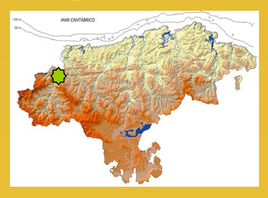
BONES EXPERIENCES AT EL ESQUILLEU CAVE (WESTERN CANTABRIA, NORTHERN SPAIN) : DOMESTIC HEARTHS MANAGEMENT, HUMAN BEHAVIOUR AND ADAPTATIONS TO ENVIRONMENTAL TRENDS BETWEEN 53-30 Kyrs. BP



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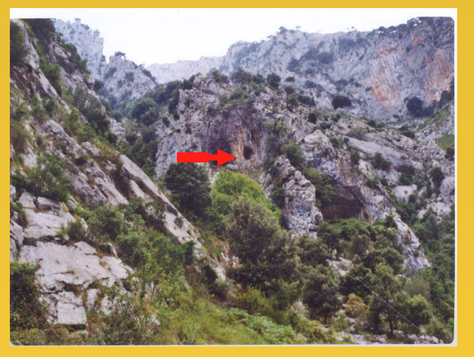
INTRODUCTION

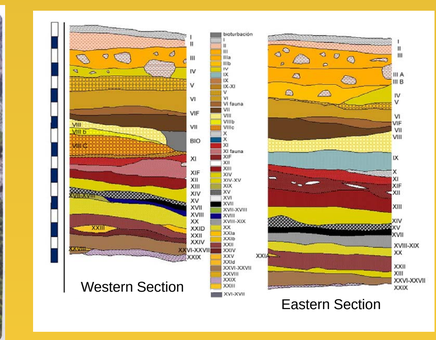
Abundant burnt bones found in a Cantabrian Mousterian site, El Esquilleu cave, let us to consider the possible fuel qualities of this material related to the domestic fires developped in this site.

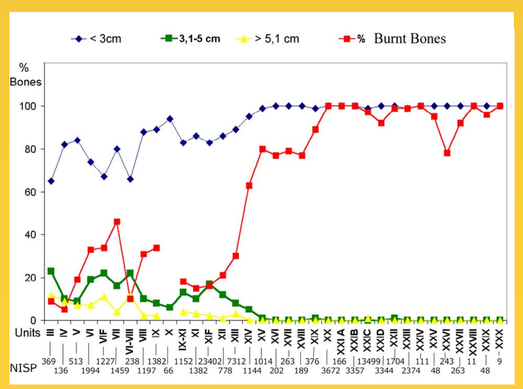
A summary of burnt bones experiences have been carried out in view to text such fuel qualities and its implications into the study and interpretation of archaeological bones assemblages : El Esquilleu have yielded in some occupations levels around 90% of bones carbonized and calcined. Otherwise to evaluate if the use of bone as fuel was directly related to unfavourable environmental causes (fuelwood 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 Hermida Gorge (Western Cantabria, Spain) at 350 m asl and 26 Km distant of the sea. East-Western mountain range disposition stop the wet westernly winds and high precipitation regime generating different sheltered conditions. The decrease in precipitations lead to a lighter and clearer atmosphere that make possible the development of Cantabrian Evergreen Oaks formations along the calcareous slopes of this gorge.





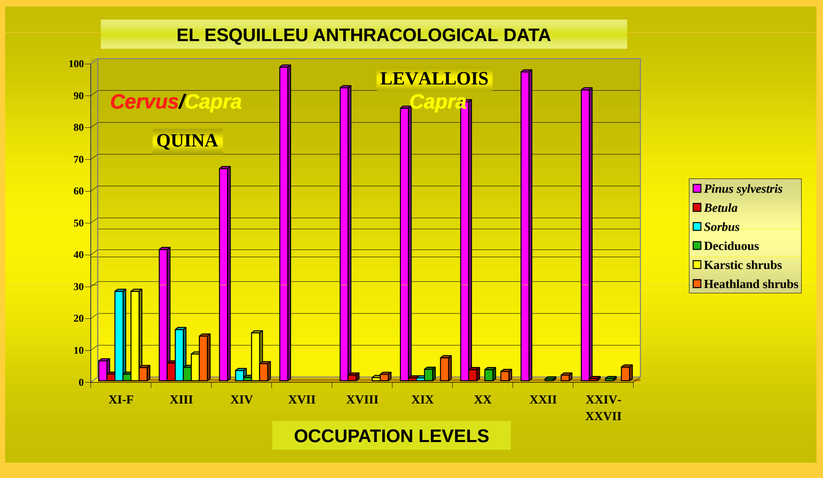


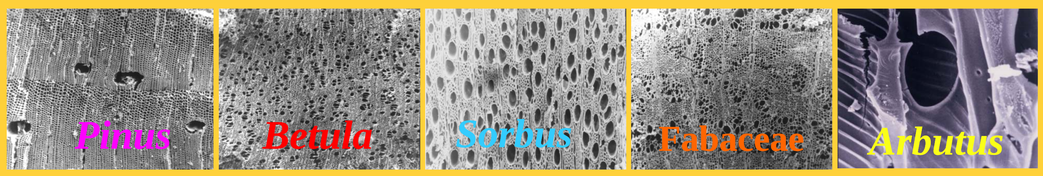
BONES EXPERIENCES AND EXPERIMENTS. BONES AND WOOD CORRELATIONS

A gradual increase in burnt bones since level XIV downwards is noticed (figure on the left) : level XIV, 60%; levels XV-XIX, >80%; lowest levels XX-XXX, >95% (red courbe). There is a direct correlation between burnt bones (red courbe) the size of fragments (blue, green and yellow courbes) and the determination 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 least in levels where hearths have appeared (levels XXI, XXIII, XXV, XVIII and XXIX). A serie of experimental *Capra* bones combustions have been conducted in view to text this hypothesis (figure on the right). Results have shown the good properties of bones in the duration of fires and in the maintenance of stables temperatures, specially by using broken epiphysis (red courbe fig. on the right) and axial bones (light blue courbe fig. on the right). Why bone was employed as fuel in this cave?. Scarcity of wood as the consequence of unfavourable environmental conditions?. Floristic information doesn't seem indicate it. Or it respond rather to a human behaviour set : as economy of time and effort in the supply of fireplaces, aseptic practises and elimination 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-Betula-Sorbus*) as well as the systematic employement of some shrubs considered as ignition taxa according to ethnographic record (Fabaceae, *Arbutus*) ensure a longer duration of flame, higher and more stables temperatures and a better condicioning of habitat in caves (lighting, heating and other domestic and technological uses).

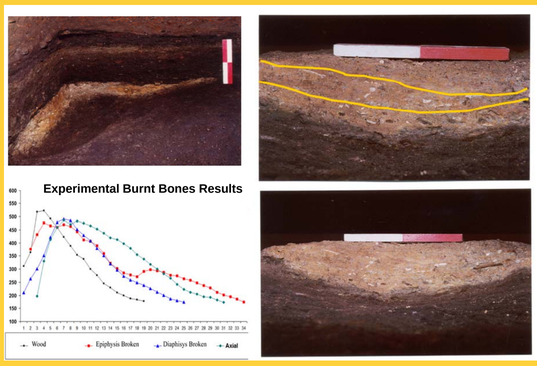
CHRONOSTRATIGRAPHIC RECORD

Thirty stratigraphic lawyers have been excavated, all of them being Mousterian. Chronology span a period of time from >53 Kyrs BP (TL 53 Kyrs. BP, level XXI) to AMS 34.3 Kyrs. BP obtained on level VI. Human occupations can be summarized in 3 phases up to downwards : levels IV-V slight human occupations (Discoide lithic technology); levels VI-XIV (stronger and more diversified human activities with main Quina technology); XV-XXX (more specialized habitat focused to *Capra* hunting with main Levallois/Discoide and occasionally Quina technologies).



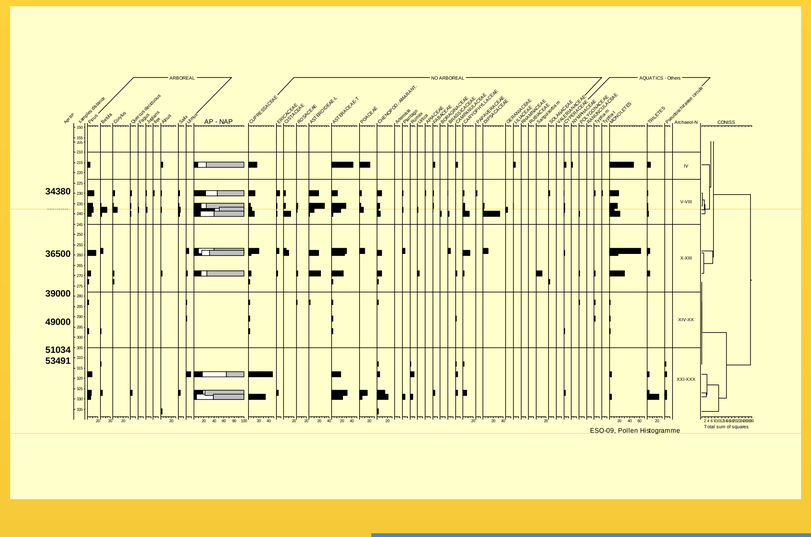


Domestic fires were supplied mainly with *Pinus. Betula* and *Sorbus* were employed as additional fuelwood supply in order to optimize the quality and duration of multifonctional fires (temperature, embers, smoke). The use of shrubs are related to starting of fires according to its ignition properties.



ANTHRACOLOGY

Pinus sylvestris is dominant in all levels with slight occurrences of *Betula, Sorbus*, Fabaceae and mesophilous trees (*Corylus*) in lower levels (since XVII downwards). Charcoal flora obtained in levels XIV to XI is more diversified (*Juniperus, Betula, Sorbus* and a greater variety of shrubs coming from different substrate sloppes areas) coinciding with a *Pinus* sharp decrease. Decrease in *Pinus,* probably related to environmental events, should have dramatically reduced the main fuelwood ressouce extent that could also have affected the continuity of Neanderthal inhabitants in this site. However such biomass loss seems have been solved by a wider range woodfire management and by the increase in the use of ignition shrubs as noticed in upper occupation levels. Changes in woodfire management observed are strongly related to those experienced in the same levels by Mousterian technologies (Levallois/Quina) and by hunting strategies (*Cervus/Capra/Bos*).

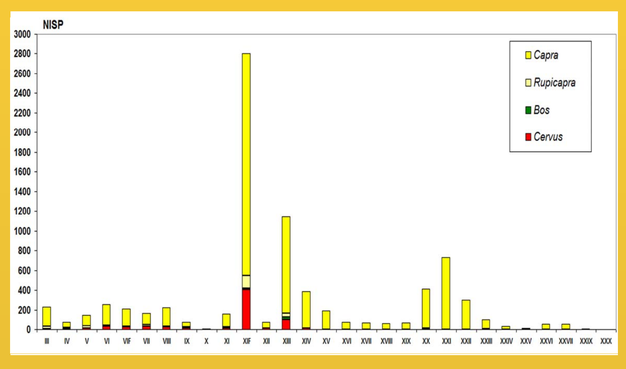


POLLEN DATA RELATED TO CHARCOAL AND MIS 3 DYNAMICS

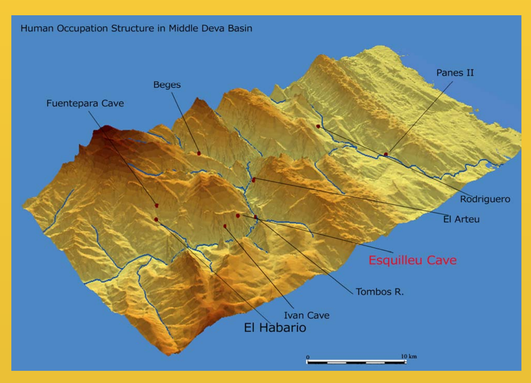
Palynological data shows *Pinus* continuous amounts along pollen record. Herbaceous plants are also relevant. Aquatics and Riverbanks taxa are presents suggesting an *optimum* in water ressources availability and edaphic moisture. Three phases are outlined according to palynogram : Phase I (XXX-XX) with open landscapes dominant (Asteraceae, Poaceae, Chenopodiaceae), relevant *Pinus* amounts and presence of *Betula* and Cupresaceae (*ca* >50 Kyr BP).

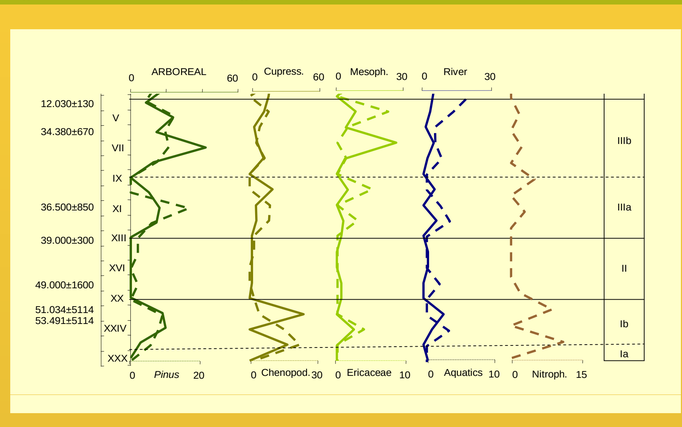
Phase II (XX-XIV) Hearths have seriously affected preservation pollen content limited to *Pinus, Betula,* Cupresaceae and Asteraceae occurences (*ca* <50-39 Kyrs. BP). Charcoal data from these levels could help in the palaeoecological interpretation according to the double nature of charcoal information and to the complementarity of both archaeobotanical disciplines. *Pinus* management suggest its abundance on the environment besides some *Betula*, *Sorbus*, *Corylus* occurences and heathland shrubs.

Phase III : (39-34.3 Kyr BP) Besides *Pinus* and NAP high amounts, mesophilous taxa are noticed indicating an optimum in moisture conditions. Level XI charcoal information also pointed to moist environmental trends, related to those recorded in other cantabrian prehistoric caves where *Betula* high amounts has resulted on the increase in moisture conditions generated by a strong precipitaton regime derived from glacial dynamics. Mountain glaciers influence have determined settlement pattern, as well as site-fonction and duration of human occupations as noticed in changes in the woodfire management occured at El Esquilleu XIV-XI levels.



	El Esquilleu Hunting Seasonal pattern											
	Capra pyrenaica				*Rupicapra rupicapra*				*Cervus elaphus*			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
III	*	*	*		*	*	*					
V		*	*			*	*					
VI			*			*						
VIF	*	*										
VII	*	*	*		*	*	*					
XI		*										
XIF	*	*	*	*		*				*		
XIII		*	*			*						
XIV			*									





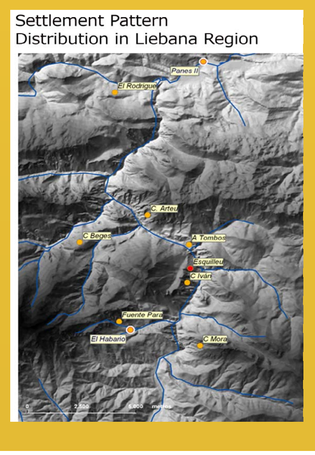
FAUNISTIC ASSEMBLAGES, SEASONALITY…

Capra pyrenaica, Rupicapra rupicapra are the dominant taxa along Esquilleu stratigraphic record, with occasionally *Cervus elaphus* and some *Bos* occurences (levels XIF and XIII). Rocky areas fauna predominance is related to topographic characteristic surrounding Esquilleu site catchment territory (La Hermida abrupt calcareous Gorge). Such environments suggest a faunal exploitation closed to the site during the most human occupations recorded in this cave (>53 to 34.3 Kyr BP). However, Red deer, present between V and XIV upper levels, also suggests long distant hunting strategies occured since these occupation levels dated between *ca* 40-34.3 Kyr BP. Auroch discontinuous occurences (levels XI-XIII) should also confirm such longer distant trajects made by neanderthalians during this period of time. Diachronic variations observed in faunal assemblages clearly indicate changes in the subsistence strategies and subsequently a change in the site-fonction and in the occupation of this cave. Faunal and Anthracological interpretations are strongly matched.

Concerning seasonality only upper levels have provided information, indicating mainly summer captures with occasional late spring and early fall ones. Such data are not suprising bearing in mind the location of the cave in the mountains and also the MIS 3 climatic variability (alternation of shorts and irregular stadial/interstadials events).

Microfaunal record is scarce suggesting temperate environments for upper levels VI-XI (34.3-36.5 Kyr BP).

Level XI seems reflect a longer seasonal occupation as indicated by *Capra* captures during all year, suggesting a more intensive occupation. Raw material are also very rich and charcoal *spectrum* have recorded the most floristic diversity in this level.



MAIN CONCLUSIONS

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

The interdisciplinary study (charcoal-pollen-fauna) has shown the existence of diverse environments on the surroundings of this cave, diary frequented and managed by humans in view to obtain all kind of economical resources they needed for their subsistence. Variations on the woodfire supply modalities have been observed between lower and upper levels related to *Pinus* gradual decrease and coinciding with changes in the hunting strategies and lithic technologies. Changes on the site-fonction and subsequently on the exploitation and management of the catchment area have been the main human adaptations to the MIS 3 climatic oscillations. Environmental trends (moisture increase) were favourable to the development of some multiseasonal occupations (level XI) but they weren't so good to the *Pinus* continuous extent, the woodfire resource mostly employed by neanderthalians along their seasonal occupations of this cave. The use of bones as complementary fuel into hearths is related to human activities and adaptation strategies developed in the different occupations of this cave as a response to the changing environment resulting of the MIS 3 climatic instability.