ARCHAEOLOGY and ENVIRONMENT 21

Proceedings from the VIII Nordic conference on the applications of Scientific Methods in Archaeology
Umeå 2001

Edited by Roger Engelmark and Johan Linderholm

UNIVERSITY OF UMEÅ
THE ENVIRONMENTAL ARCHAEOLOGY LABORATORY
DEPARTMENT OF ARCHAEOLOGY AND SAAMI STUDIES

Insect faunas from Medieval Langenes in arctic Norway

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Abstract. Cultural sediments containing significant amounts of fish bone at Langenesværet, Vesterålen, Northern Norway provide an opportunity to characterise activity during and prior to the establishment of a late medieval commercial fishing station *(fiskevaer)*. Radiometric and AMS dating techniques are used to establish a chronology for the deposits, while activities associated with the sediments are characterised fossil insect faunas. The results highlight a series of problems with the dating of the heavily disturbed organic deposits of many archaeological sites, and the need for greater care in sample selection and interpretation.

Introduction

The potential of the use of insect remains in the interpretation of archaeological environments in Scandinavia was reviewed by Noe-Nygaard (1982; 1989), after early work by Kenward (1980; 1989) in Oslo. More recently, Lemdahl (1995) has examined a number of sites, including a shipwreck (Lemdahl *et al.* 1995), and with Hellqvist (1996; 1999; Hellqvist & Lemdahl 1990; 1996) he has carried out detailed work on Iron Age and medieval sites around Uppsala. The technique, however, has not been extensively or routinely applied to archaeological contexts. In part this is perhaps more a reflection of the limited accessibility of reference collections, and a lack of awareness of the method, than of the availability of suitable waterlogged sediments. In addition, whilst the returns may be significant, the taxonomic diversity of fossil insect assemblages leads to a need to invest a greater amount of time and expertise in identification than many other techniques. The following paper considers the invertebrate faunal evidence, principally the Coleoptera (beetle) and Diptera (true fly), from a medieval site in northern Norway, Langenes on Vesterålen, presenting some interpretive data not available by other methods.

The Lofoten and Vesterålen Islands

Despite their location, more than 160 km north of the Arctic Circle, the Lofoten and Vesterålen islands have a climate, which is sufficiently ameliorated by the North Atlantic Drift to allow barley to be harvested successfully in most years. Any variations in the influx of warm water, however, leads to significant climate change, which should be reflected in both the archaeological and palaeoecological record. Given suitable preservation of archaeological sites, the islands therefore present an ideal region to examine the impact of both the putative Medieval Warm Period and the ensuing Little Ice Age. The degree of sensitivity of insects, particularly Coleoptera, to climate change is widely known from the work of Coope (e.g. 2002), Lemdahl (2000), Osborne (1980) and others, largely upon mid- to Late Weichselian and early Holocene faunas; the subtleties of later Holocene changes, however, have proved more elusive, principally because of the scale of human impact even in relatively remote areas (Buckland & Wagner 2001).

The development of the Lofoten fisheries, primarily for cod, through the medieval period reflects the need for additional storable protein to underpin urbanisation around the North Sea and Baltic. This led to the establishment of permanent and semi-permanent fishing stations, *fiskevaer*, in the Norwegian Arctic, and the large-scale movement of commodities along the western seaboard from the Arctic to towns like Bergen in Norway and Kings Lynn in England (Urbanczyk 1992) in return for imports, largely of grain. These stations, providing accommodation for a winter fishery, were typically of 8-10 households, and are considered to have been introduced with a rigid social hierarchy and a local debt driven economy by Hanseatic merchants and the Church as an adaptation to social and economic conditions prevalent in Norway after the Black Death of *ca.* AD 1350 (Urbanczyk 1992; Simonsen 1980).

It is apparent, however, that the local farming economy, into which the processes of commercialisation of the fisheries intruded, had origins further back in the Iron Age, and the processes of farm mound accumulation evident on many sites at least partly reflects the net deficit in labour, which resulted from the drawing off of many able bodied males into fishing at times when accumulating dung from stalled animals, soiled litter and turf building debris would otherwise have been

Fig 1. Vesterålen, location map.

spread out onto both arable and hayfields (Bertelsen 1979; 1984; 1990). A similar pattern has been suggested for late medieval farm mound accumulation in Iceland (Buckland *et al.* 1994), where extensive study of associated fossil insect faunas shows that animal fodder, and its residues, forms a significant element in the material (Amorosi *et al.* 1998). It might therefore be possible on the basis of preserved insect faunas to differentiate between permanently occupied sites, in which farming underpinned the fishing, and those where occupation was seasonal, dependent upon the fishery.

Langenes

At Langenes, on the northern tip of Langoya in the Vesterålen group, 2 km east of the modern village of Stø (fig. 1), the remains of structures, many representing the bases of huts from the recent fisheries, similar to those preserved at the World Heritage site of Nusfiord on Lofoten to the south, lie immediately adjacent to the shore, where *stø*, areas of beach cleared of stones for drawing up fishing boats, typical of *fiskevaer* sites in northern Norway, are evident (fig. 2). The lush vegetation and irregular surface over which these structures are built suggest that earlier occupation deposits survive below, and similar topographic features to the south, east of the surviving parish church, indicate further areas of disturbance (fig. 3). The local historian Ivor Toften (1975) has put forward the hypothesis that these were distinct localities where different social groupings clustered within Langenesværet. The first area, adjacent to the stø, *Været*, was probably the area occupied during the winter cod fishing season by merchants and fishermen, whilst *Vollen*, on higher ground adjacent to the church, is considered to be the site of the permanent settlement of Langenes village. A third site, *Staggarn*, where the remains of a house are evident, is thought to be the permanent elite residence of the royal/episcopal overseer.

Fig 2. The site at Vaeret, Langenes looking towards the church. The sto for beaching fishing boats are clearly visible and the sampling location lies between the white house and the beach adjacent to the path. Photo : C Keller (1996)

Detailed analysis of historic records from 1591 onwards track population fluctuations from 8 to 60 families, as economic prosperity varied.
The site, apart from the church, was finally abandoned *c* AD 1950 in favour of the deeper harbour facilities at Stø, although a scatter of houses remains.

In 1995, after preliminary coring revealed cultural sediments up to 1.5 m in thickness, two test pits were cut under the joint direction of Reidar Bertelsen, Tom McGovern and Sophia Perdikaris. These were exposed to the buried land surface in two test pits, at Været (fig. 4) and Vollen (fig. 5) respectively, separated by a distance of approximately 200 m.

Fig, 3. Aerial view of Langenes looking SE. The cleared areas for beaching fishing boats (sto) are evident in the foreground on the beach in front of Vaeren, and Vollen lies on ridge E (left) of the church. Photo : Christian Keller (1996)

In 1997, a further trench was excavated at Været, through the midden deposits into the underlying natural peat. No organic sediments were located close to the third site, Staggarn, although the opportunity was taken to prepare a detailed plan. Deposits at both Vollen and Været consisted of dark brown organic material with evident wood fragments (figs. 4 & 5), including both driftwood and local birch.

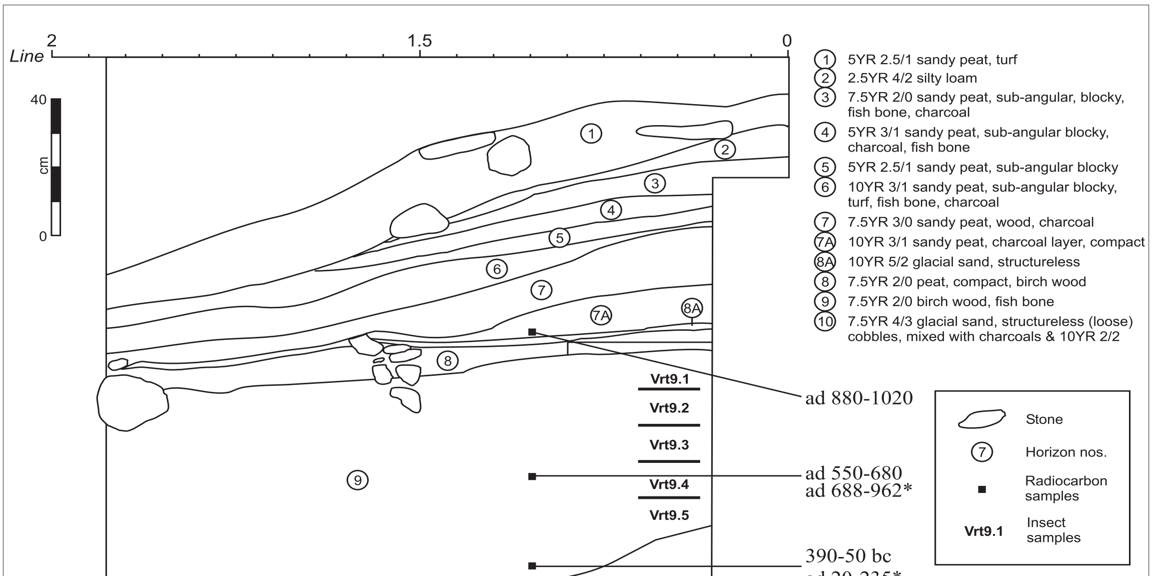

Fig. 4. Stratigraphy at Været, with palaeoentomological samples marked.

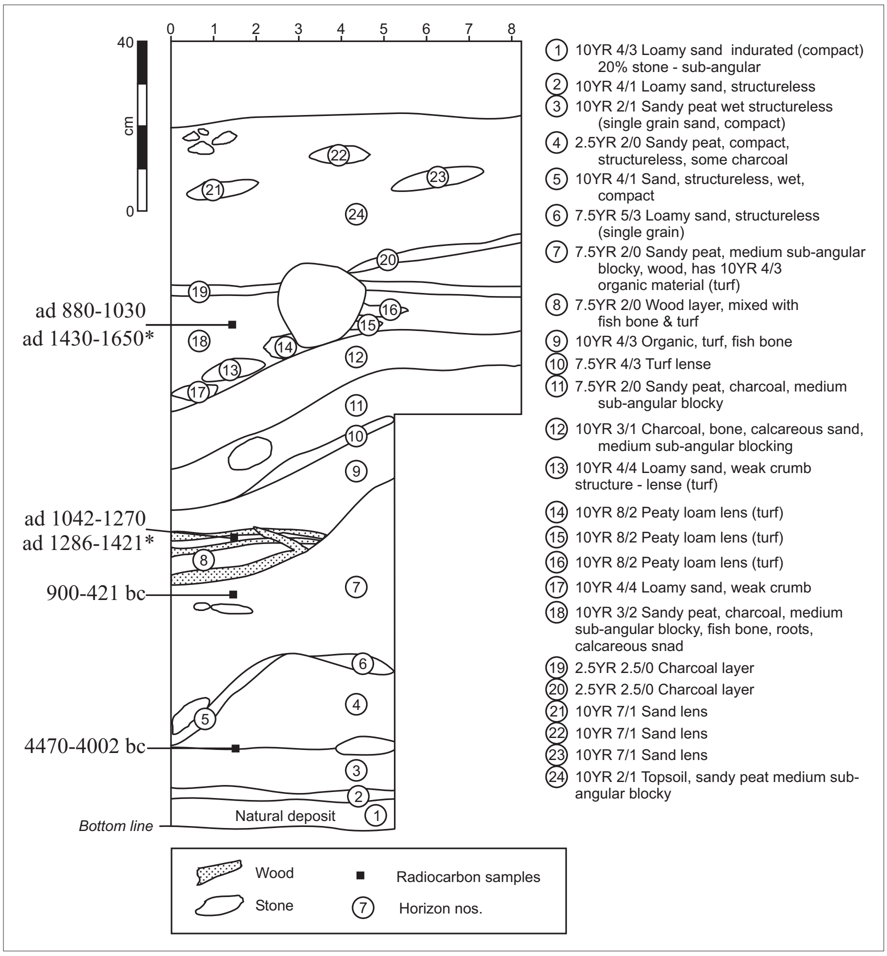

Fig. 5. Stratigraphy at Vollen, showing the wooden floor - layer 8.

Finely comminuted fish bone was found throughout the midden deposits, with other animal bone being rare. At Vollen (fig. 5), a well-preserved wooden plank floor was encountered towards the base of the test pit. Stratigraphic horizons were described in the field according to Munsell colour, hand texture and structure. A total of eighteen undisturbed representative samples were collected from the test pit sections in Kubiena tins for soil micromorphological and chemical analysis by Ian Simpson, and this work has been published elsewhere (Simpson *et al.* 2000).

Eight 27 cm^3 bulk samples were also collected for radiometric measurement, and where material was available, birch charcoal or wood samples from the same location as the bulk samples were collected for AMS radiocarbon measurement (figs. 4 & 5).

A total of ten samples came from Vollen and eight from Været. Study of the insect faunas required larger samples, and in 1995 five litre blocks were cut in 10 cm slices through the main midden deposit (layer 9) at Været, and either side of the wooden floor (layer 8) at Vollen for processing. In addition, further samples of similar size were taken at Været in 1997 for fossil insect remains.

The Invertebrate Remains

The samples were processed by the now standard technique, originally devised by Coope and Osborne (1968). Each was disaggregated in hot water, and washed out over a 300mm sieve, removing evident large fragments of wood, stone and fishbone. The organic component was concentrated by panning and pouring off, leaving the sand in the bowl to be discarded, after examination of the small bone and rock content. The organic material was then returned to the bowl and liquid paraffin (kerosene/lysfotogen) was added. The light oil adsorbs onto the waxy cuticle of the insect fragments, and these float when cold water is added. The flotant was poured off, washed in water and then alcohol, before sorting under a binocular microscope. The insect remains were identified using modern reference collections as well as published keys. Table 1 summarises the resulting identifications, indicating the minimum number of individuals for the Coleoptera and Diptera. Foraminifera were not quantified beyond few (<10 individuals) or common. The fragments of colonial Actinozoa presented a different problem, in that individual fragments sported varying numbers of oothecae. The table therefore indicates number of fragments with the total number of oothecae in brackets.

The basal sample from Vollen (Voll 3) contained no insect remains, and preservation at Været was variable. Initially work was concentrated on the organic, artefact rich horizon of Vrt 9, sampled in 10cm slices in 1995; the 1997 section contained few identifiable insect remains in its upper part, layers 9-21, although layers 10 and 11 contained large numbers of Foraminifera in a sandy matrix.

Rock Fragments

One trace after maritime trading connections often overlooked is the remains of ballast (Buckland & Sadler

1990). Stockfish in particular is light cargo, and ships under sail would require rock or sand ballast to maintain an even keel. Querns, millstones and hones present ideal ballast materials, easily trimmed, and saleable at any port of call. Archaeologically such material would be dispersed into the hinterland and not easily traced as a ballast commodity. As Lindroth's (1957) work on the Newfoundland fisheries shows, however, rock debris and beach sand were also frequently used and dumped at the fishing grounds. The beach and archaeological sediments at Langenes contain a wide range of rock types, which may reflect ballast dumping over a long period of time, but the varied nature of north Norwegian metamorphic and igneous geology makes it very difficult to separate erratics from ballast. The residue from insect sample Vrt 9/4, however, includes a small, burnt struck flake of light grey flint, as well as much finely comminuted burnt bone. If the flake is waste from prehistoric artefact manufacture, the nearest sources would lie either in Russia or the southern Baltic, but it is more probable that it reflects accidental transport in ballast from Denmark, southern Skåne or England. Such an interpretation is reinforced by two unworked flint fragments found on the beach below Vollen by Joan Buckland.

Insect Faunas

The insects from Langenes provide an interesting contrast with the many other samples examined from sites around the north Atlantic, where even in farm mounds with extensive fishbone deposits, as that at Stóraborg on the south coast of Iceland (Perry *et al.* 1985), faunas are dominated by species associated with stored hay and its residues. The need to provide fodder and overwinter at least the core animals indoors (Amorosi *et al.* 1998) is evident in the earliest post-Landnám insect faunas from Iceland and Greenland, and this pattern continues through to the present, although with some recent significant changes in faunal composition (Buckland *et al.* 1991). Species of lathridiids, cryptophagids, the mycetophagid *Typhaea stercorea* and the endomycid *Mycetaea hirta*, feeders on the microfungi of the decay of hay, and their predators, largely carabid and staphylinid beetles, along with large numbers of the puparia of Diptera, dominate samples from farm sites, whilst the one sheiling (*sel*, *sætur*) examined included large numbers of dung beetles (Buckland & Sadler 1991). Coprophilous beetles are also often frequent in related natural assemblages.

Predictably for a human occupation site in the higher latitudes of the North Atlantic, the most abundant puparia belong to the heleomyzid fly *Heleomyza borealis,* constituting 59% of the 864 dipteran individuals retrieved from Langenes. In studies of archaeological contexts in the Norse Western Settlement in Greenland, and through medieval to more recent times in Iceland, *H. borealis* have been omnipresent (Skidmore 1995). The slight degree of uncertainty regarding the precise species concerned at Langenes arises from the remarkably small size of some of the puparia, the size range being 2.4- 6.4 mm. Some of the larger specimens could have been the closely related *H. serrata.* A number of other heleomyzids occur in northern Scandinavia whose puparial features are unknown, so it would have been desirable to have been able to confirm the identity on male genitalic characters. However, since all heleomyzines whose biology is known, at least in outline, develop in faeces or carrion (Smith 1989), the overall indication from a heleomyzine presence here remains unchanged. The inference is that at Vaeret in layer 9, faeces and/or carrion were present throughout, the varying frequency perhaps reflecting differing patterns of rubbish disposal on a midden. It is most likely that it was in fact human faeces that provided the main pabulum for the heleomyzine, since quantities of carrion should have also produced large populations of calliphorids. The other main family of carrion feeders in the high latitudes is the Piophilidae, which have a strong propensity for decaying bone marrow and a significant number of these occur in sample 9.3. Surprisingly for so boreal a site, drosophilids constituted 13 per cent of the total tally of Diptera. The specific identity of the taxon (or taxa) present could not be ascertained, as puparial morphology in this family is remarkably inadequately known. However, whilst some develop in living vascular plants and fungi, most are addicted to fermenting organic matter, and they consequently figure prominently in synanthropic situations on over-ripe or rotting fruit and vegetables.

The Coleoptera from context 9 included a diverse fauna of staphylinid beetles, which are largely predatory and include several taxa, which are restricted to synanthropic situations in the Arctic. Neither species of *Xylodromus, X. concinnus* and *X. depressus*, occurs in natural habitats in the north, and the cryptophagids and species of *Lathridius* are likely to be similarly restricted. The small number of individuals, and absence of other hay dependent insects, however, supports the suggestion that there is no clear evidence for domestic animals or their fodder, although human presence is clearly indicated by the single louse, *Pediculus humanus*. The large predatory rove beetle *Creophilus maxillosus* is often synanthropic, but it has also been recorded frequently in seaweed (Larsson & Gígja 1959). Some species of the genus *Omalium*, *O. laeviusculum* and *O. riparium*, are more strongly associated with seaweed, reflecting the littoral location of the site, a point reinforced by the two species of the genus *Cercyon*, *C. littoralis* and *C. depressus*, both found in deep wrack beds (Backlund 1945). The small flightless staphylinid *Micralymma marina* may be common in the crevices of rocks in the intertidal zone but is also recorded from seaweed, where it appears to be predatory (Thayer 1985). Whilst seaweed itself rarely survives unless charred, remains of the epizoote hydrozoan *Dynamena pumilo* are remarkably common in medieval deposits around the north Atlantic, often indicating the transport to inland sites of seaweed, either for use as fodder or as a source of salt (Buckland *et al.* 1993; 1998). Despite the absence of other seaweed indicators, the presence of 35 individuals of the fly *Fucellia ?fucorum* in sample 9.3 provides conclusive evidence for its presence, and where identifiable, the *Scatophaga* sp. appear largely to be *S. littorea*, a coastal species breeding in decaying matter on the upper shore-line, though seemingly not on rotting seaweed (see Skidmore 1995). Staphylinids characteristic of foul, rotting vegetation and animal debris, such as the abundant *Aploderus caelatus*, are associated with abundant dipterous prey.

Whilst many of the taxa indicative of the natural landscape may be accidental in the assemblage, having entered structures or the midden whilst either seeking prey or dispersing, there are sufficient species, which would normally be associated with peatland to suggest the incorporation of turf and, or peat in the deposit, and there are sufficient indications in most samples to suggest a similar component. The staphylinids *Olophrum* spp., *Boreaphilus henningianus, Eucnecosum brachypterum* (grp.) and the otiorhynchine weevils are unlikely to casually enter buildings as are many of the carabids, which may range widely for prey. The fly puparia provide more definitive information on the import of materials in that the maggots are unlikely to have moved far from their place of breeding unaided. Two of the taxa present favour wooded or scrubland areas, namely *Fannia postica* and *Eudasyphora cyanicolor*, represented by one and nine individuals respectively. *E. cyanicolor* has only been recorded breeding in sheep-dung but evidently has a wider diet, often occurring in wooded areas remote from stock-rearing areas (Skidmore 1985). The puparium of *Fannia postica* was figured by Nielsen *et al.* (1954), who found one in leaf litter in an Icelandic birch-wood.

Although there are a few examples of *Lathridius* sp., *Atomaria* sp. and a few dung beetles of the genus *Aphodius*, these are insufficient to invalidate the hypothesis advanced on the soil micromorphology (Simpson *et al.* 2000) that the prime purpose of the site was not the keeping of domestic animals. The top sample from layer 9 (9.1), however, contains the widest range of species of both Coleoptera and Diptera associated with human activities, and the synanthropic staphylinids are supplemented by significant numbers of *Omalium septentrionis* and *Phyllodrepa floralis.* The dung fauna is also more extensive. This may imply that animal husbandry had become a significant element in site activities, although there are serious taphonomic problems in arguing from single samples from a large site, where local activities and patterns of rubbish disposal may have varied considerably.

The second column from Været presents a different picture in that the basal four samples, from layers 27, 28 and 31, completely lack any trace of human activity and contain species which would have lived in the accumulating litter of the wet peat of the bog which preceded the development of the archaeological site. As in most Arctic assemblages, there are few coleopterous phytophages, and the faunas are dominated by damp litter predators, including *Olophrum fuscum*, *O. assimile*, *Boreaphilus henningianus* and *Eucnecosum brachypterum* (grp.), providing a typical boreal wetland assemblage. Small open pools are indicated by the species of *Hydroporus* and *Hydraena britteni. Otiorhynchus arcticus* and *O. nodosus* are polyphagous, whilst the other weevil *Notaris aethiops* is records from a range of wetland plants, including *Sparganium* spp., *Carex* spp.and *Typha* spp (Anderson 1997; Bullock 1993; Koch 1992). The adults of the small brachypterid *Kateretes pusillus* feed on pollen of grasses and other plants in wetlands (Koch 1989). A strong wetland component was present throughout most samples, and these presumably represent the fauna native to the site, including tipulids, limoniids, pediciids, chironomids, dolichopodids, the scathophagid genus *Cordilura*, the muscid genus *Spilogona* and *Schoenomyza litorella*. Species of *Cordilura*, whose biology is known, mine in *Carex* spp. The psilid may be a *Loxocera* species, whose larvae mine in *Juncus* spp.

Despite proximity to the present shoreline, these faunas contain no halobiontic elements, and it is uncertain whether the section is truncated before occupation debris started to accumulate; there may be a significant break in deposition before the overlying layers 22 and 24/5. These still contain some species, such as the carabid *Patrobus septentrionis* and staphylinids *Acidota crenata* and *Lesteva longoelytrata*, which would have been at home on the surface of the wet peat, although the problems of the incorporation of structural turf and peat litter in archaeological deposits remains. The fourteen specimens of *Heleomyza ?borealis* in layer 24/5 provides the first evidence of foul material entering the system, and subsequent layers contain a range of

Coleoptera which are suggestive of midden deposition. Elements of the seaweed fauna, *Omalium laeviusculum* and *O. riparium*, appear in layer 22. Both are macropterous, and the two individuals may have flown in from seaweed accumulations on the adjacent beach, rather than be the result of human use of the material, a point reinforced by the absence of the colonial epizootes of the alga in the sample. Clearly significant, however, is the presence of elements of the fauna of stored cereals, three examples of the saw-toothed grain beetle, *Oryzaephilus surinamensis*, and two of the grain weevil, *Sitophilus granarius.* These are accompanied by the spider beetle *Tipnus unicolor*, which occurs not only in foul grain residues (Howe 1955), but also in human faeces. In the archaeological context, therefore it is often found in structures interpreted as cess pits (e.g. Buckland 1995; Warsop & Skidmore 1998). By practical experiment, Osborne (1983) showed that grain beetles accidentally ingested with infested bread or porridge were passed through the human digestive system virtually undamaged, if disaggregated or chewed, and it is probable that layer 22 at Været contained human faeces. The remainder of the 1997 test pit succession consisted of open textured sandy sediment with some large charcoal and other indicators of human activity, but few insect remains; only layer 12 had identifiable fragments, pronotal and elytral fragments of *Otiorhynchus nodosus* and a head and elytron of *T. unicolor.* Two samples, layers 9 and 12, however, contained large numbers of Foraminifera, and probably consisted of redeposited beach sand, laid down as a surface over the soft organic sediments which had previously accumulated; its origin need not have been local since sand was widely, if unwisely, used as ballast (Buckland & Sadler 1990).

Vollen

The three samples from the ridge at Vollen produced contrasting data, with the sample from the layer below a wooden floor, layer 7, producing a single unidentifiable fly puparium, despite the presence of preserved wood and turf remains; this may reflect a rapid phase of dumping or other accumulation. If the radiocarbon date from this horizon can be trusted, 900-421 cal. BC, there is a significant gap in the sequence here, and the overlying wooden building may have been dug down into the deposit, which if *in situ*, need not indicate any human activity. Proximity to the coast is demonstrated by a puparium of the fly *Coelopa* sp., which develops in seaweed, although its presence, with the fragments of the epizoote *Dynamena pumilo*, is more likely to suggest the human utilisation of wrack. The sample from immediately beneath the floor (V40) is dominated by a mixture of peat bog species, and more importantly, a grain and foul residue assemblage, in which the most frequent taxa are the grain beetles and puparia of the carrion fly *Heleomyza ?borealis*. The numbers of grain and related beetles are sufficient to suggest the presence of infested cereals in the immediate vicinity, and the smaller number of individuals in the sample from above the floor would support the suggestion that grain was being stored in the building, the beetles having crawled down between the planks. *Sitophilus granarius* appears to show a preference for barley, but it may also breed in a wide range of other starchy commodities (Hoffman 1954), and therefore cannot be used to indicate a particular crop. Both *O. surinamensis* and *S. granarius* are now cosmopolitan pests of grain stores, but their origins clearly lie in the Old World. The latter is present in Old Kingdom Egypt (Panagiotakopulu 2001) and there is a Linear Bandkeramik record from Germany (Büchner & Wolf 1998); its origins probably lie in the grain stores of rodents in the Fertile Crescent (Buckland 1990). The former is part of the faunal assemblage from beneath the bark of moribund trees and is known from Late Neolithic Greece (Valamoti & Buckland 1995). Both, however, only become widespread north of the Alps with the large scale provisioning needs of the Roman army, and their expansion beyond the Imperial frontier must be one feature of the changing patterns of trade in the medieval period, when both are accidentally shipped to Iceland and eventually beyond (Buckland *et al.* 1995; Sadler 1990). Also with this group of largely obligate synanthropes in the north are *Tipnus unicolor*, also apparently a Roman introduction, which occasionally is able to exploit natural habitats, such as bird nests (Palm 1959), *Xylodromus concinnus* and *Lathridius minutus* (grp.). It is apparent that this fauna must have reached Langenes as uninvited guests aboard ships bringing grain to the site. Whilst both *O. surinamensis* and *S. granarius* are relatively cold hardy, able to overwinter in unheated buildings and infest new stocks of grain (Solomon & Adamson 1955), it is more likely to maintain populations by frequent reintroductions from cereal cultivating areas to the south, a point which might be supported by the presence of several other south Scandinavian or English elements in the Langenes faunas. Whether the grain evidence indicates the import of foodstuffs to support a winter fishery or reflects a larger scale process, whereby imported cereals are exchanged for stockfish, is impossible to say on the archaeoentomological evidence, but it must be significant that amongst the few identifiable insects recovered from the small samples taken by Reidar Bertelsen and Preslev Urbancyk from the earliest medieval deposits at Vågan, the first proto-urban centre in the Arctic (Bertelsen 1985), is a specimen of the grain weevil, *Sitophilus granarius* (Buckland & Wagner, unpubl.).

Allowing for the majority of the synanthropic beetles to have been imported with the cereals, there is little evidence of the presence of domestic animals. *Aphodius* occurs in both sample V35 and V40, and these are supplemented by a single example of the dung fly *Scathophaga furcata,* a typical sheep-dung species, which will also clearly breed in a much wider range of media, probably including decaying plant refuse. Eight false puparia of cecidomyiid midges occur in sample V35. These may be associated with the cereals in that the family includes the genus *Mayetiola*, including the serious pest of cereals, the Hessian fly *M. destructor*. Better preserved material however would be necessary to secure this identification.

Insects and the Climate of coastal northern Norway

Insect remains from archaeological contexts are often problematic when considering evidence for climate change (cf. Buckland & Wagner 2001). The decay of plant and animal matter in the midden would have provided an artificially warm and insulated habitat for many synanthropic species of insect, although those species frequently associated with stalled animals elsewhere on contemporary sites in the North Atlantic region are poorly represented at medieval Langenes. The presence of species with a now more southerly distribution may reflect as much the temporary establishment of communities accidentally imported in ballast and dunnage on ships as a warmer climate prior to the Little Ice Age. In addition, the habitats represented by the samples, in particular stored hay from unimproved grassland and dung from domestic animals not treated with Ivermectin or related substances, are now largely disappearing from the Scandinavian Arctic, and some apparent retractions in insect distribution may reflect this. There is also the problem that knowledge of the distribution of many species remains inadequate. It is difficult, however, to explain in these terms the presence, for example, of the small staphylinid *Metopsia retusa* grp.(=*Phloeobium clypeatum*), found in moss, at the margins of ponds, and under leaves, and presently only recorded as far north as the far south of Scandinavia, several hundred kilometres to the south (Lindroth 1960; Lundberg 1995). Its presence in early Holocene deposits on Shetland has been used to support a case for a warmer early Holocene there (Whittington *et al.*, 2003), whilst at Langenes the three individuals in one sample (Vrt 9.5) may only be the result of casual incorporation in ballast from Skåne or further south. Along with several other species in samples from the site, including *Helophorus grandis*, only recorded from the south of Norway, although extending further north in Sweden (Hansen 1987), there is a suggestion that at least part of the succession may reflect the Early Medieval Warm Period. Only examination of peat successions from deposits away from direct human interference is likely to clarify this situation.

A further question, which can be posed, relates to the high frequency of the beetle pests of stored grain in samples from Langenes - does this reflect a need to import cereals in the face of declining or erratic local yields in a worsening late medieval climate, or is it simply that it was cheaper to import and exchange for the products of winter fishing, than run the risks of occasionally catastrophic losses in bad years? Few would argue that the personal risks involved in a winter Arctic fishery were less than in farming, but surviving shipwreck brought a secure return in cod to trade for items other than basic foodstuffs, and northern Norway entered fully into the evolving World system as a result of accumulating debt to Hansa traders, as much as to an insecure farming base in an unpredictable climate. A similar pattern is seen in late medieval Iceland, where local barley cultivation ceases (Gunnarsson 1980), apparently at about the time that substantial farm mounds begin to accumulate, an indication of a diminishing farm labour supply (Buckland *et al.* 1994).

The date of Langenes

The origins and nature of farm mounds in northern Norway has been the subject of much discussion (e.g. Bertelsen 1984; Griffin 1985; Simpson *et al.* 2000; Urbanczyk 1992). Simpson's comparison of the soil micromorphology and geochemistry of Langenes with deposits at the nearby farm mound at Kló showed that dung and animal litter accumulation was essentially absent from the former, a position largely supported by the insect evidence presented here. It should be remembered, however, that individual samples on a large site need not be representative. Spatial variations in activity patterns may be partly compensated for by the relative mobility of insects, but a broader pattern of archaeological excavation and sampling would be necessary to provide any degree of certainty, and this is even more true of micromorphological studies. These problems are even more acute with dating, and despite great care in sampling, there are serious discrepancies with the radiocarbon dates, which the insect faunal evidence can help to explain. At Vollen, where the stratigraphy is clearer (fig. 5) the two bulk sample dates are inverted and when calibrated remain significantly older than the dates on birch wood. Ring counts in thin section suggest that birch brought to the site was no more than 60 years in age (Simpson *et al.* 2000). The invertebrate fauna from directly above the wooden floor of the structure shows not only an extensive beetle fauna, which must derive from peat or turf, of unknown age, utilised for building materials, collected for fuel or as dry litter to live and work upon, but also a large number of fragments of *Dynamena pumila*, which can only have arrived attached to seaweed. This may have been intended as packing, bedding or to be burnt as a source of salt (cf. Buckland *et al.* 1998), but for any purpose its incorporation in the accumulating deposit lends an unquantifiable marine reservoir effect to any bulk date. It is hardly surprising therefore that the accelerator date falls in the calibrated range AD 1286-1421, and the bulk sample date from the same context is AD 1042-1270. Despite the clear marine component indicated by the fauna, however, the ” ^{13}C values are consistent with a wholly terrestrial source.

The situation at Været is more complex. The calibrated radiocarbon dates range from 390-50 BC to AD 880-1020 AD (fig. 2; Table 2). Younger AMS dates again parallel the radiometric dates with differences of 160, 288 and 220 years, but all are considerably older than the deposits at Vollen. Birch charcoal from the basal deposit of sand and gravel with large cobbles, the underlying natural fluvio-glacial sediments, provides a calibrated date of AD 346-546, and may indicate little more than passing occupation or burning by hunter gatherers, if not natural fires. The even older dates from close to the base of the clearly anthropogenic deposits of the midden, close to insect faunal sample Vrt 9.5, may reflect a similar episode at a somewhat disturbed horizon, although the fauna is not significantly different from those higher in the midden (table 1). Other dates from the midden are less easily dismissed, yet an early date cannot be convincingly argued. Insect faunas were examined from close to the location of both bulk sample dates, and a significant peat or turf and marine littoral fauna is evident in all (Table 1). With the comminuted fish bone, this raises considerable doubts as to the validity of the dates, indeed applying a maximum marine carbon correction to both would move them satisfactorily into the medieval period, although the D ^{13}C values would seem to negate this. The birch charcoal date of AD 688-962 could indicate an early origin for the mix of comminuted fishbone and other organic debris, but it would be unwise to accept this in the face of clear evidence for the utilisation of structural turves and peat, both of which are likely to have contained charcoal from long previous fires. The burning of fossil wood in peat, or an old tree could also explain this date. There are also some chronological clues in the insect faunas, in that both *Xylodromus concinnus* and *X. depressus* appear to be medieval introductions in the north. A silver coin, as yet unidentified but clearly Scandinavian and medieval from the middle of layer 9 (Vrt 9.3, fig. 2) however, renders any argument over the radiometric dates superfluous, but the story does provide a suitable cautionary tale upon dating complex deposits.

In isolation, the radiocarbon chronologies appear remarkably consistent, and might allow obser–vations to be made on continuity of accumulation. At Vollen, for example, accumulation rates in the lower part of the stratigraphy might seem low, at *c.* 0.15 mm per year, yet the adjoining region shows clear evidence of once being peat-covered and medieval turbary may have left a scalped landscape. How long the gap was between beach sedimentation and development of peat cover is uncertain, and the answers probably lay elsewhere, in deposits less disturbed by human activities.

Conclusions

The problems over radiocarbon dates for archaeological contexts are not restricted to the Langenes sites, but include many other attempts to date not only Norwegian farm mounds and fishing stations but also sites elsewhere. AMS dates may seem to offer a solution in providing single entity dating, but in the heavily disturbed environment of the farmyard or fishing booth, with the possibilities of charred fossil wood, charcoal incorporated in structural turves and driftwood, the probabilities of dating the *wrong* entity are legion. Recent dates on individual species of beetle and fly from secure contexts in Norse Greenland have raised further doubts as to what entity might be best dated (Buckland *et al.*, in prep.). Despite the problems of variable marine reservoir effects on cattle and sheep fed on seaweed, the dating of identified animal bone at both Været and Vollen would have been a better option. Indeed the cod bone, where at least the marine component is calculable, would have been the better choice. The problems lie not with either dating method, but with sample selection. Langenes provides a cautionary tale, which is applicable to many sites around the North Atlantic.

At face value, the first evidence of settlement may belong to the middle of the first millennium AD, found in the lower Været stratigraphy. Here the micromorphology indicates the remains of structures with embedded fish bone implying specialised fishing (Simpson *et al.* 2000), a point not contradicted by the insect faunas. Whether this site was occupied by full-time or seasonal fishermen, or represents an activity area that was part of an as yet unidentified farming community located elsewhere within Langenesværet has yet to be resolved. These observations could be to contradict existing palaeo-economic models which suggest that from the Iron Age (*c.* 500 BC) individual subsistence settlement sites combined farming with marine hunting and fishing (Johansen 1979; 1982), although the evidence is only valid for the excavated areas at Langenes and should not be applied generally. Later, in the medieval period, the beginnings of integration into a wider European market through the commercial exploitation of the rich cod spawning grounds that began to transform the subsistence economy (Nedkvitne 1977; Bratrein 1983) were still based around the individual farm, but with trade increasingly facilitated by the emerging "urban" site of Vågan in Lofoten (Bertelsen 1985; Bertelsen & Urbanczyk 1988; Urbanczyk 1992). The fossil insect faunas clearly show the utilisation of local resources and the importation of grain, but many more samples associated with a larger scale excavation and sampling programme for other biological materials is needed before it can be claimed that the work is fully representative.

Acknowledgements

Fieldwork in Norway was facilitated initially by a grant from the British Council, which allowed joint research with Professor Reidar Bertelsen of the University of Tromsø. Sample processing for insect remains was funded by NSF (USA) through the NABO, North Atlantic Biocultural Organisation, grant to Professor T. H. McGovern at the City University of New York. Later work formed part of a project funded by the Leverhulme Trust (UK). Mr. Rolf Eileifsen is thanked for allowing access to his land, and for his interest in the research. The support of Trond Torgvaer of Øksnes Museum was also invaluable. J. M. and R. J. Buckland assisted with the fieldwork, which was carried out in association with Reidar Bertelsen, Tom McGovern and Ian Simpson. The present text owes much to the comments of James Barrett, Kevin Edwards and Jon Sadler.

Table 1 : Invertebrate remains from Vaeret

	Vaeret Section 1 Layer 9 1-5					Vaeret Section 2 Layers 11-31									
Taxon	9.1	9.2	9.3	9.4	9.5	11	12	18	20	21	22	24	27	28	31
Anoplura															
Pediculus humanus L.				1											
Coleoptera															
Carabidae															
Leistus ferrugineus (L.)					1										
Notiophilus aquaticus (L.)											2				
Loricera pilicornis (F.)	3	1													
Patrobus septentrionis (Dej.)				1							1	1			
P. assimilis Chaud.	1														
P. atrorufus (Strom.)	1														
Trichocellus cognatus (Gyll.)	2														
P. diligens (Strm.)											1				
Pterostichus sp.												2			
Calathus melanocephalus (L.)	5		1												
Calathus sp.	1	1													
Agonum sp.			1												
Dytiscidae															
Hydroporus morio Aubé														3	1
Hydroporus spp.												1	2	1	
Hydraenidae															
Hydraena britteni Joy													1	5	4
Hydrophilidae															
Helophorus grandis Ill.	1														
H. aquaticus/grandis grp.	2														
H. aequalis Thoms.											1				
Helophorus spp.	1			2							1	1	1	1	
Cercyon littoralis (Gyll.)	5														
C. depressus Steph.	1														
Cercyon sp.		1									1				2
Megasternum boletophagum	4			1										1	
Catopidae															
Catops morio (F.)	1														

Table 1 cont.

Catops sp.	2		1	1	1						1	1			
Scydmaenidae															
Stenichnus sp.	1														
Staphylinidae															
Metopsia retusa (Steph.) grp.					3										
Megarthrus depressus (Payk.)	1			1											
M. sinuatocollis Boisd.	2	2	1												1
Phyllodrepa floralis (Payk.)	19		2		1										
Omalium laeviusculum Gyll.	3				1						1				
O. riparium Thom.				2							1				
O. rivulare (Payk.)	1	3	2		2						1				
O. septentrionis Thom.	18			1											
O. caesum Grav.		2	2	1											
O. excavatum Steph.	9	4		1	1	1									
Omalium spp.	5		3	3							2				
Xylodromus depressus (Grav.)				1	2										
X. concinnus (Marsh.)	6		2												
Micralymma marinum (Strom)	1	1													
Olophrum fuscum (Grav.)				1	2						3			8	1
O. assimile (Payk.)	10		2											1	
O. rotundicolle (Sahl.)													1		
Olophrum sp.		2												1	
Eucnecosum brachypterum (Grav.)	12		3		1						4		2	1	
Acidota crenata (F.)	1										3				
Lesteva longoelytrata Goez.	1										1				
Anthophagus alpinus (Payk.)	2														
A. omalinus Zett.	1														
Anthophagus sp.				1											
Boreaphilus henningianus Sahl.	3		1								2		3	4	4
Omaliinae indet.											1		1		
Aploderus caelatus (Grav.)	19	5	17	14	5	1									
Platystethus arenarius (Fourc.)	2		3	2											
Stenus spp.	3	1	3	1							2		6	4	3
Lathrobium spp.	1			1								1		2	1
Gyrohypnus punctulatus (Payk.)	1			2	1	1									
Othius angustus Steph.	2	1		2	2						1				
Neobisnius sp.					1										
Philonthus succicola Thom.			2												
P. cephalotes (Grav.)	3	2		3											
P. sordidus (Grav.)	1														
Philonthus spp.	2	1	5	6	1									2	
Gabrius sp.	6	1	1												
Creophilus maxillosus (L.)	1		1	1	1										
Quedius mesomelinus (Marsh.)				1											
Q. molochinus (Grav.)															1
Q. umbrinus Er.														1	
Q. boops (Grav.) grp	4														2
Quedius spp.	2		1	1							3				
Quedius / Philonthus sp.		1									1			2	
Mycetoporus spp.	1		1								1				
Tachyporus nitidulus (F.)	4														
Tachyporus spp.	1										5				
T. pallipes Grav.	1														
T. signatus Grav.	4		5	1							1				
T. laticollis Grav.	3		4												
T. corticinus Grav.	26	5													
Tachinus spp.	4	1			3								1		1

Table 1 cont.

Myllaena dubia (Grav.)			2												
Drusilla canaliculata (F.)	1														
Aleochara sp.			1												
Aleocharinae gen. indet.	58	15	43	14	11	2	6							1	1
Pselaphidae															
Bryaxis puncticollis (Denny)											1				
Elateridae															
Selatosomus aeneus (L.)	1														
Athous subfuscus (Müll.)	1	1	1								1			1	
Byrrhidae															
Simplocaria semistriata (F.)	3														
Simplocaria sp.		1													
Brachypteridae															
Kateretes pusillus (Thun.)													1	1	1
Silvanidae															
Oryzaephilus surinamensis (L.)											3				
Cryptophagidae															
Cryptophagus spp.	2														
Atomaria spp.	8	1	1		1										
Lathridiidae															
Lathridius anthracinus Mann.	1														
L. minutus (grp.)	4	2	5		1										
Lathridius pseudominutus Strand	4														
Corticariinae_indet.		1													
Ptinidae															
Tipnus unicolor (Pill.)							1				1				
Scarabaeidae															
Aphodius lapponum Gyll.	1	1	2												
A. fimetarius (L.)	1														
A. piceus Gyll.	5														
Aphodius sp.	1		1		1						1				
Curculionidae															
Apion spp.	2														
Otiorhynchus arcticus (F.)	1	1	1											1	
O. nodosus (Müll.)	1		1				1				4	1	2	2	
Tropiphorus obtusus (Bons.)	2														
N. aethiops (F.)											2	2	1		
Sitophilus granarius (L.)											2				
Hymenoptera															
Formicidae															
Myrmica sp.	1			4											
Diptera															
Tipulidae															
Tipula sp.	4	1	1												
Pedicia (s.l.) sp.														1	
Limoniidae													2	21	18
Limoniidae/Pediciidae		2													
Bibionidae	30														
Chironomidae													1	6	
Cecidomyiidae "false-puparia"	1			6									1		
Scatopsidae	2														
Dolichopodidae	1			1											
Phoridae (?*Megaselia nigra*)				1											
Psilidae															
Piophilidae	1		20		2										
Heleomyzidae															
Heleomyza ?borealis	100	15	93	140	14							14			

Table 1 cont.

Sepsidae			1												
Sphaeroceridae															
Copromyza sp	5	1													
Sphaeoceridae/Limosiniinae															
Limosiniinae	9		2	13	1										
Drosophilidae	43	8	9	28											
Chloropidae												1		5	
Cordiluridae															
? *Cordilura* sp.														1	1
Scathophagidae															
Scathophaga sp.	35	2	3												
Anthomyiidae	9	3	15	10	1										
Muscidae															
Fucellia ?fucorum Fall.			35												
Fannia postica (Stein)	1														
Hydrotaeoides sp.				2											
? *Spilogona* sp.														2	2
Eudasyphora cyanicolor	9														
? *Schoenomyza litorella* (Fall.)			1												
Calliphoridae															3
indet.puparia					2										
Dynamena pumilo	14(58)	5(16)													
Foraminifera indet.						Many	Many	Few		Few					

Table 2 : Invertebrate remains from Vollen.

Taxon	**V35**	**V40**	**V45**
Coleoptera			
Carabidae			
Nebria rufescens (Strom.)		1	
Pelophila borealis (Payk.)	1		
Elaphrus sp.	1		
Loricera pilicornis (F.)		1	
Patrobus sp.	1	1	
Pterostichus strenuus (Panz.)	1		
P. diligens (Strm.)	1		
Hydrophilidae			
H. glacialis Villa	2		
Helophorus spp.	1	1	
Megasternum boletophagum Marsh.	1		
Catopidae			
Choleva /Catops sp.	1	1	
Scydmaenidae			
Stenichnus collaris (Müll.)	1		
Staphylinidae			
Eusphalerum minutum (F.)	2		
Phyllodrepa floralis (Payk.)	2		
Omalium laeviusculum Gyll.	1		
O. riparium Thom.		1	
O. rivulare (Payk.)	2		
O. excavatum Steph.	2		
Omalium spp.	2	2	
X. concinnus (Marsh.)	2	3	
Olophrum fuscum (Grav.)	2		
O. assimile (Payk.)	22	1	
Olophrum sp.		1	
Eucnecosum brachypterum (Grav.) grp.	3	2	
Lesteva longoelytrata Goez.	1	1	
Boreaphilus henningianus Sahl.	1		
Omaliinae indet.	1	1	
Carpelimus bilineatus Steph.	1	2	
Stenus spp.	3		
Lathrobium spp.	3	1	
Gabrius sp.	10	1	
Quedius mesomelinus (Marsh.)	3		
Quedius spp.	4	1	
Quedius / Philonthus sp.		1	
Mycetoporus spp.	2	1	
Tachyporus spp.	3	1	
Tachinus spp.	2	1	
Autalia sp.	1		
Aleochara sp.	2	1	
Elateridae			
Athous sp.	1		
Byrrhidae			
Simplocaria semistriata (F.)		7	
Simplocaria sp.	1		
Cytilus sericeus (Forst.)	2		
Byrrhus sp.		1	
Silvanidae			
Oryzaephilus surinamensis (L.)	5	25	
Cryptophagidae			
Cryptophagus scutellatus Newm.	2		
Cryptophagus spp.	3	3	
Atomaria (*Anchichera*) sp.	1		
Atomaria spp.	4		
Lathridiidae			
L. minutus (grp.)		8	
Lathridius pseudominutus Strand	2		
Anobiidae			
Anobium punctatum (Deg.)		1	
Ptinidae			
Tipnus unicolor (Pill.)	1	1	
Ptinus sp.		1	
Scarabaeidae			

Table 2 cont.

Taxon	V35	V40	V45
Aphodius sp.	1	2	
Curculionidae			
O. nodosus (Müll.)	1		
Notaris acridulus (L.)	2		
Sitophilus granarius (L.)	6	22	
Diptera			
Tipulidae			
Tipula sp.	3	1	
Limoniidae/Pediciidae	1		
Chironomidae			
Cecidomyiidae "false-puparia"	8	1	
Scatopsidae	3		
Dolichopodidae	1	1	
Psilidae	1		
Piophilidae		1	
Coelopidae			
Coelopa sp.	1		
Heleomyzidae			
Heleomyza ?borealis		24	
Sphaeroceridae/Limosiniinae	8	3	
Drosophilidae	1		
Scathophagidae			
Scathophaga furcata Say		1	
Anthomyiidae	2		
Muscidae			
Hydrotaeoides sp.	1	1	
? *Spilogona* sp.	1		
Phaoniinae		1	
Calliphoridae	1		
indet.puparia			1
Actinozoa			
Sertulariidae			
Dynamena pumilo	33	1	

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