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## Late Jurassic or Malm

Late Jurassic fish have come from many localities within the English outcrop between the Dorset coast and Yorkshire, and are represented in rocks ranging in age from Late Oxfordian to Portlandian. The sites are detailed below stage by stage and these listings are based on sources as noted, together with examinations of major museum collections.

Fish remains are rare in the Middle-Upper Oxford Clay (Callovian and Lower Oxfordian) and Corallian Bcnds (Mid-Late Oxfordian) (however see Martill *et al.*, 1994). The Middle-Upper Oxford Clay is a slightly calcareous, non-bituminous clay and is generally not quarried for brick-making, consequently exposures and vertebrate finds are rare. A few sites (brickpits and coastal exposures around Weymouth, Dorset; Eye pit, Cambridgeshire [TF 231 034]; Warboys Brick Pit, Cambridgeshire [ST 308 818]; and Woodham brickpit, Buckinghamshire ([SP 708 185]; Martill, 1986; Martill and Hudson, 1991) have yielded teeth, fin spines, bones and scales, mainly attributed to hybodont sharks, rare chimaeroid remains and some bony fishes. Micropalaeontological residues rarely yield neoselachian teeth and denticles (Martill and Hudson, 1991). The rarity of vertebrate faunas from British Early Oxfordian rocks is also matched abroad. References include Fox-Strangways (1892), H.B. Woodward (1895), Strahan (1898), Martill (1986) and Martill and Hudson (1991).

British Mid- and Late Oxfordian localities have produced fish remains. The Coral Rag (Mid-Oxfordian) of various sites in Wiltshire, Berkshire, Oxfordshire and Yorkshire has yielded scattered fish material. Comparable Mid- and Late Oxfordian sites abroad include Vaches Noires, near Dives; Normandy, Calvados, Bourgogne and La Vendee, and Boulogne-sur-Mer, France; the La Turbie-Cap d'Aggio region, Monaco; and Baden-Württemberg, Germany.

The Kimmeridge Clay (Kimmeridgian) has yielded abundant vertebrates and includes some of the best Late Jurassic marine fish faunas in the world. There are many localities, and abundant remains have been found in Dorset, Wiltshire, Oxfordshire, Cambridgeshire and Yorkshire. Specific localities include Ringstead Bay [SY 751 813], Kimmeridge Bay (the coastal section between Gaultier Gap and Broad Bench; [SY 898 789]–[SY 908 787]), Smallmouth Sands harbour [SY 670 768] and the Isle of Portland coast [SY 68 71]–[SY 70 72], Dorset; Westbury Clay Pit [ST 880 527] and Swindon Brick and Tile Pits [SU 156 834], Wiltshire; Headington Pits, Oxford [SP 555 072], and Oday Hill landfill site, Abingdon [SP 492 948], Oxfordshire. Most inland Kimmeridge sites are clay pits and in many cases these have been infilled. The landfill site at Oday Hill gravel pit is particularly rich in fossil fish remains which can be collected from shelly seams within the grey sandy facies of the Upper Kimmeridge Clay. References include Phillips (1871), Egerton (1872b), H.B. Woodward (1895), Strahan (1898), Arkell (1933, 1947a, 1947c), Brookfield (1978), Cope (1967, 1978) and Palmer (1988).

The term 'Portlandian' is used here to refer to the last stratigraphical stage of the Jurassic, in preference to Tithonian', the primary international reference standard. This is because a basal boundary stratotype for the Tithonian has not been selected, and because the Kimmeridgian stage as used by British workers is much longer than that used elsewhere. Stratigraphical equivalents are:

Cope (1993) attempted to resolve this problem by reintroducing the Bolonian Stage for the Upper Kimmeridgian *sensu anglico*, thus allowing the standard use of the Portlandian and Volgian stage names. For the present work the traditional British 'long' Kimmeridgian stage name is used.

In the Portland Beds (Lower Portlandian) fish have been found on the Isle of Portland, Dorset, and isolated specimens have been collected in Wiltshire, Oxfordshire and Buckinghamshire. References include Phillips (1871), H.B. Woodward (1895), Strahan (1898) and Arkell (1933, 1947a, 1947c).

The Purbeck Limestone Formation (Late Portlandian to Early Berriasian) is split between the Jurassic and Cretaceous. Extremely abundant remains have been obtained from Durlston Bay and quarries west of Swanage, Dorset, and the smaller freshwater and terrestrial animals are of particular importance (including important amphibian remains). Apart from their taxonomic significance, many of the faunas are interesting from the viewpoint of their palaeoecology, in that they occur in a variety of facies ranging from lacustrine and lagoonal to shallow marine, which in addition cross the Jurassic–Cretaceous (Portlandian–Berriasian) boundary. Specific localities include the old Swanage Quarries ([SZ 021

781], etc.; many forms found at Durlston Bay – exact information not available), Sunnydown Farm Quarry, Langton Matravers ([SY 9822 7880]; microvertebrate remains; Ensom, 1987, 1988, 1990; West, 1988; Ensom *et al.*, 1991), Dorset. References include H.B. Woodward (1895), Anderson and Bazley (1971), Ensom (1987, 1988, 1990), Ensom *et al.* (1991), Allen and Wimbledon (1991) and Clements (1993).

#### **UK and northern France**

Portlandian

Upper Kimmeridgian

Lower Kimmeridgian

#### **Tethys**

Tithonian

Kimmeridgian

#### **Russia, Poland**

Volgian

Kimmeridgian

#### **[References](#)**