
Blackdown, Dorset

[SY 613 875]

Highlights

The almost unique gravels of Blackdown suggest the former presence of alluvial fan sedimentation in Palaeogene times to the west of the Hampshire Basin. The variety of pre-Chalk pebbles found here provides insights into the provenance of the gravels. Flint and chert pebbles of local Cretaceous and Upper Jurassic provenance are thought to have been derived as a result of fault movement, uplift and erosion in Eocene times.

Introduction

The site occurs within the Blackdown Outlier [SY 613 875], south-west of Dorchester and some 10 km west of the main Palaeogene outcrop of the Hampshire Basin (Figure 7.1). It comprises a series of disused gravel pits around the summit of Blackdown, with the best exposures some 100 m south of the Hardy Monument.

The Tertiary sediments of Blackdown were first noticed by Buckland (1826) who assigned them to what was at the time called the Plastic Clay Formation (now the Reading Formation). In their comprehensive survey of the Weymouth District, Buckland and de la Beche (1836) described them in more detail and agreed their Reading Beds age. Prestwich (1875), on the other hand, tentatively assigned them to the Quaternary Glacial Period. In a later study, Reid (1896) found that he was able to distinguish the Reading Beds and Bagshot Beds on petrographical grounds, noting that only in the latter was there an abundance of quartz pebbles, silicified Palaeozoic rocks and chert and limestones from the Purbeck Beds. The gravels of Blackdown were established as being of 'Bagshot Beds' type, and represent the culmination of a dramatic east to west coarsening documented in detail by Reid (1899) in the Dorchester Sheet Memoir (see also Strahan, 1898). Interest in the gravels waned until Arkell's (1947) re-examination of them, from which he concluded that they must have been brought 'from the west', i.e. Devon and Cornwall. Plint (1982, 1983d) made a relatively recent study of the deposits and decided that in part they came from local alluvial fans, whilst the more exotic pebbles may have been transported by rivers from further west.

Description

The gravels at Blackdown (Figure 7.2) represent a conglomeratic facies of Bracklesham Group age and rest unconformably on the Chalk.

Lithological succession

The Blackdown gravels have subsided on a large scale into solution pipes within the underlying Chalk and now have very variable dips. Their thickness varies and is difficult to determine but it seems likely that they are in excess of 10 m thick and perhaps greater than 20 m.

Sedimentology

The gravels may be locally crudely bedded, although this has evidently been disturbed by subsidence. They are clast supported, the interstices being filled with quartz sand. Most clasts are of pebble and cobble size, although larger blocks also occur. The pebble suite can be traced eastwards into the sandy facies of the Bournemouth Group. In this direction, both the size and abundance of pebbles decreases until, by Wareham, they disappear completely.

Pebble composition

A variety of pebble types are present including 'local' and 'exotic' components. In composition, they are quite different from the thin pebble beds of the Isle of Wight, whose clasts are almost all made of flint derived from the Upper Chalk. The Blackdown Gravels also include flint (about 70% of the total pebbles) but, in addition, chert from the Upper Greensand (13%) and chert from the Purbeck Beds (2%) (Plint, 1982). As well as these 'local' cherts, there are 'exotic' pebbles including well-rounded vein quartz (14%), plus black cherts, silicified limestones and laminated siltstones (together comprising 1%). Whilst some of the 'local' clasts reach around 35 cm in diameter, the exotic pebbles seldom exceed 4 cm. Plint (1982) suggested that the exotic pebbles were derived from Palaeozoic sources, but considered that reworking from the Wealden was also possible.

Interpretation and evaluation

The unconformable contact of the gravels at Blackdown with the Chalk is palaeogeographically significant, since it reflects the westward overlap of the 'Bagshot Beds' (now part of the Poole Formation of the Bracklesham Group; see Edwards and Freshney, 1986, p. 54) across the London Clay and Reading Formation. The gravels also facilitate an understanding of both sediment provenance and contemporaneous tectonism.

Depositional environment

The Blackdown gravels represent a period of high-energy fluvial sedimentation. With the exception of the gravels at Bincombe, they are unique in the Eocene of the Hampshire Basin, although other gravels occur to the west in Devon (e.g. as exposed in Tower Wood Quarry and Bullers Hill Quarry; see later descriptions). The progressive westerly increase in pebble content of the Poole Formation reaches its maximum preserved development at Blackdown. Whilst much of the Poole Formation appears to be the product of meandering rivers, the Blackdown gravels probably originated in alluvial fans (Plint, 1982).

Provenance and contemporaneous tectonism

In composition, the Blackdown gravels are petromictic and quite different from the flint gravels of the Boscombe Sand Formation to the east (see Plint (1988b) and the review of the 'Bournemouth Cliffs' site in this volume). Their occurrence throws considerable light on the tectonic history of this part of the Palaeogene basin. The presence of the 'local' flints, Upper Green-sand and Purbeck cherts implies considerable uplift and erosion. Both the Upper Greensand and the Purbeck Beds are exposed one kilometre SSW of Blackdown on the other side of the Ridgeway fault, a fault downthrowing to the north. Plint (1982) has argued that the presence of these local flint and chert pebbles are a direct result of contemporaneous fault movement. He has suggested that high gradients and torrential run-off produced fault-scarp alluvial fans.

The explanation of the exotic clasts is more problematical. They are smaller and better rounded and have evidently travelled a considerably greater distance. Plint (1982) considered that they can be traced to Palaeozoic sources in Devon, particularly from and around the Dartmoor Granite, and that they were introduced by rivers draining eastwards along the axis of the basin, the southern margin of which was strongly fault controlled. Such rivers were clearly of lower energy than those which introduced the local Mesozoic debris from the south. Isaac (1983), whilst agreeing with Plint's view that contemporaneous tectonics were an important influence on sedimentation, disputed the western fluvial derivation proposed by Plint. Plint (in Isaac, 1983) conceded that an alternative source of the exotics may be the pebbly facies of the local Wealden.

Notwithstanding disputes over provenance, the importance of the site, together with that at Bincombe Down, is primarily that it provides evidence of intra-Eocene tectonism. This supports the earlier suggestion (Phillips, 1964) that both the Isle of Wight and Purbeck monoclines were subject to movement during the Eocene.

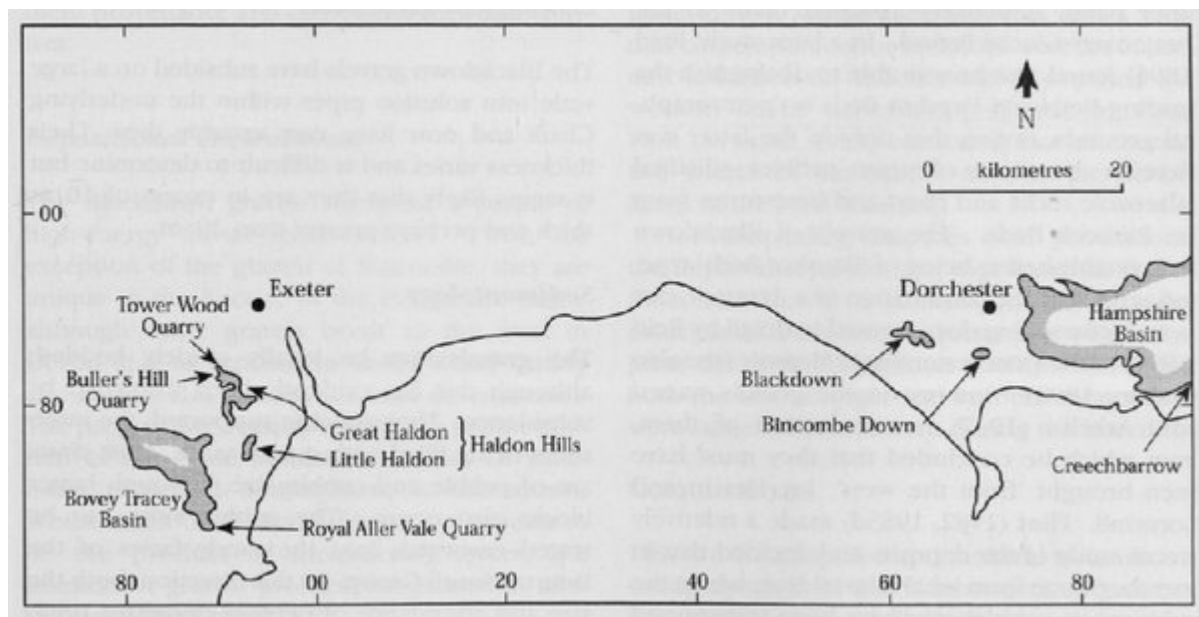
Conclusions

This site is nationally important and is significant stratigraphically in that it demonstrates the westerly overlap of the Poole Formation across older Palaeogene strata on to the Chalk.

The petromict gravels of Blackdown are derived in part from local Mesozoic rocks and in part from older rocks present further to the west. The large size of the local clasts has been interpreted as evidence for high-energy deposition in alluvial fans. Blackdown is one of only two localities where this facies is preserved.

The presence in the Blackdown gravels of clasts of chert from rocks older than the Chalk clearly differentiates these gravels from the Palaeogene flint gravels of the central and eastern parts of the Hampshire Basin. They therefore provide evidence of considerable uplift and erosion. This is considered to have resulted from contemporaneous movement of the Ridgeway fault, the trend of which is similar to the Purbeck and Isle of Wight monoclines whose occurrence is thought to be the superficial expression of deep-seated faults. If the fault movement inferred from the Blackdown gravel suite is correct, the locality provides support to the thesis that the structural evolution of the Hampshire Basin has been controlled by mainly vertical movements of fault-bounded basement blocks.

References



(Figure 7.1) Map to show the distribution of Palaeogene outliers in Dorset and Devon.



*(Figure 7.2) Blackdown, Dorset. Blackdown Gravel exposed in the disused quarry to the south of Hardy's monument
(Photograph: B. Daley.)*