East Fleet–Small Mouth

[SY 659 767]–[SY 667 763] and [SY 669 765]–[SY 672 772]

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Introduction

The foreshore and low, slipped and weathered cliffs at the eastern end of The Fleet at Wyke Regis [SY 659 767]–[SY 667 763] and south of Sandsfoot Castle [SY 669 765]–[SY 672 772] (for locations see (Figure 2.12), (Figure 2.22), expose the Baylei and Cymodoce zones of the basal Kimmeridgian, together with the underlying Oxfordian. The sections at both localities are now degraded because they are protected from marine erosion by, respectively, Chesil Beach and Portland Harbour breakwater. Nevertheless, they have featured in the literature for over a century, and continue to yield fossils from the Oxfordian–Kimmeridgian boundary beds. The boundary succession is thicker here than at other localities on the Dorset coast (Cox and Sumbler, 1994).

Description

The sections have been reported by Sedgwick (1826), Buckland and De la Beche (1836), Damon (1860), Waagen (1865), Blake (1875), Blake and Hudleston (1877), Woodward (1895), Strahan (1898), Salfeld (1914), Arkell (1933, 1936, 1947a), Morris (1968), Birkelund *et al.* (1978), Brookfield (1978), Cox and Gallois (1981) and House (1989). The early authors concentrated on the section near Sandsfoot Castle, which, in the 19th century, was the best available exposure of basal Kimmeridgian strata, such that Waagen (1865) used it for the first definition of the base of the Kimmeridge Clay. South of Sandsfoot Castle, towards Ferry (or Small Mouth) Bridge, the basal beds of the latter formation, up to *c.* 15 m thick but often badly slipped, were formerly exposed above the Osmington Mills Ironstone and Ringstead Clay members of the Upper Oxfordian (Figure 2.23) but recent building works have compromised the exposure (J.K. Wright, pers. comm.). The Oxfordian beds at this locality are included in the Oxfordian GCR Block (see site report for Sandsfoot, this volume). Later authors seem to have found the slightly shorter section at the eastern end of The Fleet more favourable. There, the low cliffs north-west of Ferry Bridge, and the foreshore beyond the first promontory, expose beds from the Ringstead Clay through to the lowest beds of the Kimmeridge Clay. The beds, which dip gently and steadily to the south, are badly slumped and must be exposed by digging, but the same stratigraphical and faunal succession as at Sandsfoot follows simply from the relative position of the beds on the beach. The most prominent single bed is a thin (up to *c.* 1 m) siltstone crowded with 'myid' and other bivalves. Birkelund *et al.* (1978), who named it the Wyke Siltstone, reported at least 17 species of bivalves as well as gastropods and occasional ammonites. The bed is also seen at Sandsfoot. At both localities, a bed of similar lithology, in an otherwise mudstone succession, occurs 1–2 m above the Wyke Siltstone, and was named the Black Head Siltstone by Cox and Gallois (1981). Lower down in the succession, the Nana Bed, rich in the small oyster *Nanogyra nana* (J. Sowerby), and the Inconstans Bed, with the eponymous brachiopod *Torquirhynchia inconstans* (J. Sowerby), have also been recorded together with clays rich in the flat oyster *Deltoideum delta* (Wm Smith) (Arkell, 1947a) (Figure 2.23). The Wyke Siltstone and overlying beds have yielded species of the ammonite *Rasenia* (Birkelund *et al.,* 1978), and *Pictonia* is reported from the beds below (House, 1989). In addition, the low cliffs to the east of Ferry Bridge have yielded many marine reptile remains (e.g. Delair, 1986) and this part of the site is included in the GCR volume on British fossil reptiles (Benton and Spencer, 1995). At both localities, the youngest Oxfordian stratum (the Osmington Mills Ironstone but, in the past, often referred to as the 'Ringstead Coral Bed') is a pale ironshot oolite full of fossils, notably serpulids and the coarsely corrugated bivalve *Ctenostreon,* but without corals.

Interpretation

The lithostratigraphical classification of the Kimmeridgian and underlying Oxfordian beds at Wyke Regis and Sandsfoot largely follows that used for over a century with the Kimmeridge Clay Formation overlying the Corallian Group, their mutual boundary being marked by the base of the Inconstans Bed (Figure 2.23). Blake (1875) suggested that the

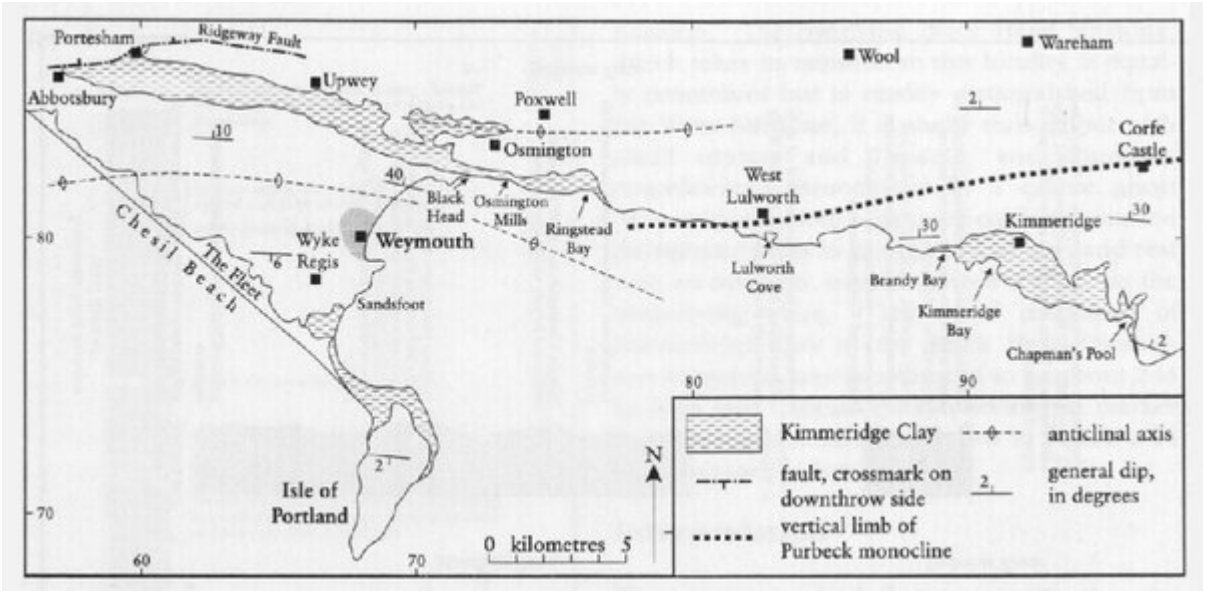
boundary beds should be assigned to a separate unit, the Passage Beds, although in his later account with WH. Hudleston (Blake and Hudleston, 1877), this term was only mentioned in passing (and then as 'Kimmeridge passage-beds'). Indeed, for the section at Ringstead Bay (see site report for Ringstead, this volume), Blake and Hudleston (1877) reported the '*Rhynchonella*-bed' (= Inconstans Bed) as 'the true base of the Kimmeridge Clay', following Waagen (1865). Although Arkell (1933) scorned the idea of the 'Passage Beds' as a separate unit, Brookfield (1978) attempted to revive it as the 'Passage Beds Formation' in which he included the beds from the base of the Ringstead Clay up to some way above the Black Head Siltstone (Figure 2.23). Although he cited faunal, lithological and mineralogical evidence to support the case for the new formation, his main contention was that the Passage Beds were predominantly are naceous with a typical Corallian fauna whereas the overlying beds of the Kimmeridge Clay comprised uniform black shales with an impoverished macro- and microfauna. These observations are not in accord with those of later authors, or indeed of Blake and Hudleston (1877), and the term 'Passage Beds' has not found acceptance (Cope, 1980; Cox and Gallois, 1981; Wright, 1986). The Ringstead Coral Bed, to which the youngest unit of the Oxfordian succession is often referred, is now recognized as only a local development (see site report for Ringstead, this volume) within a more widespread facies (the Osmington Mills Ironstone Member) comprising very variable limonite-oolite marl, which is occasionally well enough cemented to form an impure limestone (Brookfield, 1978; Wright, 1986).

The Fleet section was used by Birkelund *et al.* (1978) in their assessment of the ammonite genus *Rasenia* and the associated stratigraphy of the Lower Kimmeridgian Cymodoce Zone. Both *Pictonia,* characteristic genus of the underlying Baylei Zone, and *Rasenia* are in need of mono graphic treatment. Within the Cymodoce Zone, these authors recognized four horizons characterized by different *Rasenia* faunas, three of which were recognized in the Fleet section. The oldest horizon, occurring in the Wyke Siltstone there, is characterized by the microconch *R.* (*Prorasenia*) cf. *triplicata* (J. Sowerby) and macroconch *Rasenia* cf. *cymodoce* (d'Orbigny). The next youngest horizon, also recognized on the Fleet foreshore, is characterized by the microconch *R.* cf. and aff. *involuta* Spath and the macroconch *R.* (*Eurasenia*) spp.. The third horizon was not identified in the Fleet exposure but the fourth and youngest horizon, characterized by the microconch *R.* (*Rasenioides*) *lepidula* (Oppel) and the macroconch *R.* (*Semirasenia*) *askepta* Ziegler, was reported from the clays at its southernmost end. The base of the Wyke Siltstone, which correlates with KC 5 of Gallois and Cox (1976), was taken by those authors as marking the base of the Cymodoce Zone (Cox and Gallois, 1981), although Birkelund *et al.* (1983) thought it best to defer formal definition of the zone, in terms of its base in a type section, until the relationships between all the ammonite horizons, including some additional *Rasenia* horizons recognized in eastern England, Normandy and East Greenland, had been worked out more fully. Higher up in the Cymodoce Zone, the Black Head Siltstone correlates with KC 8 (Cox and Gallois, 1981).

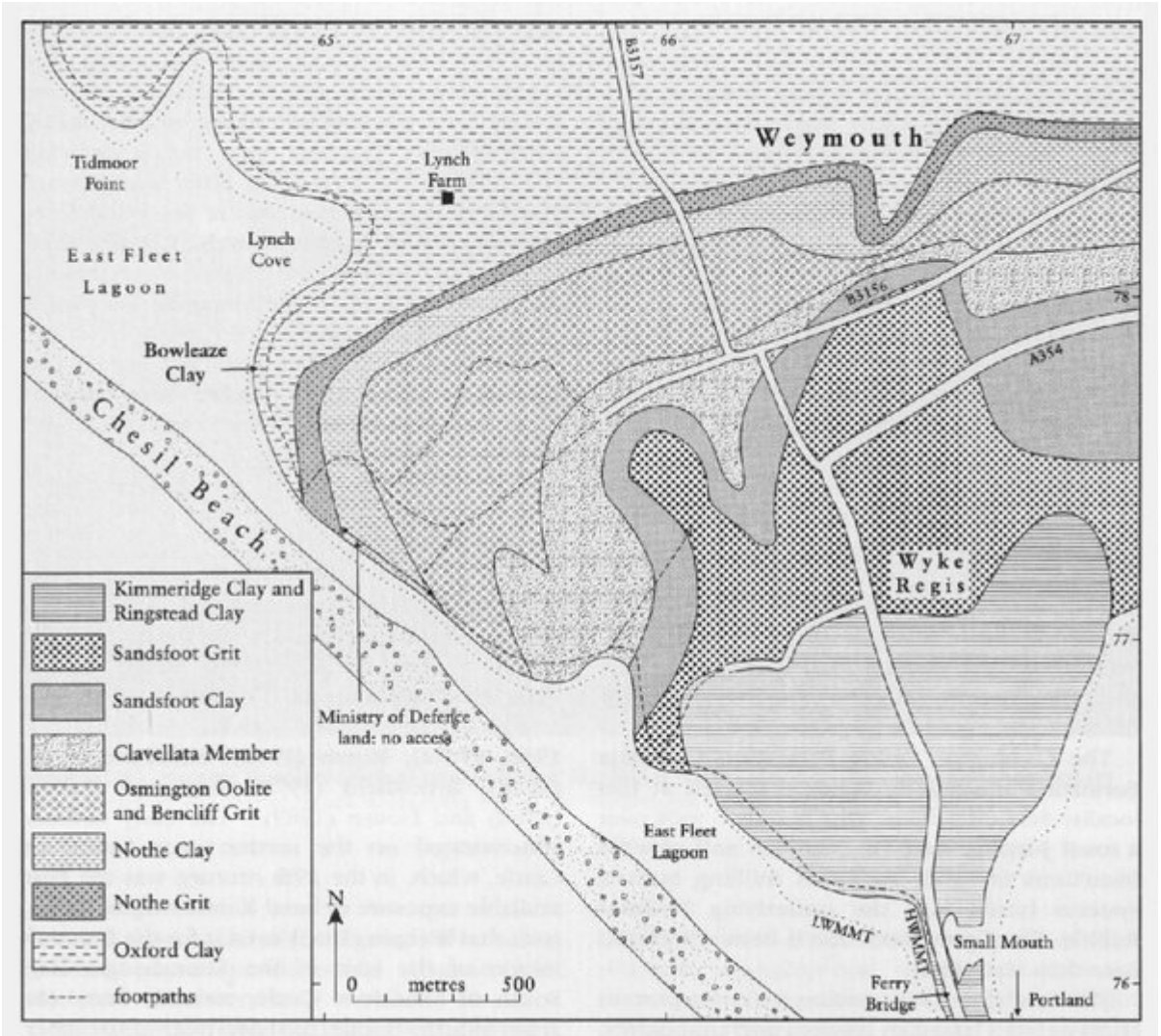
Conclusions

The sections in the Kimmeridge Clay Formation south of Weymouth have played an important role in Oxfordian and Kimmeridgian stratigraphy, particularly since they were investigated in the 19th century when exposures in the low cliffs south of Sandsfoot Castle were particularly good. The exposures of Oxfordian strata here have been key sections for the lithostratigraphical units in the upper part of the Corallian Group but also for the basal beds of the Kimmeridge Clay above. Both here and at the eastern end of The Fleet, the Kimmeridgian beds are richly fossiliferous. They have yielded rich invertebrate faunas, including ammonites that have enabled a clearer understanding of the succession of *Rasenia* species in the Cymodoce Zone, as well as one of the most varied Kimmeridgian reptile faunas known; according to Benton and Spencer (1995), it is the best site for Kimmeridgian turtles and pterosaurs. The succession through the basal Kimmeridgian beds is thicker here than at other localities on the Dorset coast (see site report for Black Head and Ringstead, this volume), and the section near Sandsfoot Castle is the historical type section for the base of the Kimmeridge Clay Formation.

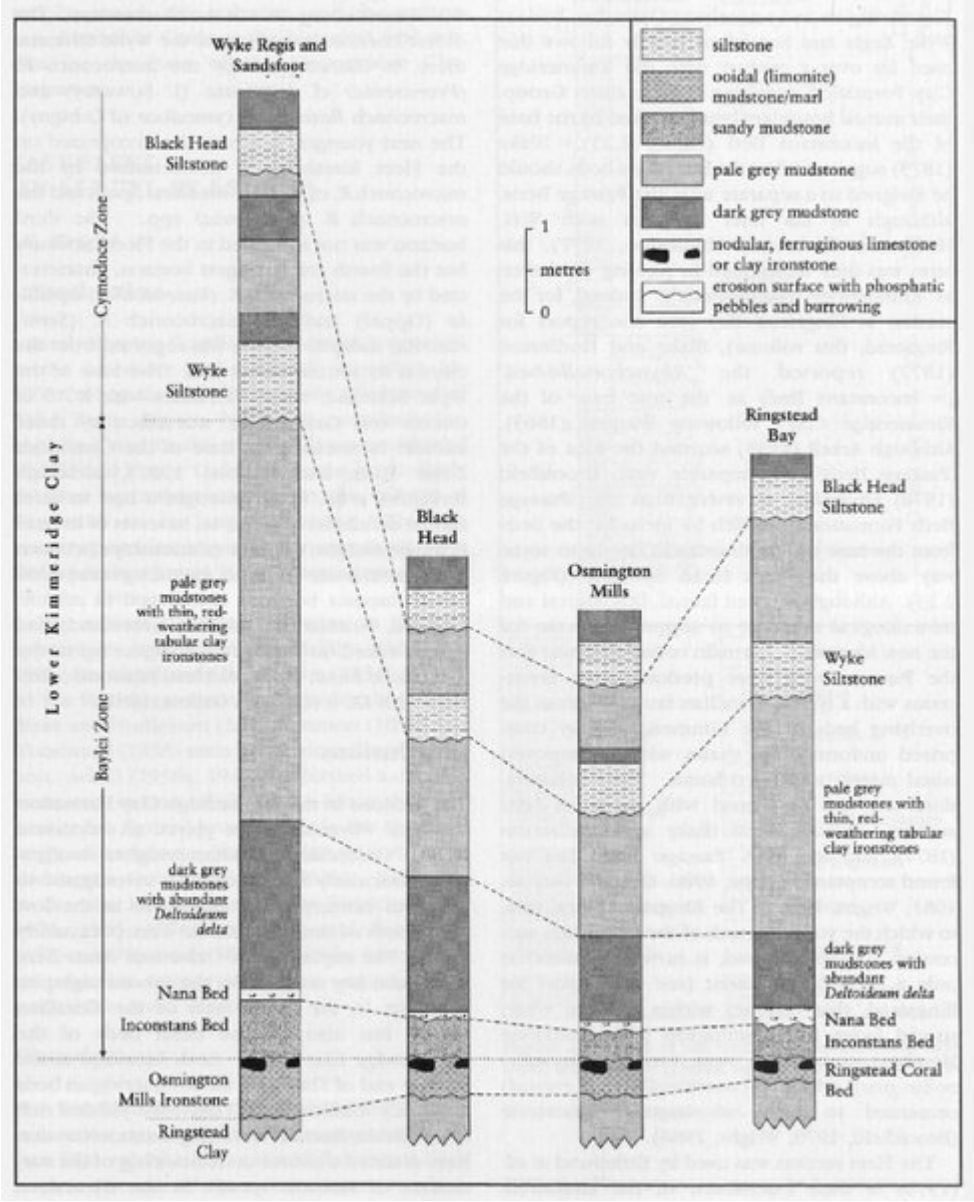
References



(Figure 2.12) Kimmeridge Clay outcrops in the Dorset type area (after Cox and Gallois, 1981, fig. 1).



(Figure 2.22) Geological map for the Small Mouth, East Fleet and Lynch Cove GCR sites.



(Figure 2.23) Correlation of the basal beds of the Kimmeridge Clay exposed at Wyke Regis, Sandsfoot, Black Head, Osmington Mills and Ringstead Bay (based on Cox and Gallois, 1981, fig. 6 and unpublished borehole data, R.W. Gallois, pers. comm.).