Verweilen im Wasser auch vollends verschwindet. Wir haben nun ein äußerst durchsichtiges Individuum vor uns, der Darm ist meist noch vollständig leer, die Drüsen an den Beinen, an den Seiten und auf dem Rücken zeigen auch nicht die Spur eines Inhalts, weshalb sie jetzt sehr deutlich als helle Blasen hervortreten. Verschiedene *Cyclops*-Arten zeigen ein ganz ähnliches Verhalten.

Eine genauere Begründung der hier mitgeteilten Auffassung gedenke ich an andrer Stelle zu geben, hier lag mir nur daran zu zeigen, daß schon innerhalb der Gattung *Diaptomus* weitgehende Differenzen hinsichtlich des Verhaltens gegenüber den wechselnden Existenzbedingungen bestehen. Daß aber diese Verschiedenheiten bei den beiden andern Vertretern der Kopepoden, den Zyklopiden und Harpaktiziden, noch bedeutend größer, aber auch schwieriger zu erforschen sind, zeigt schon ein kurzes Studium ihrer Lebensverhältnisse.

Stuttgart, den 29. August 1903.

5. Remarks on Hydroptilid larvae and their metamorphosis.

By Prof. James G. Needham, Lake Forest, Ill. U. S. A.

eingeg. 31. August 1903.

Upon the questions raised in my paper in Psyche for August 1902 I had not intended to write anything further until I should have settled them by breeding the species concerned, but Dr. Speiser's criticisms in the Zool. Anz., Bd. XXVI, for June 15th 1903 seem to call for an earlier statement upon the subject.

In the first place, he thinks that I should have called the abdominal appendages of the transforming larva tracheal gills. In my opinion there is need of discrimination in the use of this term. Not every body-process that happens to contain tracheae is a tracheal gill. It is well to remember that tracheae have an oxygen distributing as well as an oxygen gathering function. One should know that the appendages he is calling gills are respiratory organs. Since my comparison of these organs to the lateral abdominal appendages of the larvae of Sialidae is admitted to be a fair one, the Sialid larvae should teach caution-especially, *Corydalis*, in which these lateral filaments are certainly not gills, while true gills are developed independently at their bases. Concerning these same filaments in Chauliodes I have already said (Bull. No. 47, N. Y. State Mus. p. 550) in describing the new-hatched larva of *Ch. serricornis*: "The spinules on the lateral filaments may mean that these filaments are but modified larval setigerous tubercles. The function of the filaments is largely

locomotor; they are used as fins in swimming: but they are also 'outriggers', if we may so speak, serving to maintain the proper position of the long abdomen while crawling about over submerged logs."

I examined living specimens of my Hydroptilid pre-pupae under the microscope, and looked especially for evidences of gill structure in the lateral appendages. I saw but few tracheae, and none of the recurrent end loops of tracheoles that are characteristic of true tracheal gills. Recently, Lauterborn and Rimsky-Korsakow have studied active larvae (perhaps mine were too far gone in metamorphosis to show the same things), and have found the tracheae more abundant; but one may not be assured from the rather crude figures they have given whether the tracheoles anastomose at the ends to form loops or not (Zool. Anz. Bd. XXVI, Nr. 694, for Feb. 23d, 1903). Before calling these appendages tracheal gills, I should want better evidence of their oxygen gathering function than has yet been offered.

In the second place, Dr. Speiser implies that I found these appendages too unique »diese Tracheenkiemen, die vermutlich noch manchen andern, wenn nicht den meisten Hydroptilidenlarven zukommen«. Now, what are the known facts? There are a few cases described by Fritz Müller as belonging to Hydroptilidae, from Brazil, and there are a few imagos known outside the Europaean fauna, such as the three so inadequately described from North America by Dr. Hagen. In Europe, on the contrary, seven of the eight genera are fairly well known in their different stages. Herr Ulmer has given a key for their separation, based on the characters of their cases, in Stett. ent. Zeit for 1903, p. 223. And Herr Ulmer says, in a paper that Dr. Speiser cites, Stett. ent. Zeit. for 1903, p. 364, concerning these appendages: »Analoge Bildungen an andern Trichopterenlarven sind mir bisher noch nicht bekannt geworden«.

In the third place, Dr. Speiser objects to my hypothesis of hypermetamorphosis, as anyone might, having the advantage of the additional knowledge contributed in the papers he cites. But he makes the hypothesis that my pre-pupa, which I described as lying inactive in its case with head and legs folded to the left side, and with its larval cuticle loosened — the latter point illustrated in figures 3 and 4 — was really the larva, and the other (fig. 1), which I stated having seen actively walking about, was the pre-pupa; for this would fit the biogenetic law and better ally this form with the Sialidae!

The papers by Ulmer and Lauterborn and Rimsky-Korsakow contain real contributions to science. They show, among other things — what I did not know — that the young larva of *Ithytrichia* possesses appendages like those I found upon a pre-pupa. All the

active larvae that I found lacked them: and as these larvae were living in cases apparently like those containing the appendaged pre-pupae, were collected from the same stones at the same time, and belonged to a long-studied fauna from which no Hydroptilidae were known, it was surely but natural that they should be assumed to form a single series of one and the same species. The hypothesis of hypermetamorphosis was based on this assumption, and was framed to fit the developmental condition of the specimens found.

But I certainly endeavored to give the facts with sufficient fullness so that no one need be misled by any attempt at explaining them. And I said in that paper in Psyche: "The possibility that my specimens did not all belong to the same species, and that these peculiar appendages of the pre-pupa may have belonged to the (undiscovered) larva of the same species, is not to be overlooked entirely, even though it be highly improbable". In the light of the knowledge that the immature larva of *Ithytrichia* possesses just such appendages, this alternative hypothesis becomes the more probable; and this probability grows with the knowledge of the Hydroptilid fauna of *Ithaca*. My former assistant, Mr. C. Betten, sent his trap-lantern catch of adult Hydroptilidae from Fall Creek *Ithaca* to Mr. K. J. Morton of Edinburgh, who has found them to represent eleven species, belonging to five genera, and one of them a new species of *Ithytrichia*.

This most singular larva appears to have been independently described five times. Mr. Morton first noticed it in Ent. Monthly Mag. for 1888, p. 171. In 1897 Prof. Klapalek described it again in a Bohemian paper that I have not seen. Then Richters described it in Bericht Senckenberg. Naturf. Ges. for 1892, p. 19—21. This paper also appeared a little in advance of my own. Then Ulmer described it in Stett. ent. Zeit. for 1902, p. 364; and exactly at the same time my own paper in Psyche, pp. 375—378, appeared. Perhaps it was my misfortune to find only the transforming larva, and that associated with another younger larva in cases so similar they might be thought one species. But certainly as to their relationships, must wait upon further life-history studies, and is not fostered by gratuitous hypotheses that contradict the known facts.

Lake Forest, 15 August 1903.

II. Mitteilungen aus Museen, Instituten usw.

1. Personalverzeichnis zoologischer Anstalten.

12. Freiburg i. Br.

Zoologisches Institut.

Direktor: Prof. Aug. Weismann.
Assistent: Dr. med. Waldemar Schleip.