

INDICATIONS OF PLEISTOCENE MAN ON SARDINIA

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Human fossils found in a Pre-Neolithic cave deposit (Corbeddu cave, Sardinia) represent the first human remains associated with an endemic impoverished island fauna. Radiocarbon dating by AMS in Utrecht provided the chronological framework of the cave sediments for better understanding of the time-related human activities. The aberrant morphology of the human fossils and the unique character of worked deer bones discovered, suggest the development of an endemic Pleistocene human culture, adapted to the restricted island conditions and the hunting of ochotonids and deer.

1. Introduction

In 1982 excavations were started in Corbeddu cave on Sardinia in search of an explanation for the aberrant Pleistocene fauna of this island. In spite of the fact that the presence of only a few endemic taxa do indicate island conditions, the deer *Megaceros cazioti* did not become small and did not evolve short legs, as is normally observed in deer populations on islands [1]. Also the presence of a canid *Cynotherium sardous*, although small, is not in agreement with the absence of large carnivores in typical island faunas.

2. Excavation 1982

Excavation in hall 2 of the cave revealed three different layers, as is shown in fig. 1. Based on the archaeological material from layer 1, the lower part of this layer was estimated to represent the Lower-Neolithic [2]. The boundary between layers 1 and 2 is very sharp. Below this boundary the Pleistocene island fauna with the ochotonid *Prolagus sardus*, the deer *Megaceros cazioti* and the canid *Cynotherium sardous* was found in an excellent state of preservation. Very striking is the taphonomy in layer 3 in which fossils of *M. cazioti* were found which were scratched, grooved and polished. Together with a remarkable positioning of some bones with respect to each other, it suggests human activity [2]. This was a surprising discovery because the first human habitation on the Mediterranean islands was always considered to be represented by the Neolithic [3]. As a large predator the Sardinian Pleistocene man could very well be responsible for the fact that no short-legged dwarf-deer evolved.

3. Excavations 1983–1986

The aim of the following systematic excavations was to collect more information about this possible Pleistocene man and his environment. In layer 2 a human temporal bone and a maxilla were found in the same level. They represent the first human remains found in association with an endemic Pleistocene island fauna. There are some interesting differences between these fossils and *Homo sapiens* from the mainland. The most striking features are the extremely broad molars and the small incisors, a peculiar combination unknown in *Homo sapiens* [4]. An aberrant human ulna was found in hall 1.

In the top of layer 3 bones of a single skeleton of *Cynotherium sardous* were found spread over the entire excavation pit, which indicate a level inside the unstratified homogeneous clay. More than 5000 fossils of *M. cazioti* were found below this *Cynotherium*-level. Their coordinates were measured and analyses of their positions indicate that they were concentrated in 7 different levels. The unique character of these worked deer bones suggests a human culture different from any known culture of the mainland [5].

Besides this main pit in hall 2, two fossil bearing layers were found in hall 1 near the entrance of the cave. Both levels reveal again a peculiar taphonomy and during the last excavation of 1986 also limestone artefacts were discovered, which are determined as such by Martini who will publish a detailed description elsewhere. A study of the time-related activities in this cave necessitates a firm chronological framework for the cave sediments. Radiocarbon dating of fragments in the subsequent layers of the various pits may reveal answers to the following questions:

m. below reference level	LITHOSTRATIGRAPHY	FAUNA		¹⁴ C - DATES
LAYER 1 1.50	brown clay	Domesticated animals P. sardus	NEOLITHIC	6.490 ± 90
				8.040 ± 180
LAYER 2 2.00	red clay with angular limestone pebbles	P. sardus M. cazioti Homo	NEOLITHIC	7.860 ± 130
				8.160 ± 130
				8.750 ± 140
				9.820 ± 140
LAYER 3 2.50	red clay	C. sardous M. cazioti P. sardus	PRE - NEOLITHIC	11.980 ± 140
				13.530 ± 170
				14.370 ± 190
				13.510 ± 180
				13.620 ± 180
	black clay			

Fig. 1. Stratigraphy and ¹⁴C-dates in hall 2, Corbeddu cave (Oliena, Sardinia).

- (1) When did Neolithic man arrive on the island?
- (2) What is the age of the human fossils and the human activities in the Pleistocene sediments?
- (3) What is the time correlation between the sediments in the different parts of the cave?

For this purpose both charcoal and bones were collected during the excavation.

4. ¹⁴C-dates: Experimental procedure

During the excavation special care was taken in the collection of samples to avoid contamination with foreign carbon. Each sample was examined and depending on the type of material chemically pretreated to isolate the most stable uncontaminated fraction. Bones were processed according to the procedure for separating the collagen fraction [6]. Depending on the quality and type of bone, a 0.5 to 1.0 g sample yielded sufficient collagen for the final preparation of a few milligrams of graphite for radiocarbon dating with AMS. Charcoal was treated using three sequential phases of chemical treatment: acid-alkali-acid (AAA) [7]. The remaining material was combusted to CO₂ at 1200 K in the presence of excess O₂ and CuO. After purification using Cu and Ag (750 K) the CO₂ was converted into graphite [8]. This graphitisation is based upon the catalytic reduction of

CO₂ at 920 K with finely divided iron powder in the presence of excess H₂. Complete reduction is obtained by forced circulation of the gasses and condensation of the H₂O vapour (200 K). The ¹⁴C measurements have

Table 1
¹⁴C-dates from Corbeddu cave (Oliena, Sardinia)

Sample code	Identification		Stratigraphy	Age BP
UtC-15/ 233	CB-3568	bone	Layer 1 base	6.490 ± 90
UtC-22	CB-3568	coal	Layer 1 base	8.040 ± 180
UtC-235	CB-3569	coal	Layer 2 top	8.160 ± 130
UtC-301	CB-3569	bone	Layer 2 top	7.860 ± 130
UtC-300	CB-3014	bone	Layer 2 mid/ top	8.750 ± 140
UtC-14/ 237	CB-3554	coal	Layer 2 mid	9.820 ± 140
UtC-250	CB-2000	coal	Layer 2 mid/ base	11.040 ± 130
UtC-241	CB-2323	bone	Layer 3 level 2	11.980 ± 140
UtC-244	CB-XXIII	bone	Layer 3 level 4	13.530 ± 170
UtC-242	CB-2863	bone	Layer 3 level 5	14.370 ± 190
UtC-240	CB-3889	bone	Layer 3 level 6	13.510 ± 180
UtC-239	CB-6271	bone	Layer 3 level 7	13.620 ± 180
UtC-243	CB-XXVII	bone	Hall 1	25.700 ± 400

been performed using the tandem accelerator in Utrecht [9]. The carbon dates obtained are listed in table 1 and fig. 1.

5. Discussion

Charcoal and bones of *P. sardus* were collected immediately above and below the sharp boundary between layer 1 (Lower-Neolithic) and layer 2 (Pre-Neolithic). From the four dates obtained around the boundary, an age of 8000 BP can be concluded. Bones of *P. sardus* found next to the human maxilla, are dated at 8750 ± 140 (CB-3014) indicating that this level, in which also the temporal bone was found, is of Pre-Neolithic age. The dates for the various levels in layer 3 indicate a very fast sedimentation from level 7 to level 4. The presence of a small river running from hall 3 into hall 2 with possible periodical overflows, could result in a very fast covering of the bones with clay. If this model is correct each different fossil level represents a short time interval between two wet periods, providing excellent circumstances for study of the behavior of the bone manipulating Pleistocene man. The aberrant age of level 5 is not well understood. The sample consists of a laboratory-sectioned part of a metacarpus of *M. cazioti* which was found next to its corresponding carpalia. A redeposition of a complete deer-foot derived from an older layer is most unlikely.

The considerable age of the sample from hall 1 is remarkable because it was collected between the two fossil levels. This means that the second one is still older. Further datings both from hall 2 and hall 1 are currently in preparation.

6. Conclusions

The age of approximately 8000 BP for the boundary between layers 1 and 2 corresponds with the presumed first arrival of Neolithic man on Sardinia. It indicates that Corbeddu cave is among the oldest Neolithic sites on the island.

The differences in morphology between the Sardinian human fossils (8750 ± 140 BP) and contemporary *Homo sapiens* from the mainland, and the unique character of the worked deer bones (> 25000 – 8000 BP), suggest the development of an endemic Pleistocene culture, adapted to the restricted island conditions and the hunting of deer and ochotonids. The discovery of a Lithic Paleolithic industry in the north of Sardinia indicates a habitation of the island dating back to the Middle Pleistocene [10–12].

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