunal midden remains from Qaranicagi Cave are lacking in medium mammal bones, so a comparison between the earth-oven remains and the midden remains cannot be made. As well, less than 2% of the surface area of the cave has been sampled, leaving open the possibility of primary interments, other earth-oven deposits, or other human midden deposits within the cave. The miscellaneous human bone from the three test units, with a predominance of very small fragments and axial elements, unlike the earth-oven remains, is consistent with either midden remains or disturbed cave burials.

Alternatively, the diagnostic criteria proposed by DeGusta (1999, 2000) may not be applicable to this case since they were developed from assemblages significantly different from this one (e.g., MNI greater than one, habitation areas, midden context, etc.). DeGusta's diagnostic criteria do not easily accommodate the use of an earth-oven for cooking with steam rather than flame (lower frequency of burning), the use of bamboo for cutting (fewer and fainter cut marks), or the selection of meat over fat/marrow (lower rates of fragmentation, fewer cut marks). If the Qaranicagi Cave deposit does not represent cannibalism, it does expand the range of mortuary behavior recorded in prehistoric Fiji. If the Qaranicagi Cave deposit represents cannibalism, it provides the first evidence for the transportation of human meat away from habitation areas, and it requires revision of the DeGusta attributes of Fijian cannibalism.

Finally, our analyses of the earth-oven remains and discussion of changing Fijian mortuary behaviors suggest that while we may speculate on the prevalence of cannibalism across the Pacific Islands, each cannibalism hypothesis must be rigorously evaluated in each empirical context and interpreted in light of the local cultural and ecological histories. In these analyses it does not seem possible to generalize across specifically island environments.

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Table 1. Overview of Fijian Culture History.*

Time Period	Phase Name	Ceramics	Subsistence	Social Organization	Interaction Structure	References
700 BC – 100 BC	Sigatoka	Lapita and plainwares	generalized horticulture	colonizing populations	long-distance interaction	Anderson and Clark (1999); Frost (1979); Kirch (1997); Marshall et al. (2000)
100 BC – AD 1100	Navatu	paddle-impressed wares, plainwares	increasing horticultural variation	population expansion, settlement shifts	expanding and contracting interaction patterns	Anderson and Clark (1999); Frost (1979); Kirch (2000:158); Marshall et al. (2000); Parry (1987)
AD 1100 – AD 1850	Vuda	plainwares, incised and appliqué wares	agriculture, horticulture	aggregated settlements, defended habitations	contracting interaction patterns, initial European contact	Field (1998); Frost (1979); Hunt (1987); Parry (1977; 1982; 1987); Cochrane and Neff 2006
AD 1850 – present	Ra	historic wares, appliqué wares	agriculture, horticulture	population collapse	interaction with world-system	Frost (1979)

*Time periods, phases, and ceramics follow Green (1963).

Table 2. Human Skeletal Remains Recovered from Qaranicagi Cave TU 1 in 1999 (Hunt et al. 1999).

Layer	Level	Cmbd*	Mesh	Laboratory Identification
IV	5	40-50	1/8”	A human adult(?) cranial bone fragment (approximately 25 x 17 mm). A second, smaller (approximately 10 x 9 mm), human cranial fragment that exhibits slight scorching, and two (one slightly charred) very small fragments of long limb bone that may be human.
IV	7	60-70	1/8”	A fragment (approximately 19 x 24 mm) of the proximal (head) end of human(?) humerus or femur.
IV	7	60-70	1/8”	Seven human bone fragments: 1) a left parietal fragment (approximately 19 x 21 mm) with some of the coronal suture and frontal branch of the middle meningeal vessel (subadult?), no charring or cut marks visible; 2) a charred thoracic vertebral fragment including the left superior and inferior articular facets with two possible cut marks; 3) charred lumbar vertebral fragment of an anterior articulating facet; bone color is white/gray/dark brown; 4) a charred vertebral fragment; 5) three rib fragments each measuring approximately 20 mm in length, all exhibit evidence of charring/burning.
IV	8	70-80	1/8”	Two rib fragments (approximately 40 mm in length); three lower limb bone shaft fragments (approximately 67 - 82 mm in length), two exhibit faint cut marks; a navicular fragment; a small human(?) bone fragment (approximately 20 mm in length) that is blackened due to burning; and four smaller fragments that may be human.
IV	10	90-100	1/8”	A small bone fragment (approximately 16 x 21 mm) that may be human.
IV	11	100-110	1/8”	A cranial vault fragment (approximately 28 x 20 mm) that exhibits scorching.
IV	12	110-20	1/8”	Possible human bone fragment (approximately 20 mm in length).
IV	14	130-140	1/8”	A charred (blackened) human adult arm bone fragment (approximately 25 mm in length).
IV	15	140-150	1/8”	Distal two thirds of the left second metatarsal with no evidence of burning. This specimen was originally identified as *Sus scrofa*.
IV	15	140-150	1/8”	Five small bone fragments: a human adult distal end of a metatarsal and four human(?) limb bone fragments.

* cmbd = centimeters below datum.

Table 3. Miscellaneous Human Remains from Qaranicagi Cave TU 2 and TU 3.

Bag No.	Test Unit	Layer/Level	Date	Label	Laboratory Identification
1070	2	II/6 Feature 5	6.27.01	Bone	7 small human(?) bone fragments whose external surfaces are grey calcined suggesting exposure to heat.
1074	2	II/6 Feature 4	6.27.01	Human bone (1 of 2)	6 small and larger fragments of human maxillary bone and an adult maxillary 1st molar, which exhibits a worn occlusal surface exposing the dentin.
1075	2	II/6 Feature 4	6.27.01	Human bone (2 of 2)	13 small fragments (11 mm to 20 mm in length) of human bone; most appear to represent cortical long limb bone; the external surfaces are bleached white.
1078	2	II/6 Feature 4	6.26.01	Bone	Approximately 20 small human(?) bone fragments (mostly maxillae) and two adult maxillary molars (1st and 2nd); a Carabelli's cusp is present on the 1st molar; the teeth have slight wear; none of the fragments exhibit scorching.
1080	2	II/6	6.26.01	Bone	Approximately 35 very small human bone fragments (most from the infracranial skeleton) and 3 adult teeth (2 premolars, one upper lateral incisor). The teeth have slight wear; some fragments appear to have been exposed to heat and have a smoky appearance; a few are animal bone/teeth fragments.
1092	2	II/7	6.27.01	Bone	8 small bone fragments representing cranial and infracranial bones and one adult upper central incisor with wear to the dentin; the fragments are bleached white; most of the fragments appear to be human.
1117	2	III/8	6.27.01	Bone	Approximately 50 small bone fragments (a few are not human); some fragments exhibit scorching and exposure to heat; only a few could be identified as long limb bone fragments.
1120	2	III/8 89.5 cmbd	6.28.01	Human bone #3	Approximately 12 very small bone fragments and bone dust; several fragments may represent ribs. The bones may be human.
1121	2	III/8 88.5 cmbd	6.28.01	Human bone #2	Approximately 20 small bone fragments; the largest (39 mm in length) is a human rib fragment; the external surfaces are tan/grey in color.
1122	2	III/8	6.28.01	Human bone #1	8 large fragments from a human adult right ulna; 7 of the 8 fragments join perfectly to form most of the shaft; the 8th fragment is the olecranon process. The breakage occurred postmortem. Most of the surfaces exhibit scorching due to heat exposure; the bone is solid. A series of faint impressions, possibly cut marks, are visible on the medial surface of the largest mid-shaft fragment. The uncharred surfaces are a tan/grey color.
1130	3	II Feature 9	6.29.01	Bone	3 very small non-human bone fragments.
1138	3	II/7	6.27.01	Bones	2 small bone fragments; one may represent a human rib; the other is non-human and exhibits charring.
1154	3	II/8	6.29.01	Bone	Approximately 23 human bone fragments representing infracranial bones (rib, tibia, etc.). The largest fragment is approximately 46 x 19 mm; the smallest is 10 x 8 mm. The fragments are bleached white.
1219	2	III/16	7.9.01	Bone	Approximately 4 very small bone fragments; none are diagnostic for element or species.
1256	3	III/16	7.16.01	Bone	1 human(?) rib fragment; bleached in appearance with several faint cut/scratch marks.

Table 4. Number of Identified Specimens (NISP) in the Earth-oven Remains.

Side / Element	NISP Before Conjoining	NISP Conjoined	NISP after Conjoining	Additional NISP	Additional Fragment Size (mm)	Total NISP*
Tibia (right)	14	14	3			3
Tibia (left)	17	17	1			1
Fibula (right)	5	5	1			1
Fibula (left)	4	4	1			1
Femur (right)	5	4	2			2
Femur (left)	10	8	3			3
Ulna (right)	1	0	1			1
Ulna (left)	3	2	2			2
Radius (right)	4	4	1			1
Radius (left)	5	4	2			2
Humerus (right)	11	8	4			4
Humerus (left)	4	4	1			1
Patella (right)	1	0	1			1
Patella (left)	1	0	1			1
Scapula (right)	11	11	1			1
Clavicle (right)	1	0	1			1
Vertebrae	34	12	5	22	8 - 16	27
Ribs	86	55	21	31	8 - 33	52
Upper long bone fragments	41			41	6 - 31	41
Lower long bones fragments	26			26	6 - 19	26
Totals	284	152	52	120		172

*Total NISP includes conjoined NISP and additional NISP; epiphyses are included in the specimens counted.

Table 5. Summary of Modifications Observed in the Earth-oven Remains.

Bone Element	Modification	Interpretation/Evaluation
12th rib fragment	charred/burned	exposure to heat/fire
right humerus, radius, ulna	longitudinal cracking of cortical shafts	exposure to heat/fire
proximal right fibula fragment	smoky brown discoloration	exposure to heat
4th rib fragment	6-8 incisions	cut marks
sixth cervical vertebra	two linear incisions on left neural arch	possible cut marks
right clavicle	incision on superior posterior lateral end	possible cut marks
proximal right humerus	transverse incision on posterior surface	cut marks
left femur	multiple incisions in neck region	mortuary/butchery cut marks
right femur	faint incisions in neck region	possible cut marks
left tibia shaft fragment	perforation	percussion pit

Figure Captions

1. Map of the Fiji Islands showing the location of archaeological sites on Waya Island.

2. Plan map and profile of Qaranicagi Cave.

3. Profile of Test Unit 3, Qaranicagi Cave.

4. Close-up of earth-oven feature in Test Unit 3, Qaranicagi Cave.

5. Diagram showing the major skeletal elements identified in the burial from site Y2-39, Qaranicagi Cave.

6. Anterior surface of the twelfth(?) left rib fragment that exhibits burning.

7. Posterior surface of the twelfth(?) rib fragment that exhibits charring and burning.

8. Proximal end of the right fibula showing heat-associated discoloration.

9. Multiple cut marks are visible on the anterior surface of this right fourth rib fragment.

10. Superior surface of the lateral end of the right clavicle where several cut marks were observed.

11. Posterior surface of the proximal left humerus showing cut marks.

12. Multiple cut marks are visible on the posterior medial neck region of the left femur.

13. The posterior medial neck region of the right femur showing faint cut marks.

14. A perforation on the lateral surface of the proximal end of the left tibia; this region of the tibial shaft has been mended. Other marks that are visible represent random striae.

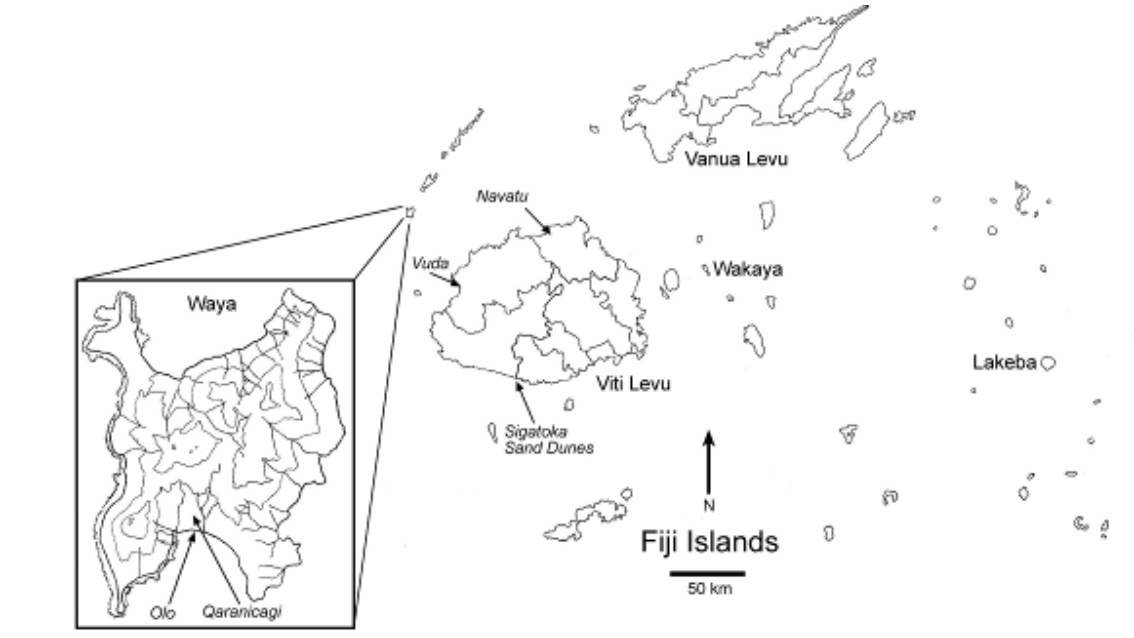

Fig. 1. Map of the Fiji Islands showing the location of archaeological sites on Waya Island.

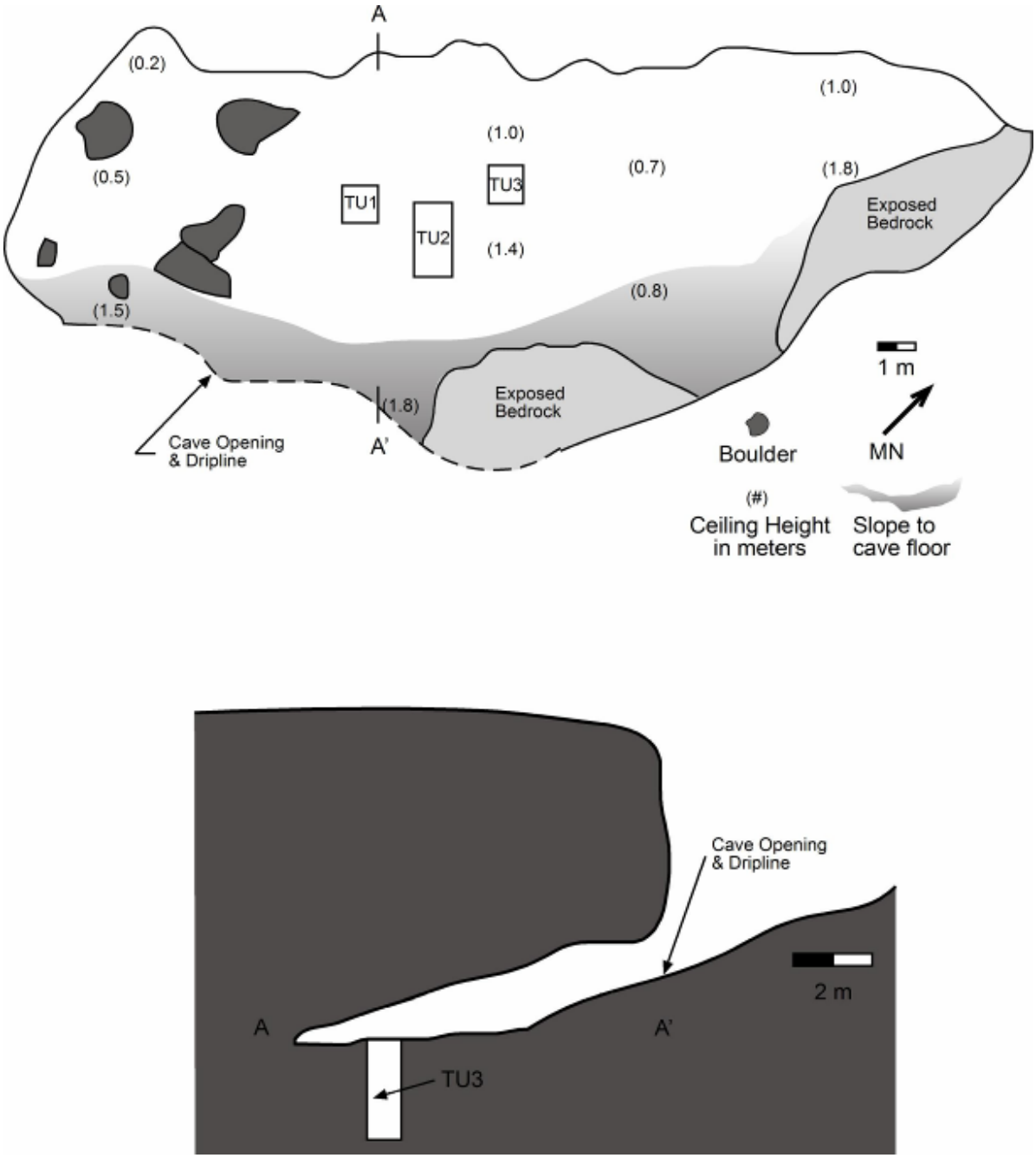

Fig. 2. Plan map and profile of Qaranicagi Cave.

Fig. 3 Profile of Test Unit 3, Qaranicagi Cave.

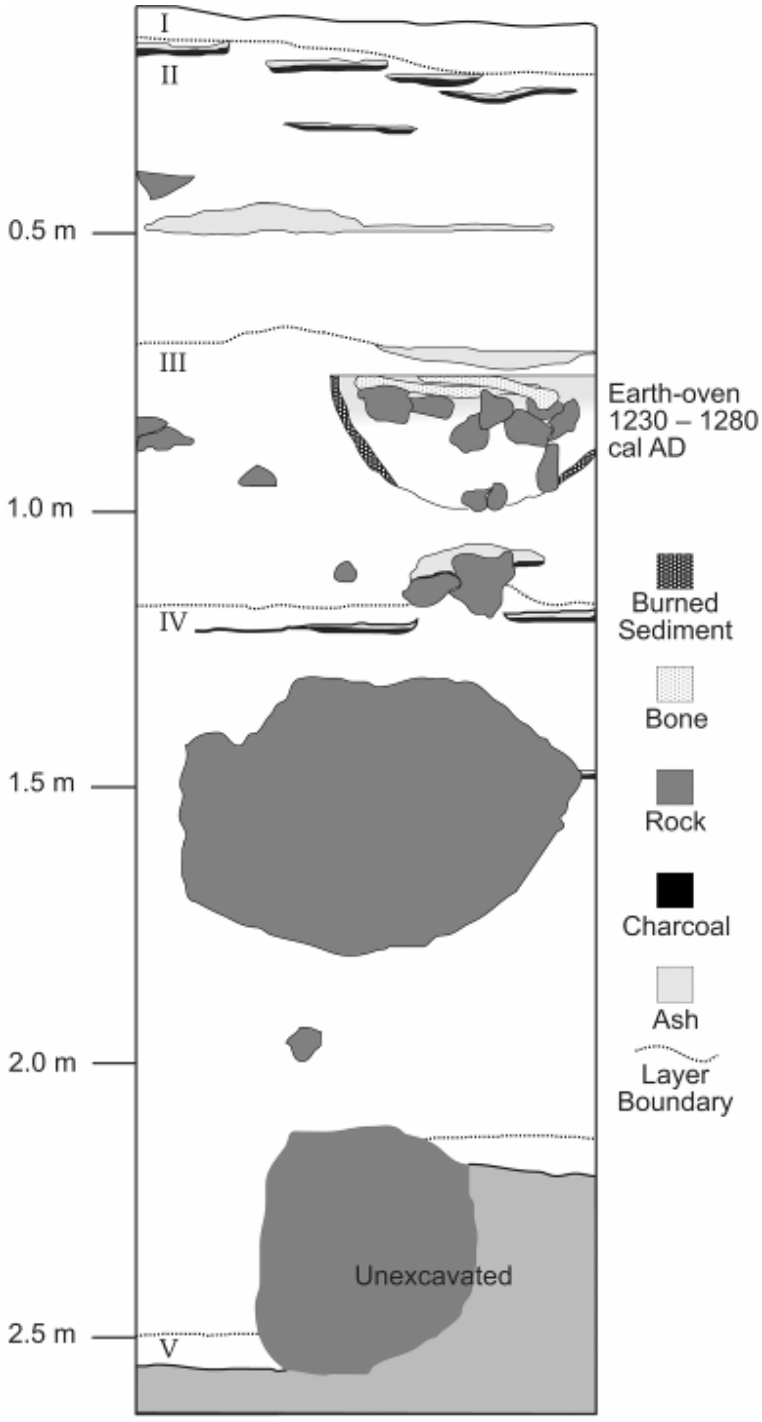

Fig. 4. Close-up of earth-oven feature in Test Unit 3, Qaranicagi Cave.

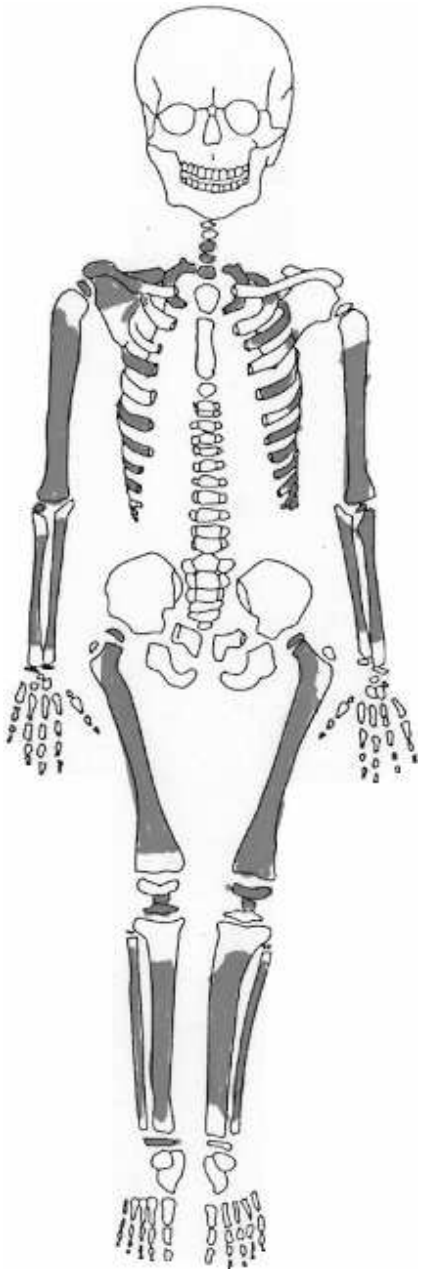

Fig. 5. Diagram showing the major skeletal elements identified in the burial from site Y2-39, Qaranicagi Cave.

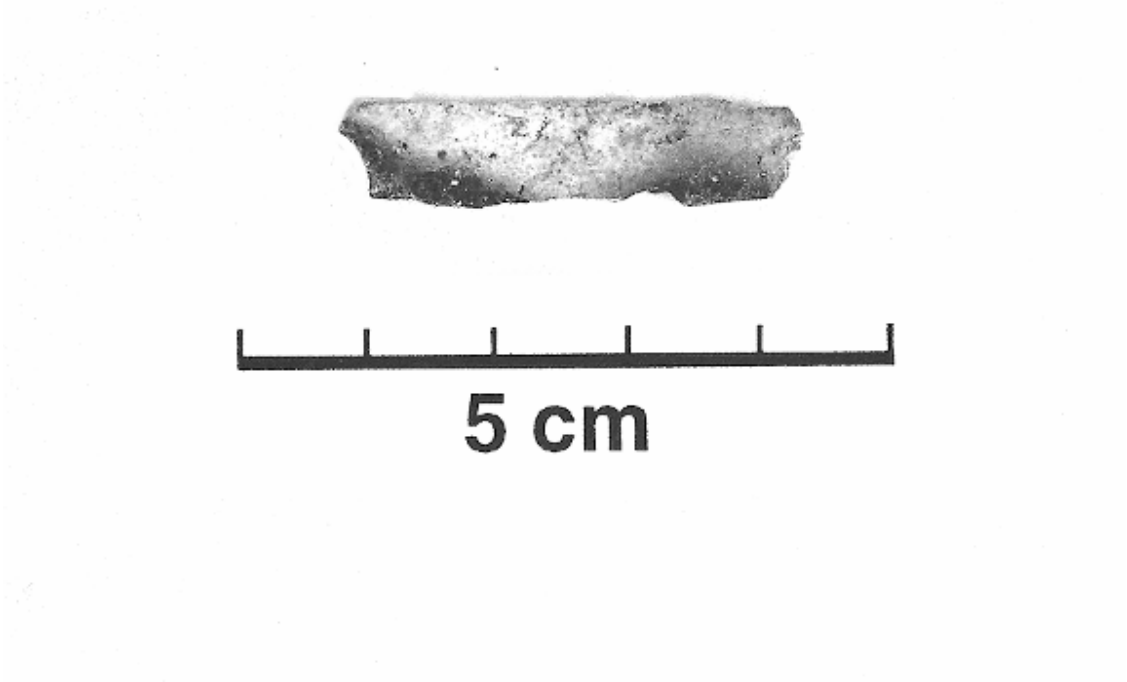

Fig. 6. Anterior surface of the twelfth(?) left rib fragment that exhibits burning.

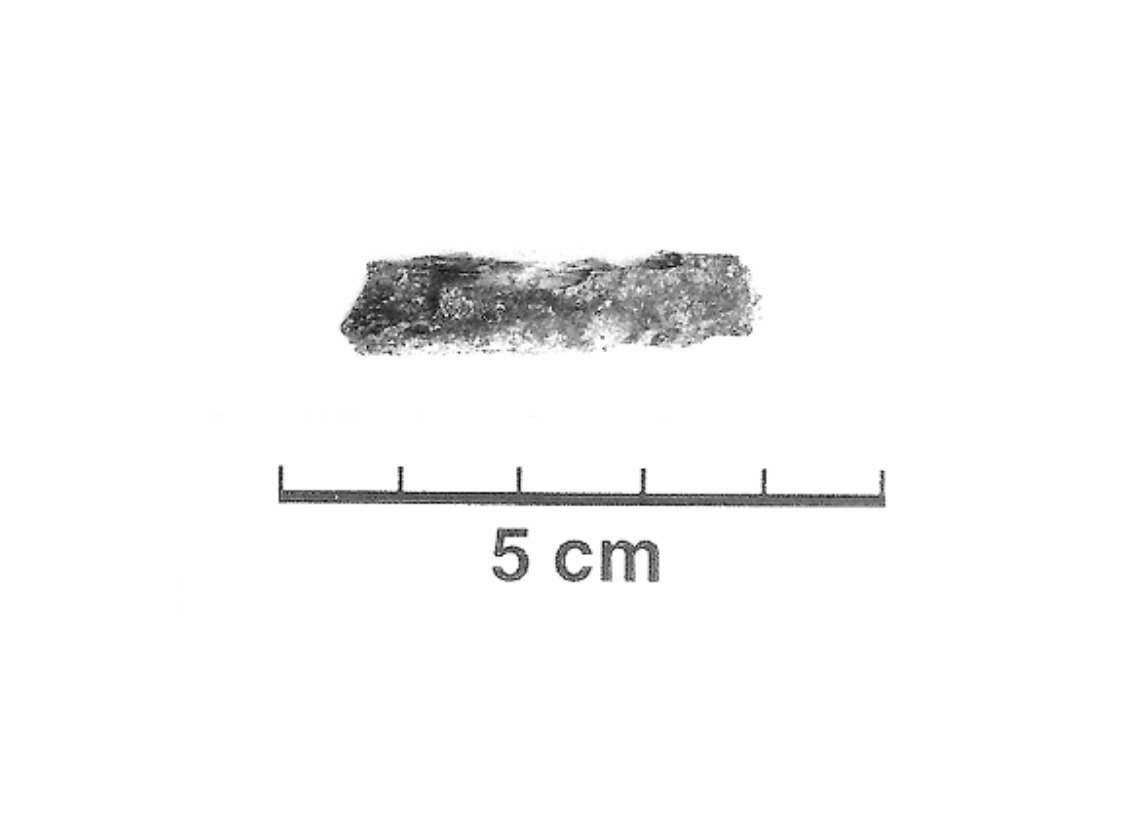

Fig. 7. Posterior surface of the twelfth(?) rib fragment that exhibits charring and burning.

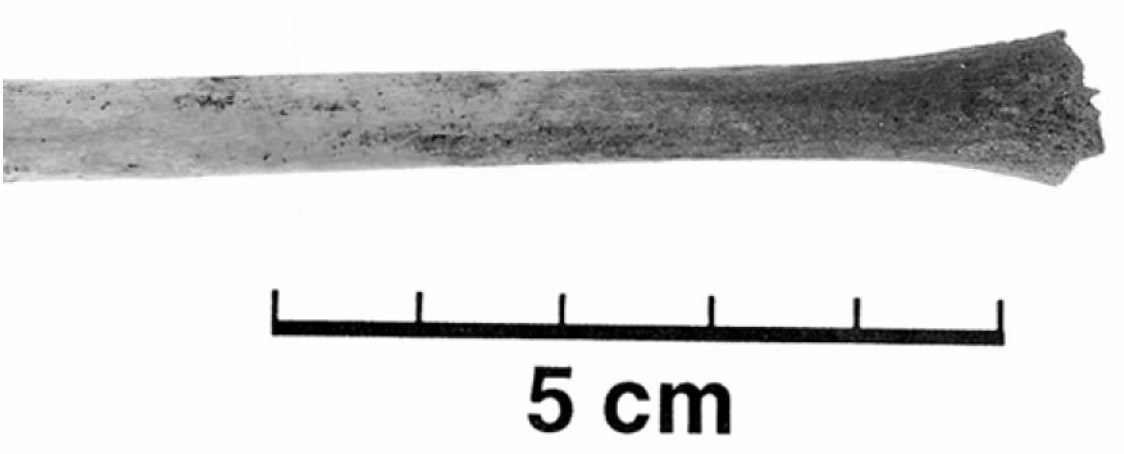

Fig. 8. Proximal end of the right fibula showing heat-associated discoloration.

Fig. 9. Multiple cut marks are visible on the anterior surface of this right fourth rib fragment.

Fig. 10. Superior surface of the lateral end of the right clavicle where several cut marks were observed.

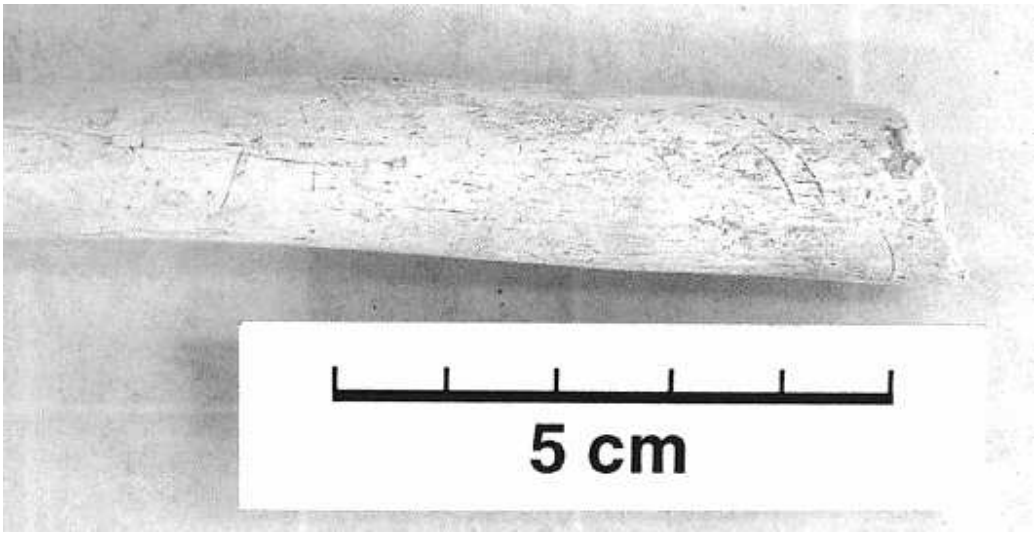

Fig. 11. Posterior surface of the proximal left humerus showing cut marks.

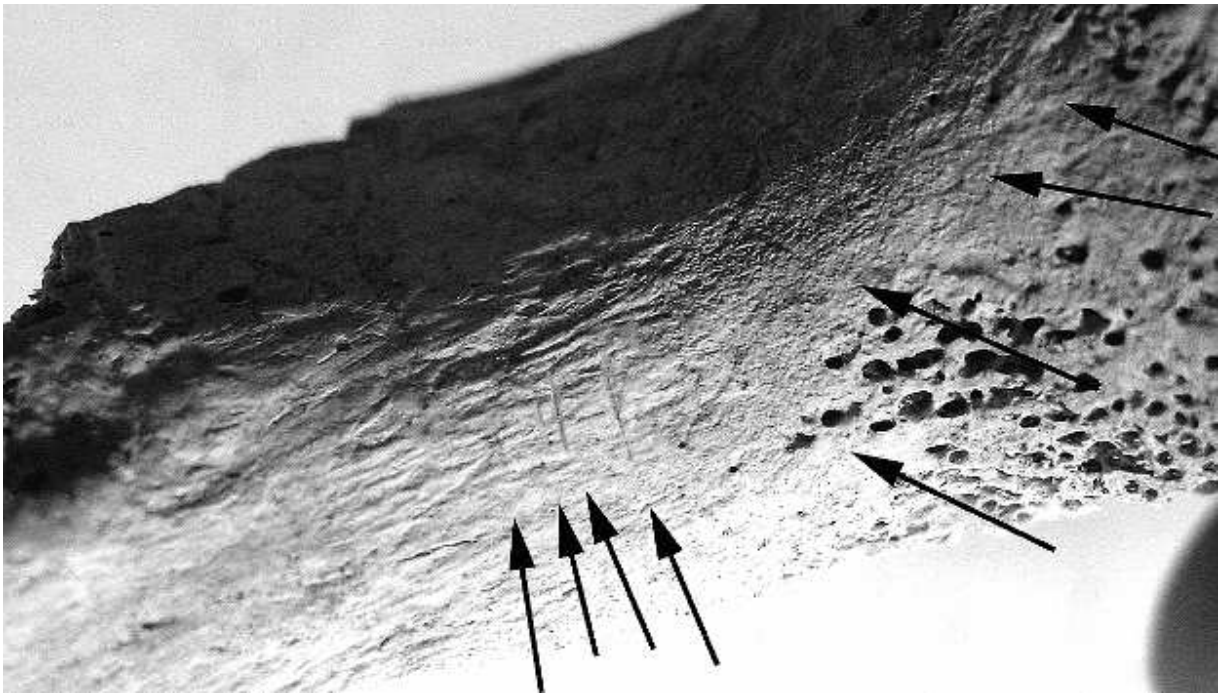

Fig. 12. Multiple cut marks are visible in the posterior medial neck region of the left femur.

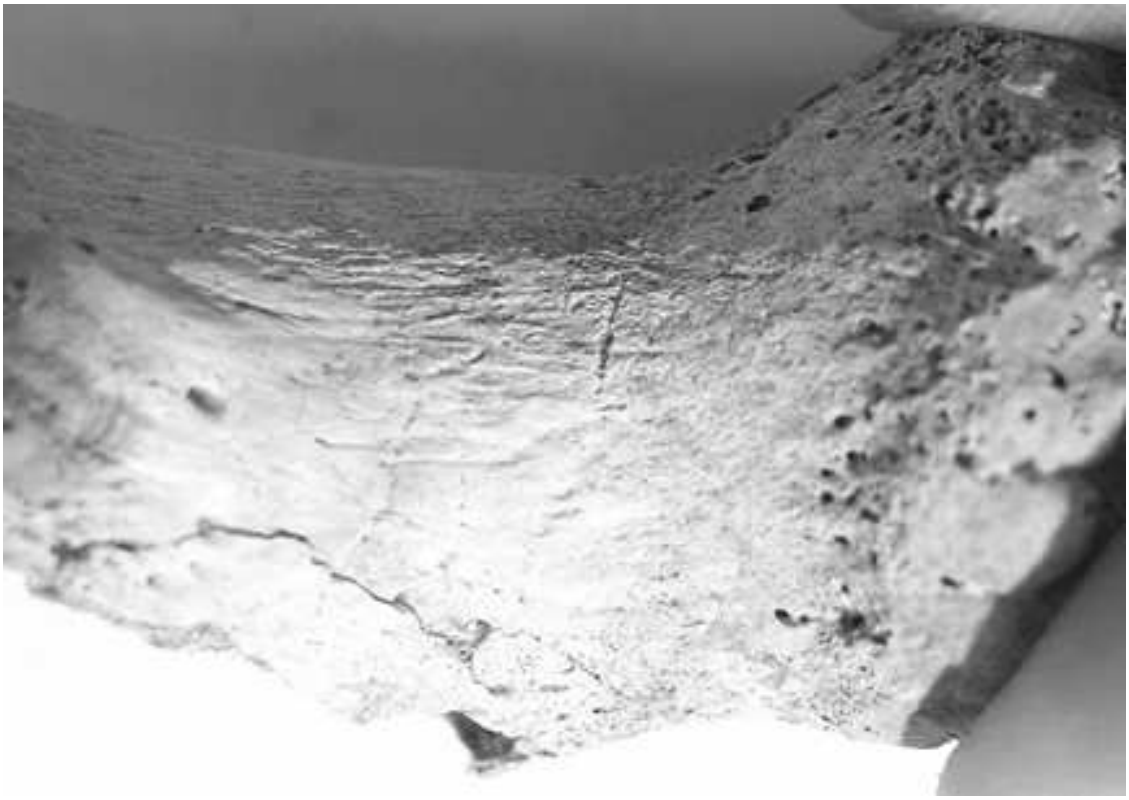

Fig. 13. The posterior medial neck region of the right femur showing faint cut marks.

Fig. 14. A perforation on the lateral surface on the proximal end of the left tibia; this region of the tibial shaft has been mended. Other marks that are visible represent random striae.