

dostrobus variabilis (Fig. 367, *b*), *Araucarioxylon*. Ostracod crustaceans, chiefly the *Leperditia* above mentioned, crowd many of the shales. With these are usually associated abundant traces of the presence of fish, either in the form of coprolites, or of scales, bones, plates, and teeth. The following are characteristic species: *Elonichthys striolatus*, *E. Robisoni*, *Rhadinichthys ornatissimus*, *Nematoptychius Greenockii*, *Eurynotus crenatus* (Fig. 363), *Rhizodus Hibberti*, *Megalichthys* sp., *Gyracanthus tuberculatus*, *Callopristodus* (*Ctenoptychius*) *pectinatus*. At intervals throughout the group, marine horizons occur, usually as shale bands marked by the presence of such distinctively Carboniferous Limestone species as *Spirorbis carbonarius*, *Discina nitida*, *Lingula squamiformis*, *Bellerophon decussatus*, and *Orthoceras cylindraceum*.²⁰⁸

The Cement-stone group of the basin of the Firth of Forth contains a great number and variety of associated volcanic masses of the puy type. At the time when it was deposited, the region of shallow lagoons, islets, and coal-growths was dotted over with innumerable small active volcanic vents. The eruptions continued into the time of the Carboniferous Limestone, but ceased before the deposition of the Millstone Grit.²⁰⁹

The Carboniferous Limestone series of Scottish geologists, probably representing the upper part of the Carboniferous Limestone series or Yoredale group of England, consists mainly of sandstones, shales, fire-clays, and coal-seams, with a few comparatively thin seams of encrinal limestone. The thickest of these limestones, known as the Hurler or Main limestone, is usually about 6 feet in thickness, but in the north of Ayrshire swells out to 100 feet, which is the most massive bed of limestone in any part of the Scottish Carboniferous system. One of a group of limestone beds at the base of the series, it lies upon a seam of coal, and is in some places associated with pyritous shales, which have been largely worked as a source of alum. This superposition of a bed of marine limestone on a seam of coal is of

²⁰⁸ For descriptions of the Calciferous Sandstone group, see Maclaren, "Geology of Fife and the Lothians"; also the explanations to accompany the Maps of the Geological Survey of Scotland, particularly those on Sheets 14, 22, 23, 32, 33 and 34. T. Brown, *Trans. Roy. Soc. Edin.* xxii. 1861, p. 385; Kirkby, *Q. J. Geol. Soc.* xxxvi. p. 559.

²⁰⁹ For an account of these Puyes see Presidential Address, *Quart. Journ. Geol. Soc.* 1892, p. 125; *Trans. Roy. Soc. Edin.* xxix. p. 437. Some of the vents are represented in Figs. 297-301, 303-307 of this text-book.