Shrewley, Warwickshire

[SP 212 674]

Introduction

The canal cutting at Shrewley exposes a section of the Arden Sandstone Formation, a distinctive and widespread unit in the Mercia Mudstone Group of central England. The sequence comprises an overall coarsening-upwards succession in which grey-green shales and siltstones with wavy and lenticular bedding pass into white, fine-grained, well-sorted, dolomitic sandstones; the facies indicates intertidal marine deposition conditions. The formation has yielded plant remains and a diverse fauna. Palynological evidence indicates a Carnian age. This is a superb site for palaeoenvironmental and regional geological studies. It is also historically important, especially for its fossil faunas.

The Arden Sandstone Formation was first described by Murchison and Strickland (1840) who referred to it as the 'Keuper Sandstone'. Subsequent names include the 'Upper Keuper Sandstone' (Phillips, 1848; Symonds, 1855; Wills and Campbell Smith, 1913; Wills, 1948), the 'Shrewley Sandstone' (Lapworth, 1898), and the Arden Sandstone Member' (Warrington *et al.,* 1980). The sediments of the Shrewley Canal Cutting have been described by these authors, as well as by Brodie (1856, 1886, 1887, 1893, 1894), Howell (1859), Hull (1869, pp. 89–90), Matley (1912), Haim and Horton (1969), Hardie *et al.* (1971), and Old *et al.* (1991, pp. 32–5).

Description

Sedimentology

The Shrewley Cutting exposes up to 8 m of flat-lying interbedded sandstones and green marls of the Arden Sandstone Formation (Figure 3.56) with red mudstones of the underlying and overlying formations of the Mercia Mudstone Group (Matley, 1912; Old *et al.,* 1991, p. 32). The Arden Sandstone Formation consists of grey and green sandstones, siltstones, and mudstones, commonly finely interbedded and laminated, and with a great deal of bioturbation, and minor soft-sediment deformation features. The sandstones and siltstones exhibit trough, planar, and small-scale ripple-drift cross-bedding. Approximately 0.3 m above the base of the formation is a thin band of small pebbles, associated with many fish bones, scales, and teeth.

The following section, adapted from Brodie (1856, pp. 374–5) and Howell (1859, p. 42), may be compared with a modern log (Figure 3.57):

	Thickness (m)
Mercia Mudstone Group	
Red marl	seen 3.0
Arden Sandstone Formation	
Thin beds of sandstone, divided by green marls; with the remains of plants	3.04
Hard sandstone, with poorly preserved casts of *Euestheria*	1.06
Green marl	0.05
Fine-grained sandstone, with ripple marks and footprints	0.68
Green marl	0.06
Beds of grey and light-coloured fine-grained sandstone, divided by marl, with *Euestheria minuta,* and ripple marks. In the middle occurs a coarse, gritty sandstone with white specks, which contains bones, teeth, and spines of *Acrodus*	0.53
Green marl (*base of the Arden Sandstone Formation*)	~ 0.10
Red marl	9.1 seen

The Shrewley canal cutting exposes a thicker succession than in many neigbouring sections (Figure 3.57). At other locations, such as Rowington [SP 202 691], thick sandstone units occur in the Arden Sandstone Formation. Measurements made on cross-beds and ripple marks indicate a generally easterly current flow, although palaeocurrent directions are highly variable within the formation.

Palaeontology

A range of plant and animal fossils has been recorded from the Arden Sandstone Formation, including plants (horsetails, conifers), bivalves, the crustacean *Euestheria minuta,* fishes (sharks, bony fishes, lungfishes), amphibian remains, and invertebrate and vertebrate trace fossils (Brodie, 1856, 1886, 1887, 1893, 1894; Howell, 1859; Newton, 1887; A.S. Woodward, 1893; Matley, 1912; Old *et al.,* 1991, pp. 32–4; Warrington and Ivimey-Cook, 1992). Miospores from the formation, and from mudstones immediately below, indicate a probable late Carnian age (Warrington *et al.,* 1980, pp. 40–1; Warrington and Ivimey-Cook, 1992). The fossil assemblage from the Arden Sandstone Formation is very similar to those of the North Curry Sandstone Member in Somerset (Warrington and Williams, 1984).

Interpretation

The red marls and mudstones in the lower parts of the section at Shrewley were deposited on a broad, low-lying plain that supported a series of large ephemeral playa lakes (Warrington *et al.,* 1980; Old *et al.,* 1991; Warrington and Ivimey Cook, 1992). Evidence for this comes from the presence of thin gypsum veins and gypsum or anhydrite nodules and occasional pseudomorphs after halite in the mudstones.

The Arden Sandstone Formation, and its equivalents farther south in England, were probably deposited in distributary channels and interdistributary areas separated by broad intertidal mudflat areas in a deltaic to estuarine environment (Warrington and Williams, 1984; Old *et al.,* 1991; Warrington and Ivimey-Cook, 1992;). Subaerial conditions are indicated in some areas by vertebrate tracks and possible insect burrows. Most of the sediment accumulated in water that ranged from fresh to brackish in character, as indicated by the presence of the crustacean *Euestheria,* but was subject to periodic drying out, as suggested by the lungfish remains. A connection to a marine source is implied by the occurrence of the teeth of hybodont and xenacanth sharks, and by sporadic bivalves of marine character.

The succession reverts to mudstones more typical of the Mercia Mudstone Group, above.

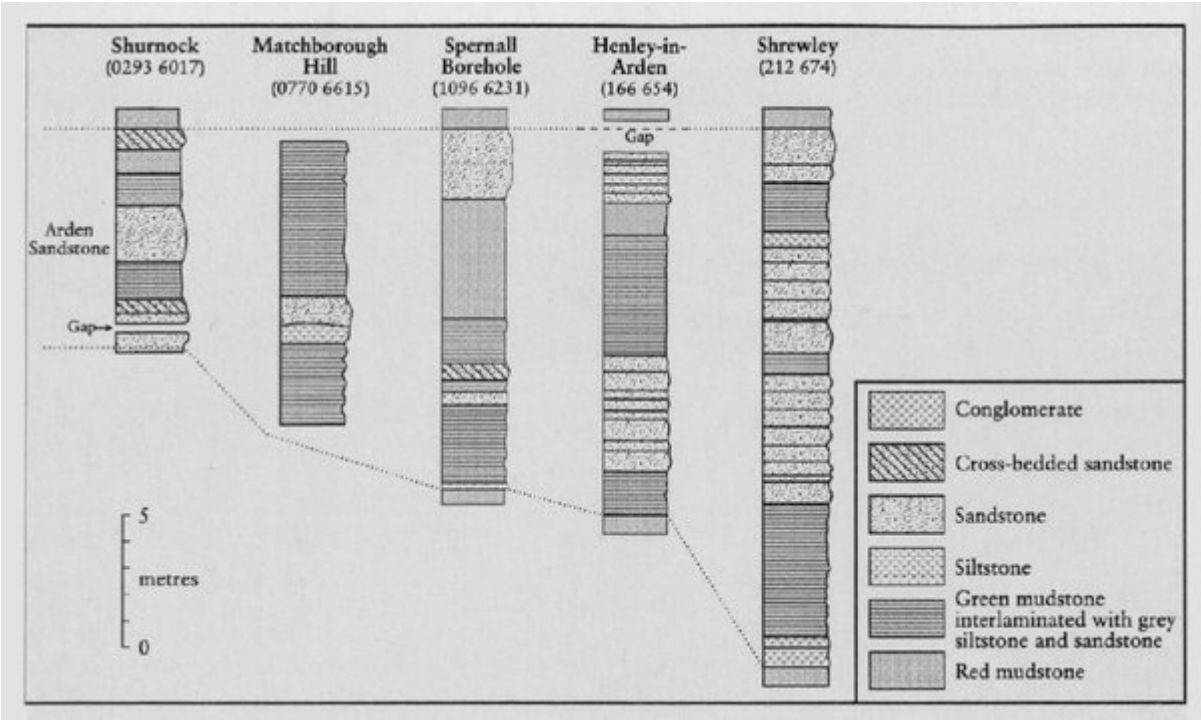
The Arden Sandstone Formation crops out over a wide geographical area, which includes much of Warwickshire (Matley, 1912) and Worcestershire, and is thought to correlate with the Dane Hill Sandstone Member of the Leicester region (Warrington *et al.,* 1980), the Butcombe and North Curry Sandstone members of Avon and Somerset, and the Weston Mouth Sandstone Member of the Wessex Basin, all of which are of Carnian age (Lou *et al.,* 1982; Warrington and Williams, 1984; Holloway, 1985c). This horizon has also been correlated with similar units of Carnian age in France and Germany, notably the Schilfsandstein (Warrington, 1970a; Warrington and Ivimey-Cook, 1992).

Conclusions

Shrewley Canal Cutting exposes an excellent section of the Arden Sandstone Formation and the under- and overlying red mudstones in the Mercia Mudstone Group. The Arden Sandstone Formation is an important, widespread stratigraphical marker, and represents a temporary, but major, change in the environments of deposition within the Mercia Mudstone Group. Most of the Mercia Mudstone Group comprises red-brown and some green clays, marls, and mudstones deposited in terrestrial-lacustrine or playa lake environments. The Arden Sandstone Formation was probably deposited under deltaic or estuarine conditions. This is an important site for British Triassic stratigraphy and palaeoenvironmental interpretation, and is historically significant for the fossils, recovered from the formation.

References

(Figure 3.56) The Shrewley canal cutting, showing the Arden Sandstone Formation of the Mercia Mudstone Group; red mudstones underlie the formation at the bottom right (arrowed). (Photo A13530 reproduced with permission, IPR/22–26C, British Geological Survey, © NERC. All rights reserved.)



(Figure 3.57) Comparative sections through the Arden Sandstone Formation at Shrewley, and at neighbouring sites. (After Old et al., 1991.)