Sweating the small stuff: Heavy Fraction collection and analysis from Tell es-Safi/Gath

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INTRODUCTION

Most modern archaeological excavations intensively collect floatation data, including both light and heavy fractions. While the light fraction (floats) is usually extensively analysed by archaeobotanists, the heavy fraction (sinks; aka *micro-residue*) is often ignored or minimally examined. However, the analysis of micro-debris provides us with a wealth of information that is not always available from the larger artefacts which may be moved and are no longer in their original use position.

Micro-debris are the tiny remnants of activities that are not cleaned up after the activity is completed. Such activities are often archaeologically invisible with standard macro-level artefact analyses. If micro-debris samples are systematically and spatially collected across surfaces and different depositional contexts, their analysis can help guide excavation strategies (identification where such debris is located, which deposits are worthwhile floating) identification of activity areas, pest distributions, which rooms were used or abandoned, missing food sources that cannot be recovered through hand collection (plants, fish and smaller remains), etc. The utility of this approach is demonstrated with data from Tell es-Safi/Gath. Here we describe our method and present some preliminary results that focus on which types of deposits are most fruitful for analysis.

Site Description

Tell es-Safi/Gath is a large multi-period tell site with a long and rich cultural history in central Israel. The tell is located atop a large crescent shaped hill c. 24 hectares in size. At the eastern end of the tell (Area E), a large domestic Early Bronze Age III non-elite quarter has been undergoing intensive excavated since 2004. Tell es-Safi is believed to be one of the largest urban polities located in the southern Levant during the EB. Micro-debris was systematically recovered and analysed from Stratum E5 (late Early Bronze III strata/2800-2500 BCE).

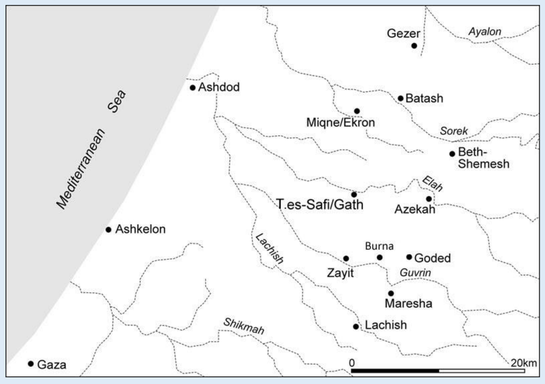

Fig1: Map of the location of Tell es-Safi Gath in Israel.

Fig 2: Aerial view of EB and later architecture in Area E at Tell es-Safi/Gath .

Method

There are two different stages in the collection of micro-debris at Tell es-Safi/Gath: field collection (macro) and analytical (micro).

Field collection: all types of deposits were sampled initially. Several different methods for heavy fraction field collection were used at the site over many excavation seasons including: sampling only interesting or unknown contexts, taking a 10L sample from every 10 buckets of dirt from each locus, and a single sample from each locus. In 2015, the collection methods were further refined into a more systematic sampling strategy. 10L soil samples were systematically collected at c. 1 m intervals across each excavation square or space within an architectural unit. This increased the sensitivity of sample collection to match the research goals within the excavation area.
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Fig 3: Room from an EB house

Fig 4: Alleyway from Area E

Fig 5: 10L samples taken from clear contexts

Separation: Heavy (sinks) and light fractions (floats) were separated in a floatation machine. Each were separately dried and bagged. The light fraction went to the archaeobotanist, while the heavy fraction was subjected to micro-residue analysis.

Fig 6: Samples in sandbags

Fig 7: Floatation Machine

Fig 8: Separate the light (float) and heavy fraction (sink)

Sorting: Types of remains collected in each heavy fraction sample included bone, flint, shells, ceramics, mudbrick, unique stones, etc. Heavier components of carbonised plant material were also found in the heavy fraction. Many special finds (beads, jewelry, metal, coins) are often missed because they are nearly invisible in the hand-sorted or dry-sieved soils appear in the heavy fraction.

Fig: 9 Heavy fraction sorting by eye

Fig 10: 1mm heavy fraction

Fig 11: Microscopic sorting

Data

To date, 27 samples have been analysed (13,133 specimens) from the various ash layers above floors, fill layers, mud brick collapse, installations, accumulations found on floors and the floors themselves within and outside of the various rooms and the alleyway between the houses. Burnt material was excluded since it has not yet been quantified.

	Bone		Flint		Mud Brick		Pottery		Shell		Stone		Special find		Total	
Context type	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**
Accumulation on floor	2511	64.25%	668	53.23%	1869	70.61%	1131	60.48%	1579	58.85%	375	51.87%	32	68.09%	8165	62.17%
Mud brick collapse	294	7.52%	239	19.04%	311	11.75%	214	11.44%	259	9.65%	178	24.62%	5	10.64%	1500	11.42%
Floor	373	9.54%	83	6.61%	365	13.79%	230	12.30%	200	7.45%	39	5.39%	3	6.38%	1293	9.85%
Alleyway	461	11.80%	143	11.39%	0	0.00%	160	8.56%	401	14.95%	23	3.18%	5	10.64%	1193	9.08%
Installation	246	6.29%	108	8.61%	100	3.78%	129	6.90%	244	9.09%	68	9.41%	2	4.26%	897	6.83%
Ash pit	23	0.59%	14	1.12%	2	0.08%	6	0.32%	0	0.00%	40	5.53%		0.00%	85	0.65%
Grand Total	**3908**	**100.00%**	**1255**	**100.00%**	**2647**	**100.00%**	**1870**	**100.00%**	**2683**	**100.00%**	**723**	**100.00%**	**47**	**100.00%**	**13133**	**100.00%**

Table 1: Table illustrating the number of finds recovered from different EB contexts from Area E

RESULTS

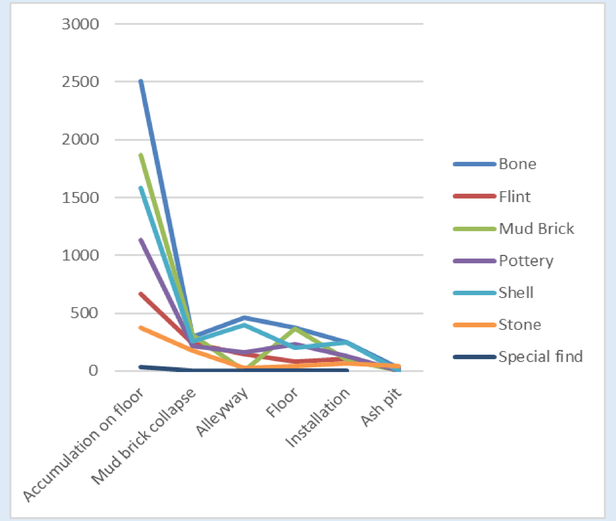

Fig 12: Graphic representation of Table 1 showing the quantification patterns between each context type from the EB levels from Area E

There is a clear pattern in the distribution of heavy fraction materials between types of context. The highest concentrations come from the occupational accumulations above floors (62%). This was expected since most of the remains represent activity areas within houses. Mudbrick collapse layers are the second most common (11%). They probably represent the materials that fell from walls, furniture, and second floors (as well as their walls) while the mudbrick walls were torn down and used as fill for the next occupational layer. Next are the alleyway and the floors, which had surprisingly small concentrations.
The lack of heavy fraction debris on floors suggests that these surfaces were kept clean during the period of their use. It is difficult to understand why the alleyway had such low frequencies given its depositional history as a dumping ground to level out the continued erosion of its surface. Installations (hearths) had the second smallest concentrations, followed by ash pits which had the fewest remains present. This may indicate that hearth installations were not used for dumping of debris/garbage.

CONCLUSIONS

Our preliminary analysis demonstrates how systematic analysis of micro-residue remains are not randomly distributed across excavation areas and which deposits are most productive for analysis. The accumulations found above and below the floors showed the heaviest concentrations and allow for the most fruitful path to investigate spatial distributions. In contrast, floors are the least productive. The poor results from the alleyway is unexpected, but may reflect that it is an open-air and narrow space that was subjected to torrential downpours. Further analysis of may help further determine the differences between the activity areas between and within rooms.

Clearly, sampling should focus only on clear depositional contexts likely to contain high frequencies of micro-debris. Remains should be most intensively collected from the matrix above and below floors, occupational accumulations above such surfaces, pits, and other special features. But, it is also important to sample the deposits and spaces where nothing is expected to allow for proper evaluation of the rich find spots.

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