Staffin Bay, Isle of Skye

[NG 473 687]-[NG 474 693]

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Introduction

The GCR site in the south-western corner of Staffin Bay on the east coast of northern Skye (Figure 6.30) includes exposures of the Skudiburgh Formation and the overlying basal beds of the Staffin Bay Formation (Upper Ostrea Member). It was primarily for these latter beds, thought to be Late Bathonian or Early Callovian in age (Sykes, 1975; Duff, 1980; Bradshaw and Fenton, 1982), that the site was included in the Bathonian GCR network. However, a more recent palynological investigation of the member at its type locality (Point 5 [NG 472 708] of Anderson and Dunham, 1966), *c.* 1.6 km north of the GCR site, suggests that it is Early Callovian in age (Riding, 1992). The exposures within the GCR site were described by Anderson and Dunham (1966) as the most complete section through the Mottled Clays (now Skudiburgh Formation) in northern Skye, and Hudson (1962) referred to them as the best section of that unit on Trotternish. However, when Harris and Hudson (1980) came to formalize the lithostratigraphy, they considered the exposure at Dun Skudiburgh (see GCR site report, this volume), on the west coast of Trotternish, to be superior, although the exposed section there is shorter.

Description

The most detailed description of the beds specific to the GCR site (rather than Staffin Bay in general) is that given by Anderson and Dunham (1966). A large-scale map of the foreshore exposures within the site, which lies between Point 1 [NG 474 694] of Anderson and Dunham (1966) and the River Brogaig, had been produced earlier by Anderson (1948) and, although not easy to follow, gives a general idea of the outcrop pattern on the beach. According to Andrews (1984), Anderson must have mapped the foreshore during an abnormally low spring tide because at normal tides, the outcrop shown on Anderson's map of the Upper Ostrea Member, repeated by a strike fault at the bottom of the beach, cannot be seen (Figure 6.31).

The following section through the Upper Ostrea Member, measured on the foreshore*c.* 366 m south of Point 1 [NG 474 694] where a wedge of sediments has been downthrown by bounding faults to the north and south, is taken from Anderson and Dunham (1966). The southern fault is small and displaces the Upper Ostrea Member by about a metre only. The northern fault has a greater throw, and brings the Upper Ostrea Member against the Skudiburgh Formation. Within a few metres, another nearly parallel fault brings the Skudiburgh Formation against Oxfordian strata. The measured section is interrupted first by a dolerite sill and then, near low water mark, by a strike fault that repeats the Upper Ostrea Member on the seaward side where, at very low tide, shales with *Neomiodon* can be seen (but see above). The beds dip steeply westwards at angles varying from 30° to 90°. A graphic section through the Skudiburgh Formation is given by Andrews (1985) and forms the basis of (Figure 6.32).

	Thickness (m)
Staffin Bay Formation	
Upper Ostrea Member	
21: Shale, black, calcareous	0.3
20: Limestone, oyster-rich, sandy, layer of cone-in-cone structure near the middle	0.3
19: Shale, black; well-preserved *Neomiodon*	0.15
18: Shales, rusty, black; *Praeexogyra hebridica* (Forbes)	2.44
17: Shale, black, calcareous	1.22
16: Shale, indurated; *Praeexogyra hebridica*	0.76
15: Shale, indurated	0.05–0.08

Dolerite sill	up to 4.6
14: Shale, black	0.46
13: Limestone, dark; *Praeexogyra hebridica*	0.15
12: Shale, dark; *Praeexogyra hebridica*	0.91
11:Shale, black	0.53
10: Limestone, dark; *Praeexogyra hebridica*	0.10
9: Shale, grey; abundant *Neomiodon*	?1.8

Skudiburgh Formation (see (Figure 6.32))

Above this section, the Upper Ostrea Member is also exposed in a low cliff. Contorted, rusty, black shales pass upwards, at the northern end of the exposure, into shales with *Praeexogyra hebridica;* the beds are intruded by an irregular mass of dolerite. According to Anderson and Dunham (1966), this section was undoubtedly that reported by Murchison (1829b) whose updated faunal list includes, in addition to those bivalves cited above, the bivalve *Isognomon murchisoni* (Forbes), and the gastropods *Neridornus staffinensis* (Forbes) and *Viviparus scoticus* (Tate).

Interpretation

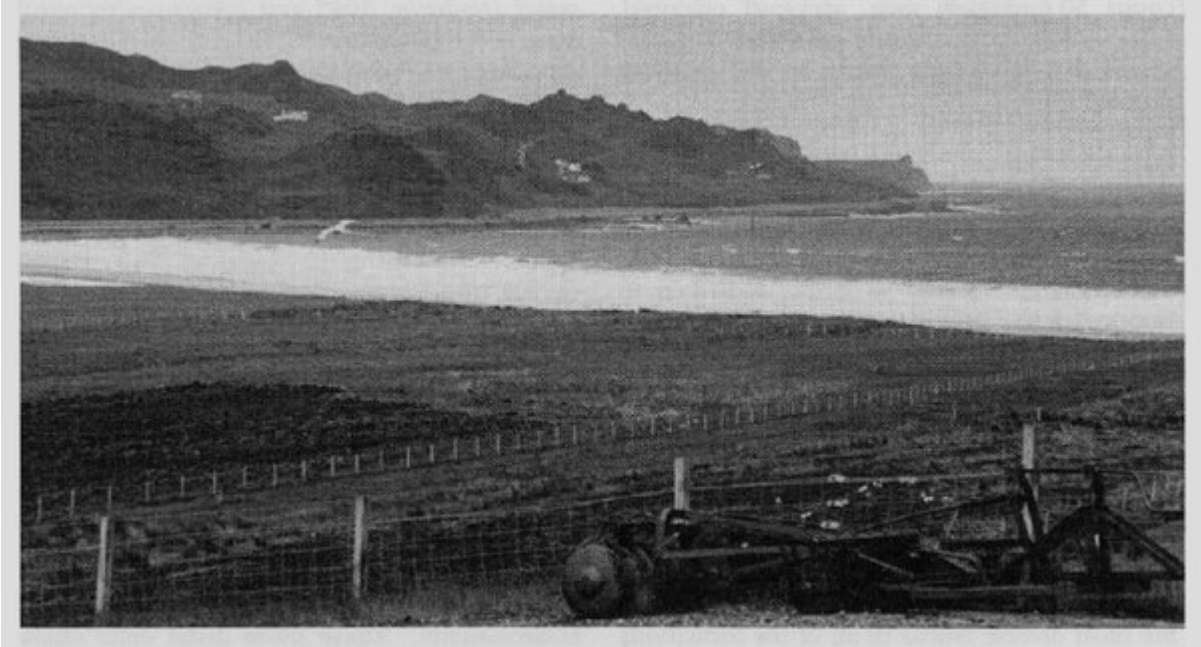
The base of the Upper Ostrea Member (and Staffin Bay Formation) is taken at a sharp upwards lithological change from red and green mottled and dark-grey clays at the top of the Skudiburgh Formation into dark-grey shales with shell beds (Harris and Hudson, 1980). A thin basal shell-bed including *Isognomon murchisoni* as well as *Neomiodon* was noted by these authors and Hudson and Morton (1969). The molluscan fauna, dominated by bivalves, was described by Anderson and Cox (1948). It is of low diversity, particularly as regards individual beds, and is clearly not fully marine, though more so than most of the underlying Great Estuarine Group (Morton and Hudson, 1995). Variations in faunal diversity between beds almost certainly reflect fluctuations in salinity. According to Morton and Hudson (1995), there have been no recent sedimentological or palaeoecological analyses but the depositional environment was probably a coastal lagoon. The palynofloras recovered by Riding (1992) from the member's type section, a little to the north of the GCR site, are dominated by miospores with lesser proportions of marine micro-plankton. The florules are of relatively low species-diversity with the dominance of just one or a few taxa; this is typical of marginal marine environments subject to salinity fluctuations. The presence of the dinoflagellate cyst *Rhynchodiniopsis cladophora* (Deflandre 1938) Below 1981 amongst the marine microplankton was considered by Riding (1992) to be conclusive evidence that the Upper Ostrea Member is Early Callovian rather than Late Bathonian in age; all of the other taxa recovered could be either Late Bathonian or Early Callovian in age.

The characteristic features of the Skudiburgh Formation in Trotternish, i.e. the red-green mottling, the calcareous concretions, and sand and silt intercalations, are all seen at Staffin Bay. According to Andrews (1985), the red mottled clays represent floodplain sediments with a water table close to the surface at the time of deposition. The ripple marks that occur in some of the silty and sandy beds are probably the coarser fraction of more extensive overbank flooding events and laterally impersistent silt-stones and sandstones may have been produced by crevasse splays or small channels. For further assessment of the depositional environments indicated by this alluvial succession see Dun Skudiburgh GCR site report (this volume).

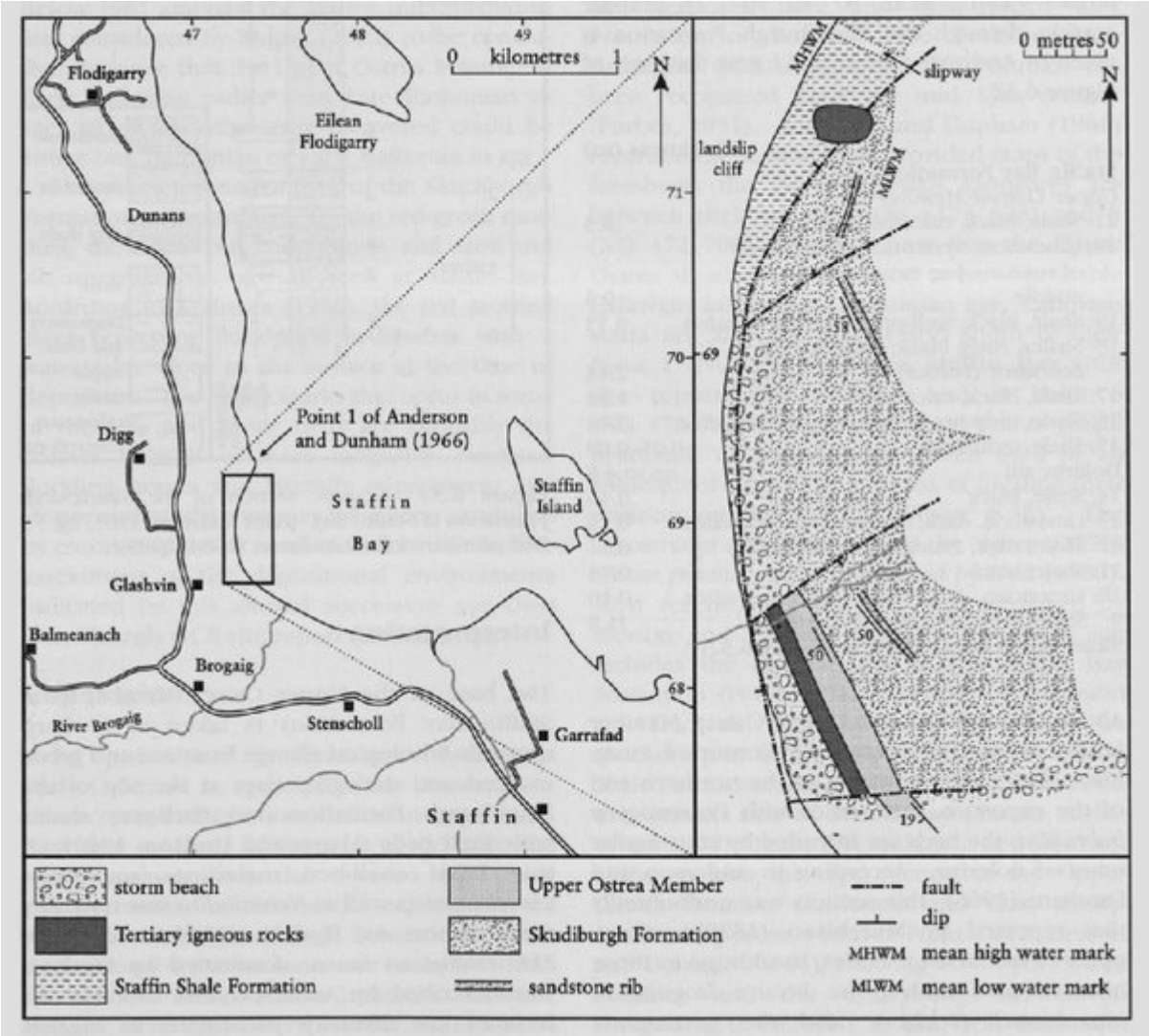
Conclusions

If the Upper Ostrea Member is correctly dated as Early Callovian in age, Staffin Bay shows a section across the Bathonian–Callovian stage boundary, and evidence of the start of the Callovian marine transgression that covered the coastal plain–terrestrial environments represented by the rocks of the Skudiburgh Formation. These depositional environments are unique within the onshore British Middle Jurassic succession, and the facies that can be studied at Staffin Bay are of considerable palaeogeographical and sedimentological interest.

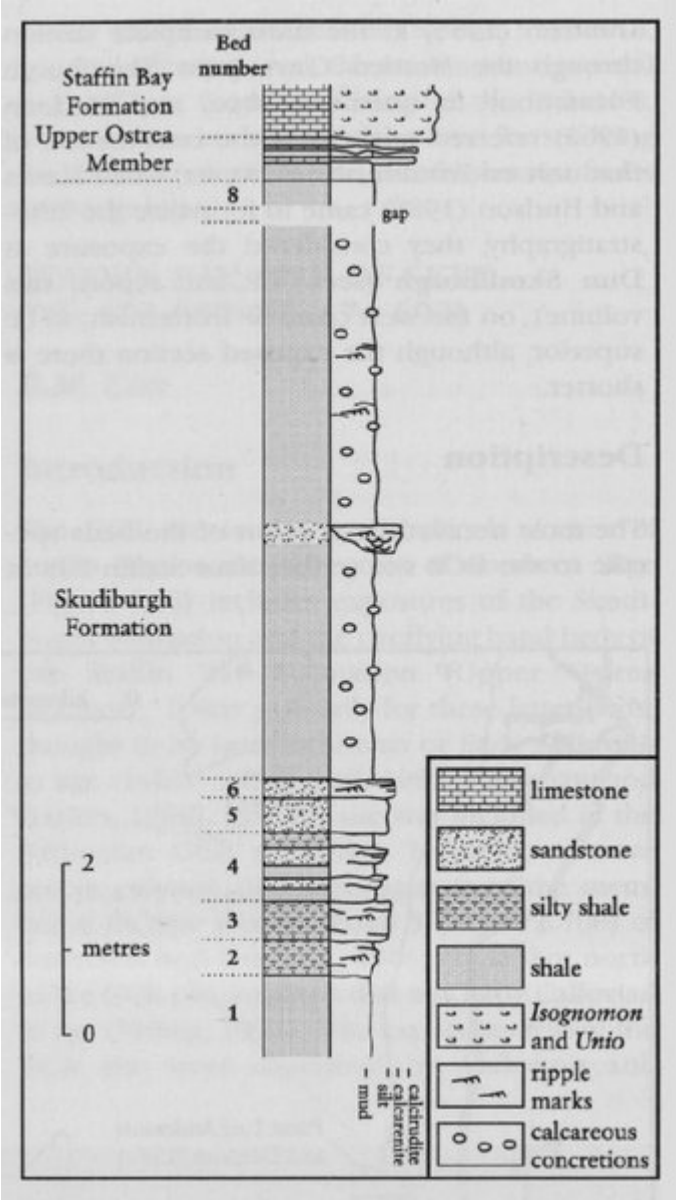
References



(Figure 6.30) General view of Staffin Bay looking north-west. The foreshore exposures on the far side of the bay comprise the GCR site. (Photo: M.G. Sumbler.))



(Figure 6.31) Locality and geological sketch maps for the Staffin Bay GCR site. (Partly based on Andrews, 1984, fig. 7.))



(Figure 6.32) Graphic section of the Skudiburgh Formation at Staffin Bay. (After Andrews, 1985, fig. 7.) Bed numbers follow Andrews (1984, 1985).)