**Everyday Life at Bjerre Site 7, a Late Bronze Age House in Thy, Denmark: Hybrid Excavation Methods and Site Formation Processes**

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**Supplementary Material**

**Introduction**

Working on Bronze Age settlements at Bjerre in the 1990s, the Thy Project joined research and rescue strategies involving teams from UCLA (Timothy Earle), Museum Thy (Jens-Henrik Bech and Anne-Louise Haack Olsen), and Gothenburg University (Kristian Kristiansen) (Earle et al., 1998; Bech et al., 2018). The goal was to combine the speed and extent of Danish rescue archaeology with intensive excavation strategies. The hybrid methods described the house by subsoil features (post and pit features) and distributions of artefacts from the site’s occupation layer.

**Hybrid Excavation Methods**

Bronze Age house sites in southern Scandinavia usually feature shallow deposits that have been ploughed out by thousands of years of cultivation. A 30 cm ploughsoil horizon typically overlies the subsoil, into which archaeological features are preserved. Starting in the 1950s under C.J. Becker who observed that ploughing had disturbed archaeological contexts, Danish archaeology developed methods to excavate rapidly large prehistoric settlement sites. Regularly spaced test trenches stripped the ploughsoil by machine to subsoil to expose archaeological features, around which areas were cleared by machine to delimit prehistoric houses marked by roof-supporting and wall posts and associated hearths and other features. Features were then cross-sectioned and diagnostic and distinctive artefacts recovered. Visible charcoal and plant remains were recovered for radiocarbon dating and identification. Methods were adequate to describe individual houses and study chronological changes in form and cultural affiliation, and large areas could be exposed quickly to describe farm patterns. Although originally developed for research, the speed and cost effectiveness of these methods adapted seamlessly to rescue excavations. These methods however involved the loss of spatially associated artefacts from the ploughsoil.

To these Danish methods, the American team added work-intensive archaeological recovery techniques to investigate household economies, specialization, division of labour, social organisation, and more. On heavily ploughed settlements, the Americans sampled 2 x 2 m ploughsoil units to recover artefacts by mechanical screening (sieving) (Steinberg, 1996). This technique provided evidence of site artefacts distributions across sites. Because experimental work shows that ploughing does not usually displace artefacts over great distances and because many Scandinavian sites were single-component sites (or dominated by one component), mixing cultural layers by ploughing did not destroy basic spatial patterning to define the nature and extent of general household activities. Such ploughsoil excavations provide an untapped opportunity to recover lithic patterning documenting normal and specialized activities (Steinberg, 1996). Where cultural layers were preserved, the American crew added full artefact recovery by screening defined excavation units and routine flotation sampling.

An opportunity to demonstrate the usefulness of such work was provided by the remarkable archaeological landscape at Bjerre. As part of a rescue investigation for a proposed racetrack, Museum Thy excavated trial trenches, followed by work at several Bronze Age farmsteads that included hand excavation and screening when occupation layers were encountered (Bech et al., 2018). Bech recognized that the well-preserved Bronze Age landscape at Bjerre offered great opportunities for the Thy Project objectives, identifying two well-preserved house sites from the Early Bronze Age (Bjerre 6) and Late Bronze Age (Bjerre 7) for excavation.

Bjerre 7 was covered by more than one metre of sand drift that sealed the house and its occupation layer. The house had been built on soils showing ard ploughing and a few cooking pits. A partially ploughed occupation layer (16 cm thick), rich in artefacts, marked the dwelling site. The house was delineated by roof support posts, partially preserved wall lines, and clusters of pits. Before the end of the Late Bronze Age, the house was abandoned and ard ploughed, leaving some occupation surfaces and features intact and displacing artefacts, but not over great distances. The sandy soils were partly waterlogged, preserving occasional wood, but loose soils obscured some post locations. Subsequently, the area was buried by wind-blown sand. The house site and its excavation are described by Olsen and Earle (2018).

In 1996, a 20 × 20m area was chosen for excavation based on the predicted house layout. Following American excavation procedures, the area was laid out on a 1 m UTM grid, and small teams were assigned to 2 × 2 m units. All soils were screened through a 10 mm mesh, and, within each 1 m grid units, artefacts were recovered and assigned to stratigraphic levels. Tools and diagnostic artefacts were recorded by Cartesian coordinates. When the underlaying layer was reached, sub-floor features were identified and excavated by standard Danish procedures.

Systematic soil samples for macrobotanical flotation were taken from stratigraphic occupation levels in 2 × 2 m units and from all features. Evenly distributed, 25 samples from features and 35 from the occupation layer were analysed (Henriksen et al., 2018). Because only carbonized plant remains were preserved, quantifying the relative importance of crops is difficult, as probable differences in the original processing of the plant material affected preservation.

Soils from the occupation layer and preserved features were screened through a 10 mm mesh and all artefacts were collected and bagged by material and excavation unit. All amber, lithics, and ceramics (minimum thumbnail size) were collected during screening. The preserved occupation layer and systematic screening produced impressively large quantities of sherds and stone artefacts for detailed spatial analyses.

Ceramic sherds were abundant but small (3.9 g average), allowing for analysis of general patterns, but not of forms. Organic residue analyses (ORA) were conducted. The lithicinventory, also large and comprehensive, is among the best-documented assemblage of stone tools, providing data on manufacture, use, and recycling during the Danish Bronze Age. Lithics were subjected to intensive, dynamic, technological analysis (Eriksen, 2018). Despite screening and systematic flotation sampling, no micro-debitage was discovered. Most tools were the result of *ad hoc* production and use. Identifying tool function was difficult, depending almost entirely on irregular morphology; most were unsuited for microscopic analyses. No discrete knapping locations were located. Amber was routinely recovered by screening, hand excavation of features, and sorting heavy fraction from flotation samples. Despite intensive strategies, no production debris for ceramics was found.

**Site Formation Processes**

Justifications for labour intensive recovery methods were twofold: the site formation processes suggest an appropriate context quality, and completeness of the recovery allowed studies of production and use, essential for the studies described in the main article. On the downside, our rigorous approach limited the excavation’s extent, compensated in part by trial trenching. The hybrid methodology proved successful, and, whenever possible, we encourage rescue work to incorporate research components of both ploughsoil and occupation layers.

Michael Schiffer (1976, 1985) drew attention to site formation processes as necessary for the interpretation of artefact patterning. Archaeological sites involve long histories of human behaviours and natural effects that affect artefact patterning. Although occupational length and reoccupation often create anthropogenic overlaying and mixing of contexts, Bjerre 7 is a single-component farmstead, probably occupied for no more than a generation and sealed by sand drift. Radiocarbon determinations are narrowly focused, and diagnostic artefacts (ceramic and lithics) comfortably date to the Late Bronze Age period V. A single occupation layer with distinctive darkened soils and a high density of finds is directly associated with the house and outside features. There is no evidence that the house was extended or remodelled, although several posts were added for stability. Before the house was built, the land had been ploughed and a few pits dug from that pre-house layer, but artefact counts from that stratum are few.

After the house was abandoned and before sand drifting, the only documented human activity was ard ploughing of the upper half of the occupation layer. Wet and shifting sands appear to have obscured some smaller post features. The house site became an agricultural field, probably with increased soil fertility from anthropogenic deposits. No post-abandonment features cut the house features, suggesting full abandonment. Almost sterile sand layers then covered the site.

We consider that household behaviours resulted in its depositional history. Site occupations are not moments in time, but result from human actions, perhaps a generation at Bjerre 7. Pits filled quickly with cultural material because of the sand was unstable and pits were dug again as needed. Many show multiple and changing uses, as for example fire or storage pits replaced by refuse deposits. Jars were removed from storage pits, often breaking. Amber storage features were cleaned out, often leaving significant concentrations behind. Differential preservation was an important factor: uncarbonized wood (except when waterlogged) and most bone were lost.

Refuse disposal causes artefacts to be distributed away from areas of production and use. Other things being equal at Bjerre 7, larger refuse items (broken ceramics or larger stone artefacts) were cleared away from living surfaces and deposited as fills in low areas and refuse pits. More valued items were recycled, as shown by several stone tools. In contrast, smaller items (such as botanical waste or chipping debris) would be difficult to clean completely and probably became embedded in working surfaces. These simple behavioural insights help explain the patterning of different classes of artefacts, such as that of plant macrofossils, amber, and smaller lithic debris *vs* the spread of larger ceramics and lithics.

Carbonized plant remains were closely patterned in space, apparently indicating that such materials were difficult to clean up. The vast majority of grains, seeds, and other plant remains were found in fire pits, either accidently or as fuel. Plant remains from pits were then probably scattered over short distances by ploughing. A similar pattern exists for amber.

Especially for the larger artefacts, refuse disposal indicates systematic cleaning and disposal in pits, in outside areas, and probable midden or refuse heaps. Refuse pits were concentrated in the south-eastern sector, close to the house entrance. Activities documented by these refuse contexts document householding, but not specific task locations of production and use.

The high density of ceramics, of sherds with encrustation, and flints in the south-eastern sector probably reflect disposal (Figures 8 and 9 of the main article), although, within the house, these sherds remain concentrated at the eastern end. No vessels were complete, and only one vessel containing amber from a storage pit was reconstructable. Ceramic forms are broadly distributed, with little pattering. Assuming many activities involving pottery took place within the house, patterning documents cleaning and disposal nearby. From the 149 2 × 2 m units excavated outside the house, fifty-three contained more than 200 sherds. Forty of these were in the south-eastern activity area; all units with more than 300 sherds (7) and the one with more than 400 were here; no units within the house comprised more than 300 sherds.

Following breakage, ceramics appears to have been removed from their original contexts and eventually discarded outside the house in pits, but also more generally probably in refuse piles spread by subsequent agricultural use.

Because lithic debris was uncomfortable underfoot, it is reasonable to assume that it was cleared away along with broken pottery and larger stone objects. Much appears to have been systematically deposited outside. The distibution of lithic debris, however, suggests that a portion was not cleaned away, documenting production tasks inside the house. Overall, flint and large stone tools, including virtually all hammer and crushing stones, were cleared away. Refuse deposits immediately outside the entrance evidently mixed materials from inside and outside, partially obscuring differences in these contexts. The observed differences in plant macrofossils were still evident, showing that size had an important effect, and the general patterning of amber inside and outside was evidently real.

Away from the house entrance to the west, refuse disposal may have been distinctive. Perhaps resulting from effort minimization, as suggested by most disposal near the entrance, the western refuse deposits could document specific outside activities. A refuse pit (N208) contained 546 sherds weighing almost 10 kilos, reasonably associated with outside cooking and serving.

Within the house, much of the smaller debris (plant macrofossils, amber, and lithic debris) was probably embedded in the floor. Most refuse disposal in the house would have been only temporary, and we assume that refuse deposited inside the house represents interior activities (but see discussion of ploughing below). At the western end, an area to hold waste temporarily existed along the southern wall; six units with more than 200 sherds were lined up here.

To what degree did light ard ploughing affect artefact distributions? The ploughing removed the upper portions of features and spread material over a few meters. Remains from the occupation layer directly above features were closely correlated with the features. Plant macrofossils found in grid units were similar to, but less frequent than, those retrieved from associated fire pits. Features N163 and N182 had the highest counts of amber and were linked to the highest density of amber immediately in the cultural layer above.

The broad distribution of ceramics and lithics represents some spreading of larger artefacts by ploughing. The bulk of the ceramic debris (92%) was found in the ard-ploughed occupation layer outside and above the house. Attempts to refit sherds were largely unsuccessful. Most retrofitted vessels (four in total) were ornamented vessels or strainers. Only a small portion of each retrofitted vessel could be rejoined, and distances between refits could be up to 8 m. Scatters document some vertical spread of sherds from the same vessel suggesting ploughing, but no directional pattern. The cleaning of material from the house and yard into pits and surface piles was evidently spread by ploughing, but not over great distances.

We conclude that:

1. Bjerre 7 is a single-component site without mixing of occupations. No post-Late Bronze Age disturbance was noted.
2. Refuse disposal significantly defined patterning, with the south-eastern outside sector being the primary area mixing remains from inside and outside the house.
3. Especially for smaller artefacts, ard ploughing spread artefacts only across short distances, suggesting that patterning by grid unit is close to that created by the original household activities.
4. Five primary activity areas can be identified despite refuse disposal and ploughing.
5. Although the frequency and volume of amber evidently reflects site preservation and systematic excavation, routine recovery from pits and postholes suggests that abundant amber collection and storage would easily have been detectable by salvage excavations of ploughed out sites.

**References**

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