

Environment and Hunters-Gatherers Mobility in the Northern Adriatic Region

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ABSTRACT - The territorial behaviour of the hunters-gatherers groups in the North-eastern side of Italy and in the neighbouring areas from the middle Pleistocene to the Early Holocene is analysed here. The data were collected through the study of the site distribution and typology, of the economical data, and of the raw material procurement areas. It results that humans did never frequent intensively the *Caput Adriae*, and that their mobility was affected by a strong environmental determinism; consisting mostly in climatic and geographical constraints. The sea-level lowering of the cold phases caused the emersion of a plain in place of the Northern Adriatic Sea, "displacing" the area from a coastal to an inner continental position, and greatly changing the availability of food resources. As a consequence the area was almost completely abandoned; only small groups of Neandertals visited this region for short and wide-range raids during the early Upper Pleistocene. During warmer periods, the movements were short to medium range, and limited to the strip between the coast and the mountains; short trips for food and raw material procurement to nearby areas were also common. In this framework, the Mesolithic groups intensified the extraction of food resources by increasing the short-range mobility within a small territory.

Parole chiave: Italia nord-orientale, cacciatori-raccoglitori, mobilità, Pleistocene, Olocene.

Key words: North-eastern Italy, hunters-gatherers, mobility, Pleistocene, Holocene.

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1. INTRODUCTION

The North-easternmost region of Italy, together with the neighbouring areas now belonging to other countries, is often called the *Caput Adriae*. Along the North-South direction, this region is squeezed between the highest hills of the Alpine chain and the northern shore of the Adriatic Sea, while to the East and to the West it respectively merges into the Dynaric region and into the Eastern Po plain. The Trieste Karst is the heart of this region, where several environmental characteristics that are peculiar to the surrounding areas are blended together.

Since the oldest times of the History of Mankind, the *Caput Adriae* has been a gateway between the Balkans and the Italian peninsula; or, in a wider perspective, between the eastern and western sides of Southern Europe. Here, the altitude of the Alpine chain decreases towards the South and originates a smooth landscape, with low mountains and many passes. This

geographical setting probably favoured the movement of groups of hunters-gatherers through the area, in the same way as it favoured the transit of other populations during the following millennia.

Nevertheless the traces of these groups of hunters-gatherers are rather scanty, or in some periods even absent in this area, so that their life strategies can hardly be understood. Which was the influence of the geographical and environmental aspects of this area on the behaviour of the ancient human groups that lived in it, or that crossed it? Were these aspects different from the present-day ones, and did they change through time?

2. SITE DISTRIBUTION AND TYPOLOGY

Traces of middle Pleistocene to early Holocene hunter-gatherer cultures occur in the *Caput Adriae* region in a somewhat discontinuous and inhomogeneous way. In the Italian territory, just a few sites have

yielded lower and middle Palaeolithic artefacts, while the Mesolithic was found in about twenty sites. As to the Slovene territory, the data are even scantier, though the middle to early-late Pleistocene sites are apparently better represented than the younger ones. It is likely that this pattern is the result of incomplete and desultory surveys and excavations, but it probably reflects also the real distribution of the sites; therefore, it may be inferred that the area was underpopulated in the middle and upper Pleistocene, while the population increased suddenly at the beginning of the Holocene.

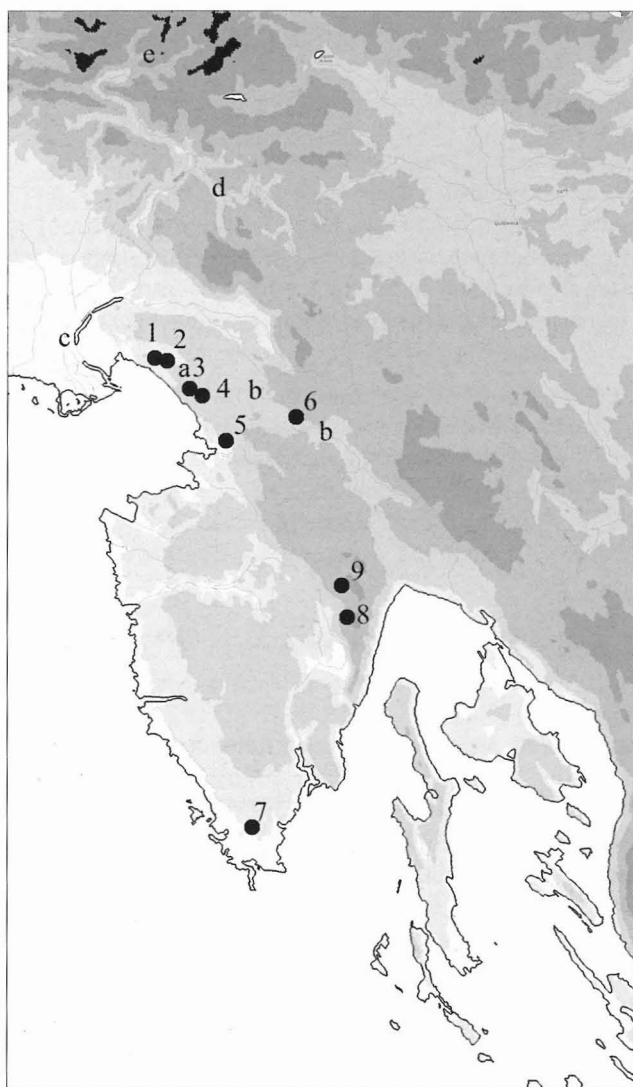


Fig. 1 - Pleistocene settlement distribution and raw material procurement areas in the *Caput Adriae*. 1: Dolina di Visogliano; 2: Grotta Pocala; 3: Grotta Cotariova; 4: Grotta S. Leonardo; 5: Caverna degli Orsi; 6: Grotta Betal; 7: Sandalja; 8: Pupiačina Pečina; 9: Abri Šebn.

Most of the Early Holocene (Mesolithic) sites of the Karst are situated between points 1 and 4.

a: Velike Nive and Komen-Skopo flint beds; b: Reka valley and Divača-Sešana flint pebbles; c: Friuli plain flints, tufa and rhyolites; d: Idrice valley green pyroclastites; e: Bača valley flint outcrops.

Lower Palaeolithic cultural remains are well represented only at Dolina di Visogliano (CATTANI *et al.*, 1991; ABBAZZI *et al.*, 2000) in the Trieste Karst, while some poorly representative assemblages from the lower levels of Betalov Spodmol-Grotta Betal (BRODAR, 1947⁽¹⁾; OSOLE, 1990; 1991) and Jama Risovec (BRODAR, 1970) in the Slovene Karst were also attributed to this cultural stage.

Four middle Palaeolithic sites were found till now in the Trieste Karst, Caverna Pocala (BATTAGLIA, 1922; 1926; 1932; 1953), Grotta Cotariova (ANDREOLOTTI & GERDOL, 1974), Grotta S. Leonardo (FORNACA RINALDI & RADMILLI, 1968; RADMILLI, 1974: 141-142; BARTOLOMEI, 1982) and Caverna degli Orsi (BOSCHIAN, 1993; BOSCHIAN *et al.*, 1998; BOSCHIAN, 2001); faint traces of Mousterian industry were found in a wide open-air area called Velike Nive doline near Aurisina (DOLZANI, 1993). As to the Slovene Karst, information on this cultural stage are available mostly from the upper part of the Betalov Spodmol-Grotta Betal sequence.

It is noteworthy that the upper Palaeolithic cultures are extremely rare throughout the *Caput Adriae*; these do not occur at all in the Trieste Karst, while most of the sites with industries ascribed to the Aurignacian and possibly to the Gravettian were found only well inland, with the exception of Betalov Spodmol-Grotta Betal. Upper Palaeolithic complexes have been newly found in Eastern Istria (MIRACLE, 1997); together with Šandalja-San Daniel (MALEZ, 1963; 1964; MONTET-WHITE & KOZLOWSKI, 1983), these sites testify to a sporadic frequentation of the extreme East of the area during the Late Glacial.

The Mesolithic is represented by about twenty sites in the Trieste Karst; eight of which were (thoroughly) excavated in the early '80s, and the study of their lithic and faunal assemblages provided good information on the economy of the groups of fishers-hunters-gatherers that lived in the Karst during the early Holocene. As to the Slovene territory, the information is rather scanty, while extensive survey brought to light several Mesolithic sites in the Croatian side of Istria (MIRACLE *et al.*, 2000).

Almost all these findings come from caves, while the only open-air site (Velike Nive, Aurisina) has yielded very poor and uncertain evidence of cultural remains.

3. ENVIRONMENTAL BACKGROUND

Unfortunately, the interdisciplinary studies are limited in most cases to the geology of the sediments and to the study of the faunal assemblages; the palaeobotanical data are usually scanty, also because of the

generalised poor preservation of the pollen grains in the sediments. Moreover, few sequences were thoroughly studied, so that good area coverage of palaeoenvironmental data is still unavailable. The environmental and cultural sequence of the Caput Adriae is outlined here by the description of the key-sequences that were excavated – or are under excavation now – in the area.

3.1. Middle Pleistocene

The middle Pleistocene environmental evolution of the Trieste Karst is known through the study of the “Dolina di Visogliano” sequence (about 15 km NW of Trieste), which is the only site of this age found in the area.

This site is a typical breakdown doline at whose edge there are a rock shelter and some outcrops of breccia. These features show that a large cave covered the whole doline, probably during the late lower Pleistocene or the early middle Pleistocene (CATTANI *et al.*, 1991; TOZZI, 1995; BOSCHIAN *et al.*, 1999; ABBAZZI *et al.*, 2000).

The doline was sounded inside the shelter (locus A), where the excavation is at present about 10 m deep, and through a breccia outcrop near the western edge of the doline (locus B), where the bedrock was reached at about 4 m depth.

The sediments crossed by these excavations can be divided into two parts, *i. e.* levels 11–38 and 39–45. In the upper one (levels 11–38), three main deposit types occur, evenly alternating in at least two cycles.

a) Breakdown deposits originated by the frost shattering of the shelter walls and ceiling, made up of medium angular gravel (*dépôts de microgélivation*) to large blocks and boulders (*dépôts de macrogélivation*) embedded in yellowish to reddish brown silty clay loam matrix.

These can be ascribed to somewhat cold and rather wet phases corresponding to the cold peaks of the oxygen isotope record, even if some seismic triggering of the main coarse breakdowns cannot be excluded.

b) Yellowish silty loam deposits, characterised by grain-size curves with a peak in the 25–50 mm interval and by a variable quantity of coarse skeleton elements. Muscovite is dominant among the heavy minerals; augite and amphiboles are also present. These deposits are typical loesses that were accumulated in rather cold and aridic periods (catastacial phases) immediately following the cold peaks. This aeolian dust was probably not blown directly into the cave by the wind; it probably derives from loess deposited outside the shelter and immediately reworked by runoff.

c) Reddish to brownish clay or clay loam colluvium deposits, with very few coarse elements and common aggregates of clay minerals. Ti-oxides are dominant within the heavy minerals.

These colluvia correspond to phases of climate deterioration following the warm peaks, with progressive shift to continental thermopluviometric *régime* causing a shrinkage in the forest cover.

They can be interpreted as end products of long polycyclical sequences of loess deposition, alteration and reworking processes that can be summarised in three steps:

- 1) accumulation of loess covers outside the shelter - catastacial phases (point b).
- 2) alteration of the loess to *terra rossa*-like soils - interstadial phases with warm and moist (oceanic) conditions. Wide and thick forest covers stabilised the soil, so that the input of clastic sediments into the cave was poor or null.
- 3) erosion of the soils and deposition of colluvium into the shelter - anastacial phases, (point c).

Apparently, this sequence testifies to two alternating cycles of relatively cold and warm climate. In fact, the occurrence of cold and/or open aridic environment species (*Equus* sp., *Ovis ammon antiqua*, *Ochotona* sp., *Citellus* sp., *Microtus* (*Stenocranius*) *gregalis*) in the faunal assemblage indicate that these cycles are subphases of one cold stage, even if the presence of *Cervus elaphus acoronatus* suggests that some wood patches were anyway present in the landscape.

The bottom part of the sequence (levels 39–45) is characterised by a more complicated interfingering of colluvia and deposits originated by the collapse of an underground karstic system, that testify to a warm and moist period.

Species of warm and thick wood environment (*Sus* sp., *Dama clactoniana*, *Felis sylvestris*, *Macaca* sp., *Microtus* (*Terricola*) sp. and *Crocidura* sp.) were found in these bottom levels, indicating a sharp shift towards milder climatic conditions. This shift is also indicated by the composition of the pollen assemblage in the few levels where the pollen grains are preserved; the arboreal versus non-arboreal pollen ratio increases in the bottom levels, where also species of warmer, almost mediterranean environment are present.

This sequence of one warm phase and two cold subphases may correspond to the OIS 11 and 10, as suggested by the evolutionary study of the thickness of the enamel of the teeth of the Arvicolids (MAUL *et al.*, 1998), carried out on samples collected at Visogliano and in other European key-sites of middle Pleistocene age.

The results of a set of 8 integrated U/Th and ESR datings carried out on samples of enamel and dentine of large ruminant teeth (*Bos/Bison* and *Ste-*

phanorhinus) (FALGUERES, personal communication, 2000) are in accordance with these hypotheses, giving an age in the time range between 295 and 386 ky.

Variable amounts of cultural remains were found throughout the sequence; nevertheless, the concentration of lithics is rather high in some levels (13, 22-25 and 38-42), while only few (14-17 and 30-37) are completely sterile. Apparently, there is a direct correlation between the deposits of type a) (breakdown horizons) and the absence of cultural remains, showing that the site was not frequented during the coldest phases.

3.2. Early Late Pleistocene

The Caverna degli Orsi is a 140 m-long tunnel-shaped cave situated in the Karst, about 10 km to the East of Trieste. It is a typical cave bear den, with well preserved bones and hibernation nests on the floor, and polished rock patches and scratches on the walls. The ancient living-floor is very well preserved because the entrance was slowly closed by a scree-slope deposit during the late Pleistocene, so that the clastic sedimentation stopped inside the cave. A few Mousterian industries were found in some levels, testifying to some occasional human visits to the cave (BOSCHIAN, 1993; BOSCHIAN *et al.*, 1998).

The deposit was sounded in two loci not far from the old entrance. The sequence of the inner locus is about 2.5 m thick and includes the following levels.

- a) Flowstone, probably formed during a moist and relatively warm period.
- b) Clay deposits, with very few coarse skeleton made up of speleothem fragments, filling up the depressions of the flowstone. These are probably distal colluvia, formed in early anastadial phases (as c) in 3.1.). Large quantities of dephosphatised bear bones occur in some interfingered levels.
- c) Breakdown deposits. The composition of the coarse fraction of the sublevels shifts from speleothem to limestone clasts from the bottom upwards, indicating a progressive dismantling of the cave ceiling and walls due to frost shattering. This level can therefore be ascribed to a cold peak (*cf.* a) in 3.1.).
- d) Silty clay loam, rich in quartz and muscovite. This was originated by the reworking of moderately altered loess deposited outside the cave in a catastadial phase (*cf.* b) in 3.1.).
- e) Discontinuous patches of active flowstone.

This sequence indicates a shift from moist and warm conditions corresponding to a warm stage or substage, to a glacial maximum followed by the typical cold and aridic conditions of the catastadial pha-

ses. The faunal assemblage is dominated by the cave bear (> 90%) and includes few remains of carnivores and small ungulates, so that its palaeoenvironmental significance is somewhat poor. Nevertheless, the data are in agreement with this model, as the warm wood species of the bottom levels (*Dama dama*, *Capreolus capreolus*) are replaced by open environment ones in the uppermost levels (*Capra ibex*, *Alces alces*).

Even if geochronometric datings are still not available, this sequence can be tentatively ascribed to the end of the OIS 5, possibly 5a, and to the OIS 4. This hypothesis is supported also by the occurrence of *Allocricetus bursae* (CHALINE & MARQUET, 1976) and of Mousterian tools.

The sondage of the outer locus was excavated through a sequence of deposits accumulated by the scree-slope that closed the ancient entrance. This is mainly made up of fine to medium angular gravel layers, sometimes richer in coarse, cobble- to boulder-size elements, whose matrix is a brownish to yellowish silty loam. Apparently, several phases of loess deposition and ceiling breakdown are interfingered with coarse scree-slope rubble.

While only few micromammalofauna was found in the upper levels, the bottom ones yielded bear and other carnivore (*Panthera sp.*) remains, together with gnawed and digested bone fragments, showing that the cave was sometimes used as a den by other large predators.

The palaeoenvironmental meaning of the sequence of this sondage is not yet clear because the sequence is still under study; therefore, also the correlation with the inner sondage is still tentative and based upon the occurrence of one cultural level in both sequences.

Cultural remains – only lithics – were found in levels 12-11 of the inner sondage and in levels 120-116 of the outer one. These are all characterised by breakdown deposits, so that it can be inferred that the human visits were correlated with cold climate phases.

3.3. Early Holocene

This period is relatively well known because several excavations were carried out in sites of this age, aiming to explore the Mesolithic levels; the most important are Grotta Azzurra (CANNARELLA, 1960; 1961; 1962; CANNARELLA & CREMONESI, 1967; CREMONESI *et al.*, 1984; CICCONE, 1993), Grotta Caterina (CANNARELLA & PITTI, 1981; 1984) and Grotta dell'Edera, where excavations are still in progress (MARZOLINI, 1970; BOSCHIAN & PITTI, 1984; BOSCHIAN, 1997; SPATARO, 1999).

The geoarchaeological study of the early Holocene sequences points out that the processes that formed the deposits did not differ substantially from those of the Late Glacial and of the previous periods of the Pleistocene.

At Grotta Azzurra and at Grotta dell'Edera, the sequences were excavated some metres deeper than the bottom of the Mesolithic, which corresponds roughly to the Pleistocene-Holocene boundary. Therefore, some information on the latest Pleistocene climatic change can be inferred, even if its timing is unknown because of the lack of cultural remains of this age.

These sequences are made up of complexly alternating colluvia and breakdown deposits; the former are made up of loess at various stages of alteration, while the latter are characterised by elements whose size varies from large blocks to gravel. The boundary between the Pleistocene and the Holocene is marked only by the appearance of the Mesolithic industries and by the occurrence of anthropogenic components (ash, organic matter, bone, etc.) in the sediments, but their "natural" components are exactly the same as in the pre-Mesolithic, showing a general continuity of climatic conditions.

Therefore it can be inferred that alternating cold and slightly warmer/aridic phases characterised the climate of the Late Glacial and of the early Holocene; a general trend towards the smoothing of the cold peaks and to a general improvement of the climate can also be detected. Apparently, the accumulation of sediments deriving from the dismantling of the soils lying outside the caves was a common process throughout this period; it testifies to strong erosion and runoff, probably due to a discontinuous forest cover.

The fauna of the early Holocene levels is characterised by mixed wood and open environment species: *Sus scrofa*, *Capreolus capreolus*, *Lepus europaeus* are the most common species, even if it must be pointed out that some selection was probably operated by the Mesolithic hunters. Some species like *Lutra* sp. and *Castor fiber* point to aquatic environments that may have occurred in or around the Karst area.

3.4. Remark

The interdisciplinary information collected in these excavations show that the geological processes forming the Karst cave infillings were the same throughout the period spanning from the middle to the early upper Pleistocene. Comparisons with other sites of the area show that these processes continued till the early Holocene in almost all the caves of the area (BOSCHIAN, 1997; 1998); moreover, these stadial-intersta-

dial sedimentary sequences show strict analogies with those excavated in the caves and shelters situated at the edge of the Po plain in Northern Italy (CREMASCHI, 1990). The geological data are in agreement with the palaeoecological information obtained from the study of the microfauna; conversely, some bias on the composition of the large mammal assemblages, that may have been introduced into the caves by animals or humans operating various sorts of selections, must be taken into account.

4. LANDSCAPE, CULTURE AND MOBILITY

In the framework of a palaeoenvironmental reconstruction of the Pleistocene in the *Caput Adriae*, the characteristics of the present-day landscape can probably be transposed with minor changes to most of the ancient warm stages of this period.

Nevertheless, it must be considered that a strong areal variability is one of the most striking characteristics of this landscape. The orography of the about 40 km wide belt around the Northern Adriatic sea varies rather smoothly from a narrow coastal belt, to the karstic plateaux, to a mountain area whose relief is rather complex even if not extremely high (1000-1200 m). The vegetational belts change from the mediterranean environment, to the *Orno-Ostryo-Quercetum* and to the birch and spruce forests along a transect perpendicular to the coastline, but this rather simplistic subdivision is complicated by the local topography. As a consequence, the whole area is made up as a intricately patchwork of contrasting environments, whose complexity must be taken into account in a palaeoenvironmental reconstruction.

During these warm periods, the sea-level was not extremely different from the present-day one; therefore, assuming that the mountain areas of the Alpine fringe did not facilitate movements of hunters-gatherers or any other human colonisation, the Karst and nearby areas were a favoured way - even a bottleneck - of easy transit from the Balkans to the Italian peninsula.

Conversely, the situation must have been quite different during the peaks of the cold stages. In a purely climatological perspective, the lowering of the sea-level caused the shift of the shore-line some hundreds kilometres to the South, and probably diminished the mildening effect of sea on the climate of the *Caput Adriae*, inducing a change towards somewhat continental-like conditions.

The position of the Würm moraines is probably the southernmost ever approached by the glaciers in the Friuli plain, and shows that the lower limit of the

ice cap of the Alps was not more than 100 km far from this area. Despite the proximity of the ice fronts, the landscape of the plains was probably more like a steppe than a tundra environment, because of the strong solar irradiation throughout the year, due to the low latitude of the area. This hypothesis is supported by the occurrence of dominant non-arboreal *taxa* in the pollen spectra of these periods, with *taxa* pertaining to *Gramineae-Chenopodiaceae-Artemisia* assemblages.

The emersion of a wide plain throughout the area of the Northern Adriatic, of which the modern Po Plain was the natural extension towards the North and the West, was the geographical result of the lowering of the sea-level. The Karst became the extreme southern fringe of the Alpine reliefs, situated at the edge of a broad extension of lowlands crossed by rivers fed by the meltwater of the Alpine glaciers.

The likely result of the expansion of the ice cap was that all the Alpine ridge could not be crossed and frequented by humans; in the meanwhile, the emersion of the Adriatic Plain opened a great resource in terms of space and probably also of food reserve in the area to the South of the *Caput Adriae*. As a consequence, the transit between the Italian area and the Balkans was no longer constrained to the narrow area of the Karst, but could take place also through all Istria and possibly Northern Dalmatia.

4.1. Middle Pleistocene: Hunters-Scavengers

The Visogliano shelter is the only source of information on the behaviour of the Middle Pleistocene human groups in the Karst; human remains ascribed to *Homo heidelbergensis* are associated with industries, bone remains and good environmental data, so that the data collected here are of extremely high quality even if restricted to one spot on the map.

The industry of the deepest levels of the Shelter (levels 40-46) and of the outer Breccia is mainly made up of limestone; large size discoidal cores, choppers, protobifaces and flakes (mostly unretouched) are present. Also small-size side scrapers, denticulates, points, end-scrapers and borers made up of flint, volcanic rock and quartzite occur in these levels; these are sometimes carinated, but dihedral ventral face tools are never present.

Limestone industry – including some choppers – occurs also in the Shelter levels 30-37, but these artefacts are here less frequent than the flint ones. Notches, denticulates and rare scrapers, rarely carinated or on dihedral ventral face blanks, occur among the flint and volcanic rock tools.

The lithic assemblages of levels 22-25 and 13 are strongly similar and share Tayacian characteristi-

cs. Straight, convex and transversal scrapers on carinated and dihedral ventral face blanks are common, mostly with Quina- and *surélevé*-like retouch. The limestone tools are rare, including one possible biface.

Several provenance areas were identified for the Visogliano tool assemblage: the local flint is finely banded black to grey, and crops out a few kilometres far from the site in the Velike Nive doline near Aurisina (ANDREOLLOTTI, 1964); its quality is very poor because the natural fracturing strongly biases the detachment of the flakes. As a consequence, large quantities of greyish to blackish fine micritic limestone was knapped during the older frequentation phase (levels 39-45), and occasionally during the others. The shape of the raw material “nodules” shows that these were collected from *terra rossa*-like soil profiles of the nearby area.

Pebbles made up of a greyish to greenish rhyolite are rather common throughout the sequence, mainly in the upper and middle levels. These rocks (Vulcaniti di Riofreddo) crop out in the Dreiländereck region (North-eastern Friuli, North-western Slovenia, Southern Austria), but were probably reworked by the rivers and transported to the South; at present, they can be collected in the Friuli plain, in the gravel sediments of the Isonzo to Tagliamento rivers.

Green, fine grained tufa and other pyroclastic rocks sometimes occur within the upper levels of the sequence. These rocks crop out in the Idrica valley (South-western Slovenia) and are easily transported into the Isonzo valley and then to the South-eastern Friuli plain.

Small pebbles of a glossy black and vitreous flint are frequent and may also come from the eastern Friuli plain; the white and dull flint is common but its provenance is rather enigmatic even if outcrops of very few and altered nodules were found in the S. Croce area, about 15 to the NW of Trieste, near the rim of the Karst plateau.

Some hypotheses on the behaviour of *Homo heidelbergensis* in the Karst area can be drawn from the data on the faunal assemblage and on the provenance of the raw materials used for flaking.

Most of the faunal assemblage is hardly identifiable because of the strong fracturing of the remains, as the bones were thoroughly exploited for marrow extraction. It is likely that the composition of the assemblage also reflects some sort of selection operated by the hunters, so that *taxa* like red deer, auroch, wild goat and some horse are normally present. In fact, the occurrence of a relatively high number of *taxa* that are supposed to be “difficult” preys, as the rhinoceros, suggest also that scavenging may have been an important food resource.

It is noteworthy that the Visogliano shelter was used more or less intensively as a campsite for about

100000 years; in this time span it was intensively frequented for only three or four short periods, apparently during warm or catastadial phases; in the other periods it was visited sporadically or even abandoned during the severest cold stages.

The size of the area exploited by these hunters-scavengers, and their mobility inside this territory can be inferred from the type of the raw material used for flaking, and from its procurement areas.

It must be pointed out that there is a basic difference in the use of raw materials between the bottom layers (39-45) and the upper ones (13-38). In the former, mostly limestone together with some flint were used; conversely, limestone is extremely rare and flint is dominant in the latter; artefacts made up of volcanic rocks occur constantly in almost all the levels, even if they are usually rather rare.

Several raw materials can be identified within the flint assemblage of the Visogliano sequence, most of which are of unknown origin; the local Velike Nive flint, usually banded black to grey, dull to glossy and highly fractured is the most frequent throughout the sequence, but it is a very poor quality raw material, whose fracturing can be one of the reasons of the relatively high percentage of tools with dihedral ventral face.

Assuming that the composition of the assemblages is not biased by the size of the excavation area (16 to 28 m², depending on the depth), or by unknown peculiarities in the distribution of the ancient activity areas within the shelter, this change in raw material use must be interpreted in a cultural/economic perspective. The massive non-expedient use of limestone indicates a diversification in the procurement, that can be due to the limited availability of other resources of better quality raw materials, and to the small size of the territory. Therefore, it can be concluded that the Lower Palaeolithic groups of Visogliano were confined to the limited availability area of the Karst.

4.2. *Early to Middle Upper Pleistocene: Mobile Bands of Hunters?*

Several sites ascribed to the Mousterian were excavated in the Caput Adriae, but the information on the behaviour of these groups are unfortunately rather poor. In most cases, the lithic assemblages are made up of few artefacts, apparently concentrated in one level; therefore, a precise typological definition is somewhat difficult, and also the taxonomic position of the assemblage within the evolution of the Mousterian typological *facies* is uncertain.

In the Trieste Karst, good palaeoenvironmental data are associated with cultural remains only at Caverna degli Orsi. Here, stone tools were found in both

sondages, *i. e.* within the First Pleniglacial breakdown deposit of the inner locus sequence (levels 11-12) and in the bottom levels of the outer one (levels 115-120) (BOSCHIAN, 2001). Unfortunately, the number of artefacts - about 30 - is extremely low, probably because the sondages had to be located in areas that are well inside the cave and rather far from the old entrance, where the lack of light did not favour an intensive occupation by humans.

Such scarcity of artefacts does not allow a precise typological identification of the industry, which in any case has evident Mousterian characteristics. Most of these artefacts are not finished tools, just blanks and some flaking debris, among which the Levallois technique is almost never identifiable; conversely, some cordal and debordant flakes, together with a relatively large number of pseudo-Levallois points may suggest the use of the discoid technique. Two tools are made up of limestone: one is an elongated pebble cap with some retouch, the other is rather questionable, and resembles a levallois-like unretouched flake.

The levallois technique is rather low (13.7%) at Grotta Cotariova, the only assemblage with a reasonably large number of artefacts (430); the industry was attributed to a *Ferrassie orientale* aspect of the *Charentien* (ANDREOLOTTI & GERDOL, 1974; TOZZI, 1994). Unfortunately, only some fragments of red deer and a few of roe deer and horse were found together with the artefacts, so that the chronology and the environmental context of this complex are completely unknown.

Conversely, the levallois technique is very well represented at Grotta Pocala (LEONARDI & BROGLIO, 1962; TOZZI, 1994), where the assemblage must be considered as a whole because of its small size (44 artefacts) and of its stratigraphical problems⁽²⁾. The same technological characteristic can be observed also at Grotta S. Leonardo (RADMILLI, 1974:141-142), where the assemblage is even smaller (24 artefacts).

The only site with a long sequence of reasonably well represented Mousterian levels is the Betalov Spodmol-Grotta Betal in the Slovene Karst, where about 1470 artefacts (185 tools) were found, distributed through several levels grouped in 4 complexes; the stratigraphical position of the findings within the deposit is also well documented, but also here the environmental data are scanty. S. BRODAR (1956:737-742) attributed the Mousterian sequence of this cave to a period ranging between the end of the last Interglacial and the maximum of the Würm First Pleniglacial; it is likely that some aspects of this sequence may be used for reference to infer the relative chronology of the other sites of the area.

Apparently, the levallois technique is dominant in the lower levels of this cave, while it decreases strongly in the upper ones; considering this and the typolo-

gical aspects of the sequence, these complexes were attributed to an evolving aspect of the *Charentien*, that started with strong *La Ferrassie* characteristics.

It must be pointed out that in all these sites very few or even no bone remains were found within the anthropised levels, and that the lithics are the only trace of the human use of the caves; therefore, the subsistence strategies and the connected activities of the Mousterian groups are substantially unknown. The occurrence of bones that were possibly processed or used by humans at Grotta Pocala has been a major source of controversy for the last eighty years (*cfr.* TOZZI, 1994 for sensible reflections on this subject), and the question is at present still to be answered.

In fact, lithics were recently found associated with cave bear bones at Caverna degli Orsi, but no evidence of bone processing by humans, like butchering marks or intentional bone fracturing was found here. This shows that the lack of (processed) bone remains is probably not casual, and suggests that the caves were not permanently occupied by the Mousterian groups.

Some more information on the behaviour of these groups can be acquired through the study of the lithic raw material, whose provenance can give good hints on the size of their territory. It is striking that the artefacts are made up of an extremely wide choice of flint types, and this aspect is enhanced by the small size of the lithic assemblages.

At Caverna Pocala, about 25% of the 44 artefacts belong to unique lithotypes, while the other ones can be classified in 8 groups of not more than 5 objects each. About 20% of this assemblage is made up of poor quality flint and chert cropping out in the Karst area; these are mostly glossy to dull, black to greyish banded flints that occurs in relatively thin layers in the Velike Nive doline near Aurisina. Small flint pebbles, 1-10 cm wide, of several colours (brown, bluish, grey, jasper-red, greenish, etc.) and usually rather glossy and of good quality come from the terraced sediments of the Reka river in Slovenia and from sparse areas between Sežana and Divača in Slovenia. The provenance of several other types is still unknown.

The lithic assemblage of Caverna degli Orsi is characterised by the same peculiarities. Here, the lithotypes most frequently occurring at Pocala are also present, together with a peculiar type of greyish-brownish coarse chert or possibly quartzite that is apparently unique to this site. It must also be pointed out that also two micritic limestone tools were collected in the inner sondage of this cave.

The assemblages of Cotariova and S. Leonardo are still to be examined.

At Betalov Spodmol-Grotta Betal the variety of lithotypes is also wide, and more or less constant throughout the sequence; apparently, flint types coming from

the Reka valley are frequent, together with other lithotypes; few artefacts made up of tufa, probably the greenish ones cropping out in the Idrice valley in Slovenia can be found in most of the horizons. It is striking that these tufa are dominant in one horizon (the cultural complex "C" defined by OSOLE (1991)), where the other lithotypes are extremely rare.

All these data suggest that small Mousterian groups - possibly hunters even if no evidence of this is available - visited occasionally the territory of the Trieste Karst, using the caves for temporary shelters and/or campsites. The wide variety of lithotypes is probably the first result of the generalised lack of good flint in the area, as also suggested by the expedient use of limestone, but also shows that these groups moved frequently through a wide territory; its size can be estimated on the distance between sites and raw material procurement areas, which is usually within 30-40 km.

The few available environmental data do not show any particular connection between climate and human presence: the Cotariova assemblage was tentatively attributed to some warm and moist phase (ANDREOLLOTTI & GERDOL, 1974); Caverna degli Orsi was certainly visited during a cold stage, (BOSCHIAN, 2001), as probably also the Caverna Pocala; the S. Leonardo cave deposit was ascribed to a cataglacial phase (RADMILLI, 1974:141-142). Eventually, the Betalov Spodmol sequence was ascribed to a period that spans from the end of the last interglacial to the beginning of the Würm First pleniglacial.

4.3. *The Last Ice Age: a Desert?*

Any hypothesis about the peopling of the Karst area by the Upper Palaeolithic groups cannot be considered other but pure speculation. In fact, it is probably more correct to inquire about the non-peopling of this area, where no data were found at all for the period ranging from the late Interpleniglacial to the Early Holocene. Late Tardiglacial frequentation traces were found only in a few caves and rock-shelters in the North-eastern (MIRACLE, 1997) and Southern (MALEZ, 1963; 1964) sides of Istria. Nevertheless, there are certain even if sparse evidences of the presence of Aurignacian and Epigravettian groups in areas situated more to the North, mainly in the fringe or even inside the Alpine ridge. Even if these findings are scarce, it may be argued that groups of hunters-gatherers were able to move inside this area and probably also to "settle" here for some time, despite the unfavourable environmental conditions. As a consequence, it is even more difficult to understand what happened to the South.

The reason for this behaviour is probably two-

fold. First, a wide plain was available in place of the Northern Adriatic Sea; here, the economical resources were probably more abundant than elsewhere, represented by a rich ungulate fauna (MIRACLE, 1996:36), so that the neighbouring hill area was not particularly attractive for settlement. Second, strong erosion resulting from deforestation and environmental instability affected the Karst area, as suggested by the geoarchaeological study of the Late Glacial sediments of the caves. Though apparently contradictory, the first consequence of the sudden climatic improvement was that the hills became even less favourable to the hunters-gatherers' subsistence.

These early effects of the fast amelioration of the climate preluded to an even worse end, because the Adriatic basin started shrinking fast as a result of the sea-level rise during the second half of the Late Glacial. It is likely that the Upper Palaeolithic groups were pushed towards the North by the progressing of the sea, that forced them to occupy the hills and change their subsistence strategies. In this framework, the few late Upper Palaeolithic sites of Istria may represent the stage of exploitation of a peripheral area, *i. e.* the result of an increase in mobility which was the first reaction to the reduction of resources in the aboriginal territory.

4.4. Early Holocene: Fishers-Hunters-Gatherers

The early Holocene is represented by a sudden burst in the number of sites, which apparently indicates a population increase; also in this case, all the sites are caves, and the only open air settlement was recently found in Eastern Istria (MIRACLE, personal communication, 2003).

The cultural evolution of the Mesolithic groups in the Karst is well known through excavations that were carried out in the 1980s (CREMONESI *et al.*, 1984); it can be divided into two typological stages characterised respectively by triangles and trapezes, that share most of the peculiarities of the "classical" Sauveterian and Castelnovian *facies* of Northern Italy.

Mostly two local flint types are reported in these assemblages (BOSCHIAN & PITTI, 1984; CANNARELLA & CREMONESI, 1967): the Velike Nive blackish layered chert and the Reka valley-Slovene Karst flint pebbles, that occur in slightly variable ratios through almost all the excavated sequences. These crop out at the opposite sides of a territory that is not wider than 40 km, suggesting short range raw material procurement in a medium-size area. It is probably not by chance that the blackish chert is the most frequent in the Trieste Karst, even if its quality is rather poor; it testifies to the extraction of locally available raw material by people that were in some way confined to a narrow territory.

Also some lithotypes of good quality are constantly present – though poorly represented – in these assemblages; even if their provenance is still undetermined, they probably show that the Mesolithic groups of the Karst either moved outside their territory for longer flint procurement trips, or that some sort of exchange relationships were active with the nearby areas. It is noteworthy that these better quality lithotypes are somewhat more common in the recent phase of the Mesolithic, as if they preluded to the increase of exotic flint that is typical of the Neolithic.

The typological evolution of these stages is paralleled also by economical changes reflecting local effects of global processes, such as the gradual increase in shellfish gathering linked to the sea-level rise during the Late Mesolithic (BOSCHIAN & PITTI, 1984; BOSCHIAN, 1993). This diversification is shown by a great quantity of land snail shells and freshwater fish remains in the levels with Early Mesolithic industry; conversely, the late phase of the Mesolithic culture (about 7000 BP) is mostly characterised by sea shells and fishes.

As to the use of the territory, several hints point to episodes of intensive occupation of the caves during the Mesolithic, mainly in the earlier phases. It has been pointed out (BOSCHIAN & MONTAGNARI-KOKELJ, 2000) that it is not yet clear whether the high concentration of sites reflects a high population density or a high degree of mobility, and whether there were intra-site or inter-site differences in caves use. These possibilities may reflect either of one community or of more groups moving around on the basis of different exploitation strategies (see the distinction between "foragers" and "collectors" in BINFORD, 1983).

Local peculiarities in the tool assemblage may help disentangling this issue, inferring hypotheses on the complementary use of the sites; unfortunately, these peculiarities – though clear – are not paralleled by the economical data, so that it must be deduced that they originated from intra-site differences in use, that should be better focused by wider excavations in the future.

The above mentioned data suggest that the Mesolithic groups were confined in a relatively narrow area. It is also likely that they were numerous, because the Karst acted as a sort of buffer zone for most of the Upper Palaeolithic people that were forced outside their territories by the sea-level rise. The economical data indicate also a remarkable broadening of diet breadth, with strong reliance on gathering. This implied high mobility in order to thoroughly extract all the necessary resources from the territory, especially when the procurement areas of these – *e. g.* seafood – were in most cases far from the settlements. Summing up, it is unlikely that a numerous and highly mobile population could be split into several groups, nomadising independently in a narrow territory; in this light, also a

possible diversification in site use sounds unlikely.

In fact, all these information apparently fit into a model of intensification, in which the behaviour of the Mesolithic fishers-hunters-gatherers-foragers-collectors-etc. of the Karst represents the lowest cost solution to the loss of the food resources of the Adriatic Plain. So as the late Upper Palaeolithic groups reacted to the first impoverishment of the resources with the exploitation of peripheral areas, so permanent (forced) emigration and diet broadening were the reaction of the Mesolithic people to the completion of the process.

5. CONCLUSIONS

Strong environmental determinism affected human behaviour in the *Caput Adriae* region from Middle Pleistocene to Early Holocene. Complex interactions between local responses to global processes, geographical setting of the area, and availability of primary resources determined the mobility of the groups of hunters-gatherers that occupied the area.

Palaeoenvironmental data suggest that a sequence of moderately cold and warm stages characterised the climate, changing it respectively from Mediterranean-like to fresh continental conditions. These were partly influenced by the sea-level changes that caused the emersion of a wide plain in place of the Northern Adriatic Sea, and the consequent "displacement" of the area from a coastal to an inner continental position.

The sites found and studied in the area are few, and therefore the data on the peopling of the area are scanty; nevertheless, some hints suggest that this situation may reflect a really low population density during the Pleistocene. A possibility arises, that the *Caput Adriae* was almost never intensively frequented by humans.

More precisely, only small bands of Neandertal hunters (?) visited this region during the ice age maxima, but just for short and wide-range raids; otherwise, the Northern Adriatic Plain was much more favourable for settling because of its better food resources, and the Karst was abandoned.

As to the behaviour of the Karst people during warmer periods, the data about the Middle Pleistocene were gathered from only one site; therefore little

can be inferred about the mobility of the *Homo heidelbergensis* hunters-scavengers. The available information suggest that their reactions to different sorts of non-glacial environments were more or less the same. Their short to medium range movements were probably limited to a narrow strip of territory between the coast and the mountains, out of which they periodically moved for food and raw material procurement trips.

This behaviour was adopted also by the Mesolithic people, on which the effects of the wide-scale dramatic cultural change that took place at the Pleistocene-Holocene boundary – Mesolithisation – were enhanced in the Adriatic region by the fast rise of the sea-level. The difference with the Upper Palaeolithic people is substantial: these reacted to the contraction of their territory and partial loss of resources with long-range mobility in order to exploit far off territories. Conversely, the Mesolithic groups intensified the extraction of food resources from their land by increasing the short-range mobility within a territory that was much smaller.

It must be pointed out that this intensification is typical of most of the Mesolithic cultural *facies*; it was remarkably stronger in the *Caput Adriae*, because this region became probably overpopulated by those groups that had been pushed outside their territories by the rise of the sea-level.

Eventually, it must be concluded that the sea-level variations played a primary role in shaping the territories of the populations that lived in the *Caput Adriae*, and conditioning their mobility. This variable must be taken carefully into account when modelling the complex interactions between humans and environment.

NOTES

(1) Prof. Sreëko Brodar excavated the Betalov spodmol from the late 1940s to the early 1950s. His wide literature on this cave and on the Palaeolithic of Slovenia is reported in the revision by OSOLE (1990; 1991).

(2) In a letter to A. M. Radmilli dated 27th February, 1956, R. Battaglia wrote: "... Nella Pocala non hanno fatto regolari scavi quando raccolsero le selci da me illustrate: scavavano solo per raccogliere ossa di orso. I miei scavi dettero rarissimi pezzi di selce e furono frustrati dalla cattiveria del Perco, che fece togliere i cartellini con le indic. stratigrafiche!...". (Archivio A. M. Radmilli, courtesy of A. M. Radmilli, 1996)

SUMMARY – The territorial behaviour of the hunters-gatherers groups in the North-eastern side of Italy and in the neighbouring areas from the middle Pleistocene to the Early Holocene is analysed here. The data were collected through the study of the site distribution and typology, of the economical data, and of the raw material procurement areas. It results that humans did never frequent intensively the *Caput Adriae*, and that their mobility was affected by a strong environmental determinism; consisting mostly in climatic and geographical constraints. The sea-level lowering of the cold phases caused the emersion of a plain in place of the Northern Adriatic Sea, "displacing" the area from a coastal to an inner continental position, and greatly

changing the availability of food resources. As a consequence the area was almost completely abandoned; only small groups of Neandertals visited this region for short and wide-range raids during the early Upper Pleistocene. During warmer periods, the movements were short to medium range, and limited to the strip between the coast and the mountains; short trips for food and raw material procurement to nearby areas were also common. In this framework, the Mesolithic groups intensified the extraction of food resources by increasing the short-range mobility within a small territory.

RIASSUNTO – Nell'articolo viene analizzato il comportamento territoriale dei gruppi di cacciatori-raccoglitori nelle regioni dell'Italia nordorientale e nelle zone limitrofe, dal Pleistocene Medio al Primo Olocene. Le informazioni sono state raccolte attraverso lo studio della distribuzione dei siti e della tipologia, dei dati economici e delle aree di approvvigionamento delle materie prime. Ne è risultato che gli uomini non abbiano mai frequentato assiduamente il *Caput Adriae*, e che la loro mobilità fosse influenzata da un forte determinismo ambientale, che consisteva soprattutto in restrizioni climatiche e geografiche. L'abbassamento del livello del mare durante le fasi fredde causò l'emersione di una pianura al posto del Mare Adriatico settentrionale, "spostando" l'area dalla costa all'entroterra e cambiando enormemente la disponibilità di risorse alimentari. Di conseguenza l'area venne completamente abbandonata; solo un ristretto gruppo di Neandertaliani visitò la regione nel Primo Pleistocene Superiore con incursioni brevi, ma a lungo raggio. Nei periodi più caldi, gli spostamenti erano di breve e di media distanza ed erano limitati alla fascia compresa fra la costa e le montagne; inoltre erano anche comuni brevi spostamenti per procurarsi materiale grezzo e cibo nelle aree circostanti. I gruppi del Mesolitico intensificarono la ricerca di risorse alimentari, aumentando la mobilità di breve estensione all'interno di un territorio limitato.

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