



Fish as diet resource in North Spain during the Upper Paleolithic

Gema E. Adán^a, Diego Álvarez-Lao^a, Pablo Turrero^a, Miguel Arbizu^a, Eva García-Vázquez^{b,*}

^a Department of Geology, University of Oviedo, Spain

^b Department of Functional Biology, University of Oviedo, C/Julian Claveria s/n, 33006 Oviedo, Spain

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ABSTRACT

During the last glacial maximum, the west European modern humans adapted to adverse conditions and their populations subsisted exploiting the natural resources available. Fish were always present as a source of animal protein, although their importance in the human diet and their contribution to the expansion of humans has not been fully explored. Based on the compilation of zooarchaeological evidences from north Spanish sites we have discovered a constant pattern of exploitation of freshwater fish (Salmonids) with high incidence in the human diet during the Upper Paleolithic. Shifts in the exploitation of marine resources can be explained by climate-related geographical changes. The characteristics of salmonids that make them target species for supporting human survival in adverse climate periods are identified and discussed.

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1. Introduction

The expansion of anatomically modern humans (AMH) in Western Europe was coincident with the critical period of the last glacial maximum (LGM, ~18,000 years before present). In spite of the enormous interest in understanding the process of modern human population growth and the substitution of the Neanderthals by the new species, our knowledge of human taxa in that period, 50,000–12,000 years before present (kya), is still poor (Finlayson and Carrion, 2007). Different levels of technological innovation have been proposed (Klein, 1999; Finlayson, 2004) for explaining the unequal adaptation of Neanderthals and modern humans to the cold conditions in Europe, but this behavioral hypothesis is controversial because it has also been suggested that the Neanderthals were capable of technological innovation (d'Errico et al., 1998). Climate-related factors, like rapid ecological turnover, have been recently proposed as main forces to the fate of humans during the glacial period (Finlayson and Carrion, 2007). It is increasingly clear that an exploration of the ecology of the human species is necessary for understanding the expansion of AMH.

The ability to exploit fish resources has been proposed as one of the reasons of the adaptive advantage of modern humans: the use of marine resources has probably facilitated the long migrations of modern humans from the African continent 125 ka (Yellen et al., 1995; Richards et al., 2000, 2001; Bocherens et al., 2005; Stiner and

Kuhn, 2006; Marean et al., 2007), likely providing the advantage in multi-generational brain development which would have made possible the advent of *Homo sapiens* (e.g. Broadhurst et al., 2002 and many references therein). In general, chemical analyses of bones indicate that Neanderthals did not feed on marine protein (Klein et al., 2004; Hockett and Haws, 2005), with some exceptions as probable fish consumption was reported in Neanderthals from Saint Césaire, France (Balter and Simon, 2006). Although in some cases the presence of fish remains at human sites has been attributed to predation by other mammals like fox and lynx (Rasilla Vives, 1990), studies on bone composition and others have evidenced that modern humans fed on fish (e.g. Flannery, 1969; Richards et al., 2001; Stiner, 2001; Dobrovolskaya, 2005) and other marine resources (Richards et al., 2005) during the Upper Paleolithic. Some authors suggest that massive consumption of fish was caused by the cold period that started with the Gravetian technocomplex (28 kya), as an additional food source besides herbivores (Djindjian et al., 1999; Carbonell, 2005).

However, the information about the type and species of ichthyological remains is scarce and sparse. It has not been systematically analyzed to date, in spite of its importance in human diet. Many questions are open with respect to the use of fish as a resource. Two markedly different types of diet, with or without use of marine resources, have been proposed for separate human groups in southwest Europe during the Upper Paleolithic (Arias Cabal, 2005); the distance to the coast could be the cause. On the other hand, broad-spectrum subsistence economy has been associated with significant population increases (Richards et al., 2001). Have modern humans exploited both freshwater and marine fish

* Corresponding author. Tel.: +34 985102726; fax: +34 985103534.

E-mail address: egv@fq.uniovi.es (E. García-Vázquez).

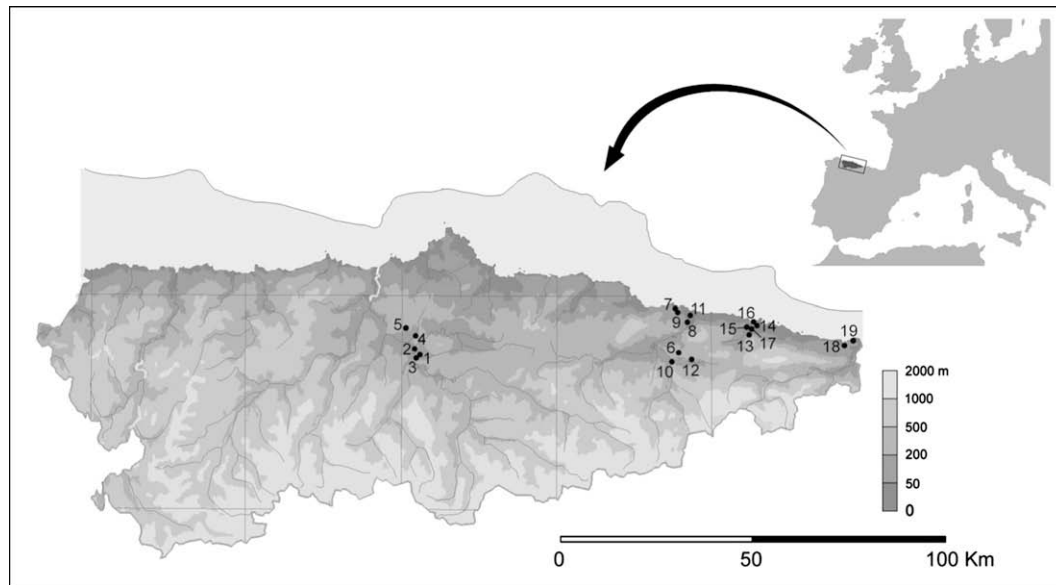


Fig. 1. Map with the location of the studied sites. Map of Asturias province showing the distribution of the archaeological sites with presence of fish fossil remains and fish representations in paleolithic art. The line in the upper part of the map indicates the most probable position of the coastline during the coldest episodes of the Upper Pleistocene, when the sea level was placed about 140 m below the present level (Clark and Mix, 2002; Jiménez-Sánchez et al., 2006). The numbers correspond to the following sites: 1 – Las Caldas; 2 – Sofoxo; 3 – La Lluera; 4 – Cueva Oscura; 5 – La Paloma; 6 – El Buxu; 7 – El Cierro; 8 – La Lloseta; 9 – Les Pedroses; 10 – Los Azules; 11 – Tito Bustillo; 12 – La Güelga; 13 – Arnero; 14 – Balmori; 15 – Cueto de La Mina; 16 – Fonfría; 17 – La Riera; 18 – Mazaculos; 19 – El Pindal.

resources simultaneously, or have they exhibited a sort of specialization on marine or freshwater fisheries? There are no answers to these questions for most European regions.

The objective of this study is to compile zooarchaeological evidences of fish consumption from human settlements and shelters during the Upper Paleolithic, as a first step to document changes in prehistoric human alimentation and determine the dietary niche of humans with respect to the aquatic environment (freshwater and marine), assessing their importance in different stages of the Paleolithic period (fishing strategies; capture methods, through bone marks, Willis et al., 2008; changes in apparel,...) and taking into account whatever isotopic analyses are available for the remains studied.

We have focused our study on the province of Asturias, in the western half of the north Spanish coast (Fig. 1), which contains Aurignacian industries (35 kya). To our knowledge, this is the first attempt to compile all existing information about fish remains in the area, dispersed until now in thesis dissertations, internal reports and symposium publications.

2. Material and methods

This study is based on an exhaustive review of publications and symposium proceedings reporting and describing archaeological sites excavated in Asturian territory (North of Spain). The reports of ichthyofauna vestiges have been compiled and analyzed in detail. Other indirect signals of the use of fish as a resource were also considered, like Paleolithic art depicting fishes, which exists in a few caves in the region. The sites, the type of vestige (remains, art) and the references analyzed are shown in Table 1.

A complete sequence of fish remains for all of the excavated Paleolithic periods was described in only three archaeological sites: Tito Bustillo (site 11), Cueto de la Mina (site 15) and La Riera (site 17). The detailed results published for these three sites were analyzed and presented graphically. Figures and representations were constructed with the Excel program (Microsoft), which was also employed for basic statistics (non-parametric Chi-square tests).

3. Results

For the Upper Paleolithic, a minimum of 88 sites have been excavated in the Asturian region and the results reported are available in different formats (PhD theses, research reports, published articles, published notes, Proceedings and Abstracts of symposia communications). Fish remains were reported from only 18 of those 88 sites (Table 1), representing a 20.5% of occurrence in the region for the whole period considered. The sites are grouped in two separate areas. One area corresponds to the Narcea-Nalón fluvial drainage (sites 1–5), where the archaeological sites are currently located at 50–30 km from the coastline, and the other corresponds to the eastern area of the region, with a higher occurrence of fish remains, where the sites are distributed near the

Table 1

Sources of information about the presence of fish in Asturian human settlements in the Upper Paleolithic. Site, type of information (remains, art), reference.

Site	Type of information	Reference
Las Caldas	Remains	Corchón et al., 1981
Sofoxó	Remains	Adán, 1997
La Lluera	Remains	Rodríguez Asensio, pers. com.
Cueva Oscura	Remains	Adán et al., 2000
La Paloma	Remains	Hernández Pacheco, 1919
	Art	Corchón, 1986
El Buxu	Remains	Soto Rodríguez, 1984
El Cierro	Remains	Clark, 1976
La Lloseta	Remains	Utrilla, 1981
Les Pedroses	Remains	Clark, 1976
Los Azules	Remains	Fernández-Tresguerres and Rodríguez Fernández, 1990
Tito Bustillo	Remains	Morales Muñoz, 1984
	Art	Corchón, 1986
La Güelga	Remains	Turrero, 2007
Arnero	Remains	Adán, 1997
Balmori	Remains	Clark, 1976
Cueto de la Mina	Remains	Rasilla Vives, 1990
Fonfría	Remains	Vega del Sella, 1923
La Riera	Remains	Straus and Clark, 1986
Mzaculos	Remains	González Morales, 1982
El Pindal	Art	Saura and Múzquiz, 2007

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