St Osyth Marsh, Essex

[TM 090 144]–[TM 130 126]

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Introduction

St Osyth Marsh (see (Figure 10.1) for general location) is an important site for studies of saltmarsh morphology, and is one of the few marsh areas in Britain to have been dated, the maximum age being 4280 ± 45 years BP, by analysis of a peat seam preserved in grey-black clay at the site. The characteristic assemblage of saltmarsh features — creeks, saltpans and saltmarsh cliff — are all present at St Osyth Marsh, and reflect the maturity of the marsh systems (Hussey and Long, 1982). The saltpans have been intensively researched by geomorphologists (Pethick, 1970, 1984; Leeks, 1979), and provide much information relating to the formation and development of this unique coastal landform. This is one of the few sites in Britain where chenier development has been described fully (Greensmith and Tucker, 1975). One of the main interests is the process of breaching and secondary spit genesis brought about by landward roll-over across the marsh surface. This process is well displayed in the upper levels of the system.

Description

The site comprises two main areas: a narrow beach and saltmarsh that extends some 3 km westwards from St Osyth [TM 130 127] to Colne Point, where the shoreline turns towards NNW for a further 2.3 km. The area between St Osyth and Colne Point rarely exceeds 400 m in width and is limited landwards by a low sea defence embankment (see (Figure 10.10)a. At its widest, the area beyond Colne Point exceeds 1.4 km and is dominated by a well-developed saltmarsh system. Longshore sediment movement is from St Osyth towards Colne Point and into the Colne estuary. The spring tidal range is 3.8 m. The beach is a narrow ridge formed predominantly of sand and pebbles and resting on the seaward-facing edge of the saltmarsh. It is a thin deposit underlain by the saltmarsh clay. Such a description follows closely that given by Price (1955) to the features known as cheniers (or marsh beach ridges). These are much shallower sedimentary features than the barrier ridges of sand and shingle that front saltmarshes in such locations as Blakeney Point and Orfordness. Whereas the latter form independently of the development of saltmarsh, cheniers depend upon the presence of the marsh deposits for their foundation. It is common for the distal end of such features to form a small, narrow barrier spit. At Colne Point this spit shows a historical pattern of extension and shortening (Greensmith and Tucker, 1975; see (Figure 10.10)a as well as destruction and reworking of the landward end of two older cheniers. The modern chenier is undergoing changes at present, which are probably related to gravel extraction between 1947 and 1962 at Colne Point (Robinson, 1953a) and to the recharging of the sediment supply by reworking of older chenier and tidal flat-deposits. Steers (1960, Plate 165) shows active excavation and the beginnings of a phase of breaching of the beach ridge to the north-west of Colne Point. Greensmith and Tucker (1975) describe a possible older chenier exposed in a low cliff at Colne Point.

Burd (1992) estimated that between 1973 and 1988 the Colne estuary marshes decreased in area by just under 12%. Although about 50 ha was gained by accretion, some 130 ha was lost by erosion and land-claim. The largest single loss was on either side of Colnc Point. Much of this loss occurred within creeks, but Burd (1992) suggested that the methodology used to compare aerial photographs of the area may overestimate this apparently high erosion of creeks. The causes of these changes are discussed in the Dengie GCR site report below.

The saltmarsh east of Colne Point is drained by a main creek, which parallels the beach throughout its length. Creeks and saltpans form less than 10% of the surface area of the marsh. In contrast, to the west of Colne Point, there is a more complex pattern of creeks. Hussey and Long (1982) estimated that creeks and saltpans occupied over 26% of one hectare of emergent marsh; 68% was occupied by a common saltmarsh–grass–sea purslane (*Puccinellia maritima-Halimione* (=*Atriplex*) *portulacoides*) community. Although they cover less than 1% of the surface area, saltpans are an important morphological feature of much of this saltmarsh. Their shape and size vary greatly, ranging from 1–15

m^2 in area and 5–40 cm in depth (Leeks, 1979). Although some appear to be roughly circular ('sub-circular'), many others are linear features with similar shapes to creeks. Saltmarsh morphology is affected by the evolution of the beach at Colne Point (Butler, 1978), for when the beach is breached, the hydrodynamics of the creeks alter. For example, when the beach is intact, most creek drainage from the western marsh is towards the estuary at Sandy Point, some 2.5 km away. When the beach is breached, much of the upper marshland drainage reaches the sea via channels just west of Colne Point.

The marsh is underlain by a clearly defined seam of peat overlain by grey-black clay that contains root remains. This has been dated at 4280 ± 45 years BP (Butler, 1978; Hussey and Long, 1982). The surface sediment above the clay is mainly clay (52%) and silt (43%), with 5% sand. Much of the marsh is described by Hussey and Long (1982) as emergent, except near the mouth of the tidal creek where it is degrading. The surface of the emergent marsh lies at 2.30 m OD ± 0.15 m and is covered by about 99 tides per annum (Hussey and Long, 1982).

Interpretation

Two features of this site are of especially noteworthy: the presence of both modern and older cheniers, and the large number of saltpans. The modern chenier is poorly developed at the eastern proximal end of the beach, and the salt-marsh is undergoing erosion to the extent that there is a risk of breaching and flooding of the upper saltmarsh. There are two old cheniers: the older was speculatively dated by Greensmith and Tucker (1975) as having formed between about 1550 and 1200 years BP and the more recent, (much of which is recycled by the retreat of the modern beach) might have formed between 1200 and 250 years BP This would be consistent with the date attributed to the marsh area of 4280 ± 45 years BP (Butler, 1978). On the Essex coast, these features appear to result from longshore transport that produces spits or fringing beaches, which during periods of higher wave-energy are carried on to the marsh edge. As the beach and ridge migrate inland, the salt-marsh is first buried and then exhumed. Erosion of the exhumed saltmarsh often produces a distinct marsh cliff. The presence of former saltmarsh standing at a higher altitude than the surrounding beach may cause local refraction of waves and so affect the alignment of the beach. The cheniers at Colne Point are composed mainly of sand and gravel, derived from cliff erosion and reworking of earlier beaches. The absence from a part of an eroded chenier at Colne Point of shells of the slipper limpet *Crepidula fornicata* (which was introduced into the Essex area between 1870 and 1880), provides an indicator of the minimum age of part of this feature (Greensmith and Tucker, 1975). Although cheniers occur elsewhere in Britain, they have rarely been described in detail and the Colne Point cheniers together with those to the south at Dengie Marsh (see GCR site report below) are the best examples of this unusual form.

The saltpans are also a feature that is particularly well represented here. The earliest descriptions in the Dovey estuary (Yapp *et al.*, 1917; Richards, 1934) identified two types of saltpan, the primary pan and the channel pan, which were described in more detail in north Norfok (Steers, 1946a; Pethick, 1974; Steers, 1977). The former are thought to have developed on the initial marsh surface as vegetation began to spread. Within small areas that were not vegetated evaporation of seawater produced highly saline conditions in which little plant life could survive or colonize. As a result, these hollows survive within the marsh topography. They often display circular forms that are attributed to the erosional effects of wavelets (Pethick, 1984), although this is rare here. There is, however, the possibility that some pans come into existence as a result of smothering of the surface by algal mats (Pethick, 1970) or, where cattle graze, by dung. Furthermore, the collapse of creek-banks may cut off sections of unvegetated mud that develop a partially rounded form under the influence of wavelets within the enclosed area. They are undoubtedly a feature of the marshes in north Norfolk, St Osyth, and elsewhere that need further investigation, especially in the light of improved understanding of creek sediment dynamics.

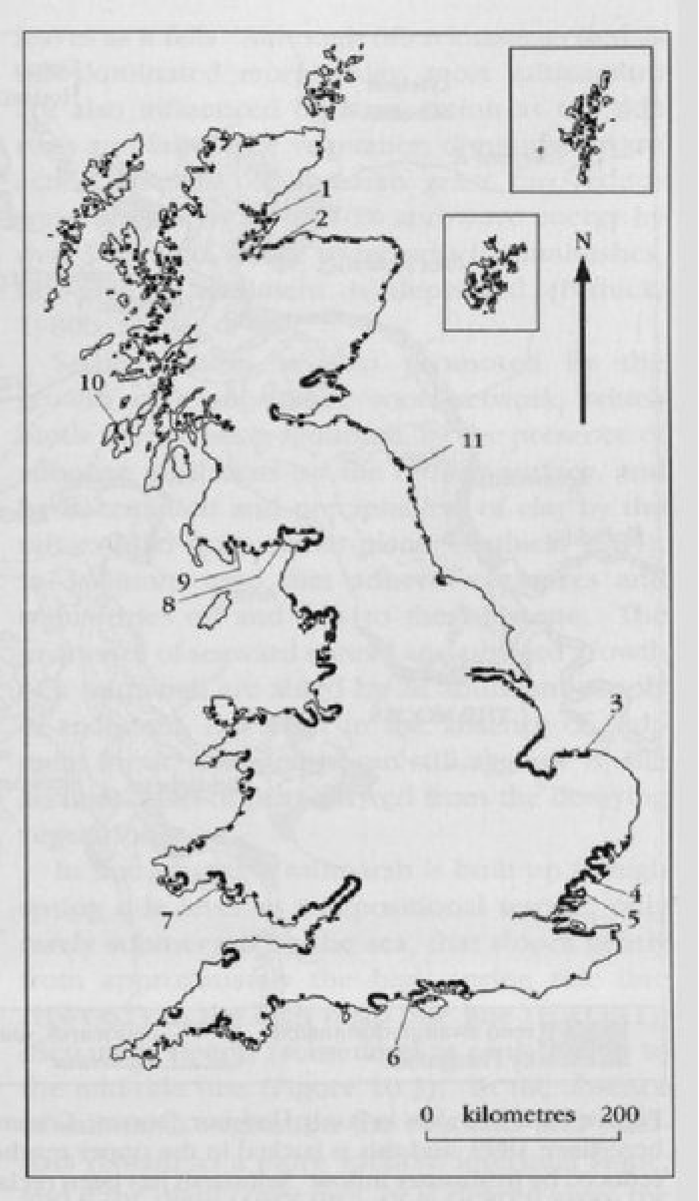
In contrast, the channel pans appear to originate when creeks are abandoned. Sedimentation at the mouth of the former creek blocks the exchange of water with active creeks and higher salinities maintain an absence of vegetation. Pethick (1984) suggests that possible causes may include changes in sea level that led to an abandonment of large numbers of creeks. Alternatively, as creeks are deepened because of saltmarsh accretion, the total volume of tidal flood water may require fewer channels. Sinuous channel pans may thus represent creek obsolescence. Although there is no evidence that subsurface piping systems occur in the marshes at St Osyth, their collapse elsewhere may also provide a mechanism for the development of elongated saltpans.

This site is of considerable importance to the understanding of saltmarsh morphology not only because it demonstrates the comparative longevity of such features in eastern England, but also because of its cheniers and saltpans. It has, however, another role as part of the coast protection of the Essex coast. The level of the saltmarsh is higher than the land that lies landwards of the site behind artificial sea defences. The continuing efficacy of the sea defences depends upon the continued presence of the beach and saltmarsh. Unfortunately, the construction of groynes at the northern end of the site has substantially reduced the supply of sediment to the beach, which is now seriously affected by erosion. As a result, not only the natural importance of the site, but also its coast protection role, are threatened.

If the sediment supply to the beach is not maintained, there is likely to be a deterioration of the proximal end of the beach, partial destruction of the saltmarshes and the sea-wall would become exposed. In these circumstances, it may prove prudent in the interest of maintaining the scientific interest to allow artificial beach-feeding by materials comparable to those that fed the beach in the past. The volume would need to be controlled so that it simulated the historical sediment transport patterns in magnitude and frequency. The coast protection needs would be furthered by such action. Like many sites on the English coast, the marsh and beach at St Osyth now depend upon human intervention for their future maintenance. The landward boundary is an artificial one (the sea-wall), without which the saltmarsh would by now have migrated well inland. The site is important, not least because it offers an opportunity to manipulate the coastal system in order to conserve features of national significance at the same time as providing insights into the links between sea defences, rising sea levels and saltmarsh development on sites restricted landwards by artificial structures.

Conclusions

One of the few dated saltmarsh sites in England and Wales, St Osyth Marsh is also important because of its cheniers, creeks and saltpans. Parts of the site are over 4000 years old and owe their preservation to the protective effects of both emergent saltmarsh and marsh-edge beaches. The cheniers at Colne Point are mainly in sand and gravel, unlike those farther south at Dengie, which are much more shelly. Understanding of the way in which saltmarshes and their protective cheniers develop has considerable importance for the protection of the low-lying Essex coastlands.



(Figure 10.1) The generalized distribution of active saltmarshes in Great Britain. Key to GCR sites described in the present chapter or Chapter 11 (coastal assemblage GCR sites): 1. Morrich More; 2. Culbin; 3. North Norfolk Coast; 4. St Osyth Marsh; 5. Dengie Marsh; 6. Keyhaven Marsh, Hurst Castle; 7. Burly Inlet, Carmarthen Bay; 8. Solway Firth, North and South shores; 9. Solway Firth, Cree Estuary; 10. Loch Gruinart, Islay, 11. Holy Island. (After Pye and French, 1993.)

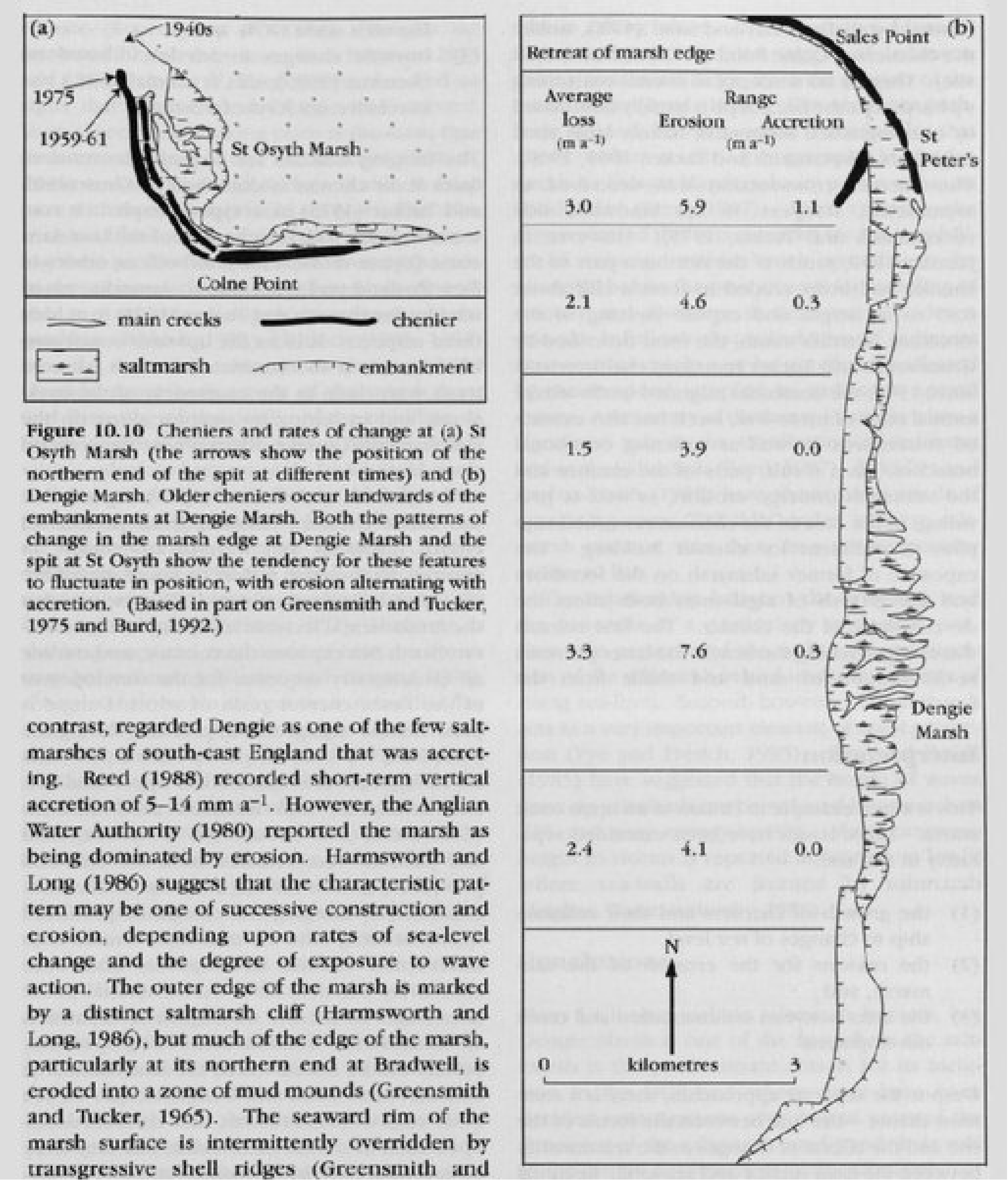


Figure 10.10 Cheniers and rates of change at (a) St Osyth Marsh (the arrows show the position of the northern end of the spit at different times) and (b) Dengie Marsh. Older cheniers occur landwards of the embankments at Dengie Marsh. Both the patterns of change in the marsh edge at Dengie Marsh and the spit at St Osyth show the tendency for these features to fluctuate in position, with erosion alternating with accretion. (Based in part on Greensmith and Tucker, 1975 and Burd, 1992.)

contrast, regarded Dengie as one of the few saltmarshes of south-east England that was accreting. Reed (1988) recorded short-term vertical accretion of 5–14 mm a^{-1}. However, the Anglian Water Authority (1980) reported the marsh as being dominated by erosion. Harmsworth and Long (1986) suggest that the characteristic pattern may be one of successive construction and erosion, depending upon rates of sea-level change and the degree of exposure to wave action. The outer edge of the marsh is marked by a distinct saltmarsh cliff (Harmsworth and Long, 1986), but much of the edge of the marsh, particularly at its northern end at Bradwell, is eroded into a zone of mud mounds (Greensmith and Tucker, 1965). The seaward rim of the marsh surface is intermittently overridden by transgressive shell ridges (Greensmith and

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