

many species, e. g., the trout and cat-fish, but in others like the perch it becomes closed, remaining only as a thin fibrous cord.

In the lining of the air bladder, small blood vessels are grouped in gland-like red bodies. The absorption and formation of gas by these bodies enables the fish to maintain its weight about equal to that of the water it displaces. Experiments seem to indicate that it is also useful as a reservoir for air; if a fish be suffocated in stagnant water the oxygen of the air bladder, which normally amounts to about one-fifth of its volume, is found to be entirely absorbed and to be replaced by carbon dioxide and nitrogen. In some fish, e. g., the dipnoi, the air bladder is used as a lung.

Correlate this phase of the work with exercises in specific gravity, and discussions on swimming and the weight of the human body in water. Which is heavier, salt or fresh water? In which can one swim the easier? Explain why.

The heart is situated on the ventral side in the region of the pectoral fins, and is a two-chambered muscular organ — one auricle and one ventricle. The blood is pumped from the heart to the gills, entering them from below, and leaving them above as pure blood. The arch tubes now unite on each side, to form the dorsal aortae, and these in turn unite to form the dorsal aorta proper, which carrying the blood towards the caudal end practically loses itself in distributing branches (arteries) along the way.

Compare this fish circulation with the circulation among the higher vertebrates. It may be interesting to know that all vertebrates have a fish-circulation at some period in their lives, for most of them during the embryonic period, while they have gill arches and gill clefts. Fish and a few other forms with permanent gills retain that circulation throughout life.

The nervous system is much like that of the higher animals, and is usually well described in elementary works in zoology.

The skeleton system presents some new features, i. e., features not present in the skeletons of the higher vertebrates, which we will reserve for some future period.

In taking up the story of the life history of these animals present some facts regarding the size, structure and number of eggs per season for each female. Make comparisons with the eggs of the chick as to size, structure and number per year, and also with those of the frog and toad. Gather

the eggs of the latter and hatch in dishes of water in the school. Watch the development of the young tadpoles.* Outline their life history and compare it with that of the fish. Why are frogs and toads considered higher in the scale of creation (development) than fish? Explain fully.

The number of eggs per year among fish varies according to the different kinds, but the eggs in all are considered numerous, and in case of some of the larger species of cod are said to reach as many as nine or ten million.

In all this work, among the higher grades, the concept of structural adaptation should ever be kept to the front. It is a difficult concept for those just beginning nature study, so considerable drill should be given before attempting to fasten it. But it is worth while, for it is perhaps the most important concept in all biological study.

Birds.

In my article on Nature Study in the EDUCATIONAL REVIEW, April, 1913, is the following — "Mr. Harrison F. Lewis reports that he discovered three evening grosbeaks at Truro, March 17, Professor Harlow, Truro Normal School, also saw the birds and agreed with Mr. Lewis's determination. As this bird is said to be fairly common from Lake Superior to the Rocky Mountains, and rather rare in Ontario and Quebec, with no records as far as I can learn from the Maritime Provinces, this report is of more than ordinary interest."

A similar account of this record appeared later in Bird Lore, and stands as the first, and as far as I am aware, the only record for these birds in Nova Scotia. During the last few months, however, interest has been aroused again in this species by newspaper reports of their appearance in the southern countries of New Brunswick — Charlotte, York, Kings, St. John, and Westmorland. I shall be pleased to receive exact reports from persons who have seen them.

I wish also to ask the teachers and others interested to be kind enough to send me reports of the arrival of the spring migrants. I will tabulate their reports and publish in the REVIEW. It takes but a few minutes of your time to make out and to send me your data, and yet the concerted action, in this particular line of work, of our interested teachers could be made of great interest and value in our nature study work.

Please send all data on postal cards.

For development of the frog see illustrations in REVIEW, May, 1915.