

Southerly-derived fluvioglacial deposits near Scrooby, Nottinghamshire, U.K., containing a coleopteran fauna

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Summary

Sand and gravel deposits near Scrooby, in northern Nottinghamshire, and similar deposits elsewhere in southern Yorkshire and the eastern midlands, are interpreted as southerly-derived meltwater sediments formed during an early deglacial phase of the last pre-Devensian ice cover in the region. A lens of peaty silt in the deposits near Scrooby yielded beetle remains which indicate a cold continental climate and a sparse low vegetation on damp ground and around localised pools, probably existing during a pause in meltwater flow.

Introduction

In 1972 Mr P. Scholey, the owner of Scrooby Top Gravel Pit, between Scrooby and Ranskill in north Nottinghamshire, reported to Doncaster Museum that a thin lens of fibrous peaty silt was exposed (at SK 6575 8930) within the sand and gravel worked there. Dr Paul Buckland, then at the museum, collected a small sample (0.25 kg) of the peaty silt, processed it and passed it to one of the authors (M.G.) for examination. Despite subsequent visits to the pit, no further traces of organic deposits were found. A paper essentially similar to this one was prepared later in the 1970s but publication at that time was not possible. Tragically, Maureen Girling died on Christmas Eve 1985, but the original paper survived amongst the other author's unpublished work and is now presented, with suitable amendments. Grateful acknowledgment is made to Dr Terry O'Connor, a colleague at Bradford, for the encouragement that resulted in publication, and to Dr Buckland for similar encouragement and also for advice on the coleopteran content.

The sand and gravel deposits

The deposits at Scrooby Top Pit vary from pebble-free sand to gravel with a sand matrix. Most of the contained pebbles are of 'Bunter-quartzite' type, derived from pebble-rich varieties of the Triassic Sherwood (formerly Bunter) Sandstone; the other pebbles in the gravel are of flint or more rarely of

Carboniferous sandstone. The deposits rest on Sherwood Sandstone, which this far north consists of red sandstone containing only a few small pebbles, and the top of the deposits is cryoturbated and strewn with ventifacts.

Similar deposits form scattered outcrops on locally elevated ground within a belt of country stretching south-south-westwards from the southern side of Doncaster Race Course to the Mansfield-Hucknall area, and rising in this direction from about 12 m OD to slightly over 180 m OD (Gaunt 1976, fig. 16). Their pebble composition is similar to that given above for Scrooby Top except for those gravels situated on or close to outcrops of Permian rocks, which in places contain small proportions of pebbles of Permian limestone. Local details of these deposits are included in several Geological Survey memoirs (Gaunt 1994; Eden *et al.* 1957; Smith *et al.* 1967; Smith *et al.* 1973; Edwards 1967; Frost and Smart 1979), and their depositional environment has been described elsewhere (Gaunt 1976, chapter 12; 1981, 87-8; 1994, 104-6), so only a summary is given here.

Several factors imply a southerly derivation. The 'Bunter-quartzite' pebbles, in the more northerly deposits especially, must have come from the south because in central and northern Nottinghamshire the Sherwood Sandstone becomes increasingly poor in pebbles in a northerly direction, and it contains virtually no pebbles from Bawtry northwards. Moreover, even in the more southerly deposits an appreciable proportion of these pebbles can be

matched in size only by those in the Sherwood Sandstone of the upper Trent Valley.

It is highly unlikely that the small but persistent amount of flint pebbles in the deposits came directly from the Chalk to the east because there are no accompanying pebbles of durable Jurassic rocks, which crop out widely in that direction also; the only other source of flint pebbles is to the south, from the 'chalky' glacial deposits, or directly from the pre-Devensian 'chalky' ice itself, in the middle Trent Valley. The sand in the deposits is reddish-brown and 'clean', which implies a Sherwood Sandstone source; because the pebbles preclude a northerly derivation this source must lie to the south. Their 'clean' condition contrasts with other sands in the region derived from Carboniferous rocks to the west and north-west, which are yellow-brown, 'dirty' (because of the presence of finely fragmented coal and mudstone) and commonly clayey. Cross-bedded directions measured in the more northerly deposits dip predominantly to the north.

Stratigraphic evidence implies a pre-Ipswichian age (*sensu* Mitchell *et al.* 1973) for the deposits. In places, notably in the Doncaster-Bawtry area, the deposits rest on tills and other glacial sediments formed during the last complete ice cover of the area, which is demonstrably pre-Ipswichian. There also, the cryoturbation and ventifact-strewn periglacial surface coincident with the top of the deposits can be traced under late Devensian 'Lake Humber' sediments and, farther north-east, under coeval glacial sediments. Finally, it is apparent that after formation of the sand and gravel deposits there was a phase of valley incision and general denudation prior to formation of the older river (sand and) gravel of the area, which is demonstrably Ipswichian in age.

The deposits cannot be marine or lacustrine because of their wide range of elevations, and formation directly from ice *in situ* is precluded by their pebble composition, which is utterly different from the north-westerly derived erratic suites in adjacent tills. The sedimentary features suggest a torrential fluvial or fluvioglacial origin. However, the former would require a degree of topographic inversion since the last pre-Devensian ice cover that is unacceptable on geomorphological grounds elsewhere in the region.

In addition, 'chalky' glacial deposits are absent north of the middle Trent Valley, so it seems likely that at least the flint pebbles and the larger of the 'Bunter-quartzite' pebbles were transported

over the watershed along the northern side of this part of the valley. Only fluvioglacial transport provides a feasible explanation of these various points. It is concluded, therefore, that the deposits formed during an early deglacial phase of the last pre-Devensian ice cover in the region when, probably because of the enormous isostatic depression of northern Britain, meltwater from the middle-upper Trent Valley escaped in a north-north-easterly direction along routes running approximately between Hucknall and Doncaster. These routes were presumably to some extent still confined by large masses of ice, especially to the south-east and east, because such an early meltwater phase must have occurred prior to the cutting, also by meltwater from the middle-upper Trent Valley, of the 'trench' between Nottingham and Newark, and deposition of the Eagle Moor (formerly part of the Hilton) terrace deposits between Newark and Lincoln (Straw 1963; Brandon and Sumbler 1988).

The coleopteran fauna

The sample of peaty silt from Scrooby Top Pit yielded 11 beetle taxa. Several of the species are now limited to more northerly regions and two are no longer living in Britain. In the following faunal list the nomenclature of the British species follows Kloet and Hincks (1977), and the non-British species are indicated by an asterisk. The fragments are expressed as a minimum number of individuals (MNI).

Carabidae	
<i>Patrobus septentrionis</i> Dej.	1
Dytiscidae	
<i>Hydroporus</i> sp.	1
Hydrophilidae	
<i>Ochthebius</i> sp.	1
<i>Helophorus aquaticus</i> (L.) type	2
* <i>H. jacuticus</i> Popp.	2
<i>Hydrobius fuscipes</i> (L.)	1
Staphylinidae	
* <i>Acidota quadrata</i> Zett.	1
Tachyporinae indet.	1
Curculionidae	
<i>Otiorhynchus nodosus</i> (Müll.)	3
<i>Notaris aethiops</i> (F.)	2
<i>Rhinoncus castor</i> (F.)	1

The ecological requirements of the fauna as a whole suggest a largely barren, treeless

landscape, with sparse, low vegetation growing damp ground and around small pools. *Patrobus septentrionis* is generally found on damp soils, although Lindroth (1974) states that the species is less hygrophilous farther north. The typical habitat of *Helophorus jacuticus* (*H. praenanus* of Angus 1973) is small grassy pools, and *Hydrobius fuscipes* lives in well-vegetated small pools. Damp ground or accumulations of plant debris around pools would also provide suitable habitats for the Staphylinidae. The three weevils are herbaceous plant feeders. *Notaris aethiops* has been recorded on *Sparanium ramosum* Huds., *Otiorrhynchus nodosus* is recorded on a wide range of plants, including *Rumex* species, *Dryas octopetala* L. and *Trifolium repens* L., and *Rhinoncus castor* occurs on *Polygonum aviculare* L. and *Rumex* species (Hoffman 1950-8).

The present distributions of most of the species indicate a colder, more continental climatic regime than that occurring in the southern Yorkshire-eastern Midlands region at present. *Helophorus jacuticus*, one of the non-British species, is now restricted to Siberia. It has previously been recorded from the pre-Ipswichian deposits at Balderton, near Lincoln (Coope and Taylor 1991), and from the 'Wolstonian channel' deposits at Brandon, Warwickshire (Osborne and Shotton 1968); it appears also to have been widespread in Britain during the colder phases of the Devensian glacial Stage. The other non-British species, *Acidota quadrata*, has a high arctic distribution at present, extending southwards in Scandinavia and Canada only at high altitudes. Three of the remaining species, *P. septentrionis*, *O. nodosus*, and *N. aethiops*, are now limited to northern regions of Britain. *Rhinoncus castor* has the most northerly range of this genus in Europe; it is of interest to note that the very small size of the specimen from Scrooby lies outside the typical size range of this species found in Britain, but closely resembles examples in the Natural History Museum, London, which were collected from Newfoundland.

Despite the small size of the faunal list, the ecological requirements and climatic implications of most of the eight named species are sufficiently distinct to give a fairly clear picture of the extremely cold, almost barren, depositional environment of the peaty silt containing the Coleoptera. The implications of the fauna are, therefore, compatible with the southerly-derived meltwater hypothesis advanced above, and the fauna possibly lived around transient pools or abandoned channels during a local pause in the meltwater flow of

sufficient duration to allow the establishment of a sparse low vegetation close to the water's edge.

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