# Ectoparasites of Sheep from Stóraborg, Iceland and their interpretation

## Piss, parasites and people, a palaeoecological perspective

*By P. C. Buckland and D. W. Perry*

### *1. Introduction*

The potential of insect fossils for refining archaeological interpretation was first realised in Osborne's (1969) study of samples from the Late Bronze Age Wilsford Shaft in southern England. It is perhaps symptomatic of the ingenuity of archaeologists that the interpretation of the feature as a 'ritual shaft' (Ashbee 1963; 1966) has continued to be preferred (cf. Coles & Harding 1979, 263) to Osborne's more prosaic 'well'. In fairness, however, the *Journal of Animal Ecology* would be consulted by few archaeologists, whilst *Antiquity* is likely to be seen by perhaps the majority. More recent studies have achieved a closer measure of integration between the purely archaeological and the entomological data (cf. Buckland et al., 1983) and, despite some over ingenious or optimistic models (e.g. Buckland et al. 1976; Buckland et al., 1974, reinterpreted in Hall et al. 1983) and other very pessimistic estimates of potential (Kenward 1975), the field of archaeological palaeoentomology has become an established discipline, although with few practioners (for bibliography, see Buckland & Coope 1985). The majority of studies have dealt principally with beetles (Coleoptera), although other groups, including the true flies (Diptera) (cf. Greig et al. 1982), have received some attention. One ecological rather than taxonomic group, the ectoparasites of vertebrates, however, deserves special note for the light which they can shed upon the presence of particular animals, or at least their pelts. Their remains may also be of value in the identification of use for individual rooms or buildings. Ectoparasites rarely stray far from their hosts, living either amongst the fur or feathers or burrowing into the skin, hair or feathers and many are restricted to a single host species or to a few closely related animals (Marshall 1981). One group, the lice which live on man, has a slight historical record and this has recently been discussed in connection with fossil finds from Norse Greenland (Sveinbjarnardóttir & Buckland 1983). Girling (1984) has been able to record a much fuller assemblage of human ectoparasites from a post-medieval pit in London. The identification of many species of lice (Pthiraptera) and flea (Siphonaptera) is often exceedingly difficult, even with complete individuals and taxonomy in several families remains disordered (Marshall 1981). Van den Brock's (1977) key and illustrations to lice found on mammals in the Netherlands includes most species likely to be found in European archaeological contexts but Smit's (1957) key to the fleas is of less use for fossil material and, for both groups, direct comparison with modern reference material is essential. For the remaining ectoparasites, the situation is slightly better in that, once isolated,

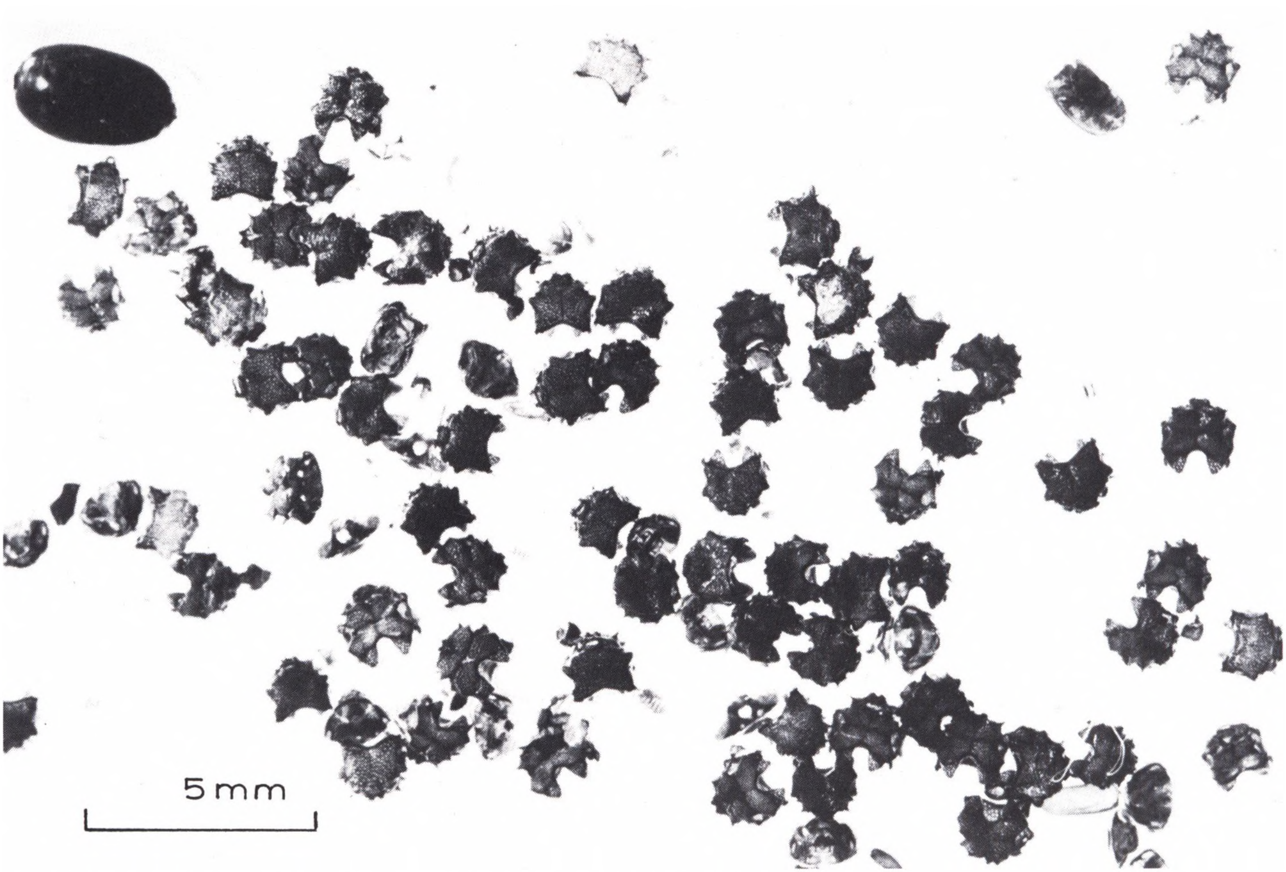


*Fig. 1. Stóraborg, Iceland: sample of fossil insect remains from conduit beneath Hús 17. Photo: G. P. Dowling*

they are more readily recognised. Osborne (1971) has tentatively identified the bed bug *Cimex* sp. from Roman Alcester in Midland England and, in view of its frequency in the relatively recent past (Busvine 1976), it is to be expected in other deposits. Although the Mallophagan and Dipteran parasites of birds may occur incidentally in archaeological sediments, only those few associated with mammals are likely to appear consistently. One of these, *Melophagus ovinus* L., together with louse *Dalmalinia ovis* L., found on the same animal, the sheep, is considered in this paper. The interpretation of this particular fossil assemblage, however, is far from simple and requires a consideration of ethnographic and other sources.

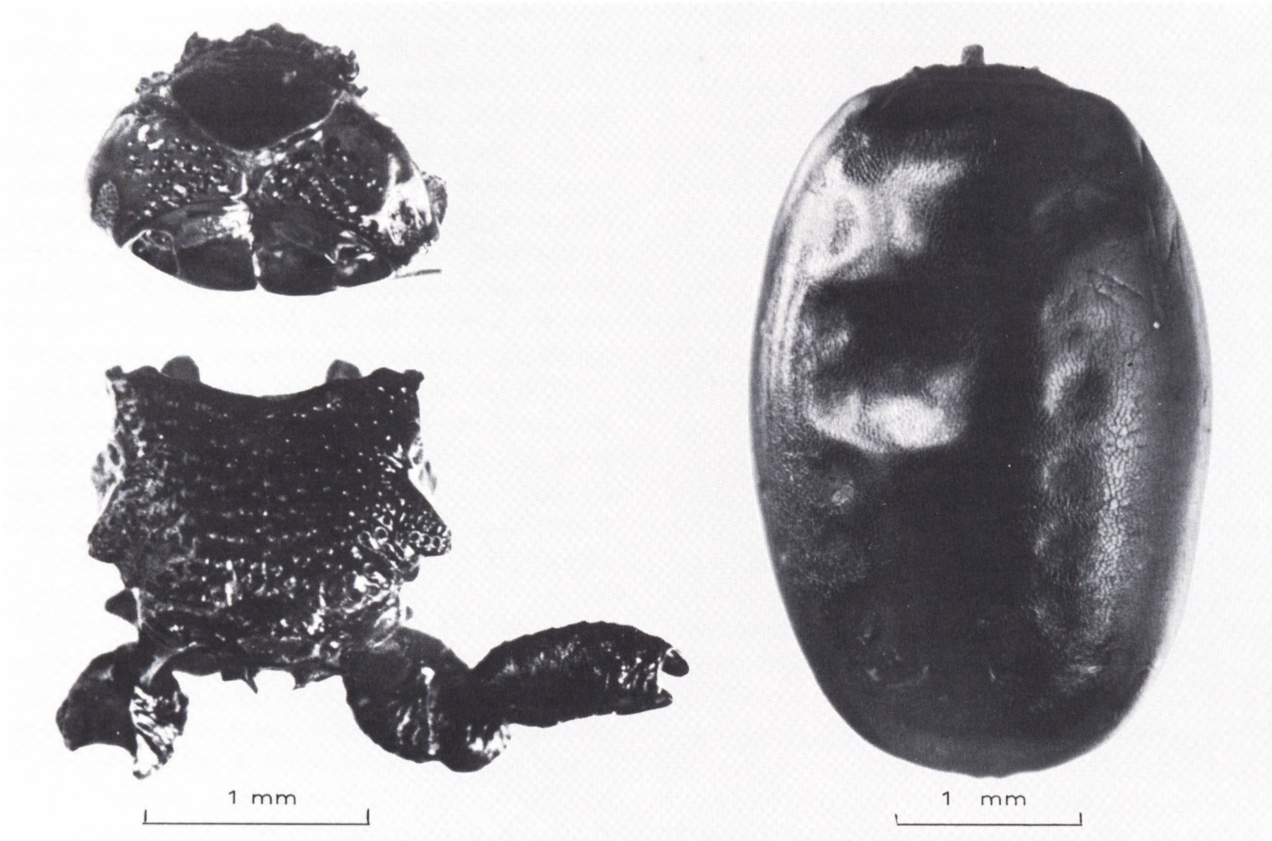


*Fig. 2.* Melophagus ovinus (L). *from Stóraborg, Iceland. [a] head and thorax. [b] puparium. Photo: G. P. Dowling.*

## *2. The Stóraborg Material*

The farm at Stóraborg on the south coast of Iceland was abandoned in 1834 as a result of marine erosion. Continuing destruction of the site led the National Museum to begin its excavation in 1978. A research award from the Leverhulme Trust allowed a major palaeoecological study to take place alongside the archaeological one, with close integration between the results. A preliminary assessment of the site's palaeoecological potential has already been published (Sveinbjarnardóttir *et al.* 1981) and the application of numerical techniques to faunal interpretation has also received attention (Perry, Buckland & Snaesdóttir 1985). One sample, from a late medieval conduit or

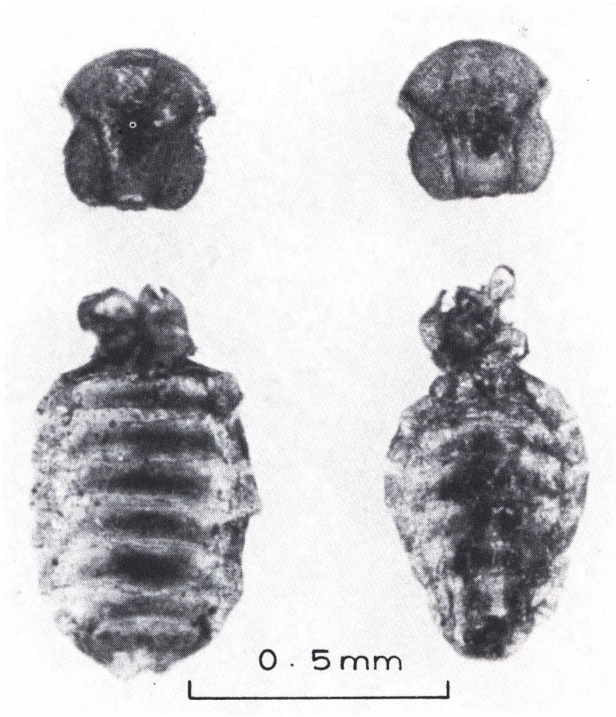


Fig. 3. Dalmalinia ovis (L). *Two fossil specimens from Stóraborg, Iceland. Photo: G. P. Dowling.*

drain beneath one of the rooms (hús 17) in the farm complex, produced a singularly atypical insect assemblage (table 1). The 3.4 kg sample contained few Coleoptera. Both *Lathridius minutus* (group) and *Typhaea stercorea* are synanthropic species associated with the microfungi of decay and the latter was once common in Icelandic haybarns. In small numbers, both species would be expected as part of the general background fauna of the farm and little additional environmental information can be had from the other beetles in the sample. The assemblage (fig. 1) is dominated by two species: the wingless fly, *Melophagus ovinus* L., provides a minimum number of 181 individuals and the louse *Dalmalinia ovis* (L.) a total of 22. Fragments of both imagines and puparia of the former are very distinctive (fig. 2) and have been recognised in small numbers in several Stóraborg samples but the large number in one sample is unusual. *D. ovis* (fig. 3) was not identified from the site until the well-preserved material in the conduit sample was examined and it is possible that specimens had been previously overlooked, although only a few examples must be involved. Both *M. ovinus*, the ked (*Icel.* færilús or saudalús) and *D. ovis* (*Icel.* fellilús or hafíslús) are ectoparasites of sheep.

## *3. Discussion*

The transport of domestic animals throughout the world has led to a cosmopolitan distribution of their parasites. *M. ovinus* occurs over most of the world, although it fails to thrive in the Tropics (Askew 1969) and *D. ovis* is recorded from Europe, Africa, North and South America (Overgaard 1942). Their close association with domestic stock makes it unsurprising that these species appear in the archaeological record. Robinson (1981a & b) noted *M. ovinus* from both Roman and medieval deposits in the Oxford region and both have been recovered from the earliest deposits in the Western Settlement of Norse Greenland (McGovern *et al.* 1983; Buckland unpubl.). In Iceland, the earliest documentary reference appears in Ólafsson and Pálsson's itinerary of 1752-57, although *D. ovis* is confused with *Pediculus* spp., human lice (Ólafsson & Pálsson 1943, 143); the Stóraborg fossils appear to predate this record by over two hundred years.Since the parasites do not usually leave their hosts, the presence of a larger number in a closed conduit is not easily interpreted. Robinson (1981a) suggested that the 26 keds, which he recovered from a pit in medieval Oxford, came either from the penning of large numbers of sheep or the preparation of skins, perhaps for parchment manufacture. Although individual sheep may be infested with well over one hundred keds (Evans 1950), it is most unlikely that the Stóraborg drain sample represents the fauna of an individual sheep since the parasites would tend to remain in the fleece or move into a position whereby they could acquire another host upon the death of the previous one; in any case, a carrion fauna is absent from the sample. In modern experiments, keds died when separated from their hosts for more than a few days and their temperature requirements are closely constrained, moving about upon the host so as to remain within the preferred range (Evans 1950). They would be most unlikely to crawl into a damp, closed stone drain in any number and it has to be assumed that the specimens arrived there by being tipped away in some residue. The room (hús 17) from which the drain led lacked direct artifactual evidence as to its use and, by recent analogy, where sheep are stalled indoors and fed upon hay through the winter, it would be possible to identify the structure as a sheep house. Close confinement of stock would have promoted high levels of parasite infestation. The alternative Icelandic name for *D. ovis*, hafíslús – 'sea-ice louse' relates, as Thoroddsen (1919) has noted, to the fact that these lice only became noticeable when a cold spring reduced the available grazing and the sheep were weakened, increasing their susceptibility to parasites. Even allowing for heavy infestation, it is improbable that at least 203 ectoparasites would appear in the drain as a result of casual losses from stalled animal and the presence of four puparia of *M. ovinus*, which occur cemented to the fleece of the host in life, also militates against this explanation. The practice of winter indoor stalling of sheep also appears to be a late development in southern Iceland. In 1809, Mackenzie (1842) noted that the sheep remained outdoors throughout the year and were infested with 'ticks', a term which would have encompassed *M. ovinus*.

*Table 1: Stóraborg: sample from conduit, south of hús 17.*

| | |
|---|---|
| Mallophaga | |
| Trichodectidae | |
| *Damalinia ovis* (L.) | 22 |
| Coleoptera | |
| Carabidae | |
| *Trechus obtusus* Er. | 1 |
| *Calathus melanocephalus* (L.) | 1 |
| Staphylinidae | |
| *Lesteva longoelytrata* (Goez.) | 1 |
| *Atheta* (s. l.) sp. | 1 |
| Lathridiidae | |
| *Lathridius minutus* (L.) group | 1 |
| Mycetophagidae | |
| *Typhaea stercorea* (L.) | 5 |
| Diptera | |
| Hippoboscidae | |
| *Melophagus ovinus* (L.) | 177 (imagines) |
| *M. ovinus* (L.) | 4 (puparia) |
| | Sample wt. 3.41 |

An alternative explanation is therefore required in which the parasites are physically removed from the sheep. The deleterious aspects of ked and louse infestation in stock has no doubt long been apparent to shepherds but, in the absence of modern insecticides, control would have been particularly difficult. In an attempt to reduce the incidence of 'scab', a term which in early sources subsumes all arthropod-induced lesions rather than only the depredations of the mange mite *Psoroptes equi* v. *ovis*, ointments of varying origins were applied to the skin of the sheep. The method has a long history. The first century Roman poet Virgil refers to the smearing of a mixture of oil-lees, bitumen, pitch, sulphur, wax and various plant extracts onto the animal (*Georgics,* III 448-451) and his near contemporary the agricultural writer Columella not only provides more detailed recipes but also recommends dipping in a saline solution (Columella VII, 5-10). Similar remedies, or rather palliatives, were used throughout the medieval period (Trow-Smith 1957). Their traditional use in Scotland is mentioned in several sources (cf. Anon 1806) and Thoroddsen (1919) notes the technique in early nineteenth century Iceland, before the accidental introduction of scab, with Scottish ewes. Dipping of the lambs in urine was also employed in the eighteenth century to reduce ectoparasite levels. This would probably kill, rather than remove some of the lice and keds and it is unlikely that the drain sample originated in this manner. The application of a salve, in Iceland usually well ground and sieved ash or shark oil, was a slow and tedious process requiring each tuft of wool to be pulled apart and numbers of parasites would inevitably have been disturbed and removed in this way. Such activities, however, are more likely to have been carried out outdoors than in the dark confines of a building, where the relative warmth would expose the farmer to more frequent painful bites from the keds. In this case, it is difficult to envisage a large number of parasites being deposited in the drain.

The more primitive breeds of sheep, like the Icelandic, usually have an annual moult cycle (Ryder 1983) and shearing was not generally introduced to Iceland until late in the nineteenth century (Jónasson 1961). The practice of pulling the fleece from the animals as they started to moult could leave large numbers of parasites in the wool, where, in the absence of new hosts, they would remain, a point emphasised by a childhood recollection of the Faroe Islands, where children were warned to keep away from the freshly sheared wool (Guðrún Larsen pers. comm.) – hungry keds bite painfully but their temperature dependence keeps them within the fleece until the approach of a warm-blooded animal. The Stóraborg sample contained little trace of wool or hair and some means of separation of the parasites from the fleece requires consideration.

After the wool has been removed from the sheep, it has to be washed to remove dirt, dung and matted grease. Too hot a wash removes too much of the natural oil and reduces the wool's water-repellant qualities and makes it more liable to breakage during spinning. A cleansing agent is therefore necessary. Soap did not become widely available in any quantity until the latter half of the nineteenth century and its role was taken both traditionally and commercially by a readily available strong alkali – fermented urine. The collection and uses of human urine, from personal washing and medicine to large scale employment in wool scouring, in Britain have recently been discussed by Stead (1981; 1982). Its use for similar purposes on farms in Iceland is alluded to by Jónasson (1961) in his general discussion of the insanitary nature of nineteenth century farm interiors. The personal recollections of Benedikt Benedikz of a childhood summer in Hnappadalssýsla, W. Iceland are more specific. Throughout the winter, the urine of all members of the household was collected in a large barrel set in the rear of the farmhouse. In early summer, a large pot, usually a cast iron cauldron or 'missionary pot' was filled with the stale urine and gently heated. The collected fleeces were then plunged into the pot, thoroughly washed and finally taken outside and rinsed in the cold water of the farm's adjacent stream before being dried in the sun. The process inevitably resulted in a frothy scum on the surface of the urine, both from the agitation of the liquid and the reaction between the grease in the wool and the strong alkali of the stale urine, and this would act as an efficient flotation agent, similar to the paraffin (kerosene) technique used to recover fossil insects (cf. Coope 1985). The ladled off scum or the disposal of the spent liquid would effectively explain the large number of sheep ectoparasites in the drain sample. Not all the parasites would be removed from the wool by this process and the general scatter of ked and lice remains throughout other samples probably relates as much to the final preparation of wool before spinning as to casual losses from sheep around the farm. The detritus would have accumulated upon the living room floors and have eventually been cleared out onto the midden (cf. Perry et al. 1985).

Stead's excellent study of domestic and commercial uses of urine (1981; 1982) provides a strong indication of the value of this readily available liquid to a subsistence farming community and evidence for its collection might be expected from other archaeological excavations. On the northern fringes of settled agriculture, the careful conservation of all resources was essential to survival and each farm would have facilities for urine collection and storage. In archaeological interpretation, however, it is the niceties of life which tend to dominate and the trace of any large receptacle becomes that of a container for food products. In the context of medieval archaeology, this is well illustrated by what is rightly regarded as one of the classic archaeological expeditions of the 1930's, that of a joint Scandinavian team to Þjórsárdalur in Iceland. The project involved several of the leading archaeologists of the day and had as its objective the excavation of a number of Norse farms destroyed by an eruption of Hekla (Stenberger 1943). Thorarinsson (1949; 1967) has dated this event to A.D. 1104, although this remains the subject of some discussion (Vilhjálmsson 1989). One site, that of Stöng at the head of the valley, sealed beneath up to 2 m of pumice and ash, was particularly well-preserved. Its plan and interpretation are widely figured as typical of a late Norse farm (cf. Foote & Wilson 1970) and a fullscale, if rather speculative 'replica' has been built close to the site (Ágústsson 1983). The main structure consisted of a hall (skáli), with central fire trench, a living room (stofa), placed in line, and two outshots and it is the latter which provide problems in interpretation. One, with stone-lined drains down each side, might be a latrine, although confirmation of this is not possible from environmental evidence; unfortunately, recent re-excavation, by Vilhjálmur Örn Vilhjálmsson, failed to produce suitable samples for study. The other outshot contained the traces of three barrels set into the floor. A white deposit in the base of one of these has been interpreted as the remains of skyr (Roussell 1943, 90) an Icelandic milk product akin to yoghourt. This interpretation has resounded through the archaeological literature (e.g. Eldjárn & Gestson 1952; Krogh 1967, 70). In Greenland, its influence is seen from Vatnaherfi (Site 071) in the Eastern (Vebaek 1958) to Nipaitsoq (Site V54) in the Western Settlement (Andreasen 1981) and traces of barrels have resulted in rooms being regarded as larders (búr); in the latter case, the palaeoecological evidence for foul conditions would appear contradictory (Buckland et al. 1983). Whilst modern sensitivities should not preclude the proximity of functions in the past which we would regard as both insanitary and conflicting, Roussell's (1943) skyr remains bear reexamination. Stöng is a fairly dry site and, as a recent sampling programme has shown, the sediments are inimical to the good preservation of organic materials; after nearly nine hundred years, a milk product would be unlikely to leave a 'white' residue. The salts precipitated from large scale urine storage, however, could survive and also indurate the sodden timbers of the base of a barrel sufficiently to allow partial preservation. Guðrún Sveinbjarnardóttir has pointed out that the Icelandic term *farði*, used by Eldjárn and Gestsson (1952) in their interpretation of the material from round impressions found during the Bergthórshvoll excavations of 1927-31, means either the film inside milk barrels or similar deposits in chamber pots, etc., although the authors of the report preferred the former explanation. Those involved in post-medieval archaeology are familiar with such salt deposits on fragments of chamber pot, the urine probably having been retained for washing the face and hair (Stead, 1981; cf. also Jónasson, 1961) rather than being thrown away every morning. Similar precipitates occur within medieval pottery urinals (Chapman et al. 1975 54-55) and occasionally other vessels ( Dunning 1942). Some such deposits, however, must derive from cooking residues and caution should be exercised in interpretation in the absence of scientific analysis.

On the majority of sites excavated, preservation is rarely sufficient to allow palaeoecological techniques to be brought to bear upon the interpretation of individual room functions. Roussell's excavations in Greenland (1936; 1941) and his involvement with the Þjórsárdalur work have therefore had wide influence. Not only did he find excellent preservation on the Norse farms in Greenland, but he was also widely versed in relevant documentary and ethnographic sources. His standards of excavation, however, were not high and, on many of the Greenland sites, he merely set his labourers to cut trenches along the edges of the walls, thereby divorcing any stratigraphy from structures. It is only recently that more meticulous techniques have been applied to well-preserved sites in Greenland and the recent excavations of both Andreasen and McGovern have received some palaeoecological support (McGovern et al. 1983). At the remote site of Nipaitsoq in the Western Settlement, careful excavation by Claus Andreasen (1981), with samples from the well preserved floor layers, deposited immediately before the farm's final abandonment, allowed a closer examination of room functions (Buckland et al. 1983). Archaeologically, the room containing a barrel, set partly into the floor, was regarded as a larder but the palaeoenvironmental evidence indicates not only foul conditions but also the storage of hay. Whilst it was initially suggested that the room was the farm's latrine, a function not previously recognised in Norse Greenland but very necessary where winter temperature remain well below freezing for weeks on end, the Stóraborg evidence for large scale urine utilisation allows reinterpretation. The barrel was employed to collect the winter's production and the remainder of the room functioned as a hay store. The use of the room for defecation also would not be surprising, although the evidence for foul conditions extends into other rooms (Buckland et al. 1983). Such detail is rarely available from archaeological sites but, particularly where human survival depended upon an effective integration of all aspects of the subsistence base, a thorough knowledge of relevant ethnographic sources can lead to more effective interpretation of the archaeology and the palaeoecological record still has much to offer to the archaeologist.

## Notes

1. The excavations at Stóraborg were funded by the National museum of Iceland and directed by Mjöll Snæsdóttir. Palaeoecological study in both Iceland and Greenland was made possible by a grant from the Leverhulme Trust. The authors are grateful for the comments of Benedikt Benedikz, Guðmundur Ólafsson, S. Moorhouse P.J. Osborne, M. Ryder and Guðrún Sveinbjarnardóttir; any errors or over interpretation remain their own. T.J. Buckland pointed out to the authors Stead's work upon urine in the West Riding.
2. Jette Arneborg, of the National Museum of Denmark, informs us that chemical analysis of the contents of the V54 barrel suggests that it is not urine.

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