WEST HARNHAM CHALK PIT

OS Grid Reference: SU128288

Introduction

The abandoned West Harnham Chalk Pit is located on the south side of the River Nadder on the south-western outskirts of Salisbury (Figure 3.43), with fine views to the north-east of Salisbury Cathedral (Figure 3.44). West Harnham Chalk Pit is the only remaining quarry of a pair of quarries (East and West Harnham) on Harnham Hill, which exposed the higher part of the Lower Campanian *Offaster pilula* and basal *Gonioteuthis quadrata* zones. These quarries, particularly East Harnham, were the source of large numbers of fossils in the collection of the local amateur geologist, Dr H.P. Blackmore, which are now in the Natural History Museum, London. West Harnham Chalk Pit is also one of the few in the western part of the region to expose the Lower Campanian Newhaven Chalk Formation and the basal beds of the overlying Culver Chalk Formation. It serves to confirm the stratigraphical continuity of many of the lithological marker beds recognized in the type sections of these two formations.

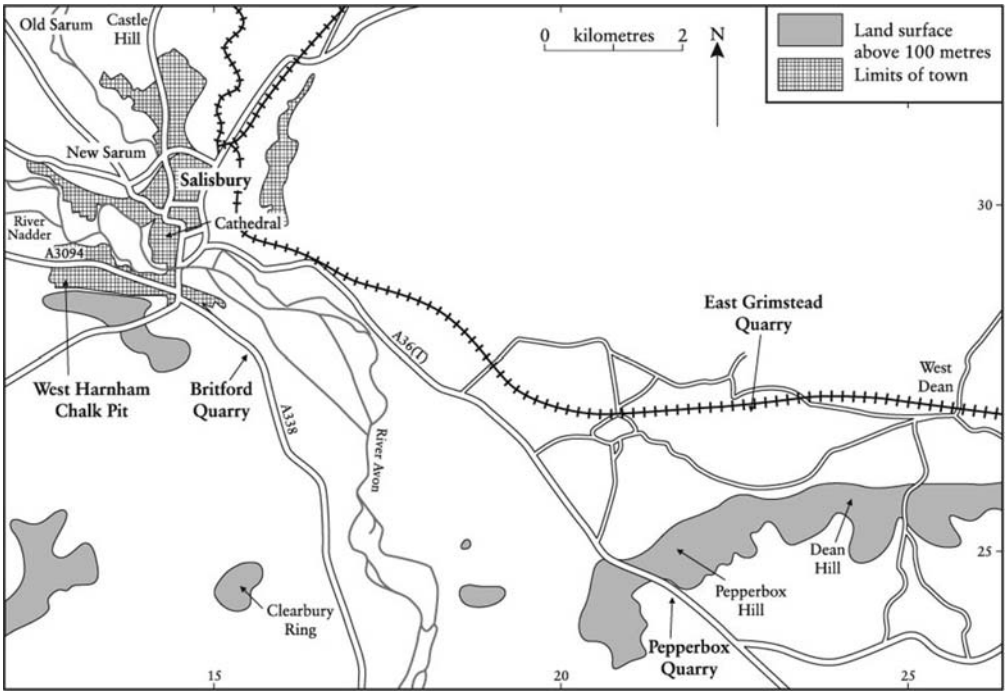


Figure 3.43: The position of West Harnham Chalk Pit on the south-western outskirts of Salisbury and correlative sections at East Grimstead Quarry, Dean Hill and Pepperbox Quarry, Wiltshire.

Figure 3.44: West Harnham Chalk Pit, Salisbury. (a) Looking north-east over Salisbury Cathedral. (b) Looking south-east on to the highest beds. (CH = upper face exposes Castle Hill and Pepperbox Marls and Castle Hill Flints, with the change from large to small forms of Echinocorys (Gaster, 1924); MM = Meeching Marls and Echinocorys scutata cincta beds in lowest exposures; TBRM = Access track to upper quarry exposing Telscombe and Black Rabbit marls; TM = Telscombe Marls and abundant Offaster pilula planatus beds.) (Photos: R.N. Mortimore.)

Description

The exposures in the pit are divided into several old benches and faces. The pit was briefly described by Jukes-Browne and Hill (1904, p. 81), but no complete section was published until 1986 (Mortimore, 1986a, fig. 19, repeated in part in Mortimore, 1986b, fig. 3.19).

Lithostratigraphy

The faces expose a composite 30 m section through the higher part of the Newhaven Chalk Formation and the basal beds of the Culver Chalk Formation (Figure3.45). The south face of the lowest bench contains beds between the Peacehaven and Meeching marls (Meeching Beds of Mortimore, 1986a) and in places extends up to the lower Telscombe Marls. As indicated by Jukes-Browne and Hill (1904), the bedding is indistinct and the chalk rather massive at this level. There are several flint bands, and bedding joints occur along weakly developed marl seams. In contrast, the Meeching Pair of Marls are strongly developed, forming a conspicuous marker in the upper part of this face. Telscombe Marls 1 and 2 are present at the top. The steeply inclined, clay-smeared conjugate joints, some filled by sheet-flints, that typify the Newhaven Chalk Formation, are present in this part of the section.

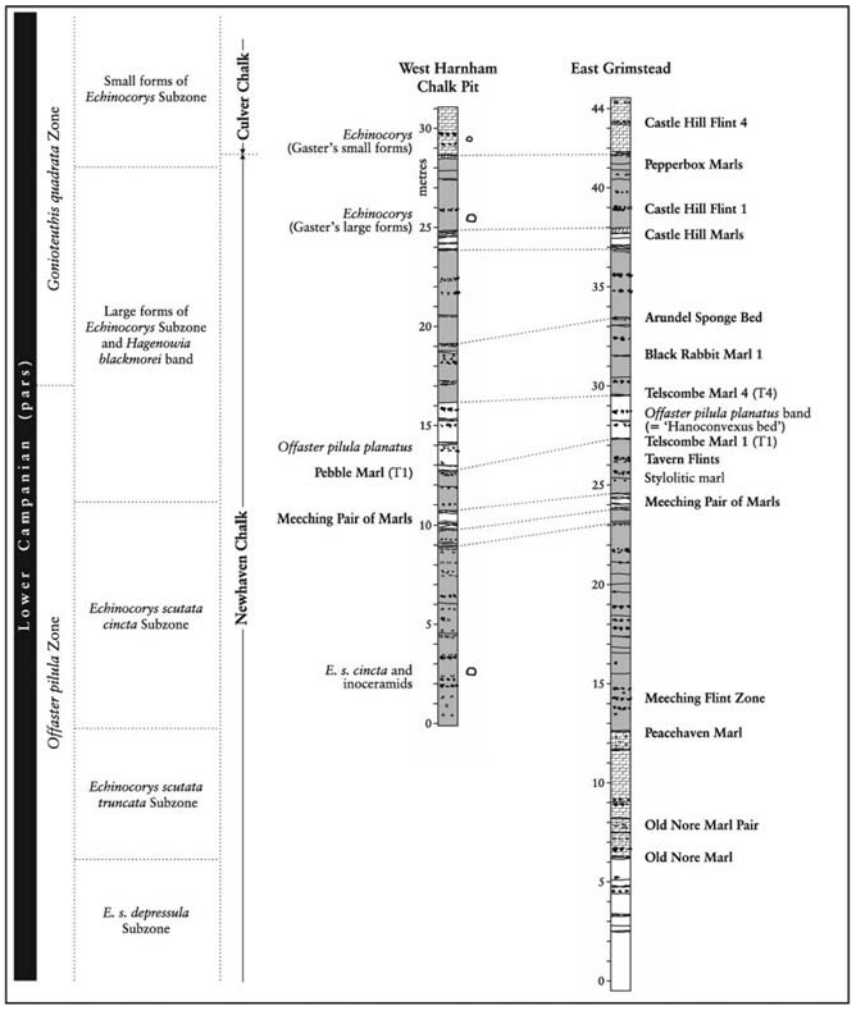


Figure 3.45: Chalk at West Harnham Chalk Pit compared with East Grimstead Quarry.

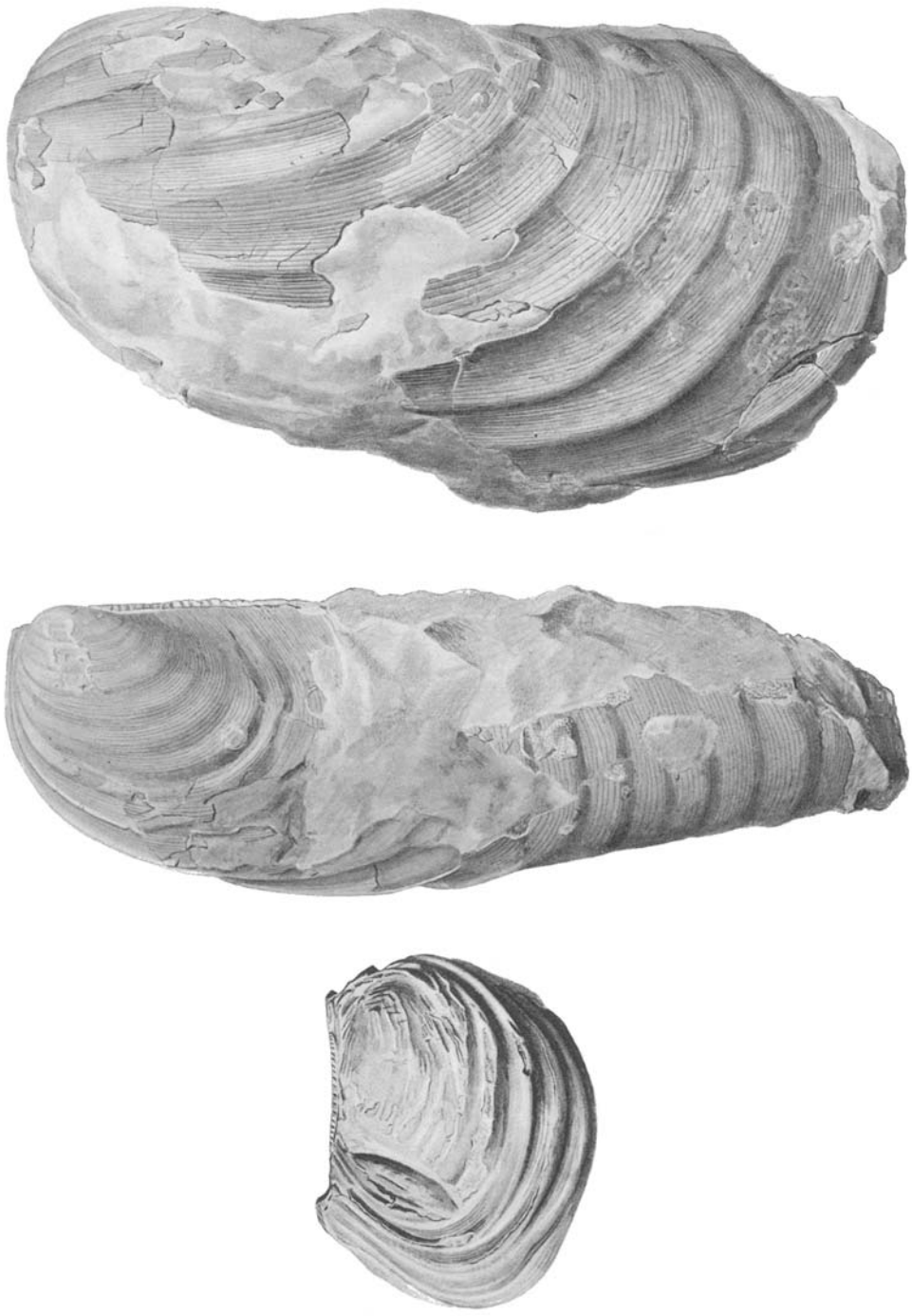
The section continues upwards through the Telscombe Marls, at the western end of the old pit. As in Sussex, Telscombe Marl 1 contains abundant intraclasts, and the Tavern Flints beneath this marl form fingers related to the abundant occurrence of the trace fossil*Zoophycos*. The Arundel Sponge Bed is a well-developed iron-stained sponge bed 3 m above the Telscombe Marls. This sponge bed is a key marker throughout the Southern Province.

Chalk faces in the uppermost bench expose the well-developed Castle Hill Marls and the Pepperbox Marls. Castle Hill Flints 1 and 4 are also strongly developed (Figures3.44 and 3.45).

Biostratigraphy

West Harnham, combined with East Harnham, provided many of the specimens of inoceramid

bivalves figured in the Palaeontographical Society Monograph on Cretaceous Lamellibranchia. From East Harnham these included the (recently designated) lectotype of *Sphaeroceramus sarumensis* (Woods) (Figures 2.26 and 2.27, Chapter 2), which is now a zonal index species in the standard European inoceramid zonal scheme for the Campanian Stage; and also one of the two specimens that were later assigned to *Inoceramus subsarumensis* Renngarten (see discussion by Walaszczyk, 1997). The holotypes of the brachiopods *Kingena blackmorei* Owen, *Orbirhynchia bella* Pettitt and *O. granum* Pettitt, the belemnite subspecies *Belemnitella praecursor mucronatiformis* Jeletzky and the echinoid *Hagenowia blackmorei* Wright and Wright also came from here. The GCR site itself yielded the holotype and unique specimen of the belemnite *Belemnellocamax blackmorei* (Crick). The two sites together are of importance in that they provided the evidence for a narrow zone in the Salisbury area in which belemnites, notably *Belemnitella lanceolata* (i.e. *B. praecursor* Stolley) were reported to be unusually abundant.



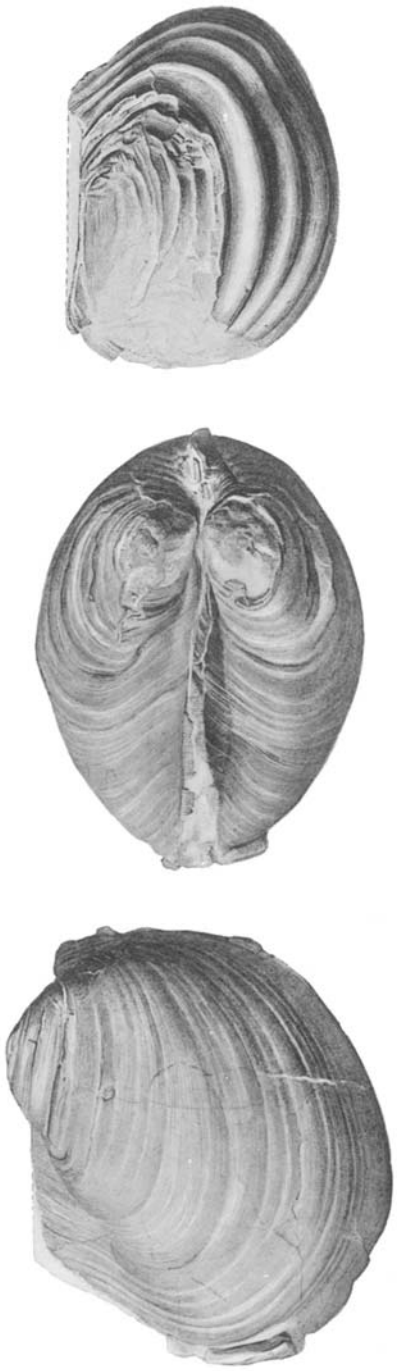


Figure 2.26: Campanian inoceramid bivalves. (A, B) Inoceramus balticus pteroides (name is uncertain) typical of the top Old Nore Beds and the Peacehaven and Meeching Beds, Newhaven Chalk (Offaster pilula Zone, lower belt) (from Woods, 1912, text-fig. 51). (C, D) Cordiceramus? sp. (co-occurs with Sphaeroceramus sarumensis in the Hagenowia blackmorei Subzone at East and West Harnham, Salisbury (from Woods, 1912, pl. 51, figs 3a,b). (E, F) Sphaeroceramus sarumensis; (F) from the Newhaven Chalk Formation, Hagenowia blackmorei Subzone, at East and West Harnham, Salisbury (from Woods, 1912, pl. 52, figs 2a,b). Large scale bar applies to A, B; small scale bar applies to C–F.

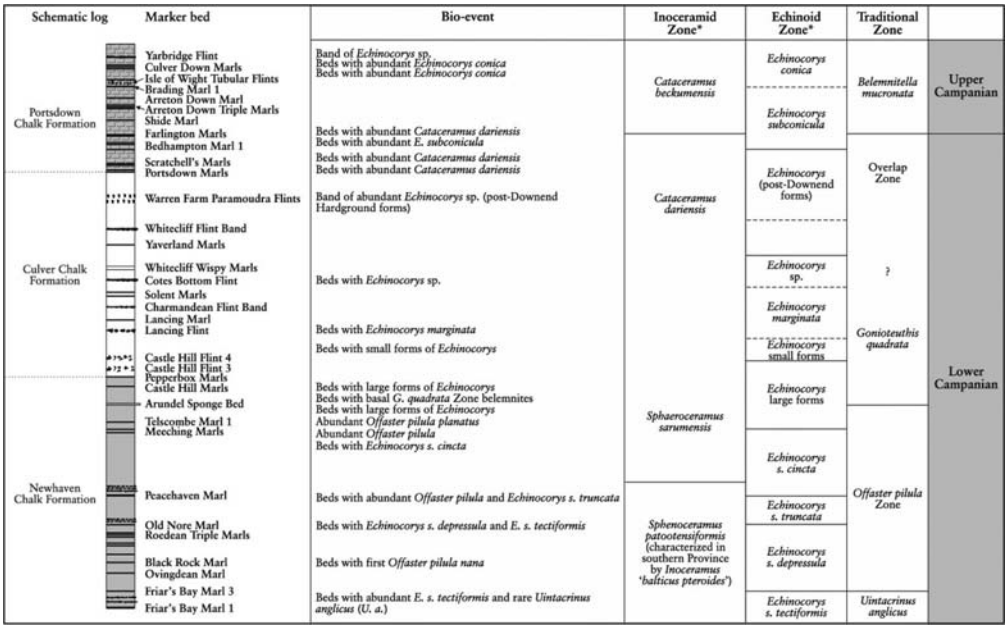


Figure 2.27: Campanian stratigraphy for the onshore UK based on the Southern Province sections at Seaford Head, Portsdown and the Isle of Wight. (= informal zones applied in this book.)*

West Harnham is a key section (and one of the most northerly) for demonstrating the sequence of *Offaster* and *Echinocorys* assemblages in the highest beds of the *pilula* Zone, including the terminal, so-called '*planoconvexus* Bed', characterized by exceptionally large forms of both *Offaster* and *Echinocorys*. The section exposes the upper part of the abundant *Offaster pilula* Subzone of the *O. pilula* Zone, including the *Echinocorys scutata cincta* horizon and the upper belt of *O. pilula,* terminating in the '*planoconvexus* Bed'. The remainder of the section belongs to the basal part (*Hagenowia blackmorei* Subzone) of the *Gonioteuthis quadrata* Zone.

The basal beds yield *Echinocorys scutata cincta* Griffith and Brydone and this echinoid also occurs in and just above the Meeching paired Marls (the *cincta* belt or horizon). Small forms of *Offaster pilula* (Lamarck) are present in the beds immediately above the Meeching Marls, and intermediate-sized forms range from here up to the Tavern Flints. Large *O. pilula planatus* Brydone are common between the Telscombe Marls, the '*planoconvexus* bed' of Brydone (1939). The 'large forms' of *Echinocorys* (Gaster, 1924) are the dominant form in the interval from just above the Tavern Flints to a level in the *Hagenowia Horizon* ' between the Castle Hill and Pepperbox Marls. These are replaced in the beds above the Pepperbox Marls by the so-called 'small forms', including morphotypes similar to, but generally smaller than, *E. scutata cincta* and *E. s. depressula* Brydone, from lower in the *pilula* Zone.

Interpretation

It is uncertain which bed or beds yielded the many belemnites that Dr Blackmore obtained primarily from the quarrymen. Jukes-Browne and Hill (1904, p. 81), indicated that belemnites were relatively common in the upper part of the pit and absent from the lower part. This suggests that they would have come from beds above Telscombe Marl 2 at the top of the lower face. By extrapolation from the Sussex coast sections at the **Cuckmere to Seaford** and the **Newhaven to Brighton** GCR sites (see GCR site reports, this volume), it has been suggested that the *Belemnitella* came from two horizons: the Arundel Sponge Bed; and the interval between Castle Hill Flints 1 and 3 (Bailey *et al.*, 1983; Mortimore, 1986a). The *Gonioteuthis* are likewise inferred to have come from horizons in and below the Arundel Sponge Bed, and from Castle Hill Flint 3.

The collections obtained by Dr Blackmore suggest that the belemnites are more common in the Salisbury area than in Sussex, but this may simply reflect the greater length of appropriate exposures and the handworked nature of the quarrying. The idea that belemnites are more common in the Salisbury area in the Lower Campanian succession is possibly supported by

Brydone (1914) who, on Dr Blackmore's authority, noted that two specimens of *Gonioteuthis* had been collected in the lower horizon of *Offaster pilula*, three in the middle *cincta* horizon, and that *Gonioteuthis* became well established in the upper horizon of abundant *O. pilula*. Brydone also implied that *Gonioteuthis* occurred in the upper horizon at Mottisfont, Hampshire (Mortimore, 1986a). This compares with Brydone's record in Sussex of one specimen from the horizon of abundant *Offaster pilula*. Unfortunately, there are no published observations relating to the exact level in the Harnham quarries of the narrow zone within the former undivided *Actinocamax quadratus* Zone from which Blackmore (1896) collected *Belemnitella lanceolata* (i.e. *B. praecursor*), *Aptychus leptophyllus* (Sharpe) and cephalopod jaws (rhyncholites). In Sussex, one specimen of *Gonioteuthis* was collected by Brydone 8 ft (2.4 m), and two more 15 ft (4.5 m) above the base of the *quadrata* Zone respectively.

The type horizon(s) in the Harnham quarries of *Sphaeroceramus sarumensis* (Woods, 1912, pl. 52, figs 2, 3) and the coarsely ornamented, unrelated forms (Woods, 1912, text-fig. 49, pl. 51, figs 3, 4), variously called *Inoceramus subsarumensis* Renngarten and *Haenleinia inordinata* Heinz (probably a *Cordiceramus*), is not known. To judge from the Blackmore collection in the Natural History Museum, London, both species must be relatively common here. The former species, which takes its name from Old Sarum, north of the city, is also reported (Woods, 1911) from Mottisfont and West Meon. These localities indicate that the horizon in question is probably either in the upper belt of *O. pilula* or in the overlying *Hagenowia* 'Horizon' (Bailey *et al.*, 1983). The *Cordiceramus*? (Figure 2.6, Chapter 2) has been collected in Sussex from the **Cuckmere to Seaford** sections in the interval between the Meeching and Castle Hill Marls (Mortimore, 1986a; and see GCR site report, this volume). Re-collecting at West Harnham failed to find an example, but a similar range can be inferred. *Sphaeroceramus sarumensis* is the index fossil of the northern European *S. sarumensis* inoceramid Zone (Walaszczyk, 1997), and appears in Germany at an equivalent level to the *pilula–quadrata* boundary beds in England.

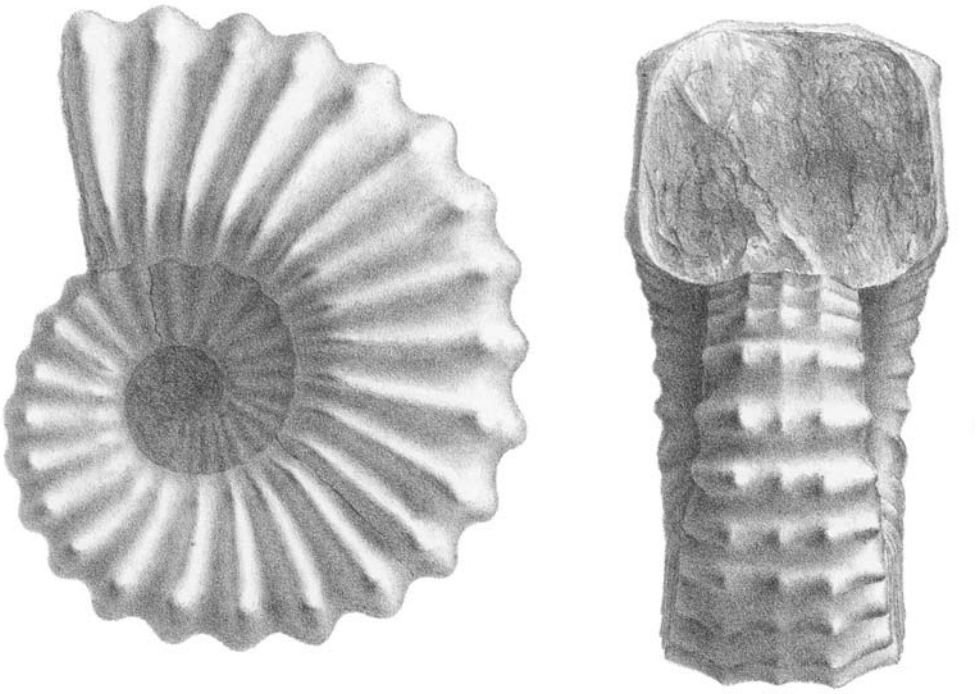


Figure 2.6: Middle Cenomanian ammonites. (A) Acanthoceras rhotomagense (from Sharpe, 1853–1857, pl. 16). (B) Parapuzosia (Austiniceras) austeni (from Sharpe, 1853–1857, pl. 12).

There are now very few exposures of the sections once common around Salisbury when Dr Blackmore carried out his work (1896), and even West Harnham is gradually degrading. Other sections in the area include East Grimstead and Pepperbox quarries (Figure 3.43). East Grimstead Quarry exposed a bigger section (Figure 3.45) down to beds below the Old Nore Marl (Mortimore, 1986a), but this quarry has now almost completely degraded. Pepperbox Quarry (the type locality for the Pepperbox Marls) was a smaller section, but is now occupied by a landfill site. Each of these localities supports the correlation of individual beds of marl, flint, sponge beds and macrofossil event horizons in the Newhaven Chalk Formation over great distances from the Sussex coast, establishing a basin-wide stratigraphical framework. Additionally, the marl seams are thicker here than on the coast sections at Bats Head, Dorset and the **Newhaven to Brighton** and **Cuckmere to Seaford** GCR sites. In contrast, the marl seams in the same stratigraphical interval are largely absent from sections just east of East Grimstead on the Dean Hill Anticline (Figure 3.43). This is a similar situation to that noted at the Shawford M3 motorway cutting near Winchester and at Hollingbury, Brighton (Mortimore and Pomerol, 1991a, 1997), where the Newhaven Chalk Formation locally loses its marl seams over tectonically controlled highs.

Conclusions

West Harnham Chalk Pit is the last remaining exposure of the Lower Campanian Newhaven Chalk Formation and basal Culver Chalk Formation in the Salisbury area, which once provided the source material for studying the belemnite genera *Belemnellocamax*, *Belemnitella* and *Gonioteuthis* in the Southern Province Chalk. The nearby section at East Harnham provided the type of *Sphaeroceramus sarumensis*, a zonal index fossil in the northern European inoceramid bivalve zonal scheme. The site itself provided the holotype (and unique specimen) of the belemnite *Belemnellocamax blackmorei*. The West Harnham Chalk Pit is a vital link, confirming the lateral continuity of the lithostratigraphical and biostratigraphical framework in the Newhaven Chalk Formation established in the **Newhaven to Brighton** and **Cuckmere to Seaford** GCR sites. It also enables long-range correlation using belemnites, echinoids and inoceramid bivalves to standard sections in the chalk and marly chalk facies of northern Germany.

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