Early Neolithic potters of the Italian Middle Adriatic region

Časně neolitičtí hrnčíři v oblasti italského středního Jadranu

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This paper presents the preliminary results of the study of the Early Neolithic pottery production in the Marche region, Italy (VI mill. BC). The main goal of this research is to expand the knowledge of pottery manufacturing processes associated to the typical Central Adriatic Impressed Ware, at present poorly understood. All sites under analysis are located in the piedmont hills of the Apennine Mountains, except one which is on the coast. This study aims to highlight synchronic and diachronic variability in pottery technology, to identify common traits and to investigate the raw materials selection and exploitation strategies. The pottery assemblages are examined by means of an integrated approach which include techno-typological and archaeometric analyses. The environmental factors, the distribution of resources, the technology solutions taken by these early Neolithic communities are considered.

Early Neolithic – Italy – Impressed Ware culture – ceramic analysis – archaeometry – thin section petrography

Článek předkládá předběžné výsledky studia časně neolitické výroby keramiky v oblasti Marche, Itálie (6. tisíciletí př. Kr.). Hlavním cílem tohoto výzkumu bylo rozšířit dosud sporé znalosti o keramických výrobních postupech spojených s typickou středojadranskou keramikou impresso. Všechny zkoumané lokality se nacházejí v předhůří Apenin, kromě jedné, která leží na pobřeží. Cílem studia je upozornit na synchronní a diachronní variabilitu keramické technologie, určit společné prvky a zkoumat výběr surovin a těžební strategie. Keramické soubory byly zkoumány jednotným postupem zahrnujícím techno-typologické a archeometrické analýzy. V potaz byly brány i přírodní prostředí, rozmístění zdrojů a technologická řešení, která sledované časně neolitické komunity volily.

časný neolit – Itálie – kultura s impresso keramikou – keramická analýza – archeometrie – petrografie výbrusů

Introduction

This paper presents the preliminary results of an analytical study conducted on the first pottery of Italian Middle Adriatic region, in particular from the territory of Marche (*fig. 1*). The study is based on an integrated approach applied to the reconstruction of pottery manufacturing processes, showing how variability in time and space can be used to understand Early Neolithic societies, which are almost unknown for this period in the area.

The Neolithisation process in Italy is dated to 6100 BC cal. approximately (*Tiné 2002*; *Forenbaher – Miracle 2005*; *Pessina – Tiné 2008*): impressed pottery first appears in Apulia as part of the "Neolithic package"; 400 years later the first agriculture reaches the Middle Adriatic region (Abruzzo, Marche, Emilia Romagna). This area is characterized by a peculiar style, which was defined as Middle Adriatic Impressed Ware culture by *Antonio*

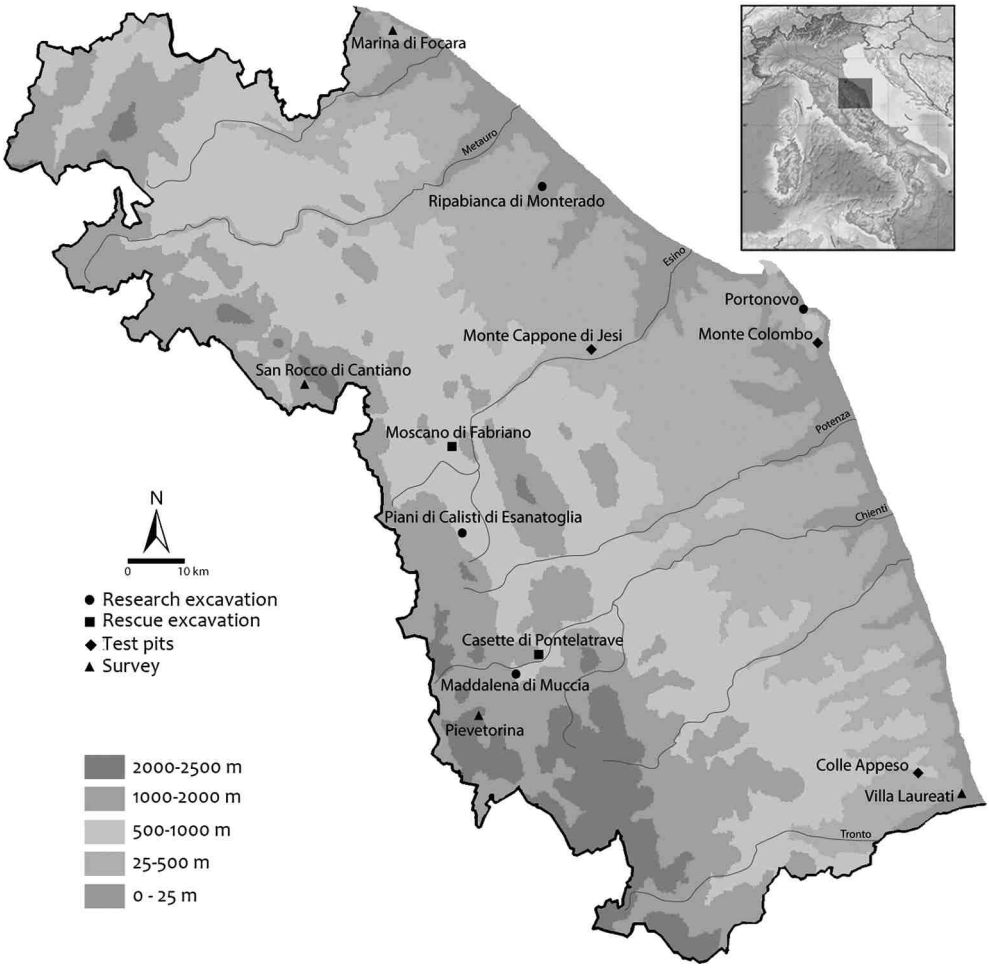


Fig. 1. Early Neolithic sites of the Marche region distinguished by method of investigation.

Radmilli (*1974*). It refers to the first appearance of productive economy along the central and north Italian Adriatic coast: the initial phase, dated to the first half of the 6th mill. BC, is characterized by pottery with standardized and slightly monotonous decoration: finger, finger-nail or instrumental impressions and patterns realized by bands of incised lines. Within the last centuries of the 6th mill BC, this cultural homogeneity come to an end and local production reflects general links with the north Italian Po Valley, Abruzzo (Catignano culture) and the Tyrrhenian area (Linear Pottery culture; *Pessina 2002*).

As regards the Marche region the Neolithisation process is still poorly understood. An overview on the arrival of the first farmers has been outlined in the 1960s by *Delia Lollini* (*1965*), who conducted excavations in the entire area as archaeologist of the Superintendence for the Archaeological Heritage of Marche. However, only few sites were extensively excavated, while others were explored through test pits or surface collections

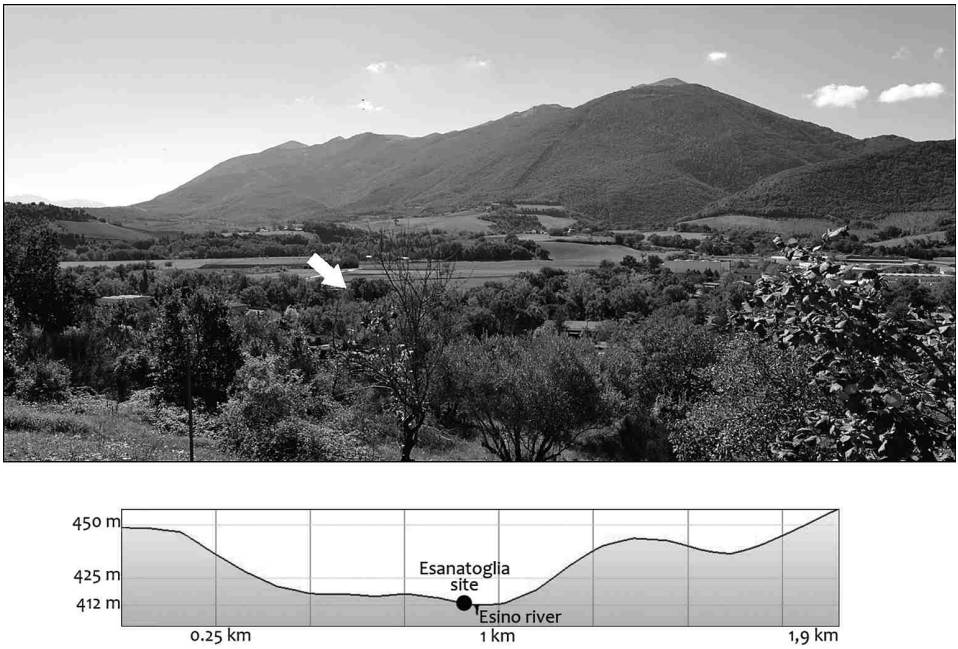


Fig. 2. Esanatoglia-Piani di Calisti. Panoramic view of the area of the site and elevation profile of the valley (NE-SW direction).

(*Conati Barbaro et al. 2014*). Later on, Maddalena di Muccia (*De Marinis et al. 2003*; *Conati Barbaro et al. 2005*; *Manfredini 2014*), Ripabianca di Monterado (*Rosini et al. 2005*; *Rosini – Silvestrini 2006*) and Portonovo Fosso Fontanaccia (*Conati Barbaro 2013*; *Conati Barbaro et al. 2013*; *2015*) were investigated by extensive excavation. Some of them are considered key sites for the study of the Neolithisation process in central Italy.

However, there are no systematic studies on early ceramics from these territories, with the exception of Ripabianca di Monterado site, partially published (*Rosini et al. 2005*; *Rosini – Silvestrini 2006*). The available archaeometric data are based on 18 samples from an Early Neolithic pit (US 114, *Muntoni 2005*; *Laviano – Muntoni 2007*) and 27 samples from the Lollini area (*Spataro 2002*, 142) of the village of Maddalena di Muccia. Furthermore, 30 fragments from Ripabianca di Monterado were also analyzed (*Spataro 2002*, 151; *2009*).

The purpose of this project is to investigate an entire geographical area, starting from a systematic study of pottery production in order to reconstruct the production processes. For this purpose, the pottery production of four sites has been analyzed: Maddalena di Muccia, Esanatoglia-Piani di Calisti (*fig. 2*), Moscano di Fabriano, all placed in the inland valleys of the region, and Portonovo-Fosso Fontanaccia, located along the Adriatic coast (*fig. 3*).

For the first time the Central Adriatic Impressed Ware pottery from Marche region is examined by means of an integrated approach which include techno-typological and archaeometric study.

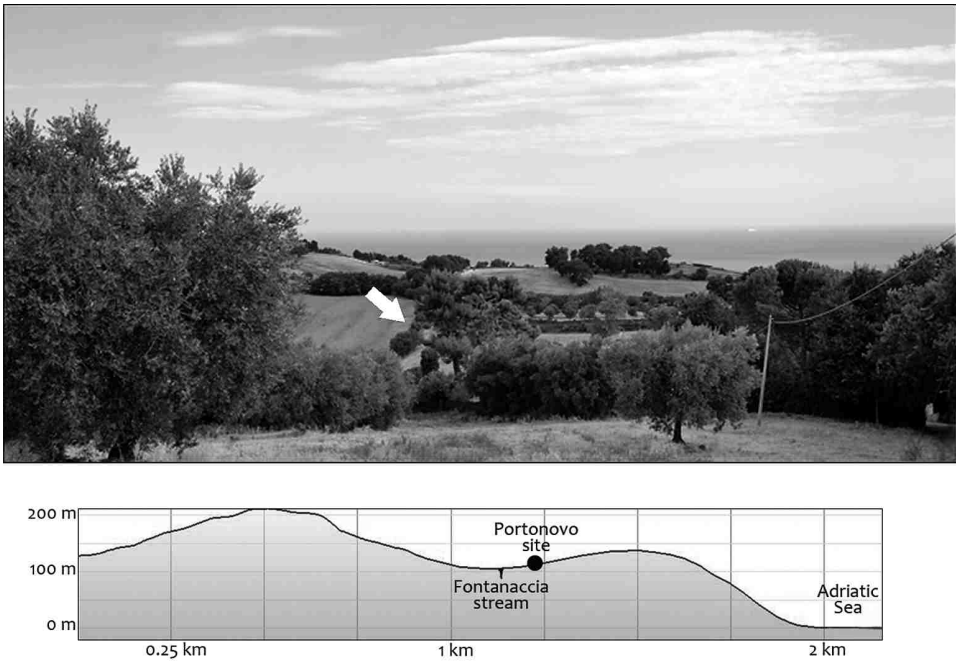


Fig. 3. Portonovo-Fosso Fontanaccia. Panoramic view of the area of the site and elevation profile of the valley (NE-SW direction).

Geographical and geological overview

During the Early Neolithic in the Marche region, the higher density of sites is recorded in piedmont hills of the Apennine Mountains. Settlements are located along the main rivers, which cross the region in a west-east direction (*fig. 1*). As a matter of fact the inland river valleys play an important role as preferential ways between the Apennines and the coast still today: inland sites were located along natural transit routes of the Apennines, which connect the Adriatic coast with the Tyrrhenian area. These sites are Maddalena di Muccia, Esanatoglia-Piani di Calisti and Moscano di Fabriano. Other sites are known from surface collections, as San Rocco di Cantiano and Pievetorina (*Conati Barbaro et al. 2014*).

The bedrock of inland territories is characterized by limestone and marly limestone formations, with outcrops of sandstone and pelitic-sandstone on the hills. The sites in this area are generally located on Pleistocene terraced alluvial deposits, which mainly consist of gravelly fluvial sediments (*Cilla – Dramis 2005*; *Deiana 2009*). In some cases, clayey red-soils rich in iron oxihydroides are present on the top of these deposits, as a result of flood alterations (Esanatoglia *Ferretto* soil; Cilla, personal comm.).

Very few sites lie close to the Adriatic coast. Portonovo is located at almost 600 m from the sea, while Ripabianca di Monterado is about 10 km far from the sea (*Rosini et al. 2005*). Other sites are known thanks to surface collections, such as Marina di Focara, Monte Colombo, Villa Laureati, or test pits, as Colle Appeso (*Conati Barbaro et al. 2014*).

Site	Lab.	BP	Cal 1σ BC	Cal 2σ BC	Sample
Esanatoglia, US 52	LTL15327A	6225±45	5300-5070	5310-5050	charcoal (*Alnus*)
Esanatoglia, US 1 tg. I	LTL15328A	6311±45	5330-5220	5470-5200	charcoal (*Quercus* sp. evergreen type)
Moscano, US 3 tg. VII	LTL15329A	6397±45	5470-5320	5480-5310	charcoal (*Fraxinus* sp.)
Moscano, US 3 tg. III-V	LTL15330A	6263±45	5310-5210	5330-5060	charcoal (*Buxus sempervirens*)

Tab. 1. New radiometric dates from the sites of Esanatoglia and Moscano.

The coastal area of the region is characterized by significant sandstone and pelitic-sandstone deposits moulded in low hills (*Cilla – Dramis 2005*; *Sarti – Coltorti eds. 2011*). In particular, the archaeological structures at Portonovo are excavated in a marl deposit (*fig. 9: 1*) on the northern part of the site and in an eluvial-colluvial deposit in the southern area (*fig. 9: 3*).

Chronology

According to radiometric dating and to the archaeological material, the Early Neolithic of the region can be divided in two chronological phases.

The Maddalena di Muccia (*Manfredini et al. 2005b*; *Alessio et al. 1970*, 603) and Portonovo (*Conati Barbaro 2013*, 48; *Conati Barbaro – Celant in press*) sites are dated to the first phase (first half/half of 6th mill. BC).

Esanatoglia and Moscano belong to the second phase according to typological observations on pottery material and to similarities with ceramics of Ripabianca di Monterado. The latter is dated in absolute chronology at the second half/end of 6th mill. BC (*Alessio et al. 1970*, 602–603).

Four new radiocarbon dates were obtained for Esanatoglia and Moscano, which confirm the typological observations (*tab. 1*). Short-life wood samples were selected among anthracological remains.[1] They were analyzed at the CEDAD of the University of Salento, by AMS technology.

Archaeological contexts

The site of Muccia was first excavated by Delia Lollini in 1960 and 1965. She found a series of irregular underground structures, which were traditionally interpreted as pit huts (*Lollini 1965*, 309–310; *Lollini ed. 1991*, 52–57). In the 2000s, new excavations undertaken by the Sapienza University revealed a large Copper Age village (*Manfredini et al. 2005a*; *Manfredini 2014*). After reviewing the documentation of Lollini's excavations it is possible to assume that not all the archaeological findings could be referred to the Early Neolithic:

[1] *Taxa* were identified by prof. Alessandra Celant, Sapienza University.

materials related to more advanced stages of the Neolithic (Diana and late Ripoli pottery) and to the late Copper Age have also been recognized (*La Marca 2016*, 122).

The underground structures dated to the first occupation of the site fall in a Neolithic tradition not only typical of the Marche region, but common to the entire peninsula. These are often the unique preserved evidence, especially in floodplain sites, where erosion and exploitation of soils have a greater impact. As regards the site of Muccia it seems possible to assume a function as storing pits at least for some cavities. In one case a reuse of a cavity for funerary purposes was documented, but mostly it is easier to identify their secondary function as midden pits (*La Marca 2016*, 123).

The site of Portonovo is located on a south-facing slope, along the Fontanaccia stream, on the Conero promontory, near the Adriatic coast (*fig. 3*). After its identification in 1990s the site was excavated by the Superintendence of Marche and later by the Sapienza University of Rome. Dozens of domed ovens were found. These were originally excavated in the ground, and share standard shapes and dimensions. The ovens have circular base and, in some cases, the vault is preserved. The inner chamber has a clay lining, smooth on the base, and they are 1.80 up to 2 m large. The ovens follow different alignment along the slope and the excavation of wide, shallow and irregular pits in front of them probably allowed the construction of the structures and the access for their use (*Conati Barbaro 2013*, 32–40).

The temperatures inside the ovens did not exceed 500 °C, estimated using X-ray powder diffraction analysis (PXRD) on hardened sediments, sampled as a compact block of deposit from the structures (*Muntoni – Ruggiero 2013*). These temperatures seem suitable for several uses, such as cooking and food processing, for example baking or roasting grains. No evidence of housing or domestic structures were identified during research, so it is possible to describe Portonovo as a production area.

The Esanatoglia and Moscano sites returned limited evidence and should be assigned to phase 2 of the Early Neolithic of Marche. The Esanatoglia site (*fig. 2*) was excavated in 2004 and 2006 by the Sapienza University (*Silvestrini 2006*; *2007*). The settlement has been heavily eroded by the Esino river. The gravel bank revealed a marked difference in height, forming a short slope with E-W orientation, probably related to the edge of a palaeochannel. The structures were originally excavated in a dark silty palaeosol and in the gravel bank of the alluvial terrace. Some pits were identified, filled with well preserved ceramics, mixed with lithic and faunal remains. A few postholes were also identified, some of which were aligned. The presence of wooden structures, even if it was not possible to recognize specific alignments, and the good preservation of findings allows us to assume a stable occupation of the terrace by the first Neolithic groups.

The Moscano site was unearthed in 2007 by the Superintendence of Marche, during preventive excavation on the new railway line Orte-Falconara. One area returned evidence of an Early Neolithic occupation: a thick, dark grey, sandy clay layer, filled with numerous findings (ceramic, lithic and faunal remains) and an underlying structure, probably related to a fire area. It consists in a circular pit with a reddish friable fill, its outer perimeter was delimited by a band of black carbonaceous layer. Inside, there were large portions of vessels, which were fully or partially reconstructed for this research.

Techno-typological analysis

Macro analysis of pottery assemblages focused on qualitative and quantitative analysis, remarking on morphological, typological and technological characteristics. For the decorative techniques a documentation system was developed, focused on the reconstruction of the gesture and the used tool. The study was based on a total of 17,640 potsherds.

Pottery production is characterized by predominance of coarse pastes (Muccia 43 %; Moscano 70 %; Esanatoglia 80 %), with the exception of Portonovo site (26 %), where the wide variety of fine pastes is probably related to the local availability and selection of resources. At the macroscopic scale it was easy to distinguish different kind of inclusions, such as calcareous, chert or vitreous elements, and to make a division into several sub-groups. Fine (Portonovo 47 %; Muccia 18 %; Moscano 18 %; Esanatoglia 5 %) and semi-fine pastes (Portonovo 27 %; Muccia 39 %; Moscano 12 %; Esanatoglia 15 %) are characterized by a more compact and homogeneous texture, with rare or less visible inclusions. All the classes often show pores or zoned sections due to the presence of organic matter in the paste. Few sherds are associated to a very fine paste, characterized by very homogeneous and powdery texture, floury surfaces, colour from yellow to pinkish yellow. They can be attributed to the *figulina* ware, a particular type of pottery widespread along the Adriatic coastlines during Neolithic (*Spataro 2009*).

A high variability of decorating techniques has been observed. Production related to phase 1 sites (Muccia, Portonovo) is characterized by a strong variability of the techniques used and in the decorative patterns created (*fig. 4*). This great changeability tends to disappear during the second chronological phase (*fig. 5*). The decorative motifs found can be divided according to the techniques used:

– impression technique, pressing with a tool on the surface of the vessel while still plastic (*fig. 4: 2–5, 10–12*; *fig. 5: 1, 8*);
– incision technique, pushing and then dragging the tool on the surface of the vessel while still plastic (*fig. 4: 2–3, 8*; *fig. 5: 9*);
– plastic decoration, realized with additions of parts modelled separately and then applied to the surface of the vessel (*fig. 5: 2–3, 6–8*).

The "tool" most commonly used is the hand of the potter: decorative patterns are realized using finger (*fig. 4: 10, 12*), nails (*fig. 5: 1, 8*) or pinching the surface (*fig. 4: 2, 5*); other motifs are realized with the help of tools with a round, elliptical or triangular section (points, dots, small circles; *fig. 4: 4, 11*), probably made of wood, bone or flint, as suggested for other Italian contexts by experimental tests (*Natali 2009*, 236). More common incised decoration consists of bands distributed on the surface of the vessel, according to more (*fig. 4: 3*) or less ordered patterns (*fig. 4: 8*; *fig. 5: 9*).

In phase 1, ceramic shapes show a certain homogeneity in terms of typology, with predominance of tronco-conical and ovoid shapes of medium and large dimensions in coarse pastes (*fig. 4: 2, 5, 10*), necked vases in semi-fine paste (*fig. 4: 7*), with traces of special treatment of the inner surfaces. The handles are rare (*fig. 4: 6*). The incidence of impression technique varies from 21 % (Portonovo) to 61 % (Muccia); incision technique from 5 % (Portonovo) to 12 % (Muccia). Plastic decoration is between 1.5 % (Portonovo) and 3.5 % (Muccia).

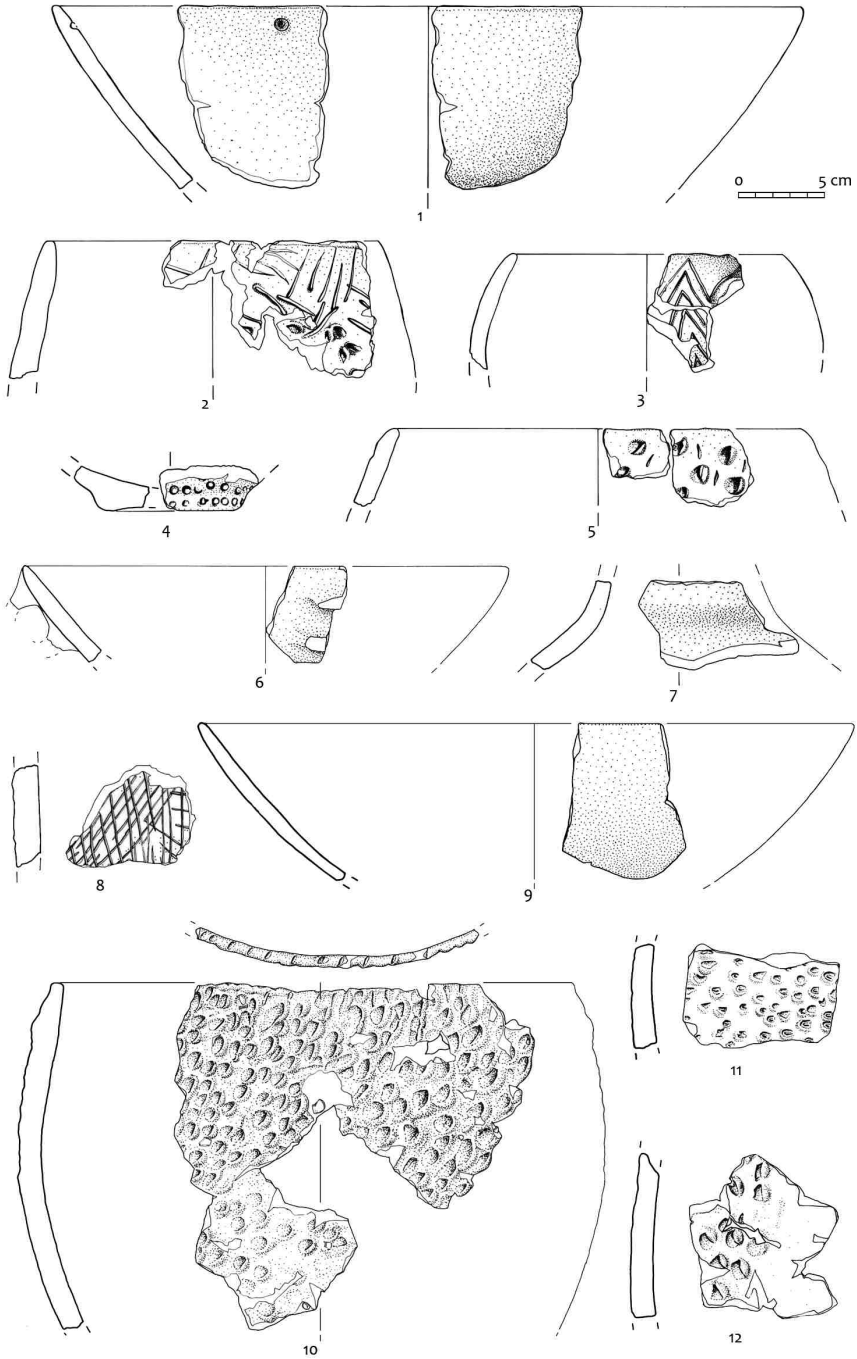


Fig. 4. Early Neolithic of Marche, phase 1 pottery. 1–5 Maddalena di Muccia. 6–12 Portonovo-Fosso Fontanaccia. Drawings by C. La Marca (1–8) and G. Carboni (9–12).

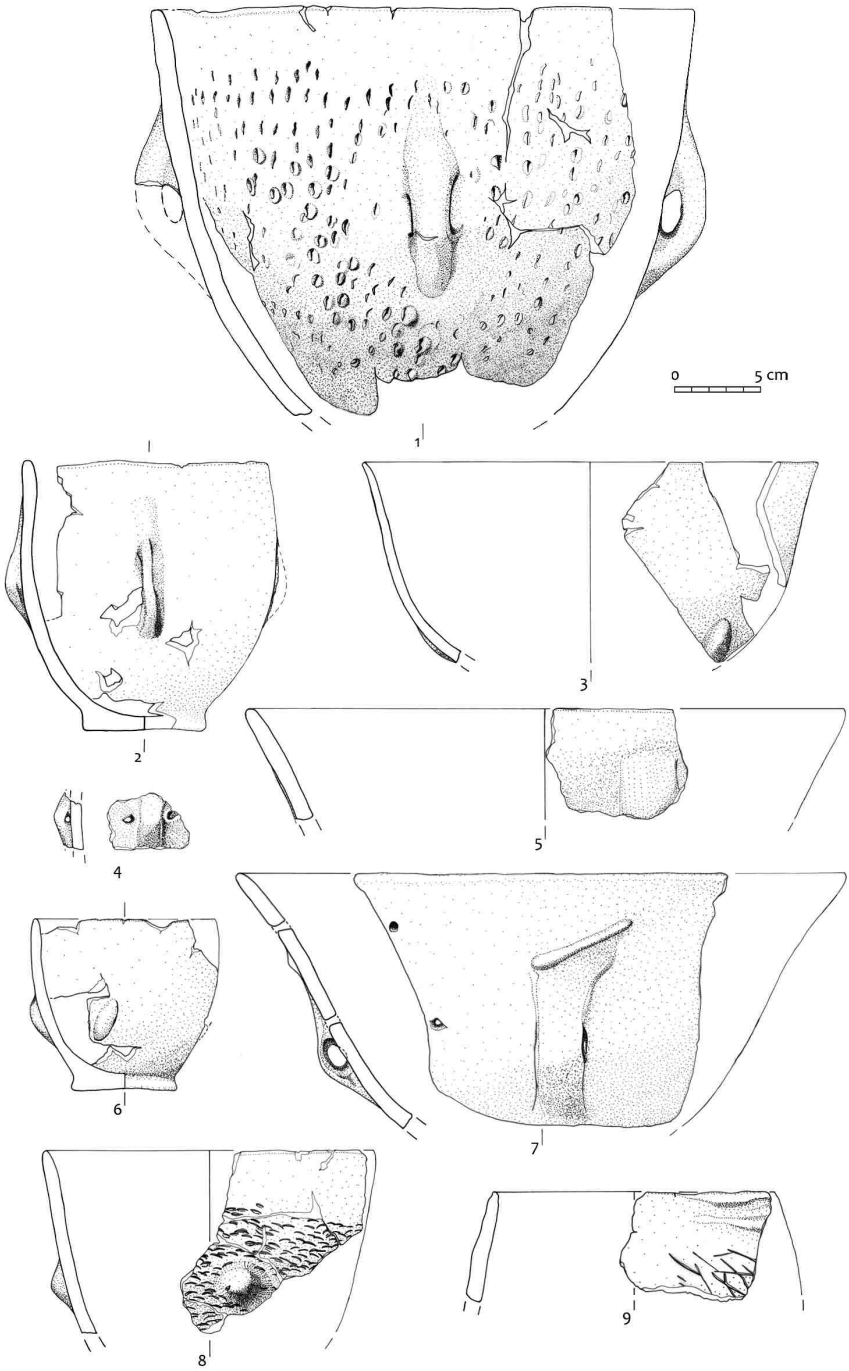
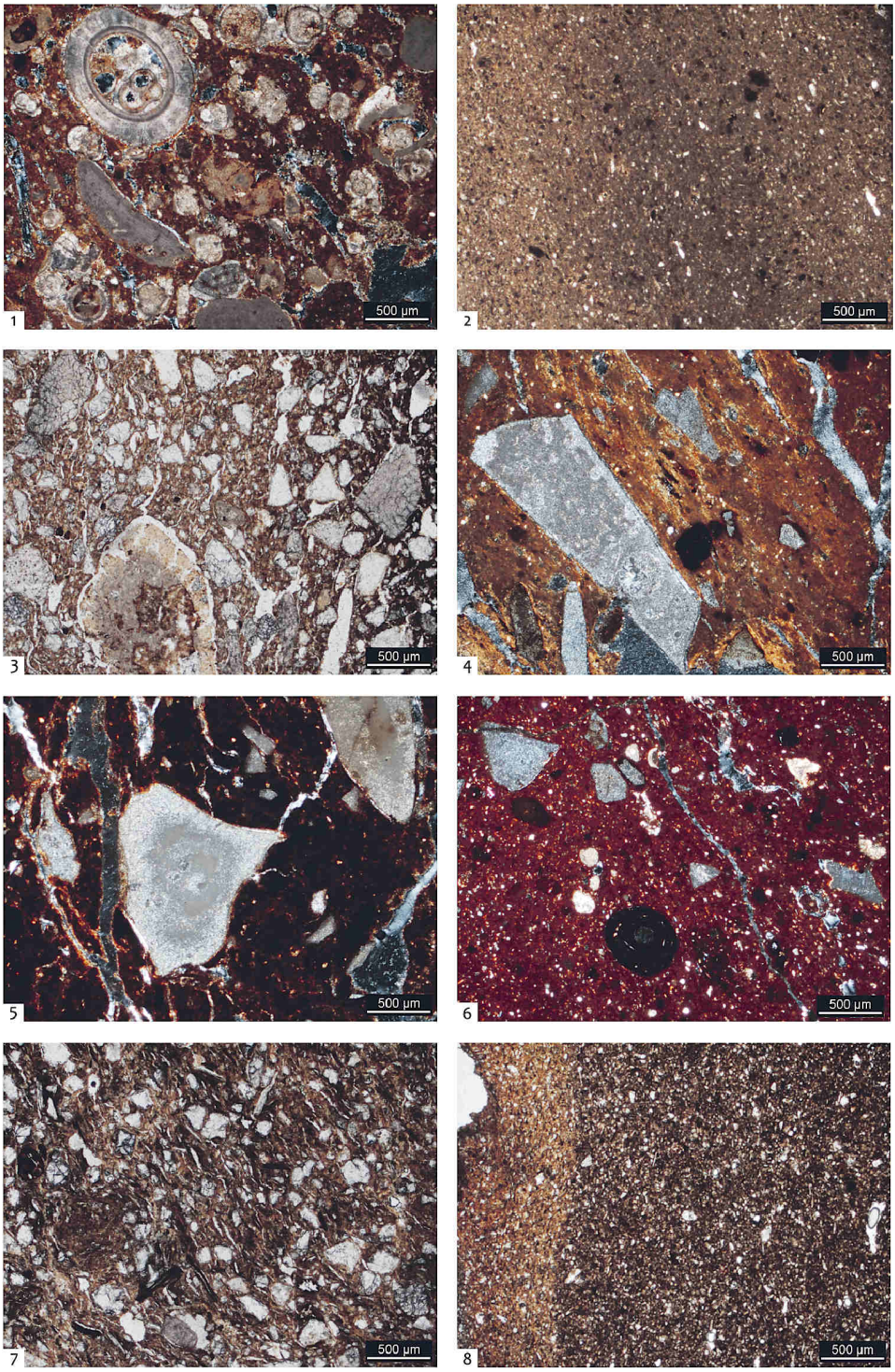


Fig. 5. Early Neolithic of Marche, phase 2 pottery. 1–2) Moscano di Fabriano. 3–9) Esanatoglia-Piani di Calisti. Drawings by C. La Marca.

Fig. 6. Technology, macro-traces on pottery. 1 Adherence of the first coil to the base plate (Moscano). 2 Simple attachment of the handle (Portonovo). 3 Assemblage of parts moulded separately (Moscano).

In phase 2 (Esanatoglia, Moscano), the impressed decoration is still used but decorative motifs seems to be much more limited: some decorative patterns disappear, such as impressed small circles, in favor of a higher incidence of plastic decoration (*fig. 5*). New features appear: grip elements, mainly plastic *appliqués*, become more common; short oblique or vertical cordons (*fig. 5: 6–7*), conical studs (*fig. 5: 8*) or tight ribbon-like handles (*fig. 5: 5, 7*) are placed on about half of the vessel. The incidence of impression technique is about 13 % in each site; incision technique varies from 10 % (Esanatoglia) to 14 % (Moscano). Plastic decoration is between 8 % (Moscano) and 10 % (Esanatoglia). The incidence of *figulina* pottery grows (from 0.14 % in phase 1 up to 7 % in phase 2). No painted pottery was found, in contrast to what happens in contemporary sites of Abruzzo, for example at Catignano (*Colombo 2010*).

Fig. 7. Thin section of ceramics: some of the groups identified. 1 Calcareous and fossiliferous matrix with calcare-nite rock fragments (Portonovo, 2.5x, N+). 2 *Figulina* ware, very low birefringence and unimodal texture (Esanatoglia, 2.5x, N//). 3 Non-calcareous matrix with abundant chert and calcite (Portonovo, 2.5x, N//). 4 Ferrouginous, argillaceous matrix with chert inclusions (Muccia, 2.5x, N+). 5 Ferrouginous, argillaceous matrix and chert inclusions with recrystallization rim (Esanatoglia, 2.5x, N+). 6 Ferrouginous matrix with chert inclusions, rich in pisolite aggregates (Moscano, 2.5x, N+). 7 Non-calcareous matrix rich in biotite and amphibole (Esanatoglia, 2.5x, N//). 8 Non-calcareous matrix with partial oxidation of the organic matter due to the carbonization of plant remains (Portonovo, 2.5x, N+).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The observation of macrotraces on the surface and section of the sherds and their comparison with archaeological (*Gomart 2014*; *2010*; *Angeli 2012*; *Burens-Carozza et al. 2011*), ethnographic (*Skibo 2013*; *1992*; *Livingstone Smith 2007*; *Gelbert 2003*) or experimental (*Skibo 2013*; *Gibson – Woods 1997*; *Rye 1981*) reference models allowed to define building techniques.

Vessels are mainly produced by coiling technique, the assembly of multiple parts moulded separately is indicated by the union of horizontal fracture lines in a circular pattern bands of 1.5 up to 5 centimetres (*fig. 6: 3*) and by the detection of specific fractures connected to the first coil at the base of the vessels (*fig. 6: 1*). Handles and grip elements are always applied by simple attachment to the vessel surface (*fig. 6: 2*), firmly pressing them into place and often leaving finger or thumb marks. A different technique was observed in the case of a single sherd from Muccia: the grip element has a cylindrical end inserted in a hole on the surface of the vessel. Surface finishing treatments undergo changes over the time. During phase 1, the outer surfaces are smoothed or left rough, while the inner surfaces are mostly smoothed. In phase 2, both surfaces are generally smoothed.

Petrographic analysis

Archaeometric analysis were performed with the aim to identify the provenance of the clay, raw materials selection system and technological specialization for each settlement.

The pottery assemblages and the local/proximal clayey sediments underwent petrographic, mineralogical and chemical analysis (OM, PXRD, XRF, SEM). They were performed at the University of Bari (Dipartimento di Scienze della Terra e Geoambientali). The discussion will focus on the most indicative data of this preliminary study, in particular on some aspects of the mineralogical examination on thin sections.

To obtain a representative sampling for each site a different number of ceramic sherds were collected, relating it to identified changes in paste classes. Petrographic analysis were performed on 57 ceramic samples from the four sites (*figs. 7* and *8*). In addition we added 38 samples of clayey sediments (*fig. 9*) from two sites, Portonovo (phase 1, coast) and Esanatoglia (phase 2, inland).

Thin sections were examined by means of a petrographical microscope, distinguishing among temper, matrix and voids characters (*Maggetti 1982*).

Pottery petrographic groups can be divided into two macro-groups according to the amount of calcite in the ceramic body: non calcareous clays (*fig. 7: 3–8*) are more abundant and characterized by a content of CaO less than 8 % (XRF); calcareous clays (CaO more than 8 %) are less numerous (*fig. 7: 1–2*).

In Ca-rich samples, calcite is mainly of biological origin (*fig. 7: 1*), such as fossiliferous limestone or fine-grained calcite. Samples characterized by a Ca-poor body register heterogeneous grain size and texture, clayey matrix. Non-plastic inclusions are primarily represented by quartz and chert (*fig. 7: 3–6*). Groups can be clearly distinguished by the presence of carbonate, metamorphic or volcanic rock fragments (*fig. 8*), in other cases by the predominance of biotite and amphibole (*fig. 7: 7*), or ferruginous aggregates (*fig. 7: 6*).

The optical birefringence of the ceramic matrix is, in general, medium or medium-high, except for the *figulina* group (*fig. 7: 2*); sometimes the matrix is zoned because of the partial

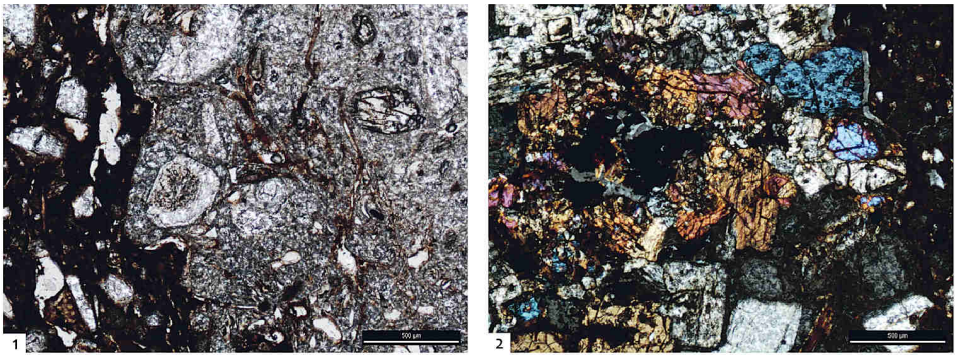

Fig. 8. Thin sections of ceramics: volcanic group from Portonovo site with low birefringence and limited porosity, bimodal texture, rhyolitic rock fragments. 1 5x, N//. 2 5x, N+. Scales: 500 micrometres.

oxidation of the organic matter originally present in the clay. Primary porosity, due to the manipulation of the clay, and secondary porosity, due to drying and firing operations, were detected. Some secondary pores were originated by the combustion of vegetal inclusions. Rare carbonized vegetal relics are clearly recognizable in some samples (*fig. 7: 8*).

A strong compositional variability in raw materials was evidenced, which can be read as a non-standardized raw material selection; this can be verified in each site and in total complex. Therefore, it is evident the plurality of choices regarding the raw material exploitation, related to availability of different clayey sediments.

The correspondence identified in pottery (*fig. 7*) and sediments (*fig. 9*) account for the exploitation of alluvial deposits available close to the settlements, although the similar geological substratum of the investigated sites in proximal areas makes difficult to exclude *a priori* other provenances in the same region. Some of these match with identified geological formations in the vicinity of the sites, while others appear to be as far as 4 km.

The volcanic group (*fig. 8*), typical of Portonovo site, shows rhyolitic rock fragments, pyroxenes and other volcanic inclusions which point to the subalkaline volcanites of the Tuscany magmatic province (*Peccerillo 2003*).

There is also evidence about the possible treatment of the clay, although most of the samples confirm a usage of unprocessed sediment. It is the case of groups characterized by a large amount of chert as a non-plastic inclusion (*fig. 7: 3–6*), for which we found analogous texture and composition in local sediments (*fig. 9: 2, 5–6*). The recrystallization rim around chert inclusions in coarse samples (*fig. 7: 5*) points to the use of unprocessed chert-bearing clays (*fig. 9: 5*). For samples characterized by a significant amount of secondary pores or partial oxidation of the vegetal relics, it is possible to propose an intentional addition (*fig. 7: 8*). *Figulina* ware has been produced with a calcareous and fossiliferous clay, it has very homogeneous matrix, very low birefringence and limited porosity, very fine grain size and unimodal texture (*fig. 7: 2*). It is possible to think that it was probably levigated, because of the coarser body of the sediment samples with similar characteristics.

In a general overview, there was a certain homogeneity in the firing conditions of the artifacts: in most of the samples section is zoned due to alternating reducing and oxidizing conditions during the firing. Only the very-fine paste pottery (*figulina*) shows high sintering:

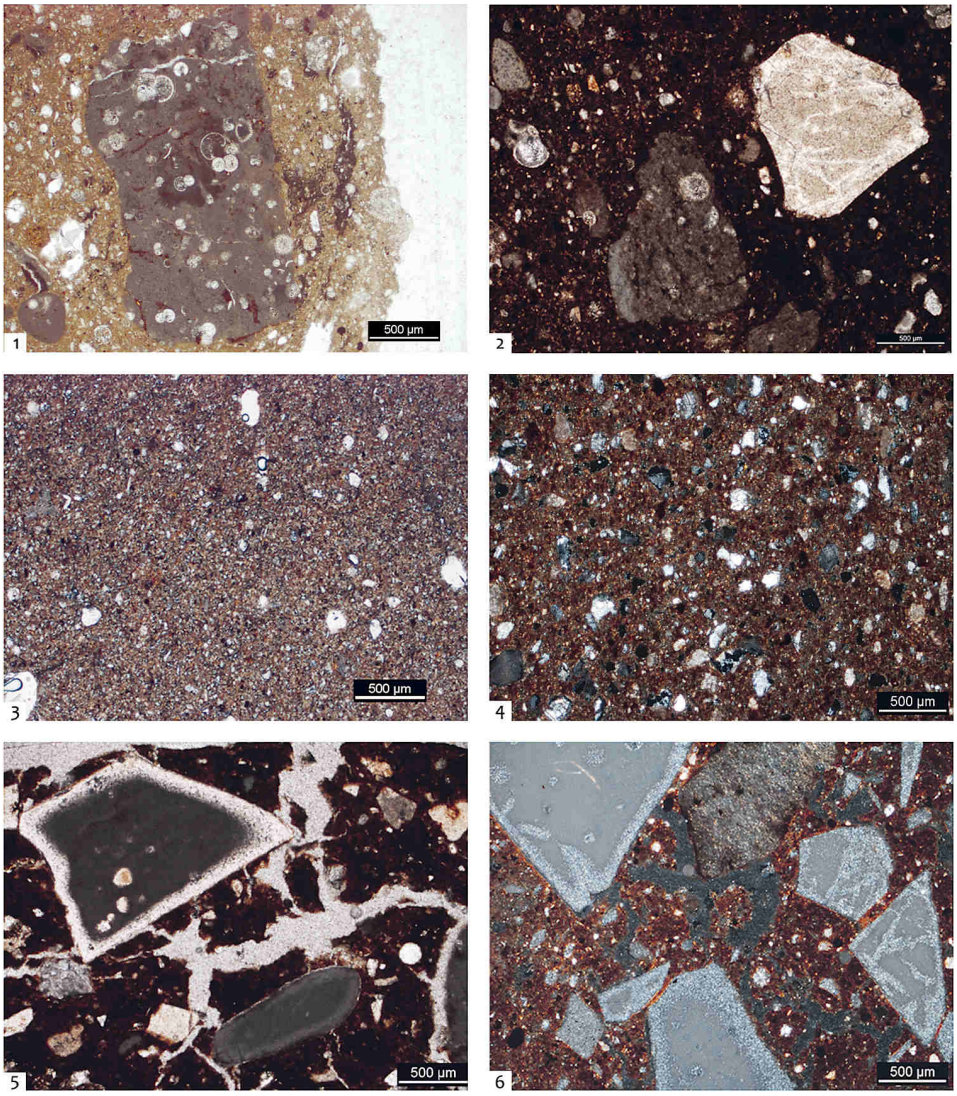

Fig. 9. Thin sections of some of the clayey sediments sampled: Portonovo (1–3), Esanatoglia (4–6). 1 Marl deposit in which some of the ovens of Portonovo were originally excavated (marl and clayey marl Shlier formation, 2.5x, N//). 2 Sediment from landslide with chert and calcareous lithic fragments (limestone Scaglia and marl Shlier formations, 2.5x, N//). 3 Red-soil in which some of the ovens of Portonovo were originally excavated (eluvial/colluvial deposit, 2.5x, N//). 4 Eluvial/colluvial sediment (Camerino Formation, 2.5x, N+). 5 Colluvial soil rich in red chert (Scaglia formation contribution, 2.5x, N//). 6 Terraced alluvial deposit, argilloceous red-soil rich in iron oxihydroides and chert (*Ferretto* soil, 2.5x, N+).

the very low birefringence of the matrix and the vitrification of the fabric indicate high-firing temperature, confirmed by the presence of neoformation phases in PXRD analysis. It could be probably indicative of vessels used in different activities than cooking.

Conclusion

The study of the four pottery assemblages outlines a clear pattern of the pottery production for each local group, highlighting links, affinities and differences between them and allowing comparison with other contemporary cultural horizons.

How can these new data give us more clues about the Neolithisation process of this area?

The process of Neolithisation of this region seems to have followed the main river valleys which link the hinterland to the coast and which were preferred for settlement location. However, the actual correlation between higher dating of sites of inland Abruzzo, Rio Tana (*D'Ercole et al. 2001*, 83) and those of the coastal site of Portonovo (*Conati Barbaro 2013*, 48; *Conati Barbaro – Celant in press*), overcomes the hypothesis of an early appearance of the productive economy in the inner valleys (*Cazzella 2000*). It defines an active role of the coastal areas in this process.

The Early Neolithic of western Middle Adriatic region is marked by characteristic pottery styles which allow to distinguish a two stages process: the Impressed Ware pottery, which has a long duration, first appears in its traditional style in Portonovo and Muccia; over time a change in local pottery production is recognizable by the appearance of new elements, probably in part related to new impulses and contacts with cultures of Central Italy (Catignano, Linear pottery) and the Po Valley (Fiorano, Vho).

The Neolithisation of the area and, more in general, of the Middle Adriatic Italian region, might be more complex than previously known and the coastal sites may have played an important role in the diffusion of the first pottery and settled villages along the region.

How can we read the high variability observed on the supply of raw material?

The exploitation of raw material seems to be closely linked to the territory and to the presence of domestic productions. Some of these sources match with the geological formations in the vicinity of the sites, while others appear to be as far as 4 km. The presence of fabrics with locally available *petrofacies* may be interpreted either (a) as the result of a local production (to exploit the same clay from proximal areas to make pottery elsewhere is technologically meaningless); (b) or it could suggest the presence of other unknown settlements along the fluvial valleys which made the same pottery.

Therefore, the use of sources located at varying distances from the settlements could indicate different units of domestic production within a village or the presence of small groups spread over a limited area using different clay sources. This internal variability probably suggests the existence of several groups in the same valley connected to each other, whose echo survives in the archaeological record.

There is also evidence of non-local provenance of some pottery sherds. It is the case of the volcanic group, to which only three samples from Portonovo refer. At macroscopic scale they are well-recognizable by the presence of "vitreous" inclusions, so it was possible to define the incidence of this group on the entire record (less then 0.2 %). Their brown colour with darker section and the characteristic inclusions find comparisons with some Tuscany Neolithic ceramics, such as samples from Grotta del Beato Benincasa site (*Martini et al. 1996*, 131). Volcanic pastes with the same petrographic characteristics are variously attested in different Tyrrhenian sites: Muraccio-Pian di Cerreto, San Rossore-Poggio di Mezzo,

Pianosa-Cala Giovanna Piano, Le Secche-Isola del Giglio (*Gabriele – Tozzi 2013*). An extra-regional provenance of this class could be considered, suggesting contacts with contemporary Neolithic groups of the north-Tyrrhenian area.

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