Eastfield Quarry, East Riding

[SE 916 323]

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Introduction

Eastfield Quarry (now known as 'Everthorpe Quarry'), near South Cave in the East Riding of Yorkshire (formerly Humberside) (Figure 4.49), exposes the shelly, ooidal limestone with sand intercalations known, since Phillips (1835), as the 'Cave Oolite Member' (Figure 4.50). This stratum has been used locally as a building stone and aquifer. The quarry was greatly enlarged during the Second World War, and Sylvester-Bradley's (1947) subsequent account of the section established the site's importance for understanding the local and regional stratigraphy, in particular the relationship of the Cave Oolite Member to the succession farther north in the Cleveland Basin, and farther south in Lincolnshire. Not only is the Cave Oolite Member well developed here (up to *c.* 8 m thick) and more fossiliferous than elsewhere, but the site has also distinguished itself by yielding an ammonite that is otherwise unknown from these beds (Senior and Earland-Bennett, 1973).

Description

The following section is based on that recorded by G.D. Gaunt (BGS archives) during the 1:10 000 scale geological survey of the South Cave area in 1969–1971, with additional information, particularly of the beds above and below the Cave Oolite Member, from Sylvester-Bradley (1947), Bate (1967b), Brasier and Brasier (1978) and Gaunt *et al.* (1992). Bate's (1967b) section, with its extensive lists of ostracod species, is itself based on an unpublished detailed section recorded by Sylvester-Bradley in 1947. As with many sections, there is considerable variance between the different records but the so-called 'shell sands' allow some comparisons (Figure 4.51). The section has also been reported by De Boer *et al.* (1958), and Bisat *et al.* (1962), and cited by Penny and Rawson (1969). The lithostratigraphical classification follows Gaunt *et al.* (1992). Their informal tripartite division of the Cave Oolite Member into lower, middle and upper, which they considered to be a basis for descriptive and correlative purposes, is also shown.

	Thickness (m)
Rutland Formation	
Thorncroft Sand Member	
Variegated sands and clays; limestone pebbles, shell fragments including occasional belemnites, pisoliths and ooids derived from underlying beds; base cuts down 1.8 m into underlying limestone to produce channel-like profile 8 m wide	seen to *c.* 1.2
Lincolnshire Limestone Formation	
Cave Oolite Member	
Upper division	
Limestone, pale greyish-brown, pinkish and purplish in parts, massive, poorly sorted, ooidal, with abundant shell-debris and rare wood	0.48
'Shell sand', pale yellowish-brown, partially cemented, ooidal	0.25
Limestone, well sorted, compacted, ooidal, with sporadic fine shell-debris at certain horizons; fine grained, pale greyish-brown, purplish at top and in lowest 0.05–0.10 m; medium-grained and cream-coloured in middle; in places, pale and grey-hearted; middle beds cross-bedded to east, north-east and south-east	0.84

'Shell sand', pale-brown, unconsolidated	0.06
Limestone, pale greyish-brown, pinkish in parts, hard, thin-bedded, well sorted, compacted, very fine-grained, ooidal; thin, shell-debris rich parting near top	0.28
'Shell sand', pale-brown, crumbly, with some white bands containing traces of ooidal structure	0.01
Limestone, pale grey-brown, pinkish in parts, hard, thin-bedded, well sorted, compacted, very fine-grained, ooidal	0.58
'Shell sand', pale-brown, unconsolidated	0.03
Limestone, pale greyish-brown, slightly grey-hearted in middle and upper parts; well sorted, compacted, fine grained, with rare shell- and wood-debris in middle and upper parts; poorly sorted, medium-grained in lower part	0.76
'Shell sand', partially cemented, slightly ooidal, with mottled rusty-brown concretionary patches and thin lenses of limestone	0.25
Limestone, pale greyish-brown; upper part pinkish and purplish, poorly sorted, compacted coarse oolite (pisolithic); lower parts partly grey-hearted, fine- to medium-grained with scattered fine to coarse (pisolithic) ooids, shell fragments and debris; two impersistent partings of 'shell sand' (up to 0.01 m thick) in middle part	0.91
'Shell sand', pale-brown and slightly yellowish-orange, unconsolidated, with rare shell-fragments	0.05
Middle division	
Limestone, pale brownish-cream, grey-hearted in upper 0.3–0.45 m, medium sorted, compacted, fine to medium ooidal with rare shell-fragments; fairly massive but weathering into harder and softer bands and with thin impersistent lenses of unconsolidated 'shell sand'	2.13
Lower division	
Limestone, pale yellowish grey-brown mottled, grey-hearted in places, poorly sorted, fine to coarse (pisolithic) ooidal, with abundant shell-debris, sporadic larger fragments, rare whole shells and wood fragments	0.56
Limestone, pale greyish-cream, poorly sorted, fine to coarse (pisolithic) ooidal, with scattered shell-debris and rare whole shells 0.56	
Limestone, pale yellowish-brown, soft, poorly sorted, fine to medium ooidal, with sporadic shell-debris; grey 'silty' limestones in lower part and thin grey mudstone beds, lenses and laminae in lowest 0.08 m	0.33
Kirton Cementstone Member	
Mudstone, pale-grey and brown, bedded and shaly in places, with rare, white, crumbly shell-fragments; upper 0.10 m contains sporadic thin beds and lenses containing white ooids, and is also slickensided; lower part contains rare ferruginous concretions	0.41
Limestone, pale-grey and brown mottled, with ferruginous 'earthy' ?silty and/or sandy appearance, and with sporadic shell-debris and ?ooids	seen 0.2

The majority of fossils found at Eastfield Quarry are bivalves, including *Ceratomya bajociana* (d'Orbigny), *Gervillella scarburgensis* (Paris), *Lima,* pectinids and *Trigonia hemisphaerica* Lycett, but the sandier partings often yield quite well-preserved specimens of the echinoid *Pygaster semisulcatus* (Phillips) (= *Plesiechinus ornatus* (J. Buckman)). Other echinoderms, in the form of pentacrinoid columnals, are abundant in some beds (Bate, 1967b). The bryozoan *Collapora straminea* (Phillips) and brachiopods (*Acanthothiris*) have also been recorded. Although fossils are relatively common, they are difficult to extract, except from the thin, soft, sandy partings between the limestone beds, and are usually fragmentary and poorly preserved (De Boer *et al.,* 1958; Penny and Rawson, 1969). Brasier and Brasier (1978) recorded the trace fossils *Arenicolites* and *Thalassinoides* in the Cave Oolite Member as well as oyster-encrusted hard-grounds near its top.

Interpretation

Gaunt *et al.* (1992) believed that, for descriptive and correlative purposes, the Cave Oolite Member was best divided into lower, middle and upper parts (see above). At Eastfield Quarry, the lower part was referred to by the quarrymen as the 'Bottom Blue'. This is Unit B of De Boer *et al.* (1958) and probably beds 5–7 of Bate (1967b). The middle part comprises cross-bedded oolites with some pisoids, scattered shell-debris and a few wood fragments, and equates mainly with Unit C of De Boer *et al.* (1958) and beds 8–11 of Bate (1967b). The upper part of the Cave Oolite Member comprises mainly closely compacted, moderately to well-sorted oolites and contains shell debris especially in 'marly shell-sand' partings. In Eastfield Quarry, these oolites form the highest 4 m of limestone and exhibit low-angle cross-bedding dipping predominantly to the northeast (Gaunt *et al.,* 1992).

According to Gaunt *et al.* (1992), close inspection of the apparently 'channelled' base of their Thorncroft Sand Member (= the lower arenaceous part of the Upper Estuarine Beds of previous authors) shows that the thin bedding, laminations and small-scale cross-bedded layers within that member are parallel to the junction with the Cave Oolite Member. From this, they deduced that these features are not part of a channel-fill but, having originally been deposited on a level surface, the beds have subsided into a hollow at the top of the Cave Oolite Member, presumably owing to solution of the limestone by acidic groundwater. Within the quarry, three large masses of Thorncroft Sand Member have been reported with their bases down to 3 m below the general top of the Cave Oolite Member, and Gaunt *et al.* (1992) suggested that these probably also occupy solution hollows. The Thorncroft Sand Member is now classified with the Rutland Formation, and is probably equivalent to the Stamford Member thereof (see (Figure 4.2)).

Although found loose, the specimen of *Hyperlioceras* (Figure 4.52) reported by Senior and Earland-Bennett (1973) is believed to come from the middle division. These authors identified it as *H. rudidiscites* S.S. Buckman but Parsons (1974b, 1980a) challenged this, believing that the specimen was too fragmentary and distorted for the species to be identified; however, Senior and Earland-Bennett (1974) upheld their original identification and deduced that it came from the upper part of Bate's (1967b) Bed 11 (i.e. near the top of the middle division) thereby providing the first tangible piece of evidence for the stratigraphical position of the Cave Oolite Member. If correctly identified, the specimen is suggestive of the Lower Bajocian Discites Zone, as first surmised by Richardson (1911a), although an open position within that substage might be a more reasonable diagnosis (see below).

De Boer *et al.* (1958) reckoned that their units A and B could be compared with the upper part of the Lower Lincolnshire Limestone, and units C to I could be compared lithologically with the Upper Lincolnshire Limestone, and Gaunt *et al.* (1992) included the Cave Oolite as a member of that formation. The latter authors correlated it with the upper part of the Kirton Cementstone Member and the Hibaldstow Limestone Member of the succession south of the Humber (see Cliff House Pit GCR site report, this volume). They believed that the lower division (the so-called 'Bottom Blue') was the lateral equivalent of the Scawby Limestone (see Manton Stone Quarry GCR site report, this volume). Since they considered that the Cave Oolite Member was equivalent in part to the upper part of the Kirton Cementstone Member, above the Scawby Limestone, they queried the zonal implications of the *Hyperlioceras* found at Eastfield Quarry (see above), which conflicted with the zonal evidence of other rare ammonite specimens found south of the Humber (see (Figure 4.2)).

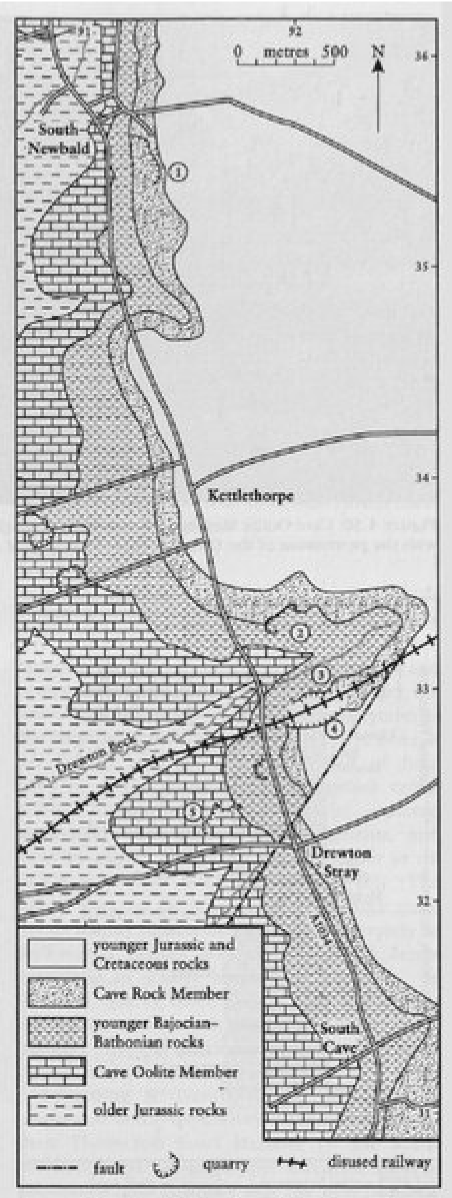
The relative stratigraphical position and the macrofaunal assemblage, including the bryozoan *Collapora* (formerly *Millepora*), have led to a correlation of the Cave Oolite Member with the unit known as the 'Millepore Bed' (Wright, 1860) on the Yorkshire coast (Clough-ton Formation, Lebberston Member) (see Chapter 5).

The fauna and lithologies are suggestive of deposition in a warm, shallow sea. Dune bed-forms suggest strong tidal conditions, the high-energy environment of which did not favour the preservation of ammonites.

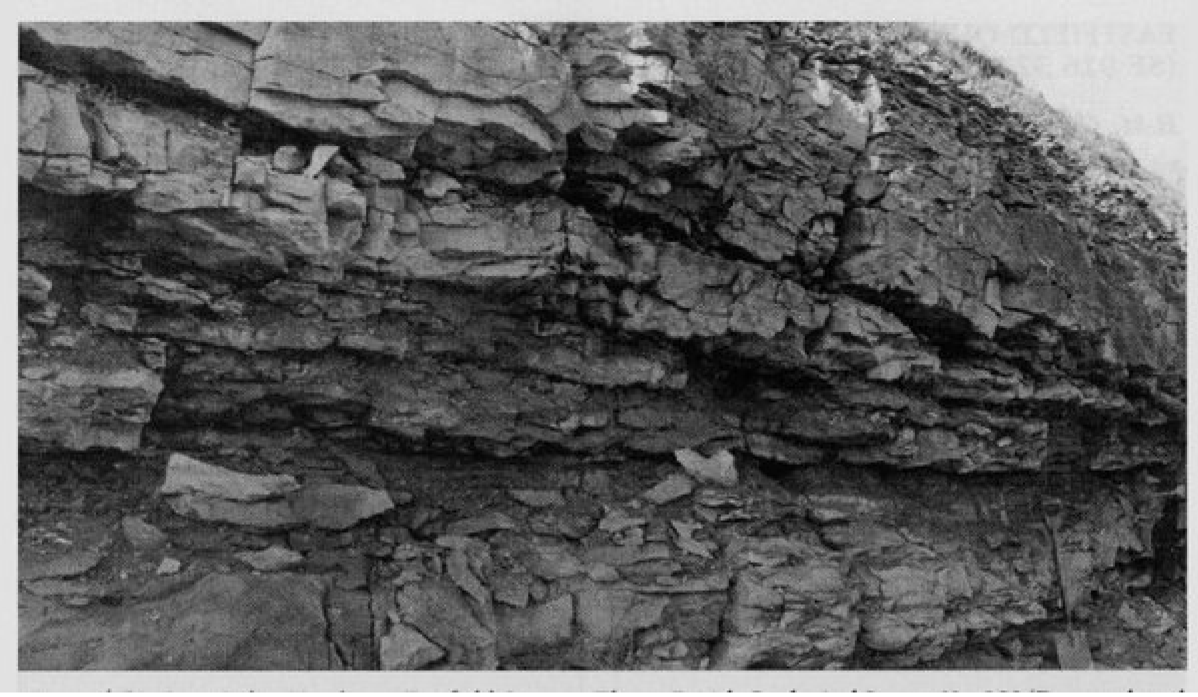
Conclusion

The Eastfield Quarry site provides one of the last, and certainly the best, existing exposure of the Cave Oolite Member. It has also yielded the only known ammonite from that unit. It is a key site for establishing the correlation of the Cave Oolite Member with its lateral equivalents — the Lebberston Member of the Cloughton Formation in the Cleveland Basin, and the Kirton Cementstone and Hibaldstow Limestone members of the Lincolnshire Limestone Formation farther south into Lincolnshire.

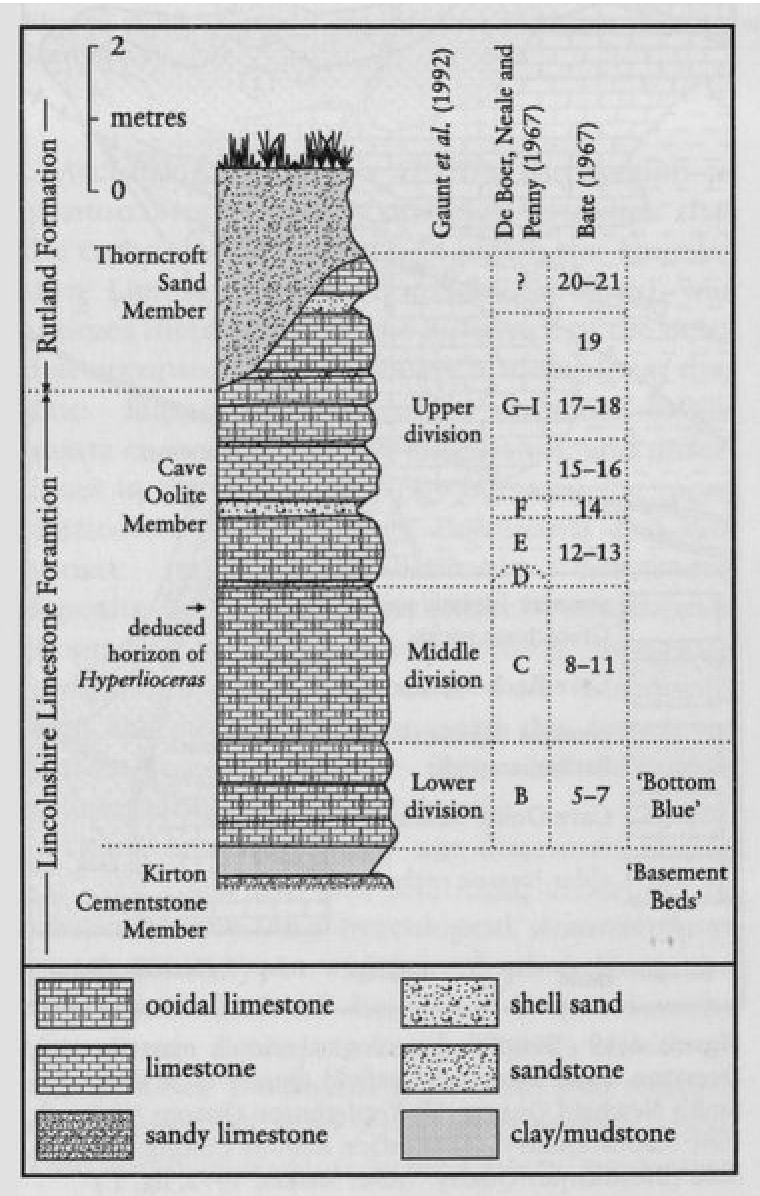
References



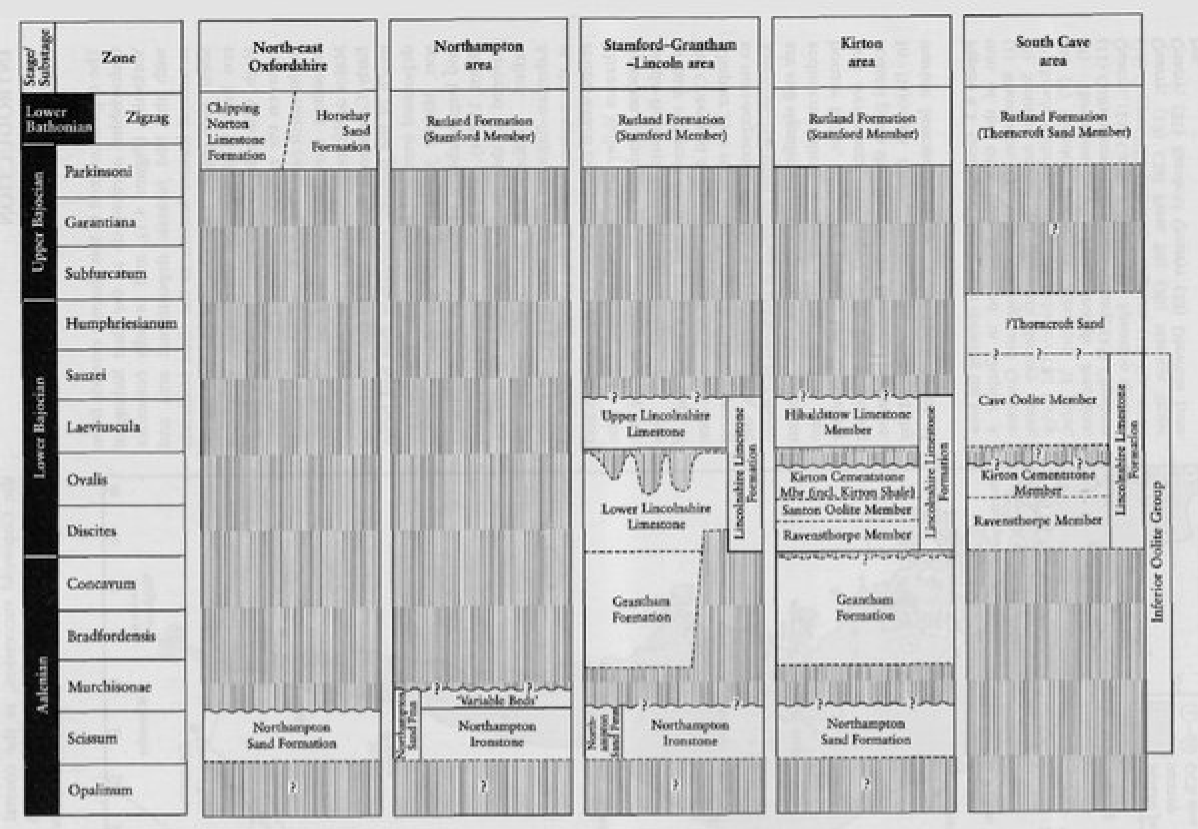
(Figure 4.49) Simplified geological sketch map showing Drewton Lane Pits and Eastfield Quarry GCR sites. (1) South Newbald Quarry; (2) Kettlethorpe Quarry; (3) South Cave Station Quarry; (4) Drewton Railway Cutting; (5) East-field (Everthorpe) Quarry (After Walker, 1972, fig. 1.))



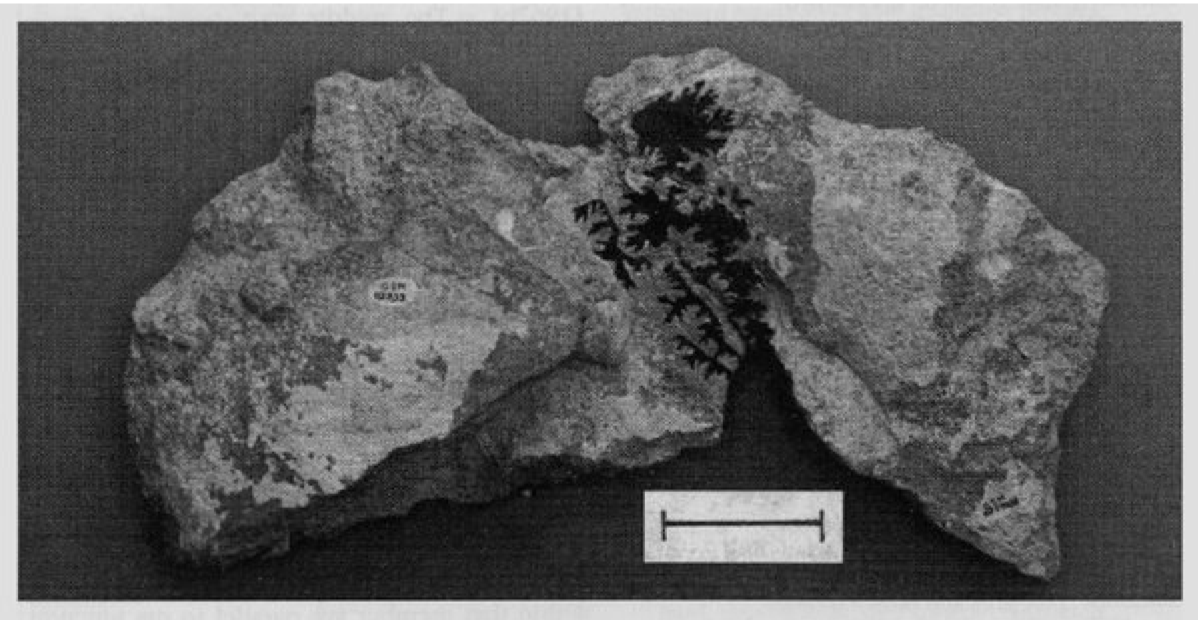
(Figure 4.50) Cave Oolite Member at Eastfield Quarry (Photo: British Geological Survey, No. L2947; reproduced with the permission of the Director, British Geological Survey, © NERC, 1982.))



(Figure 4.51) Graphic section of the Bajocian succession at Eastfield Quarry showing the approximate relationship of different authors' bed numbers and subdivisions.)



(Figure 4.2) Lithostratigraphical classification of Aalenian–Bajocian rocks in the East Midlands Shelf area. Columns are deliberately separated one from the other because of the tenuous nature of some correlations. Vertical ruling indicates non-sequence. (Based on data in Ashton, 1977, 1980; Horton et al., 1987; Gaunt et al., 1992; Wyatt, 1996a,b.))



(Figure 4.52) Poorly preserved Hyperlioceras fragment from the Cave Oolite Member of Eastfield Quarry (BGS specimen number GSM 112733); scale-bar represents 50 mm. (Photo: M.G. Sumbler.))