INTRODUCTION

Abundant burnt bones found in a Cantabrian Mousterian site, El Esquilleu, lead us to consider the possible fuel qualities of this material related to the domestic fires developed in this site.

A summary of burnt bones experiences have been carried out in view to test such fuel qualities and their implications into the study and interpretation of archaeological bones assemblages - El Esquilleu have yielded in some occupations levels around 90% of bones carbonized and calcined. Otherwise to evaluate if the use of bone as fuel was directly related to unfavorable environmental causes (hazardous scarcity) we have developed an interdisciplinary discussion taking into account the natural and human factors convergence.

SETTING OF SITE

El Esquilleu opens on the SE calcareous slopes of the La Herradura Gorge (Western Cantabria, Spain) at 200 m a.s.l and 28 Km distant of the sea. East-Western mountain range disposition stop the way west winds and high precipitation regime generating different shellfow conditions. The decrease in precipitation lead to a lighter and clearer atmosphere that make possible the development of Cantabrian Evergreen Oak formations along the calcaeous slopes of this gorge.

BONES EXPERIENCES AT EL ESQUILLEU CAVE (WESTERN CANTABRIA, NORTHERN SPAIN) DOMESTIC HEARTHS

BONES EXPERIENCES AND EXPERIMENT. BONES AND WOOD CORRELATIONS

A gradual increase in burnt bones since level XVII downwards is noticed (figure on the left): level XIV, 60%; levels XV-XIX, >80%; lowest levels XX-XXIV, >90%. The upper levels of burnt bones are in the same proportion: 90%-95%. This means that burnt bones have been produced at the same rates whatever the occupation levels considered. The increase in the use of ignition shrubs as noticed in upper levels suggests a longer duration of flame, higher and more stable temperatures and a better conditioning of habitat in caves (lighting, heating and other domestic and technological uses).

CHRONOSTRATIGRAPHIC RECORD

Thirty stratigraphic layers have been excavated, all of them being Mousterian. Chronology opens a period of time from >35 Kyrs BP (TL 35 Kyrs BP, level XXII to AMS 34.3 Kyrs BP on level VI). Human occupations can be summarized in 3 phases up the downwards: levels IV-XVIII slight human occupations (Taxodiaceae lithic technology); levels XVI-XXI intensive occupations (products from main Quina technology); XV-XIX (more specialized habitation focused to Cave hunting with main Levantico/Esquilleo and occasionally Quina technologies).

POLLEN DATA RELATED TO CHARCOAL AND BIS 2 DYNAMICS

Paloxylysis plants are also relevant. Aquatic and herbaceous taxa are present suggesting an optimum in water resources availability and edaphic moluscs. Three phases are outlined according to palynograms: Phase I (XX-XII-X) with open landscape dominants (Asteraceae, Poaceae, Cichorieae); Phase II (XI-VIII) with closed canopy. Phase III (VII) show again an optimum in water resources availability and edaphic moluscs. Few taxa are noticed indicating an optimum in moisture conditions. Level IIIX charcal information also point to wet environmental trends, related to those recorded in other cantabrian prehistoric caves where similar high amounts has resulted on the increase in moisture conditions generated by a strong precipitation regime derived from Atlantic influence. The results obtained in this research gives support to a palynological evidences pattern, as well as to the function and duration of human occupations as noticed in changes in the woodfire management occurred at El Esquilleu, XV-XII levels.

MAIN CONCLUSIONS

Burres combustion experiments have demonstrated the good qualities of bones as fuel permitting us to evaluate its use besides wood in El Esquilleu Mousterian hearths.

FAUNISTIC ASSEMBLAGES, SEASONALITY

Capra pyrenaica, Rupicapra rupicapra are the dominant taxa along Esquilleo stratigraphic record, with occasionally Cervus elaphus and some Riss late occurrences (Bos taurus). Bone-hoarding is related to hypogeous and sometimes scapulinae (Bos taurus) with open landscapes (Levantico/Quina) and by hunting strategies (Cervus/Rupicapra). A gradual increase in burnt bones since level XVII downwards is noticed (figure on the right): level XIV, 60%; levels XV-XIX, >80%; lowest levels XX-XXIV, >90%. There is a direct correlation between burnt bones (red court) the size of fragments (blue, green and yellow court) and the deterioration degree of bones. Undeterminable bones increase from 50% in level XIV to 70% (even 100%) in levels XX to XXX. Combustion of bones determines its fragmentation and identification. Abundant burnt bones and its combustion degree (carbonized and calcined) let us suppose its employment as fuel at levels where forests have appeared (leaves: XIX, XXIII, XXVIII and XXIX). A serie of experimental Capra bones combustions have been conducted in view to test this hypothesis (figure on the right). Results have shown the good properties of bones in the duration of fires and in the maintenance of stable temperatures, specially by carbonization (red court) and axial bones (light blue court). Why bone was employed as fuel in this cave? Scarcity of wood as the consequence of unfavorable environmental conditions? Functional information doesn’t seem to indicate it. Or it respond rather to a human behavior set: as economy of time and effort in the supply of fuelswood, seaspeic practices and elaboration of organic residues, and specially in a clear interest in the maintenance and duration of the flame? Woodfire employed along human occupations of this cave reinforce this last assumption as indicated below: mixture of low and rapid combustion species (Pinus-Beulte- Sorbus) as well as the systematic employment of some shrubs considered as ignition taxa according to ethnographic record (Fabaceae, Arctius) ensure a longer duration of flame, higher and more stable temperatures and a better conditioning of habitat in caves (lighting, heating and other domestic and technological uses).

Acacia senegal is almost dominant in all levels with slight occurences of Betula, Sorbus, Fabaceae and mesophitex species (Corylus) in lower levels (since XVIII downwards). Charcoal fibers obtained in levels XVII to XX are more diversified (Juniperus, Betula, Sorbus and a greater variety of angiosperms coming from different xerophyte species) away coinciding with a Pinus sharp decrease. Decrease in Pinus, probably related to environmental events, should have dramatically reduced the main fuelwood resource extent that could also have affected the continuity of Neanderthal inhabitants in this site. However such biomass have seemed have been solved by a wide range woodfire made by the annual occupation levels. Changes in woodfire management observed are strongly related to those experienced in the same levels by Pinus charcoal taxa (Levantico/Quina) and by hunting strategies (Cervus/Rupicapra).

ANTHROPOLOGY

Pinus sylvestris has been employed as additional fuelwood in order to optimize the quality and duration of multifunctional fires (temperature, ember, smoke). The use of shrubs are related to starting of fires according to its ignition properties.

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