

have been already indicated. The horny-coated resistant eggs, to which reference has been made, are structures characteristic of various fresh-water animals. The suppression of a free-swimming larval stage in certain cases may be accompanied by structural changes in the parent, having as their object the protection of the ova. Again, there is less need for stout protective armour in fresh water (particularly in ponds), so that fresh-water Gasteropods, for example, are usually distinguishable by their thin shells from their marine allies, which are fitted to withstand the breakers of the sea-shore.

In pointing out, however, the external characteristics which are directly due to the conditions under which these animals live, we would strongly emphasise the necessity for excluding such features as far as possible, when deciding the systematic position of any animal. It is only by doing so that we can gain a satisfactory idea of the true interrelationships of forms some of which have remained permanent inhabitants of the ocean, while others have secondarily become adapted to life in fresh water.

Having examined in some detail a number of facts which bear directly on the colonisation of fresh water from the sea, we must now proceed to consider the means by which this process actually took place. It is obvious that fresh-water organisms must have attained their present distribution in one of three ways: (1) by a direct, active or passive, migration from the sea; (2) by becoming terrestrial or swamp-loving in nature, and secondarily adapting themselves to life in fresh water; (3) as a result of the isolation and subsequent freshening of some portion of the sea, due to movements of the earth's crust.¹ No doubt fresh-water organisms have been derived from marine by all three of these methods, but it is by no means easy to assert which of them has played the most important part. In passing to the consideration of the methods in more detail, we must seek to determine whether the known fresh-water forms possess characteristics which would fit in with the suggested explanations, and we may also indicate the particular manner in which the more important groups achieved this material change in their environment.

Treating in the first instance the subject of active migration,² it is clear that this means is only open to strongly-swimming forms or to such as walk or crawl on the bottom, for these alone would be able to invade rivers from their mouths, and so effect a permanent settlement within them or within any associated basin of water. We think at

¹ Cf. Sollas, "The Origin of Fresh-water Fauna," in *The Age of the Earth, and other Geological Studies*, London, 1905, p. 178.

² We are dealing for the moment only with the emerging of marine types to become members of a purely fresh-water series. Migration from one area of fresh water to another is a separate question.