

A New *Heptagenia* (Ephemeroptera: Heptageniidae) from the Susquehanna and Delaware Rivers from Eastern North America

JANET L. EVANS, WILLIAM F. BOTTS, JR., AND
R. W. FLOWERS

RD 1, Box 187, York Haven, Pennsylvania 17370;
RD 1, Box 121, Millersburg, Pennsylvania 17061; and
Department of Entomology and Structural Pest Control,
Florida A&M University, Tallahassee, Florida 32307

Ann. Entomol. Soc. Am. 78: 5-7 (1985)

ABSTRACT *Heptagenia culacantha* sp. nov. from the Susquehanna and Delaware river systems is described and illustrated. The large size, abdominal tubercles of the adult, and the color pattern and abdominal spines of the nymph distinguish this species from all other known *Heptagenia*.

Heptagenia Walsh is a large genus of mayflies distributed throughout the Holarctic and Oriental regions. North American members of this genus are distinguished from one another chiefly by differences in color patterns and male genitalia. In May 1980, nymphs and subimagos of a striking heptageniid, remarkable for its large size and unusual color pattern, were collected in York Haven Pond, a mainstream impoundment of the lower Susquehanna River near Three Mile Island, Pa. Additional collecting by the senior authors in 1982 yielded nymphs from which eight imagos were reared. This mayfly proved to be a new species of *Heptagenia*, allied to *H. flavescens* Walsh but differing in several respects from it and other North American *Heptagenia*. In addition to the Three Mile Island locality, this new *Heptagenia* has also been found in the upper Susquehanna and Delaware rivers in New York. The New York specimens are young nymphs which were collected in 1974. Their identity was established through comparison with the Three Mile Island specimens.

The following description is based on characters of nymphs, imagos, and eggs.

Heptagenia culacantha sp. nov.

Male Imago (in alcohol). Length: body, 16.3-17.5 mm; fore wings, 15.3-16.6 mm. Head brown; antennae light brown; eyes black (bright yellow-green when living); basal half of ocelli black, apical half white. Pronotum brown, yellowish laterally, light brown ventrally; mesonotum brown; metanotum brown, posterior margin dark brown; pleura yellow with dark brown markings around middle coxa; pro- and metasterna light yellowish brown, mesosterna dark brown; fore femora light brown; tibiae and tarsi brown, joints darker; middle and hind femora, tibiae and tarsi light brown, joints darker. Fore and hind wings hyaline; lon-

gitudinal and cross veins pale brown; basal costal cross veins of fore wing weak; stigmatic area of fore wing opaque white. Abdominal terga 1-8 brown dorsally, yellow laterally, posterior one-fourth with black dash on posterior margin (some specimens with dark brown triangles as in Fig. 2); terga 9 and 10 brown, tergum 10 dark brown on midline and posterior margin (in lighter colored specimens, terga 2-9 with a light brown U-shaped center spot and one or two light submedian patches on either side of this center spot); sternum 1 light brown, sterna 2-8 yellow with brown posterior margins, sternum 9 yellow with anterior and lateral edges brown, forming a broad U. Terga 3-6 with small projections at posterolateral corners (as in Fig. 2); subgenital plate and genitalia brown, forceps brown basally, lighter apically; penes (Fig. 1) dark brown, median titillators swollen, discal spines lacking. Cerci brown basally, lighter apically with articulations dark.

Female Imago (In Alcohol). Length: body, 16.8-19.5 mm; fore wings, 17.5-20.1 mm. Head and thoracic color and pattern similar to male, color slightly lighter, markings more distinct. Legs yellow to yellow-brown. Abdominal terga yellow with light brown dorsal band, dark brown triangles and black intersegmental membrane (Fig. 2); segments 3-7 and 9-10 with small posterolateral projections; apex of sternum 7 and apical margin of subanal plate brown.

Mature Nymph (In Alcohol). Length of body, 17.9-19.5 mm. Head: dorsum yellow with brown markings (as in Fig. 4); antennal scape and pedicel brown, flagellum yellow; mouthparts light yellow. Thoracic nota and wing pads yellow, marked with dark brown (as in Fig. 4); pleura and sterna light yellow; legs brown, femora with longitudinal yellow streaks (as in Fig. 4), claw with 3-4 denticles (Fig. 5). Abdominal dorsum yellow with brown markings (as in Fig. 4), sternum yellow, segments

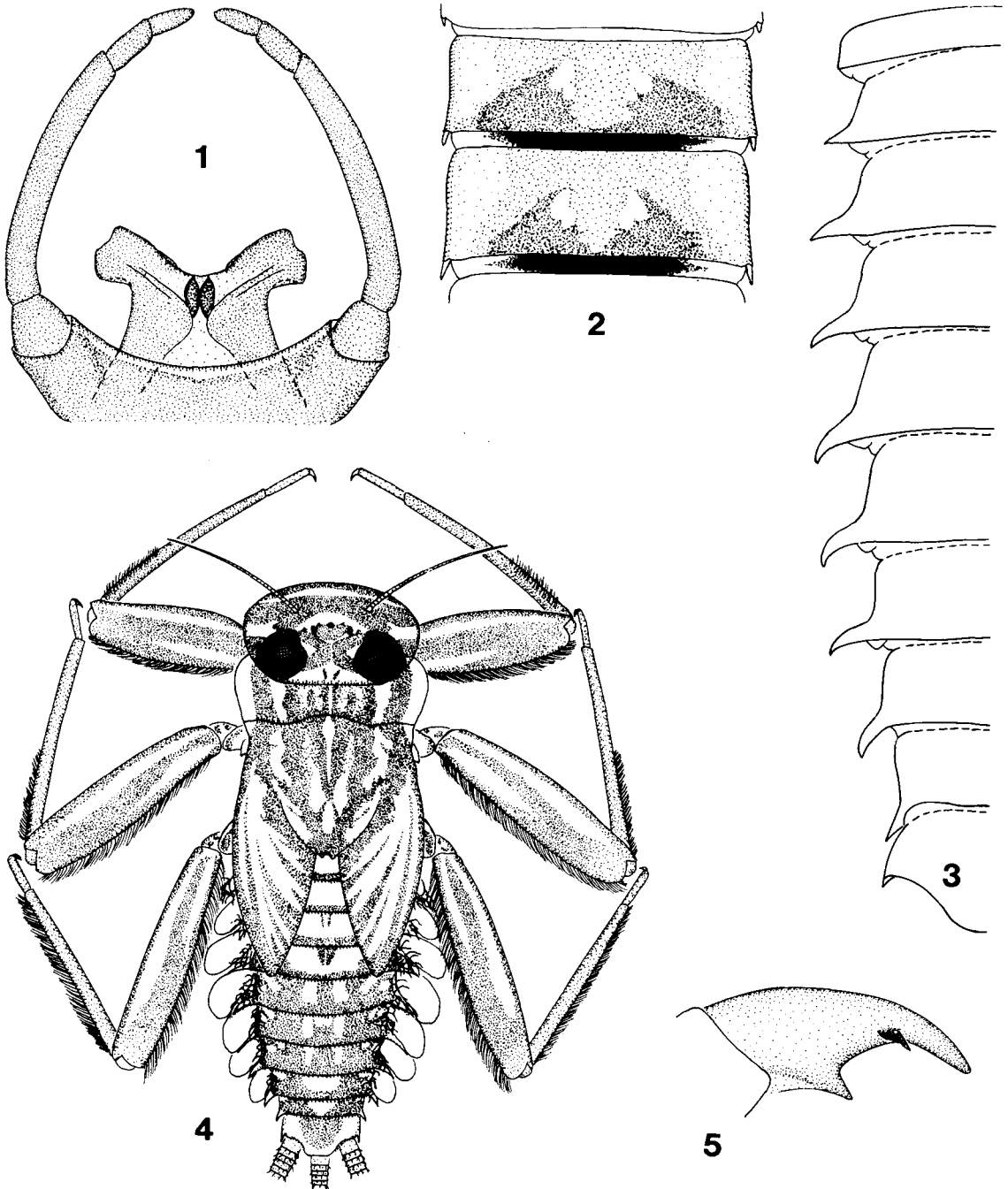


Fig. 1-5. *Heptagenia culacantha*: (1) male genitalia, ventral; (2) terga 4-5, female imago; (3) lateral outline of nymphal abdomen; (4) mature nymph, dorsal; (5) nymphal claw.

2-10 with prominent posterolateral spines (Fig. 3); plate-like portion of gills white, fibrilliform portion light grey. Cerci light brown, terminal filament yellow.

Egg. Chorion with coarse granules; coiled threads concentrated at poles, sparsely distributed elsewhere.

Types. *Holotype.* Male imago (reared with nymphal exuvia and subimaginal skin), PENNSYLVANIA: Dauphin Co., Susquehanna River along northwest shore of St. John's Island approximately 3,300 m upstream of York Haven Dam, 10-V-1982, W. F. Botts and J. L. Evans.

Allotype. Female imago (reared with nymphal

exuvia and subimaginal skin), PENNSYLVANIA: Dauphin Co., Susquehanna River along northwest shore of Henry Island approximately 3,300 m upstream of York Haven Dam, 18-V-1982, W. F. Botts and B. D. Snyder.

Paratypes. One male imago (reared with nymphal exuvia and subimaginal skin), 5 female imagos (reared with nymphal exuvia and subimaginal skin), 5 nymphs, PENNSYLVANIA: Dauphin Co., Susquehanna River approximately 3,300 m upstream of York Haven Dam, 10-18-V-1982, W. F. Botts et al.; 2 nymphs, same locality as holotype, 5-V-1982, W. F. Botts and J. L. Evans; 2 nymphs, same locality as holotype, 10-V-1982, W. F. Botts and J. L. Evans; 1 male subimago, 2 female subimagos (1 with nymphal exuvia), same locality as allotype, 23-V-1980, G. A. Hoover. One nymph, NEW YORK: Sullivan Co., Delaware River at Narrowsburg, 1.9 km upstream of Rt. 106 bridge, midstream multiplate sample, 18-IX-1974, K. W. Simpson. All specimens are preserved in alcohol. Types are deposited in the following collections: holotype, allotype, 1 female paratype, 1 female subimaginal paratype, and 2 nymphal paratypes at The Academy of Natural Sciences of Philadelphia; 1 male, 1 female, and 2 nymphal paratypes at Florida A&M University; 2 female paratypes, 1 female subimaginal paratype, and 4 nymphal paratypes at the U.S. National Museum; 1 female, 1 male, and 1 nymphal paratype at the University of Utah; 1 nymphal paratype at the Center of Laboratories and Research, State of New York Department of Health, Albany, N.Y.

Etymology. *Culus*, L., meaning rump; *acanthus*, L., meaning spine, adjective.

Biology. Adults of *Heptagenia culacantha* emerge from May to early June in York Haven Pond of the Susquehanna River. Both collection sites here were off the northwest shore of islands, in swift currents, water depth of 0.5 m or less. Nymphs live on the underside of large pieces of rubble or boulders. Rarely was more than one nymph found on the underside of the same rock. Additional sampling in May 1983 did not yield specimens. High spring flows in April and early May of that year may have altered emergence time or normal habitat. Nymphs of *H. culacantha* were also collected on multiplate samplers in the Susquehanna River at Barton, Tioga Co., N.Y., 30 October 1974; and in the Delaware River at three additional localities in Sullivan Co., N.Y., in July 1974. Attempts to recollect with multiplate samplers at these localities in 1981 were unsuccessful (Karl W. Simpson, personal communication).

Discussion

Of the known species of *Heptagenia*, *H. culacantha* is most closely related to *H. flavescens*. Size differences aside, the male genitalia of the two species are remarkably similar. The imagos of *H. culacantha* can be distinguished from large spec-

imens of *H. flavescens* by the darker color and the posterolateral abdominal projections of the former. These two species are apparently allopatric: *H. flavescens* is known from the Midwest and Southeast of the United States while *H. culacantha* is known only from the Northeast. Other North American *Heptagenia* allied to these two species are *H. cruentata* Walsh, *H. patoka* Burks, *H. marginalis* Banks, *H. dolosa* Traver, and *H. townesi* Traver. Of these, only *H. cruentata* has the swollen median titillators that occur in *H. flavescens* and *H. culacantha*. Adult *H. cruentata* (the nymph is unknown) differ from both *H. flavescens* and *H. culacantha* in having black, well developed basal costal cross veins in the fore wing. The nymph of *H. culacantha* can be distinguished from all other North American *Heptagenia* by the abdominal spines, the denticles on the claws, and the striking color pattern.

H. culacantha is the only North American *Heptagenia* with either abdominal spines or well-developed denticles on the nymphal claws. Some exceptionally large mature nymphs of *H. diabasia* Burks have minute or rudimentary denticles on the claws but this species lacks abdominal spines. The presence or absence of claw denticles can no longer be used as a character to separate *Heptagenia* from other North American heptageniid genera (see Flowers 1980).

Heptagenia culacantha is the largest known species of *Heptagenia* from North America and possibly also the largest species of North American Heptageniidae. Edmunds et al. (1976) show *Stenonema* attaining 20 mm as nymphs, slightly exceeding known *H. culacantha* nymphs. However, *H. culacantha* adults are larger than any other adult North American heptageniid on record. *H. culacantha* is also larger than any Old World *Heptagenia* species (Jensen 1972).

Acknowledgment

We thank Gregory A. Hoover, who collected the first specimens at York Haven Pond, and Karl E. Simpson, who collected the New York specimens and provided us with specimens and data. We also thank Michael D. Hubbard for his comments and suggestions. This research was supported by a grant (FLAX79009) from CSRS, USDA to Florida A&M University.

References Cited

- Edmunds, G. F., Jr., S. L. Jensen, and L. Berner. 1976. The mayflies of North and Central America. University of Minnesota Press, Minneapolis.
- Flowers, R. W. 1980. Two new genera of Nearctic Heptageniidae (Ephemeroptera). Fla. Entomol. 63: 296-307.
- Jensen, S. L. 1972. A generic revision of the Heptageniidae of the world (Ephemeroptera). Ph.D. dissertation, University of Utah, Salt Lake City.

Received for publication 9 April 1984; accepted 29 August 1984.