Journal of Archaeological Science: Reports 12 (2017) 323–333

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

The bigger the better? On sample volume and the representativeness of archaeobotanical data in waterlogged deposits

Ferran Antolín *, Bigna L. Steiner, Stefanie Jacomet

Department of Environmental Sciences, Integrative Prehistoric and Archaeological Science (IPAS), Spalenring 145, 4055 Basel, Switzerland

ARTICLE INFO

Article history:
Received 9 December 2016
Received in revised form 8 February 2017
Accepted 8 February 2017
Available online xxxx

Keywords:
Lakeshore settlement
Methodology
Sample size
Quantification

ABSTRACT

This paper provides a reference to estimate the representation of large-sized items (seeds and fruits, mainly) in samples of larger and smaller volume in wetland sites with the aim of proposing a minimum sample size to recover these remains in a representative way. For this, almost 100 samples from a late Neolithic settlement phase found at the lakeshore site of Parkhaus Opéra (Zürich, Switzerland) were subsampled into one larger subsample (A-sample, of ca. 3 l of volume) and one smaller subsample (B-sample, of ca. 0.3 l of volume). We compared how large and small-sized items were represented in the different fractions of large and small subsamples on the basis of ubiquity, concentration and proportions between the taxa. Large-sized remains (like *Prunus spinosa* or charred fragments of *Corylus avellana*) and some medium-sized remains (*Najas*, *Aethusa cynapium*) were more often represented in larger subsamples and therefore are considered to be underrepresented in smaller samples. Average concentration values were similar in both groups of samples (and therefore comparable) but large differences were observed on a one-to-one sample basis, finding no positive monotonic correlation between them. Our observations also prove that in order to obtain data that are comparable to dryland sites concerning charred remains (including cereals and large-seeded wild fruits), large volume samples of at least ca. 3 l are needed. Counting units per taxon in each fraction were re-defined on the basis of the results obtained. Finally, some clues to interpret results concerning large-sized items in sites with samples of small volume are also proposed following our observations.

© 2017 Published by Elsevier Ltd.

1. Introduction

Sampling in archaeobotany is a major issue, playing a key role in the interpretation of botanical assemblages. When designing a sampling strategy, one needs to take into consideration which contexts are sampled, their potential richness in botanical macroremains, the size of the samples and the number of contexts sampled per site, in order to have a dataset that can be considered representative of the total amount of botanical macroremains preserved until today. Above all, the scientific questions that are aimed for should be clearly stated beforehand in order to plan the sampling strategy accordingly (see overviews on this issue in e.g. d'Alpoim Guedes and Spengler, 2014; Filipović and Marić, 2013; Jones, 1991; Lennstrom and Hastorf, 1992; Pearsall, 2015; van der Veen, 1985). Archaeobotanical research in waterlogged deposits of prehistoric lakeshore settlements has some specificities. To start with, sampling is usually performed before any archaeological structure is identified with certainty, since this is mostly done at a second stage, after the conduction of dendrochronological analyses. This means that systematic or random sampling (see e.g. Hosch and Jacomet, 2001) is absolutely necessary to have different structures properly represented in the samples. Secondly, sample size is another important issue. When preservation conditions are good, plant macroremains appear in extremely high numbers (thousands in each sample). For this reason, a balance needs to be found between having samples large enough to have all kinds of fruits well-represented in them, and at the same time trying to analyse them in the most efficient way possible (Jacomet and Brombacher, 2005; Kenward and Hall, 1995: 454–455; Steiner et al., in press).

Most of the research in (mostly Neolithic) lakeshore settlements done in the seventies and the eighties of the XXth century was based on profile (monolith) samples (e.g. Jacomet, 1980; Jacomet et al., 1989; Maier, 1988; Schlichtherle, 1985), although there were some early exceptions of surface sampling (Jacomet, 1981). Profile sampling yielded samples of a relatively small volume (mostly below 0.3 l) and recommendations were done to take, in parallel, a certain amount of bulk samples (10–20 samples of >0.7 l per settlement phase) in order to record the large-sized items in a representative way (Jacomet et al., 1989: 82). The large research project carried out at Arbon Bleiche 3 in the early nineties made it possible to recover samples of a larger volume to test if large-sized items (those taxa with seeds of well above 2 mm in size or other items like spikelets or capsules) were better represented in

* Corresponding author.
E-mail address: ferran.antolin@unibas.ch (F. Antolín).

http://dx.doi.org/10.1016/j.jasrep.2017.02.008
2352-409X/© 2017 Published by Elsevier Ltd.

them. It was soon observed that samples of ca. 0.3 l only allow a representative evaluation of small-sized items (below 2 mm) and that samples of at least 2 l were recommended for a fully representative analysis (Brombacher and Jacomet, 1997: 222). The goal was to reach a statistically representative amount of remains for a sample (sensu Van der Veen and Fieller, 1982). It was observed that ca. 400 remains per fraction (2 mm and 0.35 mm) were needed for a representative analysis of a sample, so that large-sized items were also representatively recorded (Hosch and Jacomet, 2001). This made it clear that larger samples were needed to reach this amount of large-sized remains in the 2 mm fraction. As methodological conclusions of the Arbon Bleiche 3 project, it was recommended (parallel to profile sampling, which remains as the optimal strategy to target layer formation processes in lakeshore settlements) to take large-volume samples (ca. 3 l, and a maximum of ca. 8 l) in a systematic way over the excavated surface of the settlement. From these large samples, small-volume subsamples (ca. 0.3 l) could be produced in a way that large samples only needed to be investigated for large-sized items (and therefore sieved with a mesh of 2 mm) and smaller samples for small-sized items (sieved with a mesh of 0.35 mm) (Hosch and Jacomet, 2001, 2004: 116). This time-saving strategy was finally applied to the recently excavated multi-phase site of Zürich-Parkhaus Opéra, our case study (Antolín et al., 2015, 2016, 2017; Bleicher and Harb, 2015) and recently also critically revised (Steiner et al., in presss).

In parallel to this line of research developed at the IPAS (Integrative Prehistory and Archaeological Science, University of Basel), other researchers developed alternative sampling strategies, like systematic coring (every meter). This type of sampling was usually performed within scientific research projects (not rescue excavations) and resulted in a large amount of samples of <0.3 l of volume in average, or occasionally more, like at Sipplingen (0.7 l in average) (Baudais et al., 1997; Maier, 2001; Maier and Herbig, 2011; Riehl, 2004). Sometimes, this type of sampling was combined with extensive coarse-sieving, which allowed observing some of the biases of small-volume samples (Maier, 2001).

The main reason why large-volume samples are rarely taken in wetland sites is that the archaeobotanical evaluation of the samples is very time consuming. Furthermore large-volume samples can pose problems in sites with very thick (superimposed) cultural layers that might respond to more than one settlement phase, since these samples are difficult to ascribe to a particular phase if this was not possible to identify during fieldwork (such a case was observed at Pfäffikon-Burg in Zibulski, 2010). On a more practical scale, large samples also involve storage difficulties, since they need to be stored in cool dark rooms (or even deep frozen) to avoid the degradation of the plant material present in them. Most sites where large samples were investigated usually had to reduce the number of samples analysed (see Fig. 1). Sites where small-volume samples were taken rarely reached 50 l of sediment sieved in total. For this reason, the sampling strategy applied at Zürich-Parkhaus Opéra (with ca. 1000 l of sediment processed) represents a milestone in archaeobotanical research in prehistoric lakeshore research and can be used as a reference point to review previous research.

The goals of this paper are:

1. testing the comparability of the ubiquity, the concentration values (density values), the proportion (relative percentage) and the spatial analysis (using GIS) of large-sized items obtained in the 2 mm fraction of subsamples of different volume taken from the same original sample;
2. assessing which taxa are more often represented in the 2 mm and the 0.35 mm fraction in large and small-volume subsamples taken from the same samples;
3. comparing the results of our test with those obtained from roughly contemporary investigated lakeshore settlements with different sampling strategies;
4. providing guidelines for the optimal procedures to efficiently record these plants in wetland sites and some final thoughts on the reliability of data obtained from samples of small volume (<0.5 l of sediment).

2. Materials and methods

Zürich–Parkhaus Opéra (Zürich, Switzerland) is a lakeshore site with several settlement phases which was excavated during 2010 and 2011 (Bleicher and Harb, 2015). This paper focuses on the methodological research carried out with samples from one settlement phase, layer 13 (Horgen culture, dendrodated to c. 3160 BCE, of ca. 20 years of

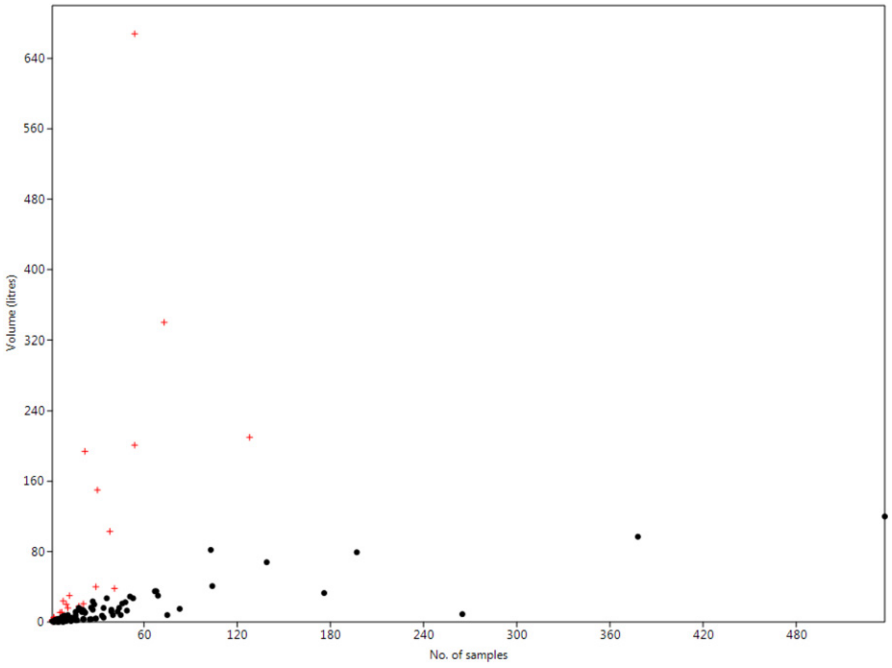

Fig. 1. Total volume of sediment (in litres) and number of samples sieved per settlement phase of Neolithic lakeshore sites in the Alpine Foreland. Crosses refer to sites where the average volume per sample was above 0.9 L. Data compiled by S. Jacomet (ESM 1).

Download English Version:

https://daneshyari.com/en/article/5112499

Download Persian Version:

https://daneshyari.com/article/5112499

Daneshyari.com