

# Environmental distribution of Bathonian (Middle Jurassic) neoselachians in southern England

Charlie J. UNDERWOOD & David J. WARD

## Abstract

Within the Bathonian (Middle Jurassic) a wide range of depositional environments were present across Britain. Within this dominantly carbonate shelf setting, there is a general palaeoenvironmental transition from open marine shelf in the south of England, to marine and non-marine lagoons in south-central England. Isolated teeth of neoselachians are frequent at several localities within a range of marine and lagoonal facies. Extensive bulk sampling has allowed teeth from over 20 neoselachian taxa to be recovered from several distinct facies. The distributions of many species suggest that they were strongly environmentally controlled, with few taxa being commonly present within both open marine and lagoonal settings. Some taxonomic groups appear to have been restricted to specific environments, with hexanchids and palaeospinacids only being recorded within open marine facies. Within other groups, environmental segregation is at generic and specific level, with different species of *Protospinax*, orectolobids, batoids and scyliorhinids being recorded within different facies. The differential distribution of neoselachians within the Bathonian demonstrates that the initial phase of neoselachian radiation during the late Early and Middle Jurassic was accompanied by diversification into a wide range of ecological niches. This greatly increases our understanding of the mechanisms and timing of neoselachian radiation and Jurassic fish palaeoecology.

## Introduction

The early phases of radiation of the neoselachians during the Late Triassic to Middle Jurassic constitutes one of the most dramatic radiation events within the fishes, seeing the appearance of many extant taxonomic groups. Despite the importance of this interval, no study has investigated the environmental distribution of these groups and role played by environmental segregation on neoselachian evolution. The range of palaeoenvironments present within the British Bathonian, and the general abundance of neoselachian remains within it, would suggest that the Bathonian would comprise an ideal study area for a study into early neoselachian palaeoecology.

Within northern Europe, the Bathonian was a time of low sea levels and high carbonate production. Across southern Britain, large areas of shallow water conditions became cut off from open marine environments by the development of extensive oolite shoals, producing extensive lagoon complexes. The majority of the Bathonian in southern Britain is included into the Great Oolite Group, within which, despite this name, oolites are only a relatively minor component of the succession. The Great Oolite Group is dominated by neritic mudstones near the English South Coast, with lagoonal micrites and marls dominating further to the north east in the northern Cotswold Hills and Oxfordshire.

## Sampling

The diversity of palaeoenvironments present within the British Bathonian give rise to a suite of facies which may be differentiated on lithological and faunal grounds. Fluctuating environmental conditions, in combination with a general southerly progradation of facies, typically result in a number of facies being

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