

Prehistoric edible land snails in the circum-Mediterranean : the archaeological evidence

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Résumé

Les escargots comestibles sont souvent abondants dans les gisements du Pléistocène final et de l'Holocène (*c.* 10000 à 6000 BP) partout en région méditerranéenne. Cette étude, la première à essayer de résumer sommairement ces données, soutient la thèse que la plupart de ces incidences représentent les déchets des repas préhistoriques.

Abstract

Edible land snails are often abundant in late Pleistocene and Holocene archaeological sites (*c.* 10000 to *c.* 6000 BP) throughout the Mediterranean region. This chapter, the first attempt to summarize the evidence, argues that in almost every instance the land snails found in occupational deposits are the remains of prehistoric meals.

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[land snails] together with a few other similar mollusks,... have – or ought to have – an honored place in the history of food. For they represent the key and perhaps the solution to one of the greatest mysteries of our story : why and how did the human animal begin to herd and breed other animals for food ? (Fernández-Armesto, 2002, p. 56).

Land snails are a frequent, often abundant, component in Late Pleistocene and early- to mid-Holocene archaeological sites throughout the circum-Mediterranean region (fig. 1). The most spectacular examples are the thousands of Capsian *escargotières* of eastern Algeria and southern Tunisia, but hundreds of other archaeological sites containing abundant land snail shells are known from Cantabria, the Pyrenees, southern France, Italy, south-eastern Europe, Cyprus and the Levant, the Zagros region, Ukraine and Cyrenaica.

These land snails represent remains of prehistoric meals. What is their significance ? My long-term interest in this question has been brought recently to the fore by Fernández-Armesto (2002, p. 56-59) who suggests that land snails were the first domesticated animal and that their importance has been ignored by archaeologists.

I do not think that archaeologists have ignored the issue, but it is certainly true that most of the interest has been on the palaeoenvironmental information that can be obtained from study of land snail assemblages, rather than on their role in human subsistence (*e.g.* Abell, 1985 ; Bobrowsky, 1984 ; Drake, 1960-1962 ; Eiseley, 1937 ; Evans, 1972 ; Goodfriend, 1988, 1991, 1992 ; Margaritz, Kaufman, 1983 ; Margaritz, Goodfriend, 1987 ; Rousseau *et al.*, 1992). There have been only a few studies with a different emphasis : Lubell *et al.* (1976) attempted to test the ideas of Pond *et al.* (1938) on the contribution of land snails to prehistoric diet in the Holocene Maghreb ; Bahn (1983, p. 47-49) constructed an interesting argument in favour of Mesolithic snail farming in the Pyrenees ; Waselkov (1987) provided encyclopaedic global coverage of the pre-1980s literature on (primarily marine) molluscs as food in prehistory ; Chenorkian (1989) examined possible dietary contributions of molluscs ; and Girod (2003, p. 50-52) discussed some of the implications of using land snails as food in prehistory.

In this paper I will discuss the archaeological evidence for the occurrence of land snails in the prehistoric record of the circum-Mediterranean. In a complementary paper (Lubell, 2004) I will build on these data to investigate whether or not this pattern represents a signature for the « broad spectrum revolution » (Binford, 1968 ; Flannery, 1969 ; Stiner, 2001) and if the presence of edible land snails in late Pleistocene and early Holocene sites signals a hitherto unrealized link in the transition to a diet based on herded animals and cultivated plants.

Archaeological evidence

Because the most dramatic and convincing evidence for prehistoric land snail consumption is found in the Maghreb, I will begin there and move clockwise around the Mediterranean.

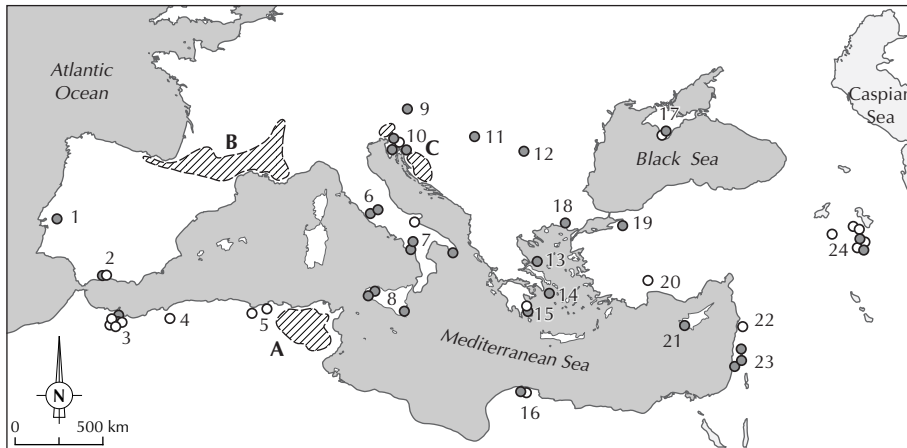


Fig. 1. Approximate location of some sites discussed in the text. Open circles represent sites or levels dated to the late Pleistocene (i.e. older than c. 10000 BP); filled circles are sites or levels dated to the early and mid-Holocene. The hatched areas, the limits of which are estimated, mostly contain sites that would be represented by filled circles. a, the main region for Caspian escargotières; b, the Pyrenean region and southern France in which there are many sites containing abundant land snails; c, the northeastern Adriatic region which also contains numerous such sites. Individually numbered sites are: 1, the Muge middens – B Moita do Sebastião, Cabeço da Arruda, Cabeço da Amoreira – B where land snails appear to be found only with human burials; 2, Nerja Cave; 3, Ifri n'Ammar, Ifri-el-Baroud, Taghit Haddouch, Hassi Ouenzga; 4, Taforalt; 5, Afalou bou Rhumel, Tamar Hat; 6, Grotta di Pozzo, Grotta Continenza; 7, Grotta della Madonna, Grotta Paglicci, Grotta di Latronico; 8, Grotta dell'Uzzo, Grotta di Levanzo, Grotta Corruggi; 9, Rosenburg; 10, Pupičina Cave and other Istrian sites; 11, Donja Branjevina; 12, Foeni Salas; 13, Cyclope Cave; 14, Maroulas; 15, Franchthi Cave; 16, Haua Fteah; 17, Laspi VII; 18, Hoca Çesme; 19, İhşınar; 20, Öküzini Cave; 21, Kissonerga Mylouthkia; 22, Ksar 'Akil; 23, Djebel Kafzeh, Hayonim Cave, Erq el-Ahmar, Mugharet ez-Zuitina, Ein Gev; 24, Asiab, Gerd Banahilk, Jarmo, Karim Shahir, Nemrik 9, Palegawra, Tepe Sarab, Shanidar Cave layer B, Warwasi, Zawi Chemi Shanidar.

The Maghreb

Beginning by at least 20 000 years ago, a succession of hunter-gatherer populations established themselves in the Maghreb. Those sites dated older than 10000 BP contain deposits called Iberomaursian. With the exception of the eastern Rif in Morocco (Mikdad *et al.*, 2000, 2002; Roche, 1963) Iberomaursian sites appear to have been almost exclusively located in caves and rockshelters very close to the modern littoral. From about 10000 to 6000 BP, a number of new archaeological industries appear. The dominant one is the Capsian which is in general restricted to inland areas, especially on the high interior plateaux of Algeria west and south of Constantine and in southern Tunisia near Gafsa (Lubell *et al.*, 1984). Land snails are common in both Iberomaursian and Capsian sites, so much so that they are called *escargotières*. In Iberomaursian sites

the land snails tend to occur in dense deposits within caves, while Capsian sites are more commonly open-air mounds¹.

The density of Capsian sites is very high (Balout, 1955, p. 397 ; Grébénart, 1976 ; Lubell *et al.*, 1976, fig. 1 ; Vaufrey, 1955, p. 234), and they are often located near springs or passes. They vary in size : the open-air sites can be only a few or several hundred square meters in area, and in depth from less than one meter to well over three meters. While the common components of almost all Capsian sites are the enormous numbers of whole and crushed land snail shells, they also contain vast quantities of ash and fire-cracked rock, and in the local Arabic dialect are called *rammadiya* (from the Arabic word, *ramad*, meaning ash). This, plus the dark grey colour of the deposits, suggested to Gobert (1937) and Morel (1974, p. 299) that they should perhaps be called *cendrières*. Other than hearths and burial cairns, no clear structures have ever been identified in these sites (however, see Lubell *et al.*, 1976 ; Tixier *et al.*, 1976).

The Capsian subsistence pattern was first investigated by the Logan Museum Expeditions in the 1930s (Lubell, 1992 ; Pond *et al.*, 1938). Subsequent research at Aïn Misteheyia and Kef Zoura D (Lubell *et al.*, 1975, 1976, 1982-1983), Medjez II (Camps-Fabrer, 1975), and Dra-Mta-El-Ma-El-Abiod (Morel, 1974, 1977, 1978, 1980) has provided data for a more complete reconstruction (see Camps and Morel, 1982 for a general overview). Investigations at Grotte Capéletti, a Neolithic of Capsian Tradition site in the Aurès (Roubet, 1979, 2003), provide additional information.

Despite their frequency in archaeological deposits, the five major species of land snail found (*Helix aspersa*, *H. melanostoma*, *Leucochroa candissima*, *Helicella setifensis*, *Otala* sp.), all of which still occur in the region today, were not the major source of animal protein in the Capsian diet (Lubell *et al.*, 1975, 1976). That was contributed by mammals ranging in size from very large to very small, including aurochs (*Bos primigenius*), hartebeest (*Alcelaphus buselaphus*), zebra (*Equus mauritanicus*), mouflon (*Ammotragus lervia*), gazelle (*Gazella dorcas*, *G. cuvieri*) and lagomorphs (*Lepus capensis*, *Oryctolagus cuniculus*). Reptiles, amphibians and birds are present, as are gerbil (*Jaculus orientalis*, *Meriones shawi*), hedgehog (*Aezechinus algirus*) and jackal (*Canis aureus*), but none of these can be assumed to have been used as food. Whether or not the eggs of ostrich (*Struthio camelus*) were eaten – the shell was used for containers and ornaments – is unknown. There is no direct evidence for the vegetal component in the diet,

1. There are only two complete modern analyses of the faunal remains from Iberomaurusian deposits, and both show that land snails were collected for food during the late Pleistocene. At Haua Fteah in Cyrenacia, the only site with a stratigraphic succession from Iberomaurusian to Capsian (Klein and Scott, 1986 ; Lubell *et al.*, 1984 ; McBurney, 1967) land snails appear to have been abundant in both Iberomaurusian and Capsian levels (Hey, 1967) although no quantitative data are available. At Tamar Hat (Saxon *et al.*, 1974), land snails are common in the upper part of the sequence which is entirely Iberomaurusian, and absent below Layer 48 which dates to about 19000 BP. Further analyses of fauna from Iberomaurusian sites in the eastern Rif of Morocco, where land snails are abundant and also found in post-Iberomaurusian and even in Neolithic deposits, are forthcoming (Mikdad *et al.*, 2000, 2002).

other than the charred bulbs of *Allium* sp. found in the collections at the Logan Museum (Lubell *et al.*, 1976, p. 919). Analyses of charcoal from archaeological deposits (Couvert, 1972, 1975, 1976) suggest that nuts (pine, pistachio, oak) and some fruits (carob, juniper) would have been available on a seasonal basis depending on local environmental conditions (see also Roubet, 2003).

The available data do suggest that most (if not all) Caspian sites represent seasonal rather than year-round occupations, if for no other reason than the great number of sites (certainly in the hundreds, most probably in the thousands) that would have had overlapping catchment territories. The arguments for and against have been reviewed exhaustively elsewhere (Lubell, 1984; Lubell *et al.*, 1975, 1976, 1982-1983; Morel, 1977, 1978, 1980; Rahmani, 2002).

Southern Europe and the northern Mediterranean littoral

There are a number of late Pleistocene and early to mid-Holocene sites in southern Europe and around the northern littoral of the Mediterranean in which levels with dense accumulations of land snail shells are found².

In Cantabria and the Pyrenees there are many sites with « couches à Hélix » found in association with stone tool assemblages ascribed to the Azilian and other Mesolithic industries (Aparicio, 2001; André, 1979; Arias Cabal, 1991; Bahn, 1982, 1983; Barbaza, 1987-1988; Boone, 1976; Guilaine, 1979; Laplace, 1953; Méroc, 1957; Ruis Cobo, Smith, 2001; Ruiz Cobo *et al.*, 1999; Sacchi, 1974; Straus, 1985) and these levels are sometimes described as « escargotières » in the literal sense of a place at which snails are raised – or perhaps as the special platter upon which escargots are served in restaurants (Montagné, 1977, p. 850). Further east in southern France and into the Jura there are Sauveterrian sites with dense deposits of snails (Boone, 1976). Other fauna found in these deposits include red deer, roe deer, wild boar, lagomorphs and, sometimes, marine resources.

In none of these regions is the number of sites so great as in the Maghreb, and their characteristics are quite different. Guilaine (1976) and Boone (1976) list a total of 65 Mesolithic sites in France in which land snails are sufficiently abundant to be considered food remains. All but three or four are caves or rockshelters (the others may be open-air) in which there are layers with abundant land snails, but nothing approaching the predominance found in Maghrebian sites. We can safely assume there are many more sites that are not yet known or described in the literature, but this is still nothing by way of comparison to the Maghreb.

The situation is similar in Cantabria where, in the eastern sector alone, Ruiz Cobo *et al.* (1999) list 33 caves or rockshelters with land snails. There are more sites further to the west, *e.g.* Los Canes (Aparicio and Escorza, 1998; Arias, 2002),

2. Few of these can be accurately described as escargotières, *sensu stricto*, and in every case I am aware of outside the Maghreb the number of edible snail species represented is never more than one or two.

and others are either unpublished or have not been investigated (pers. comm., P. Arias, R. Ontañón, Oct. 2003). Just how abundant the edible snails in these assemblages are remains uncertain. Even in carefully excavated and thoroughly published sites such as Aizpea (Barandiarán, Cava 2001 ; Moreno, Aparicio, 2001), the numbers analyzed do not appear to me to be all that significant.

With the possible exception of Tévéc and Hoëdic on the southern coast of Morbihan (Bretagne), there appear to be no such sites north of the Dordogne, and none at all in the British Isles, Belgium, the Netherlands, Denmark, southern Scandinavia, the Baltic region or Germany, although there may be pits partially filled with edible snails in some LBK sites (Lenneis, Kuijper, 1992). Land snails are not a major element, certainly not a dietary one, in any of the Portuguese *concheiros* with which I am familiar³. Furthermore, with the exceptions of El Cingle Vermell (Turbon, 1986, p. 206) and Nerja (Serrano *et al.*, 1997), they cannot be confirmed as present in early Holocene archaeological contexts along the Mediterranean coast of Spain (personal observations, 1975).

Land snails are common in the Upper Palaeolithic through Epipalaeolithic sequence at Riparo Mochi in Italy, but were apparently not consumed (Stiner, 1999, p. 743). However, there are at least three late Pleistocene and Holocene sites in central Italy with thick deposits of land snails (Mussi *et al.*, 1995) and numerous others throughout the peninsula in which there are shell midden deposits containing both marine and terrestrial molluscs (Mussi, 2001, p. 288-332 ; Mussi *et al.*, 1995, fig. 3) – all representing human food. Often, as at Grotta dell'Uzzo and Grotta di Levanzo in Sicily (Campagnoni, 1991 ; Vigliardi, 1982) and Grotta della Madonna in Calabria (Durante, Settipassi, 1972), the land snails are more common in the early (late Pleistocene/early Holocene) levels than in the later ones. In the Mesolithic levels of inland sites around former Lake Fucino in Abruzzo, such as Grotta di Pozzo (Mussi *et al.*, 1995 ; Mussi, this volume) and Grotta Continenza (Bevilacqua, 1994), land snails appear to have been an important element in a diet that included numerous small and large mammals. Radmilli (1960) suggested that the highly microlithic tools found in many of these sites were designed to remove land snails from their shells, an hypothesis that was actually put to an independent test in Iran with some success (Reed, 1962).

In north-eastern Italy and south along the eastern side of the Adriatic Basin, there appear to be numerous late Pleistocene/early Holocene sites in which land snails are abundant (Girod, 2003 ; Miracle, 1995 ; Dimitrij Mlekuz, pers. comm., Nov. 2003 and pers. obs.). The best available data come from Pupícina Cave in Istria where land snails were definitely part of the diet along with red deer, roe

3. This despite the reference to them by Guilaine (1979, p. 29) as escargotières. However, Veiga Ferreira refers in his field notes to « uma enorme quantidade de *Helix pisana* e *Helix apicina* » found in association with one of the human burials at Moita do Sebastião during the 1952 excavations (Cardoso, Rolão, 1999-2000, p. 185-186). The presence of land snails is noted for at least two other Portuguese sites : in the Upper Palaeolithic levels at Gruto do Caldeirão (Callapez, 1992, 2002), but in neither case is there any suggestion that they were eaten.

deer, wild boar, a variety of medium and small ungulates and some marine shellfish (Miracle, 1996, 1997, 2001, 2002; Miracle, Forenbaher, 1998; Miracle, O'Brien, 1998; Miracle *et al.*, 2000). The snails may have formed part of a pattern of feasting (Miracle, 2002). Further south, Mihailović and Dimitrijević (1999, p. 395) mention the abundance of snails in Layer V at Crvena Stijena, but provide no details. Nor are details available for Kopačina Cave Paunović, Karavanić (1999) although Miracle (1995) does provide some additional data.

At Donja Branjevina, near the Odzaci in northern Serbia, there are thick and possibly discrete single-event middens in pits containing « schnecken » some of which appear, from the section drawings, to be land snails (Karmanski, 1975)⁴.

To the east at Foeni-Salas, a multi-period site in south-western Romania, land snails occurred in dense midden-like deposits in Early Neolithic pit houses. Haskel Greenfield (pers. comm., 11 Nov. 2002; Greenfield, Drassovean, 1994; Greenfield, Jongsma, n. d.), says that land snails are typically found in the pit house deposits of Early Neolithic sites in the Pannonian plains of north Serbia and south-western Romania and, that while most archaeologists interpret them as remains of food debris, he is dubious, believing them instead to represent natural occurrences because the shells are whole⁵.

Further south in the Peloponnese, the Aegean, and perhaps on Cyprus, there is additional evidence for land snail consumption in the late Pleistocene and early Holocene. At Franchthi Cave, land snails were abundant in the Mesolithic (Stratum W) and late Palaeolithic (Stratum T) deposits. Farrand (2000) refers to them as *escargotières*, a description that makes sense in view of the density of whole and crushed shell (see also Jacobsen, Farrand, 1987) and Farrand's direct knowledge of Capsian deposits (Farrand *et al.*, 1982). Furthermore, the dates for these strata are equivalent to the other sites so far discussed – *i.e.* between approximately 10500 and 9600 BP for Stratum W and approximately 13000 BP for Stratum T (Farrand, 2000, tab. 6.1 and fig. 6.1). Farrand interprets the snails as food debris. A forthcoming report by Whitney-Desautels (n. d.) should allow a fuller assessment of their significance as a food resource.

Cyclope Cave, a fishing station on the island of Youra in the Aegean (Sampson, 1998; Sampson *et al.*, 1998; Sampson, Kozłowski, 1999), and

4. I am grateful to Laurens Thissen for providing this information and for copies of the published Donja Branjevina sections and of papers by Buitenhuis on the fauna from Ilipinar and Hoca Çesme in Anatolia.

5. Similar points have been made for cave deposits in Cantabria (de Barandiaran, 1947; Straus 1992, p. 212; Aparicio and Escorza, 1998; Arias, 2002) and elsewhere (Girod, 2003, with references). However I find the counter arguments of Bahn (1982, 1983), Guilaine (1979) and Miracle (1995) more compelling, especially as the Balkan sites are open-air which is not necessarily a preferred habitat for land snails. Although one might argue, as have Morrison (1942) and Matteson (1959) for some North American sites, that the abundance of calcium in shell middens will attract snails, this is unlikely to produce the kind of dense accumulation of land snail shells found in the Maghreb *escargotières* and sites of similar age in southwest Asia, and, to judge from Greenfield's description, at Foeni-Salas and elsewhere in the Balkans. I am therefore inclined to reject his interpretation, especially after discussions at the Tenth Neolithic Seminar in Ljubljana with other archaeologists working in the region.

Maroulas, an open-air settlement on Kythnos in the Cyclades (Sampson *et al.*, 2002), extend our knowledge of the pattern to situations in which access by watercraft was an essential element. Maroulas is especially significant, for in addition to thick and extensive deposits in layers 3 and 4 of land snail shells which are undoubtedly food refuse, it has evidence for structures, for exploitation of both marine and terrestrial food resources, and for the presence of (possibly domestic) dogs. Full publication of Cyclope is expected shortly, and further work is planned at Maroulas (Sampson, personal communication, Nov. 2003). Similarities of some of the evidence from Maroulas to that found further east is especially intriguing.

It is worth noting that land snail consumption was not a universal pattern in this region. There are no edible land snails in the Mesolithic levels at Theopetra Cave in Thessaly (Kyparissi-Apostolika, 2000, and personal communication, Feb. 2003). Land snails are present in the Neolithic levels at Kitsos Cave in Attica, but mollusc consumption appears to have been restricted to marine species (Chevallier, 1981). This is interesting, given the similarities of both sites in other respects to Franchthi, Cyclope and even Pupićina and Öküzini caves. It cannot be strictly a question of chronology. Other factors must be involved (such as local ecology, season of occupation, or dietary preferences), but this question cannot be answered with the evidence available (however, see Thissen, 2000).

For the post-Mesolithic period, the situation is not so clear. Land snails are present in the Neolithic faunal assemblage at Kissonerga Mylouthkia on Cyprus where they have been interpreted as food debris (Ridout-Sharpe, 1998). Having seen the full data, generously provided to me by Janet Ridout-Sharpe, I am less convinced, but I am willing for now to accept her cautious and reasoned interpretation that « some [earlier] Aceramic Neolithic well contexts could represent lenses of food debris which included *Helix* shells. In contrast, the [later] Aceramic Neolithic pit fills contain relatively few limpets and topshells, juvenile *Helix* and large numbers of [small] land snails, which could indicate colonisation by local land snail populations » (J. Ridout-Sharpe, pers. comm., Mar. 2003).

South-western Asia, the Levant and Cyrenaica

At Öküzini Cave in southern Anatolia, Stratum IV dates to *c.* 12300 BP (Otte *et al.*, 2003, p. 331) and contains abundant shells of *Helix pomatia levantina* which Otte (personal communication, Jan. 2003) says were present in « huge amounts » and « definitely eaten » and which Otte *et al.* (1995, p. 934) described as resembling « in a very general way shell middens of the latest European hunter-gatherers ».

A number of sites dating just before the appearance of an agricultural economy in the Zagros Mountains of northern Iraq and the Kermanshah region of western Iran all contain deposits of land snails that have been interpreted as food debris. These include Asiab, Gerd Banahilk, Jarmo, Karim Shahr, Nemrik 9, Palegawra, Tepe Sarab, Shanidar Cave layer B, Warwasi and Zawi Chemi

Shanidar. The species represented are either *Helix salomonica* or *Levantina* sp., and sometimes both. Braidwood and Howe (1960, 33 ff.) say that *H. salomonica* was « common » at Gird Banahilk, present in « considerable quantities » at Karim Shahir, and present at Palegawra. At Jarmo the number of unbroken shells was counted « by number of cubic foot boxes » (see also Braidwood, 1983, p. 542-543).

Harris (1961), while concerned primarily with the possible palaeoclimatic interpretations that can be drawn, does note (table V) that the *H. salomonica* and *Levantina* sp. found in layers A and B at Shanidar Cave represent « selective collection », corroborating his earlier characterization (table III) of the land snails at Jarmo as « certainly eaten » and at Karim Shahir, Palegawra and Zarzi as « probably eaten ? ». Reed (1962) confirms this interpretation and adds interesting observations on local modern land snail ecology and possible means used to prepare and consume them at these sites. He notes as well (p. 10-11), based on the evidence from Warwasi, that while snails occur throughout the levels, starting with the middle Palaeolithic, it is not until the Zarzian (late Pleistocene) that they occur in sufficient numbers to be considered food.

At Shanidar Cave, R.S. Solecki (1963) found a number of stone hearths in the Proto-Neolithic layer in association with large concentrations of land snails and suggests these may have been used to roast the snails (R. S. Solecki, personal communication, Jan. 1995 and Dec. 2002) – a situation that appears similar to what we have observed in contemporaneous deposits in Algeria and to what Miracle (2002) describes for Pupićina Cave in Istria. At Zawi Chemi Shanidar, R. L. Solecki (1981) found « areas of crushed shell concentrations » (p. 4) in Layer B (Proto-Neolithic and equivalent to the P-N layer at Shanidar Cave) and notes (p. 7) that *Helix salomonica* « concentrations are found scattered throughout the occupation, and it is presumed that these creatures were also eaten ».

At Nemrik 9, an early aceramic Neolithic site in northern Iraq with extensive architectural remains and both wild and domestic mammals, *Helix salomonica* is found in association with the river clam *Unio tigridis* in deposits dating between 10150 and 8500 BP. Kozłowski (1989, 1990) describes the molluscs as having been consumed and notes, as have others for a number of archaeological sites, that individual shells of prehistoric specimens tend to be larger than modern ones. Modern investigations from other regions (e.g. Labaune, Magnin, 2002) suggest to me that this is largely a result of habitat disturbance and degradation.

Unfortunately, no useful quantitative data on the frequencies of land snails, or of different species, are available for any of these sites, which is frustrating given their importance to our understanding of the transition to agriculture in south-west Asia. This is so especially because land snails were completely absent in the faunal assemblages from Ali Kosh and Tepe Sabz, several hundred kilometres to the south in the Deh Luran region (Hole *et al.*, 1969).

Elsewhere in south-west Asia the situation is less clear. I can find no mention of land snails at Çatalhöyük and Çayönü in Anatolia or Mureybit and Abu Hureyra in Mesopotamia, but do wonder if they have gone unrecognized perhaps

or unremarked by the investigators since land snails are present at some later sites in Anatolia : for example in north western Turkey during the early Neolithic at Hoca Çesme and and the late Neolithic at Ilıpınar (Buitenhuis, 1989-1990, 1994, 1995) where they are found in association with both domestic animals and some marine resources.

Further to the north around the Black Sea, Burov (1999) mentions several sites ascribed to the Shan-Koba (final Palaeolithic/early Mesolithic or *c.* 10000 BP) in which the shells of *Helix vulgaris* are abundant and clearly had been eaten.

Bar (1977) reviews evidence for land snails in archaeological sites of all periods in Israel as well as evidence for their modern consumption. He points out that large (*i.e.* edible) land snails are known from late Pleistocene/early Holocene levels at Djebel Kafzeh, Hayonim Cave, Erq el-Ahmar, Mugharet ez-Zuitina and Ein Gev, and interprets these as food remains. He argues that the same is true for later occurrences, but I think this is questionable. At Jericho, Biggs (1960) describes numbers too few to really constitute food resources (although the samples may be incomplete and biased) and is, in any event, more concerned with the data the snails can provide about palaeoenvironments. The same is true for Neuville's (1951) work south and east of Jerusalem and Avnimelech's (1937) earlier regional review. More recent publications suggest a similar lack of evidence. At Netiv Hagdud, Tchernov (1994, p. 9) says that « land snails constitute a major component of the fauna, but have not yet been identified and studied. No traces have been found to show that people used this protein-rich resource for food. » There is no further discussion in the subsequent study by Bar-Yosef and Gopher (1997). Neither mention abundant land snails, nor is there any reference to land snails during the Natufian occupation at Beidha (Byrd, 1989) or, for that matter, in any Natufian (Bar-Yosef, 1998) or PPNA or PPNB site (Bar-Yosef, 2002). This is curious given the modern abundance of land snails in the region (Heller, 1988). Thus there appear to be geographic/environmental factors, and perhaps cultural ones as well, at play here, and further work is needed to understand the pattern of occurrence (see also Flannery, 1969, p. 78).

At least one earlier site in the Levant does contain land snails that can be interpreted as food remains. In level 3b at Ksar 'Aqil near Beirut, edible land snails were « extremely abundant » (Tixier, 1970 ; see also Ewing, 1949). This is the top (phase I) of the long prehistoric sequence, and it contains a lithic assemblage dominated by backed bladelets (> 50 %) that has been dated to between 22000 and 23000 BP (Mellars, Tixier, 1989), slightly earlier than the Iberomaurusian levels at Tamar Hat (Saxon *et al.*, 1974), making it the oldest documented systematic use of land snails for food in the circum-Mediterranean. The land snails in the pre-Aurignacian layers at the Haua Fteah in Cyrenaica (Klein, Scott, 1986 ; Hey, 1967) are undoubtedly older, but there is insufficient information available on frequency and density to say whether or not they were introduced as food or were a natural occurrence. Similarly, the presence of abun-

dant land snails in the Mousterian deposits at Devil's Tower, Gibraltar (Garrod *et al.*, 1928) may or may not indicate their use as food⁶.

Why land snails ?

Archeological evidence cannot tell us who was eating snails, how they were prepared, or whether or not they were part of an « haute cuisine » or common fare... (Hyman, 1986, p. 23)

Hyman is wrong, as the archaeological evidence I have just reviewed makes clear. The more interesting questions to ask are : Why are land snails such a common item of food refuse in archaeological sites throughout the Mediterranean region that date just prior to the appearance of agricultural economies during the early Post-Glacial period of rapid climatic and environmental change ? Were they a necessity, a luxury or merely an appetizer ? Was their use as food restricted by age or gender ? Might they have had a ritual significance ? The last three questions are beyond the scope of this paper, but we can at least look very briefly at the first.

Recent palaeoenvironmental data and reviews of those data (*e.g.* Bintliff, 2002 ; Casford *et al.*, 2001 ; Jalut *et al.*, 1997 ; Macklin *et al.*, 2002 ; Magny *et al.*, 2002 ; Marchal *et al.*, 2002 ; Pons, Quezel, 1998 ; Roberts, 1998 ; Roberts *et al.*, 2001a, 2001b ; and the special issue of *The Holocene*, vol. 11, n° 6, 2001) suggest that while long-term trends are identifiable the situation is highly complex. There are disagreements as to how to interpret the available data and as to whether or not changes can be ascribed to anthropogenic or natural causes. The general consensus seems to be that until at least the latter part of the mid-Holocene (*i.e.* long after the establishment of agricultural economies in most of the region), any changes can be ascribed to globally observed climatic events rather than anthropogenic causes.

We can probably accept the generalized picture of Roberts *et al.* (2001a, p. 632 ; see also Roberts, 1998, p. 104) that :

The herb-steppe which surrounded most of the Mediterranean Sea during the late Pleistocene was replaced during the early and mid-Holocene by sub-humid forest, sometimes dominated by conifers, more usually by broad-leaved deciduous trees. Typically mediterranean formations of xeric evergreen forests, shrub and heathland are only rarely represented in early to mid-Holocene pollen diagrams.

What I think this tells us is that in many areas throughout the Mediterranean region between 15 000 and 6 000 years ago, conditions were right for sustained increases in land snail populations. My reasons for making this statement have to do with land snail ecology and reproduction which, unfortunately, I cannot

6. The earliest confirmed evidence appears to be from East Africa. At Mumba-Höhle on the eastern shore of Lake Eyasi, there are deposits dating to at least 31 000 years ago in which the shells of the giant African land snail *Achatina* sp. are a major component. Mehlman (1979) describes these levels as an *escargotière*.

discuss here. Suffice it to say that prehistoric populations were well equipped to take advantage of this situation when it occurred, and we see the evidence for that in the archaeological record, especially in the Maghreb where I believe a very successful foraging adaptation based in part on consumption of land snails, delayed the introduction of food producing economies well beyond the dates for this development in neighbouring regions. More detailed consideration of these and related questions are forthcoming (Lubell 2004, n. d.).

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