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Charred honeycombs discovered in Iron Age Northern Italy. A new light on boat beekeeping and bee pollination in pre-modern world

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ABSTRACT

In the ancient world beeswax and honey were of crucial importance not only for nutrition, but also for a range of activities including various artisanal practices. A rich body of iconographic and literary evidence has proven very informative, but archaeological data are strongly underrepresented in studies on ancient beekeeping. A multidisciplinary excavation project of the Etruscan trade center of Forcello near Bagnolo San Vito (Mantua province), led to the discovery of charred honeycombs in a workshop dated to 510-495 BCE. Morphoscopical, palynological and chemical analyses (IR, LC-MS, GC-MS) were conducted on these honeycombs and their associated materials (bee-breads and a mixture of melted honeycombs) in order to reconstruct beekeeping practices and the local environment. Palynological data indicate that honeybees were feeding on plants from both aquatic and ruderal landscapes. The palynological record from the bee-breads suggests the practice of itinerant beekeeping along rivers, an activity described by Pliny the Elder (Natural History, XXI.43.73) a few centuries later in relation to the town of Ostiglia (Mantua province) ca. 20 km downstream the investigated site. Hence, confirming the historical source, beekeeping in Iron Age Northern Italy appears to be characterized by a remarkably high degree of specialization. In addition, the pollen content of the melted honeycombs provides evidence for an unprecedented *Vitis vinifera* (grapevine) honey. The pollination syndrome suggests that bees fed on nectar of pre-domesticated or early-domesticated varieties of *Vitis vinifera*, confirming the archaeobotanical record of pips from Iron Age Northern Italy.

1. Introduction

In the pre-modern world beeswax and honey were precious and omnipresent products in the diet, craft production, and domestic life (Crane, 1999). A rich corpus of iconographic and written sources highlights the importance of beekeeping in the ancient world (Crane, 1999; Crane and Graham, 1985), while a recent study of lipid residues in pottery vessels has confirmed the antiquity — down to the 7th millennium BCE — of beeswax use in the Old World (Roffet-Salque et al., 2015). Despite this richness of iconographic, literary, archaeometric and ethnographic data (Evershed et al., 2003; Bonet Rosado and Mata Parreno, 1997; Mazar et al., 2008; Bradbear, 2009) there is a relative lack of direct archaeological and fossil evidence related to beekeeping and honeybees. If the importance of honey and beeswax in ancient communities is a state of fact (Crane, 1999)

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and the antiquity of their use has been proven (Roffet-Salque et al., 2015), very little is understood about the ways in which beekeeping was organized and conducted in the ancient world, because of the rarity of direct evidences — prior to this study basically limited to the apiaries of Tell Rehov, Israel (Mazar et al., 2008; Bloch et al., 2010). The literary accounts from the Roman, Greek and Medieval civilizations provide the principal available information on this subject, leaving us with very few clues regarding beekeeping in the pre-classical world. In addition, the textual evidence is as precious as problematic (Green, 1986) and requires a careful and critical evaluation based on a concordance with the archaeological data.

In spite of the perishable nature of the archaeological record, there are a number of palynological, chemical and genetic techniques to detect and to characterize ancient bee products, which allow to infer the use of honey and beeswax, as well as bee pollination biology in the past (Dickson, 1978; Körber-Grohne, 1987; Cattani, 1993; Evershed et al., 1997; Roffet-Salque et al., 2015; Rageot et al., 2016). These techniques proved to be successful even with poorly preserved and long processed materials (e.g. Deforce, 2010 and reference herein), but the availability of ancient hives, possibly bearing bee products *in situ*, would strongly increase the potential insight on beekeeping, beehive ecology and pollination biology. Yet, to our knowledge no subfossil/fossil honeycomb has been subjected to scientific study.

With the hope to partially fill this important gap, we provide here the first communication of honeycombs and honeybee products discovered in the Etruscan settlement at Forcello near Bagnolo San Vito (16 m asl, 45°06′36″ N, 10°50′06″ E, province of Mantua, northern Italy; Fig. 1). If at first those finds are an outstanding evidence of beekeeping in antiquity, adequately studied they provide as well unique information on the ancient Po Plain environment and on honeybees' behavior in a pre-modern landscape. Accordingly, those finds have been investigated by means of morphoscopic, palynological and chemical analysis. We then compared the data obtained from the honeycombs with the paleobotanical record coming from their findspot context as well as with outdoor sediments. The overall archaeobiological and chemical evidence is finally discussed in the light of the subsistence economy of the site. In its conclusion our scientifically-built narrative eventually matched the historical written sources, namely shedding new light on a specific passage from Pliny the Elder (23–79 CE).

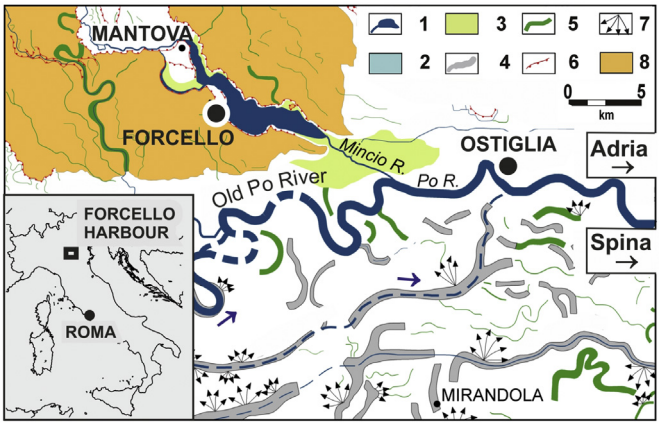

Fig. 1. Palaeohydrographic map of the central Po Plain in the 5th century BCE. The Forcello settlement was built along the lowermost track of the Mincio River valley, a tributary of the Po River. A lake (Forcello Lake) occupied the lowermost track of the Mincio River valley, entrenched into the Last Glaciation plain surface. Corings in the lake sediments enabled the reconstruction of its extent and dynamics. The Forcello harbor was situated on the lake edge. Key: 1) Rivers and lakes (dashed lines depict presumed fluvial tracks), 2) High water fluvial bed, mostly between main levees (not shown in figure), 3) Poorly drained lowland, 4) Alluvial ridge, 5) Abandoned fluvial course, 6) Main fluvial scarp, 7) Crevasse splay area, 8) Last Glaciation plain surface.

2. Archaeological context and the honeycombs discovery

The town of Forcello was founded shortly after the mid-6th century BCE on the banks of a former lake drained during the Renaissance (Ravazzi et al., 2013) a few km to the south-east of Mantua. This 12 ha settlement acted as a fluvial port of trade until its final abandonment around 375 BCE. The strategic position on the inland waterways enabled shipping connections to Adria and Spina, the Upper Adriatic harbors at the end of the sea route from Greece. The key role of the settlement in trade networks is attested by the impressive amount of Attic pottery and Greek transport amphorae discovered at the site, as well as by other materials highlighting contacts with central European Celts and non-Etruscan cultures of Northern Italy (de Marinis and Rapi, 2007).

The materials considered for this paper come from the stratigraphic Phase F of the excavation, dated according to the material found *in situ* between 510 and 495 BCE (de Marinis, 2010, 2016). The F phase in the investigated area (sectors Q-R-S 18–19) is represented by two houses (named F1 and F2; Fig. 2). A violent fire ended the buildings and the destroyed habitation level (SU476) was soon sealed by a layer of clay over the area to facilitate its reclamation. The findings are therefore preserved *in situ* albeit heavily fragmented and often warped by the heat of fire. The two F phase houses likely formed a single functional unit, an aristocratic *oikos*, which extended 314 m^2. The number, shape and size of the rooms differentiate F2- from F1 house, as well as in part the building techniques. F2 house, which covers a total surface of 100 m^2, was made up by three rooms: a small service room to the south-east (room 2); a large room of 38 m^2 with a centrally placed hearth (room 1); and a large rectangular room located to the north-west covering an area of almost 50 m^2 (room 3). Scattered on the floor of room 3 were found the charred honeycombs and honeycombs remains, found together with clots of charred vitrified porous honeycomb components (hereafter charred clots).

Beside the honeycombs, Room 3 of F2 house is characterized by a number of atypical features, altogether indicating an artisan destination of this space. Its floors seem to have been used as work-surfaces, being much blackened in some parts, burnt and reddened in others. The ditch that borders the north-western short side of the house features a series of postholes, arranged regularly at intervals of 85 cm, indicating that the north-western side of Room 3 was built with wattle and daub instead of a self-supporting wooden structure technique as the whole F1 house and of the other walls of F2 house. The choice of wattle and daub technique was probably linked to the craft activities done in the room. Indications of craft activities in Room 3 are provided also by a considerable amount of truncated pyramid-shaped loom weights and hundreds of unworked coral branches. For a detailed description of the phase F houses see de Marinis (2016) and Quirino (2011).

3. Material and methods

3.1. Sampling and macroscopic remains analysis

The phase F fire layer (SU476, the charcoals layer deposed as a consequence of the fire's destruction) was fully sampled: all the fire debris in each square of the excavation grid (1 m^2) was collected. 40 samples (304,600 ml) coming from 27 excavation squares (i.e. 27 m^2) were subjected to semi-flotation (Hosch and Zibulski, 2003) with 4 mm, 2 mm, and 0.35 mm sieves. The entirety of the processed samples has been screened under a binocular stereomicroscope for the presence of honeybees and honeycombs remains. The