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A palynological investigation of two till samples from Leicestershire

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A palynological investigation of two till samples from Leicestershire

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Foreword

This report comprises a palynological study of two samples of glacial till from Leicestershire.

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Summary

The two samples yielded similar palynological signatures. Low levels of Carboniferous (Namurian and/or Westphalian) spores are present. However, the majority of the allochthonous palynomorphs are of Late Triassic (Rhaetian) age, based on the occurrences of key markers such as *Rhaetipollis germanicus* and *Rhaetogonyaulax rhaetica*. Sample 1 yielded extremely low numbers of Quaternary pollen grains. The majority of the palynologically-productive input to these tills are of Rhaetian age. It is possible that several Triassic lithotypes and ages are present. However, older Triassic strata in the UK tend to be organic-poor and the relative proportions of species recovered are typical of the Rhaetian Stage. The most likely sources of the Triassic input are the Westbury and Lilstock formations. It is also possible that some of the abundant *Classopollis meyeriana* specimens were derived from the Early Jurassic (Hettangian/early Sinemurian).

1 Introduction

Two samples of glacial till from Leicestershire were studied for their palynomorph content. This study aimed to determine the provenance and derivation of the till samples via allochthonous palynomorphs. This work has been undertaken in order to contribute to the geological mapping of this region and to help better understand glacial history

2 Sample Details

The two samples studied are listed below. The columns are, where appropriate and respectively, the (informal) sample number, the BGS micropalaeontological registration number (prefixed MPA), the collectors number (prefixed JNC), the grid reference and details of the location.

1	MPA 52890	SP 5902 9811	Excavation east of Canal Street in Wigston, south Leicester
2	MPA 52891 (JNC 893)	SK 6390 1635	Seagrave Road, off the A46, near Thrussington

Sample 1 is of the Thrussington Till and is a red/brown, clay/clast-rich till. Sample 2 is from the 'Lias Facies' of the Oadby Till; this sample is a dark grey, clay-rich till. Both were collected by J. N. Carney.

3 Palynology

In this section, the palynofloras are described in two sections. Full listings of palynomorphs, including semiquantitative data, are held on the respective BGS micropalaeontology/palynology data sheets, which have been archived. Table 1 illustrates the numbers and percentages of the several age-based palynomorph groups.

3.1 SAMPLE 1

Sample 1, from the Thrussington Till, produced a moderately common and well-preserved organic residue and palynoflora (Table 1). Black wood fragments dominate the residue. The palynoflora is overwhelmingly dominated by the gymnospermous pollen genus *Classopollis*, with lesser proportions of other gymnosperm pollen, spores and miscellaneous microplankton. Most of the *Classopollis* specimens are referable to *Classopollis meyeriana*. The pteridophyte spores include moderate levels (5.2%) of Carboniferous spores, including *Densosporites* spp., *Lycospora pusilla* and *Simozonotriletes intortus* (Table 1). These are indicative of minor input from Namurian or Westphalian strata. *Lycospora pusilla* is the most common of these spores. Carboniferous reworking is known in younger strata such as Late Triassic sediments. However, the proportions of reworked Carboniferous material in Mesozoic samples are low and these Carboniferous spores are interpreted here as being derived directly from Carboniferous rocks.

The majority of the palynomorphs (83.8%) are interpreted as being from the Late Triassic (Rhaetian) (Table 1). The pollen grain *Rhaetipollis germanicus* was recovered; this form is confined to the Rhaetian Stage according to Morbey and Dunay (1978). The pollen grain *Ovalipollis ovalis* and the superabundance of *Classopollis meyeriana* are also indicative of the

Rhaetian (Morbey, 1978). This is consistent with the red/brown colour of this till. *Classopollis meyeriana* is relatively long-ranging throughout the Triassic and Jurassic. It is especially prominent in the Early Jurassic, hence some of the *Classopollis meyeriana* specimens may have been derived from the Blue Lias/Lower Lias (Hettangian/early Sinemurian). This is also consistent with study of the clasts, because characteristic Early Jurassic lithotypes have been recognised from this till.

Extremely rare specimens of presumed Quaternary pine pollen (*Pinus*) were also observed (1.1%), in addition to forms that are stratigraphically non-diagnostic such as *Botryococcus* and *Tasmanites* (Table 1). No evidence of input from the Lower Palaeozoic, Permian or Triassic-Neogene was observed.

In conclusion, the reworked palynoflora from sample 1 indicates input from the Carboniferous, Late Triassic (Rhaetian) and Quaternary; the major input being from the Rhaetian. The units which sourced the Rhaetian input are potentially the Blue Anchor, Westbury and Lilstock formations. The Blue Anchor Formation is normally organic-poor, thus the Rhaetian palynomorphs are deemed to be from the Westbury and/or Lilstock formations. It is also possible that some of the *Classopollis meyeriana* specimens were derived from the Blue Lias/Lower Lias.

3.2 SAMPLE 2 (JNC 893)

Sample 2 produced an abundant, well-preserved organic residue and palynoflora (Table 1). Wood fragments and palynomorphs dominate the residue. The palynoflora is dominated by the pollen genus *Classopollis*; the majority of these specimens are referable to *Classopollis meyeriana*. Lower proportions of other gymnosperm pollen, spores and miscellaneous microplankton are also present. The spores include moderate levels (3.0%) of Carboniferous spores, comprising *Densosporites* spp. and *Lycospora pusilla* in subequal numbers (Table 1). These are indicative of probable input from the Namurian or Westphalian. Reworked Carboniferous spores are known from younger strata such as Late Triassic sediments. Normally, the proportions of reworked Carboniferous material in Mesozoic successions are relatively low and these spores are interpreted as being derived directly from Carboniferous strata.

The majority of the palynomorphs (82.0%) are interpreted as being from the Late Triassic (Rhaetian) (Table 1). The pollen grain *Rhaetipollis germanicus* and the dinoflagellate cyst *Rhaetogonyaulax rhaetica* were observed. These species are confined to the Rhaetian Stage according to Morbey and Dunay (1978) and Powell (1992) respectively. The occurrences of the miospores *Kraeuselisporites reissingeri*, *Ovalipollis ovalis*, *Ricciisporites tuberculatus* and undifferentiated taeniate pollen, together with the superabundance of *Classopollis meyeriana* are also indicative of the Rhaetian Stage (Morbey, 1978; Morbey and Dunay, 1978). *Classopollis meyeriana* is long-ranging throughout the Mesozoic. It is also prominent in the Early Jurassic, hence some *Classopollis meyeriana* specimens may have been derived from the Blue Lias/Lower Lias succession (Hettangian/early Sinemurian). This is consistent with the clasts in this till, because characteristic Early Jurassic erratics have been recognised from this till.

Forms that are stratigraphically insignificant are also present (Table 1). These include acanthomorphic acritarchs, *Botryococcus*, fossil (pre-Quaternary) bisaccate pollen and *Tasmanites*. No evidence of input from the Lower Palaeozoic, Permian or the Triassic-Quaternary was observed.

In conclusion, the reworked palynoflora from sample 2 indicates input from the Carboniferous, and Late Triassic (Rhaetian); the major input being from the Rhaetian. The potential lithostratigraphical units which provided the Rhaetian input are the Blue Anchor, Westbury and Lilstock formations. The Blue Anchor Formation tends to be organic-poor, hence the source of the Rhaetian palynomorphs is deemed to be from the Westbury and/or Lilstock formations. Furthermore, *Rhaetogonyaulax rhaetica* tends to be confined to the Westbury and Lilstock

formations (Warrington et al., 1995; Warrington, 1997). It is possible that some of the *Classopollis meyeriana* specimens were derived from the Blue Lias/Lower Lias.

4 Summary

Sample 2 proved significantly more organically-productive than sample 1. However, both the samples yielded similar palynological signatures. Low (3.0%-5.2%) levels of Carboniferous spores are present. The source of this reworking is directly from the Namurian and/or Westphalian. The majority of the allochthonous palynomorphs are of Late Triassic (Rhaetian) age (82.0%-83.8%). This is based on the presence of key markers such as *Rhaetipollis germanicus*. Sample 1 yielded extremely low numbers of Quaternary pollen grains. This means that the majority of the palynologically-productive input to these tills are of Rhaetian age. There is a possibility that a range of Triassic and Early Jurassic lithotypes and ages are present, the Rhaetian age being derived solely from the key marker taxa such as *Rhaetogonyaulax rhaetica*. However, older Triassic strata in the UK tend to be organic-poor and the relative proportions of species are typical of the Rhaetian Stage. The most likely sources of the Triassic input are the Westbury and Lilstock formations. It is possible that some of the *Classopollis meyeriana* specimens were derived from the Early Jurassic (Hettangian/early Sinemurian).

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Sample number	Grains per slide	Carboniferous spores	Triassic palynomorphs	Quaternary miospores	Non age-diagnostics
1	476	25 (5.2%)	399 (83.8)	5 (1.1%)	47 (9.9%)
2	1623	60 (3.0%)	1623 (82.0%)	...	297 (15.0%)

Table 1. The overall numbers of palynomorphs per microscope slide and the numbers and percentages of palynomorphs respectively of Carboniferous to Quaternary age in the two

samples of this study. Three dots (...) indicates that the respective palynomorph group is not represented.