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# The Triassic red beds of west Cumbria and the East Irish Sea Basin

## Introduction

The Irish Sea is the site of an extensive Permo-Triassic depositional basin. Indeed, Permo-Triassic sediments here occur mainly beneath the sea, and appear on shore only in small coastal outcrops, on the northern tip of the Isle of Man, along the Solway Firth, the coastal margin of Cumbria, and west Lancashire and on the Wirral Peninsula (Figure 3.1). Many of these outcrops are masked by glacial and other superficial deposits, and good exposures are rare. The onshore representatives were summarized by Warrington *et al.*, (1980), and the offshore geology described by Colter and Ebberrn (1978), Jackson *et al.* (1987), Warrington and Ivimey-Cook (1992), Cowan (1993), Jackson and Mulholland (1993), Meadows and Beach (1993), Jackson *et al.* (1995), Jackson and Johnson (1996), and Meadows *et al.* (1997).

The East Irish Sea Basin consists of eight or more constituent half-grabens, and the Keys Basin, lying midway between the Isle of Man and the Lancashire coast, preserves one of the thickest Triassic successions (4250 m) in the British Isles. After deposition of Permian sediments, there was rapid regional subsidence, accompanied by deposition of thick Triassic successions in the middle of the basins. These include some 1450 m of Sherwood Sandstone Group conglomerates and sandstones deposited in river systems and which include an important hydrocarbon reservoir unit. The Mercia Mudstone Group accumulated to an even greater thickness (3200 m); it includes five major halite units, that correlate with the succession in west Lancashire.

The Triassic succession in Cumbria is comparable with that in Dumfries and Galloway (Figure 3.19). Above the Permian St Bees Shale and Eden Shale formations (see Chapter 3), is the Triassic St Bees Sandstone Formation (150–600 m thick), followed, successively, by the Calder Sandstone Formation (up to 600 m thick), the Ormskirk Sandstone Formation (175–250 m thick), and equivalents of the Mercia Mudstone Group (Arthurton *et al.*, 1978; Meadows and Beach, 1993; Barnes *et al.*, 1994; Jackson and Johnson, 1996; Akhurst *et al.*, 1997).

The succession in the coastal areas of Cheshire, the Wirral, and North Wales also comprises mainly Lower and Middle Triassic units (Figure 3.19). The lowest unit, termed the 'Kinnerton Sandstone Formation' (Warrington *et al.*, 1980, p. 31), formerly the 'Lower Mottled Sandstone', almost certainly spans the Permo-Triassic boundary and is probably partly laterally equivalent to the Manchester Marl Formation in other parts of the basin. Above these lie the Chester Pebble Beds and the Wilmslow Sandstone formations, formerly the 'Bunter Pebble Beds' and the 'Upper Mottled Sandstone' respectively. Northwards, through west Lancashire and south Cumbria, and offshore, these two formations become indistinguishable and pass laterally into the St Bees Sandstone Formation. In the East Irish Sea Basin, the Chester Pebble Beds Formation may pass into the Ormskirk Sandstone Formation (Figure 3.19), a unit recognized around Ormskirk (Warrington *et al.*, 1980, p. 32) and in Cumbria (Akhurst *et al.*, 1997), as well as offshore Jackson *et al.*, 1987; Meadows and Beach, 1993). Overlying units include the Helsby Sandstone Formation and the Tarporley Siltstone Formation, at the top of the Sherwood Sandstone Group and the base of the Mercia Mudstone Group respectively (Figure 3.19).

Three GCR sites have been selected to represent the Triassic outcrop around the East Irish Sea, and they inevitably focus on the lower parts of the succession. The type location for the St Bees Sandstone Formation, St Bees in Cumbria, is an obvious choice. In the Wirral, the Burton Point section includes the Permo-Triassic Kinnerton Sandstone and the overlying Chester Pebble Beds formations, while Hilbre Island shows in extraordinary detail the sedimentary structures and trace fossils, including footprints of vertebrates, of the Ormskirk Sandstone Formation. Also on the Wirral Peninsula, Thurstaston is the best site in the region for the Thurstaston Member of the Helsby Sandstone Formation, and The Dungeon offers an excellent exposure of the Tarporley Siltstone Formation.

[Fleswick–Saint Bees, Cumbria](#)

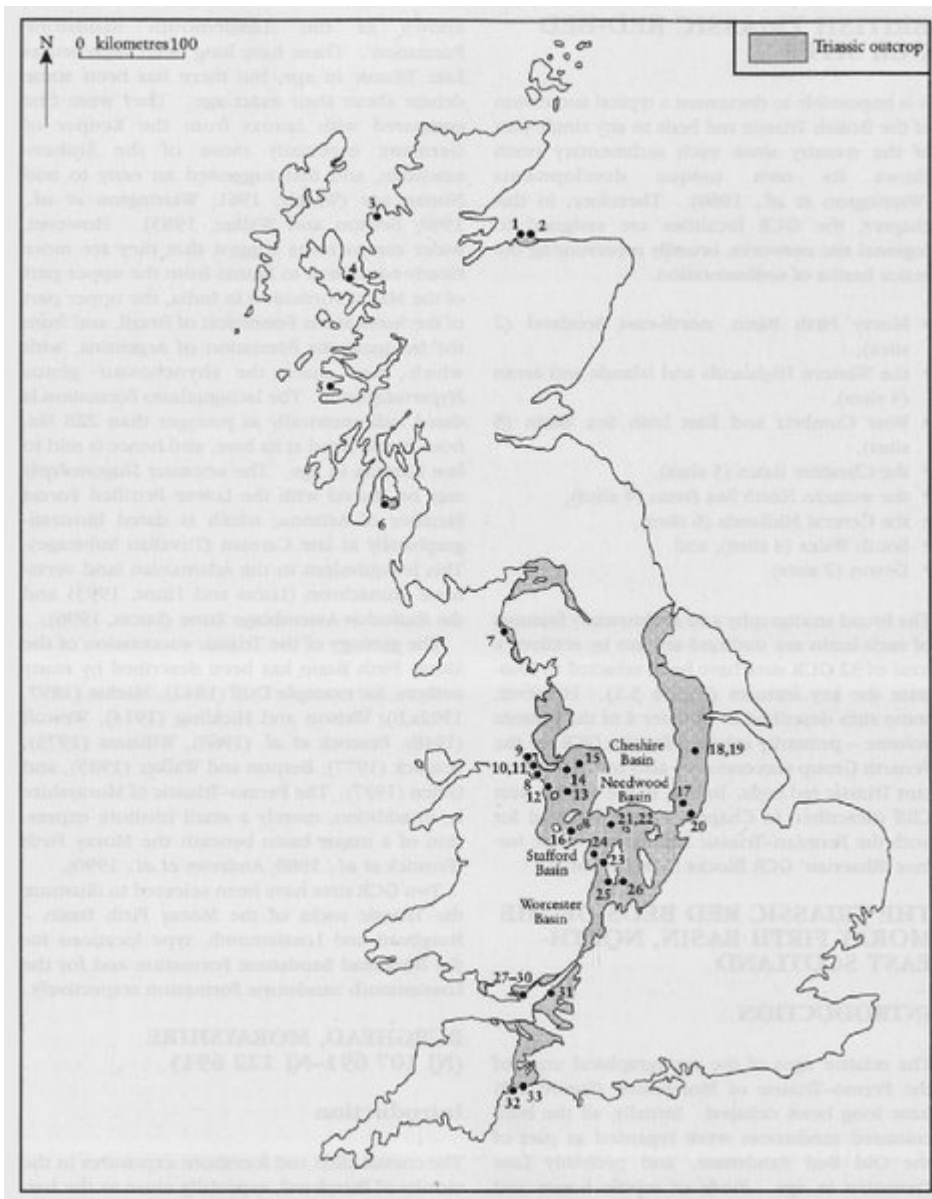
[Burton Point, The Wirral, Cheshire](#)

[Hilbre Island and Hilbre Point, The Wirral, Cheshire](#)

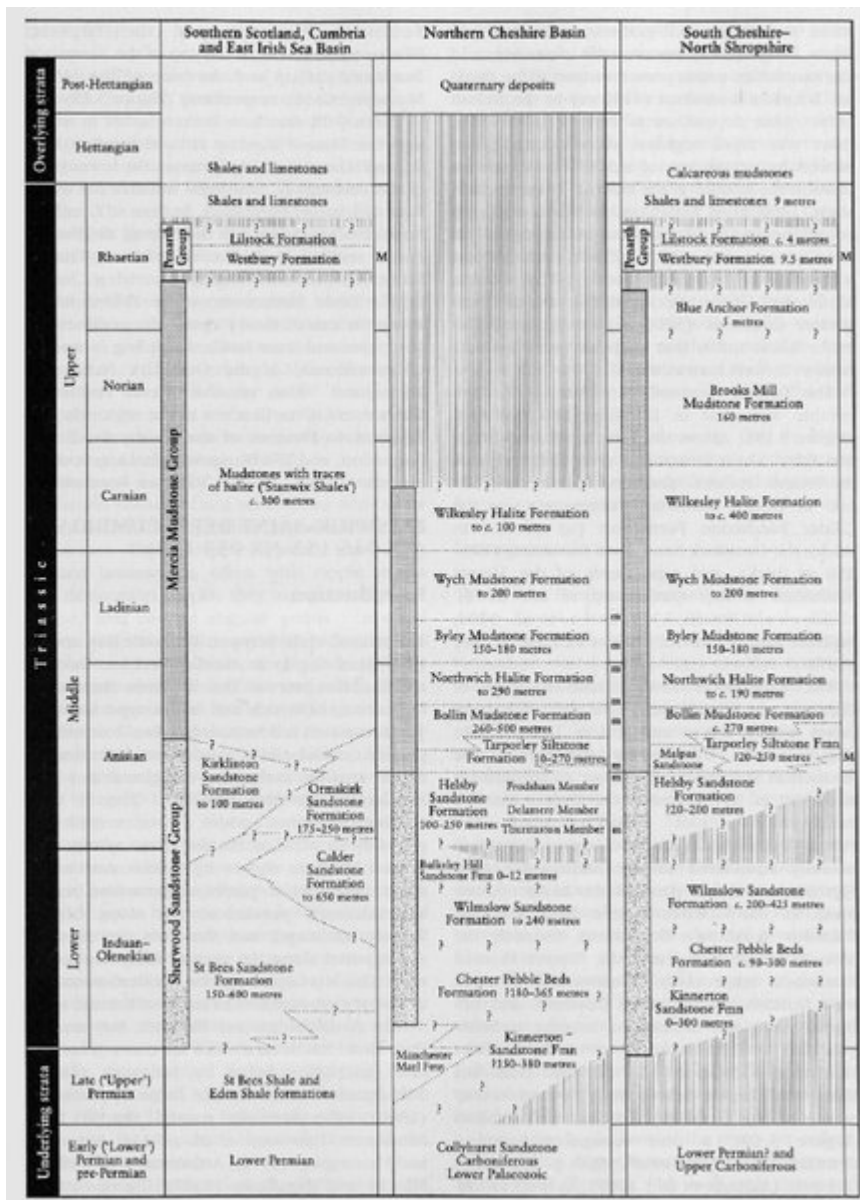
[Thurstaston Common, Merseyside](#)

[The Dungeon, Merseyside](#)

## [References](#)



(Figure 3.1) Map showing the distribution of Triassic rocks in Great Britain. GCR Triassic red-bed sites are indicated: (1) Burghead; (2) Lossiemouth; (3) Guinard Bay; (4) Eyre Burn; (5) Gribun; (6) King's Cave to Drumadoon; (7) Fleswick to St Bees; (8) Burton Point; (9) Hilbre Island; (10) Thurstaston; (11) The Dungeon; (12) Dee Cliffs; (13) Bickerton Hill; (14) Frodsham; (15) Red Brow; (16) Grinshill; (17) Nottingham Castle; (18) Styrrup Quarry; (19) Scrooby Top Quarry; (20) Colwick; (21) Hulme Quarry; (22) Brocton; (23) Wollaston Ridge; (24) Claverley Road Cutting; (25) Burcot; (26) Shrewley; (27) Sutton Flats; (28) Barry Island; (29) Hayes Point to Bendrick Rock; (30) Sully Island; (31) Aust Cliff (see Chapter 4); (32) Budleigh Salterton; (33) Ladram Bay to Sidmouth. The Triassic red-bed/Penarth Group sites described in Chapter 4 are shown on [gcr24\\_04\\_05.html](#) (Figure 4.5).



(Figure 3.19) Stratigraphical columns for the Triassic successions of southern Scotland and Cumbria, and the East Irish Sea and Cheshire Basin areas. M, macrofossils; m, microfossils. Based on Warrington et al. (1980), Jackson et al. (1987), Wilson (1993) and Ivimey-Cook et al. (1995), Jackson and Johnson (1996), Akhurst et al. (1997) and Warrington (199713).