



HOLOCENE LAND SNAIL EXPLOITATION IN THE HIGHLANDS OF CENTRAL ITALY AND EASTERN ALGERIA : A COMPARISON*

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ABSTRACT

Lands snails are frequently found in early Holocene archaeological deposits. A seasonal exploitation was suggested in eastern Algeria, at an elevation over 1000m asl. This model is being tested in central Italy, where a well preserved shell midden, dated to c. 9400 BP, has been found at Gr. di Pozzo, close to the former Fucino lake, at an elevation over 700m asl.

KEY WORDS : Highlands of Eastern Algeria, Fucino, Gr. di Pozzo, shell midden, Mesolithic economy.

LO SFRUTTAMENTO DEI GASTEROPODI TERRESTRI NELLE ZONE MONTAGNOSE DELL'ITALIA CENTRALE E SUGLI ALTOPIANI DELL'ALGERIA ORIENTALE DURANTE L'OLOCENE

RIASSUNTO

Nei depositi archeologici degli inizi dell'Olocene, tutt'intorno al Mediterraneo, si rinvencono frequentemente concentrazioni di conchiglie di gasteropodi terrestri usati nell'alimentazione. Ricerche svolte sugli altopiani dell'Algeria orientale, ad oltre 1000m slm, indicano che il consumo dei molluschi era molto probabilmente stagionale, e più specificamente primaverile ed autunnale. Depositi di questo tipo sono noti anche nei siti mesolitici italiani, ma l'importanza di questa risorsa alimentare deve essere meglio definita. La scoperta di un chiocciolaio ben conservato a Gr. di Pozzo, in Abruzzo, ad una quota superiore ai 700m slm, offre la possibilità di mettere alla prova in un'area diversa da quella di origine il modello di economia e di utilizzazione del territorio elaborato nel Maghreb.

PAROLE CHIAVE : Altopiani dell'Algeria orientale, Fucino, Gr. di Pozzo, chiocciolaio, economia mesolitica.

SUMMARY

Edible terrestrial molluscs are a common component of early Holocene archaeological deposits throughout the circum-Mediterranean. Land snails are found in Mesolithic sites in Italy, but their significance as a food source has yet to be determined. Research in the highland plateau of eastern Algeria has shown that in that region at elevations over 1000m asl the use of land snails as food must have been seasonal, probably restricted to spring and autumn. The discovery of a well-preserved Mesolithic land snail midden in the Grotta di Pozzo, Abruzzo, at an elevation of >700m asl, and dated by four AMS 14C dates to c. 9400 BP,

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provides the opportunity to test subsistence-settlement models developed for the Maghreb in another region of the Mediterranean.

INTRODUCTION

Shell middens, or shell-bearing sites (STEIN, 1992), are common in the archaeological record of the late Pleistocene and early Holocene in the circum-Mediterranean. The shells found in such sites almost always represent the remains of food consumed by prehistoric groups, although certain shells were used for decoration or other purposes (this is especially true for the occasional marine shell found at inland sites).

Most middens are found along modern or ancient coastlines. Some, like the Mesolithic middens at Muge in Portugal, are located along present or former estuaries. The majority contain predominantly the remains of marine shellfish (WASELKOV, 1987). However, there are a number of sites throughout the circum-Mediterranean, often inland, sometimes in highlands or mountainous environments, at which the abundant shells come from edible land snails.

Significant examples are Jarmo and Shanidar in Iraq, Ksar 'Akil in Lebanon, el Wad in Israel, Franchthi Cave in Greece, Haua Fteah in Cyrenaica, Tamar Hat in Algeria, the numerous *escargotières* of southern Tunisia and eastern Algeria, a number of sites in Italy (see below), el Castillo in northern Spain, and a number of sites such as Poeymaü, Mas d'Azil and L'Abri Jean Cros in Southern France (for the latter, see the review by GUILAINE, 1979).

Neither shellfish nor land snails could have constituted year-round food sources for prehistoric populations (LUBELL *et alii*, 1976; MEEHAN, 1982 with references). Land snails control intake and loss of water by aestivation: that is, by sealing themselves into their shells when water loss through evaporation is high, and then reappearing when moisture is available. This can be both a seasonal and a diurnal pattern. The important point for subsistence reconstructions is that during aestivation land snails cannot be

consumed until they have been purged of the wastes that accumulate within the shells and, furthermore, they are less abundant. These characteristics become even more extreme under arid or semi-arid conditions. Shellfish are also subject to seasonal factors, the most important of which is probably their toxicity at times of algal blooms (red tides). Furthermore, it is not possible to collect shellfish when the sea is agitated, for instance during winter storms. It is, therefore, generally assumed that neither shellfish nor land snails ever constituted year-round food sources for prehistoric groups and, unless it can be demonstrated otherwise, shell middens are interpreted as seasonally specific sites. However, one interesting example of what appears to have been year-round occupation are the middens at Muge in Portugal (e.g. ROCHE, 1972) where estuarine shell fish, marine fish, and a wide variety of terrestrial mammals and birds were exploited (LENTACKER, 1986, 1991; LUBELL *et alii*, 1992).

EASTERN ALGERIA

Eastern Algeria is characterized by a series of broad plateaux known as the High Constantine Plains and averaging 1000m asl. These are bounded by the Coastal Atlas mountains on the north and an abrupt transition in both elevation and geology on the south to the Sahara. During the Last Glacial Maximum, prehistoric occupation appears to have been almost entirely restricted to the coastal regions where groups using the Iberomaurusian bladelet and microblade industry occupied cave, rockshelter and open-air sites.

Iberomaurusian occupations occur from Morocco to Cyrenaica and are radiocarbon dated from >20,000 BP to ca. 10,000 BP (LUBELL *et alii*, in press). The subsistence pattern at these sites includes extensive exploitation of a limited number of terrestrial mammal species, especially *Ammotragus lervia*, as well as land snails and some marine shellfish. The available data have been interpreted to suggest both seasonal and year-round occupations (see overview in LUBELL, 1984).

The Iberomaurusian is followed in the early Holocene by a series of predominantly inland occupations, the best known of which is the Capsian of eastern Algeria and southern Tunisia. The Capsian industry has two major variants : an earlier Typical Capsian in which larger backed blades and burins are common, and a later Upper Capsian characterized by smaller backed bladelets, denticulated blades and geometric microliths. The Upper Capsian has been sub-divided into a number of regional facies (see overview in LUBELL *et alii*, 1984; SHEPPARD, 1987; SHEPPARD and LUBELL, 1990).

Capsian sites are abundant, and occur both in rock shelters and the open-air. They are almost universally characterized by the presence of vast numbers of land snail shells (at least 25,000 whole shells per cubic metre), ash, charcoal, fire-cracked rock, abundant lithic artefacts and mammal bone. Human burials are common. Open-air sites can be large (>30m diameter) and often thick (>4m of deposit) (Fig. 1). They frequently rest unconformably on erosional (glacis) surfaces that date to some time during the Last Glacial Maximum.

However, in that no Capsian deposit has ever been dated >10,000 bp (LUBELL *et alii*, in press), it appears likely that there is an erosional hiatus in the geomorphological and archaeological history of this region.

High quality nodular flint was easily available because the Eocene limestone bedrock has been exposed either by erosion or uplift or both. There are a number of well delineated basins formed by breached and truncated anticlines such as the Télijdjène Basin south of Chéria near the modern Algerian-Tunisian border, and these were occupied extensively by Capsian groups between ca. 9000 and 6000 years ago.

The density of occupation apparent on the map may be illusory in that these sites collectively represent at least 3000 years and not all were occupied simultaneously (Fig. 2). Detailed reconstruction of the Capsian palaeoeconomy suggests that occupation of these sites was short term with rapid accumulation of deposits that were, in the case of open-air sites, equally rapidly

deflated thus obliterating much of the stratigraphy. However, in rock shelters, the stratification is often better preserved, allowing one to distinguish between lenses of whole and crushed shell. Pond (1938) interpreted these as representing the remains of single events. While this may be correct, our reconstruction of the subsistence pattern relies on a wider range of data.

Sites with Capsian artefacts but lacking in land snails are known from the northern fringe of the Sahara. These sites are in areas approximately 1000m lower and 150km further south than the major area of Capsian occupation in eastern Algeria and southern Tunisia. Faunal remains in these sites are scarce, but when present are made up of mammals such as *Gazella* sp. that one would expect to be common in warm semi-arid conditions.

To the north of the Télijdjène Basin, there are a series of playa basins that were, almost certainly, shallow lakes during the early Holocene. There are numerous *escargotières* here as well, including classic sites such as Mechta el Arbi and Medjez II, many of which were investigated in the 1930s by an American team led by Alonzo Pond (POND *et alii*, 1938; BREITBORDE, 1992). The mammalian remains from these sites include more numerous large animals, especially the aurochs (*Bos primigenius*), than those to the south. This is what would be expected under the moister and cooler conditions likely to have prevailed at these higher altitudes.

In sites around the Télijdjène Basin, the mammalian remains are predominantly from the large antelope *Alcelaphus buselaphus*, while *Bos*, *Equus*, *Gazella* and lagomorphs are also well represented. The land snails consist of the larger grassland *Helix* and smaller, more arid adapted varieties such as *Helicella* and *Leucochroa*.

In the two sites investigated intensively by one of us, there is a change in the subsistence adaptation and technology over time. At both Aïn Misteheyia and Kef Zoura, two major occupations are represented. In levels dating prior to 8000 BP, artifacts of the Typical Capsian are associated with

larger mammals and grassland habitat snails. In levels dating after 8000 BP, the artifact assemblage is Upper Capsian and the faunal remains, both vertebrate and invertebrate, are those of smaller, more arid adapted species. These changes are consistent with reconstructions based on geoarchaeological analyses as well as independent studies of vegetation based on pollen (e.g. RITCHIE, 1984), charcoal from archaeological deposits (COUVERT, 1972), and syntheses of numerous other data (ROGNON, 1987; FONTES and GASSE, 1989).

Vegetation cover throughout the region during the early Holocene was more extensive than today. Both grassland and wooded habitats were more frequent and more productive. Nonetheless, the modern distinction between the cold wet winters of the high plains and the warm dry winters of the northern Sahara would have been accentuated. It thus seems most likely that Capsian populations did not spend the cold months of the year in the exposed locations where their sites are found around Télijdjène and further north. Furthermore, in that we know land snails to be more available in spring and autumn, we strongly suspect that the main *escargotière* occupation was during those seasons while summers were spent further north and winters further south. Therefore, it is most probable that land snail exploitation was part of the adaptation to a semi-arid environment, which involved seasonal movements from lowlands to highlands, and vice versa.

While this reconstruction is, at present, unproven, it nonetheless appears to be the most likely given the available data.

ITALY

The archaeological record is continuous in Italy from >25,000 BP onward (MUSSI, 1990; MUSSI, 1992). Gravettian industries, similar to those of Western Europe, are followed by Epigravettian industries after 20,000 BP. By then, human settlements are found in coastal areas of the peninsula, while there is only restricted evidence from inland sites, including those of mountainous areas.

The colonization of Sicily before 14,000 BP is only hypothetical.

Around the Glacial Maximum, there is an emphasis in the hunting of large mammals such as *Equus caballus* - sometimes accompanied by *E. hydruntinus* - *Bos primigenius*, *Cervus elaphus*. *Capreolus capreolus* is typical of a more wooded environment, while *Capra ibex* and, more rarely, *Rupicapra rupicapra* were found in rocky areas. *Dama dama* lived in regions with a milder climate, while *Alces alces* was present in Northern Italy.

The evidence for shellfish or land snail gathering is much more restricted. Excluding marine shells frequently collected to make ornaments, *Mytilus* and *Patella* were retrieved at Riparo Mochi in levels D and C, the age of which, while controversial, is in excess of 20,000 years (BLANC, 1938; MUSSI, 1992); a few *Patella*, *Mytilus*, *Pectunculus*, *Pecten*, as well as four *Helix* were found by Rivière (1887) at Baouso da Torre in the level which included rich burials of similar age (MUSSI, 1986); a small amount of marine molluscs of the usual edible species come from a group of levels of Gr. delle Arene Candide, which have a ^{14}C date of $18,560 \pm 210$ BP (R-745) at their top (BIETTI, 1987; EMILIANI *et alii*, 1964); a small amount of mostly marine molluscs were gathered at Gr. La Cala, when layers with industries of Evolved Epigravettian type were deposited, starting more than 16,000 years ago after radiocarbon; *Patella* and *Monodonta turbinata* were collected and apparently cooked at Fondo Zecca, which is radiocarbon-dated to $14,170 \pm 170$ (R-271) and $13,870 \pm 110$ BP (R-272) (MACRI, 1984).

At the very end of the Pleistocene, in association with the so-called Final Epigravettian industries, large mammals continue to be hunted, but different resources are also looked for: fish remains, carbonized hazel nuts, and most of all edible molluscs are more and more common. During the early Holocene, in Mesolithic settlements, land snails are very frequently exploited, together with shellfish and sometimes even fresh water molluscs (Fig. 3). Most of the Mesolithic coastal sites contain shells of both marine and terrestrial species. There is usually a shift,

through time, from predominantly terrestrial to mainly marine resources. It has long been recognized that this was related to the rise of sea level, which changed the coastal geography as the sea shore moved closer and closer to present day coastal sites (BONUCCELLI, 1971).

The evidence of shell middens : coastal sites

In Liguria, some of the Balzi Rossi (or Grimaldi) caves are known to have contained substantial amounts of sea shells, belonging to edible species such as *Trochus*, *Mytilus* and *Patella*. They were often mixed with ashes and charcoal. The industries are of Final Epigravettian type, and can be dated from the Dryas II onwards - i.e. from c. 12,000 BP - while there is no firm evidence for the Holocene.

The sites are Gr. dei Fanciulli (*Gr. des Enfants* in the French literature) lev. B, Riparo Mochi lev. A, Gr. del Caviglione, Barma Grande, Gr. di Baouso da Torre (BLANC, 1938; DE VILLENEUVE *et alii*, 1906-1919; FOREL, 1864; MUSSI, 1992; RIVIERE, 1887). The best evidence is from Gr. dei Fanciulli lev. B, where an enormous amount of *Trochi* has a C14 age of $12,200 \pm 400$ BP (MC-499). The so-called "Mesolithic" level of Gr. delle Arene Candide, which actually belongs to the end of the Pleistocene, with dates of $11,750 \pm 95$ (R-743), $10,910 \pm 90$, and $10,330 \pm 95$ BP (R-100), also included lots of marine molluscs (mainly *Trochus* and *Patella*), and terrestrial gastropods as well (BIETTI, 1987; EMILIANI *et alii*, 1964).

In the Carso, close to Trieste, many caves yielded deposits with Mesolithic industries, but their chronology is imperfectly known. Some 4000 shells of *Trochus* and *Patella* were found at Gr. Azzurra (mostly in the upper levels), marine molluscs are recorded at Gr. dell'Edera, and land snails at Caverna dei Ciclami (CANNARELLA and CREMONESI, 1967; LEGNAMI and STRADI, 1963; MARZOLINI, 1970).

At Gr. della Tartaruga, there is a more complex sequence : there is an overall increase in the amount of shells retrieved, from 50gr in cut 12, to 1150gr in cut 1; while in the lower cuts *Helix* was found, in cuts 2 and 1

there are mostly remains of *Trochus* (CREMONESI, 1967).

At Riparo Blanc, on the coast South of Rome, 32,000 shells of edible marine molluscs (mainly *Trochus* and *Patella*) were collected, as well as large amounts of fragmented shells of the land snail *Helix ligata*. There is a C14 date of 8565 ± 80 (R-341) for this Mesolithic layer (TASCHINI, 1964; TASCHINI, 1968).

South of Naples, the caves of the Costiera Amalfitana - Gr. del Mezzogiorno, Gr. Erica, Gr. La Porta - have deposits of early Holocene age, and possibly of late Pleistocene age at the bottom of the sequences, explicitly termed as *chiocciolai*, i.e. shell middens : land snails are prevalent in the lower horizons, marine shells in the upper ones (BIETTI *et alii*, 1983; BONUCCELLI, 1971; RADMILLI and TONGIORGI, 1958; TOZZI, 1975).

Further South, in the Cilento, substantial amounts of marine molluscs, and a few land snails, were collected at Gr. La Cala from the end of the Pleistocene onwards - possibly from the Bölling. The latest deposits are residual, and poorly known, having been dismantled by the sea : they include marine and terrestrial species (BARTOLOMEI *et alii*, 1975; BIETTI *et alii*, 1983; PALMA DI CESNOLA, 1969). At Nicchia Gamba, which is part of Riparo del Poggio, level 4 with many *Helix* is capped by levels 2- 3, with both *Cardium* and *Helix*, radiocarbon-dated at 11630 ± 230 BP (F-25) (PALMA DI CESNOLA, 1970; TOZZI, 1975). Residual deposits with molluscs, possibly of Holocene age, are also found at Gr. del Noglio and Gr. di S.Maria (PALMA DI CESNOLA, 1969; VIGLIARDI, 1981).

At Gr. della Madonna of Praia a Mare in Calabria, tens of thousands of remains of land snails (*Helix ligata*), as well as of marine molluscs (mostly *Monodonta turbinata* and different species of *Patella*) were found in levels L and I (DURANTE and SETTEPASSI, 1972). The C14 dates range progressively from c. 12,000 to c. 9,000 BP. At first land snails are prevalent, but later on they are outnumbered by shellfish remains.

In Apulia, at Gr. Romanelli, *Patella* and other marine species are frequently found in the upper levels, the so-called "Terre brune", with some contradictory 14C dates : they are currently related to the very end of the Pleistocene, from the final Alleröd onwards, up to the very beginning of the Holocene (BLANC, 1930; CASSOLI *et alii*, 1979). At Gr. delle Mura, an archeological deposit slightly more recent than the one of Gr. Romanelli has been found during recent excavations. It includes a lot of marine molluscs and land snails (CALATTINI, 1985-1986). Even later are the so-called "epiromanellian" industries of Gr. delle Prazziche, Riparo C delle Cipolliane, Gr. del Cavallo, Gr. di Uluzzo, found in layers which include large amounts of shells, and which are described as *chiocciolai* (BORZATTI VON LÖWENSTERN, 1963; BORZATTI VON LÖWENSTERN, 1969; PALMA DI CESNOLA, 1962; PALMA DI CESNOLA, 1963). The marine species are more frequent than the terrestrial ones, except at Gr. del Cavallo, where it is the reverse.

In Sicilian caves, Late Upper Palaeolithic to Mesolithic deposits including terrestrial/marine shells are often mentioned, if poorly defined : cf. Gr. dell'Addaura II and III, Gr. Perciata, Gr. di Ciaravello, Gr. del Crocifisso, Riparo del Castello a Termini Imerese, Gr. di Punta Capperi, Gr. di Punta Sorci, Gr. di Cala Tramontana I and II (BOVIO MARCONI, 1946; BOVIO MARCONI, 1952; VAUFREY, 1928; ZAMPETTI, 1984-1987).

At Gr. Mangiapane, Vaufrey (1928) mentions a *kjökkenmödding* of mainly marine shells (including large *Patellae*), mixed with land snails. Vigliardi (SEGRE and VIGLIARDI, 1983) tentatively suggests that there is some Evolved Epigravettian - *i.e.* an industry chronologically in the range of 16-14,500 BP -in the archaeological sequence but underlines that the latter, being 1.5m deep, could well have included more than one occupation layer.

At Gr. Niscemi, at a depth between 90 and 80cm, some 100 marine shells were found, while more than 1000 terrestrial gastropods (mainly different species of *Helix*) were collected between 50 and 40cm, and were also

recorded at a higher level in residual deposits against the cave walls (BOVIO MARCONI, 1954-1955). The chronology of the Late Palaeolithic archaeological remains of this cave are controversial (BIETTI, 1980).

In the Mesolithic deposit of Gr. dell'Uzzo, *Monodonta turbinata*, *Patella sp.*, *Helix sp.* were frequent (COSTANTINI *et alii*, 1987; PIPERNO *et alii*, 1980), while trace element analysis of the human remains suggests that people were "relying significantly on marine food, especially molluscs" (BORGOGNINI - TARLI *et alii*, 1989).

In the major cave of Levanzo, variously named Gr. di Levanzo, Gr. di Cala Genovesi, or Gr. dei Cervi, lev. 2, which is of Holocene age, has been termed *escargotièrre* or *chiocciolaio* (CASSOLI and TAGLIACOZZO, 1982; VIGLIARDI, 1982). It includes *Trochus*, *Patella* and *Triton*, as well as *Helix*.

At Gr. Corruggi, large quantities of land snails, with numerous *Trochus* and *Patella* (those mainly in the lower part of the deposit), are associated with a lithic industry of possibly Holocene age (BERNABO'BREA, 1949; SEGRE and VIGLIARDI, 1983).

The evidence from inland sites

In North-Eastern Italy, at Romagnano, 220m asl, a few *Helix*, and many fresh-water *Unio* shells were found. They are related to a rich sequence of Mesolithic levels, with Sauveterrian and then Castelnovian industries, well radiocarbon-dated from the early Holocene to c.6500 BP (BROGLIO, 1971; ALESSIO *et alii*, 1983). *Unio* was also exploited in the lower levels of the nearby Riparo di Pradestel, of similar age (BOSCATO and SALA, 1980).

In central Italy, in the Avezzano or Fucino basin, which lies just in the middle of the Peninsula, a shell midden was excavated at Gr. Continenza, at an elevation of 700-800m (BARRA INCARDONA and GRIFONI CREMONESI, 1991; GRIFONI CREMONESI, 1985). In cuts 25-29, large numbers of *Helix* shells were found mixed with ash and charcoal, and other animal remains that included fish, birds, and some mammals

(mostly micromammals).

In Southern Italy, at 760m asl in Basilicata, at Gr. di Latronico n.3, a scarce mesolithic industry was found. Land snails are said to have been intensively collected (CREMONESI, 1984). In Apulia, a residual deposit rich in terrestrial molluscs is mentioned at Gr. Paglicci, at 150m asl, and tentatively correlated with lev. 1-3 of the cave, earlier than 11,000 BP, and radiocarbon-dated to $11,440 \pm 180$ BP (F-94) (PALMA DI CESNOLA, 1978; PALMA DI CESNOLA *et alii*, 1983).

RECENT RESEARCH IN THE AVEZZANO BASIN

The evidence of shell middens in Italy is widespread. However, quantitative data on the shells are rarely included and, when present, never related to a given volume of archaeological sediment. Determination of land snail species is rarely at the subspecific level. Environmental studies, or the evaluation of diet and seasonality, are not attempted. Collecting and cooking techniques are similarly never taken into account. The very fact that land snails were collected by human beings and eaten is usually just assumed, and not discussed. Such a conclusion is actually dismissed at Arma dello Stefanin (LEALE ANFOSSI and PALMA DI CESNOLA, 1972). There is no evidence from open-air sites. The rising sea levels of the Versilian transgression which started at the end of the Pleistocene could well have submerged crucial evidence from open-air coastal sites. This is almost certainly the case along the Maghreb coast and has recently been demonstrated for the eastern Mediterranean off the modern Israeli coast (HERSHKOVITZ *et alii*, 1991).

Furthermore, archaeological research in Italy has been directed more toward coastal caves, than those in the mountains.

To test the model of seasonal land snail exploitation which one of us has elaborated in the highlands of Eastern Algeria, a project was started in the Avezzano Basin of Central Italy, in an area at a broadly

similar elevation.

Geomorphology

The Avezzano basin, in which lake Fucino developed at an elevation of c. 650m asl, is surrounded by mountains which reach 1700-1800 m within a few kilometers on the East, South and West (Fig. 4). To the North, they are over 2400m in the Monte Sirente group, where extensive traces of Würmian glaciated areas are found (GIRAUDI, 1989; MALATESTA, 1985). To the NW, a minor ridge of 720m leads to a smaller basin, called Piani Palentini. The mountain ridges include highland plateaux, basins and hanging valleys. The lack of karstic drainage in some of them, like Amplero, led to the formation of now drained seasonal lakes.

From the edges of the Avezzano basin, as the crow flies, it is 60Km to the Adriatic Coast, and 70Km to the Tirrenian Coast. However, there is no easy way to reach the sea : the Roman Via Valeria, for instance, which crosses the northern part of the Avezzano basin, climbs to more than 1100m both to the East - before reaching the Aterno Valley, which leads to the Pescara Valley and then to the Adriatic Sea - and to the West - before reaching the Aniene River, an affluent of the Tevere River which flows into the Tirrenian Sea. The pattern of communications followed the direction of the valleys, which develop longitudinally between the mountains, in a broadly NW-SE direction controlled by the uplift of the Apennines. They locally open into wide Pleistocene basins, the major of which is the Avezzano basin.

During the Quaternary the Avezzano basin and its surroundings were subjected to intensive neo-tectonic movements, which led in the first place to the creation of the depression with its steep slopes, and in the second place to its asymmetrical aspect : the Southern part is more sloping, with scarce morphological evidence of Quaternary evolution, while the Northern part is less steep, with the traces of Quaternary evolution preserved in a series of terraces (ZARLENGA, 1987). The lake, whose level was fluctuating, flooded again and again over the northern terraces, while it incised notches at different

levels in the calcareous southern cliffs. The natural environment was therefore quite different on the Northern and on the Southern shore of the lake.

However, even in the Northern part, the overall intensity and complexity of the tectonic movements left very few surfaces unaffected by erosion, incision or accumulation. As a result, the preservation of Palaeolithic or Mesolithic open-air sites is poor.

The uplift phases and aggradation processes involved the subsidiary basins and valleys as well. In some instances, however, the tectonic block movements were such that their morphology is still relatively little affected. In fact, while the Avezzano basin floor moves down with respect to the surrounding mountains, the fluvial incisions will be rejuvenated, starting from the basin level. Only later on will the more distant mountain parts be affected. Therefore, in some of these internal depressions, which have been so far spared from erosion, open-air site preservation is better.

Lake Fucino was partially drained in Roman times, flooded again starting in the Early Middle Ages, and finally drained completely one century ago. Just prior to final draining, it covered a surface of 150 Km², with a maximum depth of 18m. The drainage basin surrounded the lake over an area of c.700 Km² (GIRAUDI, 1989). It included minor surface tributaries, such as the Giovenco river, as well as karst drainage. There was no surface outlet, and the lake level is known to have been subjected to marked fluctuations in historic times.

Gr.di Pozzo

Gr. di Pozzo is a small cave of c. 12x3x1.5m, at c. 710m asl. It opens on the western side of Pozzo di Forfora, a small valley 1.5 Km long, oriented South-North, which is now dry during most of the year. To the North, it opens into the Fucino basin; to the South, it bifurcates, before suddenly ending in front of a mountain wall almost 100m high. The mountain is quite steep on both sides of the valley, too (Fig. 4).

Gr. di Pozzo, which is oriented to North-East and illuminated by the sun during many hours of the day, is half-way between the entrance and the end of the valley. Residual deposits from a land snail shell midden,, originally at least 30cm thick, are found against the walls of the cave. A charcoal sample from this deposit is dated at 9140 ± 70 BP (TO-3421). Two tests of the intact surface of a the cave, 2.5m apart, revealed a similar deposit at a depth of -70cm below datum (Fig. 5). It seems probable that they belong to a same feature of shell accumulation. Paired samples of charcoal and land snail shell from the top of the midden deposit give ¹⁴C ages of 9370 ± 80 BP (TO-3422) and 10290 ± 80 BP (TO-3423), respectively. The discrepancy is not unexpected (e.g. EVIN *et alii*, 1980; GOODFRIEND, 1987), and underlines the caution needed when such dates are quoted. The shell midden includes charcoal, ash, fire-cracked stones and a small number of animal bones and flint implements - tools as well as bladelets, trimming flakes and microburins - some of which are burnt. Lenses of well preserved shells of *Helix delpretiana* alternate with compact earth with crushed shells, as in the Capsian *escargotières* (see above). An apparently artificial feature was recognized in it, *i.e.* a small conical pit, 5-10cm depth, and 20x30cm wide. In some parts of the cave the shells are eroding from the surface, while elsewhere they are overlain by a compact light brown deposit, which is locally disturbed by roots and burrowing activity. A typical Sauveterrian point was found in this deposit, and a charcoal sample from the same square meter and at the same depth was dated at 8110 ± 90 BP (TO-3420) (Fig. 6).

The vegetation of the area, at the beginning of the Holocene, is known through the palynological analysis of a very long core, drilled into the sediments of the former lake (MAGRI and FOLLIERI, 1991). Unfortunately, it is undated and apparently undatable. The part of the sequence we must consider as corresponding to the shell midden of Gr. di Pozzo is subzone Z1 : following correlations with other pollen cores, it is of post-Pleistocene age, and earlier than 5,400 BP.

Subzone Z1 is characterized by the rapid transition from a steppe-like

vegetation, with *Artemisia*, Gramineae and Chenopodiaceae dominant, to a wooded environment, which soon includes a mixed oak forest. *Fagus* and *Carpinus* are also present. Interestingly, a substantial amount of *Corylus* pollen is found : hazel nuts were therefore seasonally available, and it is well known that they were often exploited in Mesolithic sites, in Italy and elsewhere.

Samples of charcoal recovered during excavation provide supplementary data for the reconstruction of palaeoenvironments during part of the occupation at Gr. di Pozzo. The assemblage contains members of the Rosaceae, most probably almond (*Prunus amygdalus*), juniper (*Juniperus* sp.), elm (*Ulmus* sp.) and deciduous oak (*Quercus* f. c.).

Although the quantity of material is very small, it does provide interesting indications of climate that will have to be verified by subsequent excavations. Almond has been found at several Late Glacial sites around the Mediterranean, dating between 12,500 and 11,500 BP and to a number of subsequent time periods (VERNET, 1973; BAZILE-ROBERT, 1980; KRAUSS-MARGUET, 1981). Almond is rarely identified in palynological studies due to weak seed propagation : it is insect pollinated and produces very little pollen. This taxon is not common in charcoal assemblages, leading one to interpret it as a reflection of the local vegetation community. This would have been a semi-arid one existing under relatively dry and moderately warm conditions which promoted development of transition vegetation complexes characterized by juniper and pine woodlands with thermophile species and deciduous oak (VERNET, 1991).

DISCUSSION

While in the Maghreb there is a long record of intensive collecting of both shellfish and land snails in connection with Iberomaurusian industries, in Italy there is some evidence that marine molluscs were the first ones to attract the attention of prehistoric people, if marginally, more than 20,000 years ago. By 12,000-11,000 BP, at Gr. delle Arene Candide and at Nicchia Gamba,

both shellfish and land snails were gathered, and were an important resource. At the latter site, a shift from predominantly terrestrial to mainly marine resources can be seen at this early date. The same process can be followed later on in sites such as those of the Costiera Amalfitana and Praia a Mare, but was delayed until well into the Holocene at the sites of the Carso (cf. Gr. della Tartaruga). This is not surprising : at the end of the Pleistocene the sea shore in the Northern Adriatic was still much further south than today (MOSETTI and D'AMBROSI, 1966). In some instances, however, and in the same geographical setting, shellfish were exclusively, or almost exclusively collected : cf. Gr. dei Fanciulli, Gr. La Cala, Gr. Romanelli, with archaeological layers of late Pleistocene age.

The evidence for systematic and exclusive collection of land snails is restricted, but similar in age. Nicchia Gamba lev. 4 and Gr. Paglicci have a record older than 11,000 BP. Both are close to sea level, although Gr. Paglicci is inland. The shell midden of Gr. di Pozzo, in mountainous environment and radiocarbon dated at c. 9400 BP, is of early Holocene age. The nearby, and apparently similar deposit at Gr. Continenza, also associated with an industry including Sauveterrian points, is assumed to be of similar age. The scanty evidence from Gr. di Latronico n.3, including trapezoidal microliths, is apparently of later Holocene age.

In conclusion, there is reason to suggest that, in Italy, erratic and casual collecting marine molluscs eventually led, c. 12,000 to 11,000 years ago, to a more systematic exploitation of both marine and terrestrial molluscs, often, if not always, associated. Then in the coastal sites the rising sea level of the Versilian transgression progressively induced a shift towards the collection of marine molluscs, while at inland sites land snails continued to be systematically gathered.

Along the coasts, seasonality is suggested by the evidence of sites in which marine molluscs alternate with land snails or mixed gathering in the same time range and the same geographical setting. The finding of

Holocene *escargotières* in mountainous areas points to the same conclusions. While the conditions prevailing in the Maghreb were no doubt different, the presence of *escargotièr*e deposits in the Avezzano Basin, in close proximity to a major lake and with nearby access to other ecological zones, strongly suggests that land snails must have been a seasonally exploited resource. In the Maghreb they were an important element in a pattern of seasonal movements which linked lowlands to highlands. Future research will test if a similar pattern was also present in central Italy. As the shell midden of Gr. di Pozzo is one of the earliest so far firmly dated in an inland location, if not the earliest at such an elevation, it opens stimulating research perspectives.

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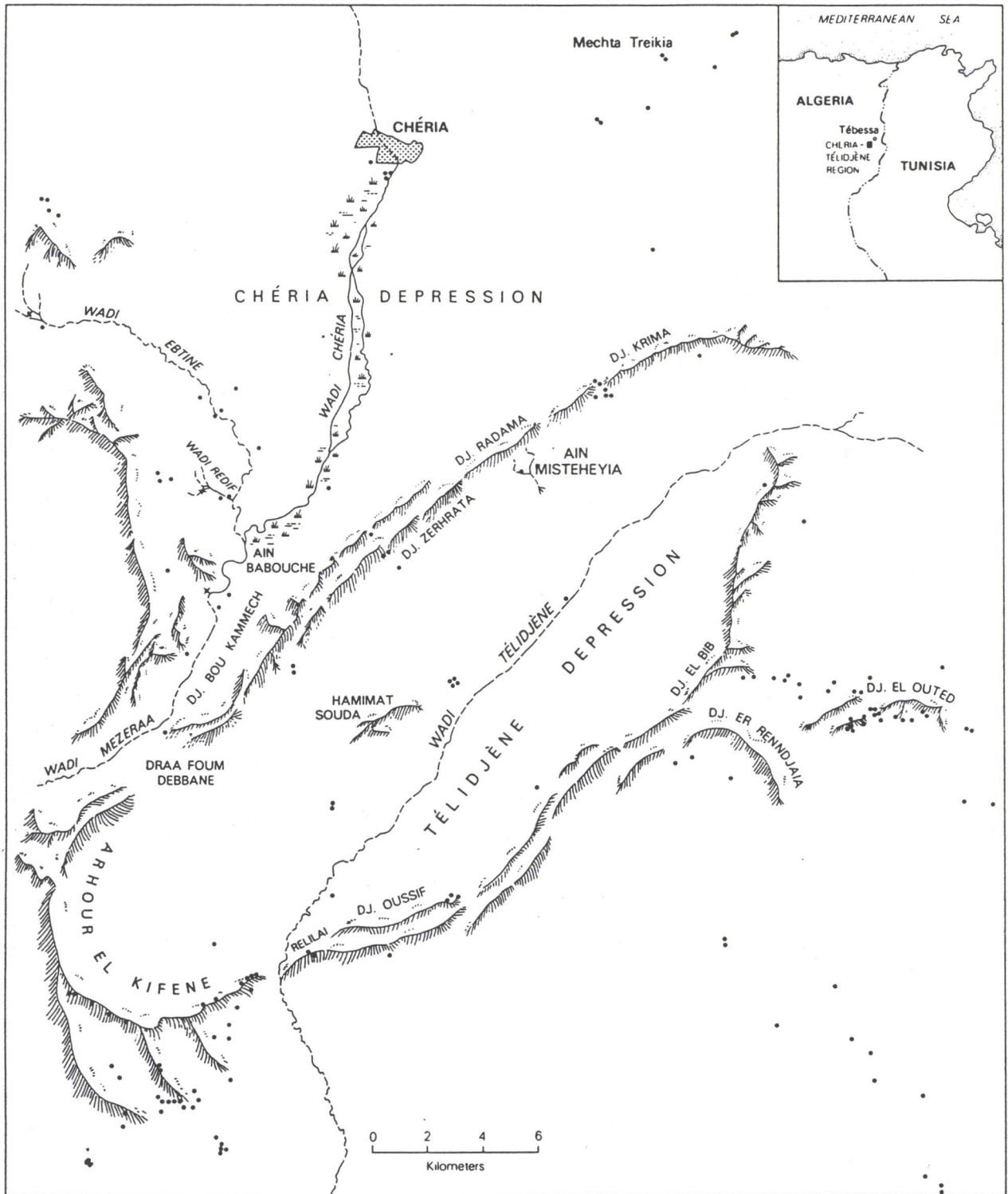
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processed using AMS by the Isotracc
Laboratory, University of Toronto.



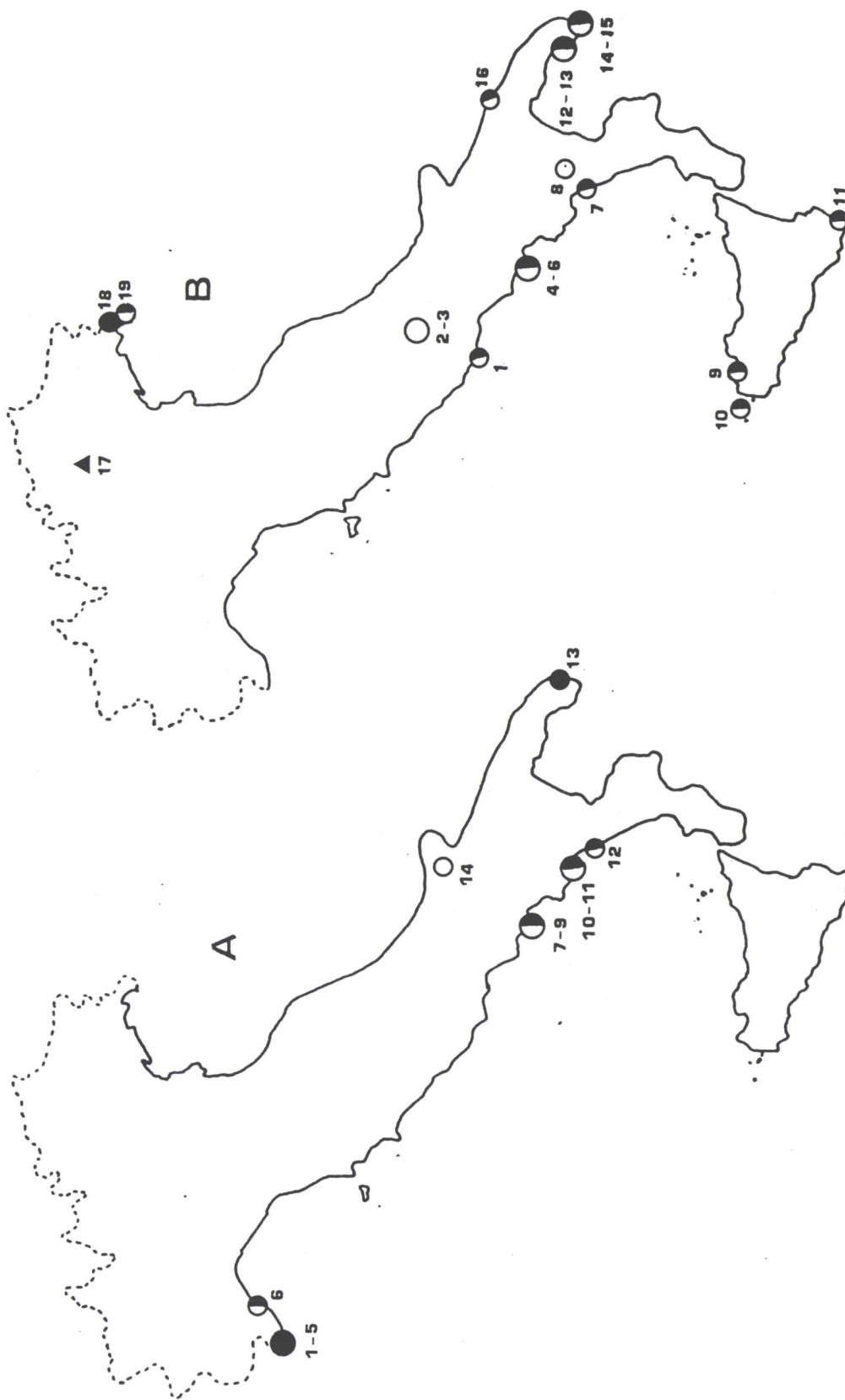
Figure 1 : The escargotière of Sidi Mohamed Chérif at Tebessa. Note the abrupt contact between the archaeological deposits (dark) and the underlying (late Pleistocene?) substrate. Il chiocciolaio di Sidi Mohamed Chérif (Tebessa). Notare il contatto discordante tra il deposito archeologico scuro e il sostrato, che probabilmente risale alla fine del Pleistocene.



- Capsian sites
- × Geological section
- Wadi (intermittent watercourse)
- ≡ Fresh water marsh
- ▬ Ridge

Figure 2 : Map of the Télijdjène area showing distribution of Capsian sites. Carta di distribuzione dei siti capsiani della regione di Télijdjène.

Figure 3 : Distribution map of the major shell middens in Italy. Black circles : marine molluscs; white circles : land snails; black and white circles : marine molluscs and land snails; triangles : freshwater molluscs. Cartina di distribuzione dei principali chioccioli trovati in Italia. Cerchi neri : molluschi marini; cerchi bianchi : gasteropodi terrestri; cerchi neri e bianchi : mollusci marini e asteropodi terrestri; triangoli : molluschi d'acque dolci.



A : Late Pleistocene shell middens. 1-5 Gr. dei Fanciulli, Rip. Mochi, Gr. del Caviglione, Barma Grande, Gr. di Baouso da Torre; 7-9 Gr. del Mezzogiorno, Gr. Erica, Gr. La Porta; 10-11 Gr. La Cala, Nicchia Gamba; 12 Gr. della Madonna; 13 Gr. Romanelli; 14 Gr. Paglicci.

B : Holocene shell middens. 1 Rip. Blanc; 2-3 Gr. di Pozzo, Gr. Continenza; 4-6 Gr. del Mezzogiorno, Gr. Erica, Gr. La Porta; 7 Gr. della Madonna; 8 Gr. di Latronico n° 3; 9 Gr. dell'Uzzo; 10 Gr. dei Cervi a Levanzo; 11 Gr. Corruggi; 12-13 Gr. del Cavallo, Gr. di Uluzzo; 14-15 Gr. delle Prazziche, Rip. C delle Cipolliane; 16 Gr. delle Mura; 17 Romagnano; 18 Gr. Azzurra; 19 Gr. della Tartaruga.

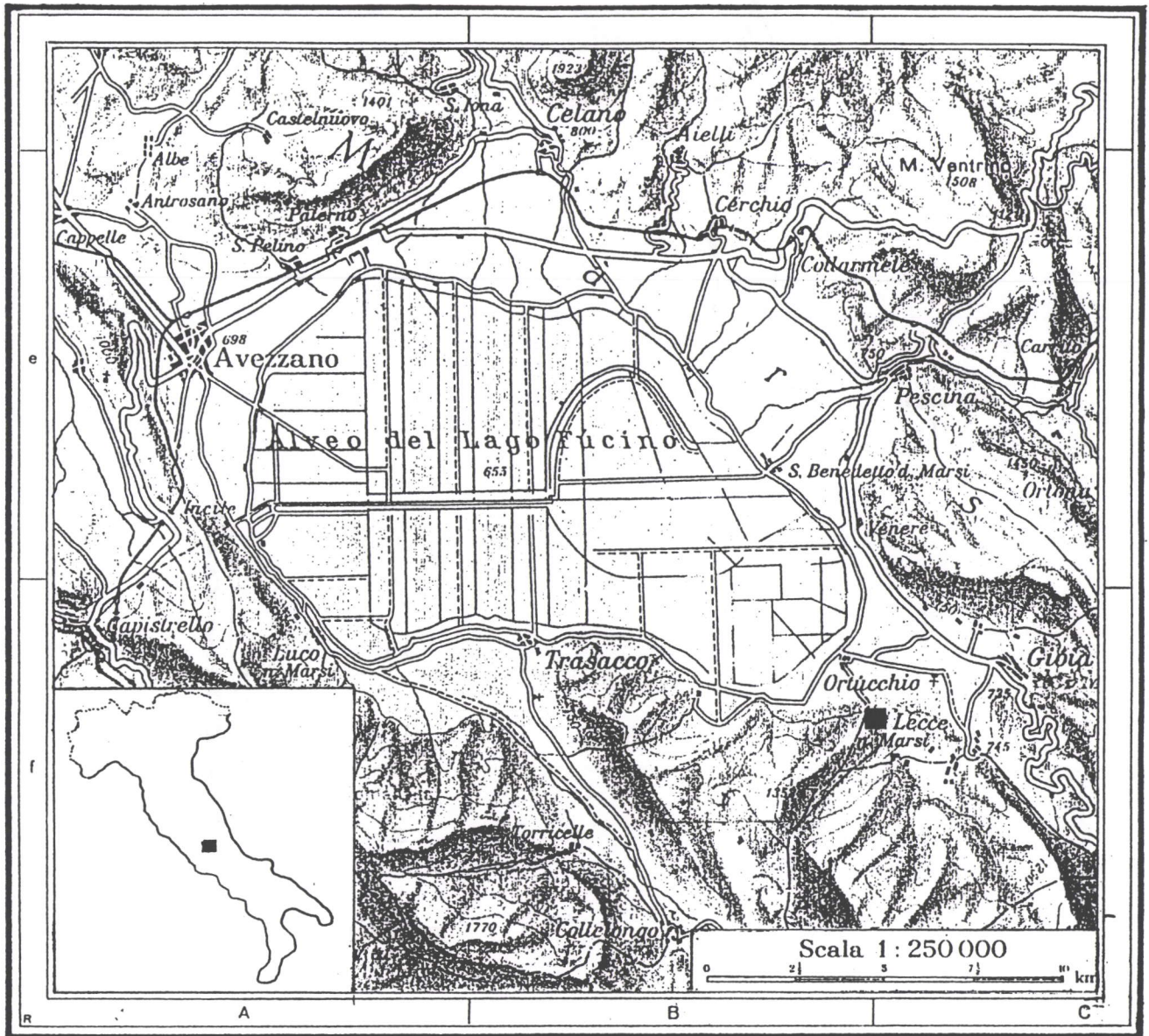


Figure 4 : Map of the Avezzano basin, with the location of Gr. di Pozzo. Il bacino di Avezzano con la localizzazione di Gr. di Pozzo.

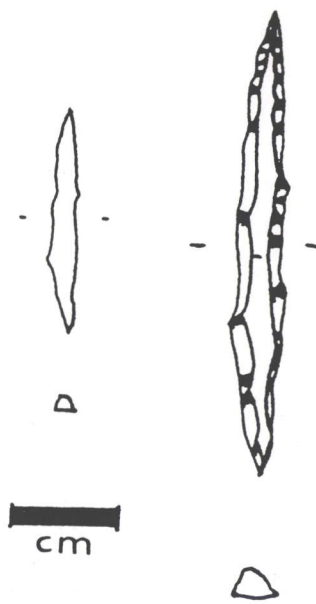
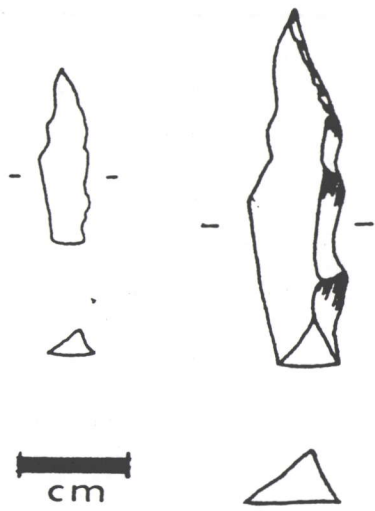


Figure 6 : Lithic industry from the upper archaeological deposit of Gr. di Pozzo. Industria litica della parte più alta del deposito archeologico di Gr. di Pozzo.

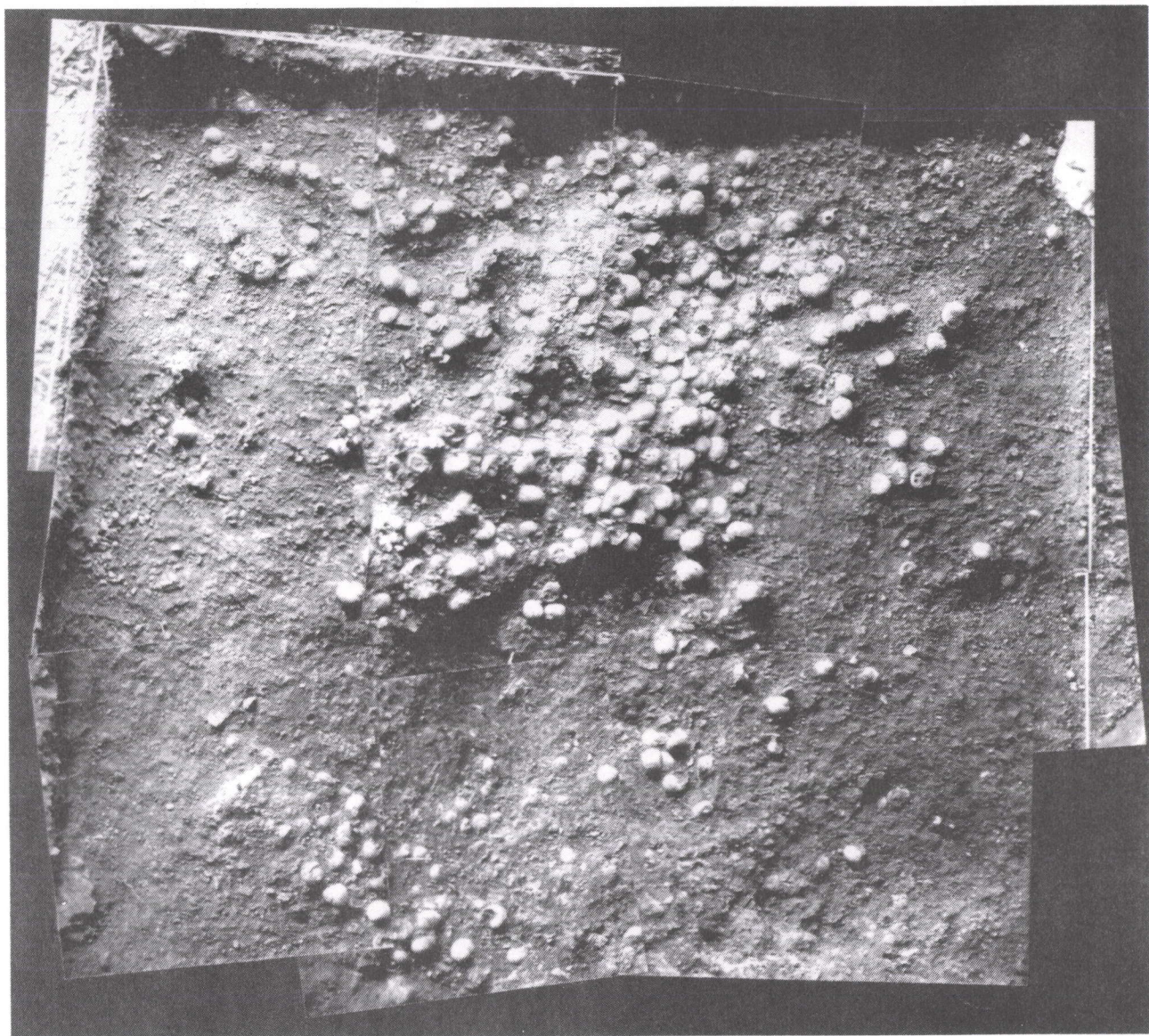


Figure 5 : The surface of the shell midden of Gr. di Pozzo. La superficie del chiocciolaio di Gr. di Pozzo.

