

## XLI. THE DYNASTY OF FISHES.

## DEVONIAN AND CARBONIFEROUS TIMES.

WHEN the morning of the Devonian Age dawned, a new form was seen moving in the populous sea. It was a vertebrate form. Without a bony skeleton, its cartilaginous framework and general plan embodied a new conception. Among vertebrates its organization was decidedly low; but it was not a fish in any ordinary acceptation of the term, though we shall have to call it a fish. There were other vertebrate forms more clearly fish-like, but all widely separated from modern fishes. One could easily distinguish three types of these archaic vertebrates. They are known among us as *E-las'-mo-branchs*, *Plac'-o-derms* and *Gan'-oids*. The Elasmobranchs are a group which still survives. They are all shark-like. The kinds which lived in the Devonian were true sharks (*Sel'-a-choids*) of the peculiar *Ces-trac'-i-on* family, the best known species of which ranges from Japan to New Zealand. *Cestracion*, the Port Jackson Shark, has spines in front of both the dorsal fins; the nostrils unite in the cavity of the mouth, and the upper lip is divided into seven lobes. The teeth along the middle of the mouth are small. External to these are large flat teeth twice as broad as long, arranged in oblique series so as to form a sort of tessellated crushing surface.

Among the very earliest American fishes were some of these spine-bearing sharks. The spines are flattened, two-edged like a bayonet, and curved as if one had belonged to the right side and the other to the left. The external surface was covered with a thin coating of enamel, sometimes smooth, sometimes ornamented. These spines are not attached by a joint, but inserted in a mass of cartilage imbedded in the flesh. They were perhaps the front rays of the pectoral fins. Some of them were more than a foot in length. Being two-edged and very sharp, they must have been very powerful weapons, offensive or defensive. These cestracionts were numerous during the Carboniferous period. Their smooth, brown spines are very often found in the Carboniferous lime-