



Field meeting in the Isle of Purbeck, September 2012, to examine the Upper Kimmeridge Clay and the Lulworth district



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ABSTRACT

An account is given of a Geologists' Association meeting in the Isle of Purbeck held on 28th–30th September 2012 and the stratigraphy and structures of the rocks examined during the weekend are described. Uppermost Jurassic Stage nomenclature and recent changes to stratigraphical nomenclature in the uppermost part of the Kimmeridge Clay Formation are discussed and the conclusion reached that the long-established divisions (Members) of this Formation are both readily recognisable and have nomenclatorial priority. The recent change to the position of Pallasiodites-Rotunda zonal boundary ignores the ammonite fauna and is inappropriate. For the Lulworth district the stratigraphy of the uppermost Jurassic (Portlandian) through Lower and Upper Cretaceous formations are described and their associated structures discussed. The coastal evolution of the Lulworth coast is briefly discussed.

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1. Friday September 28

Most of the Members attending the weekend field meeting were present at the library in Wareham, Dorset for an introductory talk by the Director, who presented an outline of the stratigraphy and structure of the area and explained the occurrence of oil in the Isle of Purbeck. The fieldtrip was arranged to follow the publication of the new Geologists' Association Guide to the Dorset Coast (Cope, 2012). This particular weekend had been chosen because of the ideal tides and it was not until after fixing this date that it was discovered that this was one of the few weekends when the Lulworth Ranges would be closed to the public; thus the Fossil Forest (Fig. 3) would not be accessible.

2. Saturday September 29

The following morning saw the group assembled in bright sunshine on the steep-sided Chalk ridge some 5 km SSW of Wareham. From here the view to the south took in the northern limb of the Purbeck Anticline. On the coast to the south cliffs of Kimmeridge Clay were visible around Kimmeridge and above the village the change of slope on Smedmore Hill where the Portland Sand succeeded the Kimmeridge Clay was clear. Quarries in the overlying Portland Stone were visible on that hill. To the south-west we could see the dip slope of the basal part of the Purbeck Group, and inland from Gad Cliff the scalloped edge of the dip slope

could be made out by the cliff-line. In the valley below us the Purbeck Group is succeeded by Wealden Group and Lower Greensand and westwards the deserted village of Tyneham and Worbarrow Bay were clearly visible. The slope below our position is formed of Upper Greensand that, in this locality, overlies the Gault (the top of the latter marked by a line of rushes) and the Upper Greensand in turn is overlain by the Chalk (Table 1).

The dip progressively steepens northwards on the northern limb of the Purbeck Anticline, the hog's back of the Chalk (here vertical) being formed as a result of its outcrop overlying the trace of the pre-Albian Purbeck Fault. This Late Cimmerian fault throws down to the south, whereas on the footwall to the north most of the Upper Jurassic and all pre-Gault Cretaceous rocks were absent (largely through non-deposition). The missing rocks are thickly developed on the hanging wall to the south presenting clear evidence that the fault was active during the Upper Jurassic and Lower Cretaceous. Looking north, the view was over the Frome Syncline, a flat-lying structure in Palaeocene and Lower Eocene strata that is succeeded northwards by the low hills of the Chalk as it emerged from beneath the syncline on the southern margin of Salisbury Plain. The Frome Syncline is effectively the western end of the Hampshire Basin. So underneath the Tertiary succession is the Chalk, Upper Greensand and Gault, below which are much earlier rocks, most probably Oxford Clay, Kellaways and Cornbrash formations. The location of the Wytch Farm oilfield (carefully screened) was pointed out and beyond this the view took in Poole Harbour and the Poole-Bournemouth conurbation.

The party then took the toll-road to the cliff-top car park at Kimmeridge (Fig. 1). The Director pointed out the nodding donkey at the site of the Kimmeridge oil-well on the crest of the Broad

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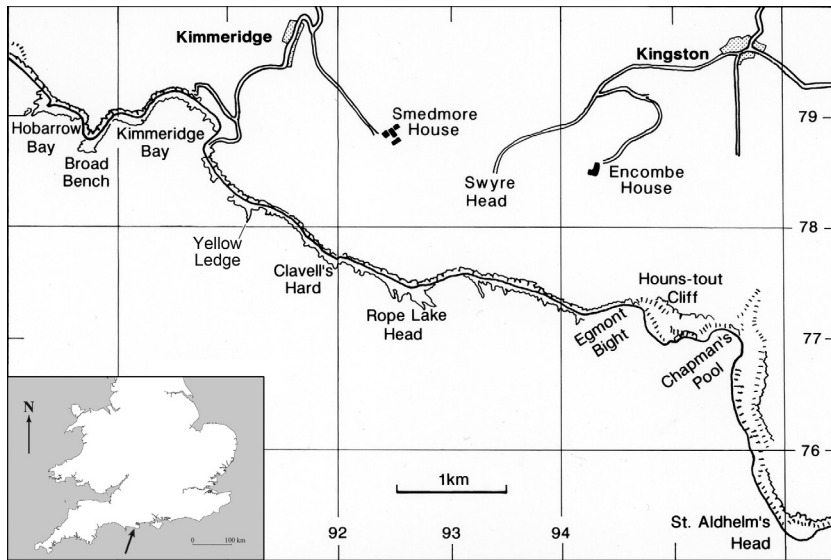


Fig. 1. Outline map of the coast around Kimmeridge. Modified after Callomon and Cope (1993). Inset shows location of the Isle of Purbeck.

Bench Anticline on the west side of Kimmeridge Bay, the only productive site on the hanging wall of the Purbeck Fault. The oil reservoir here is in fractured Cornbrash, met at 550 m depth. Although the oil, which is sourced in the lower part of the Lias Group, initially flowed under its own pressure, for many years it has required pumping. Since 1960 the total yield has been some three million barrels of oil. Nowadays the yield is some 65 barrels per day which is taken to Wytch Farm by road.

To the east of Kimmeridge Bay the Clavell Tower on Hen Cliff had been moved from the cliff edge in 2007–8 and rebuilt some 25 m inland. The party walked eastwards towards Hen Cliff and the Director explained that the quay at the base of the cliff was originally built for the export of the Kimmeridge 'Coal' – a rich oil-shale – to France in the 19th century, where its gas was used for street lighting in Paris.

Under Hen Cliff (Fig. 2) the party then stopped at a marked double cementstone band, Blake's Bed 42 (Blake, 1875). This, the Director explained, marked the base of the Bolonian Secondary Standard Stage and contains fragments of the pectinatitid

Table 1

The geological succession in the Isle of Purbeck. Thickness figures are the maximum figures obtaining within the area studied. Note that the basal few metres of the Purbeck Limestone Group are of Jurassic age.

Upper Cretaceous	White Chalk Subgroup	Newhaven Chalk Formation (seen to) 30 m Seaford Chalk Formation 70 m Lewes Nodular Chalk Fm 80 m New Pit Chalk Formation 80 m Holywell Nodular Chalk Fm 40 m Zig Zag Chalk Formation 70 m Cenomanian Basement Bed 1 m
Lower Cretaceous	Grey Chalk Subgroup	
	Wealden Gp.	Upper Greensand Formation 25 m Gault Formation 15 m Lower Greensand Fm 0–15 cm
	Purbeck Lst. Group	Wealden Group 150 m Durlston Formation 20 m Lulworth Formation 25 m
Upper Jurassic (pars)	Portland Group	Portland Stone Formation 30 m Portland Sand Formation 35 m Kimmeridge Clay Fm (base not seen) 500 m

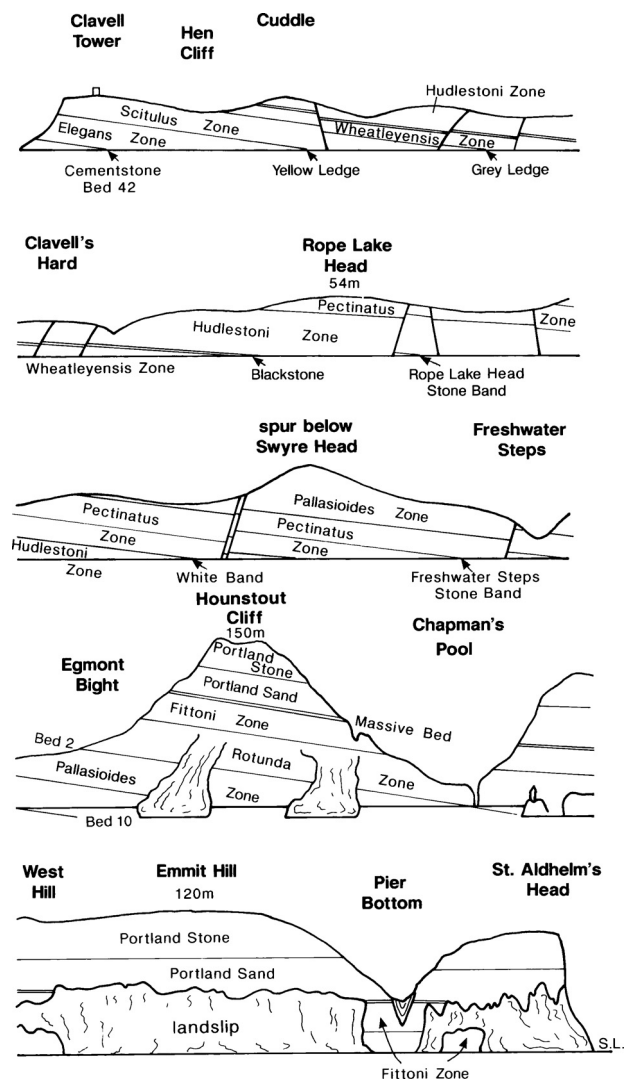


Fig. 2. The succession of the Kimmeridge Clay between Kimmeridge Bay and St Aldhelm's Head. Modified after Callomon and Cope (1993).

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