ECOFACTS AND THE TRANSITION FROM SYSTEMIC TO ARCHAEOLOGICAL CONTEXT

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ABSTRACT

The ecofacts in the archaeological record of a site were, or were perhaps not deposited by the humans that once lived at the site, from which the ecofacts have been recovered. This paper will try to contribute to the discussion on formation processes (*sensu* Schiffer 1987) as concerns ecofacts. Two historical/ethnoarchaeological examples will be demonstrated, both of them from 19th century Dalarna, Sweden. Insect and seed remains from a charcoal-burner's hut and a miner's cottage will form the starting points of the discussion. Especially the crucial question of when the ecofacts became a part of the archaeological context in relation to the occupation periods of the sites will be in focus. It is stressed that ecofacts that enter the archaeological context after that the sites were abandoned from systemic contexts are quite different from that of the occupation period of the sites. This may be due to both cultural and environmental formation processes.

Introduction

A number of concepts is linked to the processes, in which a living society and especially its material culture is turned into archaeology, e g source criticism, taphonomy, formation processes. I will try to contribute to the discussion of this set of concepts and to its way of looking at archaeology.

The process, in which the archaeological record to be presented in a publication is formed, is often looked upon as a series of events along the time-axis, which brings about a consecutive loss of information. An example is the model by Daniels (1972), which describes how a potential artifact population (formed within a cultural matrix) stepwise is diminished and turned less informative by the influence of a number of uncontrollable (functional environmental selection, preservation, post-deposition) and controllable (location of excavation, recovery procedures, analytical and sorting procedures, publishing procedures) factors:

Potential artifact population
Actual artifact population deposited
Preserved fraction
Artifacts in excavated volume
Artifacts recovered
Recorded data
Published data

An extensive literature discusses these steps in detail. A few haphazardous examples are Wood & Johnson (1978), Rolfsen (1979) discussing preservation and post-deposition, Daniels himself discussing recording procedures (Daniels 1972), and Almgren (1972) discussing the interpretation of excavation reports.

Inherent in the research strategy of the New Archaeology was the idea systematically to study, order, and formalize what, since the publications by Schiffer (1972, 1976), has been known as formation processes. The ultimate hope was to be able to analyse how an archaeological record had changed its composition through time, ie the transformation processes *sensu* Schiffer, in relation to a set of formalized, law-like mechanical statements on geo-logical and biological factors as well as human behaviour affecting the record. An informed discussion of the ideas is presented by Gifford (1978, 1981), and one of the few Scandinavian explicite applications is presented by Bertelsen (1985).

During the 1980's the stress in the discussion of transformation processes moved to the cultural context of the deposition of artifacts, ie to what Daniels (1972) very briefly mentioned as functional environmental selection from the potential artifact population. Hodder (1982a) suggested that an archaeological record, even if ever so well preserved, does not mirror the norms and intentions of human actors as members of a culture. Thus, cross-cultural generalisations, middle range theory, or any other formal, predictive statements cannot explain the formation of an archaeological record. This has to be done from a contextual understanding of the historical setting and its inherent traditions, in which the record was deposited.

Perhaps, I had better mention that Hodder is not totally void of interest in post-depositional transformation processes (Hodder 1982b:47-56).

So, while most participants in the debate accept, that what Schiffer (1987:21-23)calls n-transforms (caused by non-cultural, ie environmental, factors) may be subject to the construction of formal law-like statements meant to be used for prediction (eg Solli 1989b within the Scandinavian debate), the crucial point is to find the boundary (if there is one) between the c-tranforms (caused by cultural behaviour) by Schiffer (1987:21-23) and the symbolic role of material culture in a human game of power, meaning, and manipulation as described by Hodder (1982a).

Another way to phrase the same question is to ask, to which extent the deposition and transformation of an archaeological record can be understood as a physical process. The underlying assumption of this question is that culture is not a physical process but something qualitatively different. This way of phrasing the problem seems to suggest a way out. To look at the archaeological record as a paleontologist looks at fossils is appropriate, when trying to understand why the record looks the way it does today compared to what it looked like at the time of its deposition, and to look at it in the textual way suggested by Hodder is appropriate, when trying to understand material culture in use and on its way to be discarded or otherwise deposited (Patrik 1985).

In short, an archeological record is formed by and must be understood from both non-cultural (physical and biological) and cultural processes.

Schiffer (1976:27-41)distinguished between systemic and archaeological context. An artifact in systemic context (S) is used within a living society. An artifact in archaeological context (A) is part of a deposit, eg situated in a rubbish pit or ritually deposited in a burial mound. Artifacts can move between these two contexts in four different ways (S to A, S to S, etc). These movements are the transformation processes. A corollary of the above statement, that the transformations are both caused by environmental factors and imbedded in cultural activities, is that the formation and consecutive transformations of an archaeological record is not a linear process of information loss, as suggested by the model by Daniels (1972). Nor is it a complex web of transformations, involving for example A to S and A to A transformations, which in the long run will form a multilinear process of information loss. On the contrary, information is not only lost or distorted. It is added. Transformations, which take place as parts of meaningfully constituted human activities, are of course the very subject of study of archaeology, eg grave robbery, removal of rubbish, the digging of pits, ploughing.

Schiffer (1987) is the single so far most impressive book on transformation processes. However, he explicitely states a minimal interest in the occurrence of ecofacts in archaeological contexts (1987:7). As concerns bones there is an extensive literature on taphonomy. This concept is sometimes used to summarize all transformation processes that may affect the bone component of an archaeological record. Sometimes it is used only for factors causing information loss, ie mainly factors affecting the state of preservation of the bones deposited. Sometimes it is used for all artifacts and ecofacts, not only for bones. Anyhow, the most recent references on the taphonomy of bones in archaeological context within the Scandinavian debate are Noe-Nygaard (1987), Lepiksaar (1989). Solli (1989a) stresses that there is no difference between bones and artifacts as concerns their position within an archaeological deposit. Both have to be understood as fragments of human activities as parts of a cultural setting and as the residue from a number of environmental post-depositional transformations.

I will try to contribute to the discussion on the formation and transformation of an archaeological record as concerns plant and insect remains. This will be done less by constructing theory and more by presenting two ethnoarchaeological examples. One, a charcoal-burner's hut, is chosen because of its presumed narrow range of activities by only one single man. The other, the cottage of a family, was presumably used in a much more complex way by several persons.

Discussion of ethnoarchaeological data

The charcoal-burner's hut to be discussed here was built during the 19th century among several other similar huts at Mörtaberget (Nyberget, St. Skedvi p., Dalarna) in the mining-district of Central Sweden (fig 1). It was built in one or two days according to a standard plan. One gabel was formed by the fireplace out of piled boulders with a short iron pipe as chimney. The other three walls and the roof were

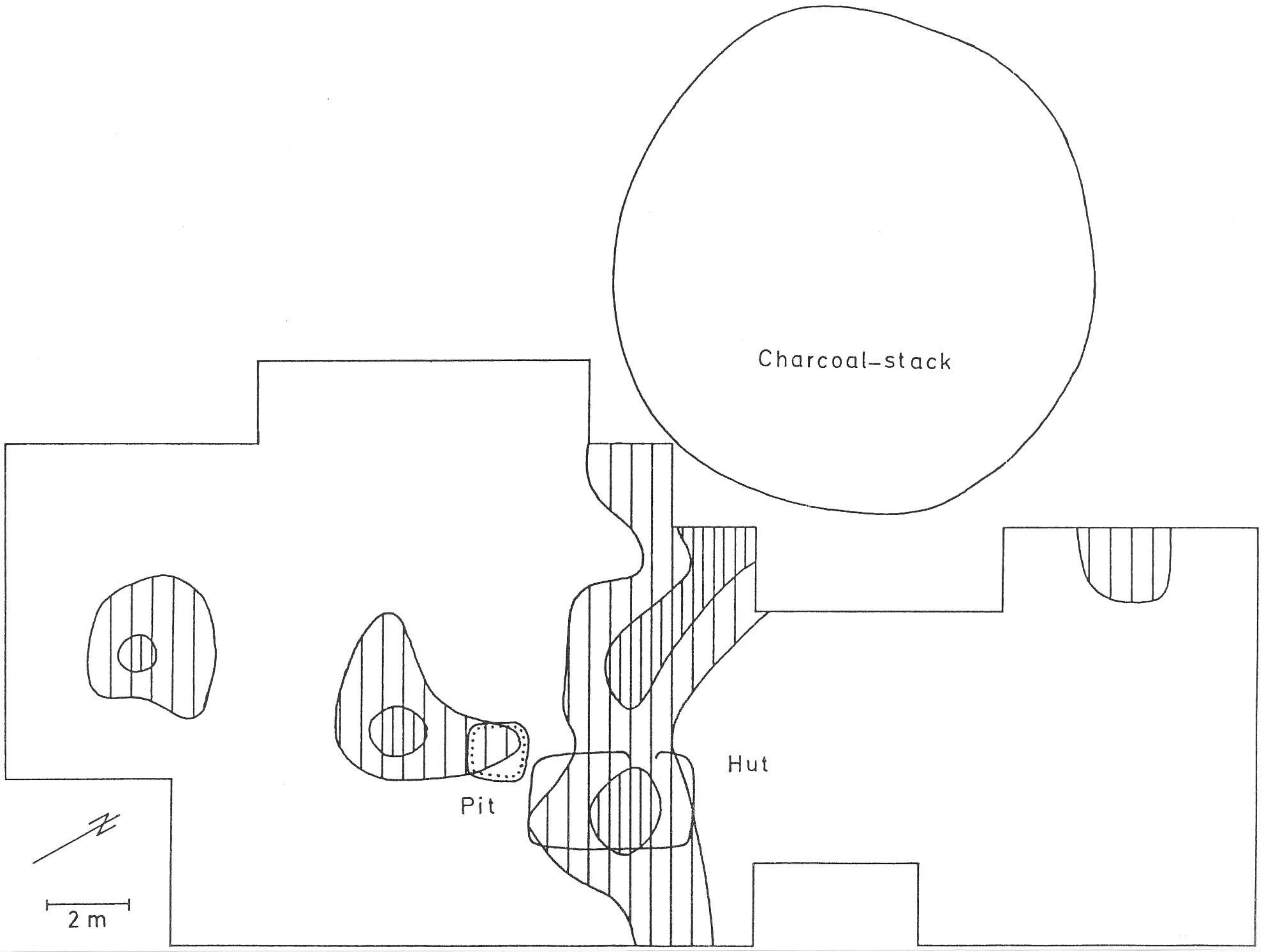

Fig 1. The charcoal-burner's hut at Mörtaberget. The hatched areas denote 6-8 and >8 P°, respectively.

made of turf and cinder covering a wooden frame. The hut had no windows, but the wooden door facing the charcoal-stack (fig 1) had a small pane of glass. The interior consisted of a 2 x 2 m space with the opening of the fire-place, the door, and two wooden sleeping-benches along the walls.

The main use of the hut was by a lonely man, who took care of some three charcoal-stacks during the winter season. When a stack was ready-burnt the cooling of the charcoal had to be watched by a team of three or four persons, possibly including also women. When the timber for the stack was collected and when the charcoal was removed at the beginning and end of the season, respectively, also a horse was present at the hut.

These are the activities that in the first place can be expected to have left behind the phosphate pattern of figure 1. The map indicates that organic rubbish was dropped inside the hut and along the path between the door of the hut and the charcoal-stack. In addition there are a number of other patches with high phosphate content, which are in no obvious way related to the hut and the stack.

The process of decay of the hut is fairly easy to follow. The wooden frame started to rot. Eventually the construction broke down to form an apparent mess of wooden splinters and turf (fig 2).

The wooden frame of the hut was kept together with iron nails. The biggest nails were used to keep the central roof-tree in place (fig 3). The transverse roof-trees had been attached to the central ridge with nails penetrating the trees lengthwise (fig 4) or obliquely as had also some of the nails used for the walls (fig 5). When a nail is to long for the thickness of the planks used, the carpenter will bend the point of it twice, ie backwards into the plank again (cf fig 6). This is obviously what happened, when the door of the hut was nailed together. The door of a charcoal-burner's hut had no hinges but was to be lifted and moved to one side in its total, when entering the hut. The in this manner unattached door seems to have fallen away from the wall of the hut and decayed lying on the ground (fig 6). In this position also most of the fragments of the pane of the door were found, although it is indicated from the scatter of the fragments that the pane may have broken and partly have fallen out before the door succumbed (fig 7).

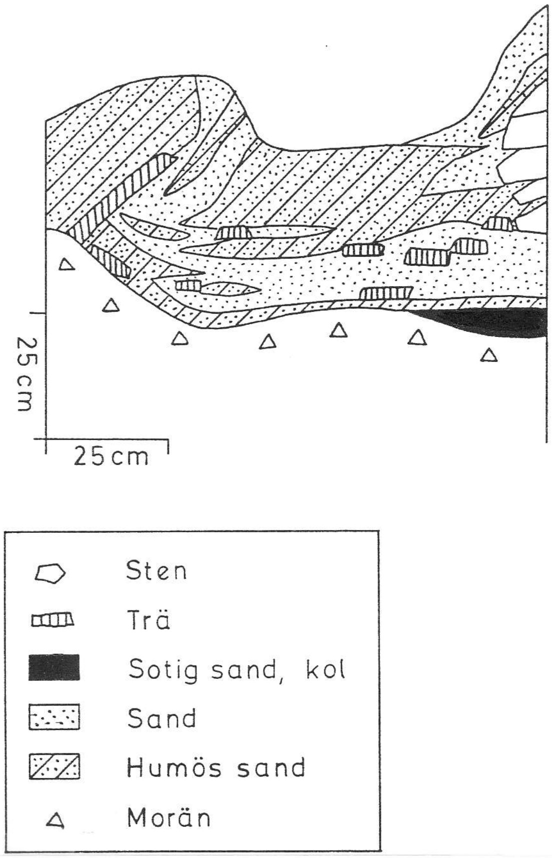

Fig 2. A profile through the charcoal-burner's hut at Mörta-berget, from the eastern gable to the fire-place. Sten = stone, Trä = wood, Sotig sand, kol = sooty sand, charcoal, Sand = sand, Humös sand = humous sand, Morän = till.

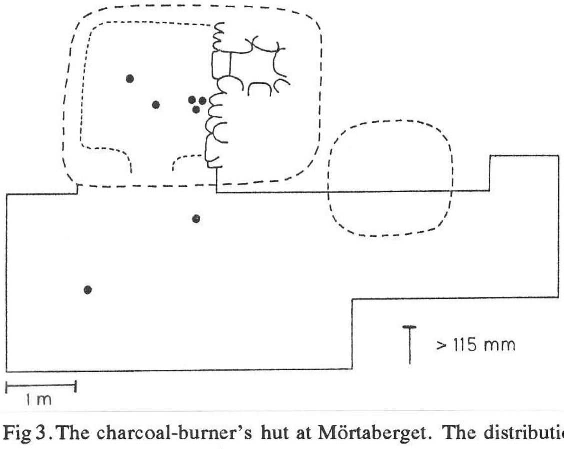

Fig 3. The charcoal-burner's hut at Mörtaberget. The distribution of nails longer than 115 mm.

All the nails from the wooden frame are not presented in the plots, but it is suggested from those displayed (figs 3-6) that the hut decayed and collapsed in a non-random manner that has preserved a functional pattern of nails and other parts of the roof and walls of the hut. The fire-place is still intact. The last meal cooked was at the time of the excavation still indicated by a rusty tin in position on

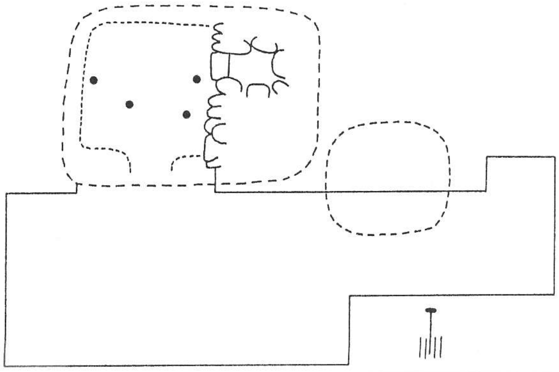

Fig 4. The charcoal-burner's hut at Mörtaberget. The distribution of nails attached to wood as indicated in the figure.

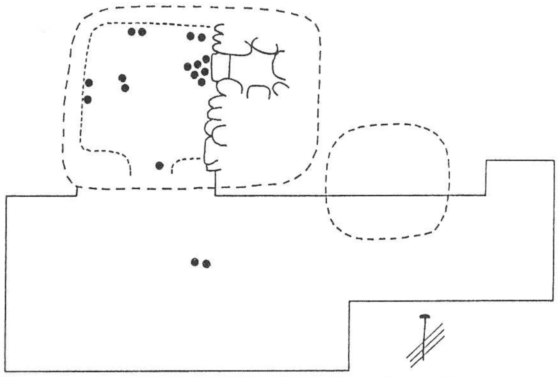

Fig 5. The charcoal-burner's hut at Mörtaberget. The distribution of nails attached to wood as indicated in the figure.

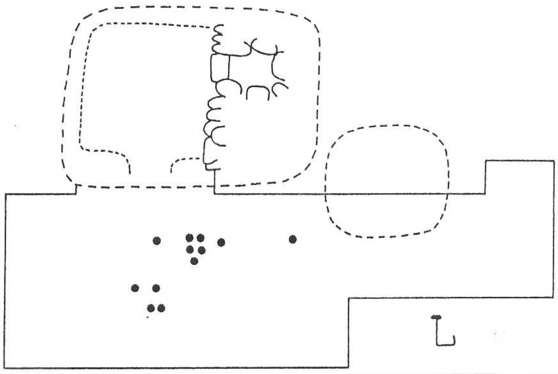

Fig 6. The charcoal-burner's hut at Mörtaberget. The distribution of nails bent as indicated in the figure.

the horizontal stone-slab in front of the room for the open fire (cf fig 3). Inside the hut and in front of the door a few glazed pot-sherds, a few fragments of clay tobacco-pipes, and a brass button was still left behind by the occupants of the hut.

The problem is, how are the ecofacts recovered during the excavation of the hut related to this life-cycle of the hut: construction - use - collapse.

The samples of soil from the interior of the hut, which during the excavation were thought most probably to have been deposited during the period of occupation and use of the hut, are poor in plant and insect remains (tab 1). What there is can tentatively be related to the above suggested life-cycle of the hut in the following way.

Tab 1. Seeds (and other plant ecofacts) and beetles (and other insect ecofacts) from the charcoal-burner's hut at Mörtaberget (det. Göran Andersson and Eva-Lena Larsson, Gothenburg).

	(1)	(2)	(3)
Insects			
Anobium pertinax	1	-	-
Hylastes brunneus/ater	-	-	1
Otiorrhynchus ovatus	-	-	1
Otiorrhynchus scaber	1	-	1
Staphylinidae	-	-	1
Formicidae	1	-	-
Oribatidae	1	-	-
Indet.	3	2	9
Seeds (charred)			
Picea abies	2	-	-
Stellaria media	-	-	1
Indet.	1	-	-
Seeds (not charred)			
Pinus silvestris	-	4	-
Rubus idaeus	4	-	-

(1) = inside the fire-place
(2) = on the floor just below the fire-place
(3) = on the floor, in the middle of the room in front of the fire-place

The majority of the beetle species feeds on just those conifers that form the majority of the plant remains, either they eat green needles or they lay their eggs in stumps of coniferous trees. Rasberry bushes are found in all glades in a forest and most certainly in manmade clearings. Thus, the main part of the species listed in table 1 may derive from what perhaps a little carelessly may be called the natural environment of a charcoal-burner's hut in a coniferous forest, either touched or untouched by forestry. There are two possible exceptions.

The beetle *Anobium pertinax* feeds on old, dry wood. Thus, of course it lives in a forest compost of several generations of trees, either due to natural succession or due to forestry. But, on the other hand, given the place where it was recovered, it is most probable that it lived in the planks of the wooden frame of the decaying hut.

Chickweed (*Stellaria media*) is an annual weed characteristic of ruderal communities within the

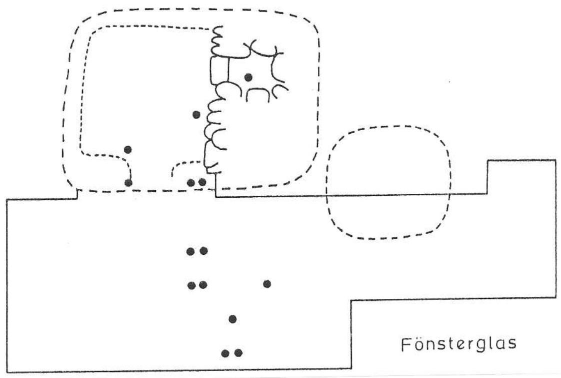

Fig 7. The charcoal-burner's hut at Mörtaberget. The distribution of window-glass fragments (Fönsterglas = window-glass).

open cultural landscape. Its presence as a charred seed may indicate the manmade environment closest to the hut with eroded soil.

Thus, it is most unclear if the plant and insect remains describe the environment of the charcoal-burner's hut at the time of its use. It may be so, or it may not. Four different environments, separate in time and space, are indicated or at least possible to suggest as the source of the ecofacts:

1. Ecofacts deposited contemporary with the period of use of the hut
   a) ecofacts indicating the natural environment (a coniferous forest affected by forestry) around the hut
   b) ecofacts indicating the manmade environment close to the hut and charcoal-stack

2. Ecofacts deposited after the period of use of the hut
   a) ecofacts indicating the natural environment as above
   b) ecofacts indicating the process of decay of the hut

There is no reason to believe that the deposits, from which the plant and insect remains of table 1 were sampled, were sealed at the end of the period of use of the hut or at the collapse of it. On the contrary, it is most likely that insects and seeds have been incorporated in the less than half a meter deep sandy soil (cf fig 2) during the 75-100 years that have passed since the hut was abandoned. The processes at work are discussed by Wood & Johnson (1978) as bioturbation.

The above ideas can be further discussed with the bones (tab 2) from the charcoal-burner's hut as another starting-point. With one exception only fragments of burned bones were present inside and in front of the hut. Not astonishingly, most of them

Tab 2. Bones (numbers of fragments) from the charcoal-burner's hut at Mörtaberget (det. Pirjo Lahtiperä and Rolf W. Lie, Bergen).

	1)	(2)	(3)
Marten			
Cervical vertebrae	-	3	-
Lumbar vertebrae	-	1	-
Small predator			
Ribs	-	4	-
Cervical vertebrae	-	2	-
Dorsal vertebrae	-	8	-
Cattle/elk			
Autopodium bones	1	-	-
Sheep/goat/roedeer			
Ribs	3	4	1
Autopodium bones	2	1	-
Antler	-	2	-
Mammals	6	15	1
Perch	-	1	-
Fish	-	3	-

(1) = on the floor of the hut
(2) = inside and just below the fire-place
(3) = outside the hut

were found in the fire-place and at the floor of the hut in front of it (fig 8).

In the fire-place there were parts of a (once complete?) carcass of a marten. Martens often have their nest in a mound of stones. This one may simply have died in its nest in the fire-place. Another possibility is hinted upon below.

The rest of the bones may be left-overs of the charcoal-burner's food, at least as the list of species concerns. In other respects there are doubts. A charcoal-burner lived alone in the forest and made his own food. Every second week he went to his home village to get food for the next fortnight. Meat is not a historically documented traditional part of this food. Fish may be. The other possibility is hunting. Either the charcoal-burner hunted for food or pleasure in addition to taking care of his charcoal-stacks, or the charcoal-burner's hut was used as a hunting cottage in between the seasons of charcoal-burning or after the end of the period of use of the hut for its original purpose. A piece of buckshot among the artifacts recovered during the excavation is worth mentioning in this context.

The scanty bone-fauna (tab 2) does not permit a

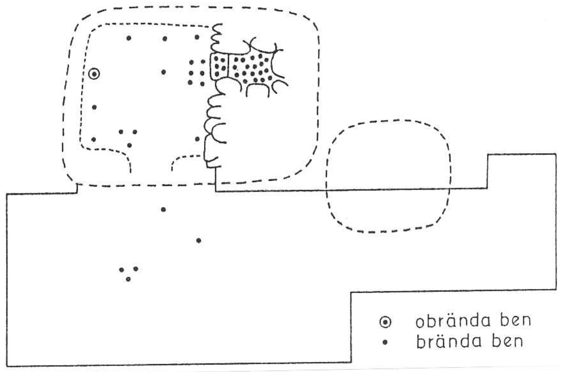

Fig 8. The charcoal-burner's hut at Mörtaberget. The distribution of bone fragments (obrända ben = unburned bones, brända ben = burned bones).

taphonomic discussion in detail, but the presence of antler and autopodium bones may indicate the butchering of whole animal bodies, while the presence of ribs may indicate food refuse.

In the relation to the above list of various sources of the ecofacts recovered in and around the charcoal-burner's hut the bones may belong to groups 2a (marten) and 1b (the rest). As concerns the latter group, one must be aware of the possibility of different seasonal, but generally contemporary, activities at the site and of changes in the general activity pattern along the time-axis.

Finally, three different sources for the increase in phosphate content inside and outside the charcoal-burner's hut can be discussed:

a) Food-refuse. This is a little likely source. The charcoal-burners that I have talked to tell that very little food was wasted. The small quantity not consumed was thrown outside the hut, where it was eaten by the jays.

b) Faeces and urine from humans and horses. The high phosphate values between the door of the hut and the charcoal-stack are suggestive of the night-habits of a man by himself. Otherwise, just a horizontal beam between two trees was used, I have been told by former charcoal-burners.

c) Refuse from butchering. This is probably the main source of increased phosphate content at many archaeological sites. It may be so here, too.

The cottage Granströms is situated in the village at the foot of Mörtaberget (the same as above). It was occupied by three patrilinear generations during the period 1805-1862 (Welinder 1989). The men in the families worked in the nearby mines and smelteries, the boys worked as farm-hands at the farms of the village, while it is not known if the female members of the families had any occupations outside the household.

The cottage had just one room and a small lobby (fig 9). It was built of timber on a sill of boulders with a fire-place likewise built of boulders but with a chimney of bricks. The cottage had one or two windows.

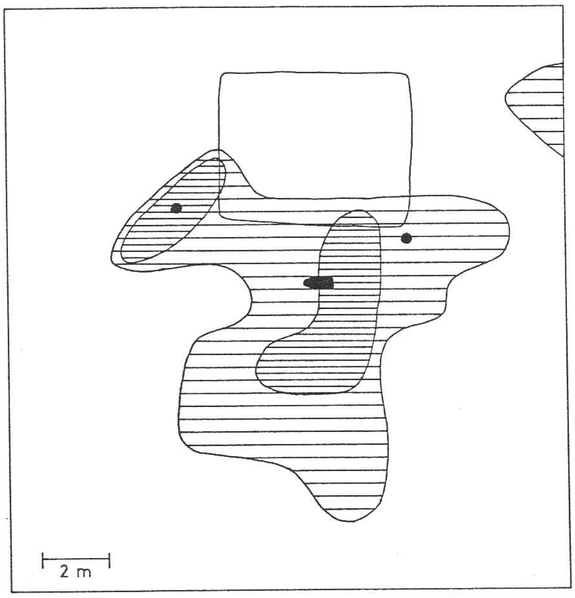

Fig 9. The Granströms cottage with a door-step stone in front of the house and the position of the two rubbish pits at each gable of the house (cf tab 3). The hatched areas denote >50and >100 P°, respectively.

The phosphate map (fig 9) shows how household rubbish and possibly night-soil was thrown close to the house, especially just outside the door and around one corner of the house. At the latter place there was a big refuse pit, and at the opposite gable there were a number of small pits for ashes. The samples in table 3 derive from these pits (cf fig 9). Thus, sample no 1 was found together with mainly fire-place ashes, and sample no 2 together with mainly household rubbish, eg bones, pottery, window glass, buttons, rusty scrap-iron, pieces of tobacco-pipes, coins, pins, and so on.

Sample no 1 contains more insect remains than sample no 2, both as concerns number of fragments and number of species, while the plant remains display the opposite relation. It is probable that this circumstance is due to the type of rubbish dumped in the two pits, or, accordingly, their type of fill, respectively, but I can offer no specific explanation. Apart from these differences, which may be due to different selection or preservation, the two samples are for all practical reasons identical.

There are few species among the insect remains typical of the putrefying organic matter indicated by the bones and high phosphate content around the cottage. The fly puparia and the beetle *Aphodius villosus* are the best candidates. There are also few species typical of a dirty indoor household environment or of a wooden house. *Eremotes nitidipennis* may feed on timber. Save these possible exceptions, the insect fauna is one typical of any plant community and its top-soil with about equally many feeders on green plants and growing trees, predators, and a few feeders on dead organic matter.

In summary, there is little to suggest that the insect fauna was deposited together with the household rubbish or in any other way contemporary with the occupation period of the Granströms cottage.

The plant remains seem to tell another story. There are no remains of the cultivated spruce forest of the lastest 40-50 years. Instead the seed assemblage may be interpreted as deriving from four different environments connected with the occupation period or at least with specific plant communities typical of a cultural landscape:

a) Night-soil. Wild strawberry (*Fragaria vesca*), bird-cherry (*Prunus padus*), and raspberry (*Rubus idaeus*) may pass the digestive system and accumulate where night-soil is deposited.

b) A ruderal plant community. Knotgrass (*Polygonum aviculare*), white goosefoot (*Chenopodium album*), sun spurge (*Euphorbia helioscopia*), stinging nettle (*Urtica dioica*), and wild pansy (*Viola tricolor*) are typical of i a lots and yards. Especially nettle and goosefoot thrive on soil rich in nitrogen from household rubbish and urine.

c) Meadows and pasture land. Lady's mantle (*Alchemilla vulgaris*), cow parsley (*Anthriscus sylvestris*), lesser stitchwort (*Stellaria graminea*), trefoil (cf *Trifolium repens*), germander speedwell (*Veronica chamaedrys*), and heath dog violet (*Viola canina*) are typical of natural as well as cultivated meadows.

d) A single potato seed is not much (especially as there is some doubt connected to the determination of the species), but potatoes have not been sown during this century, while the Granström family very well may have had a potato-patch.

The ruderal plant community of course may have invaded the yard of the cottage after that it was abandoned, and the yard was surrounded by meadows both before, during, and after the period of occupation. Nevertheless, there is a fair possibility

Tab 3. Seeds (and other plant ecofacts) and beetles (and other insect ecofacts) from the Granströms cottage (det. Göran Andersson and Eva-Lena Larsson, Gothenburg).

	(1)	(2)
Insects		
Patrobus atrorufus (?)	-	1
Trechus secalis	1	-
Carabidae	1	-
Phosphuga atrata	-	1
Olophrum	1	1
Staphylininae	4	1
Staphylinidae	2	1
Cryptophagus	-	1
Aphodius villosus	1	-
Otiorrhynchus ovatus	3	-
Otiorrhynchus scaber	2	-
Sitona	2	-
Hylobius piceus	1	-
Phytonomus variabilis	1	-
Eremotes nitidipennis	1	-
Curculionidae	-	1
Myrmica	-	2
Hymenopteran cocoon	-	1
Fly puparia	3	3
Indet.	47	20
Seeds (charred)		
Polygonum aviculare	1	-
Seeds (not charred)		
Alchemilla vulgaris	5	28
Anthriscus sylvestris	-	4
Betula	-	1
Carex	1	1
Chenopodium album	9	9
Euphorbia helioscopia	1	-
Fragaria vesca	1	2
Leguminosae	1	-
Prunus padus	-	1
Ranunculus cf acris/repens	-	1
Rubus idaeus	6	68
Stellaria graminea	1	27
cf Trifolium repens	1	2
Urtica dioica	-	3
Veronica chamaedrys	1	-
Viola canina	12	51
Viola tricolor	-	5
Indet. (Solanum tuberosum?)	-	1

(1) = the rubbish pit to the right of the house in fig 9
(2) = the rubbish pit to the left of the house in fig 9

that a good portion of the plant remains have been deposited contemporary with the occupation of the Granströms cottage, while the opposite is the case with the insect remains.

The above group a) of seeds was intentionally deposited among the household rubbish according to the suggested interpretation, while this would not have been the case with the other three groups.

Conclusions

From the discussion of the two ethnoarchaeological sites the following distinction seems useful:

a) Ecofacts are intentionally deposited at a site during its period of use.

b) Subfossils are unintentionally incorporated into the deposits of a site before, during, and after its period of use.

The deposition of ecofacts is conscious, while the deposition of subfossils may be or not. Both ecofacts and subossils may derive from both natural and cultural ecosystems around the site.

Using the concepts by Schiffer (1976), both ecofacts and subfossils may be parts of the same archaeological context. Both groups and each group alone may derive from several different systemic contexts (S_1 + S_2 + ... S_n to A_1). The subfossils in the same archaeological context may derive from several natural ecosystems or ecological contexts (E_1 + E_2 ...E_n to A_1).

Thus, in one and the same archaeological context (A) ecofacts are incorporated from systemic context (S) and subfossils from ecological context (E). The letters are confusing, but hopefully the distinction will help in understanding transformation processes and in interpreting the environment of and activities at a site.

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