KEYHAVEN MARSH, HURST CASTLE

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Introduction

The Keyhaven saltmarshes (see Figure 10.1 for general location) are important for the range of geomorphological features they display, particularly the intricate pattern of saltmarsh creeks. The site is an important research area for examining the relationship between creek dynamics, tidal processes and sedimentation. The western part of the saltmarshes forms an integral part of the Hurst Castle Spit system (see GCR site report in Chapter 6), a classic site for the study of coastal geomorphology.

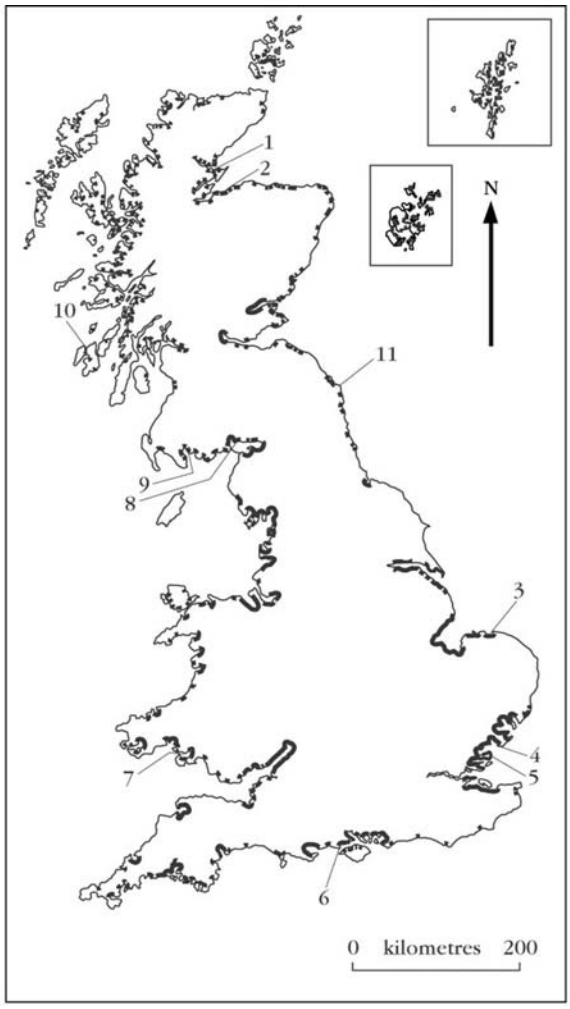

Figure 10.1: The generalized distribution of active saltmarshes in Great Britain. Key to GCR sites described in the present chapter or Chapter 11 (coastal assemblage GCR sites): 1. Morrich More; 2. Culbin; 3. North Norfolk Coast; 4. St Osyth Marsh; 5. Dengie Marsh; 6. Keyhaven Marsh, Hurst Castle; 7. Burry 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.)

Description

Hurst Castle Spit protects a large area of saltmarshes, known as 'Keyhaven Marshes' (Figure 10.11). They are drained by an intricate pattern of creeks dominated by three major creeks – Mount Lake, alongside the spit, Keyhaven Lake and Hawker's Lake. The first two merge and

drain into the Solent after being diverted by the modern recurves of the spit. Marsh-edge beaches ('cheniers' – see GCR site reports for St Osyth and Dengie above) are formed of shells and shingle. Their sand content is very low. Low-relief cheniers have developed along the marsh edge and provide some protection against erosion. Much of the saltmarsh edge is being eroded rapidly (6 m a^{-1} over the past 50 years: Pye and French, 1993), resulting in some patches of mud mounds. The upper intertidal zone is characterized by steep microcliffs and a strong concave upward profile within the upper part of the intertidal zone. The upper marsh lies at about 2.4 m OD with a seaward marsh edge at about 2.0 m OD. The elevation of the upper tidal flats is typically about 1.0 to 1.5 m OD (Pye and French, 1993). The seaward cliffs vary in height but are typically 0.7–1.5 m. The marsh surface varies in level by about 0.4 m. The surface of the marshes is characterized by a high proportion of eroded marsh, saltpans, and broad channels. There are only small areas of higher-level, species-rich saltmarsh, located mainly close to the spit and on its older recurves. Sea purslane *Atriplex portulacoides*, common sea-lavender *Limonium vulgare*, sea plantain *Plantago maritima*, sea meadow-grass *Puccinellia maritima*, common seablite *Suaeda maritima*, glasswort *Salicornia* spp., and sea aster *Aster tripolium* are common throughout these higher marshes. In contrast, the more extensive lower marshes are species-poor and dominated by common cord-grass *Spartina anglica*. The intertidal area close to the spit is often a stony mud. Before the late 19th century, much of this marsh stood as much as 1 m lower and was dominated by eelgrass *Zostera*. Colonization by *Spartina anglica* following its hybridization from the native *Spartina maritima* and the introduced *Spartina alterniflora* in Southampton Water led to a rapid build-up of the saltmarsh surface. The area of *Spartina*-dominated saltmarsh reached a maximum about 1930, after which the area declined (Bradbury, 1996). As the recurves of the modern spit have extended into the westernmost creek, they have increased local accretion of mudflats.

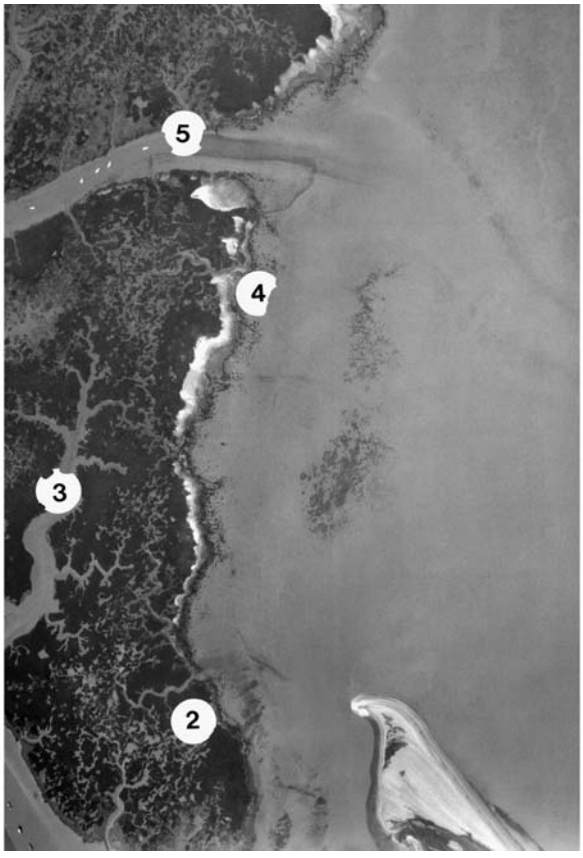

Figure 10.11: Keyhaven Marshes. (1) Distal point of Hurst Castle spit; (2) saltpans; (3) major creek; (4) retreating saltmarsh edge and chenier formation; (5) dominant channel draining upper marsh. (Photo: courtesy Cambridge University Collection of Aerial Photographs, Crown Copyright, Great Scotland Yard.)

Bradbury (1996) describes the rapid short-term morphological and ecological evolution of the western Solent saltmarshes that include this site. There have been substantial losses of intertidal flat. Ke and Collins (1993) estimated the average annual loss of saltmarsh in the

western Solent as 3.6 × 10^4 m^2 a^{-1}, at the same time as the saltmarsh surface is accumulating sediment at between 2 and 5 mm a^{-1}. Average erosion of the marsh edge was 3 m a^{-1} between 1992 and 1994, less than the open coast retreat but more than the fringing edge retreat of 1 m a^{-1} since 1950. Dyer (1980) showed that between 1950 and 1973 reduction in intertidal width varied between 180 and 360 m (7.8 m a^{-1}). There was a strong correlation between wind-generated wave-attack and the rate of erosion. Tidal range is 2.5 m on spring tides, but meteorological surges may raise waters levels by up to 50%. The upper marshes at Keyhaven are typically formed in sandy silts, becoming silty sand on the upper tidal flats.

Interpretation

These saltmarshes are remarkable for their rapid vertical accretion and areal extension with the arrival of *Spartina anglica* in the late 19th century. Their subsequent reduction in altitude and area was almost as rapid during the mid-20th century and is related to die-back of *Spartina* described in a series of papers (Braybrooks, 1957; Goodman, 1957, 1960; Goodman and Williams, 1961; Goodman *et al.*, 1959), which showed that it was associated with exceptionally poorly drained saltmarsh soils. Die-back occurred, however, both along channels and within the central parts of the marshes. In the latter, ‘pan die-back' may have been associated with the restriction of drainage by rapid accretion around the edges of marshes. In the former, however, other factors, including algal mats, possibly resulting from local eutrophication and cloaking the surface, may have led to more extensive die-back. As channels widened, erosion of the marsh edges appears to have accelerated, although in many parts of the saltmarsh, die-back resulted in a lowering of the marsh surface rather than wholesale retreat of the marsh cliff. The saltmarshes that shelter behind the beach are also liable to damage from recreational use, as well as local pollution.

Conclusions

The development of saltmarsh in the lee of Hurst Castle Spit was limited until the arrival of common cord-grass *Spartina anglica* at the end of the 19th century. The geomorphological interest of this site lies in the rapid sedimentation and saltmarsh development associated with *Spartina* followed by an equally rapid decline and loss of saltmarsh area. Unlike the saltmarshes and cheniers of the Essex coast, those of the Keyhaven marsh are very recent in origin.

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