East Mersea Restaurant Site and Hippopotamus Site

[TM 053 136] and [TM 065 142]

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Highlights

Fossiliferous sediments here appear to provide a rare record of the Ipswichian Stage in fluvial deposits within the Thames catchment downstream from London. The site has one of the richest interglacial bone-beds in southern Britain, deposited by an erstwhile Thames tributary, the Essex Blackwater.

Introduction

The East Mersea Restaurant Site and Hippopotamus Site both reveal Late Pleistocene fossiliferous deposits attributed to the River Blackwater. They are of considerable stratigraphical importance because of their close proximity to the Middle Pleistocene Thames-Medway locality at Cudmore Grove (see Part 2 of this chapter). The three sites collectively constitute a single large and complex GCR site, which also includes an area of cryoturbated London Clay between the two sets of Pleistocene deposits (see (Figure 5.22) and (Figure 5.23).

The Restaurant Site, *c.* 1.5 km to the southwest of Cudmore Grove, appears to coincide with most if not all the early records of fossil bone-bearing deposits at East Mersea (Warren, 1917, 1924b, 1933; Cornwall, 1958; Zeuner, 1958). The sequence at the Restaurant Site has produced Mollusca and ostracods, as well as abundant mammalian remains. Warren (1933) considered it the richest bone-bed he had seen. The occurrence of hippopotamus suggests deposition during the Ipswichian Stage (*sensu* Trafalgar Square) (Sutcliffe, 1964; see Chapter 1).

There is a further occurrence of hippopotamus-bearing sediments at East Mersea, at the Hippopotamus Site, which lies between the Restaurant Site and the outcrop of the Cudmore Grove Channel (Figure 5.23). The Hippopotamus Site was discovered more recently and has so far only produced a small assemblage of mammalian bones, found on the foreshore in pockets of Pleistocene sediment in the surface of a London Clay platform. Pleistocene deposits that presumably have been stripped from this platform by recent marine erosion are exposed in the nearby cliffs. This fauna consists entirely of taxa already known from the Restaurant Site. Similar sequences of deposits are found at both localities, comprising a basal gravel overlain by finer grained sediments. The (basal) gravel is quite different to that overlying the Cudmore Grove estuarine deposits and provides the basis for attributing these Upper Pleistocene sediments to the River Blackwater.

Description

Casual observation of the Restaurant Site reveals only a shallow cliff of brickearth above a modern sandy, shelly and pebbly beach, below which the foreshore is cut in London Clay. Excavation through the modern beach (Figure 5.33) reveals fossiliferous Pleistocene beds, however, as part of the following sequence ((Figure 5.34)A):

	Thickness
3. Clayey silt, weathered (brown)	1.0 m
2. Sandy silt with bones and shells (grey)	0.2 m
1. Gravel with mammal bones	0.4 m
London Clay	

This sequence appears to fill a channel excavated in London Clay, the latter rising to cut out the later deposits beneath the eastern end of the beach. The gravel contains considerably more quartzose exotic material than the Mersea Island Gravel, but also includes a large proportion of southern rocks (predominantly Greensand chert) of the type characteristic of the East Essex Gravels ((Table 5.5) and see Part 2 of this Chapter). It has been termed the (East Mersea) Restaurant Gravel (Bridgland *et al.,* 1988).

Better exposures of the sequence were available in the early post-war years, when the Restaurant Gravel was preserved at the landward edge of the foreshore (Cornwall, 1958). Cornwall interpreted this deposit as filling the channel of a 'considerable stream', trending towards 11O.D.g; east of north. He interpreted the overlying sequence as a 'floodloam' overlain by marine silt and considered there to be a buried soil at the top of the floodloam. In addition to the published descriptions, the Restaurant Site was excavated in 1934 by D. Bate and J. Reach (MS notes in the Natural History Museum) and in the late 1960s by R. Gruhn and A.L. Bryan (MS notes in the Institute of Archaeology, London University) and H.E.P. Spencer. The mammalian remains from those excavations are preserved in the Natural History Museum, except for Spencer's collection, which is in the Ipswich Museum.

The Hippopotamus Site is broadly similar to the Restaurant Site, but the cliff section at the former is considerably higher and exposes over 2 m of bedded silts with sand and gravel stringers ((Figure 5.34)B). Again, gravel cannot be seen in the cliffs or on the foreshore, but is present beneath the beach. This gravel is indistinguishable, on the basis of sedimentary characteristics and clast-lithological composition, from that at the Restaurant Site (Table 5.5) and is presumed to be a continuation of the Restaurant Gravel (Bridgland *et al.,* 1988). As at the Restaurant Site, the foreshore comprises a wave-cut platform in London Clay. However, all the mammalian bones from the Hippopotamus Site have been obtained from a small area of foreshore [TM 066 143], where they were found protruding from pockets of silty material in the bedrock surface (Figure 5.35). These probably represent scour hollows at the base of the Restaurant Gravel. The Pleistocene deposits at the Hippopotamus Site are separated from the Cudmore Grove Channel by London Clay, which rises to the full height of the cliffs between the two Pleistocene channels (Figure 5.22) and (Figure 5.23).

The Restaurant Site has yielded a mammalian fauna of ten species (Bridgland *et al.,* 1988): in addition to the important indicator species *Hippopotamus amphibius,* the assemblage includes *Palaeoloxodon antiquus* (straight-tusked elephant), *Dicerorhinus hemitoechus* (narrow-nosed rhinoceros), *Bison priscus, Megaloceros giganteus* (giant deer) and *Crocuta crocuta* (Enxleben) (spotted hyaena). Another species of stratigraphical significance to occur is the modern water vole *Arvicola terrestris,* which is known only from the Late Pleistocene (Sutcliffe and Kowalski, 1976). As the bulk of the collections is from early investigations, no attempt has been made to separate assemblages from the gravel and silt (beds 1 and 2). The Hippopotamus Site has produced, in addition to hippopotamus, only giant deer and indeterminate bovine and elephant bones (Bridgland *et al,* 1988).

The molluscan fauna, which occurs only in the sandy silt (bed 2) at the Restaurant Site, is dominated by freshwater bivalves, including *Pisidium supinum* and *P. moitessierianum,* which suggest deposition in a sizeable stream. Of particular interest is the occurrence of *Sphaerium rivicola* (Lamarck), which is rare in the British Pleistocene (Bridgland *et al.,* 1988). Five ostracod taxa have also been recovered from this same deposit: *Candona neglecta, Ilyocypris bradyi, I. schwarzbachi* Kempf, *Herpetocypris* sp. and *Cyprideis torosa.* The first two, which dominate the fauna, require a low-energy freshwater environment, but *C. torosa* is a brackish water species. However, only a few specimens of the last-mentioned species were encountered, the poor preservation of which may suggest derivation from an earlier estuarine deposit, such as that at Cudmore Grove, in which the species is common (see above).

Interpretation

Warren (1917, 1924b, 1933) was the first to recognize an 'elephant bed' at East Mersea and suggested that it was equivalent to the Clacton Channel Deposits, which also yield elephant remains (at both sites all identifiable elephant remains are attributable to *Palaeoloxodon antiquus*). The Clacton deposits were subsequently assigned to the 'Great Interglacial' (Hoxnian Stage) (Pike and Godwin, 1953), which led to a similar interpretation of the sediments at East Mersea (Cornwall, 1958; Zeuner, 1958; Spencer, 1966). However, *Hippopotamus* is prominent amongst collections from East Mersea and, since this species is believed to have been absent from Britain during the Hoxnian, the site had been attributed to the Ipswichian Stage (*sensu* Trafalgar Square) (Sutcliffe, 1964) well in advance of the recent investigations, which have confirmed that it is quite unrelated to the Clacton deposits (Bridgland *et al.,* 1988).

The Restaurant and Hippopotamus Sites have closely similar sedimentary sequences at com parable elevations, the clast-lithological composition of the gravel at both sites matches (Table 5.5), and the limited fauna from the Hippopotamus Site is entirely coincident with taxa within the assemblage from the Restaurant Site. All these factors lead

to the conclusion that a single set of deposits is represented at the two sites. These deposits are not, however, continuous between the two outcrops, but are cut out by Holocene saltings (Figure 5.23).

The most important biostratigraphical evidence from this sequence derives from the mammalian fauna. This is of fully interglacial character and, unlike that from the Clacton and Cudmore Grove channels, includes hippo■

potamus. It also includes straight-tusked elephant and narrow-nosed rhinoceros, but lacks horse. Its closest match is with mammalian assemblages from Joint Mitnor Cave (Devon), Trafalgar Square (London), Barrington (Cambridgeshire) and Victoria Cave (North Yorkshire), all ascribed to the Ipswichian Stage. The last of these has yielded a uranium-series date of *c.* 120,000 years BP, confirming a last interglacial age (Gascoyne *et al.,* 1981). There is little in the molluscan or ostracod faunas to confirm or deny the correlation of the deposits at East Mersea with the Ipswichian, although they do imply temperate conditions, and the two dominant ostracod species (*C. neglecta* and *I. bradyi*) survive in the Holocene. *Ilyocypris schwarzbachi,* however, was first described from a Holsteinian interglacial site at Karlich, near Koblenz.

If the fossiliferous deposits are of Ipswichian age, it is likely that the overlying unfossiliferous bedded silts and sands at the Hippopotamus Site represent aggradation under cold conditions during the Devensian Stage. These contain 'stringers' of gravel, the contents of which were analysed along with the underlying Restaurant Gravel (Table 5.5). The clast composition of the Restaurant Gravel is of considerable significance to palaeogeographical reconstruction. It differs in this respect from the Mersea Island Gravel (see above, Cudmore Grove) in that it contains a higher exotic fraction, dominated by the quartzose lithologies that characterize the gravels of the pre-diversion Thames. This composition is consistent with a Blackwater origin, in which case this exotic material is presumed to have been reworked from Kesgrave Group deposits in

central Essex. Other exotic lithologies, in particular *Rhaxella* chert, are probably derived from Anglian Stage glacial deposits in the same area, although they could have been reworked from older Blackwater terrace gravels or from the Mersea Island Gravel. The latter has probably contributed much of the Greensand chert, but the High- and Low-level East Essex Gravels to the south of the Blackwater are also likely to have provided this rock type (see Part 2 of this chapter). The gravel stringers within the bedded silts and sands at the Hippopotamus Site contain fewer exotic rocks and more Greensand chert, having a composition intermediate between that of the Restaurant Gravel and the Mersea Island Gravel, although closer to the latter (Table 5.5). This suggests that much of the material was derived from the immediate valley side, from the Mersea Island Gravel (Bridgland *et al.,* 1988). Such a process might be considered more likely under cold-climate conditions, thus supporting the interpretation of these upper deposits as of Devensian age.

The conclusion that the fluvial sequence at the Restaurant and Hippopotamus Sites is the product of the River Blackwater and not the Thames-Medway is fully consistent with its apparent Ipswichian age. It is thought that the Thames-Medway had migrated a considerable distance to the south of Mersea Island by the Ipswichian, leaving the area to be drained by the Blackwater (Bridgland, 1988a; (Figure 5.5)). The plotting of long-profiles of River Blackwater gravel formations (Figure 5.32) suggests that the Restaurant Gravel lies higher in the sequence than the mapped terraces in the Maldon area (Geological Survey, New Series, Sheet 241). To the north of the terrace gravels, however, a belt of 'Glacial Sand and Gravel' has been mapped, extending from Great Totham to Tollesbury. These have been identified as older terrace gravels of the Blackwater system (Bridgland, 1983a; Bridgland *et ed.,* 1990). Two formations can be recognized within these higher terrace deposits, the Tollesbury Gravel, already mentioned (see above, Maldon), and the Goldhanger Gravel, which is well-represented around the village of Goldhanger [TL 905 090]. The gradient of the Goldhanger Gravel suggests possible correlation with the Restaurant Gravel (Figure 5.32). This would imply that all the mapped terrace deposits of the Maldon area are later in age than the Ipswichian Stage (*sensu* Trafalgar Square) and, conversely, that the deposits mapped as 'Glacial Sand and Gravel' account for all Blackwater deposition between the Anglian Stage (when the river was formed — see Maldon) and the Late Pleistocene. Comparison with the fluvial record in the Lower Thames valley (Chapter 4), in which four formations are recognized representing this time interval, suggests that the sequence thus far established in the Blackwater is unlikely to be complete.

The London Clay exposures between the Cudmore Grove Channel–Mersea Island Gravel section and the silts (brickearth) at the Hippopotamus Site show evidence of severe and repeated periglacial activity. Involutions, filled with gravel similar to that above the Cudmore Grove Channel, have been observed in the upper levels of the cliff and extend

into the upper part of the silt sequence above the Restaurant Gravel near its eastern edge. Further west, the height of the cliffs declines and the uppermost, cryoturbated silts have probably been removed by erosion. Immediately east of the Blackwater sequence at the Hippopotamus Site, two sets of gravel-filled involutions occur at the top of the London Clay cliffs (Figure 5.22). The lower of these, which is formed in the top of the London Clay, is overlain by a sheet of redeposited (colluvial) clay, indistinguishable from the bedrock and probably derived directly from it. The higher set of involutions is developed in this remobilized clay. Also of interest are large dislocated pockets of gravel that occur in the London Clay between the silts and Mersea Island Gravel exposures. These apparently comprise relatively undisturbed Mersea Island Gravel, so much so that palaeocurrent measurements have been obtained from foresets in one of them. The latter are inclined directly towards the near-vertical wall of London Clay at the edge of the pocket, suggesting that the contact is not erosional, but has been produced by post-depositional deformation. The clay itself is highly fissile and appears to have been subjected to considerable disturbance. It seems likely that the gravel pockets represent the feather-edge of the Mersea Island Gravel, perhaps higher parts of the unit than are now preserved, which have been let down undisturbed into the London Clay, probably when the latter was itself highly mobile and rising diapirically around the gravel pockets. Such processes are likely to have operated during periods of summer melting in a periglacial environment. Since the Restaurant Gravel is attributed to the Ipswichian, the periglacial episode during which this occurred must belong within the Devensian Stage.

The deposits at these two localities are therefore interpreted as products of an Ipswichian to early Devensian Blackwater aggradation, laid down long after the Thames-Medway had ceased to flow further north (within the present land area of south-eastern Essex) than the immediate vicinity of its present estuary (Bridgland, 1988a; (Figure 5.5)).

Relation to the regional sequence

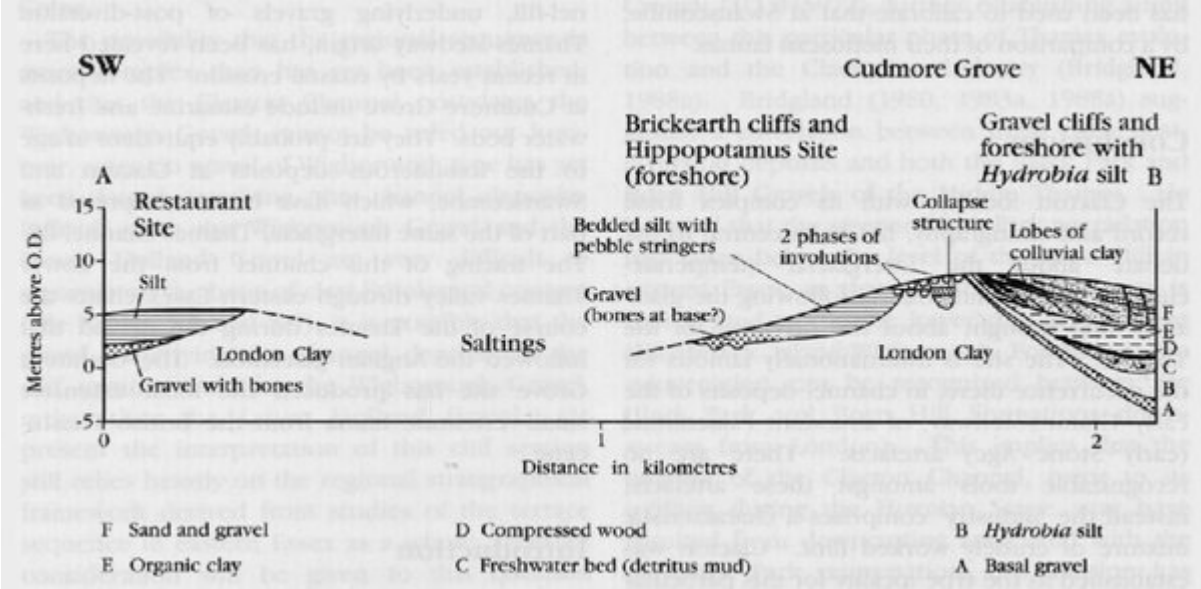
The Restaurant and Hippopotamus Sites at East Mersea, together with Cudmore Grove, form a highly significant locality spanning a large part of the Middle and Late Pleistocene. Whereas the Cudmore Grove site exposes a succession ascribed to the Hoxnian (*sensu* Swanscombe), the Restaurant and Hippopotamus Sites represent the Ipswichian (*sensu* Trafalgar Square) and Devensian Stages, the last interglacial and glacial episodes. The sediments at the Restaurant and Hippopotamus Sites are contained in the later and smaller of two juxtaposed channels (Figure 5.27), attributed in this case to the River Blackwater, whereas the earlier, deeper channel at Cudmore Grove represents the Thames-Medway. The coastal sections at East Mersea thus reveal sediments from both of the post-Anglian interglacials defined by Mitchell *et al*. (1973). However, evidence from other parts of the Thames Basin now suggests that this sequence is an oversimplification, so the preservation at this locality of sediments representing the Hoxnian and Ipswichian Stages is regarded as coincidental; there were two further post-Anglian temperate intervals that are not represented at East Mersea, but which occurred between the deposition there of the Thames-Medway (Cudmore Grove Channel) and Blackwater (Restaurant Gravel) deposits. It is clear that major changes in palaeogeography took place between the emplacement of the two sets of deposits. The Thames-Medway, represented at Cudmore Grove, had migrated a considerable distance to the south by the Ipswichian, leaving the Blackwater as the main drainage line in the area of Mersea Island (as it is today).

The Blackwater deposits at the East Mersea Restaurant and Hippopotamus Sites are therefore of considerable stratigraphical significance. Notwithstanding this, they are also of importance as a source of palaeoenvironmental evidence for the Ipswichian Stage. If the various Corbets Tey and Mucking Formation sites in the Lower Thames are correctly interpreted as of pre-Ipswichian (*sensu* Trafalgar Square) age (see Chapter 4), East Mersea is the only true 'last interglacial' site within the Thames system downstream of London. The fact that it represents a tributary is no accident. It is apparent from the elevation of the Trafalgar Square site that the projected Ipswichian thalweg level of the main river falls below the valley floor in the Lower Thames and probably below ordnance datum before the modern coast is reached. Therefore Thames-Medway Ipswichian deposits are more likely to be found offshore from the Essex coast or beneath coastal alluvium than within the onshore terrace system. Whether this is because of post-Ipswichian subsidence or whether it indicates that Ipswichian sea level was much lower than is generally believed is at present uncertain.

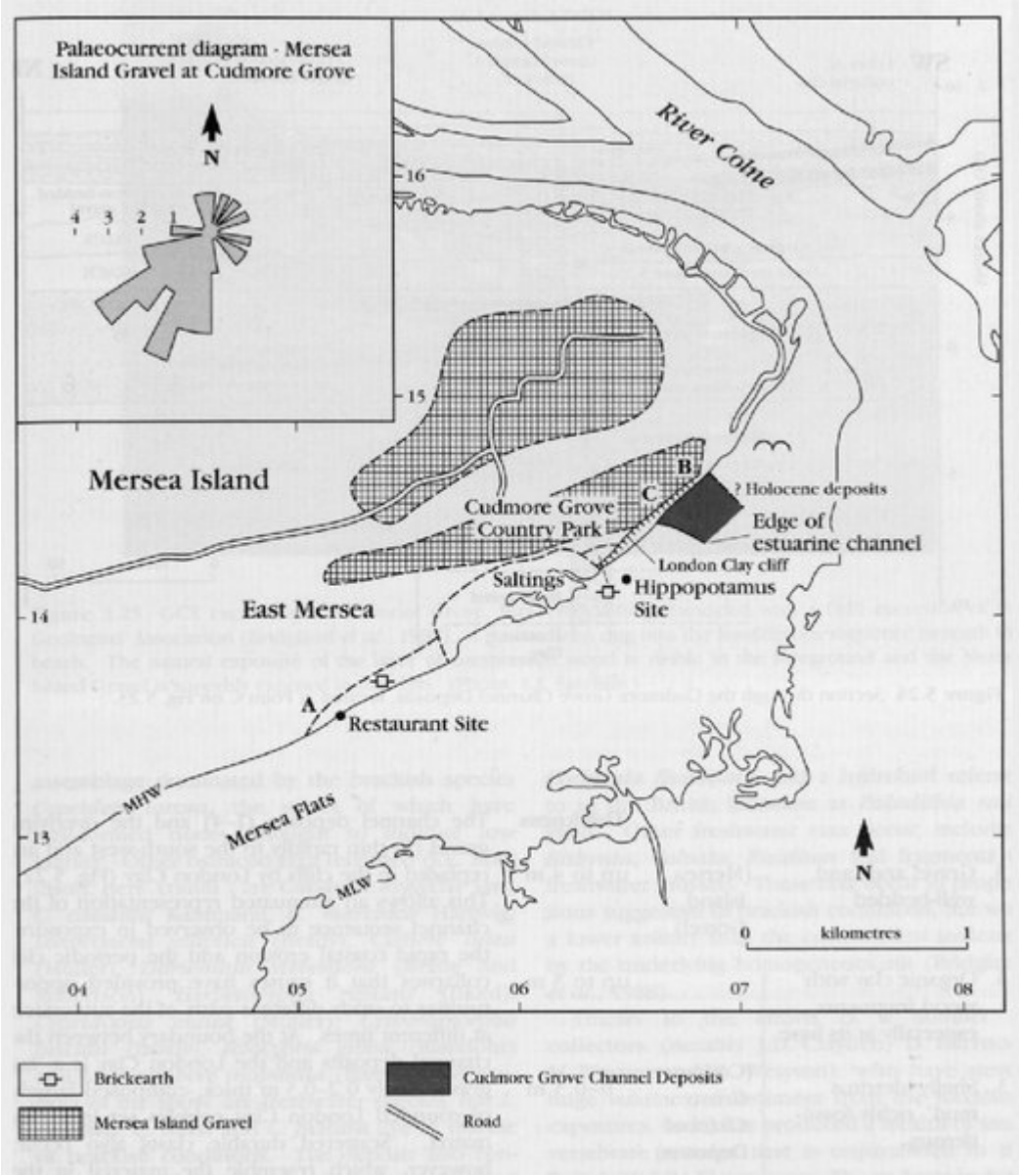
Conclusions

These two related localities provide exposures in fluvial sediments containing an assemblage of mammal remains typical of the last Pleistocene interglacial episode (the Ipswichian). These include such characteristic elements as hippopotamus, hyaena and straight-tusked elephant. The remains of molluscs and ostracods (small crustaceans) are also found at the Restaurant Site. During the last interglacial, the main channel of the Thames, downstream from London, lay well below the level of the present river floodplain, below modern sea level. It is because the interglacial sediments at East Mersea were deposited in a former tributary of the Thames, the Blackwater, that they lie at a sufficiently high level to be studied at the surface — the steeper upstream gradient of the Blackwater brings its last interglacial floodplain level above modern sea level at East Mersea. Because of this, the two East Mersea localities expose the only unequivocal last interglacial (Ipswichian) deposits (dated at around 125,000 years BP) yet recognized in the Thames catchment downstream from London. They are therefore comparable to the famous but inaccessible fossiliferous site at Trafalgar Square.

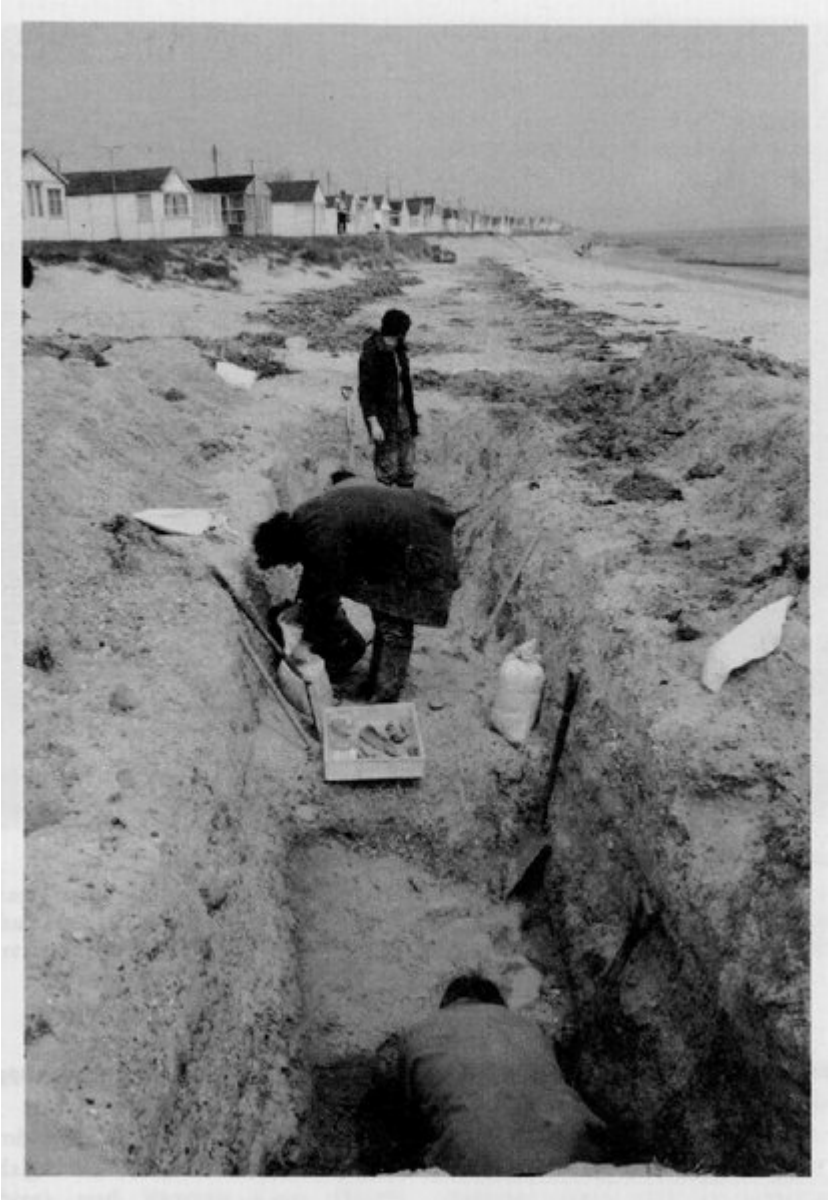
References



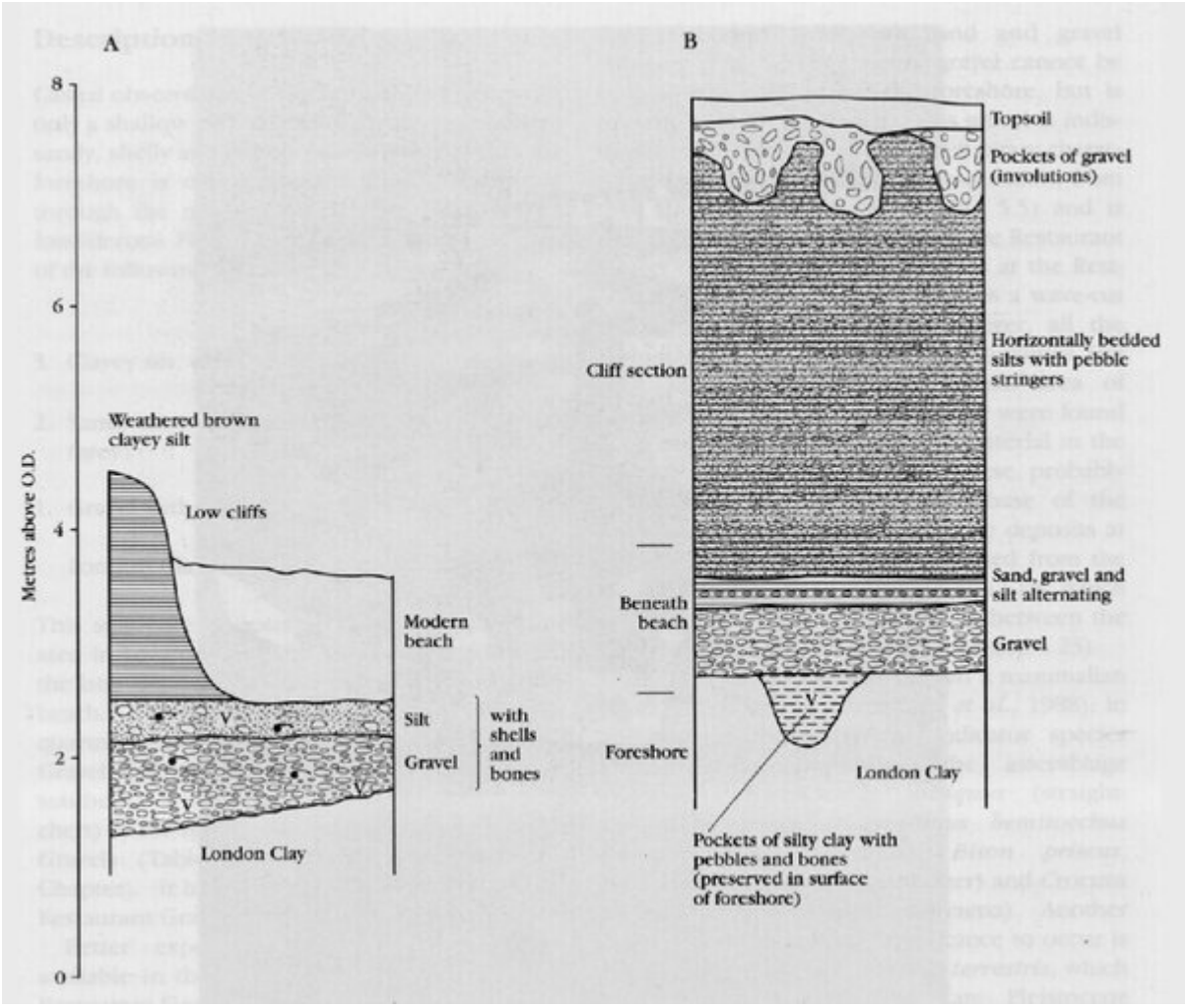
(Figure 5.22) SW–NE section through the deposits at East Mersea, showing the relations of the Cudmore Grove Channel to the Blackwater deposits at the Hippopotamus and Restaurant Sites. Points A and B are indicated on (Figure 5.23).



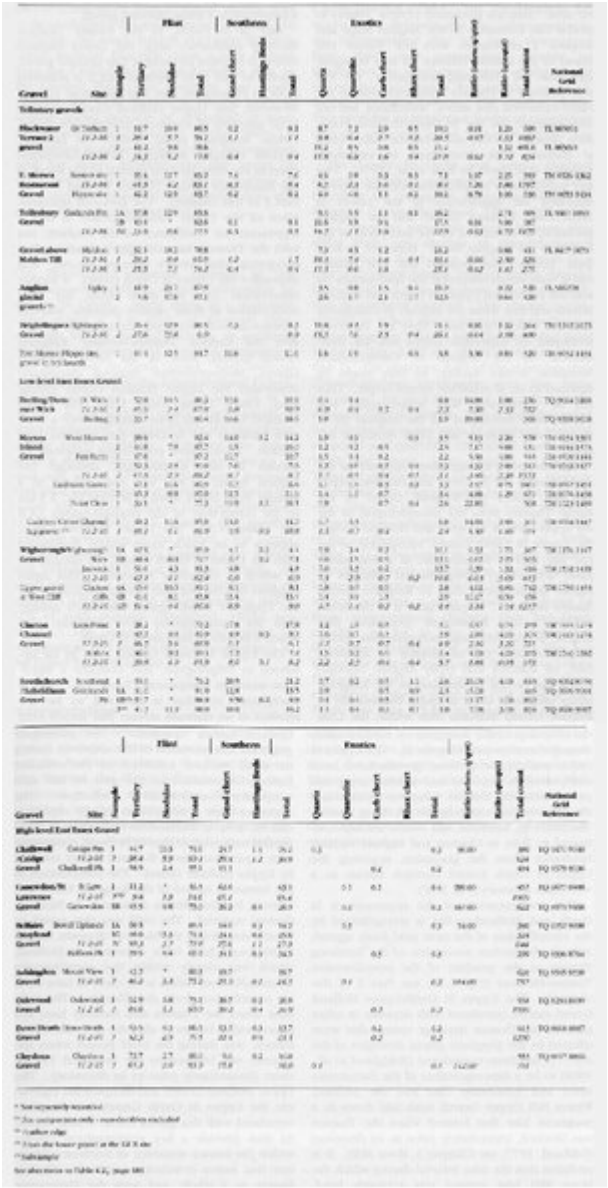
(Figure 5.23) Map showing the Pleistocene deposits of East Mersea (after Bridgland et al., 1988). The points A and B refer to the ends of the section in (Figure 5.22). Point C is the location of the section in (Figure 5.24).



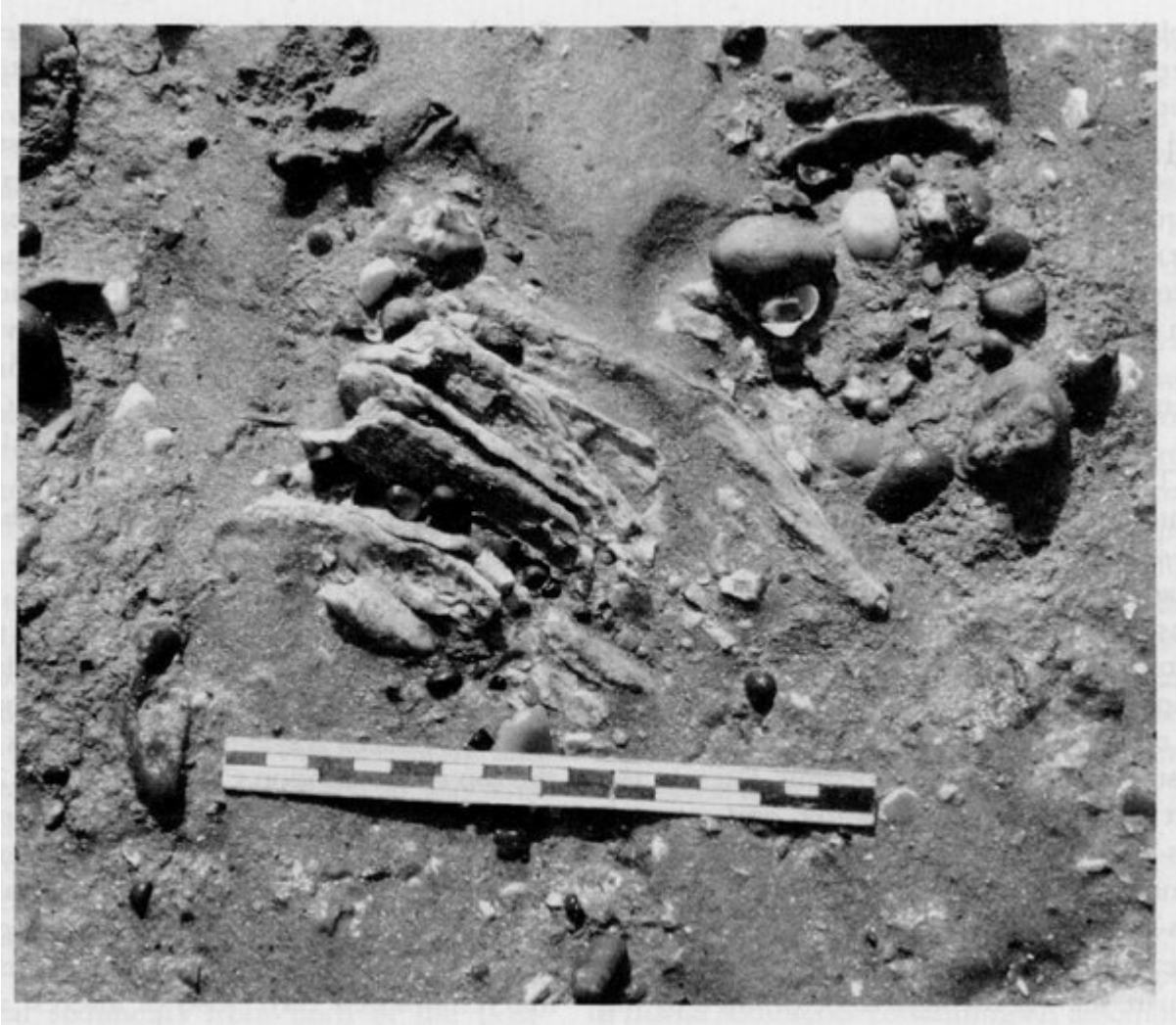
(Figure 5.33) Excavations at the East Mersea Restaurant Site. This view, looking north-east, shows bones being collected from the channel deposits temporarily exposed in a trench dug through the beach. Only London Clay is exposed on the foreshore. (Photo: A.J. Sutcliffe.)



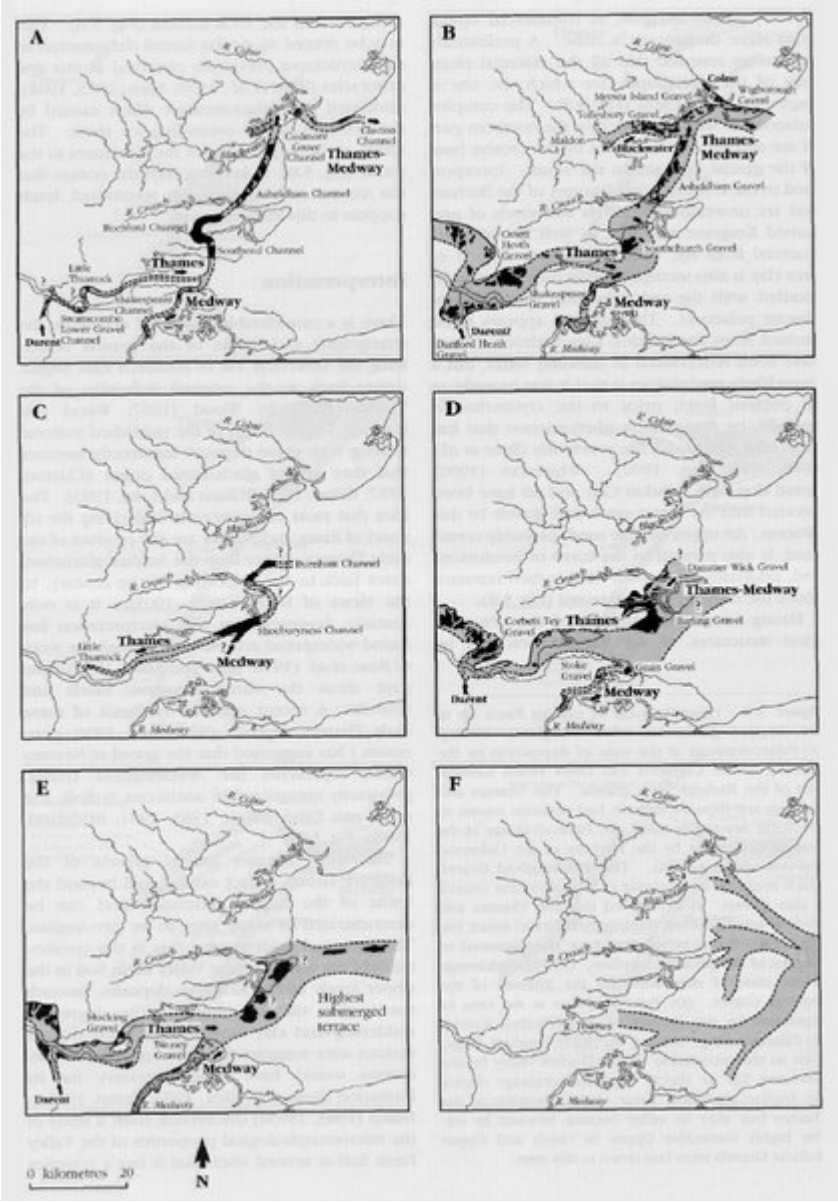
(Figure 5.34) Sections at: (A) the East Mersea Restaurant Site; and (B) the Cudmore Grove Hippopotamus Site.



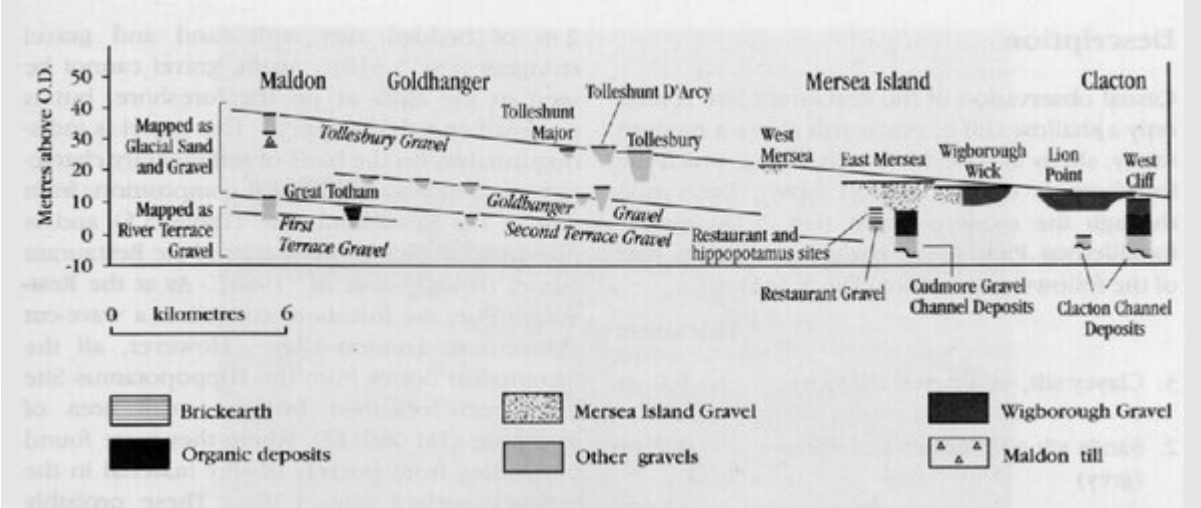
(Table 5.5) Clast-lithological composition of gravels described in Chapter 5, Parts 2 and 3.



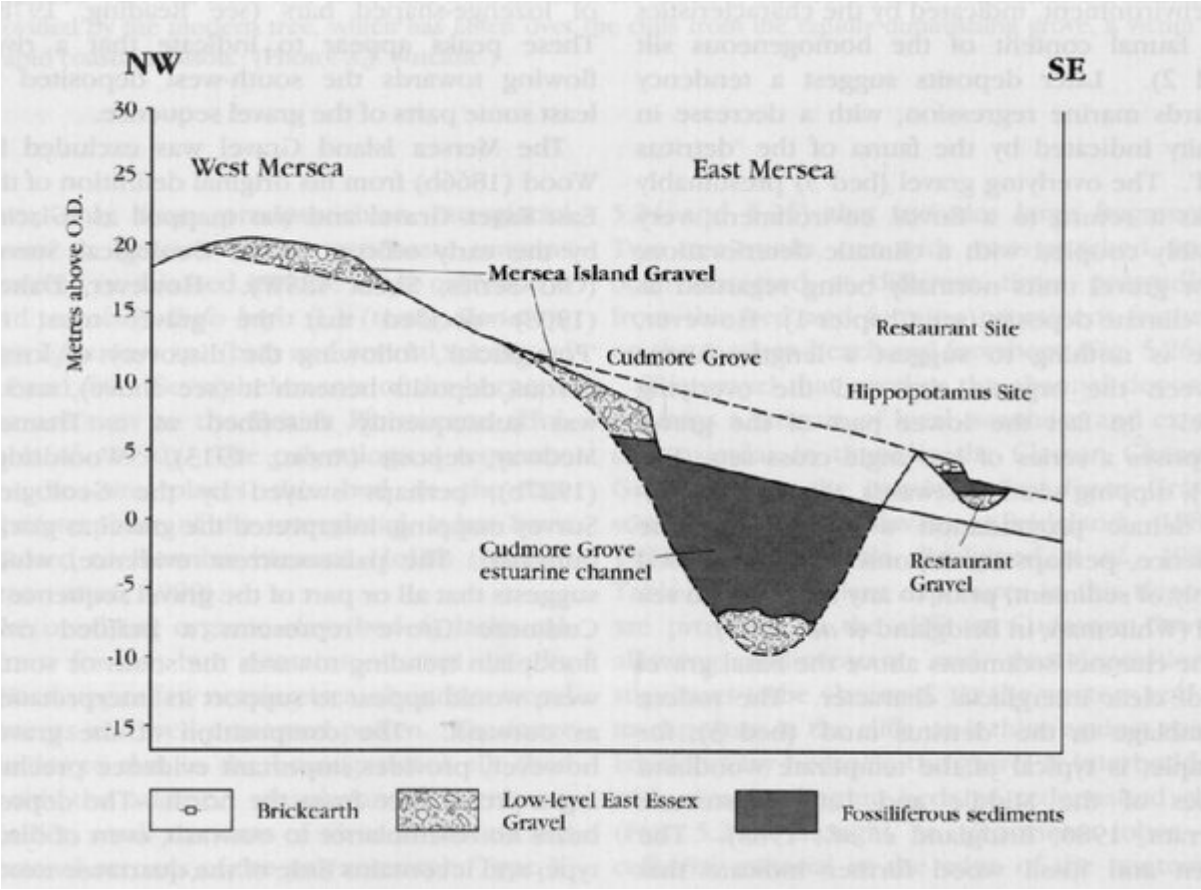
(Figure 5.35) East Mersea Hippopotamus Site: an elephant tooth is shown protruding from a silty pocket in the London Clay foreshore. All the faunal remains from this site have been recovered from similar situations, thought to represent pockets at the base of the Restaurant Gravel (see text). (Photo: A.J. Sutcliffe.)



(Figure 5.5) Palaeodrainage of Essex following the Anglian glaciation (modified from Bridgland, 1988a). (A) Palaeodrainage during the filling of the Southend/Asheldham/Clacton Channel. The Swanscombe Lower Gravel Channel and the Cudmore Grove Channel are both thought to be lateral equivalents. The Rochford Channel is now thought to represent an overdeepened section of the same feature (see text). This channel was excavated in the late Anglian by the newly diverted Thames and filled during the Hoxnian Stage (sensu Swanscombe). (B) Palaeodrainage during the deposition of the Southchurch/Asheldham Gravel.. This aggradational phase is believed to have culminated during the earliest part of the Saalian Stage, early in Oxygen Isotope Stage 10. (C) Palaeodrainage during the filling of the Shoeburyness Channel. The channel beneath the Corbets Tey Gravel of the Lower Thames is believed to be an upstream equivalent of this feature. It is thought that both the excavation and filling of the channel were intra-Saalian events, dating from Oxygen Isotope Stages 10 and 9 respectively. (D) Palaeodrainage during the deposition of the Barling Gravel. This is regarded as an intra-Saalian deposit, aggraded during Oxygen Isotope Stage 8. (E) Palaeodrainage during the deposition of the Mucking Gravel of the Lower Thames. The Thames-Medway equivalent of this formation is buried beneath the coastal alluvium east of Southend and can be traced offshore (Bridgland et ed., 1993). This aggradational phase occurred towards the end of the complex Saalian Stage, culminating early in Oxygen Isotope Stage 6. (F) Palaeodrainage during the last glacial. The submerged valley of the Thames-Medway has been recognized beneath Flandrian marine sediments in the area offshore from eastern Essex (after D'Olier, 1975).



(Figure 5.32) Longitudinal profiles of Blackwater terrace gravels.



(Figure 5.27) Idealized transverse section through Mersea Island (after Bridgland et al., 1988).