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TAPHONOMY OF A CARNIVORE-ACCUMULATED RABBIT BONE ASSEMBLAGE FROM PICAREIRO CAVE, CENTRAL PORTUGAL

by

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Abstract: The European rabbit *(Oryctolagus cuniculus)* probably has been abundant and readily available to prehistoric hunters in much of Iberia for many thousands of years. Rabbits are also the favorite prey of many mammalian and avian predators in Iberia. Thus, it is important for archaeologists to be able to distinguish rabbit bones deposited in caves and rockshelters by nonhuman predators from those deposited by humans. In this paper, a carnivore-accumulated rabbit bone assemblage recovered from the surface of Picareiro Cave is analyzed. Approximately 1% of the 739 rabbit bones recovered from the surface of Picareiro Cave exhibited puncture marks. The femur, tibia, humerus, and ulna displayed the greatest frequencies of puncture marks. Most of these damaged bones exhibited two or more puncture marks, often on opposite sides of the bone. In contrast, raptors generally create single puncture marks on rabbit bones. Prehistoric people in central and southern Iberia sometimes created large numbers of rabbit femur, tibia, and humerus shafts by snapping or biting off the ends of these bones in order to extract marrow from the medullary cavity. Rabbit long bone shafts are comparatively rare in rabbit bone assemblages created by carnivores and raptors. These data should assist faunal analysts in interpreting rabbit bones recovered from Iberian caves and rockshelters.

Key-words: Rabbit; carnivore; taphonomy; cave.

Resumo: o coelho europeu (*Oryctolagus cuniculus*) foi provavelmente abundante em grande parte da Península Ibérica durante milhares de anos, sendo, pois, facilmente acessível aos caçadores pré-históricos. Os coelhos são também presa favorita de muitos mamíferos e aves predadoras da península. Assim, para os arqueólogos é importante poder distinguir os ossos de coelho depositados em grutas e em abrigos-sob-rocha por predadores não humanos, dos que aí foram colocados por seres humanos. Neste trabalho analisamos um conjunto de ossos de coelho acumulados por carnívoros, encontrado à superfície da Gruta de Picareiro. Cerca de 1% dos 739 ossos analisados apresentavam sinais de punctura. A maior parte desses sinais ocorriam em fémures, tíbias, húmeros, e ulnas. A maior parte desses ossos afectados apresentavam dois ou mais sinais, situados, muitas vezes, em lados opostos do osso. As populações pré-históricas do Centro e do Sul da Península Ibérica produziam muitas vezes grande número de ossos de coelho (fémures, tíbias e húmeros) com fractura ponteaguda, provocada pela acção de partir a respectiva extremidade com os dentes para extrair o tutano da cavidade medular. Comparativamente, esses ossos partidos são raros em conjuntos de ossos de coelhos resultantes da acção de carnívoros e de aves de rapina. Estes dados deveriam ser tidos em conta por especialistas de fauna, quando interpretam ossos de coelho recolhidos em grutas e abrigos-sob-rocha da península.

Palavras-chave: Coelho; carnívoro; tafonomia; gruta.

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INTRODUCTION

The Iberian Peninsula is the homeland of the European rabbit (*Oryctolagus cuniculus*), and more rabbits are found here than anywhere else in Europe (Delibes and Hiraldo, 1979). Because central and southern Iberia were less effected by the large-scale changes in climate and their associated faunas experienced by northern Europe during the Pleistocene (Zilhao, 1990; Straus, 1991; Bicho, 1994), small mammals such as the rabbit probably have been abundant and readily available to prehistoric hunters in much of Iberia for many thousands of years. In addition, European rabbits excavate burrows and they may live in densely-packed warrens, which make them easily detectable to human hunters.

Subsistence studies over the past two decades document diversity in European Upper Paleolithic economies through both space and time (Straus et al., 1980; Gamble, 1983; Simek and Snyder, 1988; Straus, 1990; Grayson and Delpech, 1998; Stiner et al., 1999). European Upper Paleolithic peoples consumed both large animals (e.g. reindeer, horse, red deer, roe deer, wild boar, bison, ibex, chamois) and small animals (e.g. fish, mollusks, fox, rabbits). Large animals probably made up the bulk of the protein and fat consumed before the latter stages of the Upper Paleolithic in some regions of Europe, but this interpretation should not be assumed to hold true for central and southern Iberia, particularly considering the ubiquitous distribution of rabbits in the region.

One region of Iberia which promises to add important information about the role of small mammals in the European Upper Paleolithic diet is the Estremadura region of central Portugal. This region of southwestern Europe is relatively rich in caves containing well-preserved faunas, and rabbit remains are often found in large numbers in these caves (Rowley-Conwy, 1992; Zilhao, 1995; Hockett and Bicho, 1999). However, rabbits are the favorite prey of many mammalian and avian predators in Iberia, including lynx (*Lynx pardina*) and the eagle owl (*Bubo bubo*) (Mathias et al., 1998; Hiraldo et al., 1975). These predators may inhabit and deposit rabbit bones in the same caves occupied by prehistoric hunters. In order to accurately interpret prehistoric subsistence practices, it is important for archaeologists to distinguish rabbit bones deposited in Iberian caves by nonhuman predators from those deposited by humans.

In this paper, a carnivore-accumulated rabbit bone assemblage collected from the surface of Picareiro Cave, central Portugal, is analyzed. These data indicate that rabbit bone assemblages deposited in Iberian caves by small carnivores display unique taphonomic traces not seen in assemblages created by humans during the latter part of the Upper Paleolithic.

PICAREIRO CAVE AND THE RABBIT BONE ASSEMBLAGE

Picareiro Cave is located approximately 100 km northeast of Lisbon in the limestone mountain known as Serra d'Aire. The cave measures approximately 6m in width by 10m in length. Excavations led by Nuno Bicho of the Universidade do Algarve have thus far revealed 10 geologic strata in the top 1.5m of deposit. These strata date between the Bronze Age near the surface to perhaps Last Glacial Maximum near the bottom of the deposits. A series of hearths or firepits were constructed in the cave between 11,800 BP and 12,300 BP, which now lie approximately 1m below the surface. Within these hearths were found the remains of nearly 200 individual rabbits, represented by nearly 9,000 individual rabbit bones (Hockett and Bicho, 1999).

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A large assemblage of rabbit bones was also discovered on the surface of the cave just inside the dripline. The bones were lying within a narrow, horizontal passageway. Only 20-30cm of space was visible between the surface and the ceiling of the cave due to the accumulation of silts and eboulis. Prior to excavation, this portion of the cave would have been accessible only to small animals such as small carnivores.

The rabbit bones lying on the surface of this passageway were recently deposited in the cave. Many of the bones were found as articulating segments with ligaments still attached to the bones, and some of the bones still had rabbit fur attached to them.

There are over 40 species of Iberian mammals and raptors which feed on rabbits (Delibes and Hiraldo, 1979). As detailed below, the vast majority of the rabbit bones from the surface of Picariero Cave were from adult animals. Delibes and Hiraldo (1979) found that only nine species consistently prey on rabbits in Iberia, and of these, only two predators consistently capture adult rabbits: the lynx and the eagle owl. Considering the place of deposition within a narrow, horizontal slit in Picareiro Cave, the rabbit bones could not have been deposited there by raptors such as the eagle owl. These rabbit bones probably were deposited in the cave by a small carnivore such as the lynx. The fox (*Vulpes vulpes*) and the wildcat (*Felis silvestris*) also occur in central Portugal (Mathias et al., 1998), and these predators may be capable of consistently killing adult rabbits as well. Thus, given the context of deposition and the large percentage of adult animals, the rabbit bones analyzed below likely were deposited in Picareiro Cave by the lynx, fox, or wildcat.

TAPHONOMY

A total of 739 leporid bones was recovered from the surface in Picareiro Cave (Table 1). Of these bones, 733 (99%) were from rabbits and six (1%) were from hares (*Lepus granatensis*). These bones represent the remains of at least 25 individual rabbits and one hare. None of the bones recovered show signs of digestive damage such as corrosion, thinning, or polishing, so the bones analyzed represent those carried to the cave but not swallowed by the predator.

All bones of the rabbit carcass were relatively abundant in the assemblage, so the predator carried complete or nearly complete carcasses into the cave. In terms of relative frequencies, however, the tibia was the most numerous element recovered. The innominate and femur were also recovered in relatively large numbers.

The vast majority of these bones belong to adult rabbits. There were 96 proximal ends and 101 distal ends of femora, tibiae, and humeri recovered. Of the 96 proximal ends of these limb bones, 90 (94%) had fully fused epiphyses. Of the 101 distal ends of these limb bones, 94 (93%) had fully fused epiphyses.

A characteristic taphonomic trace on many of the rabbit long bones is the presence of puncture or bite marks. A total of 65 of the 739 bones recovered (1%) displayed at least one puncture mark. Of the 65 punctured bones, 48 (74%) of them were found on the femur, tibia, humerus, and ulna (Table 2).

The location of the punctures on these four limb bones was restricted to the epiphyses. Punctures were found most frequently on the distal femur and the proximal tibia, or at the knee joint. On the distal femur and proximal tibia, punctures were usually found on the lateral and medial sides of these bones. On the proximal femur, punctures were usually found on the anterior and posterior sides of the bone. The limb bones generally displayed multiple punctures, often on opposite sides of the bone (see also Ripoll, 1993).

Sixty-eight percent of the bones displayed two or more punctures, and some bones displayed as many as 10 individual puncture marks. Interestingly, punctures were only found on one side of each of the nine punctured proximal ulnae. The innominate was punctured most frequently on the ishium, although two innominates were punctured on the posterior side of the bone behind the acetabular fossa.

DISCUSSION

The percentage of bones displaying puncture marks from the surface of Picareiro Cave (about 1%) matches the percentage of punctured bones that I have identified on rabbit bones recovered from raptor pellet and raptor nest assemblages in the Great Basin of North America (Hockett, 1995). Raptors also differentially puncture the ends of long bones, but raptors frequently puncture the innominate behind the acetabular fossa when feeding on rabbit carcasses (Hockett, 1991). In contrast to the carnivore assemblage from Picareiro Cave, however, rabbit bones punctured by raptors generally display a single puncture mark.

Culturally-accumulated rabbit bone assemblages may contain large numbers of femur, tibia, and humerus shafts (see Hockett, 1991, 1994; Hockett and Bicho, 1999; Ripoll, 1993; Schmitt, 1990). Prehistoric hunters in the Great Basin of North America and in the Iberian Peninsula snapped or bit off the ends of rabbit long bones in order to extract marrow from the medullary cavity of these bones (Hockett and Bicho, 1999). This behavior often created intact cylinders or diaphyses. In the Great Basin of North America, rabbit cylinders have been found in sites dating between 8,500 BP and 150 BP (Hockett, 1991, 1994; Schmitt, 1990). Ripoll (1993) found these cylinders in the cultural layers of several Late Upper Paleolithic sites in Spain. Hockett and Bicho (1999) recently reported on the presence of 400 rabbit long bone cylinders from the hearths in Picareiro Cave, some of which dated to 12,300 BP. While raptors (Hockett, 1995) and carnivores (Ripoll, 1993) occasionally create rabbit cylinders during feeding, they rarely do so. Of the 739 rabbit bones analyzed from the surface of Picareiro Cave, only four cylinders were recovered. Thus, the presence of large numbers of long bone cylinders appears to be the most diagnostic taphonomic trace on culturally modified rabbit bones from Iberia. The presence of multiple punctures on rabbit bones, as well as evidence for digestive corrosion, are characteristic of carnivore modified assemblages. Rabbit bone assemblages accumulated by raptors display similarities and differences to both human and carnivore modified assemblages (see Hockett, 1991, 1995, 1996).

CONCLUSION

Rabbit bones are ubiquitous in cave sites throughout much of Iberia. Analyzing these remains in detail to determine their mode of deposition is critical to the interpretation of these sites. While it will not always be possible to determine who or what deposited all of the rabbit bones in some Iberian caves, particularly those frequented by both humans and nonhuman predators (see Hockett, 1994, 1995), the taphonomic characteristics outlined above should assist faunal analysts in interpreting these sites. The data presented here and by others (e.g. Ripoll, 1993) are crucial to accurately interpreting rabbit bones from Iberian caves. These data in turn will assist archaeologists in accurately assessing the role that

small mammals such as rabbits played in the prehistoric diet, and how and why subsistence practices changed through time.

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Table 1 – Number of Identified Rabbit Elements (NISP) and Minimum Number of Elements (MNE) recovered from the surface of Picareiro Cave

	NISP	MNE
Skull	15	15
Mandible	25	25
Innominate	38	38
Patella	2	2
Femur	42	35
Tibia	56	52
Calcaneus	31	31
Astragalus	14	14
Scapula	10	10
Humerus	19	17
Radius	13	13
Ulna	16	16
Carpal/Tarsal	36	36
Metapodial	92	92
Phalange	146	146
Rib	26	26
Vertebra	148	148
Sacrum	10	10
TOTALS	**739**	**726**

Table 2 – Punctured rabbit bones from the surface of Picareiro Cave

Element	# of Bone Portions Punctured
mandible	2
innominate	9
proximal femur	5
distal femur	15
proximal tibia	16
distal tibia	2
calcaneus	1
scapula	5
proximal humerus	6
distal humerus	1
proximal ulna	9
Total	71

Note: Six limb bones displayed punctures on both their proximal and distal ends; thus, the total number of individual bones punctured equals 65.