

A NEW BAETIS FROM MICHIGAN

(Ephemeroptera)¹

JUSTIN W. LEONARD,
Michigan Department of Conservation,
Ann Arbor, Michigan

The writer spent the period May 1 to October 19, 1948, in a temporary laboratory beside the Au Sable River in Crawford County, Michigan, where he maintained continuous observations on the aquatic insect fauna. Among a number of novelties obtained during the course of this study was the *Baetis* described below. Nymphs first attracted attention in collections made in mid-August. They grew rapidly thereafter, and subimagoes began to emerge from the stream and from laboratory rearing containers on September 11. Emergence was heaviest during the period October 1 to 3; no adults were taken after October 13.

The ecological and faunistic aspects of the collection site will be discussed more fully elsewhere. It may be sufficient here to mention that the Au Sable River is a hard-water stream deriving almost all of its volume from spring seepages and tributaries; at the collection site it is about 80 feet wide and in midstream flows at a rate of 2.5 to 3.0 feet per second over a bottom of mixed glacial gravel and sand. It is regarded as one of the most productive trout streams in the state.

Baetis hiemalis new species

Male imago.—Length of body 8 mm., of forewing 8.5 mm. In life, the turbinate eyes (fig. 1) are a brilliant, glowing orange; in alcoholic material they are a subdued yellowish brown, while in dried specimens their color changes to a dark reddish purple. In living and in alcoholic examples the bases of the translucent, faintly amber ocelli are black, the head between the ocelli and eyes is smoky brown with a narrow white area contiguous to the anteromesal margin of the turbinate eyes, the antennae and ventral surface of the head are smoky brown; in dried specimens all of these areas and structures range from piceous to black.

The thorax in life is shining piceous with purplish reflections, relieved by marginal white spots on the prescutum and by dilute grayish brown on the pleural folds. In alcoholic material, fading reduces the color of the notum to dark brown, and brings into sharper relief the pale marginal markings along the prescutum, scutum and scutellum, and on the pleural folds. In dried specimens the thorax is predominantly shining black, with paler areas changed to a deep reddish purple. Legs of living and dried specimens are amber, the tibiae and femora

¹Contribution from the Michigan Institute for Fisheries Research.

suffused with smoky gray; in alcoholic material the legs fade to grayish white. Wings are hyaline, the venation pale amber, paired marginal intercalaries between all longitudinal veins of forewing from Sc to Cu₁; hind wing (fig. 1) with costal projection prominent, truncate.

The abdomen in living specimens is piceous with purplish reflections, dorsally about the same color value as the thorax, ventrally slightly paler; in pinned specimens the color fades to uniform medium brown dorsally, pale olive ventrally, with dark tracheal arms visible in the pleural region; in alcoholic material the abdominal tergites appear dilute reddish brown and an obscure pale mid-dorsal line is revealed, while the sternites become smoky amber except for the 9th sternite and forceps bases, which remain reddish brown, and alabaster appears in the pleural region of segments 7 and 8. Claspers and "penis sheaths"

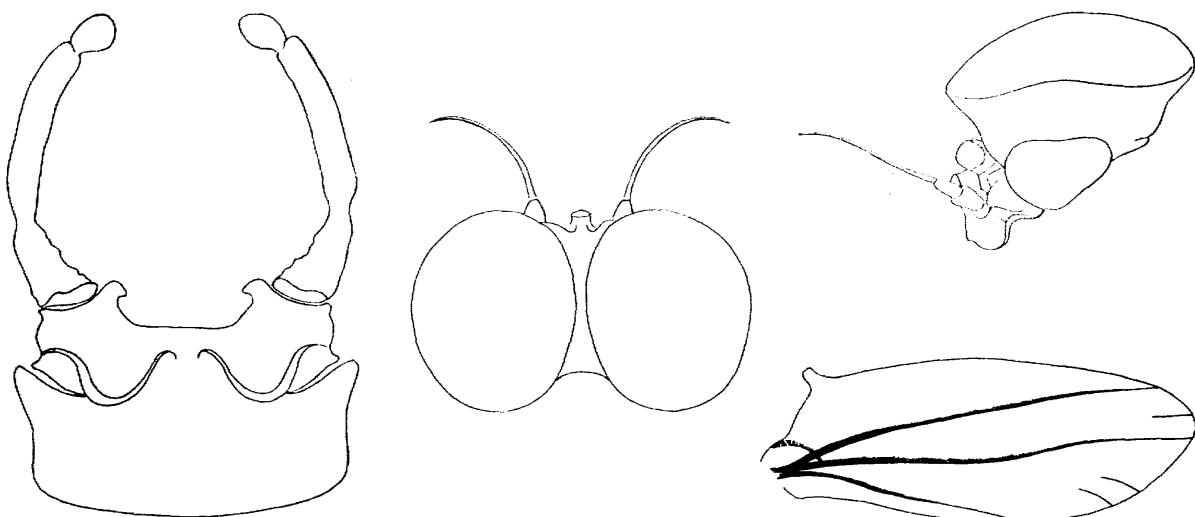


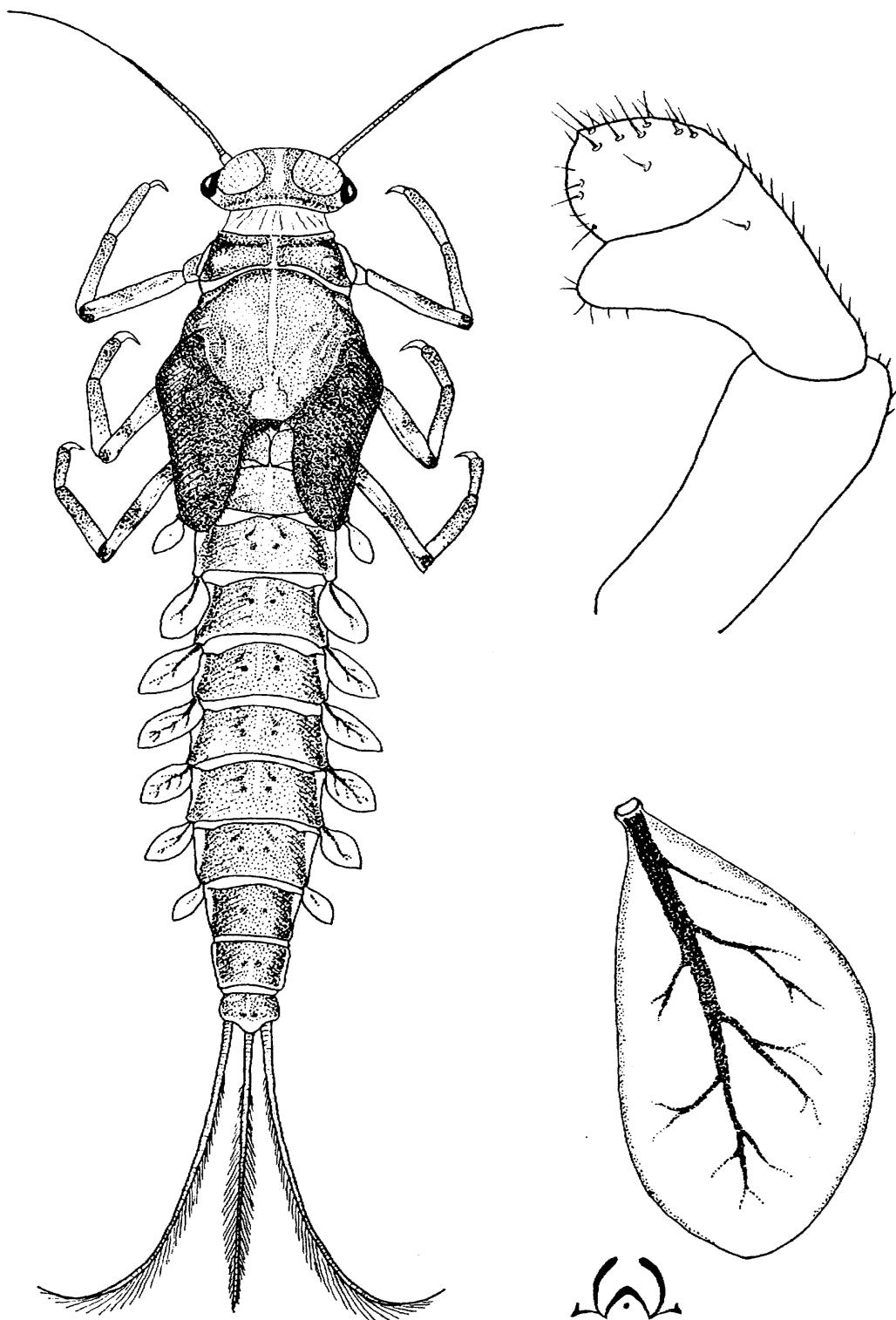
FIG. 1. *Baetis hiemalis*: Left, male genitalia ($\times 48$); center, head of male, dorsal aspect ($\times 23$); upper right, head of male, lateral aspect ($\times 23$); lower right, hind wing of male ($\times 23$).

are shown in figure 1. The caudal filaments, smoky amber in living and pinned specimens, fade to pearly white in alcoholic examples, and are always unringed.

Female imago.—Length of body 8 mm., of fore wing 9.5 mm. Closely resembling male in ambisexual characters except as follows in alcoholic specimens: the entire head dorsum is pale pinkish gray with the bases of the ocelli broadly black and the occipital margin medium brown; the fore wing is longer in relation to body length than in the male (see measurements); and in the egg-swollen abdomen the tracheal trunks ramifying from the spiracles show more extensively than in the male.

Holotype, male.—Michigan, Crawford County, T. 26 N., R. 2 W., Section 12, Au Sable River, J. W. Leonard and F. A. Leonard, October 3, 1948; a reared specimen preserved in alcohol together with its nymphal and subimaginal exuviae, genitalia in slide mount.

Allotype, female.—Same data as for holotype, but appeared as imago October 1, 1948; preserved in alcohol intact.



Baetis hiemalis: Left, mature male nymph ($\times 12$); upper right, labial palp of nymph ($\times 87$); lower right, fourth gill ($\times 65$).

Paratypes (all taken in 1948 at same locality and by same collectors as holotype). Pinned.—October 13, 1 male, 1 female, reared. In alcohol, reared, with nymphal exuviae.—September 11, 1 female; September 14, 1 male, 1 female; September 16, 2 females; September 17, 2 females; October 1, 1 male, 3 females; October 2, 1 male, 2 females; October 3, 4 males. Not reared.—September 22, 1 male; September 29, 1 male.

All types are deposited in the collection of the Insect Division, University of Michigan Museum of Zoology.

Nymph.—Length of body 9–10 mm. General configuration, dorsal markings, and labial palp as shown in Plate I. Ground color very dark olive, lighter areas medium brown (body) to grayish white (legs); narrow middorsal pale stripe clearly defined and unbroken on head and thoracic nota, apically interrupted on abdominal tergites 1 to 6 and 9 to 10, almost wholly obscured on 7 to 8. Venter of body paler than dorsum, lightly sclerotized portions of thoracic sterna, and abdominal sternite 1, grayish white, remainder of venter medium olive; abdominal sternites with paired median dark dots just apical to paired median subreniform dark spots, similar to markings of tergites (Plate I), and with a narrow, transverse pale mark about one-third the distance from the apex of each sternite except 10 originating on either side of the mid-ventral line and extending laterally to join the pale, semi-transparent lateral borders of the segments. Gills (Plate I) with darkened margins, and with rather conspicuous dark tracheae in all except first and last pairs, in which tracheae are rather faint. Caudal filaments unbanded, darker basally, fading to grayish white apically, laterals 23% longer than median.

Nymphs.—Same locality and collectors as holotype, September 16, 16 nymphs; October 2, 1 nymph; October 3, 2 nymphs; all 1948.

When nymphs of this species first attracted attention, in collections made about a month before emergence started, they were tentatively referred to *Baetis brunneicolor* McDunnough. As growth proceeded, their size, pattern, and certain morphological characters including gills, labial palp, and length of lateral caudal filaments in relation to the middle filament removed them from this assignment. Mature nymphs suggested *B. hudsonicus*, described by Ide (1937) from nymphal material. Significant differences between *hiemalis* and *hudsonicus* were apparent, however. Characters of mature *hiemalis* nymphs are tabulated with corresponding characters of *hudsonicus* as described by Ide (1937).

	<i>hiemalis</i>	<i>hudsonicus</i>
Body length:	9–10 mm.	7.5–8.5 mm.
Pronotum:	With distinct pattern.	"evenly brown."
Legs:	Apical third of femora pale, with dark median band and piceous apical stripe.	"evenly suffused with brown."
Abdominal segment 1:	Same color as remaining segments.	"segment 1 pale."
Gills:	Tracheae distinct (resembling <i>brunneicolor</i>).	"... without conspicuous tracheae."
Caudal filaments:	Laterals 23% longer than median.	"caudal filaments subequal, median rather longer."

The labial palp of *hiemalis* (Plate I) closely resembles that of *hudsonicus* as figured by Ide (1937). On morphological grounds, *hiemalis* would seem to be closely related to *hudsonicus* and only slightly less so to *brunneicolor*. Its size, morphological differences, and very late season of emergence, should assist in differentiating it from these close congeners.

Mature nymphs of *hiemalis* were collected most plentifully in areas of shallow, sluggish flow near the edge of the river, where they clung to submerged vegetation. During the emergence period air temperatures dropped as low as 24° F. at night; the subimaginal stage lasted 48 to 72 hours.

The assistance of Dr. B. D. Burks, who checked the *hiemalis* material and concurred in the view that it represented an undescribed species, is gratefully acknowledged.

REFERENCE

- Ide, F. P. 1937. Descriptions of Eastern North American Species of Baetine Mayflies with particular reference to the Nymphal Stages. Canadian Entomologist, 69: 219-231, 235-243, pls. 8-12.

PHYSIOLOGIE DE L'INSECTE, by REMY CHAUVIN. 619 pages. Institute Nationale de la Recherche Agronomique, Paris. 1949. Price, 2500 fr.

This is a much-needed work on the subject, bringing up to date the literature of the field of insect physiology. In the ten years which have elapsed since the appearance of the pioneer and only work on the subject of insect physiology, by Dr. Wigglesworth, tremendous advances have been made in methods and techniques in biophysics and biochemistry. These have gradually been adapted, by general physiologists as well as insect physiologists, to studies on the physiology of insects (e.g., the use of isotopes in physiological studies, studies involving the electron microscope, etc.). Not only has the author included findings based on biochemical methods especially, but he has also included actual descriptions of methods and apparatus, the latter occasionally illustrated. The work is conventionally divided into nine chapters beginning with the [in]tegument and ending with reproduction. An excellent treatment of insect nutrition and of the lesser-known sex physiology studies of von Frisch, as well as a section described by the author as "ecophysiology," are included. The last-mentioned will prove of interest to ecologists interested in laboratory bases for environmental influences on insect growth. The general treatment of the modern concept of cuticle composition, as expounded by A. G. Richards, is especially commendable, since the now refuted concept of a chitinous base for insect cuticle is still being taught by some contemporary entomologists.

The excellent bibliography at the end of several chapters is marked with more than infrequent inconsistencies in the titles of English-written journals. The Journal of Cellular and Comparative Physiology, for example, is written in at least four different fashions, capital letters for the adjectival words being included or omitted inconsistently from time to time. The index also leaves much to be desired, since its arrangement according to generic and family names makes the finding of material quite difficult. This is paradoxical, since the arrangement of the chapters and content is in the classical manner, i.e., according to the physiology of the various organ systems.

Aside from occasional apparently typographical errors in the text, the book is well-written and reads easily. As such it is a work which could be used as a basic text in Insect Physiology by students capable of handling the language.

—M. ROCKSTEIN.