MACHAERIDIANS FROM THE LOWER SILURIAN (LLANDOVERY, TELYCHIAN) OF SHROPSHIRE, ENGLAND

LUCY M. E. MCCOBB AND MICHAEL G. BASSETT

Department of Geology, National Museum of Wales, Cathays Park, Cardiff, CF10 3NP, UK, <lucy.mccobb@museumwales.ac.uk> and <mike.bassett@museumwales.ac.uk>

INTRODUCTION

Machaeridians are marine Palaeozoic fossils, known from sediments of early Ordovician to mid Permian age (Bengston, 1978; Cooper and Grant, 1972; Kaasa, 1992). Rare, completely articulated specimens reveal that they were long, slender, bilaterally symmetrical animals, covered by a dorsal scleritome comprising longitudinally arranged series of calcite sclerites (e.g., Adrain et al., 1991; Högström and Taylor, 2001a, 2001b). However, most known machaeridians, including those described in this paper, comprise isolated disarticulated sclerites. Until recently, the taxonomic affinities of the group were uncertain, and historically they were assigned to a number of different phyla (e.g., see Adrain, 1992). However, the recent account of an exceptionally preserved specimen with soft tissue anatomy, from the Lower Fe- zouata Formation (Lower Ordovician, Tremadocian) of Morocco, now indicates that machaeridians were annelid worms (Vinther et al., 2008).

Two orders of machaeridians are recognised: the Lepidocoleomorpha Schallreuter 1985, and the Turrilepadomorpha Pilsbry, 1916, essentially distinguished by the fact that the lepidocoleomorphs have two rows of sclerites, while the turrilepadomorphs have four (although rare cases of lepidocoleomorphs with two extra rows of outer sclerites are known [Dzik, 1986; Högström, 1997]).

The Silurian fossil record of machaeridians includes some relatively rare occurrences of articulated scleritomes (see Withers, 1926; Högström and Taylor, 2001a, 2001b; Högström, 1997; A- rain et al., 1991), together with more common disarticulated, isolated sclerites. Silurian occurrences are widespread globally, with reports from the British Isles (see below), North America (Hall and Whitfield, 1875; Clarke, 1896; A- drain, 1992; Högström and Taylor, 2001b), the Ukraine (A- drain et al., 1991), the Baltic region (Aurivillius, 1892; Schrank, 1978; Bengston, 1979; Schallreuter, 1985; Högström, 1997), Boehmenia (Barrande, 1872; Prokop, 1965), Arctic Russia (Högström, Bogolepova and Gubanov, 2002), China (Wu Hong-Ji, 1990), Australia (Chapman, 1910), and the Carnic Alps of Austria (Dzik, 1994).

The first recorded machaeridians were from Britain (Turri- lepas wrightiana) from the Much Wenlock Limestone Formation of Dudley [de Koninck, 1857, 1860; Woodward, 1865], and the British Silurian record includes material from the Llandovery, Wenlock (Lepidocoleus kettleyanus [Reed, 1901] and L. britannicus Withers, 1926), and Ludlow Series (Lepidocoleus sp.; Withers, 1926). Llandovery species have been identified in rocks of Rhuddanian age (lower Llandovery) (Lepidocoleus turnbulli Withers, 1926 from the Cartlett Beds at Haverfordwest), and Aeronian age (middle Llandovery) (‘Plumulites peachi [Nicholson and Etheridge, 1880] from the Saugh Hill Group at Girvan, Ayrshire). The only British record of upper Llandovery (Tely- chian) machaeridians, comparable with those described here from the Purple Shales, is the recent report of specimens from the Deerb- hope and Weather Law Linn Formations in Scotland, all recorded by Stewart et al. (2007) as Plumulites sp.

LOCALITY AND GEOLOGY

All material described here is from an extensive temporary exposure of the lower Silurian (Telychian) Purple (Hughley) Shales created in 1967, when a settling pit was dug at Devil’s Dingle (British National Grid Reference SJ 639 052) near Buildwas in Shropshire, for disposal of ash from a power station at Ironbridge (Cocks and Walton, 1968). The site is now infilled, but a very large number of fossiliferous blocks were collected by Dr. P. D. Lane during the 1960s and 1970s. These blocks yielded rich brachiopod (Bassett and Rong in Holland and Bassett, 2002) and trilobite (Curtis and Lane, 1997, 1998) faunas, as well as ostracodes, corals, bivalves, gastropods, crino- ids, astrozoans, graptolites and the machaeridians discussed here.

Unfortunately, the nature of the extensive excavation over a fairly long time interval precluded the systematic stratigraphic collection of faunas, but there is no doubt that all the material described here is from the Purple Shales Formation. Borehole data indicate that the regional thickness of this unit is up to 210 feet (Cocks and Rickards, 1969), spanning the turriculatus, crispus, grie- stoniensis to crenulata graptolite biozones of the Upper Llan- dovery Telychian Series. The Devil’s Dingle exposures were in the upper part of this sequence, probably mostly in the Mono- graphus grie- stoniensis and possibly part of the Monomacimac crenulata biozones (Cocks and Walton, 1968).

For a detailed account of the geology of the Purple Shales in Shropshire, see Greig et al. (1968) and Lane (p. 54–56 in Holland and Bassett, 2002). The Purple Shales crop out in two elongated areas, one on either side of the Church Stretton Lineament, which comprises Cambrian and Ordovician deposits on which Llandovery age rocks rest unconformably. To the southwest of Church Stretton, an outlier of the Purple Shales directly overlies the Pre- cambrian rocks of the Longmynd.

The Llandovery sediments comprise a transgressive sequence, with the lower Llandovery Kenley Grit and Pentamerus Beds representing very shallow and shallow marine conditions respectively. The succeeding Purple Shales were deposited further out on the outer shelf (Benton and Gray, 1981), an interpretation supported by the fauna, which has been assigned to a deeper marine Clorinda community (Ziegler et al., 1968) by Cocks and Walton (1968). The Buildwas Formation forms the base of the Wenlock Series in this area, immediately overlying the Purple Shales.

The Purple Shales are dominantly purple-brown mudstones with thin interbeds of coarser limestone, calcareous siltstone and sandstone. The mudstones represent normal background deposition, with the interbeds interpreted as shelf storm sheet turbidite deposits (Benton and Gray, 1981). Lane’s collection covers a thickness of about 25 metres of the Devil’s Dingle section, but due to erosive downslope creep it was not possible to accurately record the relative stratigraphical position of each fossiliferous block collected. The presence of the brachiopod species Eocoe- lthia curtisi Ziegler, 1966 and Coo- striktbrandia ibira irita irita (J. de C. Sowerby, 1839) place the sequence within the C3 Telychian sub- stage of the shelly Llandovery Series (Ziegler, 1966).

MATERIAL

The machaeridians are all preserved as moulds of isolated sclerites, identified by examination of some 1,500 fossiliferous blocks of Purple Shale. Around 100 sclerites are present, with some 60% of these as lepidocoleomorphs. Most of the remaining specimens are plumulitids (Family Plumulitidae Jell, 1979), with only a single turrilepadid present (Family Turrilepadidae Clarke,