

ANIMAL STUDIES.

Fish

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Fish are familiar animals to most pupils. Our brooks, rivers, lakes and coast waters are frequented by a great variety of forms, most of which are familiar objects in the localities where they are found.

All boys prize the "trout brooks" and regard the return of the smelt as a harbinger of spring, but few possess more than a general knowledge of fish. They know that fish live in the water, have a backbone, are mostly covered with scales, and breathe by means of gills, and this is the sum total of their knowledge, save for some economic considerations, such as the names of some forms used for food, etc., a few that take bait and some that do not, and the time of the return of some of the migratory forms to our coasts and rivers.

For effective class work some dead specimens are needed, also some living specimens in glass aquaria are quite indispensable. Battery jars or large fruit jars make good aquaria, and gold-fish or small specimens from the brook are good subjects. Field and aquarium trips may be made to form an important part of this study, and will add interest to the work, and place the pupils in close touch with these animals in their natural conditions, a point of great value in all nature study.

With the lower grades the first study should be with the form and parts of the fish, and this should be followed, if time permits, with an account of their habits, and economic uses. For the intermediate grades extend the work by taking up such subjects as, their life history, food, migrations, etc. Advanced grades should take up some of the following topics — structure, respiration, blood circulation, nervous system, etc. In all cases make comparisons with the higher animals.

The Dominion Fisheries Reports will show the value of our fisheries. Note the kinds that are most abundant, which possess the greatest value, and the value of the fisheries per province.

Make a fish-map of the Dominion using distinctive markings for the different kinds taken, also map the Atlantic coast from Florida to the Arctic circle, and mark in the same way. Make a list of the fresh and preserved fish sold in your locality, find out where each kind comes from (the label on

the tin, in preserved forms, will help you in determining this point), and locate the places on a map. Note the lines of transportation over which they have passed.

For correlation with history call attention to the fishery disputes between Canada and other countries, particularly with the United States. Read accounts of those disputes and note how each was settled, and list the treaties with their dates.

Examine the fish in the aquaria. Note that the body is long and narrow, and that it is joined to the head without the intervention of a neck. Note that the scales overlap in a backward direction, and that the color of the body is darker above than on the underside. There are many little cells in the skin that secrete mucus or slime which aids in the rapid movement of the fish through the water.

The fins are of two kinds, those that are placed along the middle line of the body, the median fins; and those that are paired. Of the latter there are but two pairs, the pectoral fins situated next the head and the pelvic fins farther back. The paired fins correspond in position and structure to the paired limbs of the higher animals. Which pair corresponds to the wings of a bird, and to the arms of man? The median fins along the back are called dorsal fins. How many dorsal fins in the perch, trout, and the different specimens in your aquaria? The large fin at the end of the body is the tail or caudal fin, and that on the underside of the body, just posterior to the vent, the anal fin.

Note the position and shape of the mouth, the large eyes, and the hard plates covering the gills, *opercula* (sing. *operculum*).

Have outline drawings of the fish made from aquaria specimens. Mark in and name the parts of the fish, and also sketch the scale arrangement for a short section of its body.

Watch the fish as they swim in the aquaria, and note how the flattered muscular body and caudal fin propel them through the water. The other fins are useful in directing their course, and in keeping balanced.

The eyes are large and round, and unprotected by eye-lids. The structure of the eye is such as to render them very near-sighted. Feeding experiments show that fish become aware of the presence of their food by smelling as well as by seeing it. The nostrils are small openings in front of the eyes, they have no communication