Sholeshook

[SM 966 171] and [SM 968 172]

Introduction

Sholeshook railway cutting is of regional and national significance palaeontologically and biostratigraphically. It is the type section of the Sholeshook Limestone Formation of Cautleyan–Rawtheyan age, which has long been known for its diverse trilobite and echinoderm faunas. It is the type locality for many species of trilobites, a craniate brachiopod and several echinoderms (cystoids, pelmatozoans and a coronate).

The Sholeshook Limestone, like the Robeston Wathen, Birdshill and Crûg limestones (see site reports), is part of a series of early to mid-Ashgill carbonate or carbonate-rich developments that occur between Haverfordwest and Llandeilo. Each has its own distinct faunal and facies characteristics, and precise correlation between them is difficult. Most fall within the Cautleyan Stage, although the Sholeshook Limestone has been shown to extend upwards into the Rawtheyan (Price, 1980) and, probably, downwards into the Pusgillian (Zalasiewicz *et al.,* 1995).

As with the other Ashgill limestones in southwest Wales, the Sholeshook Limestone was included by Murchison (1839, p. 397) within his Llandeilo Limestone and Flags division. Phillips (1848, p. 322) described the limestone as 'sub-calcareous and sandy beds, with Cystidea etc.', and in the appendix of the same work Salter described trilobite species. In the same year Forbes (1848) described several of the cystoids. The first detailed account of the site was by Marr and Roberts (1885, p. 480), who introduced the term 'Sholeshook Limestone' and listed the fossils present. Some trilobites and a brachiopod were described by Reed (1904, 1905, 1908), based on specimens from the Turnbull Collection in the Sedgwick Museum, Cambridge. Cantrill (in Strahan *et al.,* 1914, pp. 59–64) presented the first detailed map of the railway cutting and adjacent area and gave a long faunal list. Marr (1907, p. 68) placed the Sholeshook Limestone at the base of his then newly proposed Ashgill Series, with the underlying Robeston Wathen Limestone at the top of the Caradoc. Many later authors (e.g. Whittington, 1965, p. 41) considered the age to be middle Ashgill, but in a series of papers on the stratigra- phy and trilobite faunas Price (1973a, 1974, 1977, 1980a,b) showed that the age at Sholeshook ranges from Cautleyan Zone 2 to Rawtheyan Zone 5. The cheirurid trilobites were redescribed by Lane (1971) and the important cystoid fauna by Paul (1973–1997), who described the succession at this locality and noted (1973, p. 4) that this is 'probably the richest site for cystoids in Britain'. Donovan and Paul (1985) described coronate blastozoan echinoderms, and Donovan (1986–95) described the pelmatozoan columnals.

Description

About 57 m of strata are exposed in the railway cutting (Figure 8.21), dipping at between 20° and 30° to the NNW (Figure 8.22). The junction with the underlying Mydrim Shales is not exposed here, but according to Price (1973a, p. 227) the lowest beds seen, on the west side of the south end, must lie only a short distance above it. The contact can be seen, however, in a rather poor exposure some 30 m upstream from the bridge over Cartlett Brook [SM 9653 1694], where shales pass abruptly up into the limestone (Figure 8.21). The horizon represented by the shales is not known, but Price (1973a, p. 243, fig. 6) implied that there is a gap in the succession embracing the upper Caradoc and lower Ashgill; however, by analogy with the section at Pengawse Hill (Zalasiewicz *et al.,* 1995), it is possible that the succession is more complete than had been supposed (see Mylet Road site report).

The lower half of the Sholeshook Limestone exposed in the railway cutting comprises beds of tough, compact, dark blue-grey limestone, ranging in thickness from 6 cm to 20 cm and separated by units of light blue-grey, thinly bedded, fissile calcareous siltstone ranging from 30 cm to more than 200 cm thick. The limestone horizons are extremely fine-grained and weather rusty-brown. The thicker of these beds have gently undulating upper and lower surfaces and are probably the developments of 'nodular limestones' referred to in earlier accounts. Higher in the succession, the beds above about 25 m from the base lack these 'nodular limestones', and the uppermost 3–4 m are more argillaceous, greenish and bioturbated. These latter beds are well seen in a small exposure just west of the north end of the railway

cutting [SM 9683 1712] (Price, 1973a, loc. 91). The highest beds exposed in the cutting were estimated by Price (1973a, p. 227) to be some 4–5 m below the top of the Sholeshook Limestone; the junction with the overlying Slade and Redhill Mudstone Formation can be seen in the south-east side of a quarry [SM 9657 1683] downstream from the bridge over Cartlett Brook at Sholeshook (Price, 1973a, loc. 9d), within a small, fault-bounded thrust slice to the south of the main outcrop of the Sholeshook Limestone. An old quarry [SM 968 172] 100 m north-west of Sholeshook Farm (Price, 1973a, loc. 9e) offers a confirmatory section that lies approximately half-way up the Sholeshook Limestone (Price, 1973a, table 2) and is important in having yielded specimens of the only graptolite from the formation, recently redetermined by Zalasiewicz *et al.,* (1995, p. 615) as *Orthograptus abbreviatus* Elles and Wood.

Fossils occur throughout the Sholeshook Limestone Formation in the railway cutting, although both trilobites and cystoids are more diverse in the upper part of the sequence (Price, 1973a, table 2; Paul, 1973–1997, p. 6, text-fig. 5). Of the former, *Tretaspis* cf. *radialis* Lamont, *Ceraurinella intermedia* Kielan, *Pseudosphaerexochus tectus* Ingham, *Encrinuroides sexcostatus* (Salter), *Atractopyge* aff. *scabra* Dean, *Flexicalymene cavei* Price and *Platylichas noctua* Price are common throughout and are joined in the upper half by such taxa as *Stenopareia bowmanni* (Salter), *Pseudosphaerexochus juvenis* (Salter), *Staurocephalus clavifrons* Angelin and *Calyptaulax planiformis* Dean (Price, 1973a, 1980b). Paul (1973–1997) noted that, of the cystoids (Figure 8.23)c,d, species of *Archegocystis* and *Haplosphaeronis* occur in the upper part, *Echinosphaerites arachnoideus* (Forbes) in the lower, and *Sphaeronites litchi* (Forbes) throughout.

Interpretation

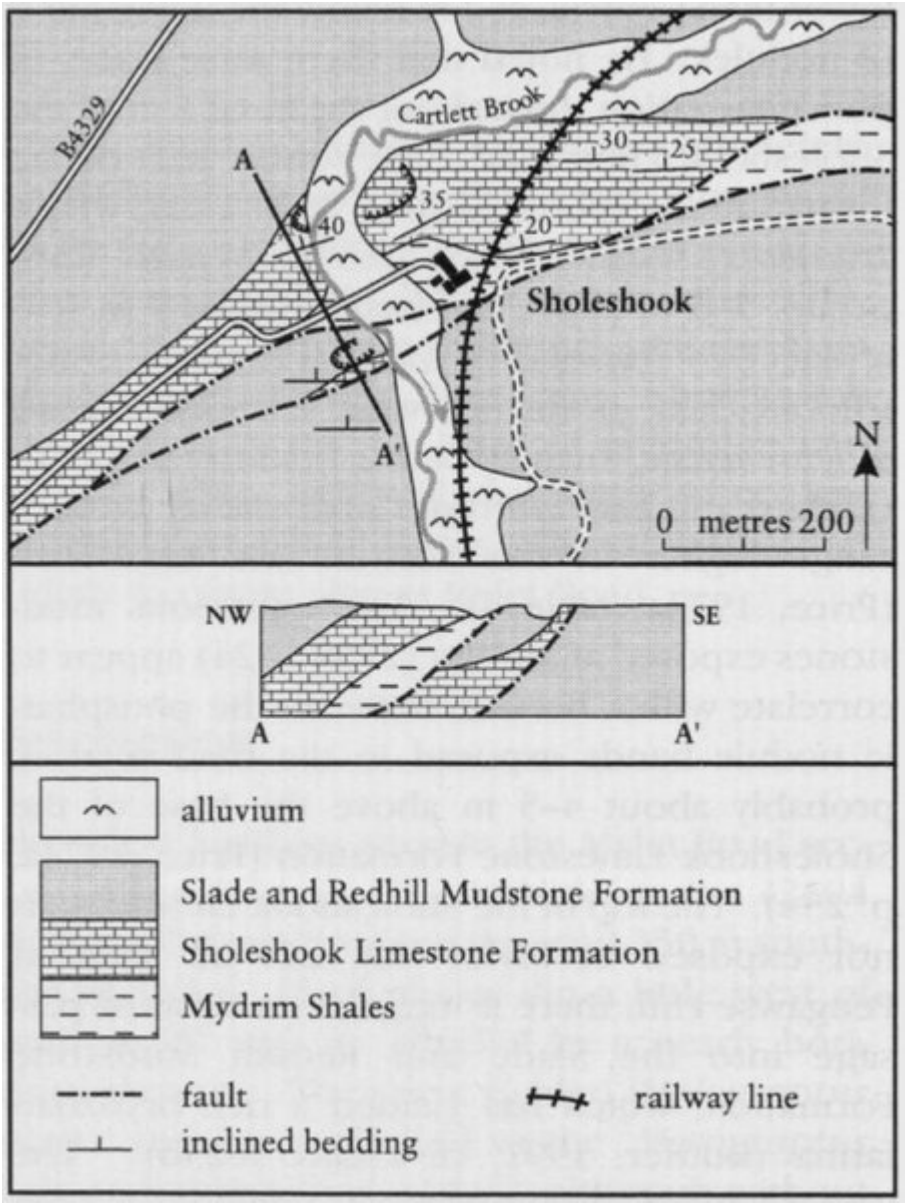
On sedimentological and stratigraphical evidence, Price (1980b, p. 882) suggested that the Sholeshook Limestone Formation probably represents an environment in the middle to upper part of the slope, between the platform edge and basin. The association of trilobite genera, with elements of deeper-water mudstones and shallow-water carbonate accumulations, supports this conclusion. The sediments are predominantly clastic but with some carbonate content. A high proportion of the trilobites are disarticu-lated, and the cystoids (Donovan *et al.,* in Harper and Owen, 1996, p. 202) have lost their stems and brachioles. With sedimentological evidence, this suggests deposition under relatively high-energy conditions. However, Paul (19731997, p. 29) inferred that conditions just below the water-sediment interface were at times anaerobic.

The trilobite fauna shows greatest similarity to that of the Cautleyan parts of the Cautley Mudstones in northern England, with a large number of species in common (Price, 1980b, p. 881), making precise correlation possible. Of these, species of the trinucleid trilobite *Tretaspis* have been particularly important in establishing the age of the Sholeshook Limestone (Price, 1973a, p. 238; Zalasiewicz *et al.,* 1995, p. 615), the base apparently being diachronous, with a possible Pusgillian age established at Whitland, a Cautleyan Zone 1 age at Llanddowror, and Cautleyan Zone 2 at Sholeshook. The mid-Cautleyan age of the middle part of the succession at Sholeshook is supported by the presence of *Orthograptus abbreviatus* Elles and Wood, which is suggestive of an *anceps* Biozone age (Zalasiewicz *et al.,* 1995, p. 615). Revision of *Tretaspis* species by Price (1977) demonstrated that the top of the formation extends into the Rawtheyan Stage, Zone 5 (Price, 1980a), and the diagnostic subspecies *Tretaspis hadelandica brachystichus* Ingham was reported from several localities, including from the quarry downstream of the bridge at Sholeshook (Price, 1973a, loc. 9d, see above), and from Robeston Wathen (see site report). The limestone at Sholeshook itself apparently does not extend downwards into horizons with *Tretaspis moeldenensis moeldenensis* Cave, but these are seen at Mylet Road (see site report) and in the Whitland section (Zalasiewicz *et al.,* 1995, p. 615).

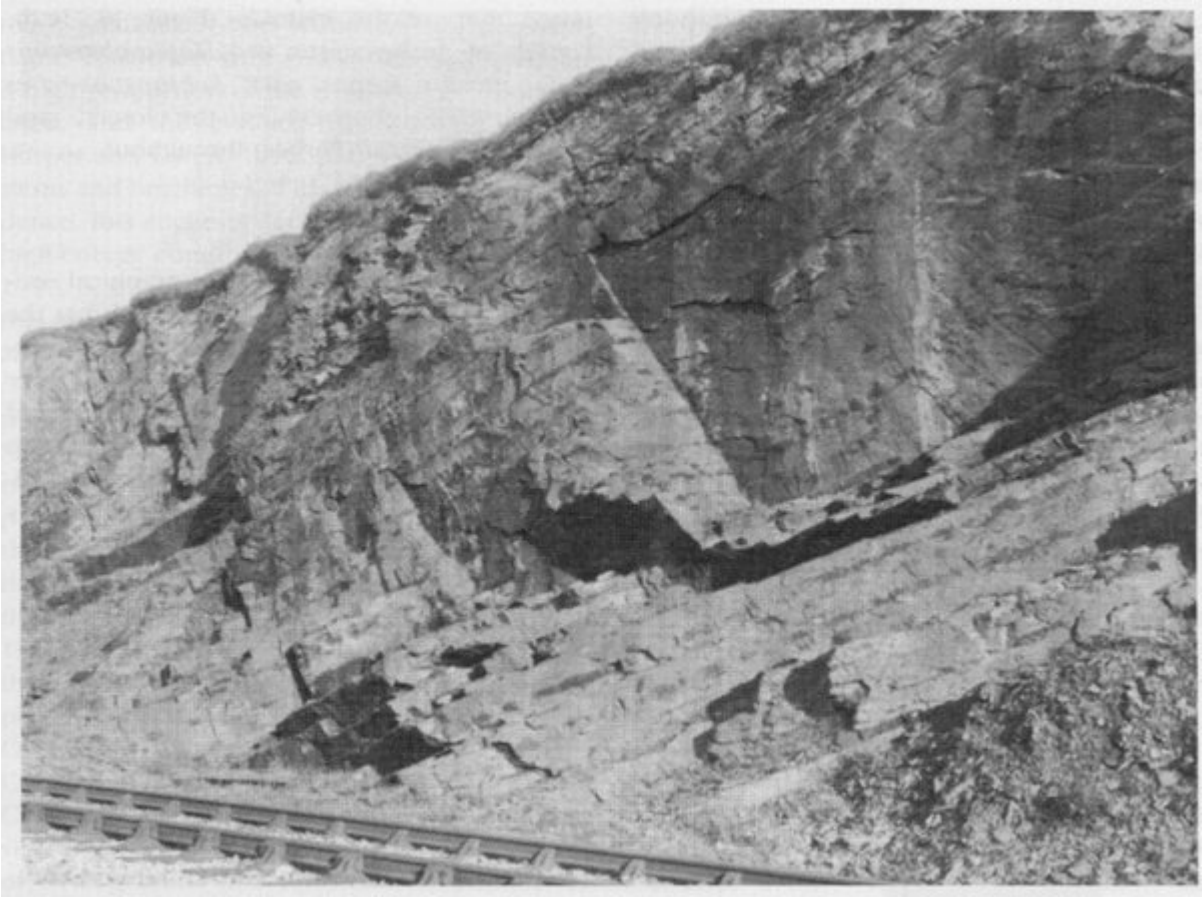
Conclusions

Sholeshook is an important locality regionally and nationally, being the type locality of the Sholeshook Limestone. This formation is stratigraphically and palaeontologically the most important of the Ashgill limestones in South Wales; it is the type stratum for several species of trilobites and cystoid echinoderms, including species of stratigraphical value.

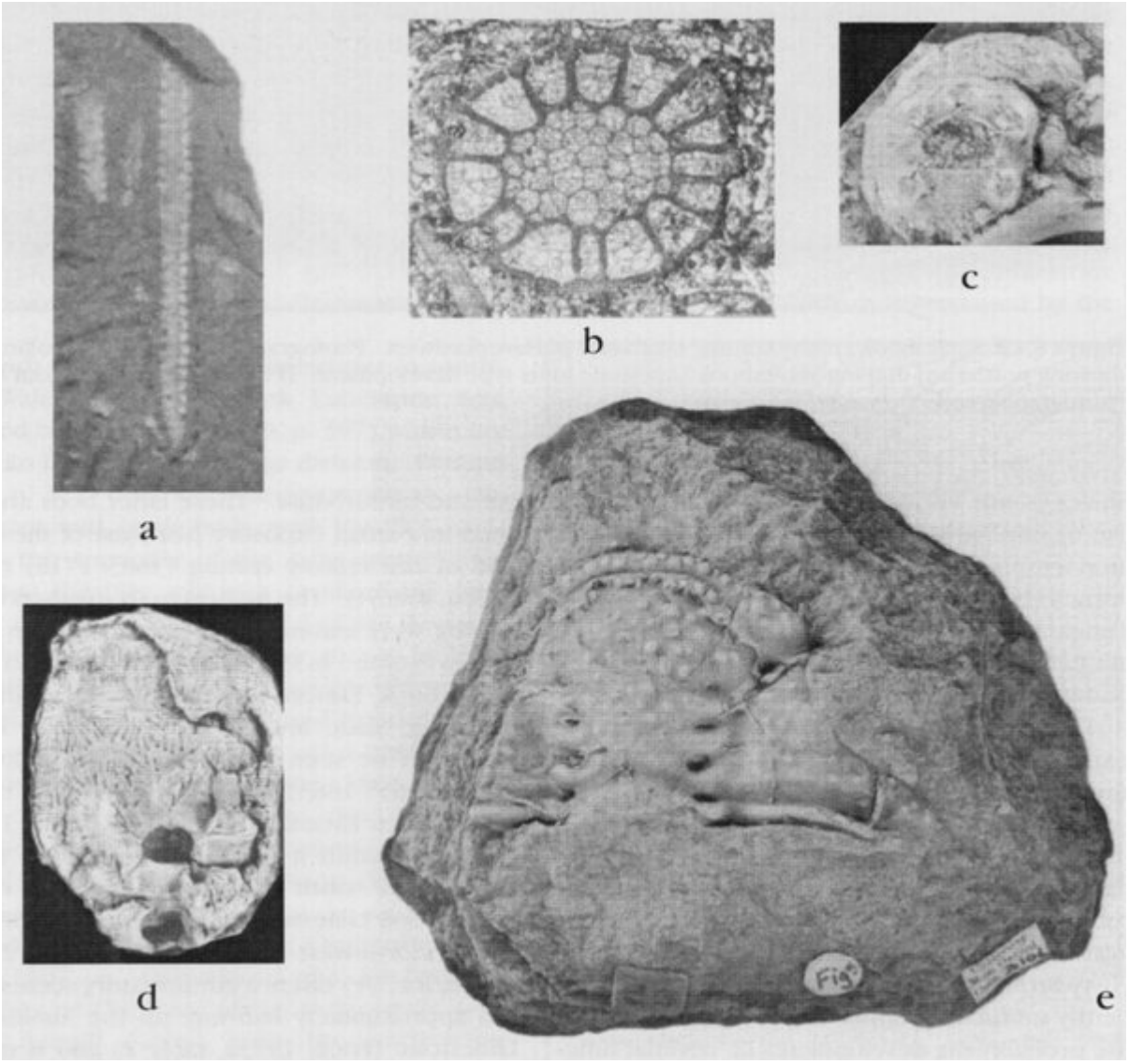
References



(Figure 8.21) Geological sketch-map and cross section around Sholeshook, after Price (1973a).



(Figure 8.22) Sholeshook railway cutting, north-east of Haverfordwest. Photograph taken in 1909, looking east, showing northward-dipping Sholeshook Limestone in its type development. (Photo: British Geologcial Survey photographic collection, A892.)



(Figure 8.23) (a) Normalograptus sp., x 3, a typical graptolite that proliferates in the upper beds of the Mydrim Shales at Pengawse Hill. (b) Transverse section of the bryozoan Kuckersella borealis (Bassler), x30, Slade and Redhill Beds, Pengawse Hill. (c) Eucystis pentax Paul, x4, Sholeshook Limestone, Sholeshook. (d) Archegocystis stellulifera (Salter), x2, Sholeshook Limestone, Sholeshook. (e) Atractopyge verrucosa (Coalman), holotype cranidium, x1.5, from the Crûg Limestone, Crûg.