Aust Cliff, Avon

[ST 565 895]

Introduction

Aust Cliff at the eastern end of the Severn Road Bridge, is famous for its excellent exposure of Rhaetian and Liassic strata (*c*: 200 Ma) between the Upper Triassic and Lower Jurassic. From this cliff and foreshore exposure (Figure 4.15) and (Figure 4.16), first described by Buckland and Conybeare (1824), a prolific fossil biota has been obtained over the intervening years. Some fossil elements have attained international importance such as the reptiles and fishes. Accompanying the vertebrates is an abundant invertebrate fauna that also includes a nationally important and diverse insect fauna. The constant erosion of the site produces new exposures and fossil-iferous material from cliff falls on the foreshore, creating a considerable potential for new finds. In addition to the fossil arthropod importance of this site, the area is also independently selected for the GCR for the Permian–Triassic, Permian–Triassic Reptilia and Rhaetian selection categories.

Description

The Aust Cliff section is an eroded and truncated NW–SE-trending anticlinal ridge of Triassic and Lower Jurassic strata cut by a series of small faults downthrowing to the south. The folding and faulting have been explained by compaction and thermal subsidence of the Triassic age Mercia Mudstone following Permo-Triassic rifting.

The Mesozoic cliff succession lies with angular unconformity upon gently folded Carboniferous Limestone that dips at 15° to the south-west. Triassic age mudrocks belonging to the Mercia Mudstone Group include Red Mudstones overlain by the 'Tea Green Marls' of the Blue Anchor Formation (Figure 4.17). Above lie the grey shales and limestones of the Triassic age Penarth Group (including the Rhaetian strata) followed by more limestones and shales of the lowest Blue Lias of early Jurassic (Hettangian) age.

Fossil insects occur sporadically in the various limestone developments in the Rhaetian Penarth Group and are occasionally concentrated at certain horizons (Figure 4.18)g,h,i. The main source of specimens is the distinctive strata of the Cotham Member, including the Cotham Marble (Lower Lilstock Formation). Insects in these beds are often associated with freshwater ostracods, conchostracans (clam shrimps) and sometimes the aquatic liverwort *Naiadita lanceolata* Buckman, 1850 [emend. Harris]; rarer marine elements (vertebrates and molluscs) may also be present Jarzembowski, 1999). The environment in which these insects were fossilized was paralic with land to the west of the Severn Valley (supplying rare charcoal) and probably consisted of marginal freshwater, brackish lagoonal or estuarine areas where mixing of freshwater, marine and blown-in or otherwise transported terrestrial elements could occur. Succeeding Lias Group beds have yielded a richer entomofauna and at least some of this material from basal levels has been considered of Rhaetian age.

Fauna

Aust Cliff is world famous for its exposures of Rhaetian near-shore marine bonebeds and the diversity of fossils they contain. The site is Britain's most prolific locality for fossil reptiles of Rhaetian age, yielding important collections of both marine and terrestrial reptiles. Most of the reptile fossils are of marine ichthyosaurs and plesiosaurs but some rare terrestrial dinosaur remains, which are typically worn by prolonged transport, have also been found (see Benton and Spencer, 1995, p. 75 *et seq.*). In addition, the site has as yielded abundant and diverse fish remains including those of hybodont sharks, actinopterygians and lungfish (see Dineley and Metcalf, 1999, p. 342ff).

The most distinctive insect fossil remains are wings, usually forewings, although bodies and body parts also occur. Fossils range in size from a few millimetres to several tens of millimetres long. At least nine major groups (orders) of insects are represented at Aust Cliff. The insects occur in fallen blocks from the top of the cliff. Coleoptera (beetles) are the commonest insects, especially elytra, for example, *?Hydrobiites giebeli* Handhirsch, 1906 ((Figure 4.18)h). There are also caddisfly (Trichopters)-like Amphiesmenoptera, for example *Necrotaulius furcatus* (Giebel, 1856) (Figure 4.19). Other holometabolans include Mecoptera (scorpion-flies) with extinct, colour-patterned Orthphlebiidae present and Neuroptera (lacewings) such as *Megapolystoechotus magnificus* Tillyard, 1933 (Whalley, 1988). Orthoptera ('grasshoppers') are represented by the 'long-horn' or bush cricket-like Haglidae (Figure 4.21). Other non-holometabolans recorded are Blattodea (cockroaches), Odonata (dragonflies) and Hemiptera (bugs).

Aust Cliff provided material during the pioneer phase of Mesozoic palaeoentomology (Brodie, 1845). It is still producing significant new finds, for example *Aenne triassica* Kzremi■ski and Jarzembowski, 1999 (Figure 4.20) currently the earliest non-biting (chironomid) midge belonging to an ecologically important aquatic family of Diptera (true flies). The insects in the Cotham Marble represent the first UK insect fauna after the Permian/rriassic extinction.

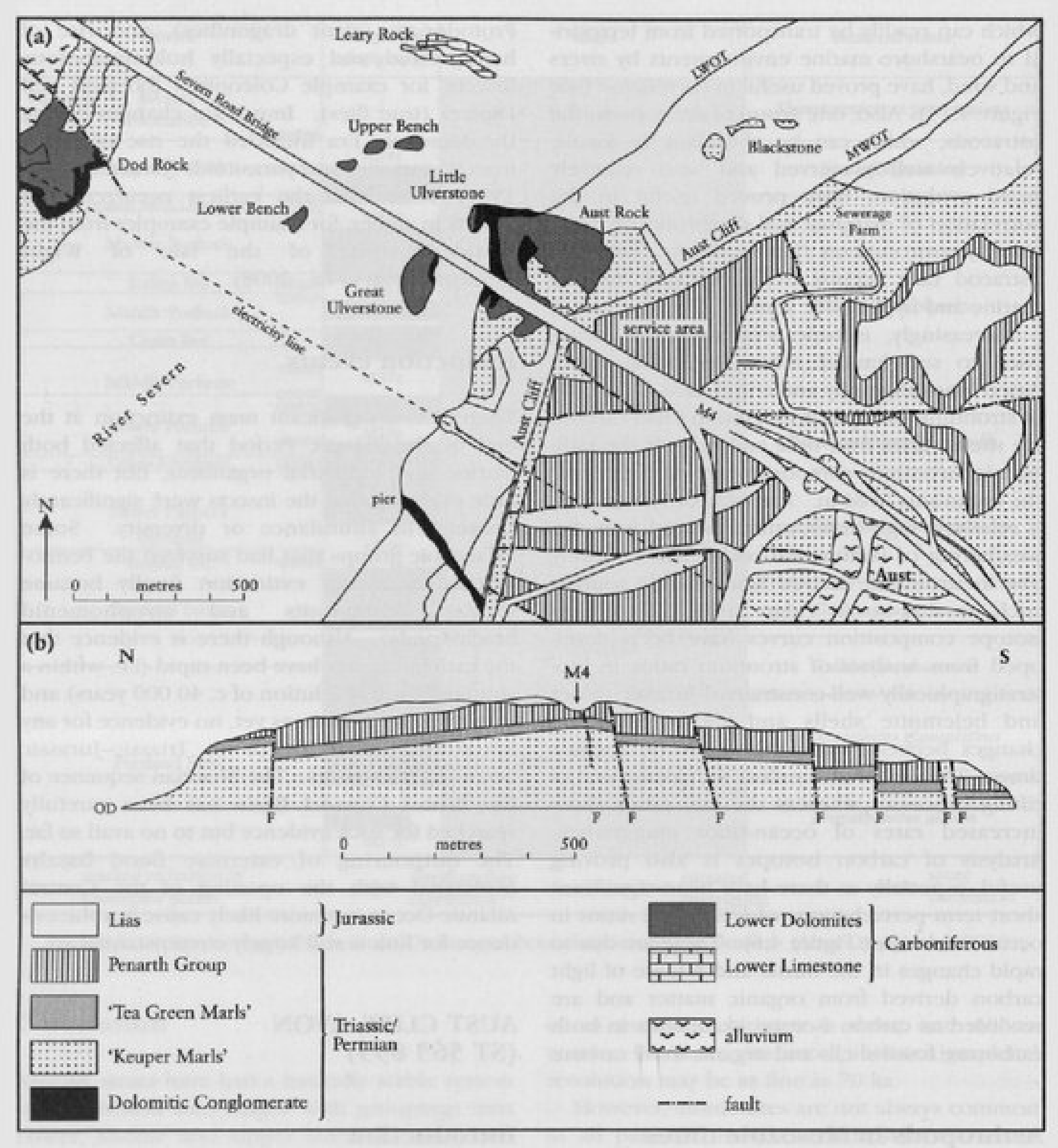
Interpretation

The fossil insects occur in fallen blocks, especially the lagoonal Cotham Marble and transgressive muddy limestones higher up. The aforementioned limestone shows particularly detailed preservation and is comparable in quality with insects from the Bembridge Marls and upper Middle Purbeck beds (see below). Unlike the other insect beds, this is a well-marked horizon. At present, disarticulated remains can be found, but historical data (Brodie, 1845) shows that richer concentrations can be exposed due to the continuing erosion of the cliff line. The insects provide data for the end Triassic extinction and early Mesozoic radiation and recovery after the Permian–Triassic mass extinction.

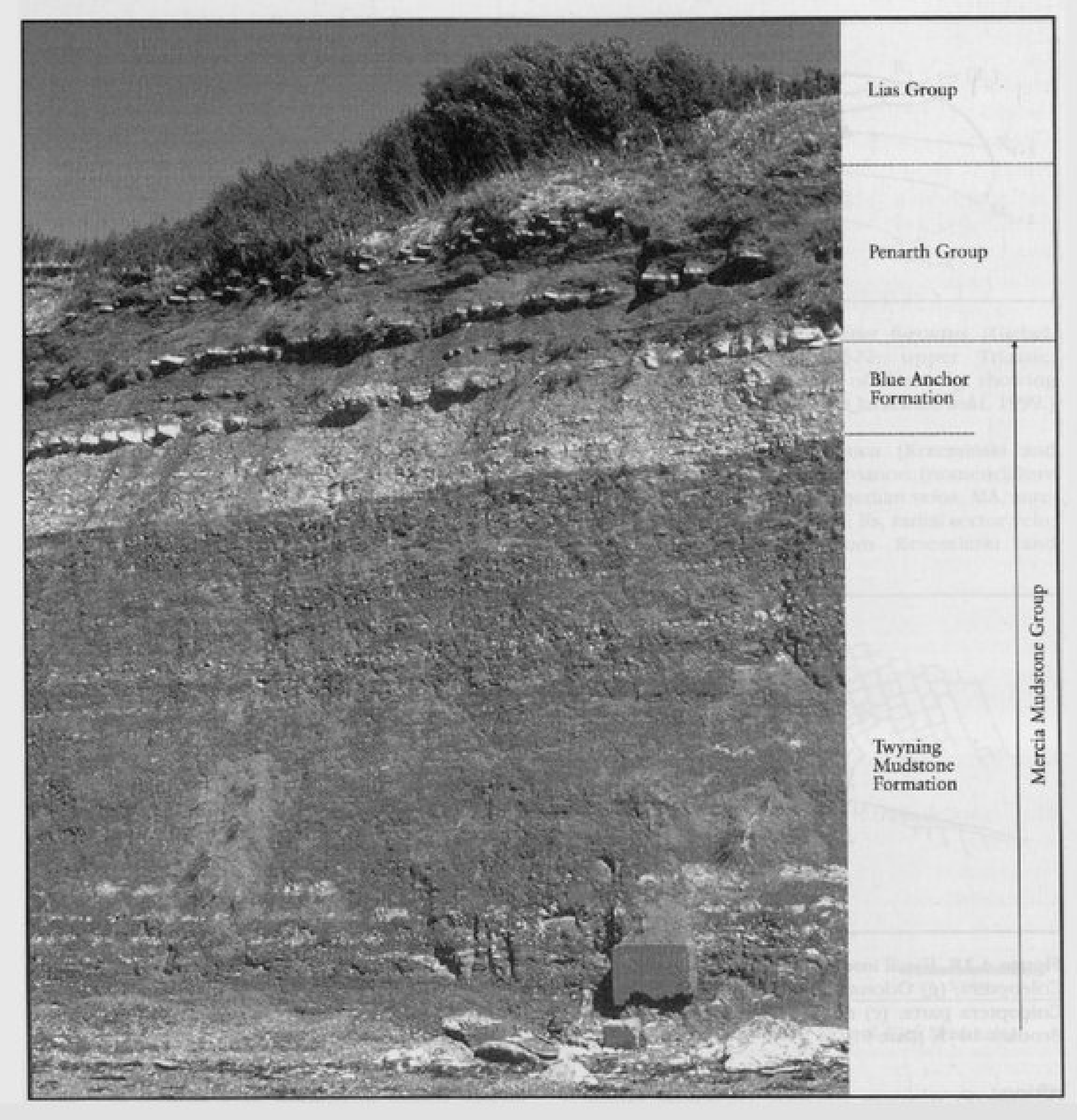
Conclusion

The conservation value of this site is based on several aspects of its geology and palaeontology, especially the fishes, reptile and insect fossils. The insect fauna obtained from Rhaetian and earliest Jurassic strata (late Triassic-early Jurassic, *c.* 201 Ma) here is of national importance. This is the most productive site in Britain for Rhaetian–earliest Hettangian insects of which scorpionflies (mecopterans) are most striking, with some of the fossils preserving original colour patterning. Furthermore, the site has considerable potential for significant finds of fossil insects in the future.

References



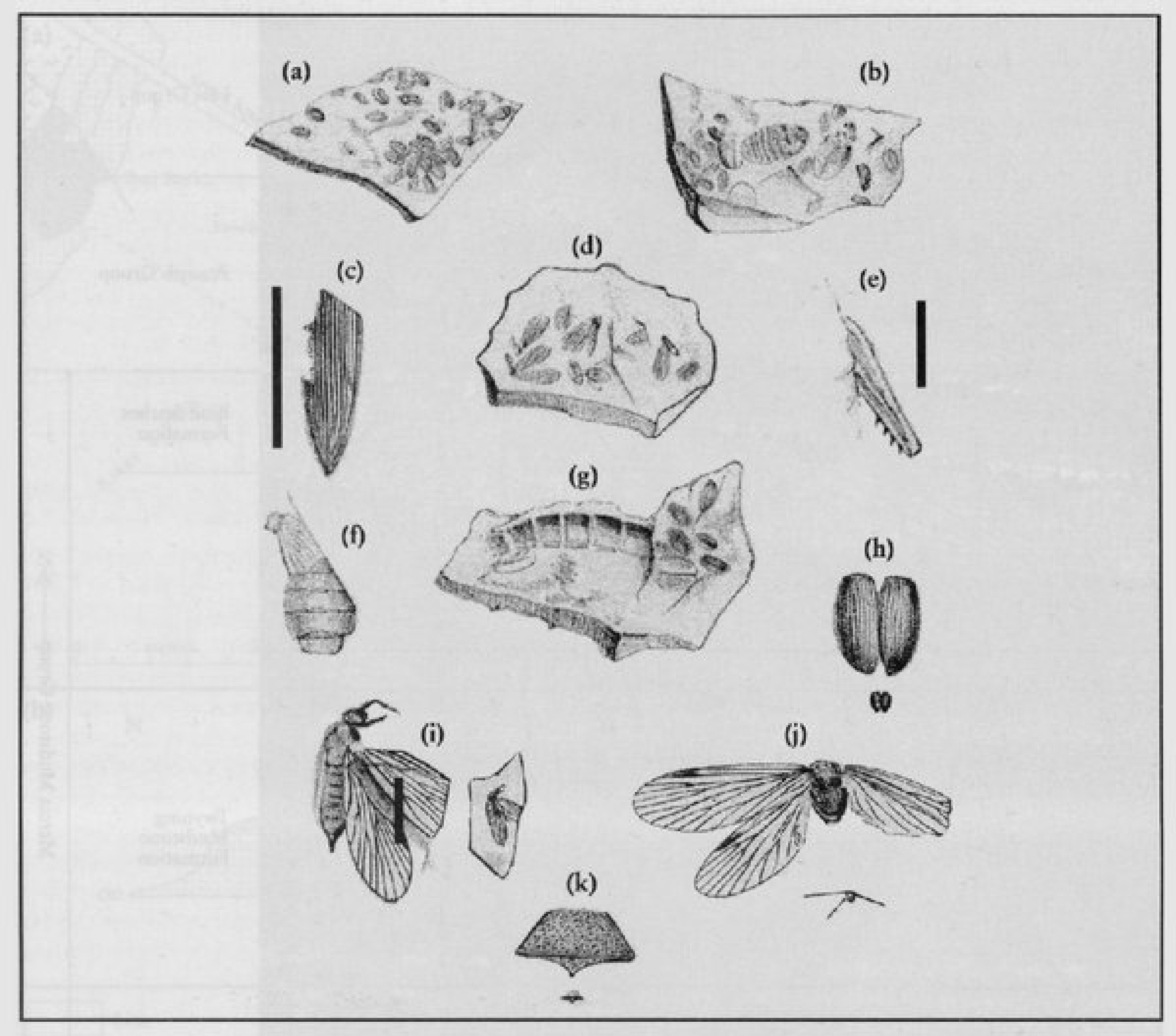
(Figure 4.15) Triassic and Jurassic strata at Aust Cliff (a) geological map, and (b) the broad anticlinal structure. (After Hamilton, 1977.)



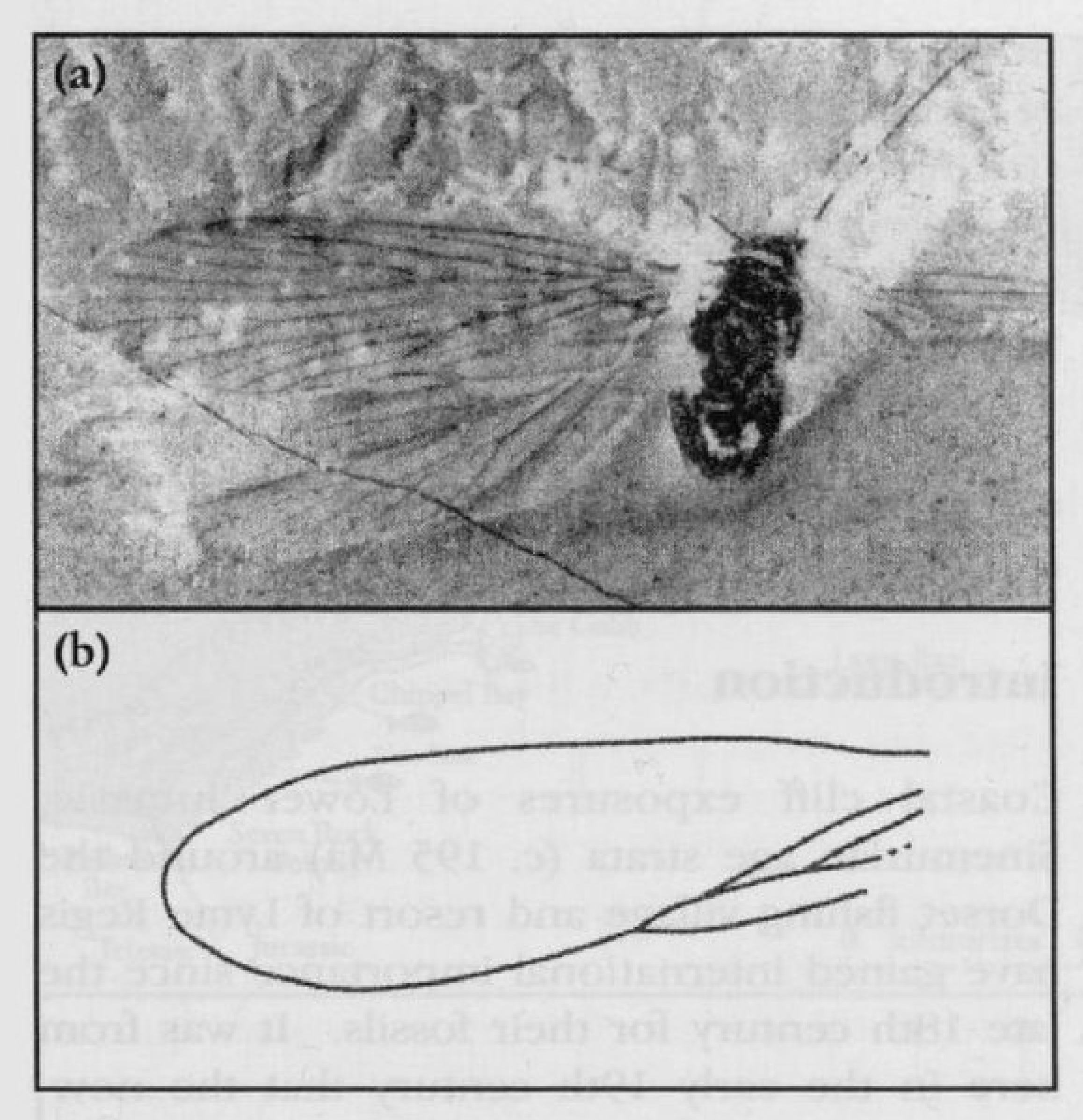
(Figure 4.16) Aust Cliff: view on the north-eastern side of the Severn Bridge, looking south-east. (Photo: Andrew Swift.)

			Thickness (metres)
Jurassic	Lower Lias	Blue Lias (Hettangian) *planorbis* Beds	(variable)
		pre-*planorbis* Beds	(variable)
Penarth Group		Lilstock Formation	*c.* 3.40
		Westbury Formation	*c.* 4.30
Mercia Mudstone Group		Blue Anchor Formation	*c.* 7.0
		red mudstones	*c.* 30.0
Carboniferous		Carboniferous Limestone	(variable)

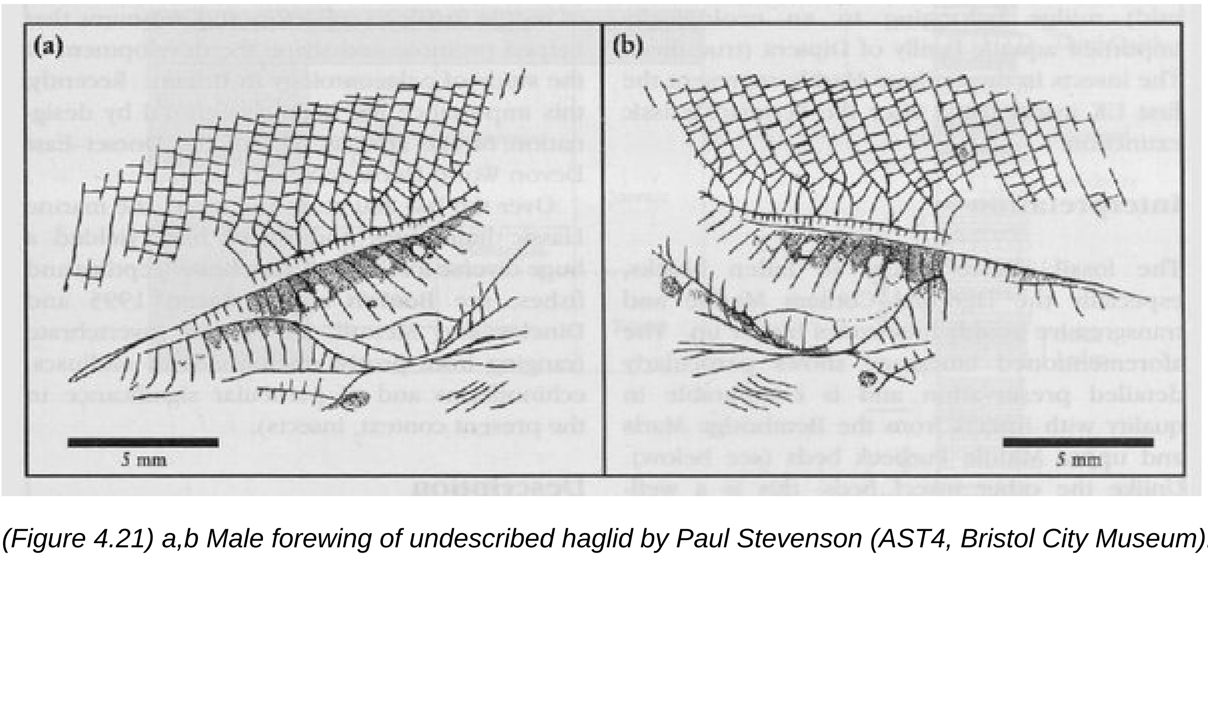
(Figure 4.17) A representative section for Aust Cliff. The Penarth Group and Mercia Mudstone Group are Triassic in age. (After Warrington et al., 1980.)



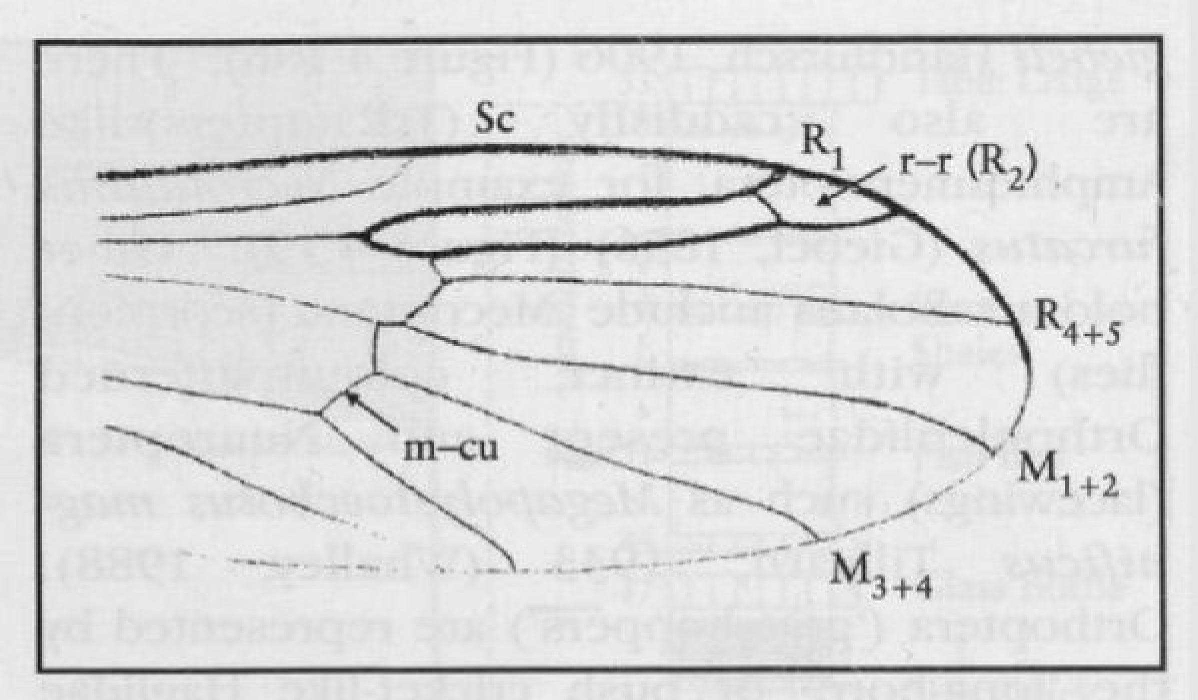
(Figure 4.18) Fossil insects from the Lias and Trias of Aust Cliff. (a, b) Coleoptera; (d) Amphiesmenoptera and Coleoptera; (g) Odonata and Coleoptera; (h) Hydrobiites giebeli (Rhaetian). Coleoptera parts: (c) elytron; (f) abdomen; (k) thorax; (e) Orthoptera leg; (i, j) Amphiesmenoptera. (From Brodie, 1845, plate 9.)



(Figure 4.19) (a) Necrotaulius furcatus (Giebel, 1856); adult BMNH I 11522; upper Triassic, Gloucestershire. (b) Outline of forewing showing looped anal veins. x 6. (From Jarzembowski, 1999.)



(Figure 4.21) a,b Male forewing of undescribed haglid by Paul Stevenson (AST4, Bristol City Museum).



(Figure 4.20) Aenne triassica (Krzeminski and Jarzembowski, 1999). Wing venation (nomenclature of veins: Cu, cubital veins; M, median veins; MA, anterior median vein; R, radial vein; Rs, radial sector vein; Sc, subcostal vein). (From Krzeminski and Jarzembowski, 1999.)