PROBLEMS IN NAMING THE PLEISTOCENE DEPOSITS OF THE NORTH-EAST CHESHIRE PLAIN

by

Peter Worsley

Summary

The acceptance of a revised Pleistocene stratigraphy for the region has invalidated the pre-existing lithostratigraphic nomenclature. An alternative definition for the glacial sequence, based upon the American Commission's Code, is provisionally proposed and called the Stockport Formation. The general application of the code to glacigenic deposits is discussed.

Introduction

The question of stratigraphic classification and terminology is one which is, to a certain extent, permeated with confusion and controversy. Of late some order has emerged, as a result of the application of the recommendations of the stratigraphic code (as proposed by the American Commission, 1961) in classifying lithostratigraphic sequences. In the British Islands, it has not hitherto been general practice to use a systematic code in describing Quaternary sequences. It would appear that this situation has arisen through a combination of two factors - firstly a practice, inherited from the latter half of the nineteenth century, of interpreting drift deposits in terms of a tripartite sequence; and secondly, an apparent unawareness of the need for such a code. It is the purpose of this note to illustrate the dilemma of inappropriate nomenclature which faces Quaternary stratigraphers in the Cheshire Plain region, to suggest a suitable interim measure, and to invite discussion so that general agreement may be obtained. It is hoped that the result will be to encourage research workers to state precisely what kinds of correlations they consider valid, utilising an accepted set of adequately defined terms.

Historical Background

In a recent paper, Boulton and Worsley (1965) argued that the simple tripartite subdivision of the glacial drift succession in the Cheshire - Shropshire Basin was untenable. They demonstrated the existence of complex drift sequences overlying non-glacigenic alluvial deposits. These 'basal' alluvial beds (characterized by a very high degree of sorting, distinctive pebble lithologies and cross stratification, and the presence of an interformational organic mud bed) were designated the 'Chelford Sands'. Thus the traditional terms 'Lower Boulder Clay', 'Middle Sands' and 'Upper Boulder Clay', for so long embedded in the thinking and language of many glacial geologists, can no longer be regarded as satisfactory lithostratigraphic divisions and should be abandoned. It is therefore proposed to substitute a terminology of lithostratigraphic

categories which are guided by a sound stratigraphic code (American Commission for Stratigraphic Nomenclature 1959, 1961).

Ever since Binney's (1848) pioneer study of the glacial succession in north-western England, the Manchester region has been regarded as the type locality for the tripartite succession. The most detailed recent analysis of the Pleistocene succession is that of Simpson (1959), who described an area of 100 square kilometers centred on Stockport and embracing the south western suburbs of the Manchester conurbation. Rather surprisingly perhaps, this region is not completely built over and considerable stretches of land, especially those along the major water courses, are accessible and allow inspection of the entire succession down to bedrock. In addition, several working pits and numerous constructional activities give fresh, albeit temporary, sections in the Pleistocene sequence. Thus, on grounds of both historical precedence and accessibility, this area would appear still to be suitable for providing a type locality and standard section for the deposits of the Late Weichselian glaciation in the north-east Cheshire Plain.

In his synthesis of Pleistocene events in the Irish Sea Basin, Mitchell (1960) accepted Simpson's (1959) correlations and introduced the name 'Adswood boulder clay' to denote the 'Lower Boulder Clay'. The 'Adswood boulder clay' was thought by both Simpson and Mitchell to be of early Weichsel (Würm) age. The criterion for establishing a 'Lower Boulder Clay' glaciation was solely that of lithological super-position, of till on sand on till. The meticulous analysis of their pebble composition showed no differences between the two tills (Simpson, 1960). In no instance was any evidence found which demonstrated that retreat occurred between two distinct glacial advances. Hence, accepting the reasoning and dating of Boulton and Worsley (1965) as being more consistent with known facts, the name 'Adswood boulder clay' should be discarded.

Application of the American Code to glacial deposits

In the lithostratigraphic hierarchy, a set of divisions of member rank associated by some common physical attribute may be linked together as a formation. Normally there is an association of visible characteristics by which the formation may be recognised. However, the very nature of Quaternary deposits, especially those associated with glacial environments (i.e. a general lack of lithification, lithological variability and transient existence), does not permit the strict application of a stratigraphic procedure which was basically divised for older rocks. Accordingly a slightly modified scheme must be utilised, though the ultimate aim remains unaltered.

There are techniques which, either solely or in combination, could be utilised in confirming a given member's association with the formation. For instance, the north-east Cheshire sequence is characterized by the presence throughout of comminuted (rarely whole) molluscan shell debris in varying degrees of abundance. Theoretically this should enable a check to be made by radiocarbon assay. Alternatively, on occasion the topographic situation and lithostratigraphic type may permit determination of the depth of carbonate leaching from the land surface. Sometimes till sheets exhibit a characteristic range of size distribution and fabric similarities, but at present, in north-east Cheshire, not enough data has been obtained to arrive at any statistically valid conclusions. With these limitations in mind, the selection of a type locality may be considered.

Proposals

For the moment, two alternative schemes will be outlined, to illustrate the application of the code to sites which appear to be suitable as type localities. The first example highlights the problem of deriving suitable geographical names and serves to emphasize the need for caution in selecting sites. The writer would stress that, ideally, no single individual should be able to determine a binding type locality and nomenclature for such an area without the consent of a central authority.

The need exists for some organisation empowered to adjudicate on all stratigraphic proposals,

no matter what age the stratum in question is. To this end, the Standing Stratigraphical Committee of Council of the Geological Society of London set up a Stratigraphical Code Sub-Committee in 1965,to consider stratigraphical usage and to make recommendations. The interim report of this sub-committee was published in 1966; the proposal outlined below is in sympathy with its aims. It is anticipated that final approval for any proposed definition, or changed definition, will be referred to the Commission on Stratigraphy of the International Union of Geological Sciences.

However, the present dilemma cannot be ignored; the second of the two alternatives here outlined has already been used as an interim measure (Worsley 1966) and, as a basis for discussion, the scheme will be here formally proposed for adoption until the subject can be more fully dealt with. Indeed it may, after discussion, prove to be the most appropriate for the area. Hence some basic geological details are given, but the very nature of glacigenic materials (as already commented upon) does to some extent prohibit precise formational definition on physical parameters.

Simpson (1959, fig. 2) depicts part of the River Tame valley north of Woodley, where a small right bank tributary descends in a ravine from the gently rising upper surface developed on the drift deposits (National Grid Reference SJ 937936). The lower reaches of the stream flow over the Carboniferous bedrock and, above this datum, the ravine sides exhibit an upward sequence of till 6.6 m, sand 8.3 m. and till 3.3 m. These divisions are considered by the writer to comprise a single suite of glacigenic deposits. According to the stratigraphic code,each division, distinguished by its lithology, is technically a member and the three members together comprise a formation. Despite their tripartite arrangement, they cannot be described, in the genetic terms of the traditional interpretation, as representing two ice sheet advances with an intervening retreat stage. An inspection of the outcrop patterns, in relation to the contours on both Simpson's accompanying map and the Geological Survey's one inch Stockport sheet no. 98, clearly demonstrates the lateral impersistence of these 'members'. A stratigraphic terminology for the above locality might be:-

Haughton Green Formation	Goyt Till Member
	Mersey Sand Member
	Tame Till Member

The names used above for the individual members result from the lack of suitable unambiguous geographical names in the immediate vicinity. In these instances the problem is similar to that encountered in describing borehole data without a known outcrop, for obviously the geographical name of its type locality cannot be given. As such names are preferable in designating lithostratigraphic divisions and no precise name can be assigned, they ought to be derived locally,yet convey no specific locational meaning. Hence the motivation for adopting local river names.

Alternatively, the ground immediately to the north of the River Mersey at Stockport provides a suitable locality. In this case, the tripartite vertical sequence may be seen in the undercut right hand bank (National Grid Reference SJ 908915) east of Reddish. The individual members, when traced westwards, successively become the surface deposit, so that in the west the lowest member represents the entire formation. The terminology may be established as follows:

Stockport Formation	Reddish Till Member
	Heaton Moor Sand Member
	Levenshulme Till Member

the two tills being well exposed in local brickpits. Chronostratigraphically, the Haughton Green and Stockport Formations, as here defined, are thought by the writer to be correlatives, although correlation at member rank would not be attempted. However, it is proposed to use the term Stockport Formation in this instance, the first name suggested being of illustrative value only.

It is considered that the Stockport Formation includes the consanguineous suite of sediments, tills and fluvio-glacial sands, which were deposited as a result of the advance and decay of a lobe of the Late Weichselian Irish Sea ice sheet. Basically, this lobe moved from out of the northern Irish Sea Basin into the Cheshire Plain. Its eastern limit is defined as the zone in which the continuous drift cover ceases as the western Pennine escarpment rises above the lowland. Deposition in this zone has no marked glacial morphological expression, but southwards it passes laterally into a marked topographic feature, a bio-lobate end moraine. The end moraine swings westwards across the Cheshire Plain, turning north to follow the Welsh foothills along the borders of the Dee Lowland. Northwestwards towards the source area in the Lake District and Irish Sea Basin, no formational boundary can as yet be defined since it is likely to be under the sea and this must await the results of future research. No satisfactory statement of criteria for defining a morphological "freshness" index to delimit this advance can be made, for the degree of apparent freshness can be notoriously misleading. In Britain it has been usual practice to assign "fresh" landforms to the last glaciation; but apparently "fresh" features are known in both Poland (Galon and Roszkowna, 1961) and in Ireland (Synge, personal communication; Finch and Synge, 1966), where they can be dated with certainty as being of a pre-Eemian Interglacial age.

Where topographic situation permitted, leaching measurements made in till lithologies indicated that the average depth of carbonate removal is in the order of 1.3 m. (Boulton and Worsley, 1965). Such measurements are fraught with difficulties, arising from the need to ensure that site characteristics are constant when the results are used for comparative purposes. Details of the pebble composition found in the till members of the Stockport type area are given by Simpson (1960) and mechanical analysis of the till matrix, undertaken by the writer, revealed that the predominant particle size was silt.

Conclusions

In view of the difficulties encountered in describing glacigenic deposits, as discussed above, it is readily apparent that, in establishing the basic glacial stratigraphy of the area, some degree of confidence in a particular worker's correlations will be necessary. If, however, future workers conform to a set of agreed definable terms, and if lithostratigraphy is clearly separated from chronostratigraphy, then the misconceptions of the past will be to a large extent eradicated. Using such terms, the communication of exact correlations will be attainable. Hence it is urged that Pleistocene stratigraphers in the area adopt a sound stratigraphic code. It is hoped that this procedure will be adopted generally for the Quaternary of the British Islands.

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Peter Worsley, B.A., F.G.S.,
Quaternary Research Unit,
Department of Geography,
The University, Whiteknights Park,
Reading, Berks.

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