Severe weather wader kill in The Solent, southern England during February 1991

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The Solent derives from the post glacial inundation of a major river and its tributaries and today comprises 14 estuaries and intertidal basins disposed around a main waterway separating the Isle of Wight from the mainland of south-central England (Figure 1). There are 9,060 ha of intertidal sediments, of which 6,191 ha are mudflats, 729 ha are sandflats, 430 ha are upper-shore saltmarsh and 1,710 ha are cord-grass *Spartina anglica* marshes. The Solent supports around 100,000 waders and 40,000 ducks and brent geese in winter and is thus among the most important estuarine systems for waterfowl in Britain. It has the advantage of a mild climate, with relatively high winter water temperatures and a low incidence if intertidal freeze-ups when ice denies mudflats to feeding birds.

In the 32 winters since 1959, ice has occurred extensively in the intertidal zone only in 10 winters and in only 5 winters did it persist for more than 7 consecutive days. The longest period was in February 1991. On the Solent coast, overnight temperatures were consistently below -2°C between 4 and 12 February, falling to below -8° during 7-10 February. Daytime temperatures did not rise above freezing point. There were snow falls on 6, 7, 8, 10 and 11 February and substantial icing on the intertidal zone by 7 February, persisting until 12 February. During, and in the month following this episode, more than 60% of the mainland shore of the Solent, but only short stretches on the Isle of Wight, was searched for shorebirds and other corpses by at least 10 observers. Few corpses were found, except at the western end of the Solent.

Bird deaths

On 16 and 20 February, one of us (EJW) searched the north shore of the West Solent for cold weather casualties. Totals of 371 Dunlin (c.10% of the total present at the onset of cold weather), 42 Redshank *Tringa totanus*, 7 Black-tailed Godwit *Limosa limosa*, 4 Grey Plover *Pluvialis squatarola*, 3 Oystercatcher *Haematopus ostralegus*, 3 Turnstone *Arenaria interpres*, 2 Lapwing *Vanellus vanellus*, 5 Shelduck *Tadorna tadorna*, 1 Brent Goose *Branta bernicla*, 1 Wigeon *Anas penelope* and 1 Teal *Anas crecca* were found on the strandline at Hurst Spit which marks the western end of the Solent. On 18 March, Simon Aspinall found the desiccated remains of a further 35 Dunlin, 10 Redshank, 4 Grey Plover and

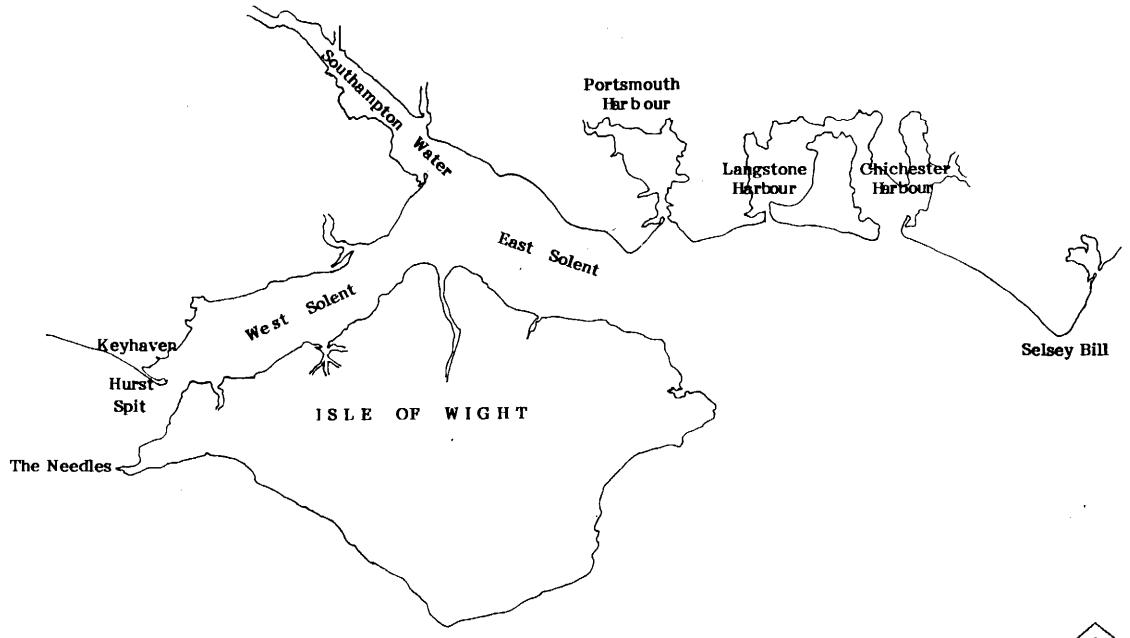

Figure 1. The Solent.

1 Ringed Plover *Charadrius hiaticula* on the shoreline at Keyhaven, also at the western end of the Solent. These had evidently lodged initially on saltmarsh and had come ashore on recent spring tides. Only a few additional corpses of the same species were reported after that. From the remainder of The Solent, a total of 56 corpses were reported in February and March 1991 - 15 Shelduck, 15 Redshank, 2 Black-tailed Godwit, 1 Curlew *Numenius arquata*, 17(+) Dunlin, 1 Ringed Plover, 1 Oystercatcher, 2 Grey Plover and 2 Brent Geese. The large kill in the West Solent appears to have been an isolated incident in the context of the central south coast. We think it occurred because of the peculiar local conditions.

Conditions in the West Solent

The intertidal zone on the north shore of the West Solent comprises extensive *Spartina anglica* marshes and a narrow fringe of mudflats which are most extensive where wide creeks penetrate the marshes, and in the lea of Hurst Spit, which is the western limit of The Solent. Cartographic evidence shows that there has been a considerable reduction in the areas of intertidal sediments in The Solent generally since the early 19th century. Successive maps published by the Ordnance Survey show a progressive narrowing of the intertidal zone. This is least evident in the sheltered estuaries and harbours and most accentuated on the shoreline of the main Solent waterway notably on the north shore of the West Solent. There, the intertidal zone at mean low water has been halved or more in width since the 1860s and in places it has been reduced by 80%. Concurrently with this process, the intertidal profile has been transformed from a convex to a flattened shape, reflecting a considerable loss of accumulated sediment. This loss of sediment appears to have been in progress earlier this century but it has been especially marked since the 1950s, since when up to 1m of sediment has been removed from the upper shore. These linked geomorphological processes appear to be among the consequences of a pulse sea level rise which probably commenced in the late 18th or early 19th centuries.

The West Solent's tidal regime is peculiar, with a high water stand of as much as 3 hours and a much-shortened ebb of about 3.5 hours. These tidal characteristics substantially reduce the period of mudflat exposure. Combined with the reduced level of the muds in the tidal range, this means that on the lowest neap tides the mudflats are only exposed as a narrow fringe for only about two hours during each low water period. At spring tides the exposed mudflats are much more extensive, though the period during which the greater part of them is exposed is no more than 3 hours.

Explanation

The severe weather of 4-12 February 1991 coincided with neap tides. The tidal range was least between 7 and 11 February, during which period the narrow upper-shore fringe of mud exposed at low water in the West Solent was the recipient of accumulated ice. The saltmarsh creeks and their fringed muds were also choked with ice. In contrast, elsewhere in The Solent extensive muds free of ice remained available to waders for feeding, although the upper shore levels were frozen and covered in drifted ice. It seems an inescapable conclusion that the relatively large kill of waders, notably Dunlin, was a consequence of the peculiar local conditions on the north-west Solent shore. The situation begs the question as to why the birds failed to move elsewhere, but they may simply have been caught in a trap in which energy reserves were depleted too quickly to move. Unfortunately, the corpses were in too modified a condition to be worthwhile weighing.

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