
Marloes

[SM 7780 0772]–[SM 7882 0715]

Introduction

South-western Pembrokeshire is divided structurally into five main blocks that are bounded to the north and the south by faults that trend roughly east-west (Figure 4.23). The nature of the Silurian succession within each block varies in detail (Figure 4.24), reflecting differing geological histories. The Marloes Block, demarcated to the north by the Musselwick Fault and to the south by the Ritec Fault, is the smallest of them; it contains Silurian strata ranging in age from Llandovery to Pridoli.

Murchison (1839) was the first to recognize Silurian strata in various sections within the area; in particular he described the geology of Marloes Bay and provided sketches of the locality. De La Beche (1846) followed with logs of the sections along the bay and to the north of Gateholm, and at the same time he introduced the terms Coralliferous Series and Gray Sandstone Series for two of the main rock units of Silurian age. Phillips (1848) made further short comment on Pembrokeshire Silurian localities, including Marloes.

The Geological Survey memoir of Cantrill *et al.* (1916) on the Milford area was the first comprehensive account of the local Silurian succession, in which they provided a detailed description, sketch section, map and faunal list pertaining to Marloes. Four lithostratigraphical units of Silurian age were recognized in this area by the survey officers: the Skomer Volcanic Series, the Conglomerate Series, the Coralliferous Series and the Sandstone Series. The Skomer volcanics were thought by them to be Ordovician, but ostracod evidence from Midland Island indicated to Zeigler *et al.* (1969) a Silurian age, and all modern accounts (e.g. Cocks *et al.*, 1992) assign this suite of lavas and pyroclastics to the Llandovery Series. Cantrill *et al.*, however, did originally distinguish those volcanics within the Marloes, Wooltack Park and Renney Slip sections as being of Llandovery age. The Conglomerate Series, placed by Cantrill *et al.* (1916) in the upper Llandovery, was subsumed by Zeigler *et al.* (1969) within the Skomer Volcanic Group.

Walmsley and Bassett (1976) resurveyed all Coralliferous and Gray Sandstone series localities in Pembrokeshire and gave these units group status. The Coralliferous Series was considered by Cantrill *et al.* (1916) to be of 'Wenlock and Woolhope' age, but the sediments of this group are now believed to have been deposited in latest Llandovery through to early Wenlock times (Walmsley and Bassett, 1976; Hurst *et al.*, 1978; Mabillard and Aldridge, 1983). The Sandstone Series was regarded by Cantrill *et al.* (1916) as mostly of Ludlow age, with some of the lowest beds possibly belonging to the Wenlock. The Gray Sandstone Group is now correlated with almost the whole of the Wenlock (Walmsley and Bassett, 1976; Cocks *et al.*, 1992).

Succeeding the Gray Sandstone Group are the Red Marls, a unit established by Cantrill *et al.* (1916) for the oldest beds of the Old Red Sandstone facies. The term 'Red Marls' has been superseded by the 'Milford Haven Group' of Allen and Williams (1978) who, in the ground to the north of Milford Haven, divided it into five formations beginning with the Red Cliff Formation. The basal beds of the Old Red Sandstone were thought by Walmsley and Bassett (1976; see also Cocks *et al.*, 1992) to 'hardly be younger than early Ludlow, and could even be of latest Wenlock age'. Allen and Williams (1978) found it difficult to support this view; they claimed that there is the strong possibility of a substantial break at the base of the Red Cliff Formation, and the age of the Milford Haven Group as a whole was given by them as late Silurian–Lower Devonian. Cocks *et al.* (1992) tentatively indicated the age of the Red Cliff formation as latest Wenlock to earliest Pridoli.

The Pembrokeshire coast is justly recognized as having some of the most superbly exposed and stratigraphically varied Palaeozoic geology anywhere in the British Isles. Outcrops of Silurian strata contribute considerably to this reputation and Martoes Sands (Figure 4.25) would be considered by most as the best locality in the area at which to study rocks of this age. Strata of the Skomer Volcanic Group, Coralliferous Group, Gray Sandstone Group and the Milford Haven Group (Red Cliff Formation) are all made available through the excellent cliff sections. The Skomer Volcanic Group of Marloes is

fully described and discussed in the present volume under coverage of Llandovery localities, where further comment is also given on the Coralliferous Group.

Description

The bay that forms Marloes Sands (Figure 3.19) is some 2 km in extent and is formed entirely of steeply inclined and faulted Silurian strata (Cantrill *et al.*, 1916; Walmsley and Bassett, 1976; Bassett, 1982a; Siveter *et al.*, 1989). The Coralliferous Group has a thickness of about 100 m (Cocks *et al.*, 1992) and crops out in three areas: at Mathew's Slade, to the south-east of the Three Chimneys, and immediately west of the pathway into the bay from Sandy Lane. The succeeding Gray Sandstone is about 300 m thick and exposed in the western and eastern parts of the bay, and in the central part between the entrance from Sandy Lane and Mathew's Slade. The Red Cliff Formation of the Milford Haven Group is less than 52 m thick and takes its name from the cliff at the eastern end of the bay.

Walmsley and Bassett (1976) drew the Llandovery–Wenlock series boundary within the Coralliferous Group at a position within the beds containing their Fauna II, just below the level at which *Costistricklandia lirata lirata* and *Eocoelia sulcata* disappear from the sequence. *Costistricklandia* becomes uncommon, and then disappears, above about 30 m and 50 m respectively from the base of the group (Bassett, 1982a). The record from Marloes by Hurst *et al.* (1978) of *E. cf. sulcata* and *Palaeocyclus porpita* some 2 m below the top of the group indicated to them that this level is very close to the series boundary. The conodont evidence from Marloes of Mabillard and Aldridge (1983) indicates that the whole group is close to the boundary. The fauna from beds high in the Coralliferous Group, which constitutes Fauna III of Walmsley and Bassett (1976), includes (from nearby Deadman's Bay) *Eocoelia angelini*, a species indicative of a lower Sheinwoodian *riccartonensis* Biozone age.

Lithologically, the Coralliferous Group consists of basal conglomerates passing upwards into siltstones, silty mudstones, thin sandstones, thin bioclastic limestones and occasional bentonites (Sanzen-Baker, 1972; Siveter *et al.*, 1989). In the top 12 m of the group there is a coarsening of the siltstones, these giving way to the sandstones that herald those of the succeeding Gray Sandstone Group. The Coralliferous Group is, above its basal beds, very fossiliferous. An extensive faunal list for Marloes was provided by Cantrill *et al.* (1916), and Walmsley and Bassett (1976) recorded from the Wenlock part of the group a total of more than 25 brachiopod, coral, trilobite, gastropod, nautiloid, bryozoan and bivalve species. Mabillard and Aldridge (1983) recovered a diverse conodont fauna from the unit, and also acritarchs, scolecodonts and possible chitinozoans.

The Gray Sandstone Group, overall, shows a coarsening upwards sequence. Horizons low in the group comprise sandstones, siltstones and grey, sandy mudstones with rottenstone bands. Sandstones become more common up-sequence, with the top 60 m of the group consisting of greenish-grey quartzitic sandstones and mudstones, the latter weathering olive-yellow and featuring cross- and lenticular-bedding and bioturbation. Channelling, also, becomes a notable feature of these higher beds (Siveter *et al.*, 1989). Fauna IV of Walmsley and Bassett (1976) is characteristic of the Gray Sandstone Group, the fauna belonging to a *post-Eocoelia*, *Salopina* Community that indicates an age of post-early Wenlock and probably no younger than mid- to late Wenlock. Fauna V, a depleted one of *Lingula*, *Cornulites* and indeterminate bivalves, occurs towards the top of the group and is undiagnostic with respect to age, but continuity of these higher beds with lower horizons and their probable rapid deposition argue, also, for a Wenlock age.

The Red Cliff Formation (Allen and Williams, 1978; Siveter *et al.*, 1989), of possible latest Wenlock to later Silurian age, is formed of red to purple mudstones, some having weakly developed calcretes and desiccation cracks, together with very fine- to fine-grained red, purple or greyish-pink sandstones. Channelling is present, as is bioturbation in the fine sandstones and coarse mudstones. There are no marine fossils.

Interpretation

The succession from the Coralliferous Group through to the Milford Haven Group represents, overall, a regressive, shallowing upwards sequence (Sanzen-Baker, 1972; Walmsley and Bassett, 1976; Allen and Williams, 1978; Siveter *et al.*, 1989). The Coralliferous Group is of marine origin, storm conditions and transportation of its constituent benthos

being suggested by concentration of fossils in shelly lenses. Walmsley and Bassett (1976) interpreted their fossil collections with respect to the nearshore to offshore Benthic Assemblages (BA1–5) of Boucout (1975). A brief deepening episode is indicated across the Llandovery–Wenlock part of the Coralliferous Group, by a shift from BA3 to BA3–4, after which, during the deposition of the rest of this group and until the end of Gray Sandstone times, shallowing is indicated by a shift to BA1. The Gray Sandstone Group has been interpreted as being of coastal marine origin in its lower part, and having shallow marine, intertidal and deltaic facies in its upper horizons. The Red Cliff Formation indicates a range of nearshore alluvial and fluvial environments; if any part of it is indeed of pre-Pridoli age, it would, in comparison with events in the main part of the Welsh Basin, represent the early onset of Old Red Sandstone facies conditions.

During the Wenlock the Pembrokeshire region was situated north of the Pretannia landmass on the south-west margin of the Welsh Basin (Bassett, 1974a; Hurst *et al.*, 1978; Cope and Bassett, 1987; Holland, 1992). The palaeoslope here was steeper than that of the central part of the basin margin in the Welsh Borderland area. Also, rocks of this age in Pembrokeshire are in the main siltstones and sandstones, unlike in the Welsh Borderland where carbonate muds and limestones predominate.

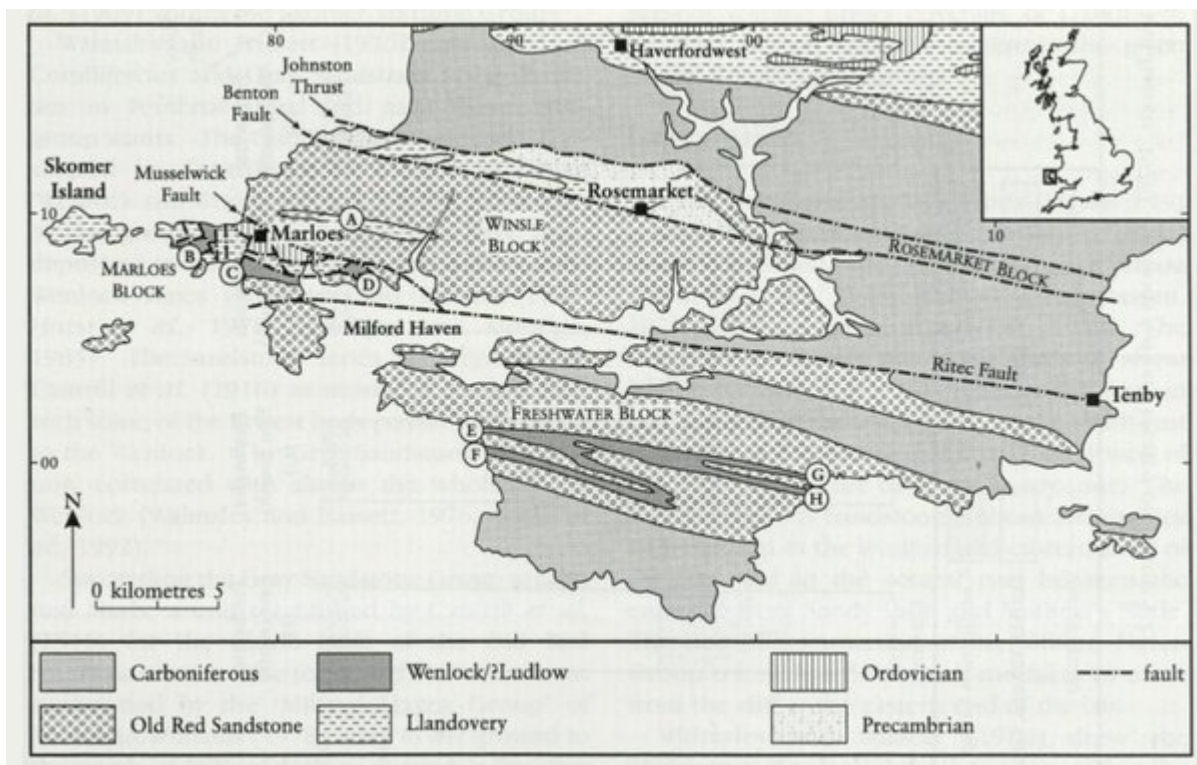
The Freshwater East site in the adjacent Freshwater Block shows a more restricted Silurian sequence, having only the Gray Sandstone and Milford Haven groups represented. Other linked sites of Wenlock age on or close to the southern margin of the Welsh Basin, all of them having elastic facies, include Penylan Quarry, Rumney Quarry and Rumney River in the Cardiff area, and Brinkmarsh Quarry and Buckover Road Cutting in the Tortworth Inlier.

Conclusions

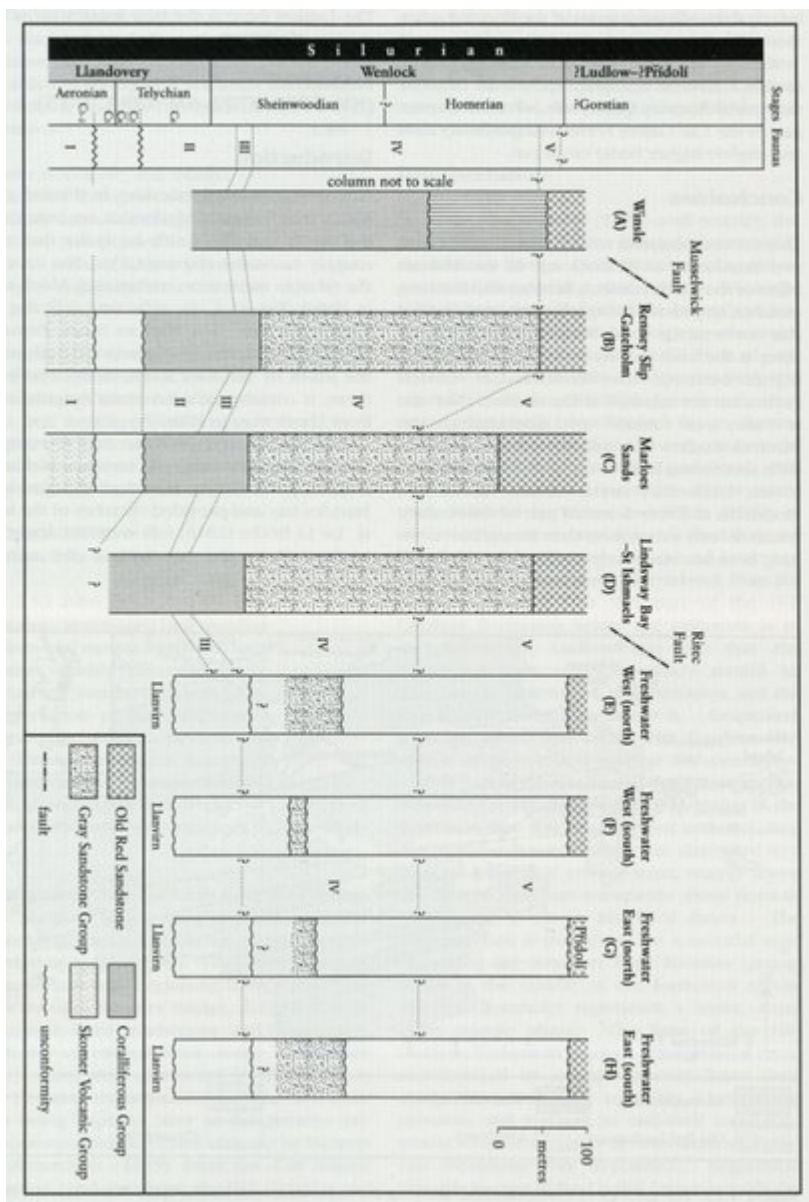
This is an outstanding and historic site for interpreting the geology of the whole of the Silurian sequence of the south-western margin of the Welsh Basin, providing data on the stratigraphy, biota, sedimentology, palaeoenvironment, palaeogeography and structure of the region. It boasts magnificent coastal sections exposing the Coralliferous Group, which straddles the Llandovery–Wenlock boundary, the Gray Sandstone Group, wholly Wenlock in age, and the Red Cliff Formation of the Milford Haven Group, the basal part of which may belong to the Wenlock. This sequence is a regressive one charting the change from fully marine to Old Red Sandstone facies fluvial environments. Brachiopods and corals feature strongly amongst the marine macrofauna, the former being useful for interpretation of depth and for biostratigraphical purposes. Conodonts aid dating of the Coralliferous Group.

The site is a most valuable resource to students at all levels, from school parties to research workers internationally.

[References](#)



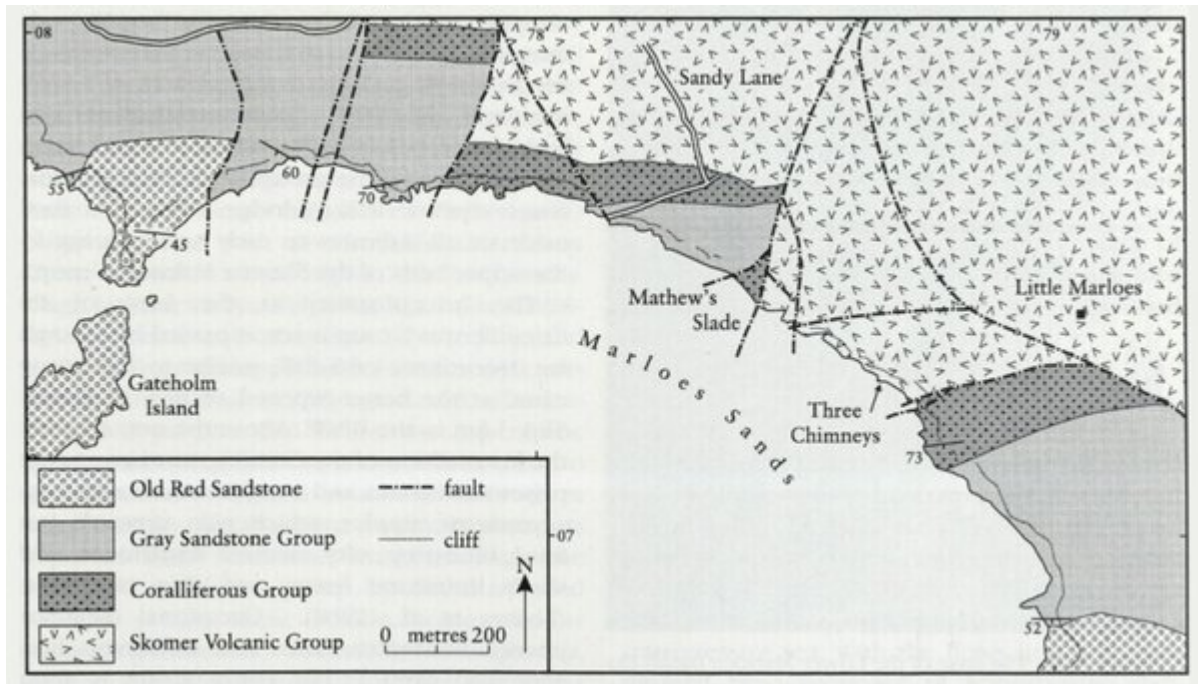
(Figure 4.23) The geology of Pembrokeshire, showing the main structural blocks (after Walmsley and Bassett, 1976). The letters A-H refer to the successions in Figure 4.24.



(Figure 4.24) Correlation of Silurian sections in Pembrokeshire (after Walmsley and Bassett, 1976). Sections A-H are located on Figure 4.23.



(Figure 4.25) Marloes Sands, Pembrokeshire. View looking south-east and including exposures of the Skomer Volcanic, Coralliferous and Grey Sandstone groups. (Photo: Derek J. Siveter.)



(Figure 3.19) Geological map of Marloes Sands (after Walmsley and Bassett, 1976).