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Local environment and human impact at Gamla Uppsala, SE Sweden, during the Iron Age, as inferred from fossil beetle remains

Magnus Hellqvist

Högskolan Dalarna, Institutionen för Ekonomi och Samhälle, SE-791 88 Falun, Sweden (mhq@du.se)

Analyses of subfossil insect remains was used to study the environmental history of Gamla Uppsala, south-eastern Sweden. The samples studied, most of which were collected in a smaller depression, Myrby träsk, are dated to a period from the Roman Iron Age (0–400 AD) to the Early Viking Age (AD 800). Beetles living in aquatic environments and waterside situations are related to the former permanent open water situation of the depression. Several host plants for beetles were probably growing either in the surrounding open areas or close to the wet or moist environment. The dominant beetles, occurring during more or less all the time periods studied, are dung beetles, generally indicating grazing.

Keywords: Late Holocene, beetles, land-use history, human impact, Iron Age, Gamla Uppsala

Introduction

Gamla Uppsala is one of the most prominent and famous historical places in Sweden, and probably played an important role in the establishment of the early Swedish state. The demesne of the Crown for the region was situated here, and the area was above all an important administrative centre. Gamla Uppsala was presumably also a religious centre with a pagan temple. The most conspicuous features in the area are three large grave mounds, constructed during the Migration period (AD 400–550), together with hundreds of smaller grave mounds. Large parts of the extensive burial areas and grave structures have been destroyed by modern exploitation and agriculture (Gräslund 1993). Dating of structures in the area found during excavations in recent years has pointed to continuous settlement at least from 300 to 800 AD.

Although Gamla Uppsala occupies an extraordinary position in Swedish history, few archaeological investigations have been performed there until recently. There have been no earlier palaeoecological studies in the immediate area, although there is a great need to reconstruct the development of the environment and the history of land use. The main obstacle to earlier investigations has been the lack of suitable sites for such purposes.

An interdisciplinary project, including archaeological and palaeoecological investigations, was started in 1992 with the aim of reconstructing the environmental and cultural history and prehistoric economy of the Gamla Uppsala area. The project has focused on problems such as the dating of human activity and reconstruction of prehistoric land use. Other objects of interest were changes in the natural vegetation around the settlement. Reports from the project have been published by Königsson et al. (1993), and also Eriksson (1996), Hellqvist (1996) and Mikko (1996). Evidence related to the vegetation history based on pollen analyses is presented by Eriksson (1999). This paper concentrates on the results of insect analyses and discusses their interpretation with reference to the local environment, climate, human activity and land use. There have been few investigations into insect fossils in the region, and there is a need for more investigations in order to generate new interpretations. The investigations of insect analyses in the region published so far cover the period from the late 15th century to modern time in an area north of Gamla Uppsala (Hell-

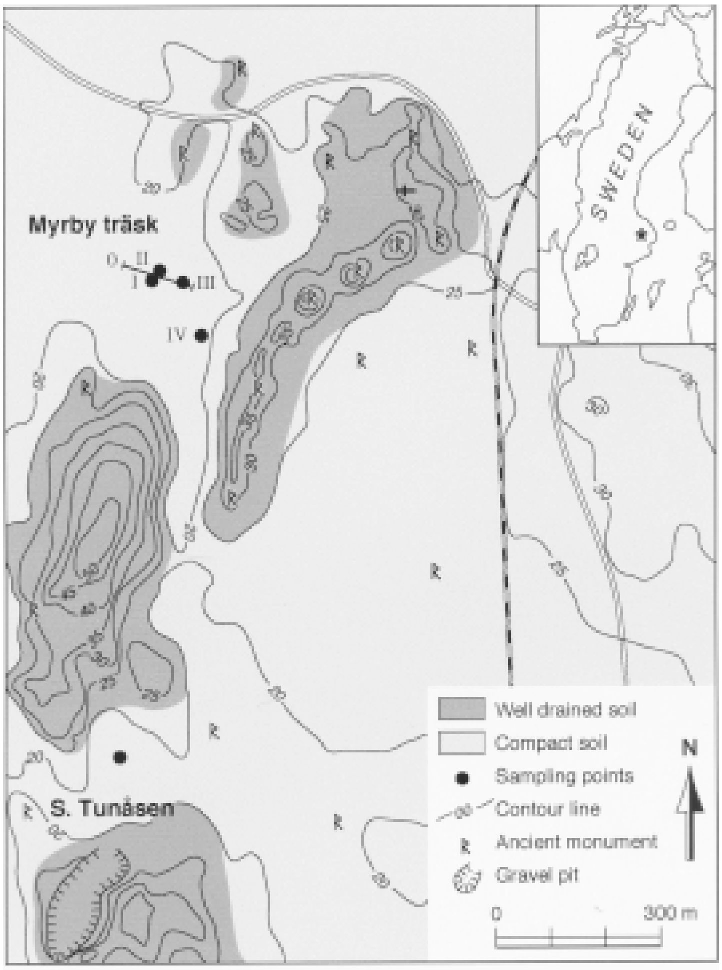

Figure 1. Location of Gamla Uppsala in Sweden and position of the sampling sites. The compact soil is clay or gyttja clay, and the well drained soil in the esker is dominated by glaciofluvial sediments. The smaller hills in the northern part of the map consist of till deposits. The line marked 0 to III represents the position of the profile presented in Figure 3.

qvist & Eriksson 2001), mediaeval Uppsala (Hellqvist & Lemdahl 1996), Stockholm (Lemdahl unpublished) and Iron Age settlements north-east of the town of Västerås (Hellqvist 1999).

The Gamla Uppsala area and its geology

Gamla Uppsala is situated in the northern part of the city of Uppsala. The area is densely populated nowadays, with cultivated fields, pastures and planted or exploited forests covering the hills. It is situated within the hemiboreal zone, characterised by mixed broad-leaved deciduous and coniferous forests (Ahti et al., 1968). The area is within the northern limit of oak (*Quercus robur*). Mean July temperatures are around 16.5°C, mean January temperatures around -4.2°C and annual precipitation about 560 mm.

The present morphology of the area is primarily a result of geological processes during the deglaciation that marked the beginning of the Holocene, together with isostatic uplift, which continues today at a rate of about 4.9 mm/year. The landscape is fairly flat, but broken up by hills and rocky outcrops. The Quaternary deposits are dominated by marine clays (16–25 m a.s.l) and glaciofluvial deposits (Möller 1993). The most prominent glaciofluvial feature is the esker of Uppsalaåsen, which reaches a height of 50 m a.s.l. and is partly covered by glacial varved clay and postglacial marine clay sediments. The River Fyris runs 400 m N of Gamla Uppsala.

After a preliminary survey, two sites were chosen for sampling, Myrby träsk, a former small, waterfilled depression, and S. Tunåsen, both situated in the western part of the area (Fig. 1). Myrby träsk and the three large grave mounds are viewed from the west in Figure 2. Four cores were taken at Myrby träsk and one south of it, in cultivated fields at S. Tunåsen. The general sampling depth in both cases was around 120 to 130 cm. The uppermost part of the stratigraphy at both sites, down to 35 cm below the surface, was not analysed because of ploughing.

The soil stratigraphy is similar at all the sampling

Figure 2. View of Gamla Uppsala from the west, with the three large grave mounds to the right and Gamla Uppsala church to the left. In the centre of the picture is the position of the former small lake Myrby träsk, an area that is still wet in early springtime. Photo: Magnus Hellqvist.

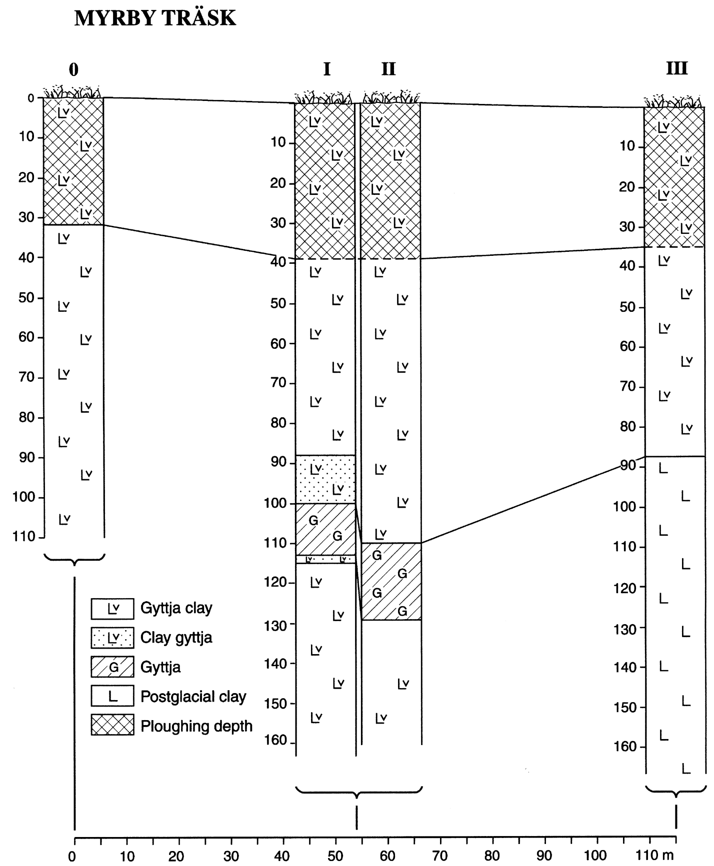

Figure 3. Profile sampled at Myrby träsk, with sites I, II and III marked. The core for site 0 was not analysed.

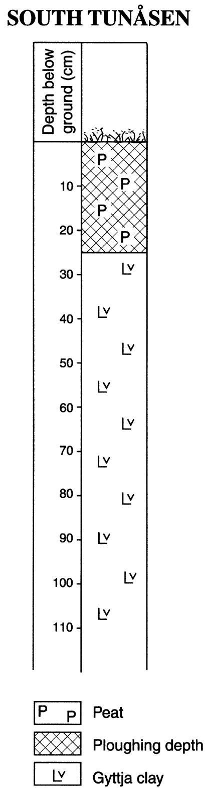

Figure 4. Profile analysed at South Tunåsen.

MYRBY TRÄSK I

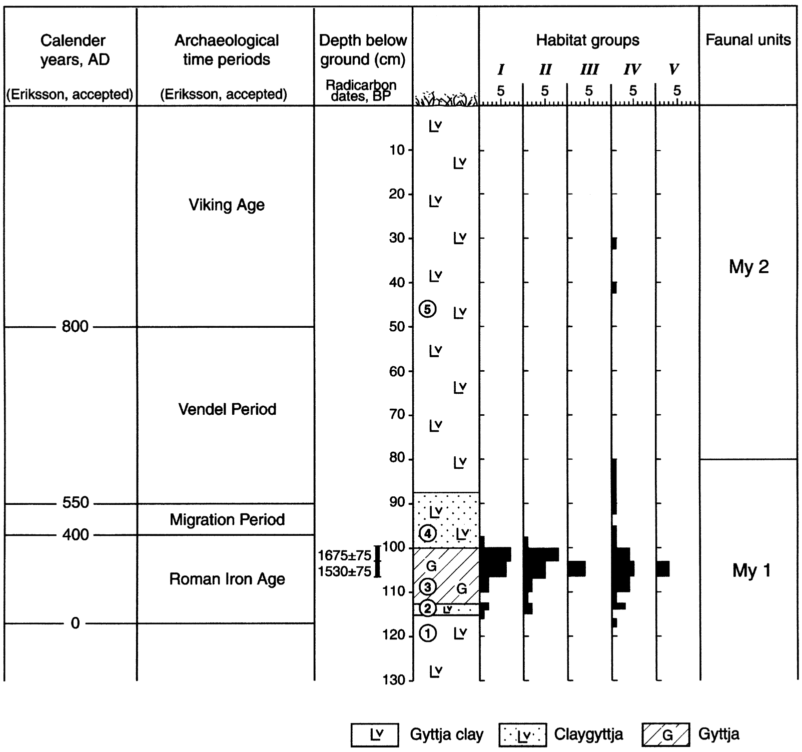

Figure 5. Profile for Myrby träsk core I, and relations to habitat groups and faunal units, represented by numbers of individuals. A species may occur in more than one habitat group. The time periods and radiocarbon dates (AD) are according to the stratigraphic division of Myrby träsk proposed by Eriksson (1999). The lithostratigraphic units, as referred to in Table 2, are numbered from 1 to 5.

Table 1. Radiocarbon dated macrofossils (*Seseli libonatis)* from the Myrby träsk I peat layer, calibrated to calendar years.

Depth (cm)	^{14}C-years BP	Calibrated age AD, (cal 1σ AD)	Calibrated age AD, (cal 2σ AD)
100–102.4	1675±75	AD 265–445	AD160–535
102.5–105	1530±75	AD 435–590	AD 345–640

(Calibration: Stuiver et al. 1993)

points at Myrby träsk (Fig. 3). In the centre of the depression (cores I and II) gyttja clay is overlain by a gyttja section between about 100 and 115 cm (I) and 110 to 129 cm (II). The overlying approx. 100 cm of soil consists of clay gyttja and gyttja clay. The gyttja section is only found in the central part of Myrby träsk, however. The stratigraphy of S. Tunåsen (Fig. 4), 900 m S of Myrby träsk, is somewhat different, consisting of marine clay overlain by gyttja clay and clay gyttja, which is in turn overlain by some 35 cm of disturbed peat up to the soil surface.

Method

Sampling for the insect analyses was carried out in open sections using metal boxes pushed directly into the walls of excavations (I, II and III at Myrby träsk and at Södra Tunåsen), or by coring from the soil surface using a Russian corer (IV at Myrby träsk). A larger section was sampled in the gyttja layer of site II at Myrby träsk, in order to obtain more fossils to represent an aquatic situation. Site IV was sampled in order to represent the littoral part of the former aquatic situation in the depression, but the sequence was subsequently considered to be of more or less terrestrial origin. Deposits from archaeological excavations in the area could not be used for complementary samples, since all of them were rather sandy and oxidised, and thus not suitable for insect analysis.

The samples for insect analysis were dispersed in 10% sodium hydroxide solution and then washed through a 0.25 mm sieve. Macroscopic remains of insects were sorted out from the sieve residue under a stereomicroscope at low magnification and identified using keys for modern specimens and by comparison with modern specimens from reference collections.

The chronologies of the sites were established from ^{14}C dates obtained for macroscopic plant remains collected from the gyttja section of Myrby träsk I and through relative dates based on the elevation of the terrain. AMS dating produced on macrofossils of the terrestrial plant *Seseli libanotis* (Apiaceae) are presented in Table 1 and incorporated into Figure 5. The dates correspond to the second part of the Roman Iron Age (0–400 AD), the Migration Period (400–550 AD) and the beginning of the Vendel Period (550–800 AD) in the conventional archaeological terminology for southern Sweden (Hedeager & Kristiansen 1985).

Using the relative relationship between altitude and land uplift in the area, Eriksson 1999 calculated that the higher parts of the esker, at about 25.5 m a.s.l., rose above sea level around 2900 years BP, the basin of Myrby träsk was isolated at approximately 2500 years BP, as land uplift has reached about 18.5 m a.s.l., and the entire area studied here was above water level by about 2000 years ago.

Results

The insect taxa identified at Myrby träsk and S. Tunåsen, together with information concerning sample depths, the habitat groups formed, habitat preferences and faunal units are presented in Table 2, and a list of phytophagous beetles and their host plants is presented in Table 3. The total numbers of insect taxa found were: Myrby träsk I, 39, Myrby träsk II, 63, Myrby träsk III, 14, Myrby träsk IV, 11, and South Tunåsen, 12. . All the species found are present in the area today. The record is dominated by subfossil beetles (Coleoptera). Remains of caddis flies (Trichoptera), butterflies and moths (Lepidoptera), true flies (Diptera), ants, wasps, bees and their relatives (Hymenoptera) were also found, but are not discussed any further in this paper.

Pollen analysis

Pollen analyses for the same sites in both Myrby träsk and S. Tunåsen are presented by Eriksson (1999). The samples for insect fossils and pollen were taken from the same stratigraphic levels, but the pollen record was sampled to greater depths, in order to establish the earliest vegetation history, from the time when the land rose above sea level as a consequence of isostatic uplift. It was not possible to establish a chronology for the whole stratigraphy of Myrby träsk based on absolute dates, because of problems with dating material, with the exception of the gyttja layer presented in Table 1. It is proposed that the stratigraphy presented in Figure 3 extends upwards to the Early Viking Age (AD 800).

The pollen record represents the general development of the cultural landscape in the Gamla Uppsala area. The area was subject to human exploitation more or less as soon as the land elevation made this possible, and an agricultural landscape was established there during the Pre-Roman (500 BC–0) or Roman Iron Age (0–400 AD). An increase in agricultural activity can be detected around Myrby träsk, with pollen indicating cultivation, when the depression was filled with water, which has been dated to the Roman Iron Age and Migration Period from macrofossil plant remains in the gyttja (Table 1). There is an decrease in agricultural activity in the sediment levels above this gyttja layer, but also an increase in charcoal particles, so that this level must correspond to the erosional event around Myrby träsk that is recorded in the insect fossils, pollen and diatoms. These changes in the pollen record probably indicate a change in the use and function of the area, with former cultivated areas being used for settlements. The pollen record in the layers that follow this event shows a new increase in cereal cultivation and pasturing up to the end of the sediment sequence, probably corresponding to the Early Viking Age (AD 800).

Myrby träsk

In order to reconstruct the environmental history of the area, the opening of the surrounding areas and patterns of land use, the insect remains were separated into five habitat groups or environmental categories, as presented in Table 2 and used in Table 4 and Figures 5 and 6.

Comparison between the habitat groups and the lithostratigraphy allows two faunal units to be proposed, My 1 and My 2 (Figs. 5 and 6). These are defined by insect assemblages reflecting the aquatic nature of the basin and land use in the surrounding area. Faunal unit My 1, which is characterised by a higher species diversity, represents the open water stage in Myrby träsk, dated to at least 265–590 AD, while My 2 represents the following terrestrial stage of the basin, with recurrent spring floods, as are still present today. It is characterised by a complicated depositional history and low numbers of taxa, and by poor preservation of the insect remains.

Several of the beetle taxa concentrated in or just

Table 2. Insects recorded in the Myrby träsk area, Gamla Uppsala, their habitat preferences and occurrence in habitat groups and faunal units as defined in the text. Numbers (1–5) refers to the lithostratigraphy of Myrby träsk as defined in Figures 4 and 5, lower gyttja clay (lgc), lower clay gyttja (lcg), gyttja (g), upper clay gyttja (ucg), upper gyttja clay (ugc). ST refers to the lithostratigraphy of South Tunåsen, gyttja clay (gc). Minimum numbers of individuals in each sample are calculated from the most abundant skeletal part. A taxon may occur in more than one faunal unit.

Taxa*	Lithostratigraphic Units						Habitat/ Substrates */**	Habitat groups
	1 (lgc)	**2 (lcg)**	**3 (g)**	**4 (ucg)**	**5 (ugc)**	**ST (gc)**		
Coleoptera								
CARABIDAE								
Clivina sp.			1				H	II
Dyschirius globosus (Herb)			1				Mw,C,He,A	II,III,V
Trechus cf. *micros* (Herb)					1		H,Mw,L,R	II
Trechus sp.			3		2	1	–	–
Bembidion sp.					3	1	–	–
Trechus / *Bembidion* sp.						1	–	–
Pterostichus cupreus (L)			1				O,Gs,A	III,IV,V
Amara cf. *apricaria* (Payk)			1				O,S	III,IV,V
Amara sp.			1				–	–
Gen. indet.			3	1	1		–	–
DYTISCIDAE								
Agabus sp.			1				Aq	I
Colymbetes sp.			2				Aq	I
Gen. indet.			1		1		–	–
HYDRAENIDAE								
Ochthebius minimus (Fabr)		1	1				Aq,(C)	I
Ochthebius cf. *marinus* (Payk)			1	1			Aq,Mw,C	I,II
Ochthebius sp.			7		1		Aq,Mw	I,II
Hydraena britteni / *riparia*			1				Aq,Mw	I,II
Limnebius sp.			1				Aq	I
HYDROPHILIDAE								
Helophorus brevipalpis Bedel			2				Aq,L,R	I
Helophorus minutus (Fabr)			1				Aq	I
Helophorus sp.			3		1	1	Aq,H,Mw	I,II
Cercyon sp.			1		1	1	–	–
Cryptopleurum minutum (Fabr)			2				Mw,Du,Do,Ca	II,IV
Cryptopleurum cf. *minutum* (Fabr)			2				Mw,Du,Do,Ca	II,IV
Hydrobius fuscipes (L)			2				Aq	I
Gen. indet.			3				–	–
STAPHYLINIDAE								
Quedius sp.			4				–	–
Xantholinae indet.			5				–	–
Lathrobium brunnipes (Fabr.)			1				H,F	II
Stenus sp.			1		1		–	–
Omalinae indet.	1		1				–	–
Oxytelinae indet.			3				–	–
Oxytelus sp.					1		–	–
Anotylus rugosus (Fabr.)			1				H,Du,Do	II,IV,
Anotylus cf. *rugosus* (Fabr)					1		H,Du,Do	II,IV
Anotylus sp.			1		1		–	–
Platystethus arenarius (Four.)			4				H,Mw,Du,Do	II,IV
Platystethus nodifrons Mann			2				H	II
Platystethus sp.		1	4				–	–
Aleocharinae indet.			2		1		–	–
Gen. indet.			2		3		–	–
HISTERIDAE								
Hister sp.			1				–	–

Table 2 (cont.)

Taxa*	Lithostratigraphic Units						Habitat/ Substrates */**	Habitat groups
	1 (lgc)	**2 (lcg)**	**3 (g)**	**4 (ucg)**	**5 (ugc)**	**ST (gc)**		
Platysoma sp.			1				–	–
SCARABAEIDAE								
Onthophagus fracticornis (Prey)						1	Duch	IV
Aphodius prodromus (Brahm)			5		2		Duch,H,Do	II,IV
A. scybalarius (Fabr.)			1				O,C,Mw,Ducs	II,III,IV
A. cf. *ictericus* (Laich)			1				O,Du	III,IV
?*A. niger* (Panz)			2				H,Mw,Do	II
A. sp.		1	30	3	15	9	Du	IV
ELATERIDAE								
Agriotes sp.			1				–	–
CRYTPOPHAGIDAE								
Gen. indet.						1	–	–
LATRIDIIDAE								
Corticaria sp.			1			1	–	–
ANTHICIDAE								
Anthicus antherinus (L)			1				X,Do,Du	IV
CHRYSOMELIDAE								
Donacia / *Plateumaris*					1		H,Mw	II
Phyllotreta sp.			1				Vh	–
Longitarsus sp.					1		–	–
Gen. indet.			3		1	1	–	–
CURCULIONIDAE								
Apion sp.					1		–	–
Barynotus obscurus (Fabr.)			1				H,O,(X),V	II,III
Sitona lepidus (Gyll.)			1				H,(X),(O),Vh	II,III
Sitona sp.			1			1	–	–
Notaris cf. *scirpi* (Fabr.)					1		H,V	II
N. acridulus (L)			11		7	1	H,Mw,Sh,V	II
N. cf. *acridulus* (L)					1		H,Mw,Sh,V	II
N. aethiops (Fabr)			6		7		H,Mw,Sh,Vh	II
N. cf. *aethiops* (Fabr)					3		H,Mw,Sh,Vh	II
N. sp.	2		11		20		H,V	II
Dorytomus / *Notaris* sp.						2	–	–
Anoplus sp.			1				Tbeal	–
Ceuthorhynchus sp.			1				–	–
Gen. Indet.		6	11	1	9	7	–	–

* The nomenclature follows Lundberg (1986). Habitat preferences (Habitat) are indicated for each taxon: generally open landscape (O), forest (F), aquatic (Aq), moist (H), dry (X), water margins, rivers and brooks (R), coastal habitats (C), grass/shrub land (Gs), meadow, arable fields (A), tree feeder on Betula and Alnus (Tbeal), shrubs (Sh), herbs (Vh), reed vegetation (Vr), fungi (Vf), decaying organic matter (Do), dung (Du), dung from cows and sheep (Ducs) dung from cows and horses (Duch), carrion (Ca), synanthropic (S).

** Information concerning the present geographical distribution and biology follows Frey (1964), Good & Giller (1991), Hansen (1987), Horion (1953), Jessop (1986), Landin (1957, 1961, 1970), Lane (1992), Lekander *et al.* (1977), LeSage (1990), Lindroth (1985, 1986), Lundberg (1986), Marsh (1991), Nilsson & Holmen (1995), T. Palm (1961), E. Palm (1996), Phillips (1992), Skidmore (1991).

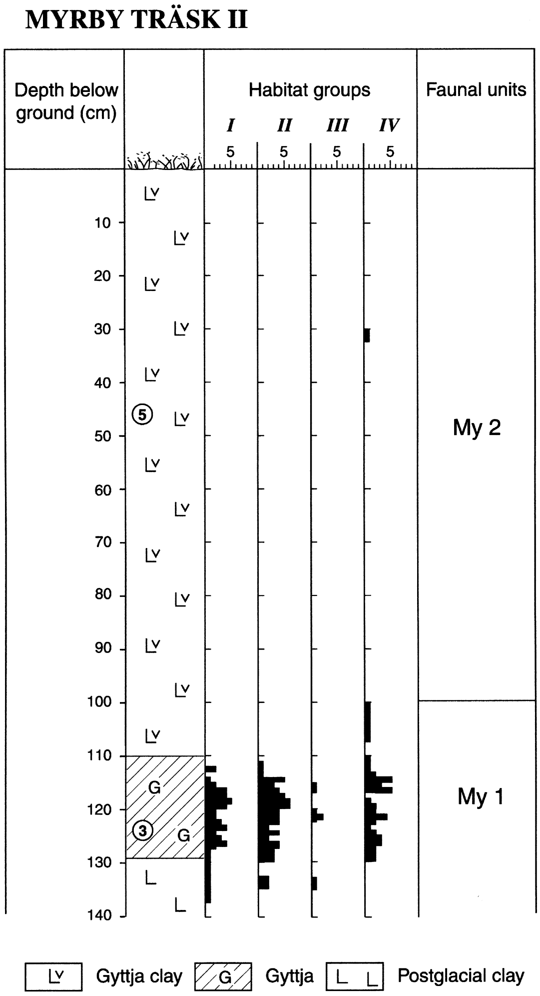

Figure 6. Profile for Myrby träsk core II, and relations to habitat groups and faunal units, represented by numbers of individuals. A species may occur in more than one habitat group. The lithostratigraphic units, as referred to in Table 2, are as in Figure 5 and similarly numbered 3 and 5.

Table 3. Plants indicated by insect remains in the Myrby träsk samples.

Beetle Taxa	Host Plants Indicated
Platystethus nodifrons	*Glyceria* spp.
Sitona lepidus	*Trifolium* spp.
Notaris scirpi	*Carex acutiformia*, *Typha latifolia*
N. acridulus	*Glyceria maxima*, *G. aquatica*, *G.* Spp., *Polygonum amphibium*, Cyperaceae
N. aethiops	*Sparganium erectum*, *Carex* spp.

Table 4. The five habitat groups (I–V), or environmental categories based on the habitats and biology of the fossil beetles found in the investigation and defined in Table 4. A species may occur in more than one group if associated with several habitats or substrates.

Habitat group	Environment
I	Dominated by aquatic species, living in the water-filled basin.
II	Species found in wet and moist habitats, such as water margins.
III	Species found on generally open ground.
IV	Substrates such as dung, indicating grazing in the area. Several of the species associated with dung are also found in decaying organic matter and under moist conditions (II).
V	Species found in arable land.

above the gyttja layer in Myrby träsk indicate a former permanent open water surface in the basin, surrounded by a swampy environment. The two weevils, *Notaris acridulus* and *N. aethiops*, both inhabit vegetation on stream banks and lake shores (Table 3), and the former is common on *Carex* spp. Also found within the aquatic period are the ground beetles *Pterostichus cupreus* and *Amara apricaria*, which inhabit open land, preferably with dense vegetation. The former often occurs on cultivated fields, mostly among cereal crops. *A. apricaria* is also favoured by human activity and is often found in fields and gardens.

The most abundant genus of Coleoptera found is *Aphodius* (dung beetles), indicating the presence of grazing animals. These beetles are mostly found in the gyttja sequence, but occur sporadically up to the ploughed soil. *A. icterícus* is eurytopic, i.e. it occurs in biotopes of many types, including open areas, and prefers a sandy soil. *A. prodromus* is found on all kinds of grazing land, preferring horse dung and occasionally cow droppings. Unlike other species of *Aphodius*, *A. niger* feeds on decaying substances, but has never been found in dung.

South Tunåsen

The samples from S. Tunåsen were very poor in insect remains and there were no remains at all in the upper disturbed peat (Fig. 4). The majority of the beetle species throughout the whole profile are dung beetles, *Aphodius sp.*, suggesting grazing animals in the vicinity. There is a minor increase in insect remains in the gyttja clay between 45 and 57.5 cm below present surface. According to the pollen analysis (Eriksson 1999), the stratigraphy of Myrby träsk and South Tunåsen cannot be correlated. The upper 55 cm of the profile point to an increase in *Sphagnum* spores, illustrating the development of the basin towards a peatland.

The most interesting find is *Onthophagus fracticornis*, an indicator of open pastures, occurring at depths of 50–52.5 cm. This species is normally found in cow and horse dung, usually on sandy ground, but is rare nowadays and together with the other members of the genus *Onthophagus* is considered a somewhat endangered invertebrate in Sweden, because of the changes taking place in the agricultural landscape (Gärdenfors et al. 2000).

Discussion

The profiles for Myrby träsk show an increase in insect remains in terms of the numbers of both taxa and individuals in the gyttja layer, correlating with a local aquatic environment and increasing human activity in the area at a time stretching from the late Roman Iron Age to the beginning of the Vendel Period. The pollen record (Eriksson 1999) points to the establishment of an agricultural landscape in the area during the Pre-Roman (500 BC–0) or Roman Iron Age (0–400 AD).

Following this situation, there is a marked decrease in the numbers of taxa and individuals, together with an increase in the destruction of fossil remains in the upper gyttja clay, beginning from around 75 cm (see Figs. 3, 5 and 6). By combining the results regarding the fossil insect remains with the ^{14}C dates, sediment stratigraphy and pollen results (Eriksson 1999), we can deduce that this erosion event probably occurred during the Migration Period (400–550 AD) and Vendel Period (550–800 AD), probably being related to an increase in local soil erosion from the surrounding arable land into Myrby träsk. The stratigraphy ends at the Early Viking Age (AD 800).

Aquatic environment

The situation in Myrby träsk during the aquatic period (dated to AD 265–590) and the formation of the gyttja layer is indicated by the presence of beetles that live in aquatic environments and waterside situations (My 1). The aquatic group more or less disappears with the change in sediment type from gyttja to clay gyttja, and the stratigraphy shows that the small lake was gradually reduced in size by sedimentation through erosional processes in the area, particularly during the Vendel Period. Most of the fossil insects indicate stagnant water, inhabiting the aquatic vegetation or shallow grassy bottoms, but some species may occasionally inhabit running water, normally the more slowly flowing stretches of streams. The dung beetle Aphodius niger, together with several other beetle species that feed on decaying substrates, probably lived in the decaying organic matter in the wetter parts of Myrby träsk, since it is found during the aquatic period.

Pastures

Grazing animals are indicated by the presence of dung beetles, the only group of beetle taxa that are present relatively continuously throughout the succession. The dung beetles identifiable to species are found particularly in dung from horses, cows and sheep. *Aphodius ictericus* prefers exposed localities and is characteristic of steppe environments, including the dry habitats that prevail on eskers, whereas the presence of several species belonging to the Hydrophilidae and Staphylinidae, both found in moist habitats and substrates such dung and decaying organic matter, may indicate that there was grazing in the wetter parts of Myrby träsk, and probably also extending onto the esker.

The majority of the dung-beetle community occurred during the period from the second part of the Roman Iron Age to the beginning of the Vendel Period (My 1). This is in good agreement with the results of the pollen analyses, showing an increase in human impact during this time. During the following Vendel Period the frequency of dung-beetles continuously decreases, coinciding with a change in faunal composition that was contemporary with the change from open water to a semi-terrestrial environment (My 2). This change may indicate less grazing in the area, but it is more likely to be an artefact arising from a higher sedimentation rate in combination with oxic conditions.

Local vegetation

A number of beetles confined to certain host plants are to be found that give information concerning the local vegetation (Table 3). The majority of the phytophagous species lived on a shore or marsh vegetation. Marshes and wet meadows have been an important resource for haymaking ever since the Iron Age, and *Sitona lepidus*, which feeds on *Trifolium* spp., may have found suitable habitats in the surrounding pastures.

Arable land

The few ground beetles indicate the proximity of arable land, especially with cereal crops, during the second part of the Roman Iron Age and up to the beginning of the Vendel Period (My 1). This information can be compared with the results of the pollen analyses, which show high pollen frequencies for barley (*Hordeum*-type) in particular, and also for wheat (*Triticum*-type) and oats (*Avena*-type). *Pterostichus cupreus* may originate from this cultivated land with cereal crops.

An old cultural landscape

The landscape in the Gamla Uppsala area has changed markedly since the Iron Age. Nowadays the land is exploited in line with trends in modern society and agricultural methods have changed and been modernised. There is little or no sign nowadays of the old cultural landscape. One could therefore conclude that species such as *Onthophagus fracticornis* and *Aphodius ictericus* indicate more extensive use of drier land, such as the sandy esker hills, as pastures than takes place in the area today.

Conclusions

At first glance the deposits studied here yielded relatively few useful indicator species for reconstructing the development of the cultural landscape in the area. However, in combination with the results of the pollen analysis, distinct patterns in the landscape history emerge. Land use was already dominated by both grazing and cereal cultivation during the Roman Iron Age, the pastures probably being located on the eskers and other drier ground and extending into the wet meadows and marshes of the small lake basin. The wet meadows and marshes probably also constituted important resources for haymaking. At the beginning of the Vendel Period (AD 550) soil erosion into the basins increased, probably as a consequence of a change in landuse. This soil erosion, which is important for an understanding of the development of the local terrain, would obviously never be apparent in the sediments other than through the investigation and interpretation of fossil remains of insects, pollen and diatoms.

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