Providing fuel, building materials and food for gold exploitation in the Eastern Desert, Egypt: Multidisciplinary dataset of the Ptolemaic site of Samut North (late 4th c. BCE)

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Abstract

Egypt's Eastern Desert, located between the Nile and the Red Sea, is one of the most arid regions of the world, where organic remains are particularly well-preserved. Archaeobotanical, archaeoentomological and textual data from the excavation of the gold mining site in Samut North, occupied at the beginning of the Ptolemaic period (late 4th c. BCE) provides unique opportunity to explore how people managed their need for fuel, wood and food at a period not currently well documented. Acacia (*Acacia* sp.) was the most important fuel, used for all artisanal and domestic heating activities. Other fuel resources (twigs, shrubs, maybe coprolites) were used sporadically, and are only associated with domestic contexts (cooking, heating, lighting, etc). Wood timber and wooden objects were made of *Leptadenia pyrotechnica* (Forssk.) Decne. 1838, acacia, caper (cf. *Capparis decidua* (Forssk.) Edgew.), tamarisk (*Tamarix* sp.) and coniferous (*Cupressus*/*Juniperus*) woods. Food products show little diversity: barley (*Hordeum vulgare* L. 1753), free-threshing wheat (*Triticum* cf. *turgidum* subsp. *durum*/*turgidum*) and lentils (*Lens culinaris* Medik. 1787). Several insects, some of them attested for the first time in an archaeological context, were common woodborer or crop pests. Plants used for fuel and woodworking are mostly of local provenance and charcoal fuel was produced locally, showing a good knowledge of desert resources. The majority of food remains came from the Nile Valley or from the oases of the Western Desert, with a limited supply of local wild desert fruits and seeds. This analysis offers an original dataset for a poorly documented though critical period, at the very beginning of the Ptolemaic period, and reveals an elaborate economic system with local supply networks and imported products, mostly aimed at essential needs.

Introduction

Egypt's Eastern Desert, located between the Nile and the Red Sea, is one of the most arid regions of the world, with important thermal amplitudes (Barron and Hume, 1902). Vegetation is sparse, except in some well-watered temporary watercourses (*wadis*) or in the mountains close to the Red Sea (Andersen, 2012). The region is mainly occupied by pastoral tribes and has seen neither permanent agriculture nor permanent occupation during the last 10,000 years. However, it has been visited, crossed and exploited since Predynastic times because of its strategic position and its natural mineral resources, ranging from gold, copper and emeralds to high quality stones (Barnard and Duistermaat, 2012). While the overall pattern of human occupation in the Egyptian Eastern Desert seems clear, the Roman and Late Roman periods (1st–5th c. CE) are by far the best documented through archaeological studies (Cuvigny, 2011; Peacock and Blue, 2006; Peacock and Maxfield, 2007), including archaeobotanical works focusing on the acquisition and trade of food and wood (Cappers, 2006; Tengberg, 2011; Van der Veen, 2011, 2001; Van der Veen and Tabinor, 2007; Vermeeren, 2000, 1999, 1998). In comparison, the Ptolemaic period, from the end of the 4th c. to the end of the 1st c. BCE, has received little attention – most of the available data comes from textual studies, with none of the known 60 Ptolemaic sites being excavated until 2013, aside from the harbours of Berenike and Myos Hormos (Figure 1). This period, however, is extremely important, as it was during this time that the Graeco-Macedonian dynasty massively invested in the area, equipping roads with way stations, wells, watch towers and activating/reactivating dozens of gold mines (Redon, 2018, 2016). Samut North is one of these key gold mining sites, occupied at the very beginning of the Greek domination of Egypt. Archaeological campaigns conducted between 2013 and 2015 by the *Mission archéologique française du désert Oriental* (MAFDO), under the direction of B. Redon and co-direction of Th. Faucher, provide new data on the organization of mining works and the miners' daily life. Due to desert climatic conditions, the specificity of the mining work and the difficulties of the water supply obtaining fuel was key. In addition, edible plants could not be cultivated locally in large enough quantities and the use of local plant resources required knowledge of the desert. Food, fuel and building activities were therefore constant challenges which we explore through archaeobotanical, archaeoentomological and textual sources.

The Ptolemaic Site of Samut North

The mining district of Samut is located in the south-centre of the Eastern Desert, in a region rich in gold resources that have been exploited since the Predynastic times (Figure 1). Samut North (E 33°54'18", N 24°48'35") is located within the mountains, close to an auriferous vein that was exploited through open-air pits and small galleries (Figure 2). Excavations revealed several zones of ore crushing as well as two huge mills for grinding. After grinding, the quartz flour was washed and the gold was smelted. No traces of gold washing or melting process (except one testing furnace) was found, indicating that this took place in the Nile Valley. A nearby structure (Building 1) hosted the command, the troop and some of the miners. All the rooms of Building 1 were excavated, except those destroyed by recent mining work. Almost all yielded artefacts evidencing several room's function: a kitchen (Room 116), storerooms (117, 120–122, 135, 137, the last being full of charcoal), living quarters (north wings), dormitories (129, 132 and maybe 138) were recognised (Figure 2). Externally, one forge (402–403) was presumably dedicated to producing and repairing iron mining tools, and one furnace (152) may have been sporadically used for melting gold and refining tests. Analysis of the pottery and the few texts found on the site, mainly *tituli picti*, i.e. inscriptions on vases, that record the name of the addressee, the contents of the jars, or their quantity, demonstrates that the occupation of Samut North dates back to the last quarter of the 4th c. BCE, probably around 310 BCE, and was short and seasonal (For more details on the site, see Redon and Faucher, 2020).

Present climate and vegetation

Egypt's Eastern Desert has a hot desert climate (Köppen climate classification *BWh*), with average rainfall of around 0-5 millimetres and extreme heat during the summer months. These conditions began some 6,000 years ago, as shown by paleoclimatic studies in the Red Sea mountains (Butzer, 1999; Moeyersons et al., 1999), as well as in the wider north-eastern African region (Hoelzmann et al., 2004; Kuper and Kröpelin, 2006).

Trees, shrubs and herbaceous plants are absent today in Samut North and in the immediate area, partly because of current intense mining works. Some isolated acacia trees (*Acacia ehrenbergiana* Hayne, 1827, *A. tortilis* (Forssk.) Hayne (1827)), overexploited for fuel and grazing, grow a few miles away, along with bushes of *Zilla spinosa* (L.) Prantl, 1898. *Wadis*, located further afield, host greater biodiversity, with gallery forests composed of acacia and shrubs, and herbs, such as *Artemisia Judaica* L., *Pulicaria undulata* (L.) C.A.Mey., 1831, *Forskholea tenacissima* L., *Fagonia* spp., *Farsetia longisiliqua* Decne., *Morettia philaeana* (Delile) DC., at a lower layer (Figure 3).

Materials and Methods

Archaeobotanical data

Samples selection and processing

Soil and hand-picked plant material were randomly sampled from different excavated areas in Samut North, namely Building 1, Forge 402–403 and Furnace 152 (Figure 2), corresponding to various occupation and destruction layers (see details Table 1).

For time and logistic reasons, only small volumes of sediment (0.15 to 3 litres) were sampled. In total, 21 soil samples, representing 16 loci and 33.15 litres of sediment were dry-sieved with coarse (2 mm) and fine (0.4 mm) sieves. All fine fractions from Room 116 (six samples) were manually floated. The dry-sieved or floated fractions were sorted by eye and under a stereoscopic microscope to extract seed, fruit, chaff elements, charcoal and non-plant remains, such as animal droppings, insect, microfauna, artefacts, etc. (Table 1). All the soil samples contained plant remains. Fourteen contained wood charcoal (13 samples studied) and eight samples had charred and uncharred seeds and fruits. Coprolites were present in five samples and insect remains in three. Twenty-nine hand-picked samples, corresponding to 28 loci, included twigs and processed wooden elements, as well as fragments of a wooden door and a bowl (Figure 4). Almost all were studied (27 samples out of 29).

Identification and counting

Identification was conducted at the materials research laboratory of the archaeometrical centre at the IFAO (*Institut français d'archéologie orientale*). Wood charcoal fragments and desiccated wood were identified by anatomical criteria using a reflected light microscope at

50x to 500x magnification. Archaeological specimens were compared to reference atlases (Fahn et al. 1986; Neumann et al., 2001) and a modern wood and charred wood reference collection. Fruits, seeds and other non-woody plant remains were identified by morphological criteria under a stereoscopic microscope (up to 60x magnification) using reference seed atlases (Cappers and Neef, 2012; Neef et al., 2012) and botanical reference collections. Egyptian flora were used for complete the plant descriptions and phytogeographical data (Boulos, 2005, 2002, 2000, 1999). Taxonomical nomenclature follows that proposed by APG III and IV (Chase et al., 2016; The Angiosperm phylogeny group, 2009) for hardwood and Boulos's Egyptian flora for softwood (Boulos, 1999).

Common indices were used to evaluate the charcoal assemblages, namely relative abundance, ubiquity rate, as well as ecological and economic/functional criteria. Due to the limited study time, only 50 charcoal fragments were analysed per sample, with the exception of two samples taken from the forge (403.06_Bot1, 403.06_Bot2; 11 and 10 fragments, respectively, analysed) (Table 2). The qualitative representativeness of the data was explored through taxonomic saturation curves. Five samples are stabilized, while five others are not (Supplementary data 1). Therefore, we cannot exclude a problem of representativeness, which should lead us to be cautious when interpreting the results. An initial dendro-anthracological approach on acacia wood (*Acacia* sp.) was carried out by recording the morpho-anatomical features cited in the literature (Allué et al., 2009; Dufraisse et al., 2017; Théry-Parisot et al., 2010), which inform on the growth conditions and physiological state of the wood before, during and after carbonization. The relevance of several morpho-anatomical criteria were questioned, such as radial cracks to highlight green wood burning, microbiologial and entomological traces as indicator of seasoned wood or vitrified structure to show high temperature (Marguerie and Hunot, 2007; McParland et al., 2010; Moskal-del Hoyo et al., 2010; Théry-Parisot and Henry, 2012). Previous studies on Roman sites in the Egyptian Eastern Desert have highlighted charcoal making based on low taxonomic variability, the charcoal quality when broken, i.e resistant (hard) or not (soft), the important size of fragments and the absence of twigs (Van der Veen, 2011, pp. 221–223, 2001, pp. 203–205; Van der Veen and Tabinor, 2007, pp. 110–111; Vermeeren, 2000, 1999). In this study, the following criteria were recorded: maximal length, presence of bark and heartwood, tyloses (cell proliferation or gummy secretion), fungi hyphae, insect damage, radial cracks, vitrification features, reaction wood and the hardness of charcoal, although this last measure is highly subjective. The evaluation of diameters was carried out only on fragments with bark and heartwood (Table 3, Supplementary data 2).

All processed desiccated wood (objects) were described and taxonomically identified. Desiccated twigs/branches were classified according to their appearance and diameter for each sample and only a selection of each category were analysed (Table 4). Measurements were made directly after the excavation. All the desiccated wood was fragmented, so lengths represent the minimal dimensions.

Seeds, fruits and other non-woody plants were classified by taxa, type of organs and ecological habitat or functional (type of use) groups. Counting was based on the total number of remains, comprising whole and fragmented elements and the estimated minimal number of items (MNI) (Table 5 and 6). These numbers and the ubiquity rate were used to discuss the results.

Archaeoentomological data

Insect remains came from locus 125.05, corresponding to an ashy occupation layer in Room 125, a distribution room leading to a chapel (126) and two storerooms (123-124). The locus also contained charred and desiccated plant remains. Two other contexts provided isolated insect fragments, but were not considered here. The dataset includes 43 well-preserved insect fragments recovered from both coarse and fine sieves. Identification was made according to anatomical criteria and comparison with a modern reference collection. Counting was based on the number of fragments, the number of determined fragments, as well as the minimal number of items, which was carried out by counting single pieces (head, thorax, abdomen, etc) or side components (elytra, legs).

Results

Charcoal

Taxonomical diversity

Wood charcoal fragments constituted the majority of plant remains found at Samut North. The charcoal analysis was based on 13 samples (12 loci) and 575 wood charcoal fragments (Table 2). They were well preserved and few remain undetermined (3% of total amount of studied charcoal). As indicated by the taxonomic saturation curves, we do not have a complete representation of the potential plant diversity (Supplementary data 1). Four taxa were recognised. *Acacia* sp. is present in all samples (547 fragments, 95% of the total number of studied fragments, including five cf. *Acacia* sp.). Taxonomical identification of acacia species is virtually impossible based on anatomical observations only (Neumann et al., 2001, p. 286). However, all fragments have axial parenchyma aliform and confluent to a broadly banded transversal section and broad homocellular rays from 1 to 8(10) cells wide in longitudinal tangential section (Figure 5). We, therefore, identified them as one group, e*hrenbergiana/etbaica/tortilis,* as these are the main acacia tree or shrubs growing locally. Common acacia of the Egyptian Eastern Desert corresponds to trees up to several meters high, namely *Acacia tortilis* subsp. r*addiana* (Savi) Brenan and *A. tortilis* subsp. *tortilis* (Forssk.) Hayne, and shrubby species, including *A. ehrenbergiana* and *A. etbaica* Schweinf. (Mahmoud, 2010, pp. 27–30). The uses and properties of these acacias are manifold. Hard and dense wood is a popular fuel and is sometimes used in construction; the leaves, twigs, bark and fruits are an important source of fodder (especially *A. tortilis* subsp. *tortilis* leaves), the gum of *A. tortilis* subsp. *raddiana* is used for food and medicine purposes, bark is used as tannin and the thorns are used to make traps (Hobbs, 1989, pp. 43, 52, 98–101; Mahmoud, 2010, pp. 27–30). Acacia trees are thus widely promoted in semi-arid and arid regions (Fagg and Stewart, 1994; Le

Floc'h and Grouzis, 2003; Wickens, 1995). Nile acacia (*Vachellia nilotica* (L.) P.J.H.Hurter & Mabb., 2008) growing along the Nile or in shallow water table areas (Boulos, 1999, p. 368) is the only species to have distinctive anatomical criteria and it is not identified in the assemblage.

Three fragments of *Leptadenia pyrotechnica* (Forssk.) Decne., 1838 were found in two loci. This shrub, up to three meters high, does not grow in or around the Samut District today, but it is frequently seen in the Southern Sahara and Northern Sahel. It is important fodder for camels and is also commonly used as fuel. Seeds and young stems are sometimes eaten by local populations and the fibres can be used for making clothes (Hobbs, 1989, pp. 53, 101).

Three fragments of *Tamarix* sp. were present in three loci. Six distinct species occur in Egypt, which cannot be differentiated through anatomical observation (Neumann et al., 2001, p. 415). The two commonest species are a tree, 3 to 12 meters high, *T. aphylla* (L.) Karst., 1882 and a shrub, *T. nilotica* Ehrenb. ex Bunge, 1852. Both grow in the desert and the Nile Valley (Boulos, 2000, pp. 126–129). Tamarisk is commonly used by Bedouin populations as fuel and timber (Mahmoud, 2010, p. 128).

Finally, one fragment of a possible caper tree, cf. *Capparis decidua* (Forssk.) Edgew., was identified. This tree or shrub, up to 8 meters high, grows in *wadis* and sandy and alluvial plains in the Egyptian Desert area (Boulos, 1999, p. 171), although it is no longer present in or around the Samut District. Its hard, compact, imputrescible and termite-resistant wood is used as fuel and for making beams and small tools. The fruits, flowers and flower buds are edible and have medical properties (Mahla et al., 2012; Mahmoud, 2010, p. 49).

Dendro-anthracological description

The maximal length of the charcoal fragments ranged from 2 to 55 mm (Table 3). With the exception of the two samples from locus 403.06 that have small fragments (mean: 5 mm), all the samples showed similar means, from 9 to 13 mm. Fragments with bark (N=32) or heartwood (N=26) were common but in low quantity; tyloses were unevenly distributed, from 2% (116.17_Bot1) to 80% (117.05_Bot1) of the total amount of acacia fragments. Fungi hyphae were rarely noticed, with sample 137.02_Bot1 having the highest proportion (36%). However, microscopic fungi hyphae are sometimes difficult to observe with an incident light microscope and some observations may be missing here. Radial cracks were observed in almost all the samples, with irregular distribution. All the samples had vitrification elements, from 19% (116.17_Bot1) to 88% (117.05_Bot1). Six samples had twigs with diameters ranging from 1 to 10 mm. Branches (diameter > 10 mm) were recognised in three samples from Room 116. We were not able to measure the other diameters precisely but most of the fragments had parallel rays that indicate bigger diameters. However, there is no way of knowing if these elements correspond to branches or trunks. Charcoal consistency when breaking was more generally soft (75% of the total amount) than hard. No entomological or reaction wood was observed.

Wood

Wood elements mostly included twig branches, as well as beams, planks, a door and a bowl. In total, 27 samples, some of them including several of the above were analysed. Five taxa were identified: *Leptadenia pyrotechnica* (16 items), *Acacia ehrenbergiana*/*etbaica*/*tortilis* type (6), *Cupressus*/*Juniperus* (cypress/juniper, 3), *Tamarix* sp. (2) and cf. *Capparis decidua* (2). The only new taxa when compared to the charcoal assemblage was cypress/juniper.

Branches

The studied twigs and branches contained 173 fragmented elements from destruction and accumulation layers (Table 4), of which most (121 fragments) corresponded to *Leptadenia pyrotechnica*. They were classified according to their size, including small–medium diameter [1–13 mm] and large calibres [15–25 mm] (Figure 4A). Branches of acacia were noted in two samples.

Beams and planks

Nine beam and plank items were uncovered from Building 1 (Table 4). These terms refer to their calibre and cross-section shape, not to their function; thus, a beam designates any element with a circular or square cross-section greater than 2.5 cm side or diameter. A plank is wider than it is thick (Chabal, 2014, p. 118). All lengths follow fibre direction. There were six beams, including three acacia rectangular beams. Two beams had similar dimensions (119.02_Bot1 and 122.05_Bot1). The large width (140 mm) suggests that they were cut from the longitudinal section of an acacia trunk. Two circular beams are possibly made of caper tree (Figure 4B) and *Leptadenia pyrotechnica*. Three planks uncovered in three different *loci* were of similar thickness (10–15 mm) and were of coniferous wood. All have rays of 1-8 cells high observed in longitudinal transversal section and may correspond to either cypress branchwood or juniper stemwood (Fahn et al. 1986, p. 56). Neither grow in the desert or the Nile Valley, except on some modern plantations. Phoenicean juniper (*Juniperus phoenicea* L.) naturally grows in the Sinai Mountains and cypress (*Cupressus sempervirens* L.) grows all around the Mediterranean belt (Boulos, 1999, p. 10).

Bark elements

Six bark fragments, sometimes significant in size, were present. It was not possible to positively identify them because of the lack of diagnostic tools and criteria, but acacia is the most plausible proposal based on simple morphological comparison. They may have been brought involuntary to the site with branches and trunk elements, directly used as caulk, as fodder or for tanning skins (Hobbs, 1989, p. 52).

Door in Room 125.03

A wooden door was uncovered in the south-west corner of Room 125 (Figure 4C). Despite its exceptional appearance, it was very badly preserved and crumbled at the slightest contact. It measures 1.60 m high and 0.70 m wide and is constituted of three vertical panels on which two uprights and three crosspieces are studded with nails. The size of the iron nails indicates a thickness of at least 6 cm. The upper and lower pivots are not visible. The lock case, if it existed, was on the side embedded in the sediment. Two wooden fragments of the right panel and intermediate crosspiece were analysed and both correspond to acacia wood. Furthermore, a free-standing well-preserved quadrangular element uncovered in the sediment and possibly corresponding to the door was also made of acacia wood. The dimensions of the panels, uprights and crosspieces imply the use of large acacia trunks, such as those of *Acacia tortilis* subsp. *raddiana*. Doors are rarely found in Egyptian archaeological contexts. The Greco-Roman examples from Tebtunis (Gallazzi and Hadji-Minaglou, 2000, p. 142, fig. 46) and Karanis (Gazda, 2004, p. 24, fig. 57) have been differently crafted and are of variable quality; the species have not yet been identified.

Bowl Po202

The almost complete bowl from 121.07 is 85 mm high and 110 mm in diameter (Figure 4D). It is made of tamarisk wood and was realised with a lathe. The flat bottom is covered with a black/brown substance (not analysed). The drilling was probably done with scissors or a gouge and grooves are still visible on the inside surface. Tamarisk wood is commonly used for everyday objects, as at Tebtunis (Marchand, 2015).

Seeds, fruits and other non-woody plants

Nine samples (6 loci) from Building 1 contained 903 remains of fruits, seeds and other non-woody plant remains, including 777 charred items and 126 desiccated items (Table 5). Five cultivated plants and at least five wild taxa were represented. The fragmentation rate (26%) and the number of taxa (7) was lower among charred items than desiccated ones (59% of fragmentation, 8 taxa).

Cereals

Hulled barley (*Hordeum vulgare* L. 1753) grains and chaff represent the majority of cultivated plants of MNI (charred 44 grains and 20 rachis fragments, desiccated 26 grains and 20 rachis fragments) and ubiquity (6 loci). All desiccated barley grains had their lemma and palea (Figure 6A) but the charred ones did not, probably because of the charring rather than the dehusking process. Indeed, dehusking is generally not done on the whole grains but occurs after grinding by winnowing the obtained product. For animals, florets are often slit to make them easier to digest (Cappers et al., 2016, p. 1320).

Seven desiccated whole grains of free-threshing wheat were identified (Figure 6B). It was not possible to identify the exact species based only on the morphology of the grain. However, these grains likely correspond to tetraploid free-threshing wheat (*Triticum turgidum* subsp. *durum*/*polanicum*/*turgidum*) which has already been identified on contemporary sites in Egypt (Agut-Labordère et al., in press; Murray, 2000a, p. 513). The cultivation of bread wheat (*Triticum aestivum* L. subsp. *aestivum*) is not attested in Egypt before the modern period (Cappers, 2016).

Some desiccated and charred remains of grains, rachis segments and straw of undetermined cereals were identified.

Pulses

Lentil, *Lens culinaris* Medik. 1787, was the only pulse found at Samut North. The seeds were mainly present in and around a lead plate (123.02, Po100, Figure 7). The ten perfectly preserved lentils on the plate and their location leaves no doubt as to their function as food. Lentils have to be soaked or leached, then rinsed and boiled to soften, detoxify and make them digestible. Simple experimentations showed that lentils tend to swell and crack when they are cooking. However, most of the lentils here have complete testa, showing that they are either raw or very lightly cooked, meaning they could either represent the remains of food that was about to be cooked, or uneaten, uncooked scraps of an already prepared dish.

Other plants

Sample 117.05_Bot1 contained one charred black mustard seed (*Brassica* cf. *nigra* (L.) W.D.J. Koch 1833). This plant is an important ingredient in mustard and is used in traditional medicine in Egypt for its digestive, diuretic and stimulating properties (Boulos, 1999, pp. 211–212). It is also a common arable weed in winter crops (Boulos and El-Hadidi, 1994); the seed, therefore, may have arrived at Samut North as a contaminant (Van der Veen, 2011, p. 167). A concentration of charred fruit (*Zilla spinosa*) was present in two ovens from the kitchen (Room 116). Other taxa remains include charred acacia seeds and desiccated acacia leaves, desiccated and charred colocynth seeds (*Citrullus colocynthis* (L.) Schrad., 1838) and *Medicago* sp. and desiccated seeds of *Panicum turgidum* Forssk., 1775 and cf. *Trifolium* sp. Aside from acacia, which is a tree species, all of the wild plants were common herbaceous desert plants. Their presence could result from wind dispersal or show different uses: fodder, food, medicine, fuel, etc. *Panicum turgidum* seeds are one of the main fodder resources encountered in the desert, and they can also be cooked (Mahmoud, 2010, p. 104). The presence of these seeds, therefore, can indicate both the combustible use of dried fruit and the consumption of seeds by animals (especially donkeys) or, if roasted, by humans. The oil extracted from roasted seeds could also have been used as medicine or tannin (Hobbs, 1989, pp. 53, 93; Osborne, 1968, p. 167; Zahran and Willis, 2009, p. 87).

Among undetermined plants, the category called "half-moon" refers to charred curved elements from 1 to 5 mm in length, with an irregular surface or cross ribs on the convex part, sometimes tied in pairs (Figure 6). Similar remains were also found at Wadi Kubbaniya (Paleolithic, Upper Egypt) and interpreted as bird droppings, presumably from wild ducks of the Anserinae or Anatinae family (Hillman et al., 1989, fig. 7.3). Krystyna Wasylikova noted the same hypothesis at Nbata Playa (Neolithic, Egyptian Western Desert) (Wasylikowa et al., 1964, p. 139, pl. 26); however, when compared with modern bird droppings, these identifications are not convincing. "Half-moon" elements are always charred and frequently associated with desert sites (Figure 6). One element from Samut North was found adhering to acacia charcoal, but a precise identification and nature are yet to be determined.

Coprolites

There were at least two types of coprolites. The first one corresponds to ovicaprids coprolites, present in two loci. These testify to the presence of animals in or around Samut North and could explain the presence of possible grazed and undigested plants in the same contexts, such as cf. *Trifolium* sp., *Medicago* sp. or *Panicum turgidum*. Charred elements probably highlight their use as fuel (Charles, 1998; Marinova et al., 2013; Miller, 1984). The second type includes rodent droppings that were uncovered in huge quantities in sample 132.08_Bot1.

These remains evidence the presence of rodents in Building 1 during its occupation or shortly after its abandonment.

Insects

The archaeoentomological analysis, based on 43 insect fragments from locus 125.05, showed a wide diversity with 11 species of beetles (Coleoptera) belonging to eight families. The study of desiccated sclerites highlights the presence of two main ecological groups: woodborers and crop pests.

Woodborers insects

Three woodborer species belonging to Bostrichidae, all dependent on acacia for the Saharan region (Mateu, 1975), were identified at Samut North: *Enneadesmus forficula* Fairmaire, 1883, *Calopertha truncatula* Ancey, 1881, and *Acantholyctus cornifrons* (Lesne, 1898). All these species are attested for the first time in an archaeological context.

E. forficula (Figure 8) is a common species of the Saharo-Sahelian region which lives at the expense of several acacia species (Beeson and Bhatia, 1937; Halperin and Damoiseau, 1980; Lesne, 1924), notably *Acacia tortilis* (Lesne, 1901, p. 608). *C. truncatula* is smaller (3–4.5 mm, Figure 8) and digs deep galleries in acacia sapwood to lay its eggs, specifically in *A. tortilis* subsp. *raddiana*, *A. scorpioides*, *A. flava* and *Fadherbia albida* (Lesne, 1924; Mateu, 1975). It has been observed on the dead branches of *A. seyal* and *A. tortilis* subsp. *raddiana* (Español, 1947).

A. cornifrons belongs to the Lyctinae subfamily ("powderpost beetles"), which are among the most harmful woodworm species. This insect has been observed on dead and living *Acacia tortilis* (Alfieri, 1976; Halperin and Geis, 1999).

Crop pests

Four crop pests belonging both to primary and secondary species were identified within the archaeoentomological assemblage: *Sitophilus granarius* (L., 1758) (Dryophthoridae), *Rhyzopertha dominica* (F., 1792) (Bostrichidae), *Oryzaephilus surinamensis* (L., 1758) (Silvanidae), and *Stegobium paniceum* (L., 1758) (Anobiidae) (Figure 9). Primary pests grow inside the grain and feed on nutrient grain reserves; secondary pests live off the debris and grain already damaged by the primary pests.

The grain weevil (*S. granarius*, MNI=1) is the most famous and harmful primary pest in the world. Although it shows a clear predilection for wheat, it attacks a wide variety of cereals, such as barley, sorghum (*Sorghum bicolor*), oat (*Avena sativa*) and also some pulses such as chickpea (*Cicer arietinum*). The lesser grain borer (*R. dominica*, MNI=1) is also a primary pest (Edde, 2012). It often cohabits with the grain weevil and infects wheat, barley, along with other cereals and spices. The sawtoothed grain beetle (*O. surinamensis*, MNI=1) is a secondary pest of small size (2.5–3.5 mm) which can infest a large diversity of plant food, such as wheat, barley, flax (*Linum usitatissimum*), flour and dried fruits, such as dates (*Phoenix dactylifera*), etc. The bread beetle (*S. paniceum*, MNI=1 larva) is one of the most damaging pests being extremely polyphagous, resistant and indistinctly degrading wheat grains, semolina, porridge, couscous, coffee (Lepesme, 1944).

All of these crop pest beetles have been recorded in different Egyptian archaeological contexts (Alfieri, 1976, p. 188; Leek, 1973; Panagiotakopulu, 2001, 1998; Solomon, 1965; Zacher, 1937)

Other insects

Teretrius cf. *pulex* Fairmaire, 1877 (Histeridae) (MNI=11), like other *Teretrius* representatives, is a predator living within Bostrichidae galleries, especially those of *E. forficula* and *A. cornifrons* where it preys on the eggs and larvae of the latter (Gomy, 2007). Dessicated larval remains attributed to the genus *Dermestes* L., 1758 (Dermestidae), a genus grouping species living on carrion in various stages of post-mortem decomposition figured among the remains. These carrion beetles are often found associated with mummies (Alluaud, 1908; Hope, 1836; Huchet, 2016, 2010, 1995). Finally, *Mesostenopa picea* (Kraatz, 1865) (Tenebrionidae) (MNI=1), as with the other members of the family, figures among the main representative insect of desert environments. Its presence does not provide any specific information since it is extremely polyphagous. In archaeological contexts, *M. picea* is recorded both in Egyptian cereal stocks and in association with mummies (Attia and Kamel, 1965; Curry, 1979; David, 1978).

Discussion

Wood management in desert environments

Plants as witnesses of artisanal and domestic activities

There was no archaeological trace of accidental fire, so the presence of charcoal fragments probably results from their use as daily fuel. The specific context of Samut North, mainly defined through mining and metallurgical activities that require *a priori* large amount of fuel, combined with the desert environment offering *a priori* limited resources, should have impacted fuel management. Gold melting and refining probably did not take place on site, or only occasionally (such as in Furnace 152, see introduction). The presence of a forge, used to produce and repair iron tools, requires a controlled heating processes to reach and maintain temperatures above 1000°C. The charcoal stock from storeroom 137 (Figure 10) confirms the local use of charcoal fuel. In parallel, the use of green and seasoned wood must be considered, notably for domestic activities (i.e. cooking, heating, lighting), although we do not have any robust argument to confirm or discard this hypothesis. A charcoal study did not allow the differentiating of charcoal fuel from burnt wood. Moreover, the charcoal dataset might result from a mix of heating activities (Théry-Parisot et al., 2010). With the exception of specific contexts (i.e. charcoal stock 137.02 and Forge 403.06) the functional understanding of other charcoal assemblages is tricky.

Correspondence analysis (CA) was carried out in order to hierarchize relations between archaeological contexts (individuals) containing charcoal, seeds and fruit remains, and archaeobotanical/coprolites components (variables) (Figure 11, Supplementary data 3). Contextual structuring defines the two axes. On the one hand are clear artisanal contexts, (i.e.

charcoal storage room 137 and Forge 403), characterized by the absence of seeds, coprolites and similar dendro-anthracological criteria (hyphae and vitrification, see discussion and criticism in the following section). On the other hand, utility rooms, such as kitchen 116, storeroom 125 and guard room 130 are associated with the presence of seeds, coprolites, charred twigs and branches. In between, there are a bulk of contexts which cannot be assigned but tend to be related to the first group. The analysis shows how fuel resources strongly structure the archaeobotanical assemblages, by splitting contexts where charcoal fuel has been exclusively stored or used and contexts with more variable fuel resources.

Charcoal making in the desert

Charcoal from Room 137 (storeroom) had low taxonomic diversity (a single taxon, acacia) and no twigs or seeds. These observations are in line with Roman studies where the presence of charcoal fuel was assumed (Krzywinski, 2001, p. 346; Van der Veen, 2011, 2001; Van der Veen and Tabinor, 2007; Vermeeren, 2000, 1999, 1998), and considered fragment size, hardness criteria, presence of radial cracks and the *puffing effect* to emphasize its presence. The charcoal fragments from 137.02_Bot1 are no bigger or smaller than charcoal fragments from other contexts, showing that size, also subject to other constraints (Théry-Parisot et al., 2010), cannot be used as a diagnostic criteria like radial cracks (Théry-Parisot and Henry, 2012). Hardness and the *puffing effect* as indicators of high combustion temperature have never been scientifically tested, while numerous intrinsic (wood density, anatomy and state of preservation) and extrinsic (combustion quality, taphonomy) factors affect charcoal consistency.

The hypothesis based on archaeobotanical and textual sources during the Roman period indicates that Nile acacia charcoal was imported from the Nile Valley to supply stone quarries (Bouchaud et al., 2018; Van der Veen and Tabinor, 2007 O.Claud. I 21, O. Claud. IV 697, 742, 826, 850). In contrast, no Nile acacia was observed at Samut North, and charcoal fuel likely corresponds to local acacia species (*A. tortilis*, *A. ehrenbergiana*, *A. etbaica*). This is significant and show that the need for charcoal could be met using local species and that the situation is different from Roman times. Acacia is still the most favoured tree to make charcoal, probably because of its intrinsic properties (Andersen and Krzywinski, 2007a, 2007b; Durand et al., 2018) and availability. An acacia tree produces between 50 and 250 kg of charcoal depending on the species, its size, the cutting method and technique used (Belal et al., 2009; Le Floc'h and Grouzis, 2003; Le Houérou, 2002; Springuel and Mekki, 1994). Charcoal making is a common practice in the present Saharo-Sahelian region (Le Floc'h and Grouzis, 2003; Le Houérou, 2002, 1990) and is well documented for the Eastern Desert (Belal et al., 2009; Christensen, 2001, 1998; Hobbs, 1989; Krzywinski, 2001; Springuel and Mekki, 1994). During 19th–20th c., Bedouins produced acacia charcoal in a sustainable way by cutting branches instead of trunks and by using two different techniques: open burning or in a pit/kiln (more details in Christensen, 2001, pp. 112–114, 1998; Durand et al., 2018; Krzywinski, 2001, pp. 135–136) (compilation in Bouchaud, 2020). No charcoal burning platforms have been identified at Samut North; however, one can assume that the pit/kiln model may have been used to ensure sufficient charcoal production for artisanal activities, as already suggested by Krzywinski (2001, pp. 138-139). This author also suggests the use of green wood. The correspondence analysis (Figure 11) shows that the samples associated with charcoal production have more fragments affected by bacteriological elements (hyphae fungi), that could indicate the use of seasoned or dead wood (Moskal-del Hoyo et al., 2010). However, we lack robust taphonomic and experimental works on acacia tree, as it has been done for other species (Henry and Théry-Parisot 2014; Vidal-Matutano et al. 2017) to know the original state of the wood gathered. Charcoal production needs a workforce, possibly ensured by the mine workers, and know-how. It must therefore have required the presence of charcoal burners coming from the Nile Valley, or exchanges (of know-how or trade) with local Bedouin populations.

Selection of ligneous plants

There is a clear distribution of ligneous plants according to their use, with acacia dominating as fuel. The presence of charred acacia seed and leaves suggests branch use, although the cutting of trunks for fuel cannot be excluded. *Acacia tortilis*, whose presence is confirmed by woodborer insects, could indicate large branches and trunks for its probable use as beams and the door. *Leptadenia pyrotechnica* is mainly used for its flexible branches and its trunk serves as a beam, while fuel use is sparsely recorded. Tamarisk and possibly caper trees are occasionally used as fuel and building material. The fruits of *Zilla spinosa* probably highlight the use of twigs as fuel which disappeared while charring. All these taxa are known for their high-fuel or building qualities (Belal et al., 2009; Hobbs, 1989) and likely grew in the area. The presence of cypress/juniper shows that wooden furniture partly come from Sinai or the Mediterranean region.

Building material

Leptadenia pyrotechnica twigs and branches have a singular horizontal arrangement within the destruction layers (Figure 12), showing that they were used for covering some if not all the rooms of Building 1, probably mixed with clay, as is the case elsewhere (Vandenbeusch, 2017). Leaflets, possibly of date palms, were uncovered in Room 125, as were bark fragments, indicating their possible use for roofing systems, like in some traditional Egyptian houses (Henein, 2001, pp. 42–43). The accumulation of *Leptadenia pyrotechnica* and acacia branches in dormitories (129.03, 129.05, 129.07, 132.13) indicate other uses. The high amount of acacia in one of the locus, while it is virtually absent from the branches of the destruction layers, suggests other purposes, such as fuel storage or fodder.

We can reasonably think that beams were used to support the roofing system made of branches and clay, according to a simple system of superimposition (Vandenbeusch, 2017, see type n°2 on Figure 10). The use of twigs, branches, trunks (for beams and planks) show a complete exploitation of local desert trees and shrubs.

Planks made of coniferous wood may indicate other potential uses or re-uses, in architecture, support or transport.

Food supply

Scarce and unvaried food products

Food products were mainly present in Room 123, 125 and 130, and secondarily in Rooms 116 and 117, which are all dedicated to food preparation, storage or consumption. Local agriculture is hardly conceivable due to extreme aridity, water scarcity and mine function; however, the vase inscriptions show that a variety of foodstuff – honey, cheese, wine, figs, cereals – was imported from the Nile Valley (Redon and Chaufray, 2020), about four days walk away. The archaeobotanical results complete this data and are in line with other Egyptian corpuses. Barley and lentils are the most common eaten cereal and pulse in Egypt since Neolithic times (Cappers, 2016; Murray, 2000a, 2000b). The presence of free-threshing wheat matches with the general chronology of wheat in Egypt established through written and archaeobotanical sources (Agut-Labordère et al., in press; Cappers, 2016; Crawford, 1979; Préaux, 1939; Schnebel, 1925). The Ptolemaic period is a milestone during which tetraploid wheat increases and replaces emmer wheat (*T. turgidum* subsp. *dicoccon*), but, although this phenomenon is well known, chronology and geography still need to be specified. Wheat from Samut North provides new clues showing that free-threshing wheat was traded and consumed in the Eastern Desert from as early as at the late 4th c. BCE on a site managed and supplied by the royal administration. No fruits were found, although they were cultivated at the same time in the Nile Valley or Western Desert oases (Grüss, 1930; Newton et al., in press; Newton and Clapham, in press). Notably, there are no date palm stones, though they are generally well preserved in archaeological contexts. We assume, therefore, that date palm was not part of the general diet of the Samut North inhabitants. Among the Greek ostraca, there were two mentions of black fig, *Ficus carica* (ἰσχάδες μέλαιναι, *O.Sam.* 4) and cress, *Lepidium sativum* (κάρδαμον, *O.Sam.* 8) showing that other uncommon products were consumed, at least occasionally (Redon and Chaufray, 2020). There is no direct evidence of desert wild plant consumption but the presence of several edible seeds, with medical properties, such as *Panicum turgidum* and *Citrullus colocynthis*, indicate that some local plants were used for purpose other than for fuel.

The number of food remains were surprisingly low in the domestic and culinary rooms, with bacteriological attacks, as well as insect pests and rodents most likely to blame. However, this cannot be the only argument since numerous other organic items, namely wooden building material, were found in almost all the rooms. We put forward two other reasons. First, the site generally yielded little material, showing that the occupation was short and seasonal (Redon et al., 2020). Secondly, inhabitants were mostly workers, probably prisoners, with access to little food diversity which was partly infested – primarily cereals and lentils, perhaps irregularly supplemented by meat, as shown by the remains of old slaughtered animals (camels, equids), and sheep, goat and pig bones (Leguilloux, 2020). The figs, cress, honey and cheese, mentioned in the few texts were surely exceptions, primarily given to those in charge of the mine and the miners, high-ranking soldiers and the administration.

Ritual food

The lead plate containing lentils was located in a sedimentary matrix (123.02) where uncharred lentils, whole and fragmented barley grains and one wheat grain were found. Broken barley florets could indicate the partial crushing with a mortar to make porridge or *fereek* (roasted and crushed grains). It is worthwhile noting that one amphora found in Room 110 contained broken cereal, χόνδρος, *O.Sam.* 6. This assemblage was discovered next to a votive mud foot and a mollusk operculum, two possible cultic objects in Room 123, near to a possible chapel (Room 126). We cannot exclude that the lead plate of lentils and cereals grains belonged to this votive set. Offering food was a common practice in Greco-Roman and Egyptian worlds, as shown through iconography (Barakat and Baum, 1992; Peters-Destéract, 2005, pp. 341–375), Greek sources (Pausanias, *Description of Greece* III.23.8) and archaeobotanical data in religious contexts (Megaloudi, 2005). The presence of raw food products, therefore, may mean that they were not dedicated to human consumption but were an offering to a divinity.

Conclusion

Different strategies were developed at Samut North to ensure fuel, woodworking and food needs were met. Acacia was the most important fuel used for all heating activities, and the production of charcoal was ensured by local workers or Bedouins and stored in Building 1. Other fuel resources (twigs, shrubs, maybe coprolites) were used sporadically, and are only associated with domestic contexts (cooking, heating, lighting, etc.). Roofs were composed of *Leptadenia pyrotechnica*, acacia and possible caper beams supporting branches (mainly of *Leptadenia pyrotechnica*) and clay. Other wooden elements were made from acacia, tamarisk and coniferous woods. Food products show little diversity, including barley, free-threshing wheat and lentils. Plant resources for fuel and woodworking are mostly of local, i.e. desert, provenance. The majority of food remains came from the Nile Valley or Western Desert oases, with a limited supply of local wild desert fruits and seeds. Only coniferous planks attest to the use or re-use of wood imported from the Sinai or the Mediterranean region. This model is far from the one observed during the Roman period (1^{st}–3^{rd} c. CE) in the Eastern Desert, which highlights more varied plant resources, of different origins, regardless of the site (Bouchaud et al., 2018; Van der Veen et al., 2018). Similar conclusions were reached from the analysis of the other artefacts, texts, pottery, and faunal remains, found at Samut North (Redon and Faucher, 2020) and from other recently excavated Ptolemaic sites (study in progress). This analysis offers an original dataset for a poorly documented though critical period, at the very beginning of the Ptolemaic period, and reveals an elaborate economic system with local supply networks and imported products, mostly aimed at essential needs. The presence of local plants show that the inhabitants had a good knowledge of desert resources and used them wisely, perhaps thanks to exchanges of knowledge or materials with local Bedouin populations.

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Captions list

Figure 1. **Location of Samut District and main sites of Eastern Desert during Ptolemaic period** (© MAFDO, A. Rabot, Th. Faucher, B. Redon, 2018).

Figure 2. Satellite view of Samut North (left, ©GeoEye1) and **plan of Building 1 – scale 1/200** (right, © MAFDO, survey B. Redon, Th. Faucher, J.-P. Brun, F. Téreygeol – Photogrammetry G. Pollin (Ifao) – DAO M. Vanpeene).

Figure 3. Present vegetation around Samut North (© C. Bouchaud)

A. Isolated recently cut acacia (*Acacia tortilis* subsp. *raddiana*)
B. Gallery forest of acacia trees (*Acacia tortilis* subsp. *raddiana/tortilis*, *A. ehrenbergiana*) with lower stratum of green shrubs (*Zilla spinosa*) and herbaceous plants (*Fagonia* sp., *Morettia philaeana*).

Figure 4. Wooden elements

A. Twigs and branches of *Leptadenia pyrotechnica* (© C. Bouchaud)
B. Beam of cf. *Capparis* sp. (© C. Bouchaud)
C. Door from 125.03 (orthophoto, Photogrammetry: G. Pollin, DAO: O. Onézime, IFAO)
D. Bowl PO 202 (© MAFDO, A. Bülow-Jacobsen)

Figure 5. *Acacia ehrenbergiana/etbaica/tortilis* type. Transversal (a), tangential (b) and radial (c) sections (© C. Bouchaud). Green arrows = radial cracks; yellow arrow = fungi hyphae.

Figure 6. Plant macroremains from Samut North (© C. Bouchaud). (a) *Hordeum vulgare* grain with lemma and palea; (b) free-threshing wheat grain, probably *Triticum turgidum* subsp. *durum/polanicum/turgidum*; (c) *Panicum turgidum* seed; (d) Undetermined "half-moon" type from Samut North (left), Xeron Pelagos, 1st–3rd c. CE, Eastern Desert (centre), Dumat al-Jandal, 1st–3rd c. AD, Saudi Arabia (right).

Figure 7. Lentils (*Lens culinaris*) contained on a lead plate, inside the red square (a) and details (b). (© MAFDO, A. Bülow-Jacobsen) Only one lentil (top left) does not have testa.

Figure 8. Bostrichidae insects from Samut North. Modern specimens are indicated by an arrow (left) *Enneadesmus forficula,* right elytra; (right) *Calopertha truncatula*, right elytra (left) and fragment of pronotum (right). Photos of the archaeological specimens: J.-B. Huchet; modern specimens © F. Génier, Canadian Museum of Nature, Ottawa, Ontario, Canada.

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Figure 10. Charcoal fragments from Room 137 (© MAFDO, J.-P. Brun).

Figure 11. Correspondence analysis on archaeological contexts with charcoal, seed and fruit remains. Cons=consistence, Copro=coprolite, DIV=charcoal taxonomical diversity, Rad-C=radial cracks, Hyp=fungi hyphae, Tw-Br=twigs, branches, Vitr=vitrification.

Figure 12. Horizontal arrangement of branches within the destruction layers of Building 1 (© MAFDO, C. Bouchaud).

Table 1. List and description of samples.
Black=presence of ecofacts
Grey=charcoal, wood or insect sample that have not been studied
Volume (l)=volume of soil sample, in litre.
H-P=hand-picked material.

Table 2. Charcoal analyses. Taxonomical identification and counting (ubiquity). Volume (l) = volume of bulk sediment, in litres.

Table 3. Resum of dendro-anthracological criteria. See supplementary data 2 for details.
Only acacia charcoal are included (cf. and other taxa excluded)
Nb fgmt=number of fragments analysed
Nb tax =number of taxa identified
Av. Length=average maximal length.

Table 4. Analysis of processed and unprocessed desiccated wood. Taxonomical identification, description and counting.
Measures indicated in [ ] are diameter categories; NR=number of items; Leng=length; Wid=width; Heig=height; diam=diameter.

Table 5. Desiccated seed and fruit remains data. Taxonomical identification and counting.
NRw=number of whole remains; NRfr=number of fragmented remains; MNI=minimal number of items.

Table 6. Charred seed and fruit remains data. Taxonomical identification and counting.
NRw=number of whole remains; NRfr=number of fragmented remains; MNI=Minimal number of items.

Supplementary data 1. Taxonomic saturation curves of charcoal samples.

Supplementary data 2. Details of dendro-anthracological criteria.

Dom=domestic; Stor=storage; Smit=smithy (see table 1 for details of contexts); N°=charcoal numbering; Heart=heartwood; Insect degra=insect degradation; Vitrif=vitrification; diam=diameter; Consist=consistence; React w=reaction wood
1=present and 0=absent for column “Bark”, “Heart”, “Thyles”, “Fungi Hyphae”, “Insect degra”, “Radial cracks”, “Vitrif” and “React w”.

Supplementary data 3. **Details of the correspondance analysis on archaeological contexts with charcoal, seed and fruit remains**. Cons=consistence, Copro=coprolite, DIV=charcoal taxonomical diversity, Rad-C=radial cracks, Hyp=fungi hyphae, Tw-Br=twigs, branches, Vitr=vitrification. See table 3 for details. The variable “consistence” is a supplementary variable.
The correspondence analysis was created with the software AnalyseSHS (http://analyse.univ-paris1.fr/).

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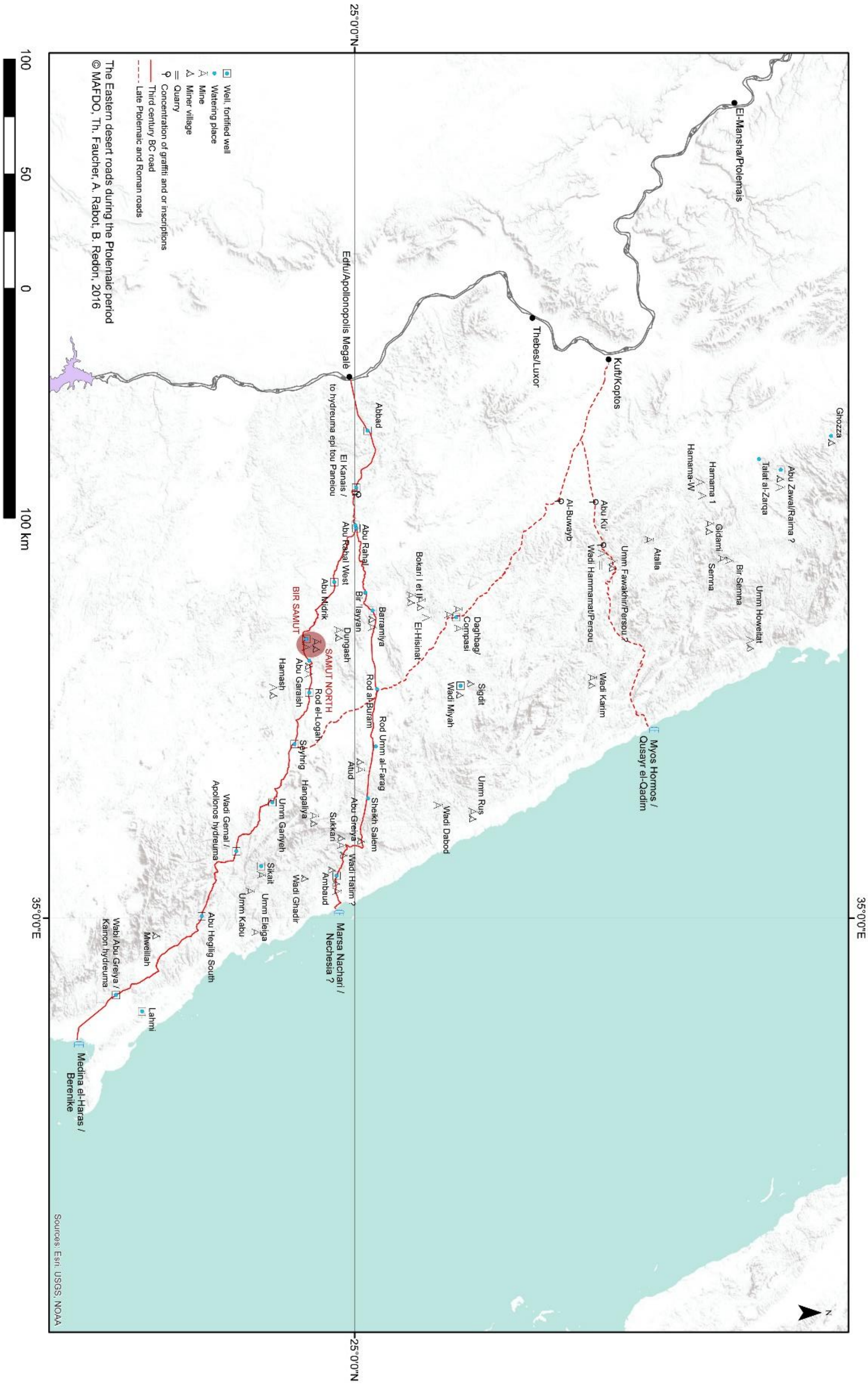

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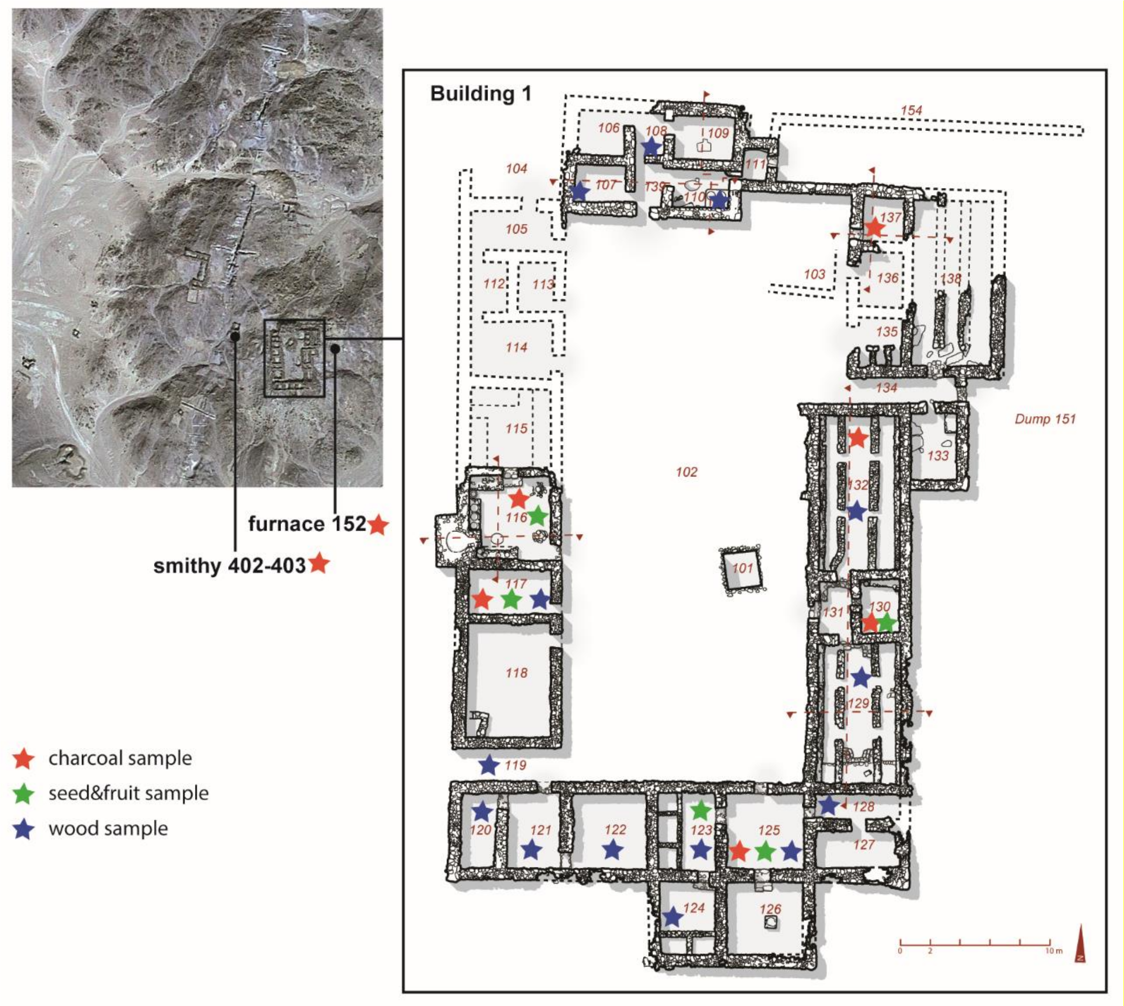

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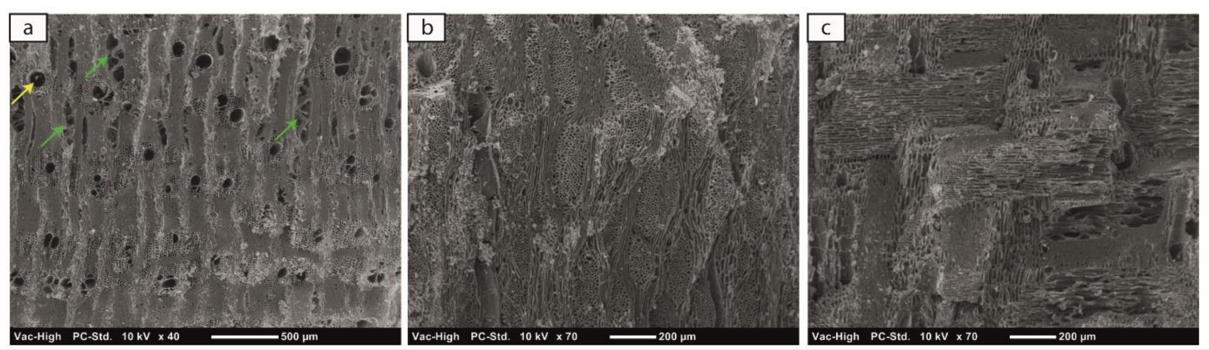

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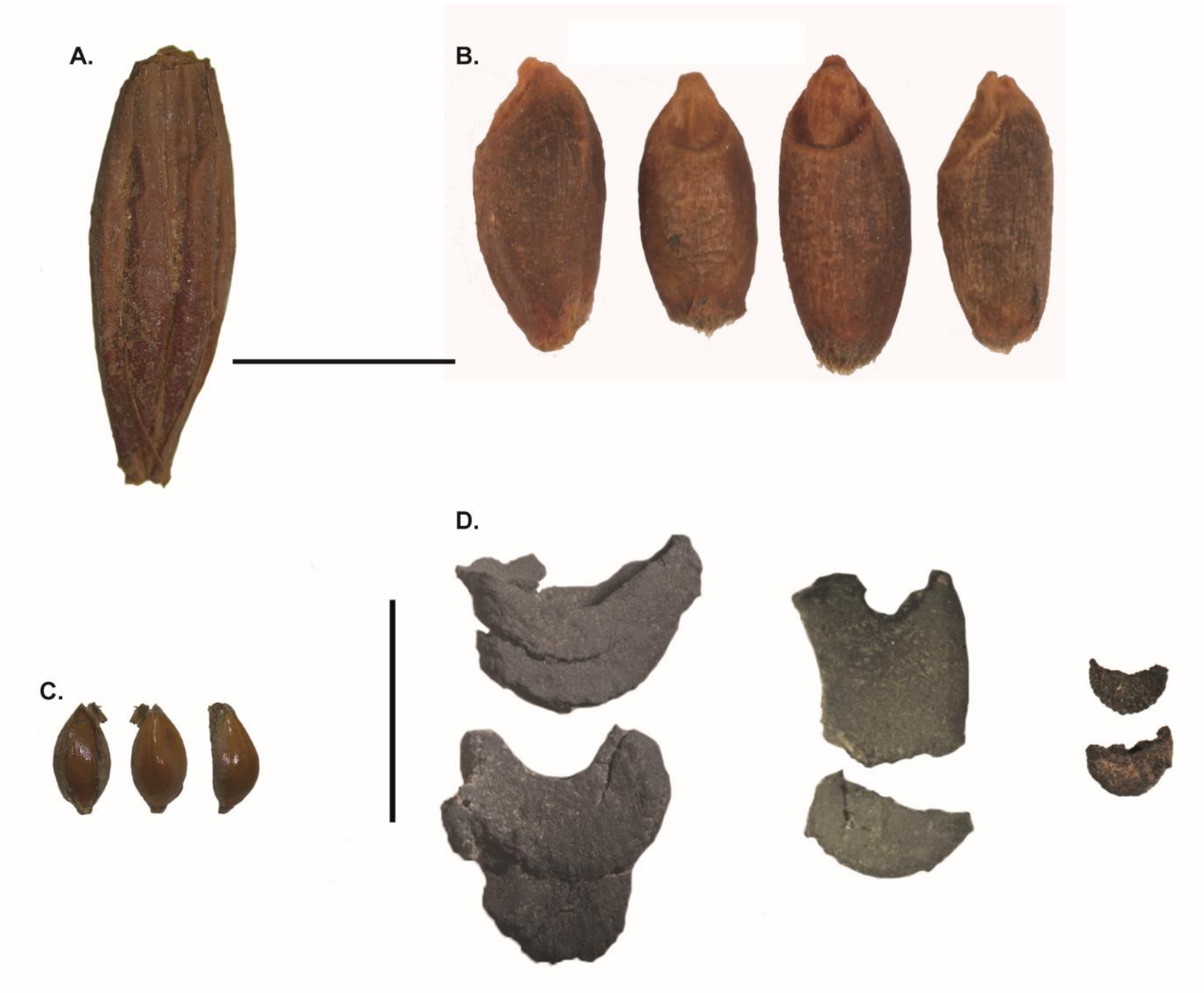

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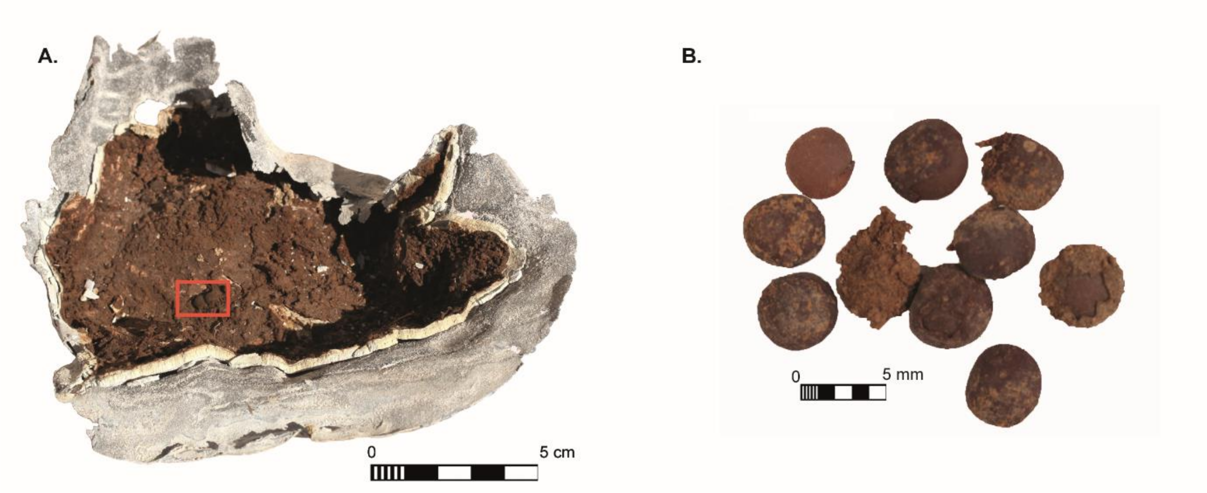

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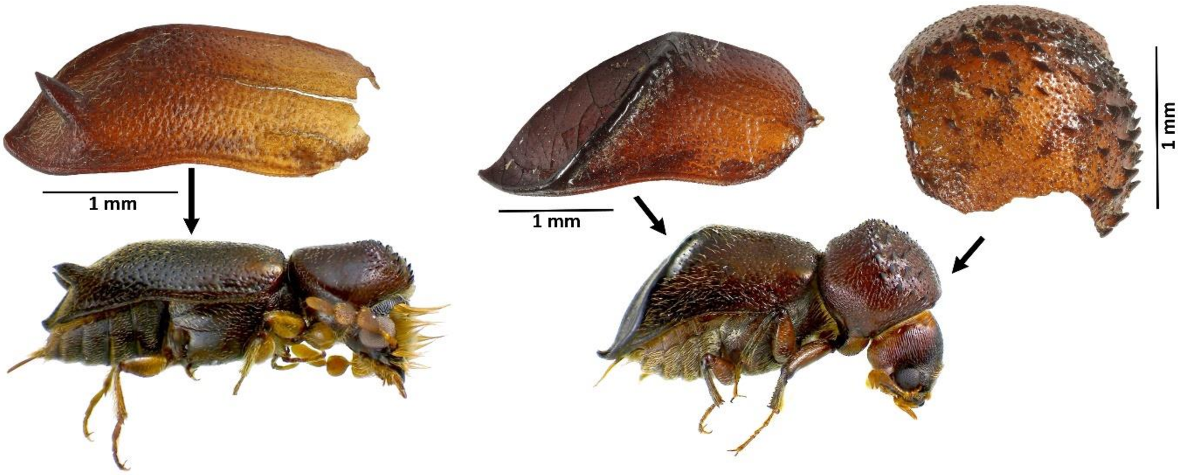

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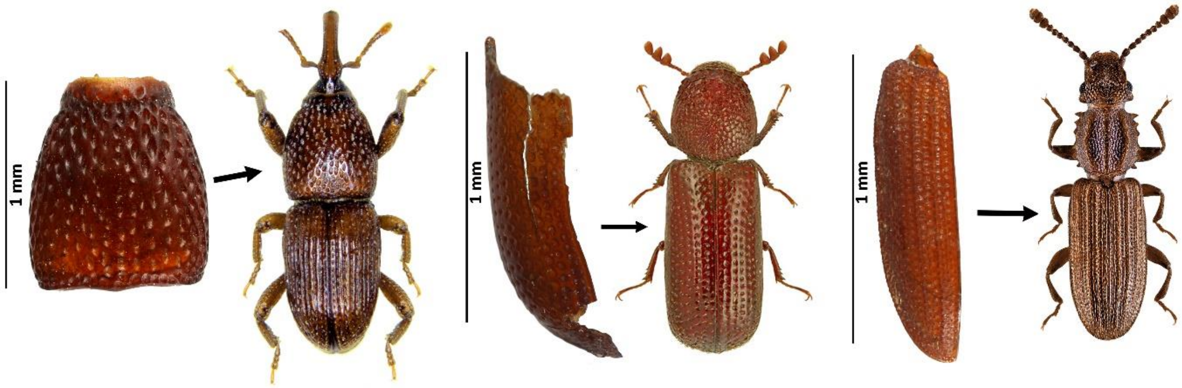

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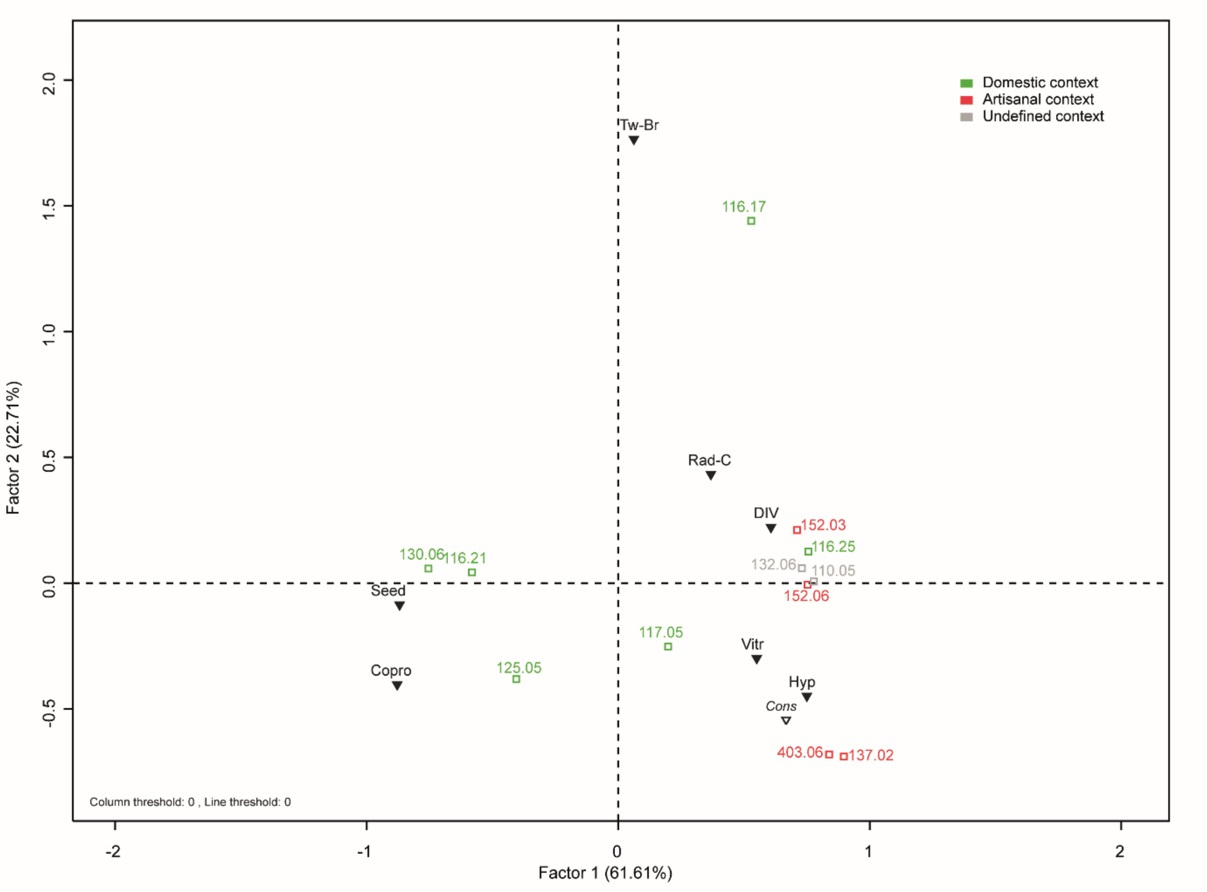

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Black=presence of ecofacts
Grey=charcoal, wood or insect sample that have not been studied
Volume (l)=volume of soil sample, in litre.
H-P=hand-picked material

Year	Sample	Room	No. IFAO	Description	Volume (l)	Charcoal	Seed&fruit	Wood	Insect
2015	SN_107.05_Bot1	107	9276	North wing. Destruction	H-P				
2015	SN_108.02_Bot1	108		North wing. Destruction	H-P				
2014	SN_110.03_Bot1	110	5803	North wing. Destruction	H-P				
2014	SN_110.04_Bot1		5804	North wing. Destruction	H-P				
2014	SN_110.05_Bot1		5832	North wing. Ashy layer	2				
2014	SN_116.17_Bot1	116	5833	West wing. Filling of the amphora (n°94)	2				
2014	SN_116.21_Bot1		5835	West wing. Filling of one oven (n°76)	2				
2014	SN_116.21_Bot2		5836		2				
2014	SN_116.22_Bot1		5837	West wing. Filling of one oven (n°77)	2				
2014	SN_116.22_Bot2		5838		2				
2014	SN_116.25_Bot1		5840	West wing. Oven n° 74. Ashy slab overlay	2				
2014	SN_117.02_Bot1	117	5805	West wing. Destruction layer	H-P				
2014	SN_117.03_Bot1		5806	West wing. Destruction layer	H-P				
2014	SN_117.05_Bot1		5841	West wing. Ashy layer	2				
2014	SN_119.02_Bot1	119	5808	Main entrance. Destruction layer	H-P				
2014	SN_120.05_Bot1	120	5809	South wing. Destruction layer	H-P				
2014	SN_120.07_Bot1			South wing. Destruction layer	H-P				
2014	SN_121.04_Bot1	121	5810	South wing. Destruction layer	H-P				
2014	SN_121.05_Bot1		5811	South wing. Destruction layer	H-P				
2015	SN_121.07_Bot1			South wing. Destruction layer = Po202	H-P				
2014	SN_122.05_Bot1	122	5812/5813	South wing. Destruction layer	H-P				
2014	SN_122.07_Bot1		5814	South wing. Destruction layer	H-P				
2014	SN_123.02_Bot1	123	5842	South wing. Inside and outside of a lead plate	-				
2014	SN_123.02_Bot2		5843		-				
2014	SN_123.06_Bot1		5815	South wing. Destruction layer	H-P				
2014	SN_123.07_Bot1		5816	South wing. Destruction layer	H-P				
2014	SN_124.02_Bot1		5817	South wing. Destruction layer	H-P				

2014	SN_124.03_Bot1	124	5818	South wing. Destruction layer	H-P				
2014	SN_124.04_Bot1		5819	South wing. Destruction layer	H-P				
2014	SN_124.05_Bot1		5820	South wing. Destruction layer	H-P				
2014	SN_124.07_Bot1		5821	South wing. Destruction layer	H-P				
2014	SN_124.08_Bot1		5822	South wing. Destruction layer	H-P				
2014	SN_125.03_Bot1	125	5826	South wing. Abandonment layer just above a soil.	H-P				
2014	SN_125.03_Bot2		5823		H-P				
2014	SN_125.05_Bot1		5844	South wing. Ashy layer	1				
2014	SN_128.02_Bot1	128	5825	South wing. Destruction layer	H-P				
2014	SN_129.03_Bot1	129	5826	East wing. Accumulation of desiccated plant elements	H-P				
2014	SN_129.05_Bot1		5828	East wing. Accumulation of desiccated plant elements	H-P				
2014	SN_129.07_Bot1		5829	East wing. Accumulation of desiccated plant elements	H-P				
2014	SN_130.06_Bot1	130	5846	East wing. Filling of amphora	0,5				
2014	SN_132.06_Bot1	132	5847	East wing. Fireplace	2				
2014	SN_132.08_Bot1		5848	East wing. Concentration of organic matter	0,15		*Coprolites*		
2014	SN_132.13_Bot1		5849	East wing. Concentration of organic matter	0,15				
2015	SN_137.02_Bot1	137	9273	East wing. Thick layer of charcoal across the entire room	2				
2015	SN_137.02_Bot2		9274		1,5				
2014	SN_152.03_Bot1	152	5851	Outside. Furnace discharge	2				
2014	SN_152.06_Bot1		5854	Outside. Furnace discharge	3				
2014	SN_403.06_Bot1	403	5852	Sector 4. Ashy layer at the top of a furnace	1				
2014	SN_403.06_Bot2		5853		3				

Table 2. Charcoal analyses. Taxonomical identification and counting (ubiquity).

Volume (l)=volume of bulk sediment, in litres.

Locus	**110.05**	**116.17**	**116.21**	**116.25**	**117.05**	**125.05**	**130.06**	**132.06**	**137.02**	**152.03**	**152.06**	**403.06**	
Sample	110.05_Bot1	116.17_Bot1	116.21_Bot1	116.25_Bot1	117.05_Bot1	125.05_Bot1	130.06_Bot1	132.06_Bot1	137.02_Bot1	152.03_Bot1	152.06_Bot1	403.06_Bot1	403.06_Bot2
Volume (l)	2	2	2		2	1	0,5	2	1,5	2	3	1	3
Taxa													
Acacia etbaica/tortilis type	47	47	46	48	50	43	45	47	50	49	49	11	10
cf. *Acacia* sp.			2				2			1			
cf. *Capparis decidua*		1											
Leptadenia pyrotechnica	2							1					
Tamarix sp.	1			1			1						
Angiosperm		1	1										
Bark		1	1	1		6	3						
Undetermined		1				1	2	2			1		
Sum	**50**	**51**	**50**	**50**	**50**	**50**	**53**	**50**	**50**	**50**	**50**	**11**	**10**

Table 3. Resum of dendro-anthracological criteria (acacia charcoal only). See supplementary data 1 for details.

Nb=number of acacia fragments analysed; M.=mean; diam=diameter; H=hard; S=soft

Sample	**Nb**	**M. Length**	**Nb Bark**	**Nb Heart**	**Nb Tyloses**	**Nb Fungi Hyphae**	**Nb Radial cracks**	**Nb Vitrification**	**Nb diam**	**Consistence**
SN_110.05_Bot1	47	12	1	1	31	5	24	36	1	12 H / 35 S
SN_116.17_Bot1	47	12	7	7	1	1	25	10	10	4 H / 43 S
SN_116.21_Bot1	46	12	0	3	9	0	43	31	2	2 H / 44 S
SN_116.25_Bot1	49	13	2	5	2	10	25	19	1	16 H / 33 S
SN_117.05_Bot1	50	10	1	1	40	7	16	44	1	31 H / 19 S
SN_125.05_Bot1	43	9	0	0	30	6	3	31		12 H / 31 S
SN_130.06_Bot1	45	9	6	5	30	6	32	16	6	9 H / 36 S
SN_132.06_Bot1	47	11	0	0	26	2	25	30		6 H / 41 S
SN_137.02_Bot1	50	10	0	0	34	18	5	42		31 H / 19 S
SN_152.03_Bot1	49	10	0	0	27	5	36	26		4 H / 45 S
SN_152.06_Bot1	49	11	1	0	20	8	17	12		8 H / 41 S
SN_403.06_Bot1	11	5	0	0	5	0	0	11		7 H / 4 S
SN_403.06_Bot2	10	5	0	0	6	0	0	8		4 H / 6 S

Table 4. Analysis of processed and unprocessed desiccated wood. Taxonomical identification, description and counting.

Measures indicated in [ ] are diameter categories; Nb=number of items; Leng=Length; Wid=width; thick=thickness; heig=height; diam=diameter

Locus	**Sample**	**Taxa**	**Type**	**Nb**	**Comments**
107.05	107.05_Bot1	*Cupressus/Juniperus*	plank	1	leng= 100 mm, wid=20 mm, thick= 15 mm, 2 mortises
110.03	110.03_Bot1	*Leptadenia pyrotechnica*	twigs/branches	2	[15-25 mm]
110.04	110.04_Bot1	*Cupressus/Juniperus*	plank	2	thick=10 mm
110.04	110.04_Bot1	Indéterminable	bark	1	
117.02	117.02_Bot1	Indéterminable	bark	1	
117.03	117.03_Bot1	*Leptadenia pyrotechnica*	twigs/branches	3	[1-13 mm]
119.02	119.02_Bot1	*Acacia etbaica/tortilis* type	beam	2	Rectangular section, leng=120 mm, wid=140 mm, thick=60 mm
120.05	120.05_Bot1	cf. *Capparis decidua*	beam	1	Circular section, beam
120.05	120.05_Bot1	*Leptadenia pyrotechnica*	twigs/branches	18	[1-13 mm], [15-25 mm]
121.04	121.04_Bot1	Indéterminable	bark	1	
121.04	121.04_Bot1	*Leptadenia pyrotechnica*	twigs/branches	8	[1-13 mm], [15-25 mm]
121.05	121.05_Bot1	*Leptadenia pyrotechnica*	twigs/branches	4	[15-25 mm]
121.07	121.07_Bot1	*Tamarix sp.*	bowl	1	Bowl, heig=85 mm, diam=110 mm
122.05	122.05_Bot1	*Acacia etbaica/tortilis* type	beam	1	Rectangular section, leng=400 mm, wid=140 mm, thick=80 mm
122.05	122.05_Bot1	*Leptadenia pyrotechnica*	twigs/branches	1	[15-25 mm]
122.05	122.05_Bot1	Indéterminable	bark	1	
122.07	122.07_Bot1	*Leptadenia pyrotechnica*	twigs/branches	11	[1-13 mm]
122.07	122.07_Bot1	*Leptadenia pyrotechnica*	beam	1	Circular section, diam=52 mm
122.07	122.07_Bot1	Indéterminable	bark	2	
123.06	123.06_Bot1	cf. *Capparis decidua*	beam	1	Circular section, leng=70 mm, diam=58 mm
123.07	123.07_Bot1	Indéterminable	bark	2	
124.02	124.02_Bot1	cf. *Acacia etbaica/tortilis* type	twigs/branches	1	[1-13 mm]
124.02	124.02_Bot1	*Leptadenia pyrotechnica*	twigs/branches	4	[1-13 mm], [15-25 mm]
124.02	124.02_Bot1	*Tamarix* sp.	twigs/branches	1	[1-13 mm]
124.02	124.02_Bot1	Indéterminable	bark	2	
124.03	124.03_Bot1	*Leptadenia pyrotechnica*	twigs/branches	2	[1-13 mm]
124.04	124.04_Bot1	*Leptadenia pyrotechnica*	twigs/branches	2	[1-13 mm]
124.05	124.05_Bot1	*Leptadenia pyrotechnica*	twigs/branches	4	[1-13 mm]
124.07	124.07_Bot1	Indéterminable	bark	1	
124.08	124.08_Bot1	Indéterminable	bark	2	
125.03	125.03_Bot1	*Acacia etbaica/tortilis* type	door	1	Badly damaged door
125.03	125.03_Bot2	*Acacia etbaica/tortilis* type	beam	1	Rectangular section, leng=55 mm, wid=17 mm, thick=15 mm
128.02	128.02_Bot1	*Leptadenia pyrotechnica*	twigs/branches	2	[1-13 mm], [15-25 mm]
129.03	129.03_Bot1	*Cupressus/Juniperus*	plank	1	thick=10 mm
129.03	129.03_Bot1	*Leptadenia pyrotechnica*	twigs/branches	2	[15-25 mm]
129.05	129.05_Bot1	*Leptadenia pyrotechnica*	twigs/branches	5	[1-13 mm], [15-25 mm]
129.07	129.07_Bot1	*Leptadenia pyrotechnica*	twigs/branches	3	[1-13 mm]
132.13	132.13_Bot1	*Acacia etbaica/tortilis* type	twigs/branches	50	[15-25 mm]
132.13	132.13_Bot1	*Leptadenia pyrotechnica*	twigs/branches	50	[1-13], [15-25 mm]

Table 5. Desiccated seed and fruit remains data. Taxonomical identification and counting.

Volume (l)=volume of bulk sediment, in litres; NRw=number of whole remains; NRfr=number of fragmented remains; MNI=minimal number of items.

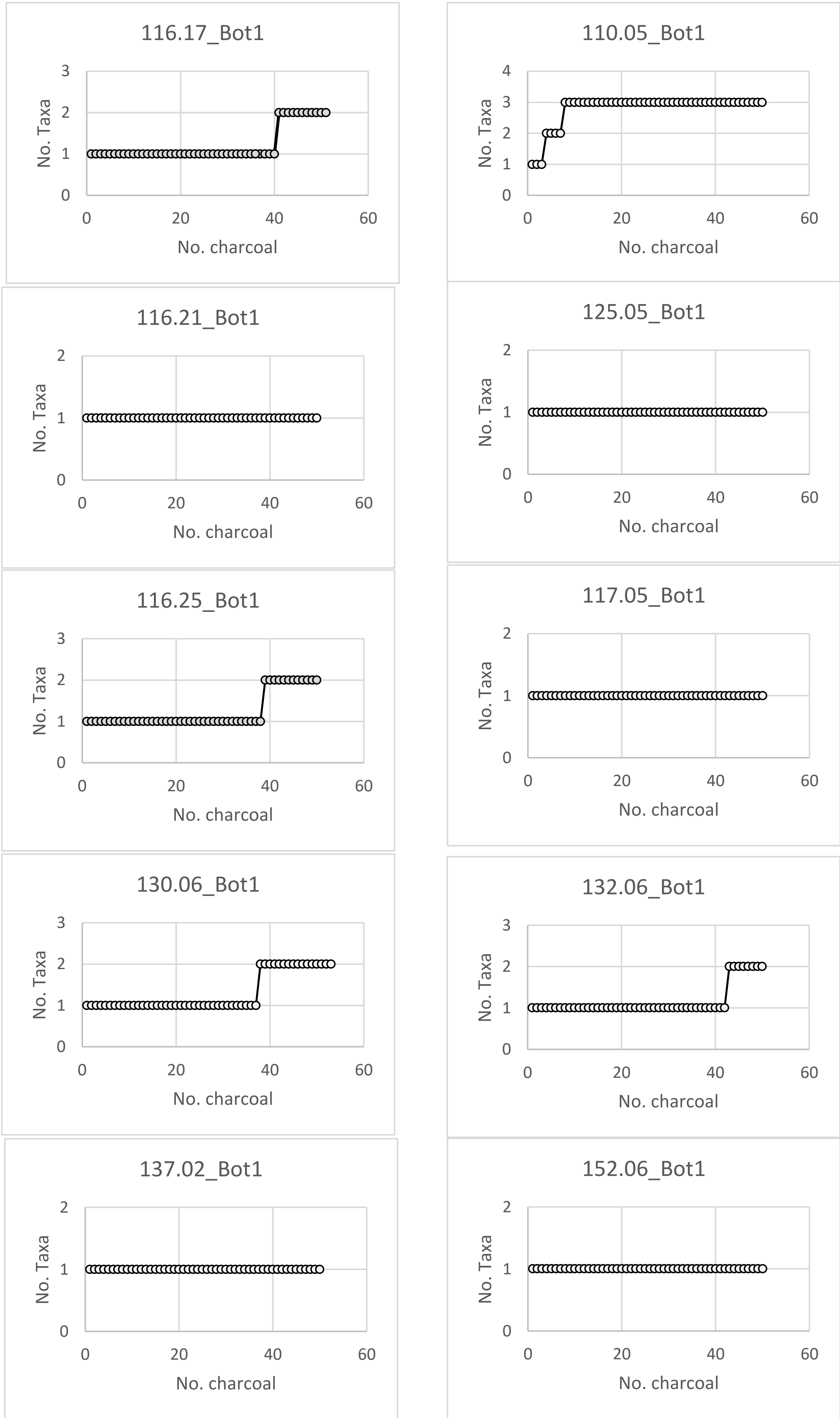
	Locus	**116.22**	**123.02**						**125.05**			**130.06**			**132.08**
	Sample	116.22_Bot1	123.02_Bot1			123.02_Bot2			125.05_Bot1			130.06_Bot1			132.08_Bot1
	Volume (l)	2							1			0,5			0,15
		NRw	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw
Cultivated plants	**Type of remains**														
Hordeum vulgare hulled	Caryopsis/ floret					21	17	25	1		1				
Hordeum vulgare hulled	Lemma basis			2	1										
Hordeum vulgare hulled	Lemma, palea						17	3		20	5				
Hordeum vulgare hulled	Rachis fgmt						1	1					2	2	
Triticum aestivum/durum	Caryopsis					1		1	6		6				
Cerealia	Caryopsis									1	1				
Cerealia	Straw									5	5				
Lens culinaris	Seed		10	1	10	2		2							
Lens culinaris	Cotyledon						2	1		1	1				
Lens culinaris	Seed coat			1											
cf. *Phoenix dactylifera*	Leaflet									4	1				
Wild plants															
Acacia sp.	Leaf								1		1				
Citrullus colocynthis	Seed						1	1							
cf. *Medicago* sp.	Fruit								1		1				
Panicum turgidum	Caryopsis								1		1				
cf. *Panicum turgidum*	Caryopsis								1		1				
Panicum turgidum	Spikelet								1		1				
cf. *Trifolium* sp.	Seed								3		3				
Other plants															
Undetermined	Pericarp						1	1							
Undetermined	Thorn								1		1				
	Sum		10	4	11	24	39	35	16	31	29		2	2	
Non-plants items															
Coprolites ovicaprid									1			1			
Coprolites rodent		14	1						2						100

Table 6. Charred seed and fruit remains data. Taxonomical identification and counting.

NRw=number of whole remains; NRfr=number of fragmented remains; MNI=minimal number of items.

	US	**116.21**						**116.22**						**117.05**			**125.05**			**130.06**		
	Sample	116.21_Bot1			116.21_Bot2			116.22_Bot1			116.22_Bot2			117.05_Bot1			125.05_Bot1			130.06_Bot1		
	Volume (l)	2			2			2			2			2			1			0,5		
		NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI	NRw	NRfr	MNI
Cultivated plants	**Type of remains**																					
Hordeum vulgare hulled	Caryopsis	2		2				9		9	5	3	7		1	1				15	32	25
Hordeum vulgare hulled	Fgmt rachis																				20	20
Cerealia	Caryopsis				1		1															
Lens culinaris	Seed													1	20	3		4	3	5		
Lens culinaris	Cotyledon																				14	6
Brassica cf. *nigra*	Seed													1		1						
Wild plants																						
Acacia sp.	Seed							10		10												
Medicago sp.	Seed																			3		3
Citrullus colocynthis	Seed																				1	1
Zilla spinosa	Fruit	17	52	27	84		84	66		66	106	23	112									
Other plants																						
"Half-moon" type		65		65	66		66	35		35	33		33	4		4	6		6	47		
Undetermined	Seed																			26		26
Sum		**84**	**52**	**94**	**151**		**151**	**120**		**120**	**170**		**152**	**6**	**21**	**9**	**6**	**4**	**9**	**96**	**67**	**81**
Non-plant items																						
Organic remains		1						4			14									1		
Coprolites undetermined																	5					
Coprolites ovicaprid											1									4		
Coprolites rodent																				4		

Supplementary data 1. Taxonomic saturation curves of charcoal samples (except 403.06_Bot1/Bot2)



Supplementary data 2. Details of dendro-anthracological criteria.

Dom=domestic; Stor=Storage; Smit=Smithy (see table 1 for details of contexts); N°=charcoal numbering; Heart=heartwood; Insect degra=Insect degradation; Vitrif=vitrification; diam=diameter; Consist=consistence; React w= reaction wood.

1=present and 0=absent for column “Bark”, “Heart”, “Thyles”, “Fungi Hyphae”, Insect degra”, “Radial cracks”, “Vitrif” and “React w”

Sample	Context	N°	Lenght (mm)	Bark	Heart	Thyles	Fungi Hyphae	Insect degra	Radial cracks	Vitrif	diam (mm)	Consist	React w
SN_110.05_Bot1	DOM	1	10	0	0	0	0	0	1	1		0	0
SN_110.05_Bot1	DOM	2	20	0	0	1	0	0	1	1		1	0
SN_110.05_Bot1	DOM	3	20	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	5	11	0	0	0	0	0	0	0		1	0
SN_110.05_Bot1	DOM	6	22	0	0	0	0	0	1	1		0	0
SN_110.05_Bot1	DOM	7	10	0	0	0	0	0	1	0		0	0
SN_110.05_Bot1	DOM	9	15	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	10	10	0	0	0	0	0	0	0		1	0
SN_110.05_Bot1	DOM	11	22	0	0	0	0	0	1	1		0	0
SN_110.05_Bot1	DOM	12	12	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	13	13	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	14	11	0	0	0	0	0	0	0		0	0
SN_110.05_Bot1	DOM	15	16	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	16	13	0	0	1	0	0	1	0		0	0
SN_110.05_Bot1	DOM	17	10	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	18	15	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	19	13	0	0	1	1	0	1	1		0	0
SN_110.05_Bot1	DOM	20	16	0	0	0	0	0	0	0		0	0
SN_110.05_Bot1	DOM	21	14	0	0	1	1	0	0	0		0	0
SN_110.05_Bot1	DOM	22	17	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	23	7	0	0	1	0	0	1	1		1	0
SN_110.05_Bot1	DOM	24	14	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	25	20	1	1	0	0	0	1	1	7	0	0
SN_110.05_Bot1	DOM	26	9	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	27	18	0	0	0	0	0	0	1		0	0
SN_110.05_Bot1	DOM	28	8	0	0	1	0	0	0	1		1	0
SN_110.05_Bot1	DOM	29	12	0	0	0	0	0	0	0		0	0
SN_110.05_Bot1	DOM	30	12	0	0	0	0	0	1	0		0	0
SN_110.05_Bot1	DOM	31	10	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	32	11	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	33	13	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	34	11	0	0	0	0	0	0	0		0	0
SN_110.05_Bot1	DOM	35	16	0	0	0	0	0	0	1		0	0
SN_110.05_Bot1	DOM	36	6	0	0	0	0	0	1	1		1	0
SN_110.05_Bot1	DOM	37	5	0	0	1	1	0	1	1		0	0
SN_110.05_Bot1	DOM	38	11	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	39	10	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	40	18	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	41	7	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	42	7	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	43	7	0	0	1	0	0	0	1		0	0
SN_110.05_Bot1	DOM	45	11	0	0	1	1	0	0	1		0	0

SN_110.05_Bot1	DOM	46	9	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	47	8	0	0	1	0	0	1	1		0	0
SN_110.05_Bot1	DOM	48	12	0	0	0	1	0	0	0		0	0
SN_110.05_Bot1	DOM	49	10	0	0	1	0	0	1	1		1	0
SN_110.05_Bot1	DOM	50	7	0	0	1	0	0	1	1		0	0
SN_116.17_Bot1	DOM	1	16	1	1	0	0	0	1	0	12	0	0
SN_116.17_Bot1	DOM	2	12	1	1	0	0	0	1	0	7	0	0
SN_116.17_Bot1	DOM	3	15	1	0	0	0	0	0	0	10	0	0
SN_116.17_Bot1	DOM	4	16	1	0	1	0	0	0	1		0	0
SN_116.17_Bot1	DOM	5	22	0	0	0	0	0	1	1		0	0
SN_116.17_Bot1	DOM	6	20	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	7	20	0	1	0	1	0	1	0		0	0
SN_116.17_Bot1	DOM	9	12	0	0	0	0	0	1	1		0	0
SN_116.17_Bot1	DOM	10	12	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	11	16	0	0	0	0	0	0	1		0	0
SN_116.17_Bot1	DOM	12	10	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	13	8	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	14	16	0	0	0	0	0	1	1		0	0
SN_116.17_Bot1	DOM	16	16	0	0	0	0	0	1	1		0	0
SN_116.17_Bot1	DOM	17	11	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	18	15	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	19	11	0	1	0	0	0	0	1	8	0	0
SN_116.17_Bot1	DOM	20	12	0	0	0	0	?	1	0		0	0
SN_116.17_Bot1	DOM	21	17	0	1	0	0	0	1	1	19	0	0
SN_116.17_Bot1	DOM	22	12	0	0	0	0	0	1	0		1	0
SN_116.17_Bot1	DOM	23	10	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	24	8	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	25	14	0	0	0	0	0	0	1		0	0
SN_116.17_Bot1	DOM	26	11	1	0	0	0	0	0	0		1	0
SN_116.17_Bot1	DOM	27	13	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	28	11	1	0	0	0	0	1	0	8	0	0
SN_116.17_Bot1	DOM	29	9	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	30	13	0	0	0	0	0	1	0	20	0	0
SN_116.17_Bot1	DOM	31	10	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	32	5	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	33	8	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	34	12	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	36	7	0	1	0	0	0	1	0	3	0	0
SN_116.17_Bot1	DOM	37	11	0	0	0	0	0	1	0	10	0	0
SN_116.17_Bot1	DOM	38	11	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	39	6	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	40	7	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	42	8	0	1	0	0	0	1	0	5	0	0
SN_116.17_Bot1	DOM	43	11	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	44	20	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	45	10	0	0	0	0	0	0	1		1	0
SN_116.17_Bot1	DOM	46	16	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	47	13	1	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	48	13	0	0	0	0	0	1	0		0	0
SN_116.17_Bot1	DOM	49	11	0	0	0	0	0	0	0		0	0
SN_116.17_Bot1	DOM	50	11	0	0	0	0	0	0	0		1	0

SN_116.17_Bot1	DOM	51	10	0	0	0	0	0	0	0		0	0
SN_116.21_Bot1	DOM	1	10	0	0	1	0	0	1	0		0	0
SN_116.21_Bot1	DOM	2	20	0	1	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	4	21	0	1	0	0	0	1	1	21	0	0
SN_116.21_Bot1	DOM	5	13	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	6	11	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	7	13	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	8	8	0	0	1	0	0	1	0		0	0
SN_116.21_Bot1	DOM	9	16	0	0	1	0	0	1	1		0	0
SN_116.21_Bot1	DOM	10	17	0	0	1	0	0	1	1		0	0
SN_116.21_Bot1	DOM	11	8	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	12	17	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	13	18	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	14	13	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	15	9	0	1	0	0	0	1	1	9	0	0
SN_116.21_Bot1	DOM	16	8	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	17	7	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	18	10	0	0	1	0	0	1	1		0	0
SN_116.21_Bot1	DOM	19	14	0	0	1	0	0	1	1		0	0
SN_116.21_Bot1	DOM	20	12	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	21	9	0	0	1	0	0	1	0		0	0
SN_116.21_Bot1	DOM	22	10	0	0	0	0	0	0	1		0	0
SN_116.21_Bot1	DOM	23	18	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	24	9	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	25	10	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	26	15	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	27	8	0	0	0	0	0	1	1		1	0
SN_116.21_Bot1	DOM	28	18	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	29	10	0	0	0	0	0	1	1		1	0
SN_116.21_Bot1	DOM	30	13	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	31	15	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	32	14	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	33	13	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	34	9	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	35	13	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	36	8	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	37	13	0	0	0	0	0	0	0		0	0
SN_116.21_Bot1	DOM	38	10	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	39	14	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	40	14	0	0	1	0	0	0	0		0	0
SN_116.21_Bot1	DOM	41	10	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	43	8	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	44	11	0	0	1	0	0	1	0		0	0
SN_116.21_Bot1	DOM	45	8	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	47	11	0	0	0	0	0	1	0		0	0
SN_116.21_Bot1	DOM	49	8	0	0	0	0	0	1	1		0	0
SN_116.21_Bot1	DOM	50	8	0	0	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	1	18	0	0	1	0	0	1	1		1	0
SN_116.25_Bot1	DOM	2	27	0	0	0	0	0	1	1		1	0
SN_116.25_Bot1	DOM	3	15	1	1	0	0	0	1	1	12	1	0
SN_116.25_Bot1	DOM	4	6	0	0	0	1	0	0	1		1	0

SN_116.25_Bot1	DOM	5	20	0	0	0	1	0	1	1		1	0
SN_116.25_Bot1	DOM	6	17	0	0	0	0	0	0	0		1	0
SN_116.25_Bot1	DOM	7	18	0	0	0	0	0	0	0		1	0
SN_116.25_Bot1	DOM	8	8	0	0	0	0	0	0	1		1	0
SN_116.25_Bot1	DOM	9	16	0	1	0	0	0	1	0		1	0
SN_116.25_Bot1	DOM	10	11	0	0	1	0	0	1	1		0	0
SN_116.25_Bot1	DOM	11	17	0	0	0	0	0	1	1		1	0
SN_116.25_Bot1	DOM	12	11	1	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	13	17	0	0	0	0	0	1	1		1	0
SN_116.25_Bot1	DOM	14	18	0	1	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	15	7	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	16	15	0	0	0	0	0	1	1		1	0
SN_116.25_Bot1	DOM	17	11	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	18	16	0	0	0	1	0	1	1		0	0
SN_116.25_Bot1	DOM	19	19	0	0	0	0	0	0	0		1	0
SN_116.25_Bot1	DOM	20	7	0	1	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	21	18	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	22	10	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	23	7	0	0	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	24	14	0	0	0	0	0	1	0		0	0
SN_116.25_Bot1	DOM	25	15	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	26	18	0	0	0	1	0	1	0		0	0
SN_116.25_Bot1	DOM	27	20	0	0	0	0	0	1	0		0	0
SN_116.25_Bot1	DOM	28	10	0	0	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	29	15	0	0	0	1	0	0	1		0	0
SN_116.25_Bot1	DOM	30	12	0	1	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	31	11	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	32	10	0	0	0	1	0	1	0		0	0
SN_116.25_Bot1	DOM	33	15	0	0	0	0	0	1	0		1	0
SN_116.25_Bot1	DOM	34	13	0	0	0	1	0	1	1		0	0
SN_116.25_Bot1	DOM	35	8	0	0	0	0	0	1	0		0	0
SN_116.25_Bot1	DOM	36	17	0	0	0	1	0	0	0		0	0
SN_116.25_Bot1	DOM	37	11	0	0	0	0	0	1	0		0	0
SN_116.25_Bot1	DOM	38	11	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	40	9	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	41	12	0	0	0	1	0	0	0		1	0
SN_116.25_Bot1	DOM	42	12	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	43	12	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	44	8	0	0	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	45	10	0	0	0	1	0	0	0		0	0
SN_116.25_Bot1	DOM	46	10	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	47	9	0	0	0	0	0	1	1		0	0
SN_116.25_Bot1	DOM	48	10	0	0	0	0	0	0	0		1	0
SN_116.25_Bot1	DOM	49	10	0	0	0	0	0	0	0		0	0
SN_116.25_Bot1	DOM	50	12	0	0	0	0	0	1	0		0	0
SN_117.05_Bot1	DOM	1	55	0	0	1	1	0	0	1		1	0
SN_117.05_Bot1	DOM	2	19	0	0	0	0	0	1	1		1	0
SN_117.05_Bot1	DOM	3	12	0	0	0	0	0	0	1		0	0
SN_117.05_Bot1	DOM	4	19	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	5	8	0	0	0	0	0	0	1		1	0
SN_117.05_Bot1	DOM	6	13	0	0	1	0	0	0	1		1	0

SN_117.05_Bot1	DOM	7	9	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	8	8	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	9	7	0	0	0	0	0	0	0		0	0
SN_117.05_Bot1	DOM	10	5	0	0	1	0	0	0	0		1	0
SN_117.05_Bot1	DOM	11	13	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	12	10	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	13	4	0	0	0	0	0	0	1		1	0
SN_117.05_Bot1	DOM	14	12	0	0	0	1	0	0	1		1	0
SN_117.05_Bot1	DOM	15	11	1	0	0	0	0	0	1		0	0
SN_117.05_Bot1	DOM	16	8	0	0	0	0	0	1	1		0	0
SN_117.05_Bot1	DOM	17	10	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	18	16	0	0	1	0	0	1	1		0	0
SN_117.05_Bot1	DOM	19	14	0	0	0	0	0	0	1		0	0
SN_117.05_Bot1	DOM	20	11	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	21	6	0	0	1	1	0	1	1		0	0
SN_117.05_Bot1	DOM	22	8	0	1	1	0	0	0	1	8	1	0
SN_117.05_Bot1	DOM	23	18	0	0	0	0	0	1	1		0	0
SN_117.05_Bot1	DOM	24	8	0	0	1	1	0	0	1		1	0
SN_117.05_Bot1	DOM	25	12	0	0	1	0	0	1	1		0	0
SN_117.05_Bot1	DOM	26	8	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	27	8	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	28	10	0	0	1	1	0	0	1		1	0
SN_117.05_Bot1	DOM	29	7	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	30	7	0	0	1	1	0	0	0		1	0
SN_117.05_Bot1	DOM	31	8	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	32	7	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	33	12	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	34	10	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	35	7	0	0	1	0	0	1	0		0	0
SN_117.05_Bot1	DOM	36	12	0	0	1	0	0	0	0		0	0
SN_117.05_Bot1	DOM	37	7	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	38	8	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	39	4	0	0	1	0	0	0	1		0	0
SN_117.05_Bot1	DOM	40	12	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	41	10	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	42	11	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	43	12	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	44	4	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	45	7	0	0	1	1	0	0	1		1	0
SN_117.05_Bot1	DOM	46	4	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	47	4	0	0	1	0	0	0	1		1	0
SN_117.05_Bot1	DOM	48	8	0	0	1	0	0	0	0		1	0
SN_117.05_Bot1	DOM	49	10	0	0	1	0	0	1	1		1	0
SN_117.05_Bot1	DOM	50	7	0	0	1	0	0	1	1		0	0
SN_125.05_Bot1	DOM	2	10	0	0	1	0	0	0	0		0	0
SN_125.05_Bot1	DOM	3	13	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	4	15	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	5	9	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	6	12	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	7	15	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	8	5	0	0	1	0	0	0	0		0	0

SN_125.05_Bot1	DOM	9	6	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	10	10	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	11	8	0	0	0	0	0	0	1		0	0
SN_125.05_Bot1	DOM	13	7	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	14	9	0	0	0	1	0	0	1		0	0
SN_125.05_Bot1	DOM	15	17	0	0	0	0	0	0	0		0	0
SN_125.05_Bot1	DOM	16	10	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	17	10	0	0	1	1	0	0	1		0	0
SN_125.05_Bot1	DOM	18	10	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	19	11	0	0	0	0	0	0	0		1	0
SN_125.05_Bot1	DOM	20	8	0	0	0	0	0	0	1		1	0
SN_125.05_Bot1	DOM	21	20	0	0	0	0	0	0	0		1	0
SN_125.05_Bot1	DOM	23	13	0	0	0	0	0	0	0		0	0
SN_125.05_Bot1	DOM	24	6	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	25	12	0	0	0	0	0	0	1		1	0
SN_125.05_Bot1	DOM	26	10	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	27	12	0	0	1	0	0	0	1		1	0
SN_125.05_Bot1	DOM	29	9	0	0	0	0	0	0	1		1	0
SN_125.05_Bot1	DOM	31	8	0	0	0	0	0	0	1		0	0
SN_125.05_Bot1	DOM	33	11	0	0	1	0	0	1	1		0	0
SN_125.05_Bot1	DOM	34	10	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	35	5	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	36	8	0	0	1	0	0	0	0		0	0
SN_125.05_Bot1	DOM	37	4	0	0	1	1	0	0	1		0	0
SN_125.05_Bot1	DOM	38	8	0	0	0	0	0	0	1		0	0
SN_125.05_Bot1	DOM	39	8	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	41	5	0	0	0	0	0	1	1		0	0
SN_125.05_Bot1	DOM	42	4	0	0	1	1	0	0	0		0	0
SN_125.05_Bot1	DOM	43	11	0	0	1	0	0	0	0		0	0
SN_125.05_Bot1	DOM	44	5	0	0	1	1	0	0	1		0	0
SN_125.05_Bot1	DOM	45	8	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	46	7	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	47	7	0	0	1	0	0	0	1		0	0
SN_125.05_Bot1	DOM	48	4	0	0	1	0	0	0	0		0	0
SN_125.05_Bot1	DOM	49	5	0	0	0	1	0	0	0		1	0
SN_125.05_Bot1	DOM	50	4	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	1	13	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	2	18	0	0	1	1	0	1	0		0	0
SN_130.06_Bot1	DOM	3	15	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	5	9	0	0	1	1	0	1	0		0	0
SN_130.06_Bot1	DOM	6	4	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	7	10	0	0	1	0	0	1	1		1	0
SN_130.06_Bot1	DOM	8	10	1	1	0	0	0	0	0	5	0	0
SN_130.06_Bot1	DOM	9	9	0	0	1	1	0	1	0		0	0
SN_130.06_Bot1	DOM	10	8	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	11	8	0	0	1	0	0	0	1		1	0
SN_130.06_Bot1	DOM	12	10	0	0	1	0	0	1	1		1	0
SN_130.06_Bot1	DOM	13	8	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	14	13	0	0	0	0	0	1	0		0	0
SN_130.06_Bot1	DOM	15	15	0	0	0	0	0	1	0		0	0
SN_130.06_Bot1	DOM	16	11	0	0	1	0	0	1	1		0	0

SN_130.06_Bot1	DOM	17	9	0	0	1	0	0	1	1		1	0
SN_130.06_Bot1	DOM	18	5	0	0	0	0	0	0	0		0	0
SN_130.06_Bot1	DOM	19	12	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	20	8	0	0	0	1	0	1	0		0	0
SN_130.06_Bot1	DOM	21	12	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	23	5	0	0	1	0	0	0	0		0	0
SN_130.06_Bot1	DOM	24	8	0	0	0	0	0	0	1		1	0
SN_130.06_Bot1	DOM	25	5	0	0	1	0	0	0	0		0	0
SN_130.06_Bot1	DOM	28	9	0	0	1	0	0	0	1		1	0
SN_130.06_Bot1	DOM	29	10	0	0	0	0	0	1	1		1	0
SN_130.06_Bot1	DOM	30	5	0	0	1	0	0	1	0	5	0	0
SN_130.06_Bot1	DOM	31	5	0	0	1	0	0	1	0		1	0
SN_130.06_Bot1	DOM	32	13	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	34	10	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	37	12	0	0	0	0	0	0	0		0	0
SN_130.06_Bot1	DOM	38	9	1	0	0	0	0	0	0		0	0
SN_130.06_Bot1	DOM	39	12	1	1	0	0	0	0	0	1	0	0
SN_130.06_Bot1	DOM	40	6	0	0	0	0	0	1	0		0	0
SN_130.06_Bot1	DOM	41	5	0	0	1	0	0	1	1		1	0
SN_130.06_Bot1	DOM	42	4	0	0	0	1	0	1	0		0	0
SN_130.06_Bot1	DOM	43	6	1	1	0	0	0	0	0	1	0	0
SN_130.06_Bot1	DOM	44	8	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	45	15	1	1	0	0	0	0	0	1	0	0
SN_130.06_Bot1	DOM	46	7	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	48	8	1	1	0	0	0	0	0	1	0	0
SN_130.06_Bot1	DOM	49	7	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	50	9	0	0	1	0	0	1	0		0	0
SN_130.06_Bot1	DOM	15BIS	18	0	0	1	1	0	1	0		0	0
SN_130.06_Bot1	DOM	16BIS	4	0	0	1	0	0	1	1		0	0
SN_130.06_Bot1	DOM	17BIS	9	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	1	35	0	0	0	0	0	0	0		0	0
SN_132.06_Bot1	DOM	2	20	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	3	10	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	4	18	0	0	0	0	0	0	0		0	0
SN_132.06_Bot1	DOM	5	18	0	0	1	0	0	1	1		1	0
SN_132.06_Bot1	DOM	6	3	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	7	13	0	0	1	0	0	0	0		0	0
SN_132.06_Bot1	DOM	8	18	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	9	13	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	10	13	0	0	0	0	0	0	1		0	0
SN_132.06_Bot1	DOM	11	14	0	0	0	0	0	1	0		0	0
SN_132.06_Bot1	DOM	12	16	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	13	12	0	0	0	0	0	1	0		0	0
SN_132.06_Bot1	DOM	14	10	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	15	10	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	16	10	0	0	1	0	0	0	0		1	0
SN_132.06_Bot1	DOM	17	16	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	18	18	0	0	0	0	0	0	0		0	0
SN_132.06_Bot1	DOM	19	11	0	0	0	0	0	1	0		0	0
SN_132.06_Bot1	DOM	20	14	0	0	1	0	0	0	0		0	0
SN_132.06_Bot1	DOM	21	11	0	0	1	1	0	0	1		0	0

SN_132.06_Bot1	DOM	22	16	0	0	1	0	0	0	0		0	0
SN_132.06_Bot1	DOM	23	12	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	24	10	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	25	8	0	0	1	0	0	0	0		0	0
SN_132.06_Bot1	DOM	26	9	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	27	4	0	0	1	0	0	1	0		0	0
SN_132.06_Bot1	DOM	28	12	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	29	7	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	30	8	0	0	0	0	0	0	0		0	0
SN_132.06_Bot1	DOM	31	10	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	32	7	0	0	1	0	0	1	0		0	0
SN_132.06_Bot1	DOM	34	5	0	0	0	0	0	1	1		1	0
SN_132.06_Bot1	DOM	35	4	0	0	1	0	0	1	0		0	0
SN_132.06_Bot1	DOM	36	8	0	0	0	0	0	0	1		1	0
SN_132.06_Bot1	DOM	37	4	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	38	8	0	0	1	0	0	1	0		0	0
SN_132.06_Bot1	DOM	39	6	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	41	11	0	0	1	0	0	1	1		0	0
SN_132.06_Bot1	DOM	42	8	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	44	7	0	0	1	1	0	0	1		0	0
SN_132.06_Bot1	DOM	45	5	0	0	0	0	0	0	1		1	0
SN_132.06_Bot1	DOM	46	5	0	0	0	0	0	0	1		1	0
SN_132.06_Bot1	DOM	47	10	0	0	0	0	0	1	1		0	0
SN_132.06_Bot1	DOM	48	4	0	0	1	0	0	1	0		0	0
SN_132.06_Bot1	DOM	49	7	0	0	1	0	0	0	1		0	0
SN_132.06_Bot1	DOM	50	8	0	0	0	0	0	0	1		0	0
SN_137.02_Bot1	STOR	1	15	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	2	5	0	0	0	0	0	0	0		0	0
SN_137.02_Bot1	STOR	3	20	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	4	10	0	0	1	1	0	0	1		0	0
SN_137.02_Bot1	STOR	5	10	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	6	12	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	7	12	0	0	1	1	0	0	0		1	0
SN_137.02_Bot1	STOR	8	11	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	9	12	0	0	1	0	0	0	0		0	0
SN_137.02_Bot1	STOR	10	12	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	11	13	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	12	2	0	0	0	0	0	0	0		0	0
SN_137.02_Bot1	STOR	13	12	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	14	14	0	0	1	0	0	0	1		0	0
SN_137.02_Bot1	STOR	15	9	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	16	8	0	0	0	1	0	0	1		0	0
SN_137.02_Bot1	STOR	17	7	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	18	5	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	19	8	0	0	1	0	0	0	1		0	0
SN_137.02_Bot1	STOR	20	8	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	21	9	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	22	11	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	23	12	0	0	1	0	0	1	1		0	0
SN_137.02_Bot1	STOR	24	8	0	0	1	1	0	1	1		1	0
SN_137.02_Bot1	STOR	25	11	0	0	0	0	0	0	1		1	0

SN_137.02_Bot1	STOR	26	8	0	0	1	1	0	0	1		1	0
SN_137.02_Bot1	STOR	27	12	0	0	0	1	0	0	1		0	0
SN_137.02_Bot1	STOR	28	6	0	0	1	0	0	0	1		0	0
SN_137.02_Bot1	STOR	29	5	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	30	13	0	0	1	1	0	0	1		0	0
SN_137.02_Bot1	STOR	31	11	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	32	10	0	0	0	0	0	0	0		0	0
SN_137.02_Bot1	STOR	33	13	0	0	1	1	0	0	0		1	0
SN_137.02_Bot1	STOR	34	14	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	35	8	0	0	0	0	0	0	1		0	0
SN_137.02_Bot1	STOR	36	8	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	37	6	0	0	0	1	0	0	0		0	0
SN_137.02_Bot1	STOR	38	8	0	0	1	0	0	0	1		0	0
SN_137.02_Bot1	STOR	39	10	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	40	12	0	0	1	1	0	0	1		0	0
SN_137.02_Bot1	STOR	41	9	0	0	1	1	0	1	1		1	0
SN_137.02_Bot1	STOR	42	10	0	0	0	1	0	0	1		1	0
SN_137.02_Bot1	STOR	43	12	0	0	1	0	0	0	1		0	0
SN_137.02_Bot1	STOR	44	14	0	0	1	0	0	1	1		1	0
SN_137.02_Bot1	STOR	45	6	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	46	9	0	0	1	0	0	1	1		0	0
SN_137.02_Bot1	STOR	47	6	0	0	0	0	0	0	0		0	0
SN_137.02_Bot1	STOR	48	10	0	0	0	0	0	0	1		1	0
SN_137.02_Bot1	STOR	49	13	0	0	1	0	0	0	1		1	0
SN_137.02_Bot1	STOR	50	8	0	0	1	0	0	0	1		1	0
SN_152.03_Bot1	OVEN	1	22	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	2	10	0	0	1	1	0	0	0		1	0
SN_152.03_Bot1	OVEN	3	6	0	0	1	1	0	0	0		0	0
SN_152.03_Bot1	OVEN	4	17	0	0	1	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	5	13	0	0	1	0	0	1	1		1	0
SN_152.03_Bot1	OVEN	6	17	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	7	20	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	8	14	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	9	8	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	10	5	0	0	1	1	0	1	0		0	0
SN_152.03_Bot1	OVEN	11	8	0	0	1	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	12	5	0	0	1	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	13	4	0	0	1	0	0	1	1		1	0
SN_152.03_Bot1	OVEN	15	8	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	16	7	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	17	15	0	0	1	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	18	8	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	19	7	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	20	10	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	21	8	0	0	1	1	0	0	0		0	0
SN_152.03_Bot1	OVEN	22	13	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	23	4	0	0	0	1	0	0	1		0	0
SN_152.03_Bot1	OVEN	24	8	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	25	7	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	26	8	0	0	1	0	0	0	1		0	0
SN_152.03_Bot1	OVEN	27	10	0	0	0	0	0	0	0		0	0

SN_152.03_Bot1	OVEN	28	11	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	29	17	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	30	11	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	31	9	0	0	0	0	0	1	1		1	0
SN_152.03_Bot1	OVEN	32	10	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	33	12	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	34	5	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	35	10	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	36	7	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	37	10	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	38	8	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	39	7	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	40	6	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	41	10	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	42	7	0	0	0	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	43	9	0	0	0	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	44	12	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	45	10	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	46	6	0	0	0	0	0	0	0		0	0
SN_152.03_Bot1	OVEN	47	7	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	48	10	0	0	1	0	0	1	1		0	0
SN_152.03_Bot1	OVEN	49	5	0	0	1	0	0	1	0		0	0
SN_152.03_Bot1	OVEN	50	5	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	1	15	0	0	0	0	0	0	0		1	0
SN_152.06_Bot1	OVEN	2	16	1	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	3	22	0	0	1	1	0	0	1		1	0
SN_152.06_Bot1	OVEN	4	10	0	0	0	1	0	0	0		0	0
SN_152.06_Bot1	OVEN	5	8	0	0	1	1	0	0	0		1	0
SN_152.06_Bot1	OVEN	6	19	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	7	18	0	0	1	0	0	1	1		0	0
SN_152.06_Bot1	OVEN	8	15	0	0	1	0	0	1	1		0	0
SN_152.06_Bot1	OVEN	10	18	0	0	1	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	11	8	0	0	0	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	12	9	0	0	1	1	0	1	0		1	0
SN_152.06_Bot1	OVEN	13	12	0	0	0	1	0	0	1		0	0
SN_152.06_Bot1	OVEN	14	20	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	15	8	0	0	1	1	0	0	0		0	0
SN_152.06_Bot1	OVEN	16	22	0	0	1	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	17	18	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	18	10	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	19	15	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	20	24	0	0	0	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	21	14	0	0	0	0	0	1	1		1	0
SN_152.06_Bot1	OVEN	22	10	0	0	0	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	23	17	0	0	1	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	24	12	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	25	9	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	26	12	0	0	0	0	0	0	0		1	0
SN_152.06_Bot1	OVEN	27	13	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	28	6	0	0	1	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	29	8	0	0	0	0	0	1	0		0	0

SN_152.06_Bot1	OVEN	30	8	0	0	1	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	31	6	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	32	10	0	0	1	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	33	12	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	34	5	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	35	11	0	0	1	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	36	9	0	0	1	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	37	9	0	0	1	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	38	10	0	0	0	1	0	1	0		0	0
SN_152.06_Bot1	OVEN	39	10	0	0	0	0	0	0	1		1	0
SN_152.06_Bot1	OVEN	40	5	0	0	0	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	41	6	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	42	7	0	0	1	0	0	0	1		0	0
SN_152.06_Bot1	OVEN	43	7	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	44	8	0	0	1	1	0	1	0		0	0
SN_152.06_Bot1	OVEN	45	7	0	0	1	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	46	7	0	0	1	0	0	0	0		1	0
SN_152.06_Bot1	OVEN	47	10	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	48	8	0	0	1	0	0	1	0		0	0
SN_152.06_Bot1	OVEN	49	10	0	0	0	0	0	0	0		0	0
SN_152.06_Bot1	OVEN	50	10	0	0	0	0	0	0	0		0	0
SN_403.06_Bot1	SMIT	1	8	0	0	1	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	2	8	0	0	0	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	3	8	0	0	1	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	4	4	0	0	1	0	0	0	1		0	0
SN_403.06_Bot1	SMIT	5	4	0	0	1	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	6	4	0	0	0	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	7	4	0	0	1	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	8	5	0	0	0	0	0	0	1		0	0
SN_403.06_Bot1	SMIT	9	5	0	0	0	0	0	0	1		1	0
SN_403.06_Bot1	SMIT	10	4	0	0	0	0	0	0	1		0	0
SN_403.06_Bot1	SMIT	11	3	0	0	0	0	0	0	1		0	0
SN_403.06_Bot2	SMIT	1	11	0	0	0	0	0	0	1		0	0
SN_403.06_Bot2	SMIT	2	4	0	0	1	0	0	0	1		0	0
SN_403.06_Bot2	SMIT	3	10	0	0	1	0	0	0	1		1	0
SN_403.06_Bot2	SMIT	4	6	0	0	1	0	0	0	1		1	0
SN_403.06_Bot2	SMIT	5	5	0	0	1	0	0	0	1		0	0
SN_403.06_Bot2	SMIT	6	3	0	0	0	0	0	0	1		1	0
SN_403.06_Bot2	SMIT	7	3	0	0	1	0	0	0	1		1	0
SN_403.06_Bot2	SMIT	8	2	0	0	1	0	0	0	1		0	0
SN_403.06_Bot2	SMIT	9	6	0	0	0	0	0	0	0		0	0
SN_403.06_Bot2	SMIT	10	4	0	0	0	0	0	0	0		0	0

Supplementary data 3. Detailed results of the correspondance analysis on archaeological contexts with charcoal, seed and fruit remains.
Cons=consistence, Copro=coprolite, DIV=charcoal taxonomical diversity, Rad-C=radial cracks, Hyp=fungi hyphae, Tw-Br=twigs, branches, Vitr=vitrification. Context 403.06 groups two samples (403.06_Bot1 and 403.06_Bot2). "Consistence" variable is complementary. For the CA we used the software AnlyseSHS (http://analyse.univ-paris1.fr/).

Pearson's Chi: 958.4565
Degrees of freedom: 77
Probability of independence: 3.17871e-152
Ø: 0.7888531

Factor scores

	Eigenvalue	Percent contribution	Cumulative proportion
dim 1	0.494997	64.024419	64.024419
dim 2	0.165172	21.363846	85.388264
dim 3	0.055899	7.230185	92.61845
dim 4	0.047468	6.139706	98.758156
dim 5	0.006677	0.86367	99.621826
dim 6	0.002924	0.378174	100

Individuals – Coordinates, contribution and cos2

	F1			F2			F3			F4			F5			F6		
Individuals	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2
110.05	0.7422	7.20336	0.903	7.20336	0.0059	0	-0.01227	0.17998	0.003	0.0059	6.42188	0.077	-0.03942	0.12834	0	0.17998	22.37457	0.017
116.17	0.53435	2.75968	0.107	2.75968	60.482	0.785	1.44502	23.94618	0.105	60.482	0.40616	0.002	0.52895	1.45384	0.001	23.94618	0.41707	0
116.21	-0.84332	43.93842	0.987	43.93842	0.46793	0.004	-0.05027	1.06473	0.003	0.46793	0.52689	0.001	-0.04412	18.38794	0.006	1.06473	0.44054	0
116.25	0.74197	5.94683	0.751	5.94683	0.57535	0.024	0.13331	7.85781	0.112	0.57535	8.43077	0.102	-0.28661	0.06742	0	7.85781	14.86876	0.011
117.05	0.54311	4.36024	0.711	4.36024	3.0644	0.167	-0.26301	3.01693	0.056	3.0644	2.46718	0.039	0.15182	3.87553	0.009	3.01693	20.04724	0.019
125.05	-0.18975	0.55268	0.12	0.55268	7.97445	0.578	-0.41635	6.56901	0.161	7.97445	0.0312	0.001	0.21983	46.95453	0.138	6.56901	2.07036	0.003
130.06	-0.46218	6.07241	0.77	6.07241	3.56529	0.151	0.20457	0.1256	0.002	3.56529	3.56484	0.043	0.02234	20.19612	0.035	0.1256	0.091	0
132.06	0.71377	5.69651	0.739	5.69651	0.07034	0.003	0.04582	4.23146	0.062	0.07034	15.65244	0.195	-0.20673	0.37722	0.001	4.23146	0.36329	0
137.02	0.90138	10.16259	0.523	10.16259	16.70096	0.287	-0.66749	8.14633	0.047	16.70096	27.62185	0.136	0.2712	8.01726	0.006	8.14633	0.71437	0
152.03	0.68985	6.31314	0.641	6.31314	1.60795	0.055	0.20111	22.31702	0.256	1.60795	3.11819	0.03	-0.43586	0.127	0	22.31702	29.33861	0.018
152.06	0.76251	4.2973	0.681	4.2973	0.00629	0	0.01686	8.97716	0.161	0.00629	10.28741	0.156	-0.37036	5.00E-05	0	8.97716	1.78181	0.002

403.06	0.84351	2.69683	0.33	2.69683	5.47914	0.224	-0.69453	13.56779	0.188	5.47914	21.47117	0.252	0.6358	0.41475	0.001	13.56779	7.49236	0.005

Variables – Coordinates, contribution and cos2

	F1			**F2**			**F3**			**F4**			**F5**			**F6**		
Variables	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2	coord	contrib	cos2
DIV	0.6309	1.35777	0.596	1.35777	0.58299	0.085	0.2388	0.30258	0.015	0.58299	1.11138	0.047	0.10008	3.03751	0.018	0.30258	91.91922	0.238
Hyp	0.8101	8.45726	0.468	8.45726	6.31784	0.117	-0.40446	0.21177	0.001	6.31784	78.08056	0.414	-0.04308	0.2104	0	0.21177	0.34319	0
Rad C	0.36008	6.33939	0.318	6.33939	26.94532	0.451	0.42882	39.87385	0.226	26.94532	0.9672	0.005	-0.30347	0.19962	0	39.87385	1.47199	0
Vitr	0.59149	21.21718	0.707	21.21718	17.43043	0.194	-0.30969	12.56554	0.047	17.43043	16.13479	0.052	0.15297	0.37008	0	12.56554	2.26323	0
Tw Br	0.15204	0.10952	0.005	0.10952	46.96893	0.736	1.81879	46.11903	0.244	46.96893	3.14233	0.014	1.04846	0.59593	0	46.11903	0.71904	0
Seed	-0.93732	62.43752	0.991	62.43752	1.67739	0.009	-0.08875	0.04692	0	1.67739	0.24562	0	0.00863	0.25892	0	0.04692	0.15539	0
Copro	-0.46331	0.08136	0.053	0.08136	0.0771	0.017	-0.26054	0.88031	0.064	0.0771	0.31813	0.02	0.51213	95.32753	0.834	0.88031	3.12795	0.012

Complementary variable – Coordinates and contribution

	F1		**F2**		**F3**	
Variables	coord	contrib	coord	contrib	coord	contrib
Cons	0.770	-0.522	0.408	-0.169	-0.110	0.003