

THE VEGETAL REMAINS AND THE
BIO-ARCHAEOLOGICAL FINDINGS: AN OVERVIEW OF
WATER FLOTATION SAMPLES FROM ANCIENT SERDICA
(SOFIA, BULGARIA)

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Abstract

This paper explains the method, borrowed from the discipline of paleobotany, of sample processing for water flotation retrieved from archaeological contexts and their adjacent sediments. It presents insights, including the specific methodological approach and initial results of the samples' assessment, from a case study of the archaeological site located at 35 *Exarch Joseph St* – now within the heavily urbanised city centre of Sofia, Bulgaria, but falling within the frame of Serdica during the Antiquity. New evidence deriving from the study of the water flotation samples is shown, along with an accent on the bio-archaeological and in particular – to the vegetal macro-remains, including those of charred and waterlogged seeds and wood species, such as deciduous oak, fir, pine and spruce.

Key words: archaeological sediment, water flotation, bio-archaeological remains, vegetal macro-remains, Serdica, Antiquity

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Introduction. The archaeological site of *35 Exarch Joseph St* is located at the contemporary city centre of Sofia, Bulgaria and is part of the north fortification wall of Serdica (6th c. AD) and a subsidiary to the main wall called *proteichism* (5th c. AD). However, between the two walls, structures dated on the basis of the archaeological findings they contained and related to earlier periods were also recorded, including a ditch (2nd – 3rd c. AD), wooden building remains (3rd – 4th c. AD), stone sewage with a brick floor (5th – 6th c. AD) and a number of architectural remains (2nd – 3rd c. AD), located south of the main fortification wall and towards the interior of Serdica. Evidence for the earlier occupation of the area is also the collective coin hoard with coins coined at 320 AD and found amongst the wood remains [1,2]. During the excavation campaigns of the site soil sampling for the purposes of water flotation and the subsequent analysis was performed.

Materials and methods. Soil samples were collected from two excavation seasons of the archaeological site registered at *35 Exarch Joseph St* in Sofia – from the 2019 and 2020 campaigns, respectively, and their number came to twenty-eight (28). The sampling was targeted and not systematic in its design. However, a standardised volume of 10 l per sample was accepted and later processed via water flotation system. The flotation was conducted with the aid of a “Siraf” type flotation tank and operated in two fractions of the sample division [3]. The coarse one, or the Heavy Residue (HR) was retrieved with a sieve aperture of 1 mm, while the fine one, or the Flot (F) was collected by a sieve aperture of 250 μ . All flotation samples were dried under room temperature of 26 °C and in an environment with reduced sunlight.

The initial assessment of both flotation fractions was completed macroscopically for the HR samples and microscopically for the F samples. The macroscopic approach aimed at assessing the abundance and hence registering the presence or absence of the presented in this study micro-findings. For this purpose, coding the quantitative diameters was performed as follows: items of quantity between 1 and 10 were coded with value “1”, items of quantity between 11 and 20 – with value “2”, items of quantities between 21 and 50 – with value “3” and items of quantity above 51 – with value “4”. When no presence is registered, a value “0” was assigned (Fig. 2, [4]).

Regarding the microscopic approach, a stereoscopic equipment (Optika SZM-2) was applied when sorting the material, while high power microscope (Optika MET B-500) with Reflected Light (RL) and under Dark Field (DF) environment was employed for the analysis of the wood charcoal and some of the uncharred wood fragments. Some waterlogged wood fragments were thin-sectioned, and then Transmitted Light (TL) microscopy was applied in a Bright Field (BF) environment. The imaging of the wood (both charred and uncharred) was performed with a microscopic camera (Optika CP-6) and a designated micrographic software [5]. In addition, the micrographs were processed via a stacking procedure with spe-

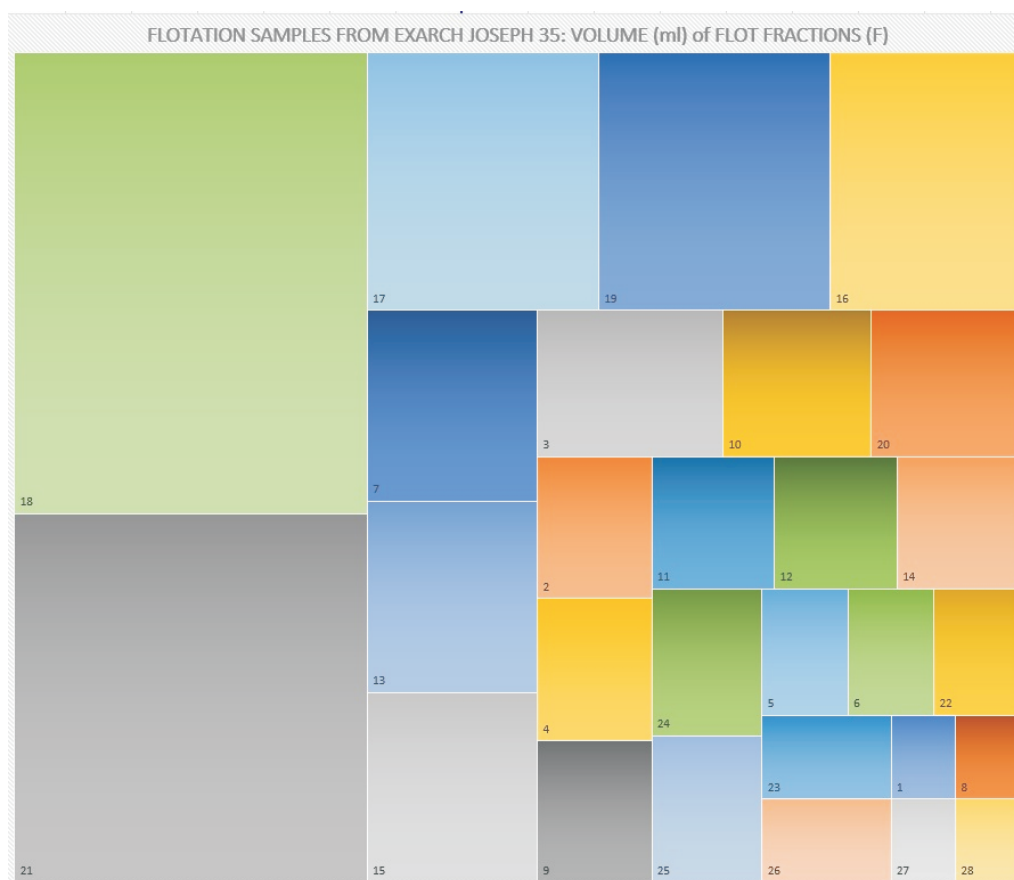


Fig. 1. Graphic representation of the volumetric analysis of each flot fraction as per sample numbers

cialised software [6]. The botanical identification of both charred and uncharred wood was completed via manual fragmenting in order to achieve three planes of observation – transversal (Fig. 3a, d, g), longitudinal (Fig. 3b, e, h), and radial (Fig. 3c, f, i) to allow analysis of different anatomical features of wood [7–9].

Results and discussion. After completing the flotation process and the subsequent sample drying period, an initial assessment of all flotation samples was carried out. The first step it included was the volumetric analysis of the flots or the fine fraction collected in the 250 µaperture. This analysis shows that there are six categories, according to the volume each sample presented (Fig. 1). These are: samples ranging between 600 ml and 750 ml (Samples 21, 18); samples ranging between 225 ml and 275 ml (Samples 16, 17, 19); samples ranging between 100 ml and 150 ml (Samples 3, 10, 20, 7, 13, 15); samples about 75 ml (Samples 2, 4, 9, 11, 12, 14, 24, 25); samples about 50 ml (Samples 5, 6, 22, 23, 26) and samples of 25 ml (Samples 1, 8, 27, 28). The volumetrics showed that the most populated

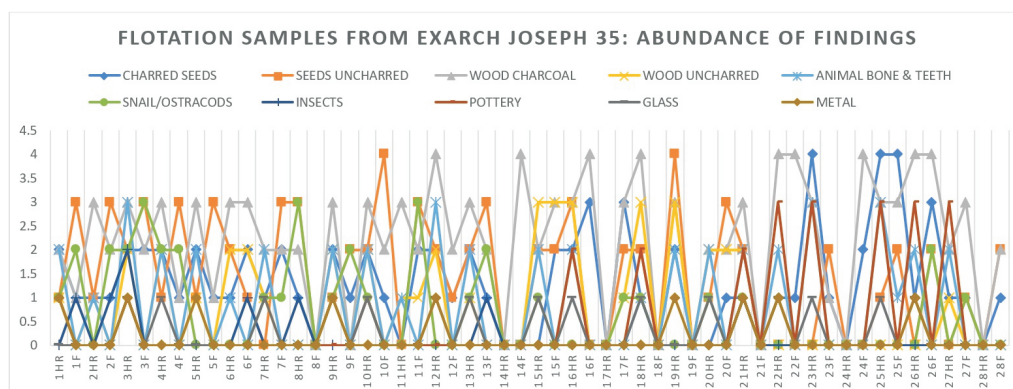


Fig. 2. Graphic representation of the flotation fractions (HR and F) and the findings, retrieved from them (both organic and inorganic)

category in terms of samples' volume is the one of 75 ml, represented by 28.5%, followed by the flots of 100–150 ml, which represent 21.4%, while the largest in their volume samples (600–750 ml) are only 7.14 % of the whole assemblage. Given the above data it may be concluded that the flot fractions are rather diverse in their volume, but there is a core range in terms of the retrieved samples, which spans between three of the discussed above categories (those between 50 ml and 150 ml) and this way 67.85% of the whole flot sample collection are positioned in this focus range. The provenance of the samples falling within this range coincides with the earlier structures studied at the site, dating from the period 2nd to the beginning of the 4th c. AD (the remains of wooden buildings and those south of the main fortress wall). The larger by their volume samples (those over 225 ml) originate exclusively from the presumed “riverbed”, possibly active during the Antiquity [2].

The whole assemblage of flotation samples, including both the Heavy residue and the Flot fractions, provided organic and inorganic micro findings. Amongst the inorganic material, no surprise were the categories such as pottery, glass and metal, which were also recorded on site during the excavation at *35 Exarch Joseph St* [1,2]. However, the water flotation fractions which provided those inorganic findings were mainly the Heavy Residues because of the increased weight and compactness of those artefacts (they are heavier than the organics and do not float on the water surface of the flotation system; Fig. 2).

The second and largest group of flotation findings is the one of the organic remains. It consists of charred and uncharred vegetal macro-remains, including both seeds and wood, animal bones and teeth, terrestrial snails and ostracods and insects. Taking into account both Heavy residues and Flot fractions (coming to a total of 56 samples), the following observations regarding the vegetal remains may be extracted: charred seeds are present by 80.35% (in 45 samples of 56),

uncharred seeds – by 67.85% (in 38 samples of 56), wood charcoal – by 83.92% (in 47 samples of 56), uncharred wood – by 46.42% (in 24 samples of 56) of the complete water flotation sample assemblage. In terms of the faunal remains, the animal bones and teeth are registered by 42.85% (in 24 of 56 samples), the snails and ostracods – by 41.07% (23 of 56 samples) and the insects – by 12.5% (7 of 56 samples).

As described above, it is evident that the vegetal macro-remains of the studied samples are, with no doubt, the most abundant bio-archaeological findings retrieved via water flotation at 35 *Exarch Joseph St.* This would be somehow expected given the suitable edaphic conditions observed on site, such as the high underground water levels supplied by the Vladayska River nowadays, but also in the past since evidence for the existence of a possible river leg was observed when analysing the loamy, organic sediments at a “riverbed” sector of the archaeological site [2]. Such a high-humidity profile of the edaphic environment would support the preservation of organic remains of plant origin, such as subfossil seeds and wood, being classified as macro-remains, but perhaps would also be promising for the preservation of micro-botanical remains, such as palynological material [10].

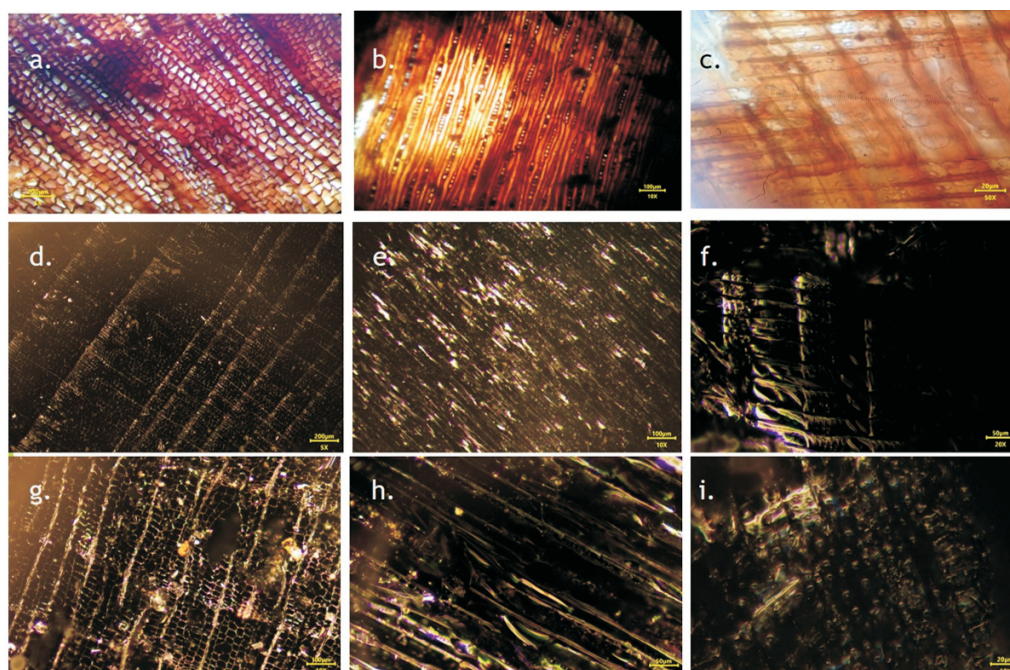


Fig. 3. Micrographs of the major coniferous species recorded at 35 *Exarch Joseph St.*: a. transversal thin section of *Abies* sp., b. longitudinal thin section of *Abies* sp., c. radial thin section of *Abies* sp.; d. transversal manually fragmented plane of *Pinus* sp., e. longitudinal plane of *Pinus* sp., f. radial plane of *Pinus* sp.; g. transversal manually fragmented plane of *Picea abies* L., h. longitudinal plane of *Picea abies* L., i. radial plane of *Picea abies* L.

The above conditions are often referred to as *waterlogged* in the scientific literature, and this term captures both charred and uncharred remains preserved in humid and/or wet environments. This is precisely the case of *35 Exarch Joseph St*, but this would be also positive for the majority of the archaeological levels of Serdica during the Antiquity and the Roman period as shown in previous studies [11], but perhaps fully valid for the future ones too. In addition, the solid presence of charred wood is also a result of the favourable long-term humid conditions on site, because even at a carbonised stage of preservation, wood charcoal would be impacted when at hostile edaphic environment, such as the one with highly alkaline or highly acidic sediments [12–14].

Nevertheless, amongst the wood macro-remains of *35 Exarch Joseph St*, both deciduous and coniferous species are recorded, with the domination of the deciduous oak (*Quercus* sp.) within the first category and firs (*Abies* sp.; Fig. 3a-c), pines (*Pinus* cf. *sylvestris*; Fig. 3d-f) and Norway spruce (*Picea abies* L.; Fig. 3g-i) at the softwoods [15]. This also comes expected as previous archaeobotanical studies of material of ancient Serdica [11] have also registered those softwood species. However, of interest of a future study will be the precise botanical identification of all wood-containing assemblage of *35 Exarch Joseph St*, along with the carpological material (Fig. 2) in order to contribute to the questions of occupation, inhabitation, and consumption of edible plants and consumption of wood resources as timber.

Conclusions. This study overviewed the sample processing and initial analysis of water flotation samples originating from *35 Exarch Joseph St*, falling within the boundaries of Serdica during the Antiquity. It displayed new data regarding the sorting results of the micro-findings (both organic and inorganic) recorded amongst the analysed assemblage by discussing the volumetric characteristics of the samples and their initial abundance values. It stressed onto the vegetal macro-remains, their preservation, ubiquity in the sampled assemblage and directions of their future study.

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