

CORNELIAN BAY

J.K. Wright

OS Grid Reference: TA064854

Introduction

The cliff section at the southern end of Cornelian Bay, 50 m due west of the headland known as 'Osgodby Nab' (not 'Osgodby Point' as on the OS map) or 'Knipe Point' (Figures 4.11 and 4.14), represents one of the few localities in Britain where a stratigraphical junction between the Oxfordian and the underlying Callovian Stage is well exposed. The earliest reliable account of the geology of this part of the Yorkshire coast was provided by Phillips (1829), who based his stratal identifications on those of his prestigious uncle William Smith, the 'Father of English Geology'. Works by Hudleston (1876), Blake (1891), Fox-Strangways (1892) and Kendall and Wroot (1924) referred to the site in general terms. However, it was the studies of the regional stratigraphy by Wright (1968) that brought the site to prominence, and subsequently it was the decision of George *et al.* (1969) to insert the 'Golden Spike' defining the base of the Oxfordian Stage at this locality that made this a site of international scientific importance.

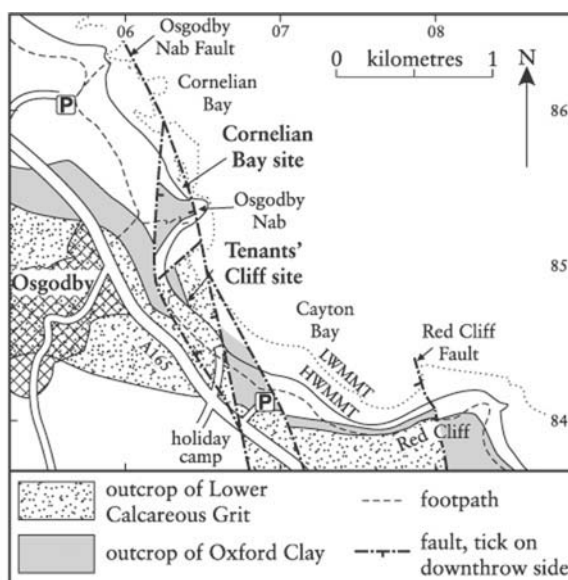


Figure 4.11: Locality map of the Tenants' Cliff and Cornelian Bay GCR sites. Outcrop of the Oxford Clay and Lower Calcareous Grit from Wright (1968, fig. 9).

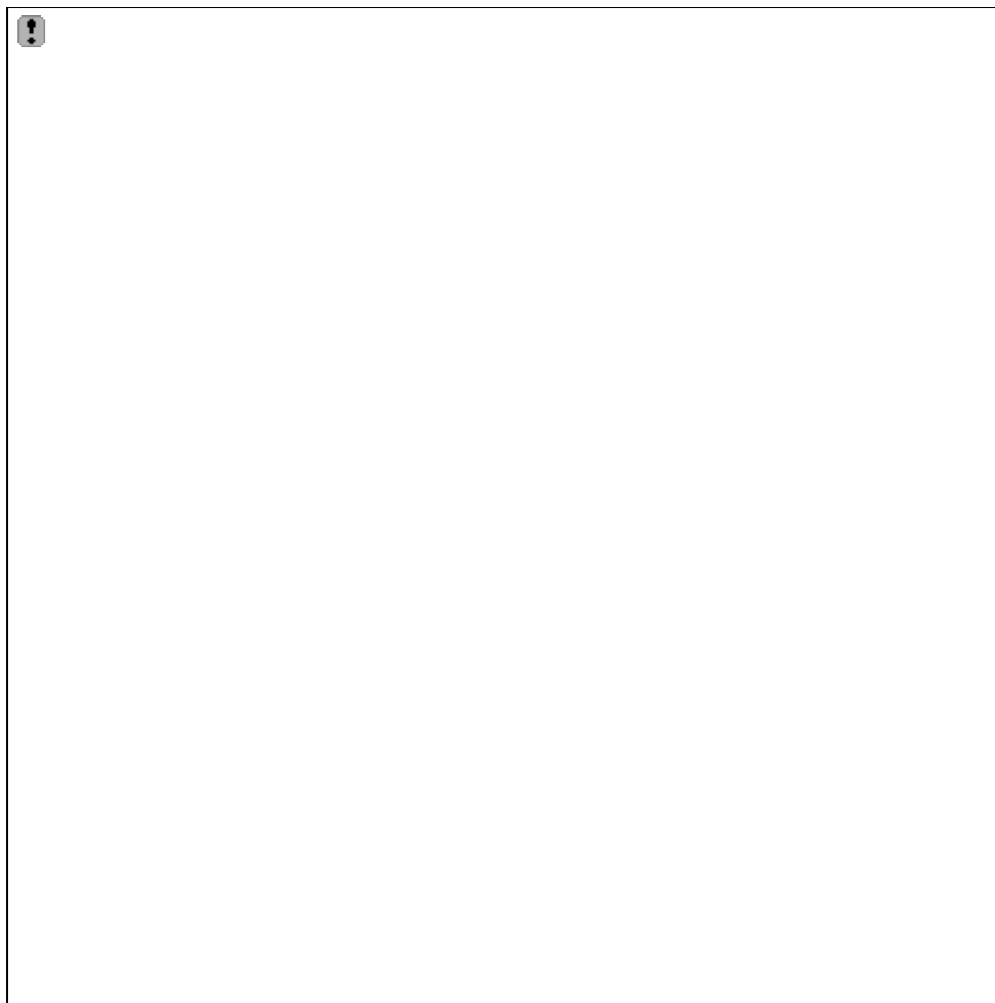


Figure 4.14: General view of the southern end of Cornelian Bay showing the Middle Jurassic Ravenscar Group (on the left) faulted against easterly dipping Osgodby Formation sandstones (Callovian) overlain by Weymouth Member Oxford Clay. (Photo: J.K. Wright.)

Description

The Cornelian Bay exposure shows a continuous section through 8 m of Callovian strata and some 10 m of Oxfordian strata, which dip gently south-eastwards at the base of the low cliff. The basal Scaburgense Subzone of the Oxfordian Stage is present in very condensed facies (Figure 4.14), as is evident from the following measured section adapted from Wright (1968). Bed numbers continue up from the Callovian section below.

		Thickness (m)
<i>Oxford Clay Formation</i>		
<i>Weymouth Member, Praecordatum Subzone</i>		
14	Grey, silty clay containing, in a thin band 1 m up, <i>Cardioceras (Scarburgiceras) praecordatum</i> Douvillé, <i>Peltoceras (Peltoceratoides) arduennensis</i> (d'Orbigny) and fossil wood	seen to 9
<i>Scarburgense Subzone</i>		
13	Tough, medium-grey, fine silty clay with abundant black chamosite ooliths. Scarce ammonites include <i>C. (S.) praecordatum</i> and <i>C. (S.) scarburgense</i> (Young and Bird)	0.10
12	Sticky, black clay	0.02
11	Tough, medium-grey, fine silty clay with abundant black chamosite ooliths and a line of calcareous nodules containing well-preserved ammonites 0.05 m up. Contains <i>Quenstedtoceras omphaloides</i> (J. Sowerby), <i>C. scarburgense</i> , etc.	0.18
10	Grey, slightly sandy shale with scattered green chamosite ooliths and a line of calcareous nodules 0.08 m up. Just below this occurs a band with frequent excellently preserved ammonites: <i>C. (S.) scarburgense</i> , <i>Q. mariae</i> (d'Orbigny), <i>Q. aff. macrum</i> (Quenstedt); also <i>Gryphaea dilatata</i> J. Sowerby, <i>Chlamys fibrosus</i> (J. Sowerby) and <i>Pleuromya</i> sp.	0.20
<i>Osgodby Formation</i>		
<i>Hackness Rock Member, Lamberti Zone</i>		
9	Green, chamositic sand	0.10

A log of the section is given in Figure 4.15. The attenuation of the basal Lower Oxfordian is more marked on the Yorkshire coast than in any other area in Britain. At Cornelian Bay evidence of slow sedimentation is abundant, the Scarburgense Subzone comprising only 0.4 m of fine, nodular, chamositic clays (beds 9–13). (In comparison, this subzone has its thickest development (37.5 m) in the Warlingham Borehole in Surrey; Callomon and Cope, 1971). The ammonites are preserved uncrushed, as phosphatic internal moulds (Figure 4.5P). A facies change then occurs, with the deposition of the tough, silty clays of the Praecordatum Subzone. Sedimentation was much more rapid, and the ammonites are crushed, though the preservation can still be quite good (Figure 4.5O).

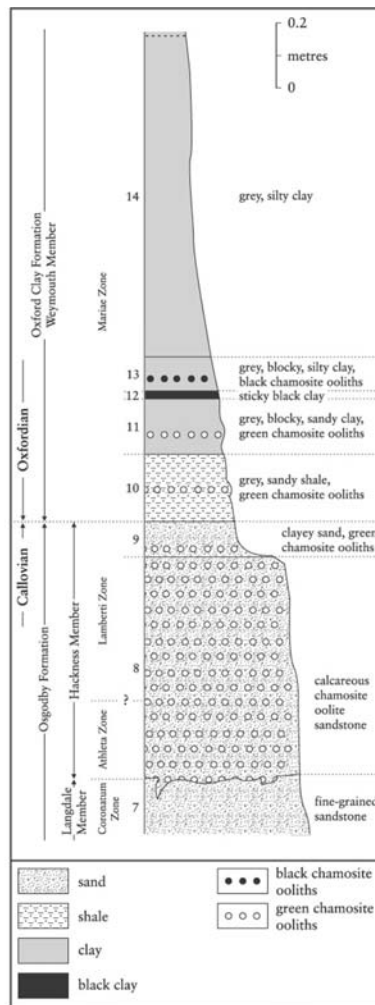


Figure 4.15: Log of the Upper Callovian–Lower Oxfordian sequence at Cornelian Bay (after Wright, 1969, fig. C4).

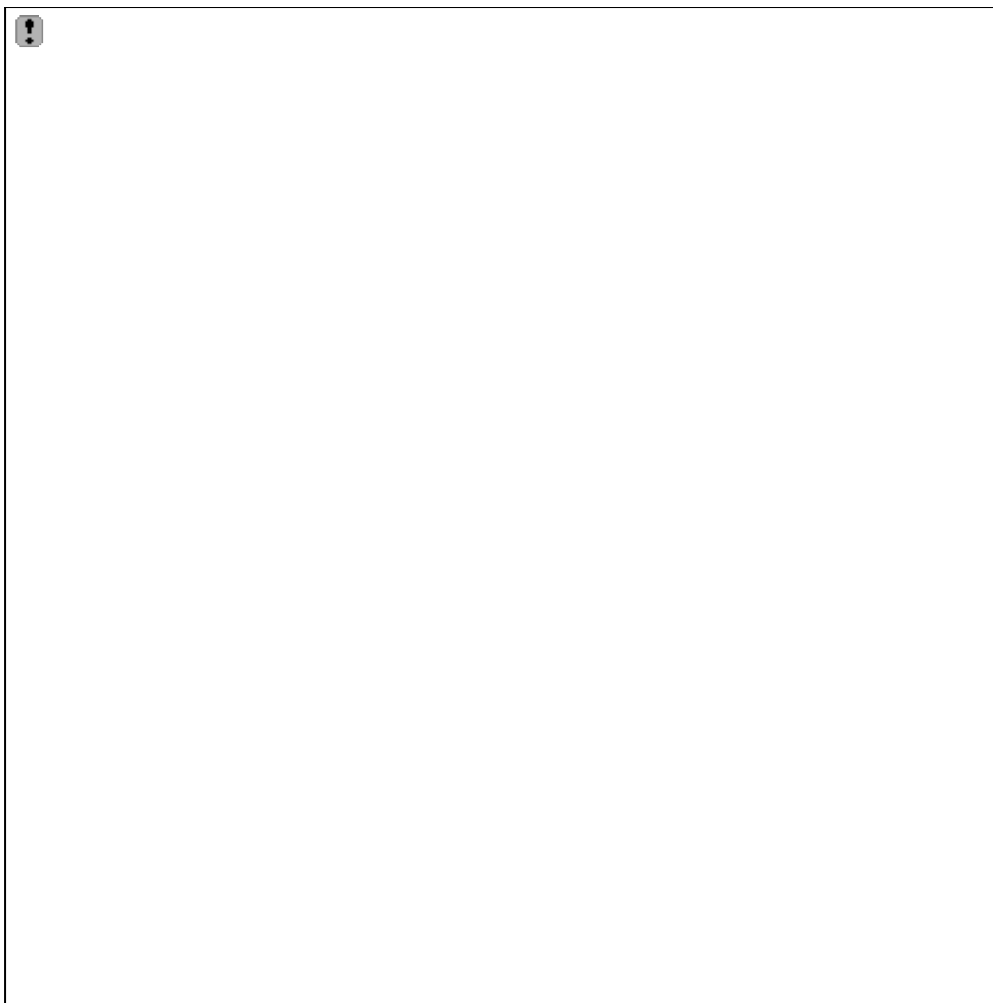


Figure 4.5: Selection of ammonites from the Corallian Group of the Cleveland Basin. (A) *Amoeboceras nunningtonense* Wright (holotype), Spaunton Sandstone, Leysthorpe Quarry, m27, $\times 1$. (B) *A. glosense* (Bigot and Brasil), Newbridge Member, Leysthorpe Quarry, U/1/14, $\times 1$. (C) *A. transitorium* Spath, Newbridge Member, Leysthorpe Quarry, U/1/5, $\times 1$. (D) *A. ilovaiskii* (M. Sokolov), Spaunton Sandstone, Newbridge Quarry, U/2/38, $\times 1$. (E) *A. newbridgense* Sykes and Callomon, Spaunton Sandstone, Newbridge Quarry, U/2/20, $\times 1$. (F) *Perisphinctes* (*Pseudarisphinctes*) *pachachii* Arkell, Spaunton Sandstone, Spaunton Moor Quarry, U/3/63, $\times 0.33$. (G) *P. (Dichotomosphinctes)* sp. Newbridge Beds, Leysthorpe Quarry, U/1/103, $\times 0.7$. (H) *Cardioceras* (*Cardioceras*) *persecans* S. Buckman, Birdsall Calcareous Grit, Filey Brigg, YM1983/45F, $\times 1$. (I) *C. (C.) cordatum* (J. Sowerby), Birdsall Calcareous Grit, Flassen Gill, YM1983/36F, $\times 1$. (J) *C. (Vertebriceras)* aff. *dorsale* S. Buckman, Hambleton Oolite, Spikers Hill Quarry, C/2/17, $\times 1$. (K) *C. (Plasmatoceras)* *popilaniense* Boden, Hambleton Oolite, Spikers Hill Quarry, C/2/59, $\times 1$. (L) *C. (Scarburgiceras)* *harmonicum* Arkell, Tenants' Cliff Member, Tenants' Cliff, YM1983/17F, $\times 1$. (M) *C. (S.) reesidei* Maire, Tenants' Cliff Member, Tenants' Cliff, YM1983/20F, $\times 1$. (N) *C. (Vertebriceras)* aff. *phillipsi* Arkell, Tenants' Cliff Member, Tenants' Cliff, YM1983/23F, $\times 1$. (O) *C. (S.) praecordatum* (Douvill ), Weymouth Member, Cayton Bay Waterworks, YM1983/9F, $\times 1$. (P) *C. (S.) scarburgense* (Young and Bird), Weymouth Member, Cornelian Bay, YM1983/3F, $\times 1$. (Photos: (A–E), (H, I), (L–P), J.K. Wright; (F, G), K. D'Souza; (J, K) K. Denyer. Collections: Prefixes 'U', 'C', J.K. Wright Collection; 'YM', Yorkshire Museum Collection, York; 'm', Woodend Museum, Scarborough.)

Interpretation

The ammonites of Bed 10 consist solely of Boreal cardioceratids with no Tethyan forms present. Connections with the Tethyan seas to the south had yet to be established. The bivalves *Gryphaea*, *Chlamys* and *Pleuromya* indicate non-toxic bottom conditions favouring both infaunal and epifaunal suspension feeders. Sedimentation appears to have been in restricted basins, preventing ingress of clastic sediment. The silty clays of the overlying Praecordatum Subzone (Bed 14) represent the establishment of more open-water conditions over the whole area. Offshore shelf conditions predominated, with a limited benthic fauna but

numerous free-swimming ammonites. Tethyan and Boreal forms are found in roughly equal proportions, *Peltoceras*, *Aspidoceras* and *Taramelliceras* representing the aforementioned, while the Boreal *Cardioceras* and *Quenstedtoceras* were joined by *Goliathiceras*.

Attenuation of the basal strata of the Oxfordian sequence on the Yorkshire coast probably represents a response to the effects of deep-seated tectonic movements affecting deposition near to the Market Weighton High, the northern edge of which lies only 15 km to the south (Kent, 1980a). The basal Oxfordian in much of north-west Europe is either thin or absent, there being a regional hiatus or lacuna at this horizon. In those areas affected by episodes of still-stand and erosion, the earliest Scarborough Subzone faunas occur in small pockets of sediment found in hollows, and have been overlooked until recently (Wright, 1983).

The junction between the Oxfordian and Callovian stages was taken by George *et al.* (1969) between beds 9 and 10. However, subsequent to the choice of Cornelian Bay as the British stratotype section for the base of the Oxfordian, it has become apparent that the succession here may not be entirely complete. Wright (1983) records silty, sandy beds containing *Quenstedtoceras paucicostatum* (Lange) overlying the Lamberti Zone Hackness Rock at Gristhorpe Cliffs (TA 095 833). When first described by Marchand (1979), the *Q. paucicostatum* fauna was considered to be the earliest fauna of the Oxfordian. However, subsequent work (Callomon and Cope, 1995) has shown that the *Q. paucicostatum* fauna is the highest fauna of the Callovian Stage. The *C. scarburgense* silts appear to have overstepped the *Q. paucicostatum* silts at Osgodby Nab. This evidence of a non-sequence or non-sequences at this site, and the problem that the site is occasionally covered by slipped clay (Figure 4.14), has led Marchand and Fortwengler (1995) to propose a French locality as the international standard for the Callovian–Oxfordian boundary. This action does not detract from the importance of the Cornelian Bay site as one of the best localities in Britain at which the Callovian–Oxfordian junction can be examined.

Conclusions

The Cornelian Bay site provides one of the few sections in Britain where the conformable contact between basal Oxfordian Scarborough Subzone rocks and the underlying Lamberti Zone beds of the Callovian sequence is well exposed and can be studied in detail. The base of the Weymouth Member of the Upper Oxford Clay is thinly developed, there being a regional hiatus present at the level of the highly condensed Scarborough Subzone, which is only half a metre in thickness. This locality is important in palaeogeographical studies of this heavily faulted region north of the Market Weighton High, and is essential in elucidating the complex biostratigraphy of the Oxfordian of the Sub-Boreal Province.

Reference list

- Blake, J.F. (1891) The geology of the country between Redcar and Bridlington. *Proceedings of the Geologists' Association*, **12**, 115–44.
- Callomon, J.H. and Cope, J.C.W. (1995) The Jurassic geology of Dorset. In *Field Geology of the British Jurassic* (ed. P.D. Taylor), Geological Society, London, pp. 51–103.
- Fox-Strangways, C. (1892) *The Jurassic Rocks of Britain, I. Yorkshire*, Memoir of the Geological Survey of the United Kingdom, HMSO, London.
- George, T.N., Harland, W.B., Ager, D.V. *et al.* (1969) Recommendations on stratigraphical usage. *Proceedings of the Geological Society of London*, **1656**, 139–66.
- Hudleston, W.H. (1876) The Yorkshire Oolites. Part 2, The Middle Oolites. Introduction and Section 1. *Proceedings of the Geologists' Association*, **4**, 353–410.
- Kendall, P.F. and Wroot, H.E. (1924) *The geology of Yorkshire*, 2 vols, privately printed in Vienna.
- Kent, P.E. (1980a) Subsidence and uplift in East Yorkshire and Lincolnshire – double inversion. *Proceedings of the Yorkshire Geological Society*, **42** (4), 505–24.
- Marchand, D. (1979) Un nouvel horizon paléontologique: l'horizon *apaucicostatum* (Oxfordien inférieure, zone à Mariae, base de la sous-zone à Scarborough). *Compte Rendu Sommaire des Séances de la Société Géologique de France*, **1979** (3), 122–4.
- Marchand, D. and Fortwengler, D. (1995) Selection of the Oxfordian G.S.S.P.: Proposal for Savournon/Thoux sections, south-eastern France (Hautes-Alpes Department). *Kimmeridgian*

- Boundary Working Group Report*. Unpublished report of the International Subcommittee on Jurassic Stratigraphy.
- Phillips, J. (1829) *Illustrations of the Geology of Yorkshire. Part 1, The Yorkshire Coast*, Murray, London.
- Wright, J.K. (1968) The stratigraphy of the Callovian rocks between Newtondale and the Scarborough coast, Yorkshire. *Proceedings of the Geologists' Association*, **79**, 363–99.
- Wright, J.K. (1983) The Lower Oxfordian (Upper Jurassic) of North Yorkshire. *Proceedings of the Yorkshire Geological Society*, **44**, 249–81.