

EMERGENCE OF A MAYFLY FROM ITS NYMPHAL SKIN.*

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The emergence of a subimago mayfly from its nymphal skin observed by Superintendent George F. Miller and Captain Bickford, both of the Ohio State Fish Hatchery at Put-in-Bay, Ohio, and later described to me by them, impressed me as being of sufficient interest to warrant the addition of one more account to the number that have already been published regarding the subject of mayfly emergence.

The transformation occurred in a large, portable fish tank which had been standing for a number of weeks on the dock in front of the Hatchery building. This tank had been filled with water from the lake by means of a steam pump which had its intake lying very near the bottom and, presumably, the mayfly nymph had been drawn up with the water. Mr. Miller and Captain Bickford were standing at the side of the tank and were thus in an unusually fortunate position for observing the entire process of emergence. It occurred sometime during the month of June. The nymph swam upward from the bottom of the tank and when it reached a point about six inches beneath the surface of the water the nymphal skin split along its dorsal surface and the subimago began to push out. By the time it had reached the surface the subimago had freed itself entirely from the nymphal skin and was able to fly away immediately.

Neither of the men was familiar with the names of ephemerid species or the criteria for distinguishing them and therefore it is impossible to say to which one this individual belonged. The species which occur most commonly in the region of Put-in-Bay during the late spring and early summer are *Hexagenia bilineata* and *Ephemera simulans*.

Needham ('18) describes the emergence of *Hexagenia bilineata* as follows: "Transformation occurs at the surface

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of the water and usually at night. The grown nymph swims up and floats. A rent appears in the skin of its back. The subimago suddenly emerges from this rent, its wings expanding almost full size instantly. It stands a moment on the surface and then rises and flies away to the shore." Heptagenia was seen emerging under laboratory conditions by Clemens. He says, "they were observed to crawl up sticks placed in the breeding jar for the purpose and transform just above the water-level."

Some species are apparently able to adapt themselves to varying conditions, as is shown by their ability either to crawl up some solid support or else arise directly from the surface of the water. This is the case in *Chirotenetes albomanicatus* as described by Miss Morgan. She writes: "They crawl up on the shore, leaving their cast skins clinging to the stones or less often they flew up directly from the mid-current." Needham's ('05) statement regarding the same species: "Transformation takes place at the surface of the water as in other species," was made some years before Miss Morgan published her observations. It is merely an example of the fact that our knowledge of habits is subject to modification and it leaves open the possibility that the case I have described may concern some species for which other descriptions have been given, perhaps a *Hexagenia* or a *Heptagenia*.

Of the various accounts concerning emergence given in the literature, a description by Miss Morgan for *Iron fragilis* (*Heptageninæ*) appears to resemble the instance reported to me most closely, so far as the ability to fly immediately upon emerging from the water is concerned. I do not mean to imply any identity of species. Miss Morgan says, "The nymphs popped from the surface of the water and flew unsteadily upward. * * * " She was probably not in a situation which enabled her to describe what occurred before this, but presumably some preliminary processes took place beneath the surface. Another account which bears some resemblance to the one I have given is by W. E. Howard and concerns *Polymitarcys albus*. "I have seen the subimagos emerge and arise from the surface of the water in great numbers, but always just far enough from shore so that the nymph skins were immediately swept into the current. * * * " Somewhat

similar to this is Needham's description of the emergence of *Caenis diminuta*. "It emerges from the water at nightfall leaving its nymphal skin floating on the surface, and, alighting on the first support that offers, sheds its skin again. * * *"

In neither of the last two accounts is it definitely stated whether the mayfly issued from its nymphal skin after reaching the surface of the water or whether the process began before that. In the case of *Iron fragilis* with regard to which Miss Morgan uses the phrase, "popped from the surface of the water," it would appear that the shedding of the nymphal skin must have occurred beneath the surface. The emergence I have described, is, I believe, the only case on record in which such a process has actually been observed.

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