

beneath the lowest strata of the "Old Red." Some of the fish are of the shark family, and their defences are referred to the genus *Onchus* (fig. 569). There are also numerous minute shagreen scales (fig. 570), which

Fig. 569.



*Onchus tenuistriatus*, Agass.  
Bone-bed. Upper Silurian; Ludlow.

Fig. 570.



Shagreen scales of a placoid fish  
(*Thelodus*).  
Bone-bed. Upper Ludlow.

may possibly belong to the same placoid fish. The jaw and teeth of another predaceous genus (fig. 571) have also been detected. As usual in bone-beds, the teeth and bones are, for the most part, fragmentary and rolled. Many statements have been published of fish remains obtained from older members of the silurian series; but Mr. Salter has shown all these to be spurious.\* Professor Phillips has, however, discovered fish-bones at the bottom of the "Upper Ludlow," at its junction with the Aymestry Rock;† and lower than this no one seems as yet to have succeeded in tracing them downwards, whether in Europe or North America, for M. Barrande's most ancient ichthyolites (bony fragments, 8 inches long) occur in the Upper Silurian of Bohemia; and those of the American Geologists are from the Oriskany Sandstone, a formation which is still considered as debatable ground between the Devonian and Silurian systems (see p. 426, above).

Fig. 571.



*Plectrodus mirabilis*, Agass.  
Bone-bed. Upper Ludlow.

In England it is true, as in the United States and Canada, globular, cylindrical, or flattened masses have been detected, composed principally of phosphate of lime, in the Lowest Silurian rocks, and they have been suspected to be coprolitic. Messrs. Logan and Hunt have recently shown that shells of the genera *Lingula* and *Orbicula*, which occur abundantly in the same formations, are also made up of phosphate and carbonate of lime, mixed in the like proportions; and it has been suggested that the decomposition of such shells might give rise to the nodules alluded to, which may owe their form to concretionary action.‡ Even if the zoologist should think it more likely that the phosphatic matter was rejected in fœcal lumps, by creatures feeding on *Lingulæ* and *Orbiculæ*, we cannot decide that such feeders were of the vertebrate class, rather than Cephalopods, Crustaceans, or some other of the Invertebrata. In regard to the doctrine of the supposed non-existence of fish in the Silurian seas before the time of the Ludlow bone-bed, I shall consider that question fully in the concluding pages of this chapter, p. 453, *et seq.*

\* Geol. Quart. Journ. vol. vii. p. 203.

† Memoirs Geol. Surv. vol. ii.

‡ Logan and Hunt; Silliman's Journ. No. 50, 2d series, March, 1854.