

These, consisting of diabases, porphyrites, felsites, and tuffs, attain a thickness of more than 6000 feet, and form important chains of hills, as in the Pentland, Ochil, and Sidlaw ranges. They lie several thousand feet above the base of the system, and are regularly interstratified with bands of the ordinary sedimentary strata. They point to the outburst of numerous volcanic vents along the lake or inland sea in which the Lower Old Red Sandstone of central Scotland was laid down; and their disposition shows that the vents ranged themselves in lines or linear groups, parallel with the general trend of the great central valley. The fact that the igneous rocks are succeeded by thousands of feet of sandstones, shales, and conglomerates, without any intercalation of lava or tuff, proves that the volcanic episode in the history of the lake came to a close long before the lake itself disappeared.<sup>167</sup> As a rule, the deposits of this basin are singularly unfossiliferous, though some portions of them, particularly in the Forfarshire (Arbroath) flagstone group, have proved rich in remains of crustaceans and fish. Nine or more species of crustaceans have been obtained, chiefly eurypterids, but including one or two phyllopod. The large pterygotus (*P. anglicus*) is especially characteristic, and must have attained a great size, for some of the individuals indicate a length of 6 feet, with a breadth of 1½ feet. There occur also a smaller species (*P. minor*), two Eurypteri, and three species of *Stylonurus*. Upward of twenty species of fishes have been obtained, chiefly from the Arbroath flags, belonging to the sub-orders Acanthodidæ and Ostracostei (Fig. 351). One of the most abundant forms is the little *Mesacanthus* (*Acanthodes*) *Mitchelli*. Another common fish is *Ischnacanthus* (*Diplacanthus*) *gracilis*. There occur also *Climatius scutiger*, *C. reticulatus*, *C. uncinatus*, *C. Maenicoli*, *C. grandis*, *C. gracilis*, *Parexus incurvus*, *Cephalaspis Lyellii*, and *Pteraspis Mitchelli*. Some of the sandstones and shales are crowded with indistinctly preserved vegetation, occasionally in sufficient quantity to form thin laminæ of coal. The egg-like impressions known as *Parka decipiens* and referred to on p. 1316 also abound in some layers. In Forfarshire, the surfaces of the shaly flagstones are now and then covered with linear grass-like plants, like the sedgy vegetation of a lake or marsh. In Perthshire, certain layers occur, chiefly made up of com-

---

<sup>167</sup> Presidential Address, Quart. Journ. Geol. Soc. 1882, p. 62 *et seq.*