

Plant impressions and cereal remains in Neolithic pottery from the Arene Candide Cave (Finale Ligure, Italy)

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PURPOSE OF THE RESEARCH

The Arene Candide Cave preserves one of the most detailed and complete stratigraphy in the Mediterranean, spanning from the Upper Paleolithic to the Byzantine Age. The site has been investigated by several excavations since the second half of the nineteenth century (Fig. 1).

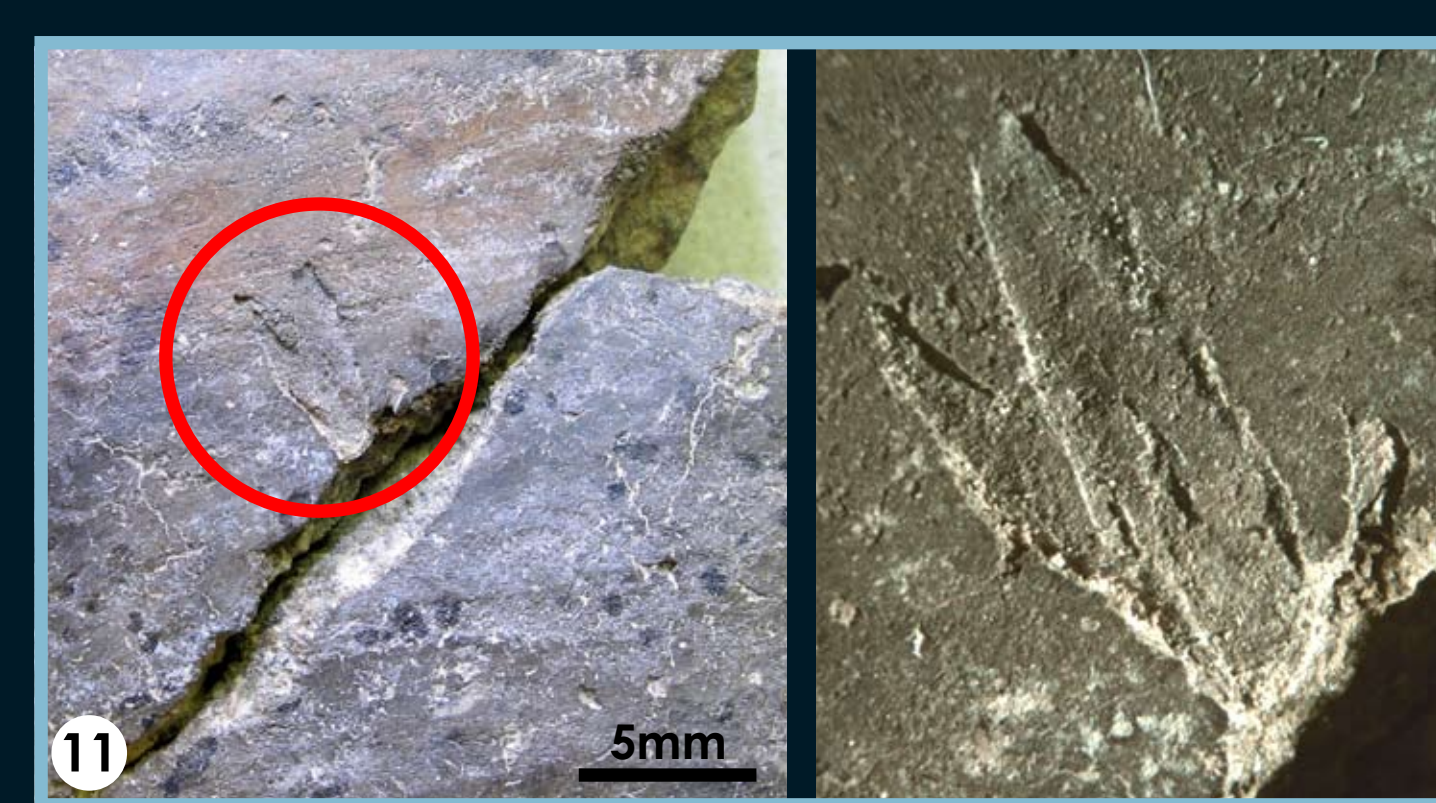
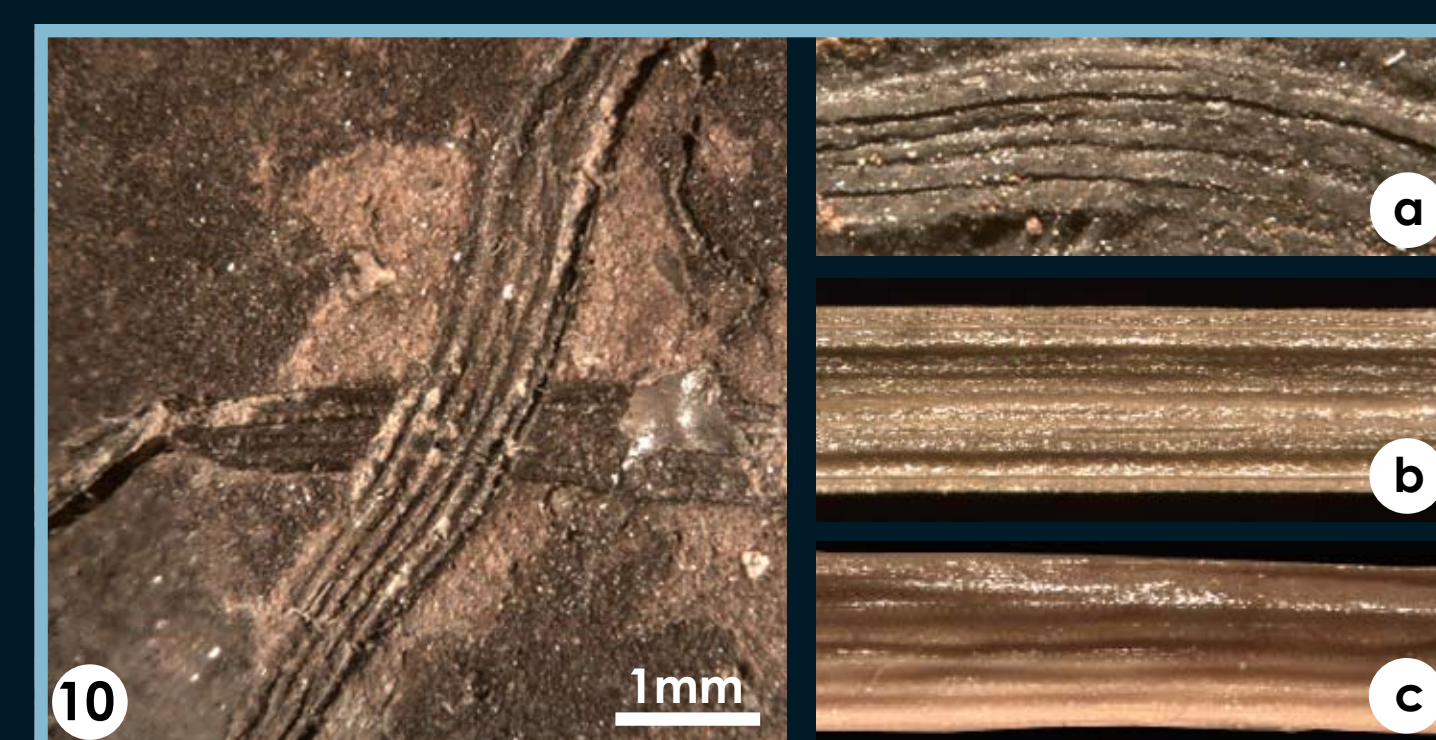
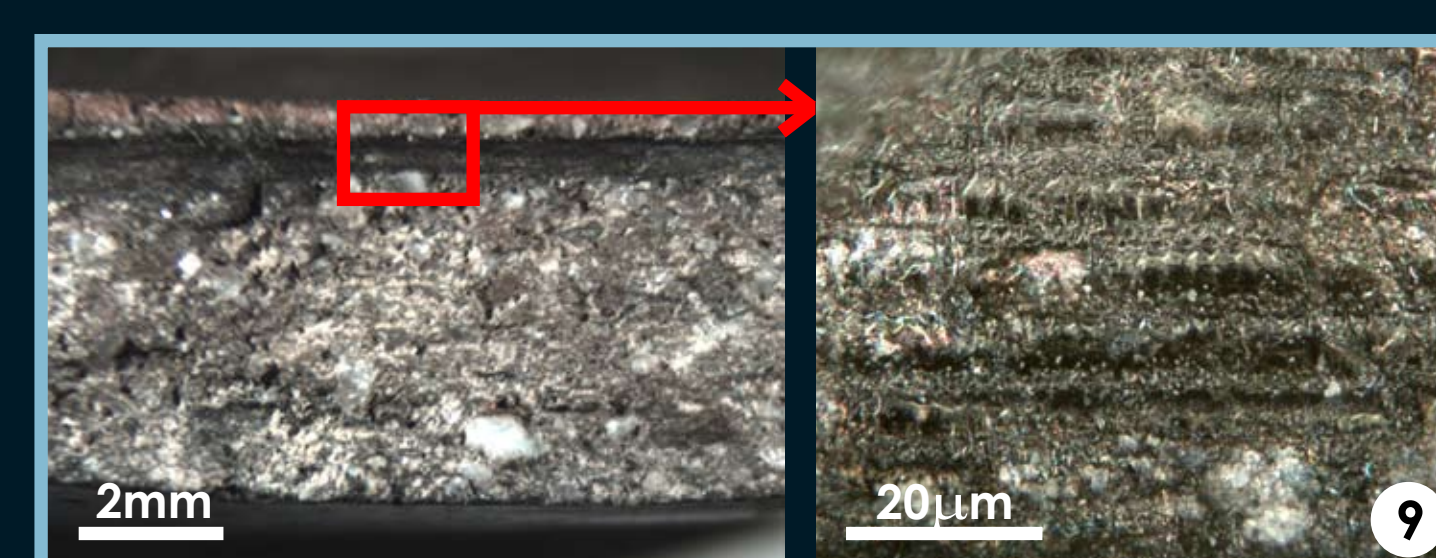
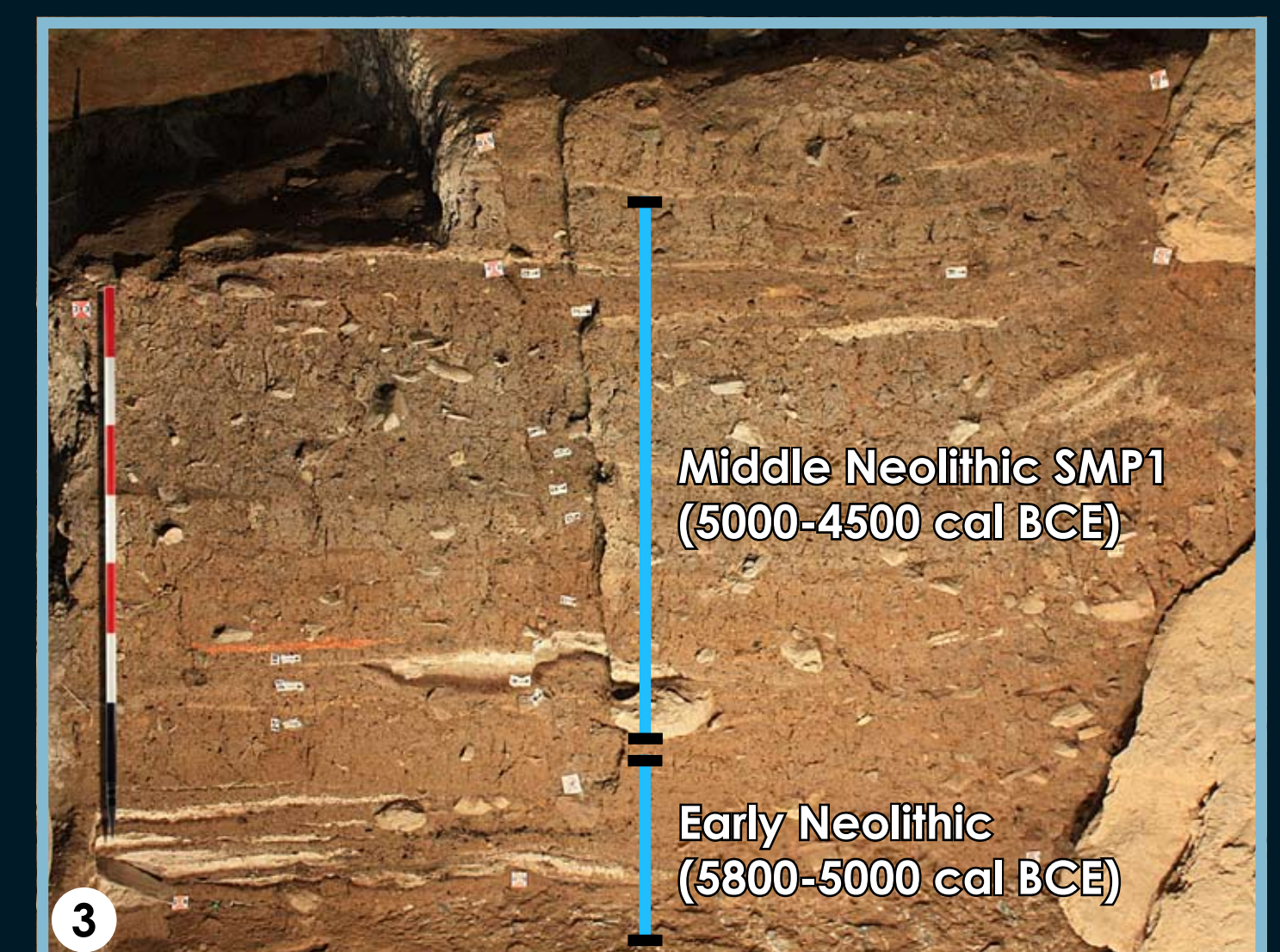
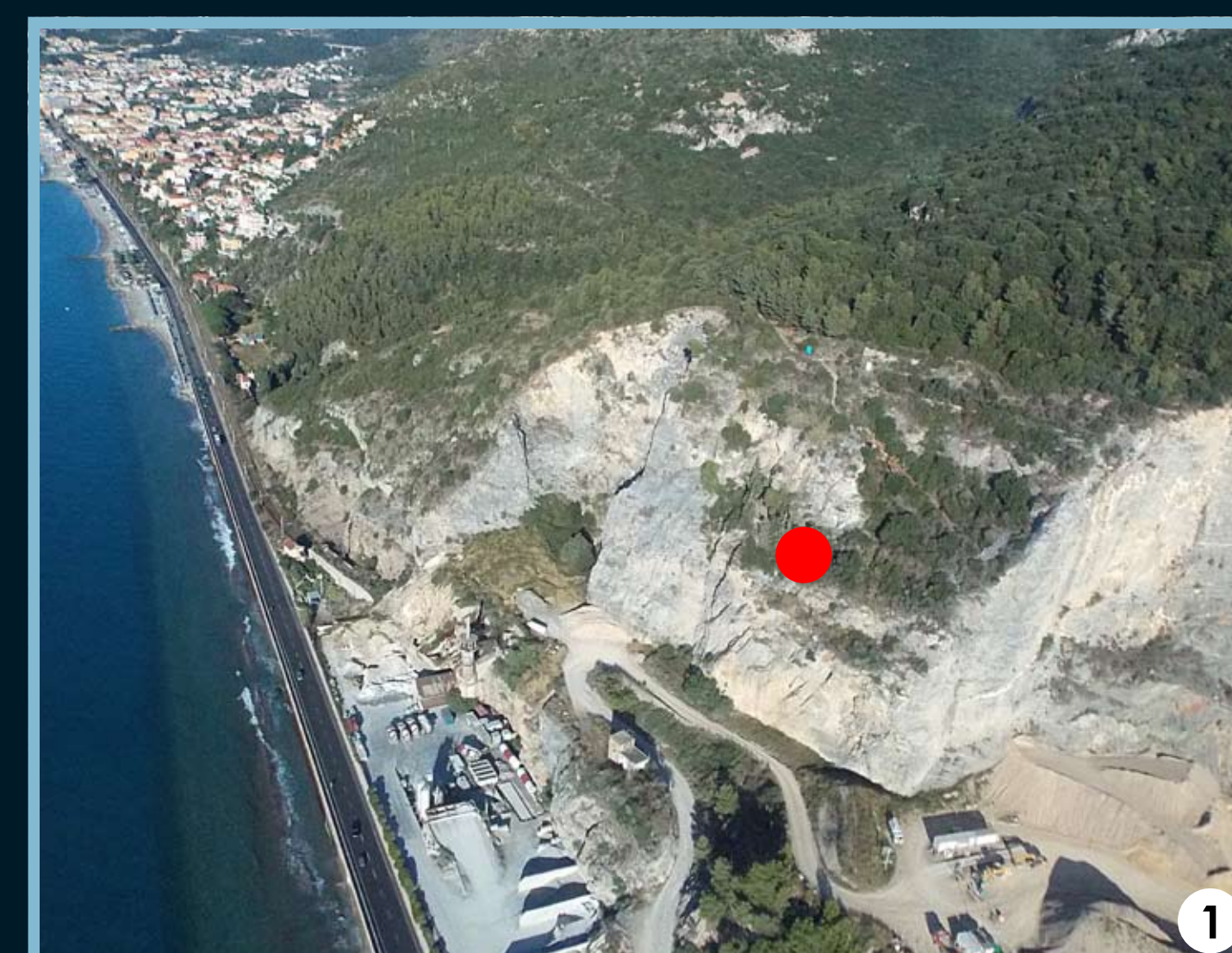
While the Neolithic sequence of this cave has been repeatedly investigated between 1941 and 1977 (Bernabò Brea 1946, 1956; Maggi 1997; Tiné 1999) recent excavations (1997-2012) added new and relevant data on the VI millennium BCE layers (Impresso-Cardial Complex/first phase of the Square Mouth Pottery Culture – SMP1) (Figg. 2-3).

Following previous works (Evet & Renfrew 1971; Arobba et al. 1997), this research presents new data on the incidence and types of bioclats embedded in the potsherds as charred remains or imprints based on the analysis of the whole pottery assemblage.

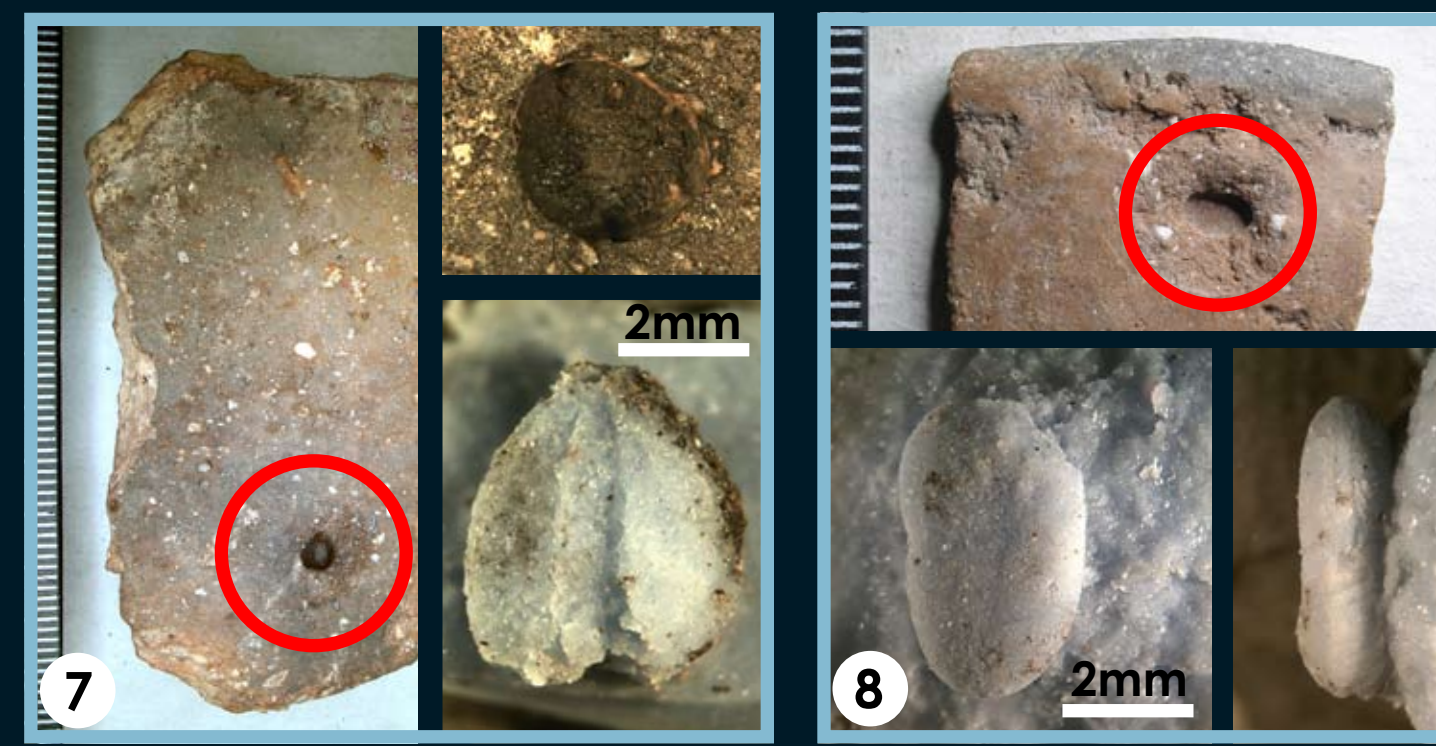
MATERIALS AND METHODS

During this research were analysed the pottery shards found in the recent excavations, for a total of 5560 fragments. This assemblage derives from about 300 vessels, of which more than two-thirds relate to the earliest phases of the Neolithic occupation (Impresso-Cardial Complex). The analysis was conducted in stereomicroscopy (10-75x) and using an optical microscopy in reflected light with darkfield (75-750x) directly on the remains, or on casts of the imprints obtained by high-definition silicone elastomer (Provil Novo) according to the method proposed by Arobba & Caramiello (2006) and Sestier et al. (2011).

1. Geographic collocation of Arene Candide Cave facing the Ligurian Sea - Lat. 44,1623385; Long. 8,3283117; 90 m a.s.l. (by courtesy of Carabinieri 15° Nucleo Elicotteri Albenga); 2. Field's excavation in the neolithic layers (2012). 3. Neolithic stratigraphic sequence (latest excavations).



4. *Triticum monococcum* (spikelet); 5. *Triticum dicoccon* (endocavity cast and charred grain); 6. *Triticum dicoccon* (endocavity cast of the grain impression); 7. *Hordeum vulgare* (endocavity cast of the grain impression); 8. *Medicago* sp. - cf. *M. minima* - (endocavity cast of the seed impression); 9. Culm with elongate spiny phytoliths (*Pooideae* type); 10. Straw (cf. culm of cereal) cast (a) compared with actual culms of *Triticum dicoccon* (b) and *Hordeum vulgare* (c); 11. Light chaff (lemma and palea) of cereal grain.



DISCUSSION

The comprehensive examination of the bioclats found in the Neolithic potsherds from the recent excavations conducted at the Arene Candide Cave has provided paleoeconomic data related to everyday productive, farming and nutrition practices.

The analysis of the pottery paste confirms the use of mostly local raw materials and excludes the intentional addition of vegetal tempers.

The cereal remains (spikelets, grains, glumes, lemma and palea, culms and leaves) attest the presence of species already evidenced by the archaeobotanical analysis of macroremains extracted from sediments (*Triticum monococcum*, *Triticum dicoccon* e *Hordeum vulgare*), and confirm the practice of farming in the oldest stage of Neolithic (Impressed Ware).

The small charcoals may result from clays collected from secondary deposits and/or be a residue of dispersed hearths. The imprints of *Thelypteris palustris* emphasize the past presence of wetlands in the areas of raw material supply.

These interesting results support an approach based on the analysis of macroremains embedded in pottery alongside more traditional archaeobotanical studies (Arobba et al. 1997, 1999; Nisbet 1997a-b; 2008; Branch 1997; Castelletti & Castiglioni 1999; Arobba & Vicino 2003).

This research suggests that the botanic remains embedded in the artifacts constitute a valuable opportunity for direct dating of diagnostic pots.

In fact, large pottery shards are less susceptible to stratigraphic dislocations (anthropic- and bio-turbations) when compared to loose seeds and charcoals.

RESULTS

The pottery analysis detected four different kind of vegetal elements on 24 fragments, corresponding to 20 different vessels, including 16 from the earliest levels and 8 related to the first SMP phase.

1. Seeds/fruits imprints or remains

Seven remains are related to caryopsis or spikelet fork with residues of glume, lemma and palea (Fig. 4-7, 11) of *Triticum monococcum*, *Triticum dicoccon*, *Hordeum vulgare* and *Triticum vel Hordeum*.

A single imprint of a *Medicago* sp. seed, (cf. *Medicago minima*), an annual xerothermophile herbaceous plant which is currently widespread in Ligurian arid grasslands and garrigues, from the coast to the hilly-mountain was found (Fig. 8).

2. Culm remains

Five macroremains belong to hollow stems with parallel veins (average diameter of 0.87 mm), attributable to Monocotyledons (Fig. 9-10).

In some of these elongate spiny phytoliths (50-70µm) such *Pooideae*, related to different parts of cereals (culms, leaves and spike rachis) were found.

3. Imprints of fronds and remains of leaf

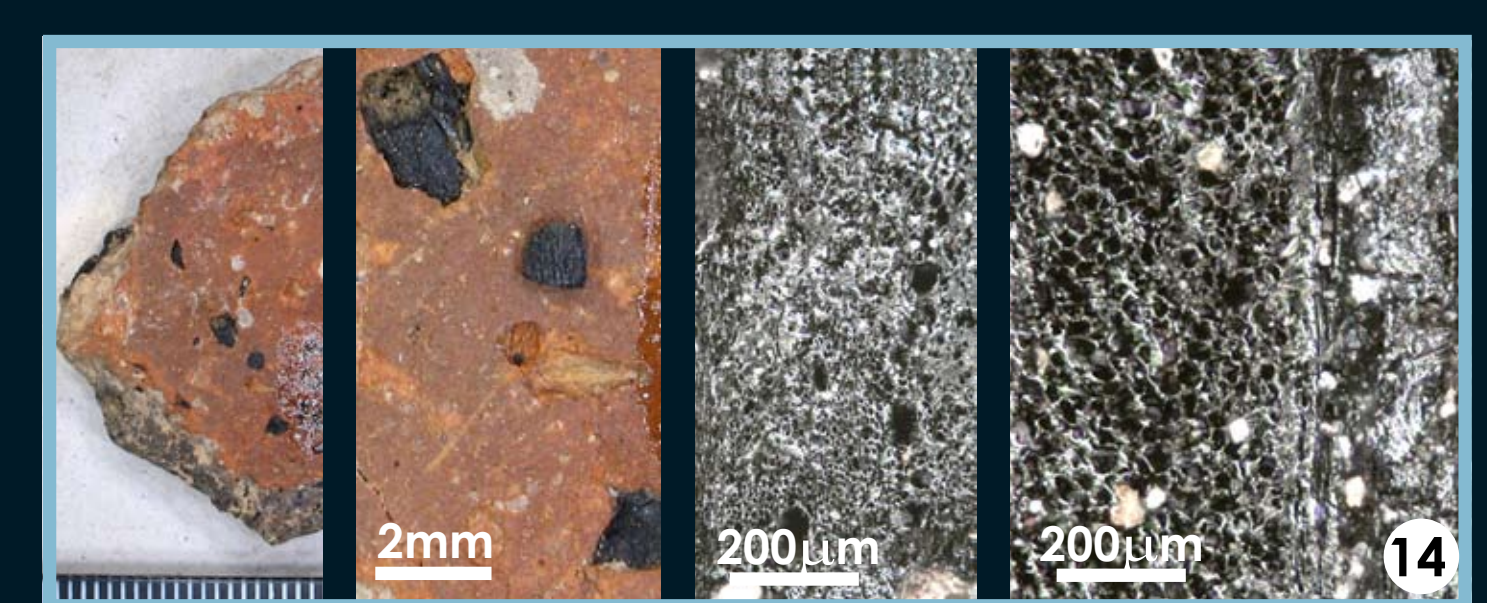
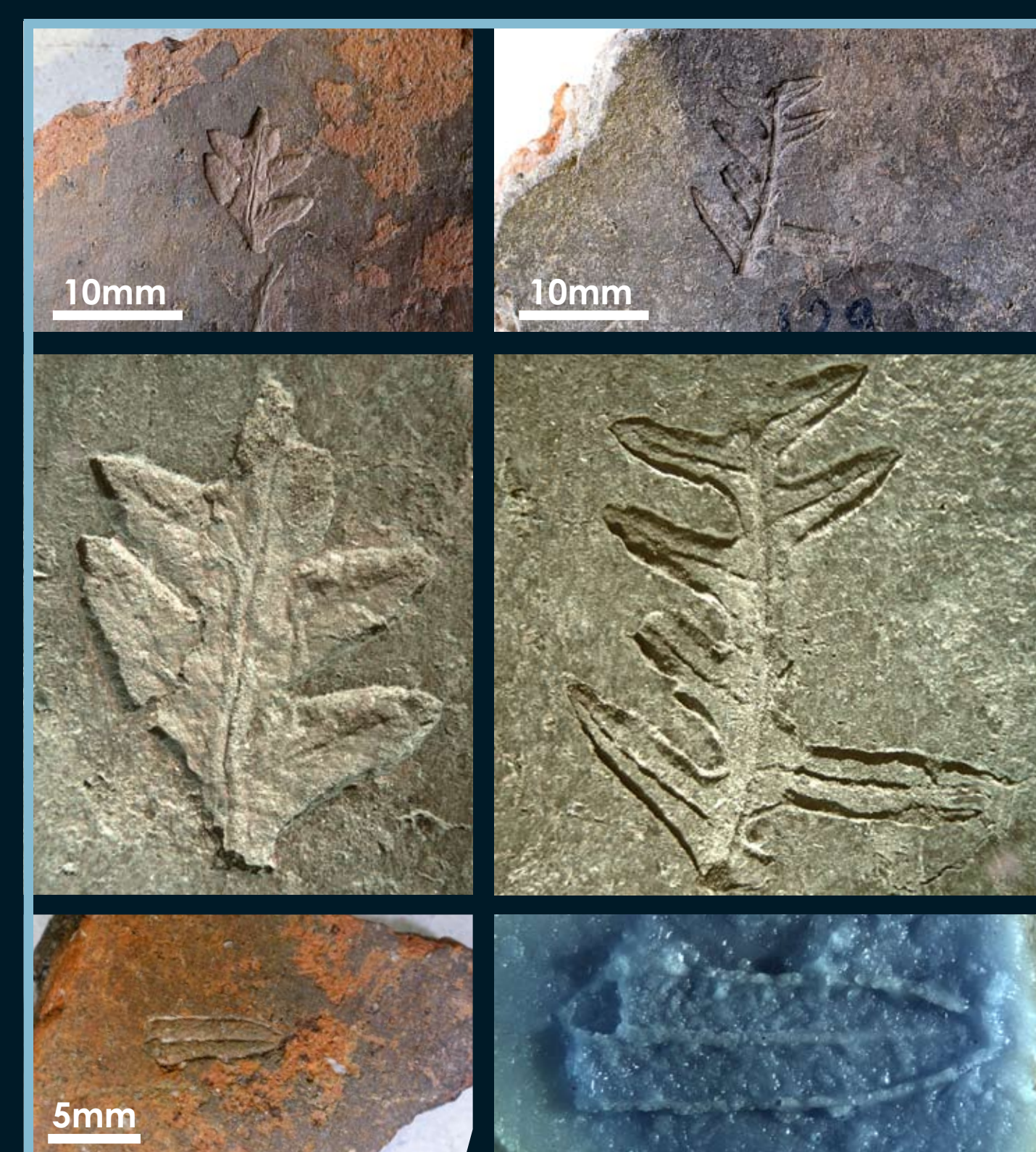
Two shards, from the same vessel, show on their internal and external surfaces imprints of portions of pinnae and pinnule of *Thelypteris palustris*, a fern which cannot be found near the Arene Candide site nowadays, but is still reported in the wetlands of Central and Eastern Liguria (Fig. 12).

On the fractures of two shards were found two imprints of leaf blades (9,1x3,5mm and 5,9x2,7mm) oblong-lanceolate shaped with pinnate veined, with weakly serrated margin; the largest is fitted with a petiole 2,3mm length (Fig. 13). Both are probably related to the same species of Angiosperm Dicotyledone, whose precise taxonomy has yet to be determined.

A single fragmented specimen of a linear leaf with parallel veins and intact margins (20x2,2mm) can be related to a Monocotyledon (cf. *Poaceae*).

4. Wood fragments

Six other findings, mostly founded along fractures of potsherds, are attributable to different arboreal-shrub plant: *Quercus* sp. (cf. *Q. ilex/coccifera*), *Rosaceae Prunoideae* (cf. *Prunus spinosa*, *P. mahaleb*, *P. padus*) and to a conifer that cannot be better determined because of the reduced size of the sample (Fig. 14).



12. *Thelypteris palustris* (pinnae fragments and pinnule impressions with its cast compared with the actual fern); 13. Leaf found in shard cross section (Angiosperms Dicotyledones). 14. Wood charcoal of *Quercus* sp. (cf. *Q. ilex/coccifera*).

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