
Late Triassic of central and South-West England

Late Triassic fish faunas have been obtained in south-west and central England from two main sources: the 'Rhaetic Bone Bed' in the Penarth Group, and from the cave and fissure fillings in the region of the Severn estuary, which are treated separately towards the end of this chapter. The 'Rhaetic Bone Bed' is actually several fossiliferous horizons of varying duration and lateral extent that occur within an unusual sequence at the base of the Westbury Formation, over a wide geographical area (Dawkins, 1864).

The Penarth Group is entirely Rhaetian in age (Warrington *et al.*, 1980). The Westbury Formation is the basal unit of the Penarth Group and is lithologically a thin (1–15 m) band of black, pyritic shales with occasional limestone lenses, shell beds and thin sandstones. The formation is best exposed in south-west Britain, where the base of the unit is characterized in some sections by distinctive bands of a bone and intraclast conglomerate, which are approximately 0.1–0.3 m thick. It is these bone beds that form a basis for much of the present knowledge of Rhaetian vertebrate palaeontology. The Westbury Formation lithologies show cyclical sedimentation, suggesting fluctuating but generally shallow water depths during deposition (Hamilton, 1977; Ivimey-Cook, 1974). Localized channels, bioturbation, fragmented shell horizons and the concentrated bone beds all confirm the shallow-water nature of the Westbury sea (Ivimey-Cook, 1974).

Fish sites

Typical Rhaetian localities that yield fish material include the following.

DEVON: Culverhole Point ([SY 275 893]; *Hybodus minor*, *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, *Sargodon tomicus*, fish scales, teeth and coprolites; Richardson, 1906); Axminster ([SY 30 98]; *Pseudodolatias barnstonensis*; Sykes, 1974); Axmouth ([SY 26 91]; *Hybodus minor*, *Gyrolepis alberti*; *Severnichthyes acuminatus*; Agassiz, 1833–1845, 1839; Dames, 1888).

SOMERSET: Bagley, near Wedmore ([ST 457 462]; *Lissodus minimus*, *Sargodon tomicus*, *Severnichthyes acuminatus*; Boyd-Dawkins, 1864); Ben Knowle, Wookey ([ST 515 449]; *Lissodus minimus*, *Gyrolepis alberti*; Boyd-Dawkins, 1864); Blue Anchor Bay–Watchet coastline ([ST 042 432]–[ST 167 456]; *Lissodus minimus*, *Hybodus* sp., *Nemacanthus monilifer*, *Palaeospinax rhaeticus*, *Pseudodolatias barnstonensis*, shark coprolites, *Agkistracanthus mitgelensis*, *Gyrolepis alberti*, *Severnichthys acuminatus*, *Sargodon tomicus*, *Legnonotus cothamensis*; Richardson, 1911b; Hamilton and Whittaker, 1977; Sykes, 1977; Storrs and Gower, 1993; Storrs, 1994; Duffin, 1994); Charlton Mackrell railway cutting ([ST 417 212]; *Lissodus minimus*, *Gyrolepis alberti*, '*Lepidotes*' sp., coprolites; Richardson, 1911); Chilcompton railway cutting ([ST 626 509]; *Polyacrodus (Hybodus)* sp., *Lissodus minimus*, *Hybodus* sp., *Nemacanthus monilifer*, shark coprolites, *Severnichthyes acuminatus*, *Gyrolepis alberti*, *Sargodon tomicus*; Savage, 1977; Antia, 1979b; Duffin, 1980b, 1994); Dunball, Puriton ([ST 31 41]; *Lissodus minimus*, *Hybodus minor*, *Gyrolepis alberti*, '*Lepidotes*' sp., *Severnichthyes acuminatus*, coprolites, fish scales; Richardson, 1911b); Dunkerton colliery railway cutting, Camerton ([ST 695 585]; *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Richardson, 1911b); Hapsford Bridge, Vallis Vale [ST 755 490]–[ST 756 489]; *Lissodus minimus*, *Hybodus* sp., holotype specimen of *Vallisia coppi*, ?neoselachian calcified vertebrae, shark coprolites, *Severnichthyes acuminatus*, *Gyrolepis alberti*, *Sargodon tomicus*; Duffin, 1982); Langport railway cutting (*Gyrolepis alberti*, coprolites, other fish remains; Richardson, 1911b); Milton Lane, Wells ([ST 545 455]; *Lissodus minimus*, *Gyrolepis alberti*, fish scales; Richardson, 1911b); Sparkford Hill railway cutting ([ST 604 254]; *Lissodus minimus*, *Gyrolepis alberti*, fish scales; Richardson, 1911b); Three-Arch Bridge railway cutting, Shepton Mallet ([ST 594 433]; *Gyrolepis alberti*, coprolites, other fish remains; Richardson, 1911b); Uphill railway cutting ([ST 317 589]; *Lissodus minimus*, *Hybodus minor*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Richardson, 1911b).

SOUTH GLOUCESTERSHIRE (AVON): Aust Cliff, Severn estuary ([ST 566 898]; 16 species, including one type specimen; see site report; Sykes, 1974; Storrs, 1994); Barnhill Quarry, Chipping Sodbury ([ST 725 830]; *Hybodus minor*, *Lissodus minimus*, *Gyrolepis alberti*, *Sargodon tomicus*, *Severnichthyes acuminatus*; Reynolds, 1938; Macfadyen, 1970); Brislington ([ST 635 704]; *Hybodus minor*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Kellaway, 1933); Cotham Road,

Bristol ([ST 586 739]; *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, fish coprolites; Rendle-Short, 1904); Horton ([ST 76 84]; *Gyrolepis alberti*; *Severnichthyes acuminatus*; Richardson, 1902); Lilliput, Chipping Sodbury ([ST 73 81], *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes* sp.; Richardson, 1904); Manor Farm Quarry ([ST 575 895]; *Polyacrodus (Hybodus) cloacinus*, *Lissodus minimus*, *Hybodus* sp., *Hybodontif-ormes incertae sedis*, *Nemacanthus monilifer*, *Palaeospinax rhaeticus*, *Pseudodalatias barnstonensis*, shark coprolites, *Myriacanthus padoxus*, *Severnichthyes acuminatus*, *Gyrolepis alberti*, *Colobodus* sp., *Sargodon tomicus*, *Legnonotus cothamensis*, *Pholidophorus higginsi*, *Ceratodus latissimus*; P. Davis, pers. comm., 1995); Pylle Hill, Totterdown ([ST 598 718]; *Hybodus minor*, *Lissodus minimus*, shark coprolites, *Gyrolepis alberti*, *Severnichthyes acuminatus*, *Pholidophorus* sp., *Legnonotus* sp., ' *Lepidotes*' sp., *Ceratodus* sp.; Wilson, 1891); Redland ([ST 585 753]; *Hybodus minor*, *Lissodus minimus*, shark coprolites, *Gyrolepis alberti*, *Severnichthyes acuminatus*, *Pholidophorus* sp., *Legnonotus* sp., ' *Lepidotes*' sp., *Ceratodus* sp.; Rendle-Short, 1904); Stoke-Gifford ([ST 62 80]; *Hybodus minor*, hybodont spines, *Gyrolepis alberti*, *Severnichthyes acuminatus*, fish scales; Rendle-Short, 1904).

GLOUCESTERSHIRE: Coomb Hill ([ST 764 940]; *Hybodus minor*, *Lissodus minimus*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Richardson, 1902); Charfield ([ST 723 924]; *Lissodus minimus*, *Hybodus minor*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, coprolites; Richardson, 1904); Chaxhill ([ST 737 887]; *Gyrolepis* sp.; Richardson, 1902); Garden Cliff, Westbury-on-Severn ([SO 718 128]; *Polyacrodus (Hybodus) cloacinus*, *Lissodus minimus*, *Hybodus* sp., *Nemacanthus monilifer*, *Pseudodalatias barnstonensis*, shark coprolites, *Severnichthyes acuminatus*, *Gyrolepis alberti*, *Sargodon tomicus*, *Ceratodus latissimus*; Etheridge, 1872; Savage and Large, 1966; Macfadyen, 1970; Sykes, 1977; Storrs, 1994); Tites Point, Purton Passage, Severn estuary ([SO 692 047]; holotype of *Hybodus minor*; Storrs, 1994); Wainlode Cliff, Severn estuary ([SO 845 257]; *Lissodus minimus*, *Hybodus minor*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, fish debris; Etheridge, 1872; Storrs, 1994).

GLAMORGAN: Coity ([SS 925 814]; hybodont spines, *Sargodon tomicus*, other fish teeth; Francis, 1959); Cowbridge ([SS 999 745]; *Hybodus minor*, *Lissodus minimus*, *Gyrolepis alberti*, *Sargodon tomicus*, ' *Lepidotes*' sp., *Severnichthyes acuminatus*, fish scales, teeth and coprolites; Richardson, 1905); Dinas-Powys ([ST 155 712]; *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; fish scales and teeth; Richardson, 1905); Penarth Head–Lavernock Point coastline ([ST 186 697]–[ST 188 682]); *Lissodus minimus*, *Hybodus minor*, *Nemacanthus monilifer*, *Pseudodalatias barnstonensis*, *Sargodon tomicus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; ' *Lepidotes*' sp., fish scales; Etheridge, 1872; Storrs, 1994); St. Mary's Well Bay, Sully ([ST 175 676]; *Gyrolepis alberti*, ' *Lepidotes*' sp., *Sargodon tomicus*; Richardson, 1905); Stormy Down ([SS 846 806]; *Hybodus minor*, *Severnichthyes acuminatus*; Newton, 1899; Francis, 1959).

GWENT: Bishton ([ST 390 873]; *Gyrolepis alberti*, fish scales, teeth and coprolites; Richardson, 1905); Cadoxton ([ST 124 696]; *Lissodus minimus*, *Gyrolepis alberti*, ' *Lepidotes*' sp.; Richardson, 1905); Goldcliff ([ST 366 831]; *Hybodus minor*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Strahan, 1899; Richardson, 1905); Llanwern ([ST 353 878]; *Lissodus minimus*, *Gyrolepis alberti*; Richardson, 1903); Milton ([ST 367 884]; *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; Richardson, 1903); Lis-Werny ([ST 339 880]; *Gyrolepis alberti*; Richardson, 1905); Sedbury ([ST 555 930]; *Lissodus minimus*, *Hybodus minor*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, *Sargodon tomicus*, fish teeth, scales and coprolites; Richardson, 1903).

LEICESTERSHIRE: Barrow-on-Soar ([SK 573 173]; *Hybodus minor*, *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*; *Pseudodalatias barnstonensis*; Woodward, 1889b; Sykes, 1974); Wigston ([SK 603 991]; fish remains including *Pholidophorus higginsi*; Quilter, 1889; Woodward, 1889c; Richardson, 1909); Spinney Hills brickpits ([SP 604 045]; *Lissodus minimus*, *Hybodus minor*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Sargodon tomicus*, *Severnichthyes acuminatus*, *Pholidophorus higginsi*, *Ceratodus latissimus*; fish coprolites; Woodward, 1889c; Kent, 1968); Glen Parva brickworks ([SP 56 89]; *Hybodus minor*, *Lissodus minimus*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Sargodon tomicus*, *Severnichthyes acuminatus*, *Pholidophorus higginsi*, *Ceratodus latissimus*, fish coprolites; M. Browne 1889, 1894a, 1894b; Fox-Strangways, 1903; Horwood, 1916).

NOTTINGHAMSHIRE: Bantycok Pit [SK 811 502] and Staple Pit ([SK 805 499]; *Lissodus minimus*, *Hybodus minor*, *Nemacanthus monilifer*, *Pseudodalatias barnstonensis*, *Severnichthyes acuminatus*, *Gyrolepis alberti*, *Sargodon tomicus*, ' *Lepidotes*' *barnstonensis*, *Lepidotes*' sp.; Martill and Dawn, 1986); Barnstone cutting ([SK 739 358]; type specimen of

Pseudodalatias barnstonensis, '*Lepidotes barnstonensis*', '*Lepidotes*' sp.; Sykes 1971, 1974, 1979; Sykes *et al.*, 1970); Beacon Hill ([SK 810 530]; *Lissodus minimus*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, shark fin rays, fish scales and teeth; Johnson, 1950); Bunny cutting ([SK 578 211]; *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, fish scales and teeth; Kent, 1953); Owlthorpe ([SK 666 336]; *Hybodus* sp., *Lissodus minimus*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, other fish remains; Ivimey-Cook and Elliot, 1969); Stanton-on-the-Wolds ([SK 637 312]; *Hybodus minor*, *Lissodus minimus*, *Nemacanthus monilifer*, *Gyrolepis alberti*, *Severnichthyes acuminatus*, *Sargodon tomicus*, *Ceratodus* sp.; Lamplugh *et al.*, 1909).

LINCOLNSHIRE: Lea railway cutting, Gainsborough ([SK 81 89]; *Hybodus minor*, *Lissodus minimus*, *Nemacanthus monilifer*, *Pseudodalatias barnstonensis*, *Gyrolepis alberti*, *Sargodon tomicus*, *Severnichthyes acuminatus*; Burton, 1867; Sykes, 1974).

YORKSHIRE: Thornton-le-Beans ([SE 397 902]; fish remains; Sykes, 1977).

Rhaetian sediments in a large glacial erratic at Linksfield, near Elgin, Morayshire [NJ 223 641], have produced remains of fishes including *Lissodus minimus*, '*Hybodus*', '*Sphenonchus*', and '*Lepidotes*', and reptiles (Woodward and Sherborn, 1890; Storrs, 1994).

Of these numerous localities, one stands out clearly from the rest in the abundance of its fauna, its accessibility and potential for future research and is therefore selected as a potential GCR site:

Aust Cliff, [ST 565 895]–[ST 572 901]. Upper Triassic ('Rhaetian'), 'Rhaetic Bone Bed', Westbury Formation.

[References](#)