East Sands–Buddo Ness, Fife

[NT 519 158]–[NT 563 149]

Introduction

The East Sands–Buddo Ness GCR site is an elongate shore site, extending eastwards, from the eastern margin of St Andrews [NT 519 158], for a distance of 4 km along the East Fife coast to the Buddo Rock [NT 563 149]. Within the site, which Iles at the north-east extremity of the Carboniferous outcrop in the Midland Valley, are the local representatives of parts of the Anstruther, Pittenweem and Sandy Craig formations (Strathclyde Group, Asbian), which show significant differences from those formations in the Anstruther area. The succession was first described by Geikie (1902) and then parts of the section were described in detail by Kirk (1925) who, as corroborated by Forsyth and Chisholm (1977), first correctly established the sequence of marine bands. A guide to part of this site has been published by MacGregor (1968).

Description

The succession within the area is about 300 m thick and is dominated by sandstones and seatearths together with less significant developments of shale. The oldest rocks occur at the eastern end of the site and the youngest rocks towards the western end but, in the intervening ground, the rocks have been faulted and folded into a series of anticlines, synclines and domes (Figure 2.10) with the result that some beds are repeated several times along the section. In the past this caused problems of correlation at the site (Geikie, 1902; Kirk, 1925; Forsyth and Chisholm, 1977) but it also provides a useful insight into the variability of the succession, which contains evidence of local unconformities and of rapid changes in the thickness and character of particular units, including a cross-bedded shell bank (Kirk, 1925). At Buddo Ness there is a mudstone band with a marine fauna, which has been identified as the West Sands Marine Band and which is the local boundary between the Anstruther Formation and Pittenweem Formation. Close by and apparently below it stratigraphically are sandstones with non-marine dolomitic limestones. Between Kittocks Den [NO 554 151] and the Maiden Rock [NO 526 158] two principal marine bands have been recognized, of which the lower band has a more diverse fauna and is identified as the Witch Lake Marine Band (Forsyth and Chisholm, 1977), formerly known as the 'Encrinite Bed'. Leitch (1942) and Bennison (1961) have described unusual dwarfed specimens of the non-marine bivalve *Naiadites* from beds above the Witch Lake Marine Band near the Rock and Spindle. The upper marine horizon, which lies about 80 m higher, is identified as the St Andrews Castle Marine Band and marks the upper boundary of the Pittenweem Formation. The upper parts of the Pittenweem Formation at Pittenweem are cut out by a fault, and therefore this is the only good natural exposure of this part of the sequence in East Fife. The parts of the succession above the St Andrews Castle Marine Band are assigned to the Sandy Craig Formation. Within these beds there are concretionary calcretes, tuffaceous beds and a single marine band, the St Nicholas Marine Band.

Interpretation

The East Sands–Buddo Ness site is situated at the north-eastern extremity of the Carboniferous outcrop in the Midland Valley and thus provides invaluable palaeogeographical information. Compared with the equivalent succession at the Elie–Anstruther GCR site, the Strathclyde Group in the northern area is thinner and sandier. The marine bands present here can be correlated with marine bands at Anstruther, but overall there are fewer marine intervals and their faunal content is reduced (Forsyth and Chisholm, 1977). Thus, as one goes north, the contribution of fluvio-deltaic material increases and marine influences wane. The development of calcrete (cornstone) palaeosols in the Sandy Craig Formation may indicate a period in which the climate was more arid than that during which the seatearths formed. A similar and probably coeval arid interval has been noted in successions in East Lothian (Andrews and Nabi, 1998) and indicates that this is a phenomenon of regional significance.

The section is dated by correlation with rocks elsewhere and is entirely Asbian in age. The marine bands are the local representatives of the MacGregor Marine Bands (Wilson, 1974, 1989). They are the oldest horizons in the Scottish Carboniferous succession to be correlatable over a considerable distance within the Midland Valley and they contain a distinctive fauna (Wilson, 1974). The section is also well known for its non-marine bivalve fauna (Geikie, 1902; Kirk, 1925; Leitch, 1942; Bennison, 1961; Brand, 1998).

Conclusions

This site reveals extensive and important sections of formations within the Strathclyde Group. These include northern developments of the Pittenweem Formation and the Sandy Craig Formation, in which the Witch Lake Marine Band (Encrinite Bed) and other 'associated beds with diverse marine faunas make their first appearance in the local succession. It is the only good natural exposure of the upper parts of the Pittenweem Formation in East Fife. When compared with sites to the south, it shows, in its attenuation with fewer marine bands and sandier beds, a markedly increased fluvio-deltaic influence. It also contains important non-marine faunas and pedogenic carbonates. The section is of crucial palaeogeographical and palaeoclimatic interest.

References

(Figure 2.10) General view of the Craigduff Dome, a symmetrical fold structure in interbedded sandstones and mudstones of the Strathclyde Group at the East Sands–Buddo Ness GCR site, east of St Andrews. (Photo: British Geological Survey, No. D560, reproduced with the permission of the Director, British Geological Survey, NERC, all rights reserved (IPR/19–39C).)