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Conserving classic geological sections in the Inferior Oolite Formation, Middle Jurassic of the Wessex Basin, south-west England

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ABSTRACT

Over 200 years since the publication of William Smith's 1815 geological map, we explore the conservation of the Inferior Oolite Formation including Dundry Hill in Somerset which was visited by, and critical to Smith's work. In particular, the network of nationally important Sites of Special Scientific Interest (SSSI) that encompass the Middle Jurassic Aalenian–Bajocian sequence in the Wessex Basin are considered. A number of examples of conserving disused Inferior Oolite quarries are used to illustrate these challenges and benefits of geoconservation, including Frogden Quarry SSSI and Horn Park Quarry National Nature Reserve (NNR) in Dorset, and South Main Road Quarry SSSI on Dundry Hill. This paper briefly reflects on John Callomon's critical contribution to understanding the Inferior Oolite Formation, and the shared challenge faced by William Smith and John Callomon.

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1. Introduction

First presented in the bicentenary year of William Smith's 1815 geological map and as part of the celebration meeting of the life and work of John Callomon, this paper considers briefly the contribution of both to our understanding of the Inferior Oolite Formation of the Wessex Basin in south-west England. It provides an overview of the conservation of key Inferior Oolite localities in this area with three examples examined in detail: Dundry Hill; Frogden Quarry, Osborne; and Horn Park Quarry.

The term 'Inferior Oolite' was first used (in print) in 1813 by William Smith's close friend, the Reverend Joseph [Townsend \(1813\)](#). William Smith (1769–1839), the 'Father of English Geology' ([Phillips, 1844](#)), had a long and close association with the Inferior Oolite having been born and lived on or near the Jurassic limestones of Somerset and Oxfordshire for much of his early life. This was the period in which he started to form his ideas on the relationship between groups of rocks and the fossils that they contained which eventually led to his famous 1815 geological map "A delineation of strata of England and Wales, with part of Scotland". It is particularly timely that in the bicentenary year of the publication of William Smith's map we consider the

conservation of the Inferior Oolite, 200 years since it was depicted as a dark ochre-orange cross cutting the world's first large-scale geological map.

The Inferior Oolite Formation has been the subject of research from the 19th Century to the present with periodic advances connected to particular people: J. Buckman and S.S. Buckman (father and son) in the 19th and early 20th Centuries, Richardson in the mid-20th Century, Parsons in the 1970s and the current resurgence of interest particularly driven by Callomon, Chandler and colleagues (of the Wessex Cephalopod Club) from the 1970s to present.

Since 1950, key Inferior Oolite localities in England have been conserved through national conservation legislation. A review of this process is provided here, that, in particular, illustrates the challenge and opportunity of conserving inland Inferior Oolite sites through three examples: the localities of South Main Road Quarry, Dundry Hill, Somerset (ST 567655); Frogden Quarry, Osborne (ST 649183); and Horn Park Quarry near Beaminster, Dorset (ST 457021) (see [Fig. 1](#) for localities). Here, conservation continues to enable research, education and, more widely, the opportunity to inspire people through the fossils and ancient world of the Jurassic Inferior Oolite. In recent terms (e.g., [Callomon and Cope, 1995](#)) the Inferior Oolite is the lowest formation of the Middle Jurassic incorporating the Aalenian, Bajocian and the lowest part of the Bathonian stages. In Dorset ([Cope, 2012](#)) it is a thinly bedded succession of iron oolitic and micritic, bioclastic limestones. It is

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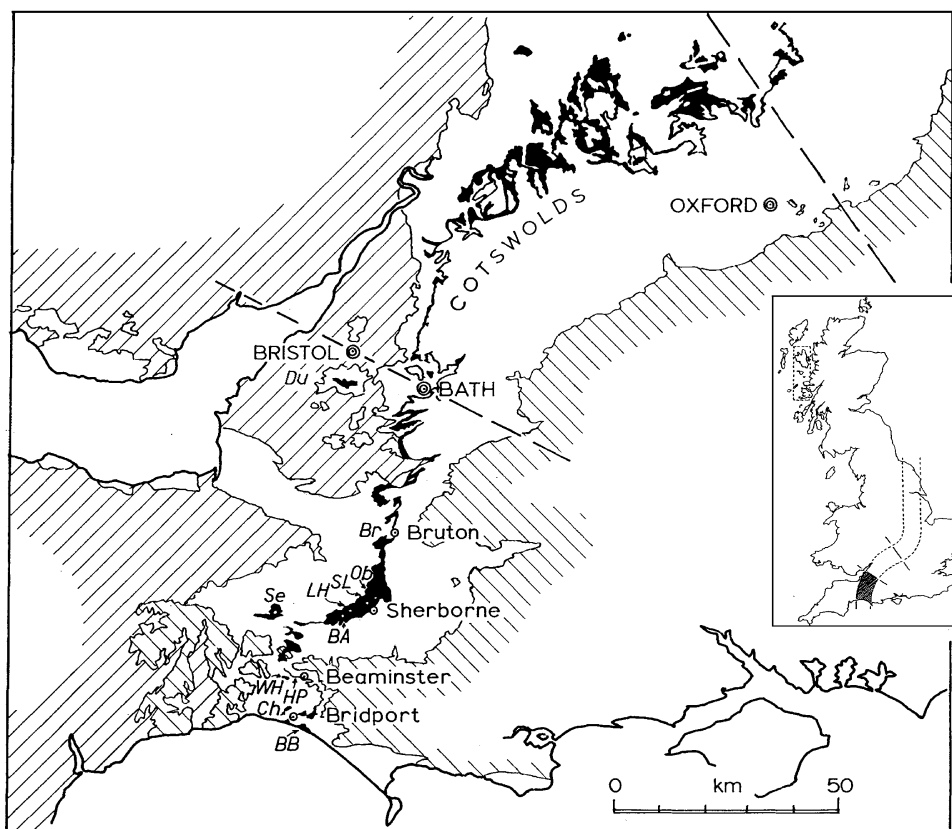


Fig. 1. Outcrop of the Inferior Oolite Formation (solid) in southwest England. Diagonal shading to the west: pre-Jurassic rocks; diagonal shading to the east: post-Jurassic rocks. Key localities discussed in detail in the present paper: Du – Dundry Hill (South Main Road Quarry and Barns Batch Spinney) Ob – Osborne (Frogden Quarry); HP – Horn Park. Additional key Inferior Oolite Formation localities in the Wessex Basin are indicated as follows: Br – Bruton; LH – Louse (Lows) Hill; SL – Sandford Lane; Se – Seavington St Mary; BA – Bradford Abbas, WH – Waddon Hill, Stoke Knap; Ch – Chideock; BB – Burton Bradstock.

relatively thin, seldom exceeding about 5 m and has no natural inland exposure. It is seen on the coast capping Burton Cliff and East Cliff at the southern end of its outcrop, and can be traced north-eastwards to the Yorkshire coast; however, outside the Wessex Basin it presents a different lithological character.

Along the outcrop of the Inferior Oolite Formation in southwest England there existed in the past numerous exposures, most of which have now gone. A number of key sites have been re-excavated over the years and these have enabled a considerable advance in our understanding of the nature of deposition in the region during the Aalenian and Bajocian. The sites indicated (Fig. 1) are all unique in that each provides a different succession, thus showing what is missing as well as what is present and providing confirmation of Buckman's (1893, 1910) view that the succession is highly incomplete. Each of the sites, in particular those considered in detail here, have been subjected to geological scrutiny over many years and have therefore provided many specimens now in museums. The conservation and careful re-examination of these key locations has provided an opportunity to identify the exact horizons and ranges of numerous previously unlocalised fossils in museum collections.

2. William Smith, John Callomon and the Inferior Oolite

2.1. William Smith (1769–1839)

In 1799 William Smith visited Dundry Hill to the west of Bath with his close friends, the Reverends Benjamin Richardson and Joseph Townsend. The purpose of their visit was to examine Smith's theory that "the same strata were found always in the

same order of superposition and contained the same peculiar fossils" (Phillips, 1844, p. 28). Smith had postulated that Dundry Hill (Fig. 2), which he knew to be capped by the lowest of the Middle Jurassic Bath Freestones (the Dundry Freestone of the Inferior Oolite), would exhibit the same group of fossils already encountered in Bath. Smith was proved correct and, as similar observations were repeated from locality to locality, Smith's friends concluded that "a new light had begun to manifest itself on the previously dark horizon of geology" (Phillips, 1844, p. 29).

There was agreement that Smith's observations and theory should be more widely shared, and Richardson drafted Smith's dictation of strata and their characteristics from the Chalk to the coal, producing a tabulated "Order of strata and their imbedded organic remains, in the vicinity of Bath; examined and proved prior to 1799" (Phillips, 1844) which was widely distributed. Smith (1815) himself noted that the tabulation had reached as far as the East and West Indies. At this stage the term Inferior Oolite was not in use; rather, the Bath Freestones were described and noted to be 'Oolytic'. Smith subsequently used the terms 'Under Oolyte' and 'Great Oolyte' (used in his 1815 map), and it is Joseph Townsend that is credited with the first published use of 'Inferior Oolite' in 1813 (Parsons, 1980; Cox and Sumbler, 2002). The dark ochre-orange of the Inferior Oolite and rich yellow of the Great Oolite, which Smith used to depict their outcrop on his 1815 map, are among the most striking of colours and still used on today's geological maps.

Smith's understanding of the Inferior Oolite, and its associated fossils, was central to the development of stratigraphical geology and the publication of the world's first large-scale geological map in 1815. The Inferior Oolite remains part of Smith's legacy to

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