

THE STRATIGRAPHY AND SEDIMENTOLOGY OF THE DUNSCOMBE MUDSTONE FORMATION (LATE TRIASSIC) OF SOUTH-WEST ENGLAND

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The mid to late Triassic Mercia Mudstone Group exposed on the east Devon coast between Sidmouth and Seaton consists of c. 450 m of predominantly red mudstones that were deposited in low-relief sabkha environments in hot deserts. In marked contrast to this, the Dunscombe Mudstone Formation in the middle part of the group consists of 35-40 m of interbedded and interlaminated green, purple and grey mudstones, breccias, muddy limestones and lenticular siltstones/sandstones that were deposited in a wetter, possibly cooler climate. The formation is poorly exposed inland, but the striking colour difference from that of the adjacent formations enables its outcrop to be traced more or less continuously from the Devon to Somerset coasts. A detailed study of the sedimentology and ichnology of the formation, in particular that of laterally impersistent arenaceous members in its lower part, has shown that it was deposited in a succession of shallow, freshwater lakes in a low-relief topography that was at times crossed by broad shallow distributary channels. A combination of palynology and magnetostratigraphy is interpreted to represent that the Dunscombe Mudstone Formation is a condensed succession that occupied most of the late Triassic Carnian Stage, about 11.5 million years. It was deposited at a time of active tectonic subsidence, as a result of which it is laterally highly variable in thickness. In its extensive subcrop in the Wessex and Bristol Channel basins it locally reaches over 150 m in thickness in the more rapidly subsiding graben areas by the addition of halite. The northern boundary of the depositional area roughly followed the Variscan Front, along the line of the present-day Mendip Hills and South Wales coast.

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INTRODUCTION

The mid to late Triassic Mercia Mudstone Group in south-west England crops out on the east Devon coast, in the floors of the deeper valleys in east Devon beneath an unconformable cover of Cretaceous rocks, and over a broad area of south Somerset (Figure 1). It is divided into four formations in this region, in ascending order the Sidmouth Mudstone, Dunscombe Mudstone, Branscombe Mudstone and Blue Anchor formations (Gallois, 2001). About 380 m of the group total of c. 450 m exposed on the east Devon coast between Sidmouth and Seaton consists of relatively structureless red mudstones (Sidmouth and Branscombe Mudstone formations) that were deposited in low-relief sabkha environments in hot deserts. In contrast, the intervening Dunscombe Mudstone Formation consists of up to 43 m of interbedded and interlaminated green, purple and grey mudstones, breccias, limestones, siltstones and sandstones that were deposited in a wetter, possibly cooler climate.

In the east Devon cliffs, the most prominent Dunscombe Mudstone Formation lithology is a friable-weathering green mudstone, that contrast with the red-brown mudstones of the underlying and overlying formations. Woodward and Ussher (1911) referred to this as a conspicuous "hard greenish band", and Warrington and Scrivener (1980, figure 3) incorrectly identified it as a 20 m-thick sandstone. This was formally named the Weston Mouth Sandstone Member by Warrington *et al.*, (1980).

Lenticular beds of siltstone and fine-grained sandstone are present in the lower part of the Dunscombe Mudstone Formation at several localities in south-west England, but they represent only a small percentage by volume of the formation. At outcrop on the Devon coast, the thickest of these units has

been named the Lincombe Member (Porter and Gallois, in press). In Somerset, sandstones in the Taunton-North Curry and Sutton Mallet areas (Ussher, 1908) have been named the North Curry Sandstone Member (Warrington *et al.*, 1980) and Sutton Mallet Sandstone Member (Porter and Gallois, in press) respectively.

OUTCROP DETAILS

The Dunscombe Mudstone Formation is wholly exposed in a series of disconnected sections in the cliffs adjacent to Weston Mouth on the east Devon coast, and its outcrop can be traced intermittently from there to the Devon-Somerset border north of Luxton (Figure 1). It emerges from beneath the Cretaceous rocks of the Blackdown Hills south of Taunton and has a more or less continuous outcrop, albeit displaced in part by faulting, between there and Stathe. Northwards from there, the outcrop is broken by faulting and the formation is largely obscured by the Recent sediments of the South Somerset Levels (Figure 1). It crops out in a fault-bounded outlier on the north side of the Levels between Moorlinch and Sutton Mallet, and is cut out by faulting between there and the Somerset coast. Blocks of green mudstone and fragments of sandstone are exposed in a fault breccia at the junction of the Sidmouth and Branscombe Mudstone formations at St Audries Bay on the Somerset coast.

Inland sections in the Dunscombe Mudstone Formation in Devon and Somerset are confined to a small number (<10 recorded) of natural exposures and a few overgrown quarries and sunken lanes. None of these expose the full thickness of the formation and most expose only a small part of it. The most complete inland sections currently extant in Devon are in a stream bed (SY 160 995) at Littleton, Honiton and a sunken lane (ST 166 047) at Penny Thorn Cross, Luppitt.