

TRANSFORMATIONS OF TRICHOPTERA

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The Trichoptera, commonly called caddis-flies, are moth-like insects, usually of small size, in which the wings are more or less densely covered with hair. They are abundant in summer near most streams and ponds, and a large number of species are known to occur in Illinois. So far as known, all the North American species lay their eggs in or very near the water. The eggs are sometimes carried around by the female after extrusion, and some workers claim that in certain species she descends into the water to lay the eggs. This observation, however, has not been confirmed. The eggs are

surrounded by jelly, and often form a ring around a twig, or other small object in the water. The eggs usually hatch in four or five days, and the larvae, which are called caddis-worms, are at first free-swimmers. The larvae and their habits are the chief cause for our interest in this order, because the adults are so small, and not particularly beautiful. The larvae have the general appearance of caterpillars. They have no antennae, the legs are very long, and there are no prolegs but the anal pair. The body has a varying number of filaments containing tracheae, which serve for respiration. Shortly after hatching each larva begin to construct a case in which, with certain alterations, most of them spend their larval and pupal life. These cases are made of small bits of leaves or twigs, sand, pebbles, or any other small fragments of material available. These are fastened together with silk spun from the mouth of the larva. Some of the species of *Trichoptera* carry their cases around with them, while in others the cases are fixed. The larvae living in movable cases have a large swelling on the dorsum of the first abdominal segment, and usually two smaller swellings on the ventral surface. These swellings are furnished with hooks, which hold the larva in its case. The hooks on the anal prolegs are supposed to serve the same purpose, and it is certainly very difficult to pull a larva out of its case. The cases are large enough to allow for the passage of water through the tube and for the movement of the respiratory filaments. Most of these cases have a thin web of silk spun across the caudal end of the tube. When the larva moves it protrudes the head and legs from the tube and crawls along. There is also a species which bores into fallen twigs found at the bottom of streams. The larvae line the burrows with silk, and these twigs form portable cases which the larvae drag along, or which are allowed to float down stream with the current. When the twig is too long for the occupant it is girdled with a circular incision, which is deepened until the end is cut away. It is said that this is the method the larvae employ in altering the cases to suit their growth. The cases are nearly always larger at the caudal end, so the larvae cut off the small end and add to the large end.

The life history of these insects has not been worked upon sufficiently to determine the number of molts in the larvae,

but it is known that many of them live through the winter as larvae and transform in June or July. When the larvae are ready to pupate they either fasten the case to some larger object, and close the other end, or they close both ends with a web of silk and frequently fasten on a pebble or a bit of stick. They are completely helpless while transforming. The pupae differ from the larvae in having larger mandibles with which they cut their way out of the case, and usually swimming hairs on the mesothoracic legs. Most of the larvae which inhabit movable cases transform to pupae which have respiratory filaments much like the larvae. The pupae have rows of hooks on several dorsal segments which hold them in the case.

The larvae, which live in fixed cases, build them in the same way. Sometimes their cases are only tubes of silk, which are found on the bottom of the stream or on the surface of sticks and stones. Others are of various shapes and generally covered with sand, pebbles, or leaves. Certain species build their cases in the form of a snail's shell, which are covered with sand, and some of these were described as snails' shells.

The larvae inhabiting these fixed cases are mostly of another type of body, which is not as strongly curved. They have no hooks to hold them to the cases, and although the majority breathe by means of respiratory filaments, a number of them breathe by means of spiracles. They pupate in much the same way as the larvae inhabiting movable cases and the pupae strongly resembles the larvae, differing in the larger mandibles and the swimming hairs on the mesothoracic legs. In some species the respiratory filaments are lost during pupation and the pupa breathes by means of one large spiracle located in the conjunctiva between the prothorax and mesothorax.

The most interesting species of larvae with fixed cases are those that spin nets, with which they catch their food. These nets are placed in the streams where the current is swift. They are usually spun somewhat funnel-shaped, so that the current keeps them expanded. These larvae often do not build a case but hide in masses of rubbish near where they have spun their nets. Those which spin cases often place them side by side, so that there is quite a colony.

The length of the pupal stage varies, but is at least two weeks. The more specialized forms which inhabit thin cases spin a thick cocoon. At the close of pupal life, the pupa cuts its way out of the cocoon and swims, back downward, to the surface, or to some solid object by which it can ascend to the surface. There it splits the pupal skin and the adult emerges. The wings dry almost immediately and the insect is then ready for flight.
