

Economic transitions in *finis terra*: the western Mediterranean of Iberia, 15–7 ka BP

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Abstract

A gradualist approach has been taken in describing the evolution of the last foragers in the Iberian Mediterranean Region (IMR) up to their rapid collapse, brought about by the appearance of the first prehistoric farmers. This point of view assumes that the post-Last Glacial Maximum (LGM) climatic change brought about a certain restructuring of the mammal fauna and exerted a direct influence by flooding the changing coastal plain and submerging coastal sites related to marine resource use. This paper proposes that small prey was a constant and structural resource in the IMR that did not signal intensification, since human consumption of rabbits goes back to the Middle Palaeolithic. At the same time, it proposes that the diversification-intensification associated with the Pleistocene-Holocene transition must be assessed mainly based on marine resources but integrated with the tool kits used to process them, symbolic imagery and the transportation of marine resources to some inland sites as evidence of the use of these resources extends to the Middle Palaeolithic. With this goal in mind, two different regions (Valencia and Andalusia) are compared by means of two sites which are respectively an example of inland mountainous areas near the coast (Coves de Santa Maira) and of southern Iberian coastal sites (Cueva de Nerja).

Much has been written during the second half of the 20th century suggesting a link between ecology and culture (Binford 1968; Flannery 1969; Clarke 1976;

Price & Brown 1985; Straus & Eriksen 1998). A large part of this literature focuses the discussion on the last major transition in Old World prehistory: the one

starting after the LGM and ending in the middle Holocene, with the expansion of the first Neolithic farmers. In most of these works terms such as intensification and diversification are to be found, but their meanings are not explained. If intensification is understood as a dynamic tendency towards the maximal use of resources, it could be countered that any ethological action of optimisation could be taken as intensification. After all, saving time and energy when hunting for prey allows foragers to invest the excess in social activities (Kaplan & Hill 1992). Taking this approach, behavioural ecology has developed different explicative models of predator decision making to hunt prey. They all fall into two broad categories: related to prey choice and related to use of space or territory (Charnov 1976; Grayson & Delpech 1998; Kaplan & Hill 1992; Orians & Pearson 1979; Schoener 1979; Smith & Winterhalder 1992; Winterhalder 1981; Winterhalder 2001; Winterhalder & Smith 1981, 1992, 2000).

It is not these models, but an evolutionary perception that has been used to study prehistoric foragers in the Iberian Mediterranean Region (Aura et al 1998 and 2002a; Aura 2004). A gradualist approach has been adopted to describe the Pleistocene-Holocene transition until the rapid collapse prompted by the presence of the first prehistoric farmers, which gave rise to economic diversification and to the development of different specialised forms of exploitation of the most productive resources.

Our contribution will focus on two major questions:

- 1 how confident can we be in the identification of diversification and intensification in the IMR based on the analysis of the extent of exploited resources and the relative importance of these resources? Multiple factors need to be considered such as climate change as well as changes in economic and sociocultural trends
- 2 what changes in biogeographical distribution of resources in the IMR took place across the Pleistocene-Holocene boundary according to new data from archaeological sites in Valencia and Andalusia (Spain), dated between c 15–7 ka BP?

1 Regional context & main sites

An assessment of the diversification-intensification in the IMR would require a better knowledge of the palaeoenvironmental and chronological changes than is currently available. It is evident that we have no information on most open-air sites; it is also true that

there is not enough evidence at present to prove the impact of the refuge effect on the Iberian Peninsula during the Pleniglacial. There are remains of some sites near the Pleniglacial coast in Andalusia, whereas in Valencia the coastal plains were flooded by sea level rise. This differential conservation allows us to analyse how the exploitation of marine resources evolved in the south.

The main site is the Cave of Nerja (Málaga, Andalusia), near the strait of Gibraltar, is presently located at 158 m altitude, one kilometre away from the coast. This prehistoric site presents several external rooms that have been inhabited for 25,000 years. It was also used as a necropolis, and Palaeolithic and Neolithic art have been found in its galleries. It is a paradigmatic site for southern Iberia (Jordá Pardo 1986).

The central region of the IMR holds an important nucleus of archaeological sites, some excavated during the first decades of the 20th century, such as the Cova del Parpalló (Pericot 1942). These sites, located on a land strip about 40 km from the present coastline towards the inland valleys and on the middle mountains of Valencia, have provided us with important data on the exploitation of resources (figure 1).

Some Valencian data (raw materials and marine shells without ornamental value) indicate that, since the LGM, an increasingly closer relationship existed between the coastal plain and the inland valleys. One such site was Coves de Santa Maira, located at 640 m altitude and 32 km inland from the present coastline, surrounded by summits higher than 1300 m. It was a medium-sized settlement, sporadically occupied between 20–14 ka BP, and more continuously between 12–7 ka BP.

Before continuing, we will clarify some of the terms we use. Epipalaeolithic (c 11.5–9 ka BP) refers to the archaeological complexes that have many points in common with the Final Palaeolithic techno-typological tradition, Magdalenian (c 15.5–11.5 ka BP). Both Epipalaeolithic and Later Magdalenian 'groups' often occupy the same sites, use similar raw materials, have microblade technology and represent a palaeoeconomic continuity (see below). The scarcity of portable art and bone points is a common feature of Epipalaeolithic sites. The Mesolithic (c 9–7 ka BP) breaks with this technological tradition; we can recognise in it a lithic flake complex, with hardly any stone or bone projectiles, called Notches and Denticulate Mesolithic (Alday 2006) and, since c 8 ka BP, there is

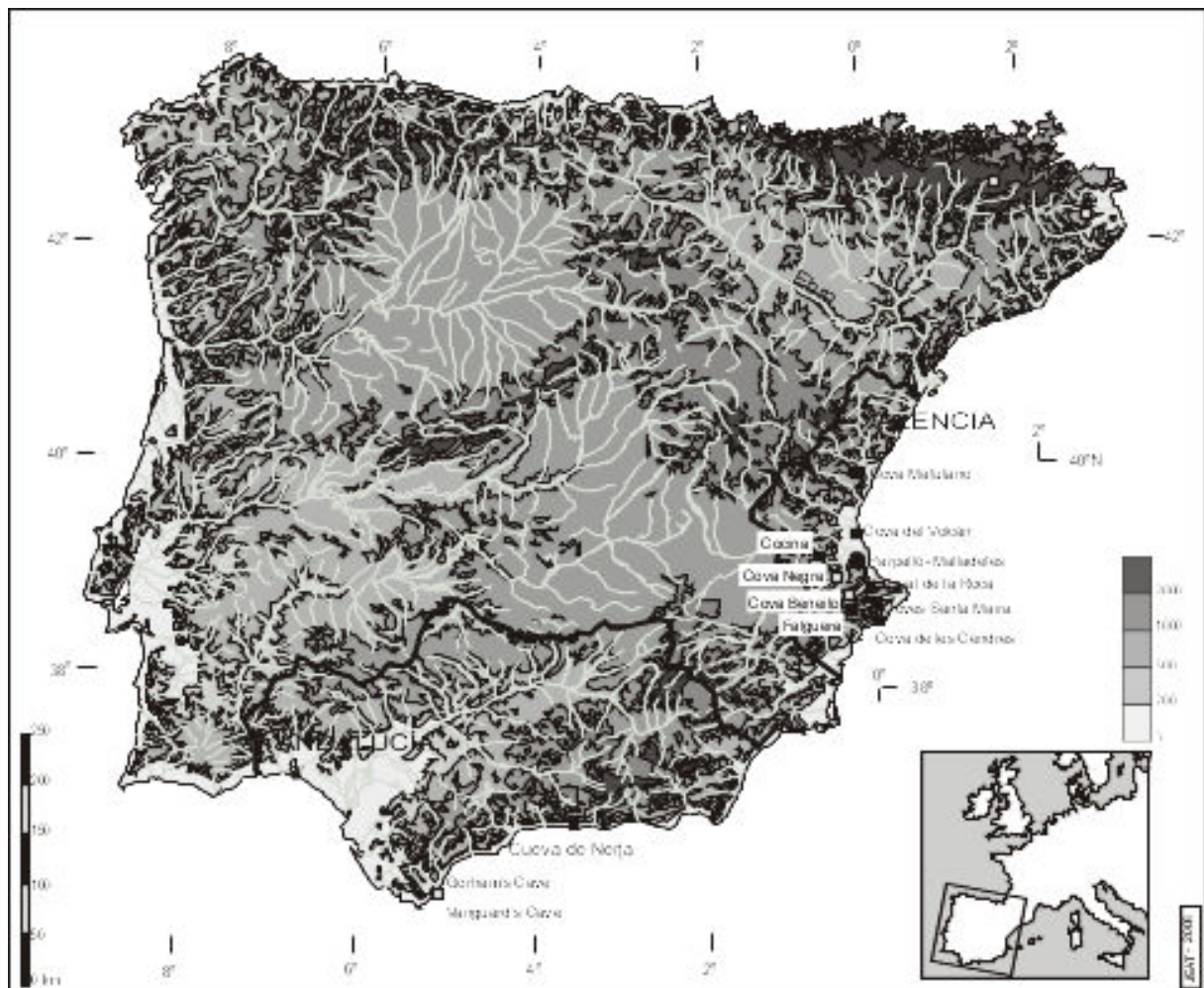


Figure 1 Study areas and sites mentioned in the text

BP		Archaeological units	VALENCIA						ANDALUSIA	
7.000	MESOLITHIC	GEOMETRIC 'Cocina type'	Cocina I - II		Tossal I	Sta Maira (W) -3.1 (?)	Falguera VII-VIII		Nerja /M -12/11 (?)	Nerja /V - 3c (?)
8.000		NOTCHED- DENTICULATES			Tossal II-A	Sta Maira (W) 3.3/4				
9.000	EPIPALAEOLITHIC	EPIPALAEOLITHIC 'Sauveterroide'			Tossal II-B	Sta Maira (W) 4-A			Nerja /M -13	
10.500		EPIPALAEOLITHIC 'Microlaminar'			Tossal I (int)	Sta Maira (W) 4-B	Malladetes W -VI			Nerja /V - 4
11.500	UPPER PALAEOLITHIC	MAGDALENIAN 'Blade-bladelet'	Cendres IX/XII		Tossal II /III (int)	Sta Maira (W) 5 (E) II		Parpalló T - 1/5	Nerja /M -14/16	Nerja /V - 5/7
15.000		BADEGOULIAN 'Old Magdalenian'						Parpalló T - 6/11		
17.000		SOLUTREAN	Cendres XIII/XIV			Sta Maira (E) II.B	Malladetes III/I	Parpalló T - 13/26	Nerja /M -18 (?)	Nerja /V - 8/10
21.000										

Figure 2 Chronological and archaeological frameworks for the Upper Palaeolithic, Epipalaeolithic and Mesolithic of IMR

also a blade-bladelet lithic industry with Tardenoisian-style geometric arrowheads, which J Fortea (1973) called Cocina-type geometric Epipalaeolithic (figure 2).

2 Diversification

An association seems to exist in southern Europe between post-LGM climatic change and diversification, related to the availability of new species and resources. We should not forget, however, that other causes could have influenced the exploitation of these new environments, such as technical innovation, palaeodemography, territoriality or cultural traditions. In La Riera (Asturias, Spain), for example, Clark and Straus (1986) related diversification-intensification to the use of marine resources within a broader process caused by population pressure.

A general, diachronic description of different types of resources might provide us with a preliminary assessment of diversification. *Cervus elaphus* and

Capra pyrenaica were the basic subsistence species in the IMR since the LGM due to the environment and altitude of settlements. Ecological changes at the end of Pleistocene could have favoured a redistribution of some mammal species, such as *Bos primigenius* and *Equus* sp, whose remains are found less frequently in the Tardiglacial, as well as an increase of minority species, such as *Sus scropha*, *Rupicapra rupicapra* or *Capreolus capreolus*.

Rabbits (*Oryctolagus cuniculus*) display the highest NISP since c 30 ka BP. Their remains come from human consumption, a fact that has been demonstrated through the Upper Palaeolithic, Epipalaeolithic and Mesolithic, and they have also been identified in Middle Palaeolithic records (Aura & Pérez 1992; Aura et al 2002a; Pérez Ripoll 2005–2006; Pérez & Martínez 2001; Sanchis & Fernández 2008). This information suggests that rabbit consumption had consolidated, since it was a structural part of the diet and a pervasive, readily available resource. Its NISP describes a

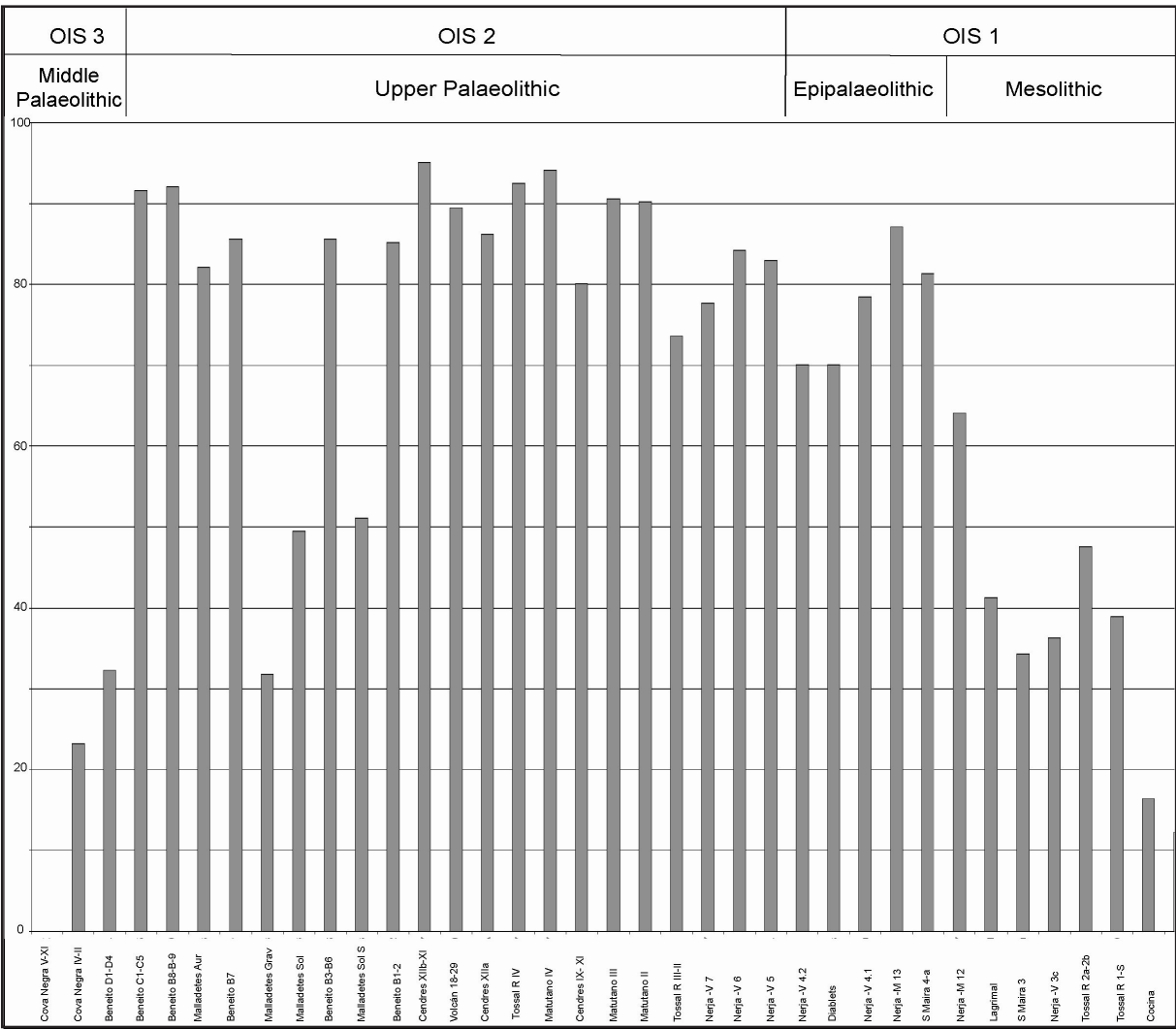


Figure 3 Diachronic percentage of rabbit bone remains consumed by humans from Valencian and Andalusian archaeological sites

Gauss curve with lowest values at both ends, coinciding with the interglacial conditions, and highest values during the Pleniglacial, precisely when the ecological productivity of Mediterranean regions was more influenced by aridity (Sánchez Goñi 1996; Sánchez Goñi & d'Errico 2005) (figure 3).

Generally speaking, there is an increase in diversification during the Mesolithic in comparison with the Upper Palaeolithic and Epipalaeolithic. At Valencian middle mountain sites, the Iberian ibex is still the main species found, but the importance of what could be called minority taxa (red deer, wild boar, chamois, roe deer and carnivores) grows. In Santa Maira, these minority taxa go from 3.8% (Number of minority Taxa, NmT=6) in the Epipalaeolithic to 9.4% (NmT=6) in the Mesolithic. In Tossal de la Roca, they go from 5.8% (NmT=2) in the Magdalenian and 3% (NmT=4) in the

Epipalaeolithic to 34.7% (NmT=10) in the Mesolithic levels; there is also an increase in the amount of species, and diversification is therefore to be inferred not only from the number of taxa, but also from the increase in their relative importance (figure 4 & table 1).

At the Nerja coastal site the data are somewhat more complex due to the importance of the exploitation of marine resources and their irregular distribution in the various galleries or rooms of the cave. The Mina room succession is similar to the one found in Valencian sites: the NmT in the Epipalaeolithic phase is four, representing 2.3 per cent of the NISP, compared to five in the Final Epipalaeolithic-Mesolithic phase, which represents 16 per cent of the NISP. This sequence is the opposite of the one found in the Vestíbulo room: in the Epipalaeolithic level (NV 4), NmT is seven, 3.7 per cent of NISP, compared to

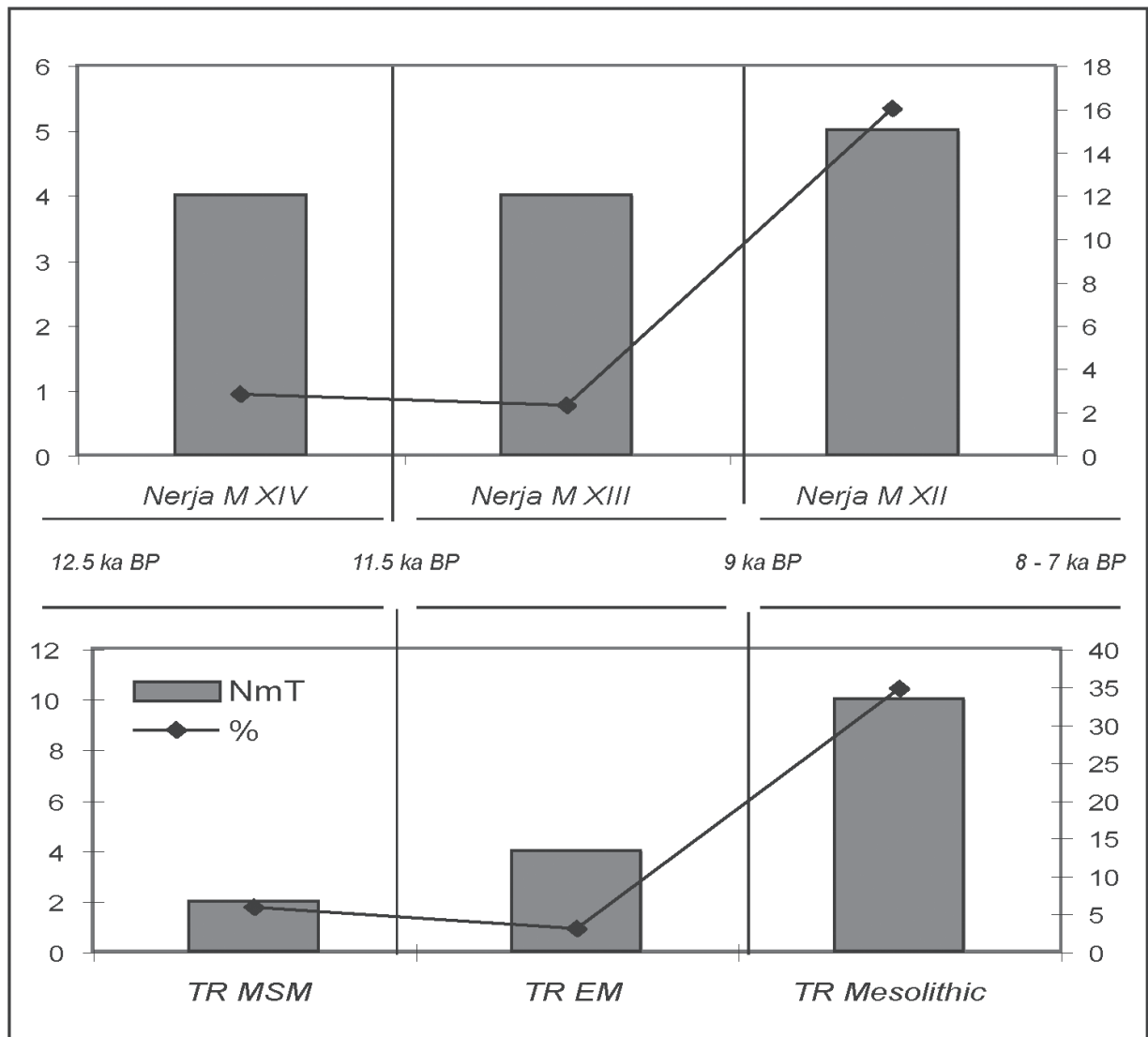


Figure 4 Number of Minority Taxa (NmT) and percentages in Tossal de la Roca (Pérez & Martínez in Cacho et al, 1995) and Nerja Mina (F. Jordá Excavation)

Table 1 Upper Palaeolithic, Epipalaeolithic and Mesolithic faunal assemblages from IMR. Tossal de la Roca (Pérez & Martínez in Cacho *et al* 1995), Nerja-Mina & Nerja-Vestibulo (Pérez Ripoll & Morales Pérez, n d), Santa Maira (Pérez Ripoll & Morales Pérez in Aura *et al* 2006), Lagrimal (Pérez Ripoll, in Soler 1992), Cocina (Pérez Ripoll in Fortea *et al* 1987)

	MAGDALENIAN					EPIPALAEOLITHIC				MESOLITHIC									
	Tossal III/IV	Nerja M XIV	Nerja M XV	Nerja M XVI	Tossal Int II	Nerja V 4	Tossal Int I	Santa Maira 4	Nerja M XIII	Santa Maira 3	Nerja M XII	Nerja V 3	Tossal Ext IIb	Tossal Ext IIa	Tossal Ext I	Tossal Meso	Lagrimal III/IV	Cocina	
<i>Capra pyrenaica</i>	177	87	144	234	127	732	180	92	45	324	55	167	34	110	373	517	124	503	
<i>Cervus elaphus</i>	34	10	15	39	22	12	27	12	3	31	11		20	102	222	344	30	139	
<i>Rupicapra rupicapra</i>						4	3	2		19			8	20	7	35			
<i>Capreolus capreolus</i>								1								0		1	
<i>Bos primigenius</i>														3		3			
<i>Equus</i> sp.				1										1		1	7	2	
<i>Sus scropha</i>	1	1	1	1	3	27	12		2	8	3	10	2		26	28	8	16	
<i>Canis lupus</i>														1		1		1	
<i>Canidae</i> sp.								1								0			
<i>Lynx pardina</i>		2				3				1	2			10	1	11			
<i>Felis sylvestris</i>	1	3	1	4		3	1		1		3			2	2	4	1		
<i>Vulpes vulpes</i>						3		1	1	23	1	1	3	17	4	24			
<i>Meles meles</i>													1	6	9	16			
<i>Monachus monachus</i>						50										0			
<i>Erinaceus</i>								4		3						0			
<i>O. cuniculus</i>	1282	466	551	691	279	1892	1210	446	249	497	53	166	8	244	111	363			
TOTAL	1495	569	712	970	431	2726	1433	559	301	906	128	344	76	516	755	1347	170	662	
NT	5	6	5	6	4	9	6	8	6	6	7	4	7	11	9	12	5	6	
NmT	3	4	3	4	2	7	4	6	4	6	5	2	5	9	7	10	4	5	
NR mT	36	16	17	45	25	102	43	21	7	85	20	11	34	162	271	467	46	159	
% mI	2.408	2.8	2.4	4.6	5.8	3.742	3.001	3.8	2.3	9.4	16	3.2	45	31	36	34.67	27	24	

NmT two in the Mesolithic phase (NV 3c), 3.2 per cent of NISP. The Mesolithic phase NISP is quite limited in both rooms (table 1).

Regarding birds, there is no systematic study associated with the archaeological contexts dated between 30–7 ka BP. Their NISP, however, seems to increase from the LGM onwards, becoming more abundant from c 15 ka BP (Eastham 1986; Hernández 1995; Martínez Valle 1996; Alcover article in preparation). There is also evidence of plant use since the end of the Middle Palaeolithic (*Pinus pinea* is cited by Waechter [1964] in Gorham's cave) and also in Upper Palaeolithic and Epipalaeolithic levels in Nerja (Badal 1998), with a noticeable increase in the number of species early in the Holocene: *Sorbus* sp, *Prunus* sp, *Quercus* sp, *Vicia/Lathyrus*, etc (Aura *et al* 2005).

3 Intensification

Changes in mammal hunting or the analysis of small prey use related to broad-spectrum economies (Flannery 1969; Stiner 2001, with references) indicate trends towards intensification. It is important for both types of indicators to compare regional trends with

the diachronic changes that occurred in long-occupied sites. Animal remains of anthropogenic origin show a significant occurrence of fractured bones throughout the Upper Palaeolithic and Epipalaeolithic-Mesolithic, even in remains of small prey such as rabbits or birds. The study of lithic marks and fractures on rabbit bones has revealed the processing sequence of this lagomorph: meat was torn from the bones, which were systematically fractured or chewed to make the most of the fragments of meat and marrow. (Pérez Ripoll 1992, 2004, 2005/2006).

Although marrow extraction is common in large game, there are no data so far pointing to any form of intensification. Table 2 shows the degree of fragmentation in long bone epiphyses of *Capra pyrenaica* in Nerja collections. In the sequence shown, from Solutrean up to Epipalaeolithic (c 21–9.5 ka BP), there are few intact epiphyses in comparison to fragments. These data indicate that most long bone articulation areas were fractured to extract the marrow before boiling the fragment in order to obtain fat.

Table 3 shows the state of *Capra pyrenaica* phalanxes I. There are very few intact phalanxes I in the Epipalaeolithic, none in the Magdalenian and only one

Table 2 Occurrence of fragments of *Capra pyrenaica* long bones epiphyses

Nerja -Vestíbulo	Epipalaeolithic	Magdalenian	Solutrean
Epiphyses	24	2	20
Epiphysis fragments	46	14	104

Table 3 Occurrence of fragments of *Capra pyrenaica* Phalanx I

Nerja Vestíbulo	Epipalaeolithic	Magdalenian	Solutrean
Intact	4	0	1
Sagital fg.	7	2	4
Lateral fg.	0	1	2
Px-Dt.	23	4	58
Px.-Dt. fg.	42	10	78
	76	17	143

in the Solutrean. All other remains are fragments resulting from fracturing to extract bone marrow. These data show that phalanx I was systematically fractured, although the amount of marrow to be obtained from it was very small. Since no significant difference is found throughout the sequence, the use of bone marrow is constant across the whole of the analysed sequence (c 21–9.5 ka BP). In this case, the less fracturing there is, the more abundant marine resources are; therefore, it is not a very useful criterion when it comes to identifying intensification phenomena.

Data on deer and ibex hunting indicate that between the Tardiglacial and the early Holocene there is a greater number of sites with significant NISP values of juveniles and subadults, probably indicating the hunting of breeding herds and young specimens. This is in stark contrast with earlier patterns. During the Solutrean and the Badegoulian-Magdalenian in Parpalló (c 19–15.5 ka BP), heavier individuals (groups III–IV) were chosen (Davidson 1989); during the Solutrean in Nerja, adult and old individuals also made up most of the prey: in both cases, very young animals were spared and male individuals were the preferred game (figure 5). This could be argued to be evidence for intensification, but also as a simple reflection of the hunting tactics used between spring and early summer, when herds had this composition (Pérez & Martínez 2001; Aura et al 2002a). Such seasonal variability in age composition precludes its use as a clear marker of intensification.

Marine resources are also used to evaluate diversification-intensification due to their good conservation and visibility in archaeological records. Although they were first used in the Middle Palaeolithic (Waechter 1964; Stiner et al 2000), their exploitation has been considered a characteristic trait of *H sapiens sapiens* (Richards et al 2001). Furthermore, their

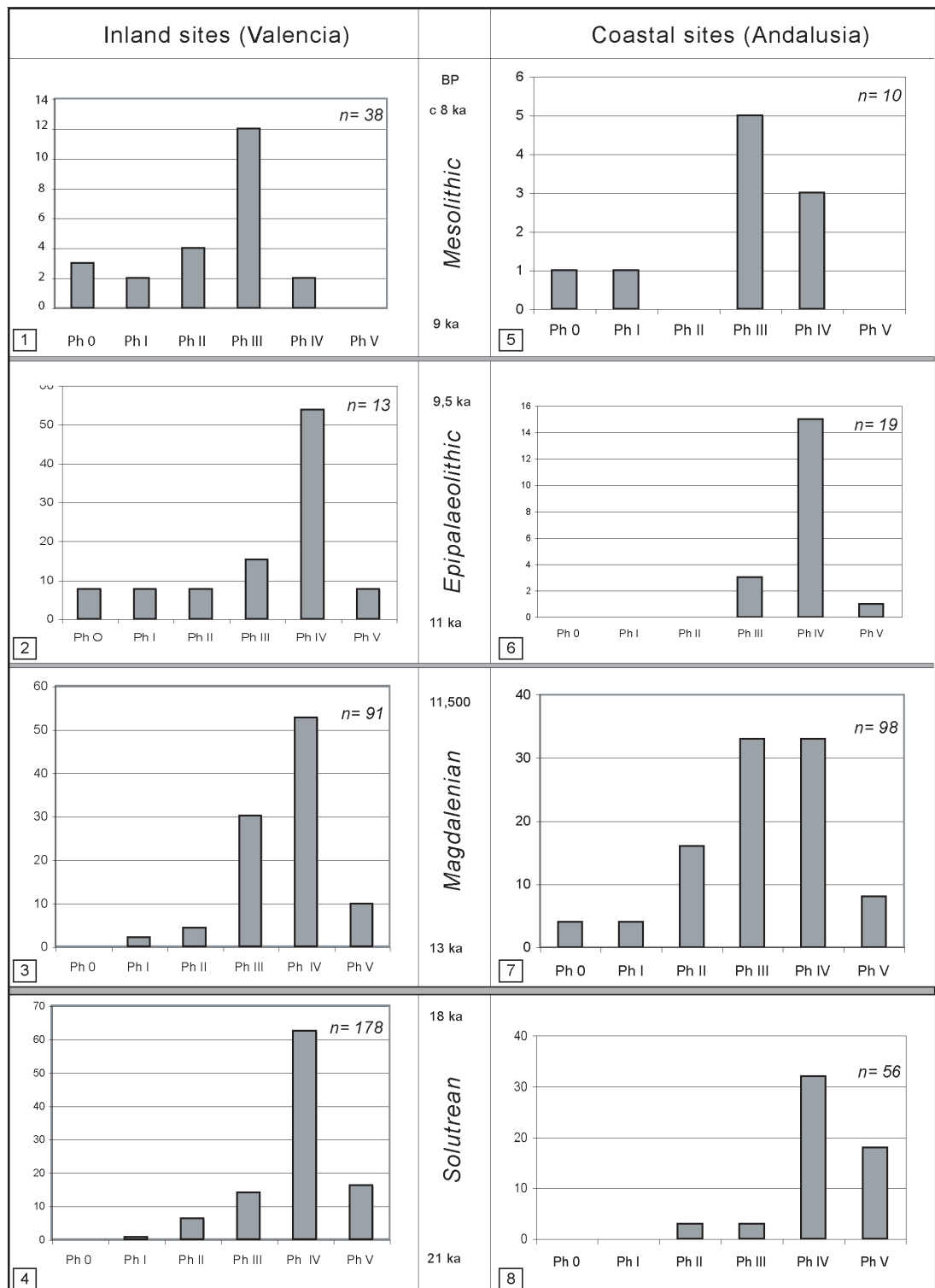
presence at sites located at a certain distance from their place of origin provides us with valuable behavioural information.

Remains of different sea mammals have been identified in southern Iberian sites: Cetacea, *Delphinus* sp and *Monachus monachus* (Waechter 1964; Stringer et al 2008; Bicho & Haws 2008). Their first recorded use is associated with Neanderthal occupations, such as the Vanguard Cave, where a fireplace with *Mytilus galloprovincialis* remains has been reported, as well as seabirds from an earlier period (Stringer et al 2008). These species are documented once again across the Pleistocene-Holocene boundary (Boesneck & Driesch 1980; Alcalá et al 1987; Pérez & Raga 1998). Their association with a significant number of fish, sea urchins and shellfish, with no ornamental value whatsoever, has not been documented until after the LGM in the Cave of Nerja (Aura et al 2000, 2002; Jordá Pardo et al 2003, 2008). At the same time, we find scarce fish and shellfish remains at Valencian sites 15–40 km inland from the present coastline. Preliminary data on the Cova de les Cendres, a site on the present coastline, indicate five *Phocidae* sp remains in levels c 13–12 ka BP (Villaverde et al 1999) (figure 6).

The same pattern is reflected in seabirds. It is significant that after their first identification—in levels c OIS 5–3 (?) of Gorham's Cave—they are not found until occupations later than the LGM (Nerja or Cendres, for instance). Landbirds, however, have been identified in many collections where the mention of waterbirds, such as *Anatidae*, is also frequent (Eastham 1986; Hernández 1995; Martínez Valle 1996; Alcover in prep).

These data suggest the same trend: the first records show us that seabirds, fish, shellfish and sea mammals were used only in coastal settlements. No marine remains from human consumption are found at inland sites until the Pleistocene-Holocene transition, and it can thus be assumed that their consumption was immediate at coastal sites. No marine remains have been found at Neanderthal inland sites, as figure 6 shows, nor at most of the Upper Palaeolithic ones, and it is accepted that fishing sites were submerged by the sea level rise (Aura et al 1989).

Intensification is a hard to define process. Some of the criteria used to identify it might have their origin in other causes, as is the case of death patterns, or might simply not be completely diagnostic, as is the



Age profiles of the ibex (*Capra pyrenaica*) from Santa Maira (1-2, Pérez & Morales), Parpalló (3-4, Davidson, 1989) and Nerja (5-8, Pérez & Morales).

Ibex age phases

Phase 0: From birth to eruption of M1 (0–6 months)

Phase I: From the eruption of M1 to the beginning of M2 (6–15/17 months)

Phase II: From the eruption of M2 to the beginning of M3 (15/17–27/29 months)

Phase III: From the eruption of M3 to the first stages of wear of M3 and PM (October–December 3rd year)

Phase IV: Adult individuals between 4 and 9 years

Phase V: Old individuals of more than 9 years of age

Figure 5 Age profiles of the ibex (*Capra pyrenaica*) in Santa Maira (1-2, Pérez & Morales in prep), Parpalló (3-4, Davidson 1989) and Nerja (5-8, Pérez, in prep)

case of fracture indices. The transport of marine resources inland, however, is a novelty that takes place at the Pleistocene-Holocene boundary. This form of management requires a broader empirical basis, but it could indicate an intensification of both resources and use of space.

4 Rethinking coast-inland complementarity

The combined use of coastal plain resources and those found in the first elevations represents the basic situation in the IMR. The first prehistoric IMR forager mobility models were based on the Parpalló-Malladetes-Volcán (Valencia) site group, where coastal exploitation was of marginal importance (Davidson 1981, 1989). Andalusian data on marine resources use, however, have permitted an assessment of coastal sites and the importance of fishing, seafood foraging and seabirds and mammal hunting (Aura et al 2001; Aura et al 2002b; Jordá Pardo et al 2003, 2008).

4.1 Marine resources

According to the stratigraphic sequence of the continental margin of the Alborán sea (Hernández Molina et al 1994), the Cave of Nerja was located 6 km inland, away from the coast, during the occupations dated between 25–18 ka BP. Regarding the fauna of that age, remains of sea fish, sea urchins and seabirds are practically non-existent. There is a limited presence of molluscs, but there is a predominance of terrestrial over marine specimens of four to one. Sea Gastropoda also sometimes surpass Bivalvia, a result that is not documented at other IMR sites (figure 7.1).

Sub-unit NV-8s (c18–17.5 ka BP?) marks a change in this pattern with an important increase in marine resources: fish, molluscs, sea urchins and birds. However, NV-8s is also the contact between the Pleniglacial-LGM (25–17.5 ka BP) and Tardiglacial (12.5–11.5 ka BP) deposits. Its treatment as an independent episode recognises that this unit represents a depositional or erosional hiatus of about 5000 years in the Nerja stratigraphic record. Recent work on data derived from excavations in 1960–1963 (Cortés et al 2008) resulted in the proposal that marine resources had been exploited since the LGM (c 24–17.5 ka BP), this based on the simplistic correlation with the stratigraphical and chronological data obtained in excavations by F Jordá (Aura et al 1998b, 2001, 2002b; Jordá Pardo et al 2003, 2008). This is a tentative

interpretation, made in the absence of supporting descriptions of the lithostratigraphy or of the lithic and bone tool kits.

Deposits dated between 12.5–9.5 ka BP, which overlie the hiatus, are preserved. The sea level rise placed the coastline less than 4 km away from the cave and it is at that moment that a profound change takes place in the density of marine remains per cubic metre of excavated sediment (Aura et al 2002a; Jordá Pardo et al 2003, 2008). This change cannot be explained solely by the greater proximity to the coastline, since longer distances were covered to obtain the raw materials from which humans made stone tools before the LGM.

At the same time, it is possible to recognise a tendency towards the intensification of the use of marine resources by comparison with terrestrial ones. In Nerja, a reduction of the density of the NISP of rabbits by cubic metre of sediment is noticeable with the incorporation of marine resources. Whereas during the Pleniglacial (c 25–21 ka BP) the ratio of the NISP of Bivalvia to the NISP of rabbits was 1:13, at the Pleistocene-Holocene boundary (11–10 ka BP) this ratio is reversed to 58:1. A similar pattern is shown by the analysis of the NISP ratio of rabbits and fish, whose size and weight permit a more balanced comparison (figures 7.2 & 7.4). Data also suggest alternative uses of Gastropoda and Bivalvia across time and a different distribution, according to rooms, of seabed and rocky zone molluscs (Aura et al 1989). Foraging of sea urchins and crabs is also documented (Villalba et al 2007), as well as of seabirds and, above all, seal hunting (Pérez & Raga 1998).

4.2 Inland valleys

In the excavation of the latter occupations of Coves de Santa Maira (12–7 ka BP), marine remains of fish and shellfish with no ornamental value have been recovered: Sparidae, *Mytilus edulis* or *Cardium edule* (Aura et al 2006) (figure 8). Their numbers are not comparable to the ones described in Nerja, but their interest is indubitable. First, their chronologies coincide, despite the former being an interior site and the latter being a coastal one. Secondly, the distance between the site and the present coast is five times greater than the distance of the Cave of Nerja to the coast when they were first occupied (c 25–23 ka BP) and the exploitation of marine resources was restricted to Gastropoda.

The mammal species at all these inland sites

(Cueva de la Cocina, Parpalló, Malladetes, Tossal de la Roca, Abric de la Falguera or Santa Maira) is very similar, which leads us to think of some common patterns (table 1). Between the Tardiglacial and the early Holocene (c 13–9 ka BP) a relative continuity existed: ibex hunting at sites in mountainous areas and red deer hunting in the lowlands, always accompanied by an absolute dominance in NISP of rabbits. At approximately 9–8.5 ka BP it is possible to notice some changes that might be indicators of a greater transformation. All sites show a similar tendency: the NISP of rabbit declines drastically after c 8.5 ka BP, reaching a ratio of one to one to more frequent big game species. The decrease in rabbit remains can be put down to two factors: a) the formation of extensive holm oak forests at the expense of open spaces, more suitable for rabbits; b) the adoption of new hunting strategies, resulting in increased mobility and less use of static resources.

This change in trend is accompanied by a certain diversification, not only because of the increase in the number of taxa but, above all, because of their relative value. *Capra pyrenaica* still was the most numerous species at all middle mountain sites, although there also was a marked increase in red deer and wild boar. Finally, we have verified the consumption of *Erinaceus* sp and of some carnivore species (*Lynx* sp, *Felis silvestris* and *Vulpes vulpes*), with butchery marks not limited to skinning (Martínez Valle 2001; Aura et al 2006).

The consumption of turtles (*Emys* sp and *Mauremys* sp) seems to take place later than 11.5 ka BP and there are only a few remains, scattered at different sites (Aura et al 2006). This pattern is documented in other places in the Mediterranean (Félix, et al 2006; Hervet 2000).

5 Perspectives

During the Upper Palaeolithic and Epipalaeolithic, small prey in the IMR comprised a permanent, structurally important resource (figure 3); bone fragmentation to extract marrow is also documented and does not change in a significant way (tables 1–2), and there is also evidence of early use of vegetal resources (Waechter 1964; Badal 1998). None of these data taken on its own could measure diversification-intensification in a region broken into two parts: Valencian sites provide data on inland and middle mountain sites, whereas Andalusian sites offer an important

part of the information on marine resource exploitation.

A linear reading of the described data might suggest that the most important tendencies towards diversification-intensification in the IMR could be related to the use of marine resources (figure 8). These resources were mainly consumed at the sites where they were foraged. The problem is that, for most of the Iberian Mediterranean façade, these places are currently submerged (Aura et al 1989 and 2001). A diachronic evaluation of this form of management will depend in the future not so much on the conservation of the coastal sites, but on the careful recovery of the palaeobiological remains at inland sites and, above all, on human palaeodiet studies (Richards et al 2005).

Many southern Iberian coastal sites have been preserved where Neanderthals exploited marine fauna (especially mammals, birds and molluscs) (Waechter 1964; Barton 2000; Stringer et al 2008; Bicho & Haws 2008). The list of marine species is important, but marginal relative to the sum of exploited resources. However, an assessment of the behavioural significance of these marine resources, which has until now been attempted only with anatomically modern humans, can now be extended to Neanderthals: their use of marine foods ‘provides higher territorial stability ... and this might have facilitated a late survival of Neanderthals in the South of the Iberian Peninsula’ (Stringer et al 2008:14323), a point previously made by Hockett & Haws in their nutritional ecology perspective (2003, 2005). It has also been suggested that these data might render obsolete the model proposing that marine resources have been important in human diets only since the Tardiglacial-Holocene (Bicho & Haws 2008). Both observations make the same point: similar data on the use of marine resources cannot be interpreted in different ways. If marine exploitation has provided a measure of diversification-intensification or settlement stability, such criterion must be general, irrespective of it being applied to an archaic (Neanderthal) or modern behaviour (Adler et al 2006).

The NISP values for marine species at the Gibraltar sites might be compared to those obtained at Nerja dated c 25–18 ka BP, when the basic resources were ibex and deer. This situation, however, changes mightily between the end of the Tardiglacial and the Holocene (figure 6). It is obvious the NISP of marine species multiplies, but these differences are not only

Inland sites - Valencia						Coastal sites - Andalusia							
Plants	Rabbits	Birds	Marine resources				Marine resources				Birds	Rabbits	Plants
			Fish	Shellfish	Birds	Mammals	Fish	Shellfish	Birds	Mammals			
<i>Quercus</i>							<i>Labridae</i> sp						
<i>Vicia</i>		<i>Phasianidae</i> sp					<i>Scombridae</i> sp		Cetacea				
<i>Lathyrus</i>							<i>Gadidae</i> sp		<i>Delphinus delphi</i>				<i>Quercus</i> sp
<i>Sorbus</i>		<i>Columbidae</i> sp		<i>Bivalvia</i>			<i>Bivalvia</i>		<i>Monachus monachus</i>				
<i>Prunus</i>		<i>Anatidae</i> sp		<i>Sparidae</i> sp		<i>Phocidae</i> sp	<i>Sparidae</i> sp				<i>Phasianidae</i> sp		
							<i>Equinidae</i>						
													<i>Pinus pinea</i>
											<i>Anatidae</i> sp		
							<i>Gastropoda</i>		<i>Phocidae</i> sp				<i>Pinus pinea</i>
		<i>Columbidae</i> sp									<i>Columbidae</i> sp		
							<i>Bivalvia</i>						
		<i>Corvidae</i> sp							<i>Tursiops truncatus</i>		<i>Corvidae</i> sp		<i>Pinus pinea</i>
									<i>Monachus monachus</i>				
									<i>Delphinus delphi</i>				

Figure 6 Comparison table with our present knowledge of the use of exploited resources in inland (Valencia) and coastal (Andalusia) areas

quantitative: they coincide with relevant depictions of marine fauna in southern Iberian Palaeolithic art and with the manufacture of simple but specific tools. These animal representations are parietal motifs, of six seals and five fish, located at a coastal site, Nerja, as well as at sites 50 km inland from the present coastline, Pileta and Trinidad (Sanchidrián 1994; Cantalejo et al 2006). An important collection of small bone gorges ($n=80$) has been described in Nerja, and they have also been found at other coastal sites (Aura & Pérez 1998). Based on the marks on their cutting edges, chopping tools associated with seal remains have also been linked to meat and hide processing (Aura & Jardón 2006).

At the same time, there are indications that the immediate consumption of marine resources at their exploitation sites could have changed across the Upper Pleistocene. A few fish and shellfish remains have been recovered at Tardiglacial-Holocene (c 12–7 ka BP) sites in Valencia, relatively far from their places of origin, and something similar happens in Portugal (Hockett & Bicho 2000; Bicho & Haws 2008). Thus considered, it might be asked to what extent tenden-

cies observed in the interior areas (figure 4) or changes in seafood consumption trends can be taken as proof of diversification–intensification.

An important increase in sites at the end of the Tardiglacial has been found in the IMR in comparison with what had been observed during LGM (Fullola et al 2006, with references). There are apparently no major changes in the material culture at sites dated between c 12–10ka BP, they are neither bigger nor more complex, and there is no increase in their number. But fishing and seal hunting gave rise to distinctive tool kits and became part of the symbolic iconography of the groups of hunters and fishers in southern Iberia at the end of the Tardiglacial; quite the opposite happened in Valencia, where marine species representation is absent from the important Palaeolithic art collection of Parpalló (Villaverde 1994, 2001). These are important differences in comparison to how marine resources were exploited by Neanderthals.

Lastly, the Holocene sites on the coastal plain and in the nearby inland valleys of the IMR do not provide us with any data on more recent times. This gap is

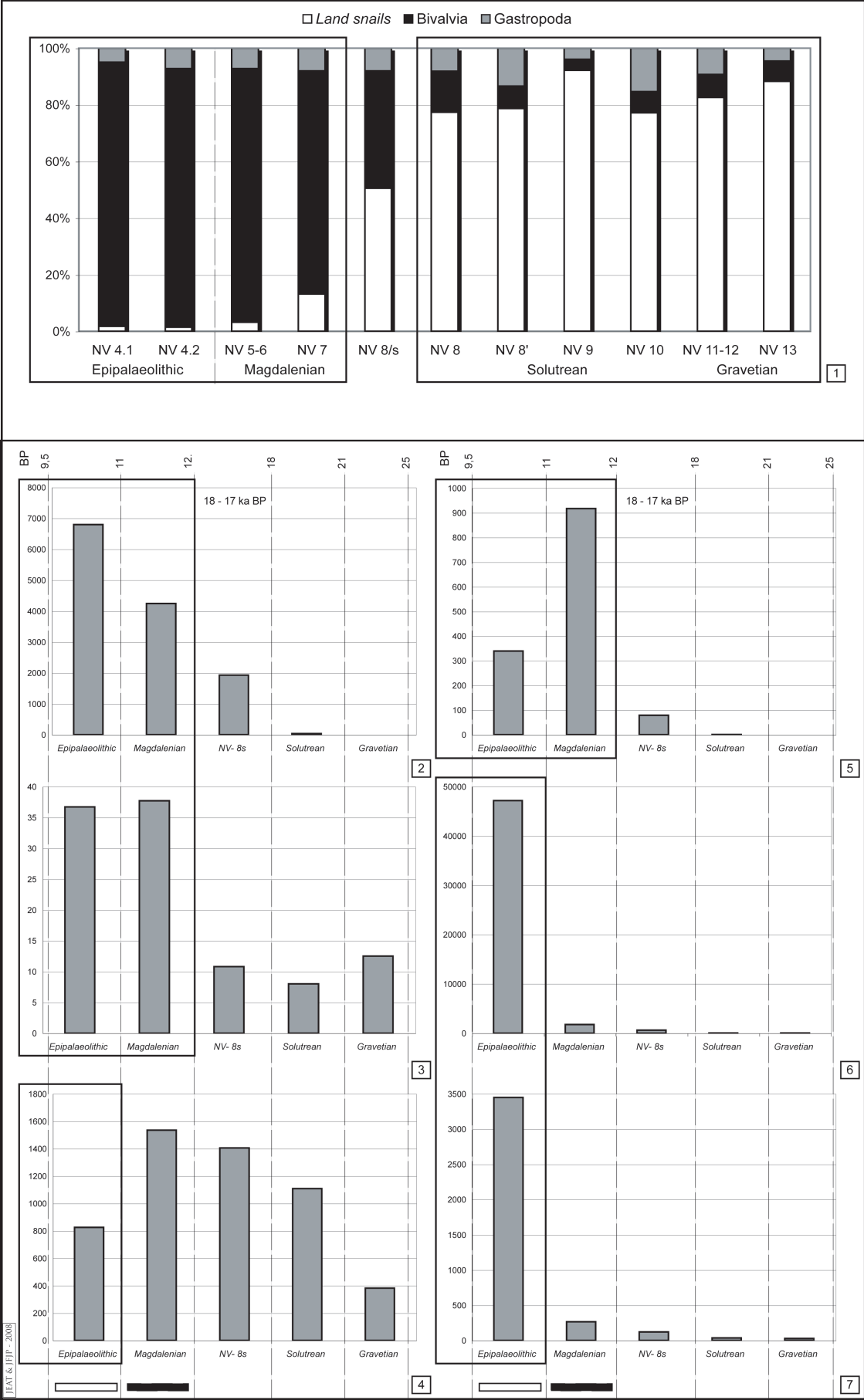


Figure 7 Small prey distribution in Cueva de Nerja-Vestíbulo (F Jordá excavation). 1: Distribution of molluscs between 25–9.5 ka BP. 2-7: NISP per cubic metre of excavated sediments. 2: fish, 3: birds, 4: rabbits, 5: sea urchins, 6: Gastropoda, 7: Bivalvia

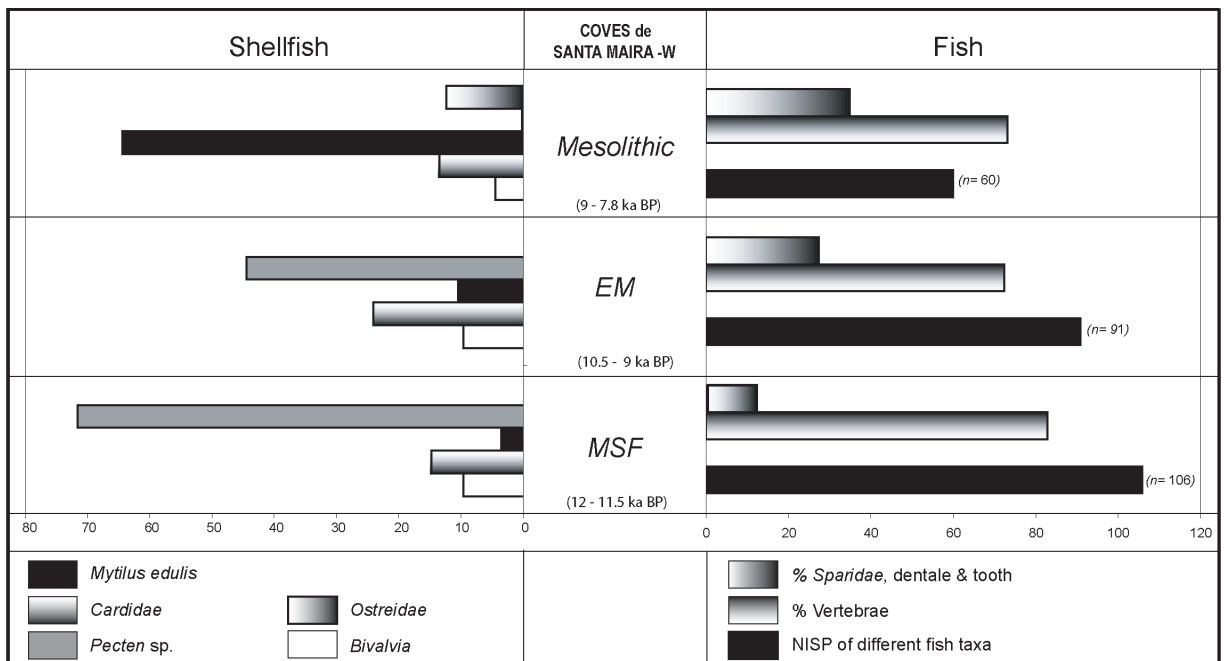


Figure 8 Coves de Santa Maira-West. NISP of fish and marine malacofauna taxa and their weight percentage in the Final Magdalenian (MSF: 12-11.5 ka BP), Epipalaeolithic (EM: 10.5-9 ka BP) and Mesolithic (9-7.8 ka BP) (Aura et al, 2006)

evident for the period c 8–7 ka BP, whose marine, lacustrine and terrestrial fauna composition is unknown. At el Collado (Valencia), however, a shell midden site with 14 graves yielding human remains enabled the reconstruction of the palaeodiet (García-Guixé et al 2006; Arias & Álvarez 2004). These results indicate a combination of both marine and terrestrial resources (Martí et al 2009).

Marine resource exploitation represented a major change in the economic bases and their forms of management since the late Tardiglacial in the IMR. Nothing, however, points to the existence of two separate economies, one on the coast (fishers) and one in the interior (ibex and deer hunters), but rather to a potentially complementary use. The difficulty of tracking most exchangeable foods (dry and smoked meat or fish, medicinal plants, fruits, etc) represents a clear limitation (Kelly 1995) that has discouraged the study of goods exchange amongst prehistoric hunters, gatherers and fishers (Spielmann 1986). However, raw materials for the manufacture of tools and ornaments were exchanged over greater distances than those reckoned solely on the basis of fish and shellfish remains found at inland IMR sites (Álvarez 2006).

The evolution of intensification depends not only on ecological availability, there are other intervening factors as well. Perhaps what is important is not the list of exploited resources mentioned in this text, but

knowing how the foraging groups of the Tardiglacial-Holocene organised the territories between the coast and the middle mountain, and the approach used should therefore not be limited to the individual sites. The crux of the matter is that the 'potential disequilibrium between escalating demand and productive capacity provides at least one internal source of change and intensification' (Bender 1981:149). The increase in burials on the coast as well as in the interior since c 9 ka BP must be borne in mind, as it might be linked to deep changes in the forms of social reproduction. The main difficulty lies in knowing if this process, which is noticeable in economic data and in symbolic language, can also be linked to a growing territoriality of Final Palaeolithic-Epipalaeolithic foragers.

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