SALMONIDAE. The distinguishing features of this family of fishes are described in technical language in the article Ichthyology (vol. xii. p. 693), and it is un­necessary to repeat the definition. The most conspicuous of the external characteristics is the presence of two dorsal fins, of which the anterior is well developed and supported by the usual jointed bones known as fin-rays, while the posterior is thick and fleshy, rounded in outline, and desti­tute of rays. The posterior fin is thus a rudimentary organ, and it is commonly called the adipose fin. There are two other families of fishes which resemble the *Salmonidae* in the arrangement of the dorsal fins—the *Percopsidæ* and *Haplochitonidae;* but the former consists of only one species, found in the United States, and the latter is confined to the southern hemisphere. Amongst British fishes a Salmonoid can be always recognized by its dorsal fins.@@1

The *Salmonidae* retain the open communication of the air-bladder with the intestine, and the original posterior position of the pelvic fins,—features which characterize the division of *Teleostei* known as *Physostomi.* In the great assemblage of bony fishes known as *Physoclisti,* these features are lost in the adult condition. It is known that in all cases the air-bladder develops in the young fish as an outgrowth or diverticulum from the intestine; and it is obvious from a survey of Vertebrates in general that the posterior limbs belong originally to the neighbourhood of the anus. It follows therefore that in these features the *Salmonidae,* and all the *Physostomi,* are more similar to the early ancestors of the bony fishes than are those species in which the air-bladder is closed and the pelvic fins have an anterior position.

In the *Salmonidae* the characteristic Teleostean pseudobranchia is present. This organ is the diminished remnant of the series of gill-lamellae belonging to the posterior face of the hyoid arch, as the pseudobranchia in Elasmobranchs is the rudiment of the series of gill-lamellae belonging to the posterior face of the mandibular arch.@@2 The bones known as maxillae form portion of the boundary of the upper jaw in *Salmonidae ;* in many fishes they are excluded from the jaw margin by the backward prolongation of the premaxillae. There are no scales on the head in this family, and there are no fleshy filaments or “ barbels ” in the neighbourhood of the mouth as there are in many bony fishes—for example, the Cod, in which a single short barbel is attached beneath the lower jaw. The pyloric append­ages, cæcal diverticula of the intestinal tube immediately behind the stomach, are nearly always present in consider­able numbers. In the female Salmon the oviduct, the tube connecting the ovary with the exterior, is wanting; the eggs when ripe escape from the surface of the ovary into the abdominal cavity and pass thence to the exterior through a pair of apertures in the body wall situated one on each side of the anus; these apertures are the abdominal pores. In the male salmon there is a duct to the testis, and the semen is extruded through it in the usual way. Fertilization takes place outside the body, the spermatozoa and eggs uniting in the water.

*Distribution.—Salmonidse* are found both in the sea and in fresh water. Most of the marine species inhabit the deeper parts of the ocean. Many of the freshwater forms pass a portion of their lives in the littoral parts of the sea, ascending rivers when adult every year in order to deposit

their spawn; that is to say, many species are anadromous. Some are confined entirely to fresh water. The *Salmonidæ* are, with the exception of one species indigenous to New Zealand, peculiar to the temperate and arctic regions of the northern hemisphere. Fossils belonging to the family are found in strata of Mesozoic age. *Osmerus* occurs in the greensand of Ibbenbüren, and the schists of Glarus and Licata. *Mallotus villosus,* indistinguishable from the living Capelin, occurs abundantly in clay in Greenland, the geological age of the bed being unknown. *Osmeroides acrognathus* and *Aulolepis* are fossil genera occurring in the chalk near Lewes in Sussex, and were probably deep-sea Salmonoids. The introduction of certain species into new areas by human agency, which has been effected recently, and is still going on, will be described in another section.

*Synopsis of Genera.*

The following five genera include British species :—

1. Salmo, Artedi (Salmon and Trout). Scales small. Cleft of mouth wide; maxilla extending backward to below or behind the eye. Dentition well developed ; conical teeth on the jaw bones, on the vomer and palatines, and on the tongue ; none on the pterygoid bones. Anal fin short, with fourteen or fewer rays. Pyloric appendages numerous. Ova large. Dark transverse bands, known as “parr marks,” present on the sides of the body in the young stages of life.
2. Osmerus, Cuv. (Smelts). Scales of moderate size. Cleft of the mouth wide; maxilla long, extending to or nearly to the hind margin of the orbit. Dentition well developed; teeth on the maxilla and premaxilla smaller than those on the mandible; transverse series of teeth on the vomer, several of which are large and fang-like ; a series of conical teeth along the palatine and pterygoid bones ; strong fang-like teeth on the front of the tongue, several longitudinal series of smaller ones on its posterior part. Pyloric appendages short and few in number, Ova small.
3. Coregonus. Scales of moderate size. Cleft of mouth small; maxilla rather short, not extending back beyond the orbit. Teeth minute, or absent altogether. Anterior dorsal fin with few rays. Pyloric appendages numerous, Ova small.
4. Thymallus, Cuv. (Graylings). Similar to *Coregonus,* but having a long anterior dorsal with many rays. Small teeth on jaws, vomer, and palatine bones.
5. Argentina, Cuv. Scales rather large. Cleft of mouth small; maxilla not extending to below the orbit. Teeth wanting on jaws; minute teeth on the head of the vomer and fore part of the palatines; series of small curved teeth on each side of the tongue. Dorsal fin short, in advance of the pelvic. Pyloric appendages few or in moderate numbers, Ova small. The most conspicuous peculiarity of this genus is the flattening of the sides to plane surfaces bordered by keeled ridges, so that the transverse section of the fish is hexagonal.

The following eleven genera include no British species :—

1. Oncorhynchus, Suckley *(Ann. Lyc. Nat. Hist.,* 1861). Similar to *Salmo,* except that the anal fin has more than fourteen rays. @@3
2. Brachymystax, Gunther. Intermediate between *Salmo* and *Coregonus.*
3. Luciotrutta, Günther. Migratory trout from North America.
4. Plecoglossus, Schlegel. Body covered with very small scales. Cleft of mouth wide ; maxilla long. Dentition feeble ; premaxilla with few small conical teeth. Ends of mandibles separate at the chin, the mucous membrane between them forming folds and pouches. Tongue very small, with minute teeth.
5. Retropinna, Gill. Similar to *Osmerus.*

11 and 12. Hypomesus, Gill, and Thaleichthys, Girard, are allied genera.

1. Mallotus, Cuv. (Capelin). Scales minute, somewhat larger along the lateral line and along each side of the belly. In mature males those scales become elongate, lanceolate with projecting points. Cleft of mouth wide ; maxilla very thin, lamelliform, extending to below middle of eye. Dentition very feeble ; teeth in single series. Pyloric appendages very short, few. Ova small.
2. Salanx, Cuv. Body elongate, compressed, naked, or with small, exceedingly fine deciduous scales. Head elongate and much depressed, terminating in a long, flat, pointed snout. Cleft of mouth wide. Jaws and palatine bones with conical teeth, some of those on premaxilla and mandibles being enlarged ; no teeth on vomer ; tongue with single series of curved teeth. Anterior dorsal fin far behind ventral, in front of anal; adipose small. Pseudobranchiae well developed; air-bladder none. Alimentary canal quite straight; pyloric appendages none. Ova small.

@@@1 It is interesting to observe that a peculiarity of the dorsal fins is often a family character among the bony fishes. Thus the species of the Cod family *(Gadidæ)* have usually three separate dorsal fins similar in shape and size. The *Blenniidæ* are characterized by the presence of a continuous dorsal fin extending almost the whole length of the back. The *Clupeidæ* or Herrings all have a single triangular dorsal fin in the middle of the back.

@@@2 This at least is the view till recently accepted by most morpho­logists ; its correctness is questioned by Anton Dohrn.

@@@3 This is the generic distinction adopted by Dr Günther. Suckley’s original diagnosis was the prolongation of both jaws in the males.