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Session 2: The medieval societies and their areas: towards historical biodiversity:

The archaeology of a peat bog in context: contribution to the study of biodiversification processes in historical time (Ligurian Apennine, NW Italy)

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Abstract

In the framework of an interdisciplinary research project concerning wetlands considered as cultural heritage sites, an environmental archaeology approach was employed in order to reconstruct their historical ecology and possible management practices. Specific stratigraphic excavations in a small mountain peat-bog on the Ligurian Apennines revealed several waterlogged trunks dating since 2620-2920 cal. BC. Remains of a dry-stone wall at the lower limit of the basin, perhaps a dam, were also excavated.
A contribution to the project has come from the historical approach to the ecology of the site and of its surroundings. Surviving indicator species were investigated to decode past evidence preserved in the sediments. Several pollen and non-pollen palynomorph indicators allow outlining the variation of the ecological features and hypothesizing different uses of environmental resources in the site during the last thousand years. Actually, the strongest variation of the vegetation cover and a rise of the anthropogenic indicators took place in the Early Middle Ages. Various algal and other water-demanding organisms suggest changes of the water table, perhaps related to the dry-stone wall. In particular, the contemporaneous occurrence of several plant and fungal indicators related to livestock rearing characterises the medieval phase of the local resources exploitation.

The project and the site

The environmental archaeology approach - typical of prehistoric archaeology, at least in Italy - dissolves the limit between different archaeology (chrono-)fields because in this type of sites the indirect traces are often the only ones available, while artefacts are lacking. Moreover, these often-neglected methodologies show their potentiality also for periods rich of other sources, both archaeological and documentary, as the Middle Ages, especially when we try to better understand how the environmental resources were managed.
Since 2000 the site of Moglie di Ertola is the object of historical ecology and environmental archaeology observations within different campaigns promoted by L.A.S.A. [Laboratorio di Archeologia e Storia Ambientale, Sezione geografico-storica (DISMEC) and Sezione botanica (DIPTERIS)] with the participation of students and researchers from different universities and Italian and European research centres[1].
In 2003, a group of researchers from the University of Genova and the “Direzione Regionale per i Beni Culturali e Paesaggistici della Liguria” (MiBAC - Ministero per i beni e le attività culturali) started a project with the intent to promote the importance of wetlands as cultural heritage sites (ZUM - Studio di fattibilità di un progetto per la conoscenza, conservazione e valorizzazione delle zone umide liguri). In the framework of this main project, several activities were carried out and experts from various disciplines,

[1] Among them C. Watkins, M. Pearce and S. Metcalfe (Univ. of Nottingham), J.-P. Métailié (GEODE-CNRS, Toulouse), C.Backmeroff.

such as archaeologists, archaeobotanists, botanists, dendrochronologists, geographers, geologists, historians, and mycologists were involved (GUIDO et al., 2003; BELLINI et al., 2007). Here we will focus on the results concerning the most recent records (post-medieval and medieval) from the Moglie di Ertola site.

This is the local name of a small wet plateau located at an altitude of 1120 m a.s.l. (Fig. 1), two hundred meters below the watershed that divides the Aveto valley from the near Trebbia valley.
From a hydrographic point of view it belongs to the basin of the Rio Molineggi, which is an affluent on the left side of the Aveto stream. In the area, the Cretaceous rocky formations "Mt. Penna/Casanova Complex" (ELTER et al., 1991) crop out. The complex is a sedimentary mélange with ophiolitic turbidites, mono and polygenic breccias as matrix and blocks of ophiolite (basalts, serpentinite and gabbros), cherts, limestone and clay inside (olistolite). There are also quaternary sediments that can be recognized in form of detritus sheets, deriving from ancient landslides, or slope deposits, with both gravitative and erosive origin (REGIONE LIGURIA, 2006).
The site is situated in a slope context, in correspondence of a terrace, extended about 13,000 m^2, lengthening in NNE–SSO direction. The terrace is delimited by a steep slope with an irregular profile going up toward the watershed (about 1300 m) at NW and by a 1167 m high relief at NE, both consisting of basalts, while in the SE and SW directions, where clayey and arenaceous complexes crop out, there is a slight slope degrading toward the Aveto valley. The plateau collects the waters of a very little catchment basin (50,000 m^2 surface) and presently a small stream emissary drains it, on its eastern extremity.

Fig. 1 – The Moglie di Ertola clearing during the 2005 excavations. The star indicates the location of the core, the light blue diamond, the subterranean water spring, and the red ellipse, the excavations area, around the cut of the effluent.

From a hydrogeological point of view the presence of a rocky complex with different types and degrees of permeability allows the existence of a great number of spring waters. In particular, their presence is favoured by the considerable difference of permeability between clayey and ophiolithic complexes. In fact, while the former are watertight by nature, the latter are characterised by a fair degree of permeability due to fractures affecting them. Another factor that allows spring-waters is the presence of detritus sheets, characterised by a high degree of permeability due to their porosity, superimposed to the bedrock. Therefore some peculiar aspects such as the watertight characteristics of the clayey bedrock and the peculiar basin conformation in correspondence of the terrace favoured the onset of waterlogged conditions, possibly in the context of an environmental resource management system.

Mainly coppiced beech woodlands with Turkey oaks (*Quercus cerris*) and other broadleaved trees surround the clearing. At lower elevations also chestnut woods are present, and hay meadows and fields frequently occur in the vicinity of the small hamlets.

The history of the human presence in this area is very long and several scattered stone chipped artefacts from sites located in the Trebbia side of the same watershed (area of Casanova) show human frequentation during the Middle and Upper Palaeolithic, Mesolithic and Neolithic ages (from 40.000 to 3.600 BC). Therefore the archaeological evidence suggests that, from Palaeolithic to the Bronze Age, the Aveto-Trebbia watershed, perpendicular to the Apennine chain, may have represented a route for the movements and the exchanges between sea coast, inner mountains, and the southern Po plain (MAGGI and CAMPANA, 2003). An important clue for the presence of prehistoric routes, as for roman and medieval routes, is provided by the location of archaeological sites and by the occurrence of several springs and wetlands ("Moglie"), which are a probable indicator of the use of the valley as a transhumance route (PEARCE, 2003).

The archaeological excavations in the Moglie di Ertola plateau (DE PASCALE at al., 2006) investigated a stratigraphy that covers the whole Holocene. Evidences of the evolution of the water basin, of changes of its shape, and of its transformation into a peat bog have been recorded. Noteworthy, the basin contains several collapsed large trees, mainly silver fir, at least from ca. 2900 till 1020 cal. BC, embedded in different layers of peat. The peat layers have grown-up on a grey clay layer whose origin is still debated.

Stratigraphic excavations revealed several fragments of charcoal dated since the 7th millennium BC and mainly belonging to the 4th-3th millennium BC (late Neolithic/Copper Age in cultural chronology). Their occurrence suggests that anthropogenic factors (e.g. woodland clearance) may have contributed to erosion/colluviation processes which in turn caused the waterproofing of the basin. This in accordance with the current available information of Middle/Late Holocene clearance by fire of Ligurian mountain woodlands, in order to create highland pastures useful to the arising system of short transhumance between the lower valleys and the coastal belt (winter grazing, agriculture on alluvial soils) and the inland mountain area (mainly summer pastoral activity on lighter soils) (MAGGI, 2004).

The remains of a stone structure show the existence of a dam (still to be dated) for the control of the water regime. A peat layer dated 210 cal BC - 130 AD[2] (cf. Fig. 2) is buried under a clay layer that could have been intentionally deposited in order to drain the peat bog after the Roman period. On the top of the peat layer some evidence of burning (charcoal) testifies a dry event of the basin (250 - 540 AD[3], cf. Fig. 2).

The Early Middle Ages history of the Aveto Valley is dominated by Bobbio monastic settlement: the main information sources are written documents, while only few archaeological evidences are available (cf. DESTEFANIS, 2003). However, the documents tell us that in the 8th century two important monasteries (S. Pietro in Ciel d'Oro in Pavia and S. Colombano at Bobbio, in the Trebbia valley) possessed some estates in this valley. Only from the 13th century the importance of the three main roads that crossed this valley is better known. One of these roads ran on the watershed line between Trebbia and Aveto valleys and was part of the network of communications between the Ligurian coast and the Po valley. In the central centuries of the Middle Ages, the village Rezzoaglio was one of the junctions for transportation of goods (Fig. 3).

The site is part of a "water perimeter" which includes the upper part of the slope and the hamlet of Ertola within a whole hydrographical system, which is still to be studied in detail. Some of the present-meadows in this watershed are enclosed by wall barrages. Different campaigns of environmental archaeology and historical ecology have been devoted to reconstruct this perimeter and the different uses of the area, starting from the practices still in use.

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[2] AMS, LTL775A: 2093 ± 40 B.P. (210 cal BC - 10 cal AD, 94.1 %) and AMS, LTL776A: 1977 ± 50 B.P. (110 cal BC - 130 cal AD, 95.4 %)

[3] AMS, LTL1814A: 1650 ± 55 B.P. (250 - 540 cal AD, 95.4 %)

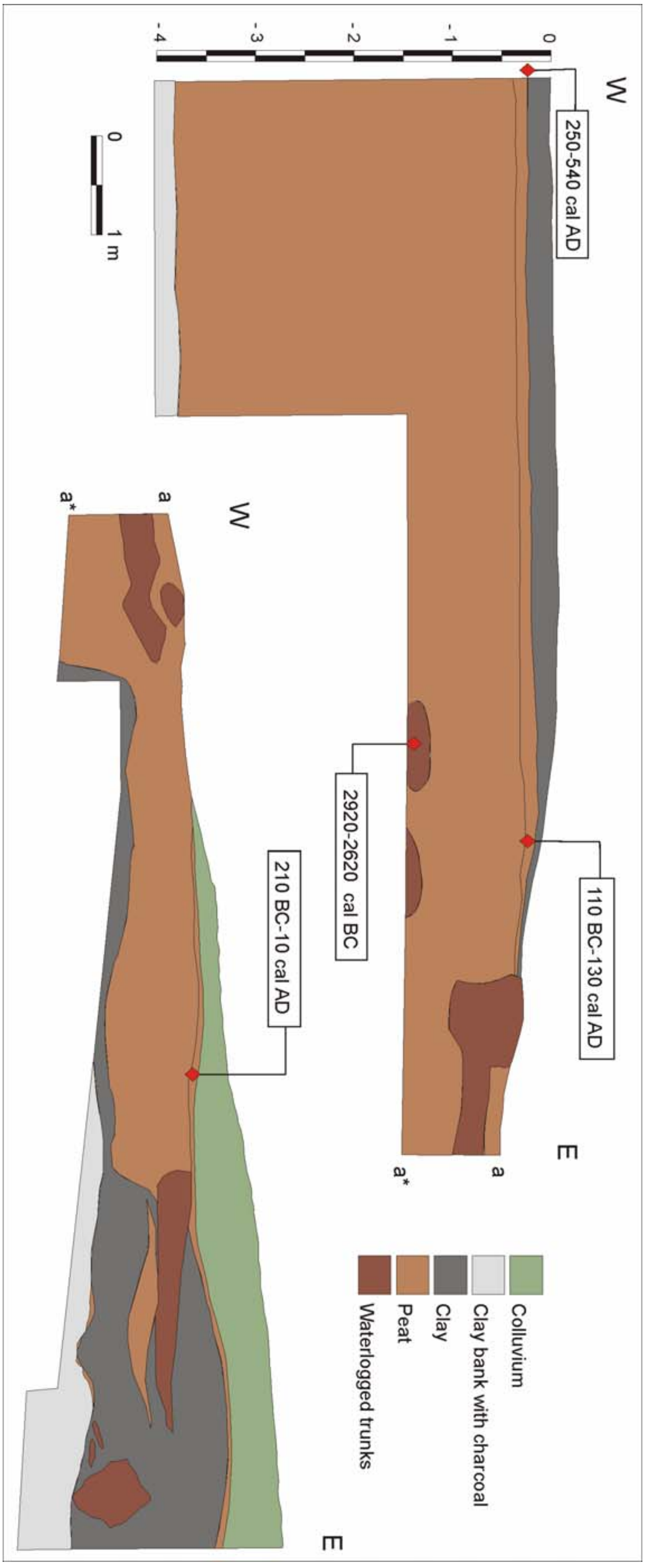

Fig. 2 - Mogge di Ertola, excavation area, section West-East (simplified).

At the moment the whole research is in progress and a final stratigraphic correlation is still lacking. Here a historical ecological discussion is proposed, mainly to focus, with a regressive approach, the unresolved problems in the site and in the surrounding area.

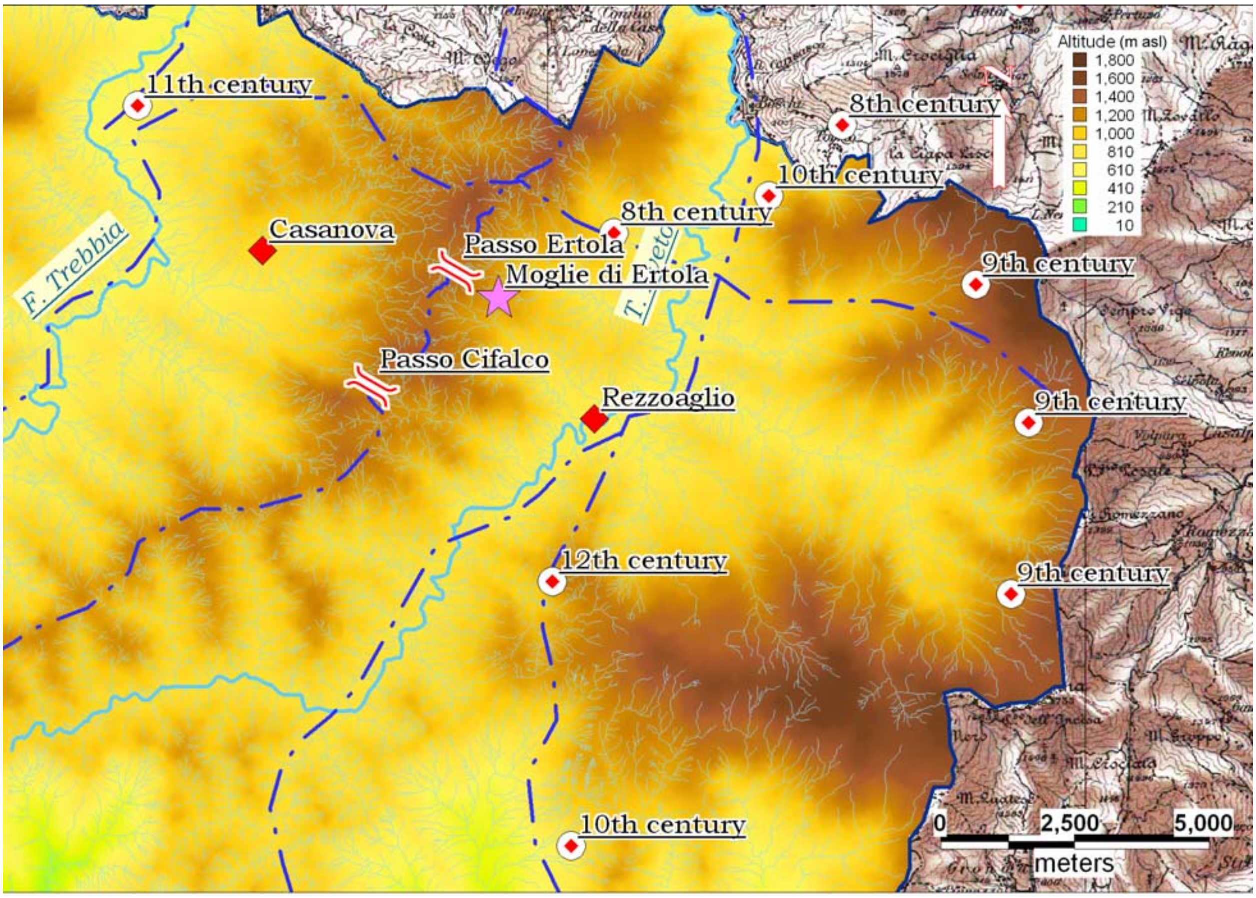

Fig. 3 – Location of the Moglie di Ertola (pink star) in the framework of Trebbia and Aveto valleys. The blue dashed lines indicate roads documented for the Middle Ages (13th century). The red and white symbols show the positions of some estates of two monasteries; the centuries indicated are referred to the first documentation (written sources) (Data from DESTEFANIS, 2003).

Results and discussion

In order to obtain stratigraphical information and to reconstruct the original bedrock geometry in correspondence of the basin, a number of investigations, including exploration pits, manual rotary drillings and seismic refraction, were carried out between 2004 and 2006.

The crossing of the data obtained by using different methodologies allows reconstructing a preliminary model of the subsoil in correspondence of the site of the Moglie di Ertola. The stratigraphy is very complex and variable also from one point to another. The primary basin is filled prevalently by fine sediments (clays) and peat. Only close to its margins, coarse colluvial sediments (gravels and sands) appear. The sedimentary sequence presents a maximum thickness of about 7 m in correspondence of the eastern part of the basin. Nevertheless, for our present purposes, only the uppermost ca. 40 cm, constituted by clays laid on the peat, are examined. They are plastic grey clays with orange or yellow speckling (caused by oxidation) rich of charcoals in the middle and in the upper part (MONTANARI and MORENO, 2005). The fine nature of the sediments indicates calm and underwater conditions of deposition. The yellow/orange speckles are due to subsequent sub-aerial processes possibly caused by a water level lowering. Later, as demonstrated by the alternation of fine and coarse sediments coming from sequences close to this one, different lowering and heightening water levels alternate in the basin (Fig. 4). These variations of the water level could be due to the effects of the dry-stone wall discovered at the SE limit of the basin.

Fig. 4 - Stratigraphic sequence from the W side of the S5 explorative pit. The transition from peat to grey clay is shown in the lower part, whereas in the upper part a clear yellow/orange speckling and the alternations of fine and coarse sediments are evident.

With the purpose of obtaining a complete sequence for pollen analysis, a core was drilled in the plateau sediments, providing a 7 metres deep, mainly peaty, sedimentary series. A standard pollen analysis was carried out along the sequence, whereas in this note we will focus on the most recent part of the core, approximately concerning the last 2000 years. The whole pollen diagram (unpublished) illustrates the variation of the vegetation cover throughout the Holocene and will be discussed elsewhere; preliminary results from the survey undertaken in 2001 are reported in GUIDO et al. (2003).

The synthetic pollen diagram (Fig. 5) shows three main phases marked by both pollen and non-pollen palynomorph trends. The oldest phase (90-55 cm) is characterised by the quite abrupt rise of the beech curve corresponding to the fall of silver fir (*Abies*). At the end of this period the grasses rise while *Fagus* decreases to low values again. The second phase (55-25 cm) begins around 1000 years ago (770-1160 cal AD[4] at 50 cm deep) with high values of herbaceous taxa and several anthropogenic indicators; also various algae are recorded. Finally, the most recent phase (25-15 cm) is distinct by the rise of sedges, alder and Cyanobacteria.

To better interpret pollen and stratigraphical data, observations have been done starting from the practices still carried out in the area by local farmers and muleteers: cow, horse, and mule low intensity grazing, mainly during the summer; rotation coppicing in the surrounding woodland; small scale temporary cultivations (“orti”); management systems of the water resource in the hamlet of Ertola, etc.

The present vegetation is discussed, according to the historical ecology approach, as living memory of past cultural systems and of their abandonment (CEVASCO, 2007). For example, the old hawthorns (*Crataegus monogyna*) around the Moglie di Ertola site are proposed as evidence of a temporary cultivation system (“ronco”) still in use in this area in the first half of the 20th century, according to oral sources. These shrubs were used as protection of the temporary fields from grazing animals. Also the herbaceous populations of *Rumex acetosella*, distributed in the centre of the site, and the rare specimens of *Antennaria dioica*, both promoted by controlled fire (Fig. 6), are proposed as “indicator species” of the last temporary cultivation practices (“ronco”) and sheep grazing, soon to be confirmed by sedimentary proof. *Rumex* itself may now be followed in its historical dynamics thanks to the pollen evidences.

[4] AMS, LTL546A: 1065 ± 80 B.P. (770 – 1160 cal AD)

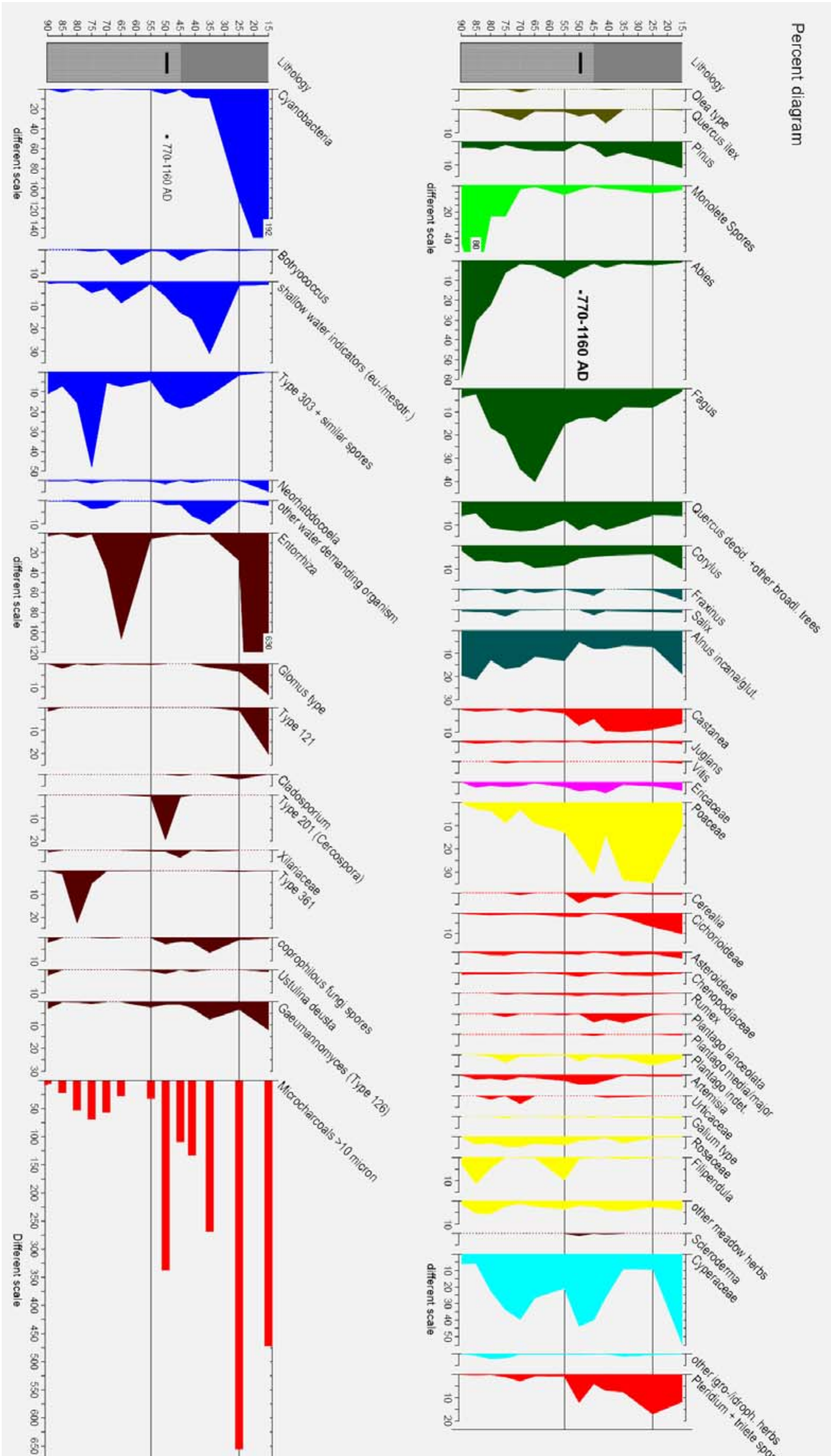

Fig. 5 – Simplified percent pollen and NPP diagram of the topmost layers from the Moglie di Ertola core sampling.

Fig. 6 – Antennaria dioica *(L.) Gaertner, a possible indicator species for past temporary cultivation system in the northern Apennines (Cevasco, 2007).*

Extra-site surveys were carried out in the beech woodlands, Turkey oak parcels and alder (*Alnus incana*) parcels around the site, terraces, and mule tracks. The surveys allowed to identify and localize environmental-archaeological evidence of past practices and systems: old stumps of alder trees (living or sub-fossil, in dated sites), old pollarded beech trees (evidence of the "wooded meadow system"), old shredded Turkey oaks, geometric alder parcels associated with clearance cairns, hawthorns and local microtoponomy referred to "ronchi" (evidence of temporary cultivation practices), rock shelters, charcoal pits, wall barrages in other meadows of the area, drainage and watering systems connected to the main mule track.

A network of documentary, archaeological, and historical ecological evidences largely documents for the Aveto valley in the 19th and 18th centuries a multiple land-use system for grazing and sowing cereals: alder-woods played a key role in the system (for this reason we have called it "alnocoltura"), and a specific local knowledge was involved (CEVASCO and MORENO, 2007). At the beginning of the 18th century, this system at work in the "Forestri" sites of this watershed recalls the infield/outfield system of the British Isles. "Forestro" (no longer in use in the local dialect or in Italian) takes on a juridical and physical meaning in opposition to the word “domestico”: it is not an opposition between wild/cultivated land or cultivated/uncultivated land, because in this system the “forestro” is also cultivated, although only temporarily, with different practices of *ronco* (CEVASCO et al., in press).

The diagram of Fig. 5, since around 770-1160 AD, shows that beech enhance its role in the surrounding woodlands, while at the site, an unstable pattern of drier and wetter patches may explain the contemporaneous rise of different herbs (*Artemisia*, Apiaceae, Chenopodiaceae and Poaceae) and the low presence of several aquatic NPP types (Cyanobacteria, *Botryococcus*, *Pediastrum boryanum*, other algal spores suggesting the presence of shallow eu- / mesotrophic water, and Neorhabdocoela).
Later, the presence of numerous anthropogenic indicators such as Poaceae, Cerealia, Chenopodiaceae, *Rumex*, *Plantago lanceolata*, *Artemisia* and Urticaceae suggests a change in the management of the basin, with the introduction of important pasture activities. Cereal pollen, in particular, was more probably accumulated in the sediments by these activities, including transhumance (Moe et al., 2006), rather than by cultivation in the immediate surroundings (which should have resulted in higher cereal pollen percentages and presence of other cultivation indicators). Nevertheless, the contribution of temporary agriculture practices in terms of sedimentary evidence is only partly understood.
Pasturing evidence is supported by the presence of coprophilous fungi spores as well (cf. VAN GEEL and APTROOT, 2006). The clearance around the wetland was possibly obtained and maintained by fire, as the increase of microcharcoals suggests; moreover, in the earliest samples of this phase, a part of the microcharcoals consist of charred epidermis of sedges.
The understanding of past pollen spectra is effectively helped by present pollen dispersal and representation studies, which are dedicated to grassland management too (AZZOLINI and MONTANARI, 2001; HJELLE, 1999).
In the medieval period we observe also an increase of the percentages of water-demanding NPP *taxa*, suggesting a rise of the water table or, at least, the occurrence of shallow and relative eutrophic pools, possibly required as watering places for livestock.
In the surroundings, chestnut woodlands spread, as demonstrated by the increased values of the *Castanea* pollen curve.

The sequence ends with a new change in the management of the area, influencing not only the vegetation cover of the clearing itself, but also the surrounding woodland. The previous pasture and mowing activities seem to decrease as suggested by the fall of the grasses and *Plantago lanceolata* pollen. On the increase of Cichorioideae different hypothesis can be proposed. The fall of beech pollen, the rise of alder and hazelnut and the further increase of microcharcoal fragments suggest that also the previous use of the woodland changed. The increased values of *Glomus* suggest soil erosion in the woodland (VAN GEEL, 2001, ALMEIDA-LENERO et al., 2005, KENDRICK, 1992) of the up-stream slope.
Further evidence come from the bloom of Cyanobacteria in the topmost levels which possibly indicate the eutrophication of the local environment, caused by a new contribution of nutrients (i.e. phosphor) (cf. VAN GEEL 2001; VAN GEEL et al., 1996).
To reconstruct the management system we can take into account that in recent times the surrounding woodlands were used for charcoal production, as demonstrated by the charcoal burning sites found in the vicinity, whereas nowadays beech woods are coppiced for timber production.

The present pasture, which around the first millennium AD substituted the previous ecosystems, raises specific questions when a historical approach to the ecology of the site is employed: how has it been “constructed”, from a technical and ecological point of view? For instance, one of the formulated hypothesis is the occurrence of practices of artificial filling of a wetland, such as the “colmata di monte” (Moreno, 2002). How has it been managed until now, and what does it remain today of that ancient dry pasture in terms of herbaceous species?
To answer these questions, the stratigraphical studies from the archaeological excavation and the pollen and anthracological analysis are discussed together with the “observational” sources produced for this area and for the whole Trebbia-Aveto watershed, and with the documentary sources.
The site seems to be a key point also for a sedimentary proof of the “alnocoltura” system on these slopes, since starting from the above date, the decline in alder pollen together with the rise of grasses and the appearance of cereals is evident (CEVASCO and MORENO, 2007).

The increase of microcharcoal particles is further evidence in favour of this hypothesis. Other interesting evidences regarding this topic come from the near peat bogs of Casanova and Lago Riane, already discussed in a historical ecological perspective[5].

Conclusions

These preliminary results can be a starting point for an in depth study of sedimentary, observational and documentary sources towards a higher spatial and temporal resolution, with the aim of reconstructing past cultural systems (as wooded meadow, temporary cultivation "alnocoltura", charcoal production, stable and transhumant pasture, and water management systems). The same aim must be pursued also from a historiographical point of view.

Analysis of present flora, sediments, charcoal, microcharcoal, pollen and non-pollen palynomorphs (that is quite rare in Italian research) have proved in this case to be able to add information on local ecology, particularly interesting when past cultural landscapes are involved and data are collected in an environmental archaeology context.

Moreover, these new achievements show the interest of a comprehensive discussion of the outcomes of different sources and how the ecofacts can be informative even when artefacts are lacking.

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