

and water-plants, and the young emerge in practically the adult condition. In *Paludina*, a stage further has been reached, for the ova are retained within the body of the parent, and the young are born alive. This is similarly the case in the fresh-water bivalves *Cyclas* and *Pisidium*, which are provided with brood-pouches in which the eggs develop.

Turning to consider passive migration from the sea, we realise that, if this has taken place, it must have been mainly by the transport of sessile or feebly-swimming forms, through the agency of those which are actively locomotive. We have already seen how tidal influence may carry certain marine organisms for some miles inland, but this process could not effect the colonising of more than an estuary, and that only under exceptional circumstances. While it is likely that a considerable number of small organisms, both animal and vegetable, are passively carried from the shores of the ocean into rivers and lakes, it is improbable that many survive the sudden change in environment. It is conceivable, for instance, that ova or encysted animals might be left dry upon the beach, and transported by winds to fresh-water surroundings, but there is not much likelihood that they would successfully accommodate themselves to the altered conditions. Again, quite a number of diverse organisms might be carried from the sea-shore to fresh water sticking to the feet of wading birds, and some forms might adhere to active immigrants such as fishes and perhaps Crustaceans.

A case which seems fully proved, in which animals have been conveyed by fish directly from the sea to fresh water, is that of the parasitic fish-louse *Argulus*. Species inhabiting both fresh and salt water have long been known to occur, but it was reserved for Wilson<sup>1</sup> to prove by experiment that, in certain instances at any rate, the change of medium produced little effect, even if suddenly made. Other parasitic forms which are probably direct but passive immigrants from the sea are *Lernæocera*, *Achtheres*, and a Bopyrid.<sup>2</sup>

A truly remarkable example of sessile forms which take advantage of the locomotory power of fishes may find fitting mention here. We refer to the interesting reproductive habits of the fresh-water mussels *Anodon* and *Unio*. The ova undergo partial development within the parent, but, arriving at the larval stage known as the glochidium, are expelled into the water, provided with a long adhesive filament. If the latter comes into contact with a passing fish, the little larva becomes attached, and by means of the sharp spines on its shell secures its hold. The epithelial layers of the fish soon grow to enclose the embryo in a definite cyst, and within this

<sup>1</sup> *Proc. U.S. Mus.*, vol. xxv., 1903, p. 648.

<sup>2</sup> *Semper, op. cit.*, p. 147.