

NEWLY ASSOCIATED LARVAE OF THREE
SPECIES OF *HEPTAGENIA*
(EPHEMEROPTERA: HEPTAGENIIDAE)¹

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ABSTRACT

The larvae of *Heptagenia inconspicua* McDunnough, *H. minerva* McDunnough, and *H. persimplex* McDunnough are described for the first time. Treatments of larvae are based on reared associations from Indiana and Arkansas populations. Each of the species appears to be easily distinguishable on the basis of known and new morphological characteristics of *Heptagenia* larvae.

Key Words: *Heptagenia*, larval descriptions

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Larvae of the species of *Heptagenia* Walsh are imperfectly known. A key to 11 known larvae of some 38 nominal species presently described from North America was presented by Burks (1953), but is of only limited value in diagnosing larvae because of its incompleteness. Based on reared associations of larvae and adult males, descriptions of the previously unknown larvae of three species are here presented. Treatments are applicable to mature or nearly mature individuals preserved in 70% ethanol, and deposited in the Entomological Research Collection of Purdue University.

Heptagenia inconspicua McDunnough, 1924

This is a relatively common species throughout the midwestern U.S. and central Canada, and larvae should prove to be common in mayfly collections taken from this area. Larvae were reared from material taken in Indiana in 1973 and Arkansas in 1974.

Size — Male: body up to 5 mm, caudal filaments up to 3 mm; female: body up to 7 mm, caudal filaments up to 4 mm.

Coloration — Generally, body with tan markings on white ground color, with some brown granulations on head and legs dorsally. Dorsal pattern of male typically as in Fig. 1; head with conspicuous brown interantennal patch; bases of spines of caudal filaments brown giving appearance of brown annulations at joints. Head of female lacking conspicuous interantennal patch but with dense granulations in anterior half; female thorax, legs, and abdomen similar to male (Fig. 1) but usually less pronounced. Male and female white ventrally, abdominal sternites 6-9 with pair of small brown spots sublaterally near anterior margins.

Head — Head distinctly wider than long, hind margin straight, as wide as mesothorax in male, slightly wider than mesothorax in female. Compound eyes of male nearly contiguous (Fig. 1). 10-11 pectinate spines at crown of maxillary galea-laciniae. Two setae at base of mandibular canines.

Thorax — Pronotum not as wide as head and not distinctly produced laterally (Fig. 1). Tarsal claws (Fig. 5) with median tooth followed by inner pectinate row of 2-4 small spines.

Abdomen — Marginal spicules at posterior margins of abdominal tergites minute (Fig. 6). Lamellate gills translucent throughout with cloudiness intensified medially and basally (Figs. 9 and 10); filamentous gill tufts well developed on gills 1-5 (Fig. 9); absent on gills 6 and 7 (Fig. 10); lamellae of gills 1-6 (Fig. 9) with pigmented tracheation restricted to dorsad of main trunk with usually no tracheation ventrally; shape of gill 5 as in Fig. 9; tracheation reduced and shape of gill 7 as in Fig. 10. Medial margins of cerci and lateral margins of median terminal filament with long setae in distal two-thirds.

Variability — Intraspecific differences appear to be due to sex and relative age of the larvae, with only slight variation between geographic populations.

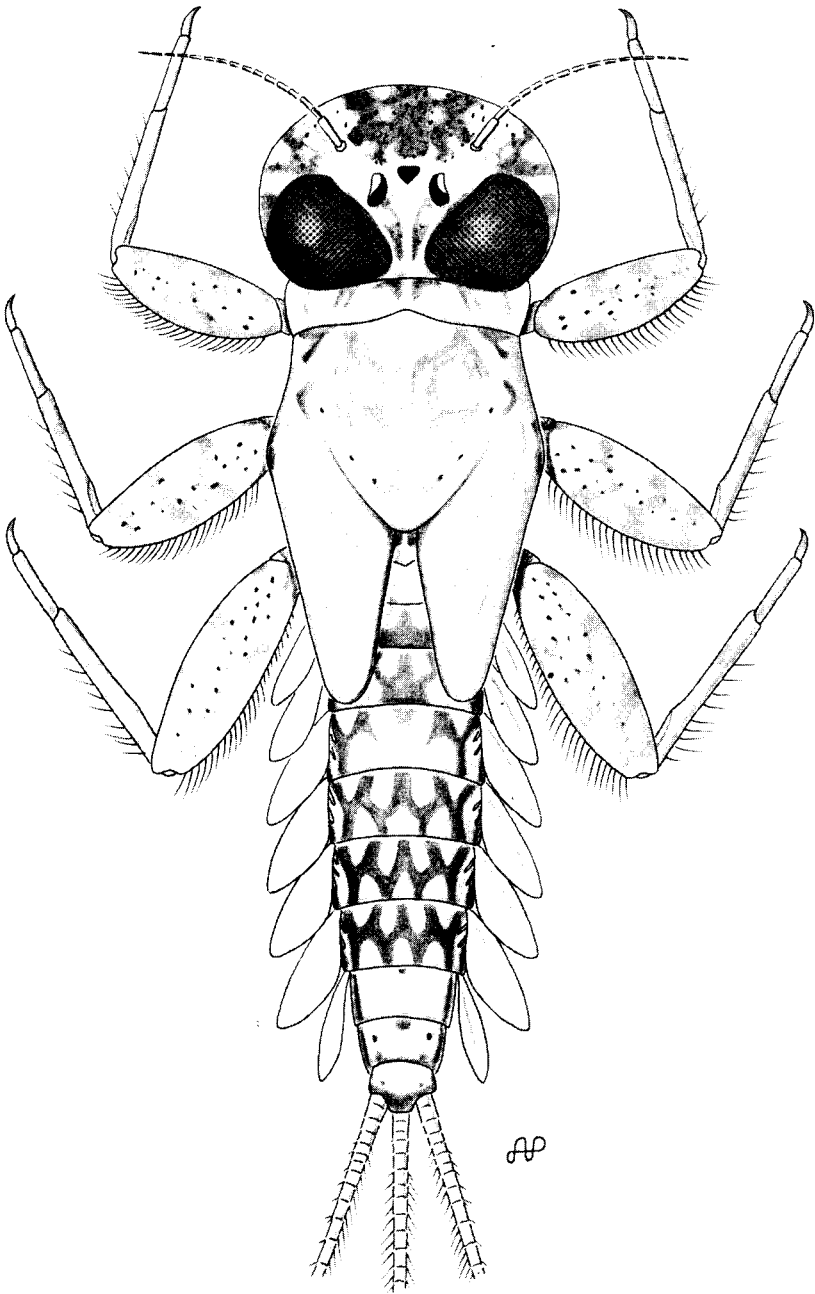


Fig. 1. — *Heptagenia inconspicua*, male larva.

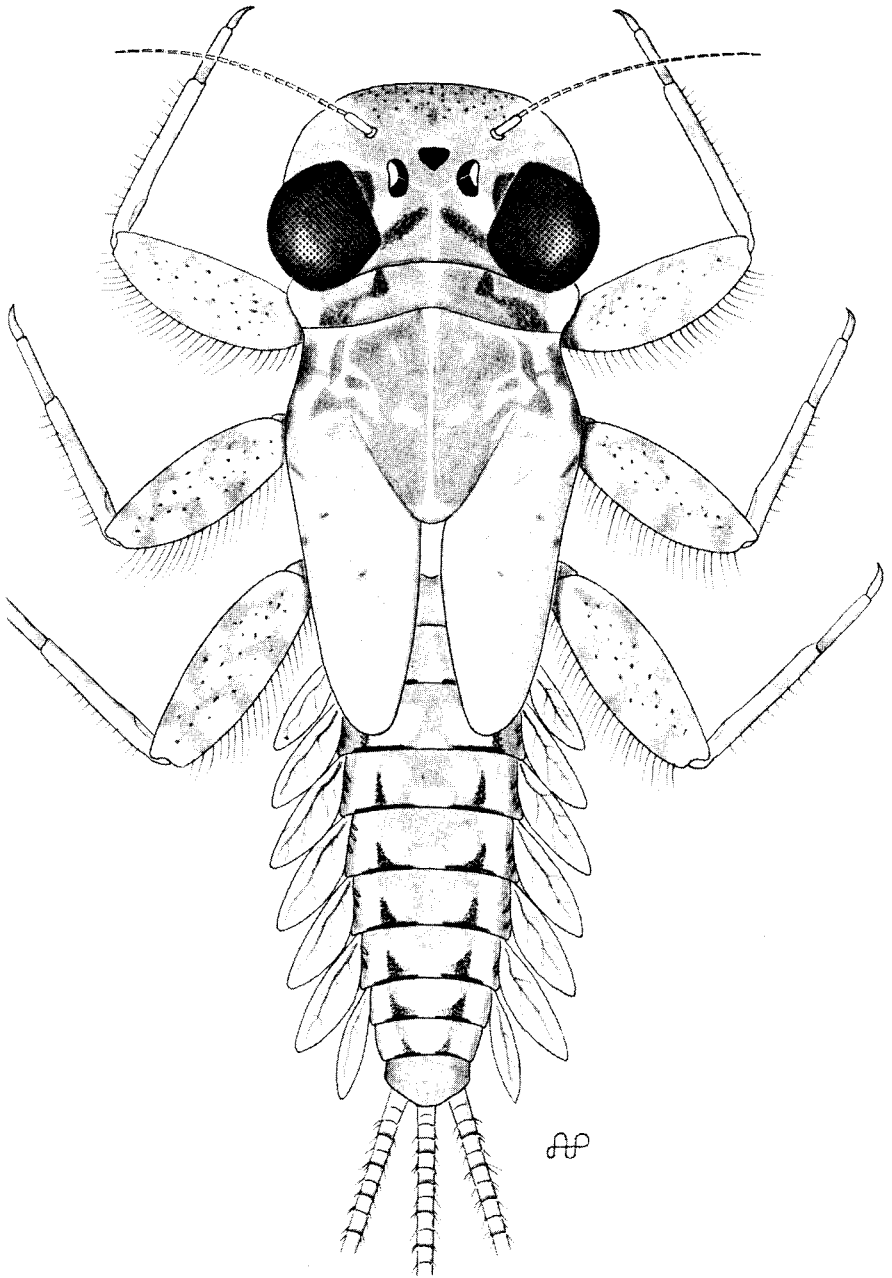
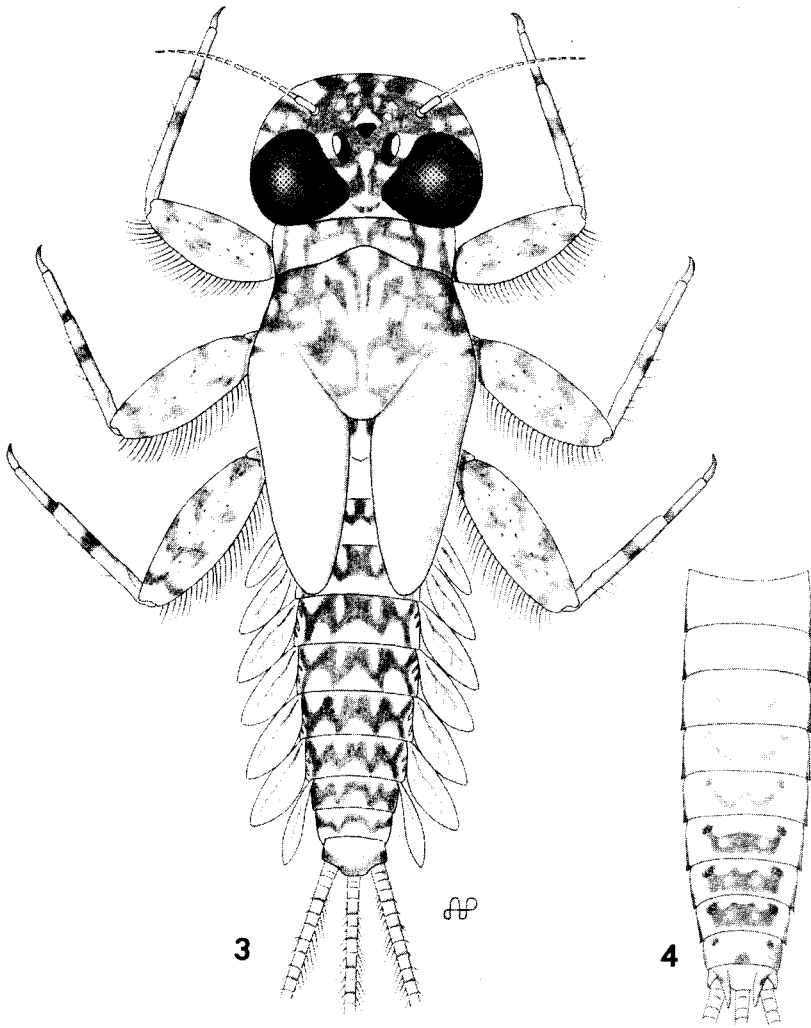
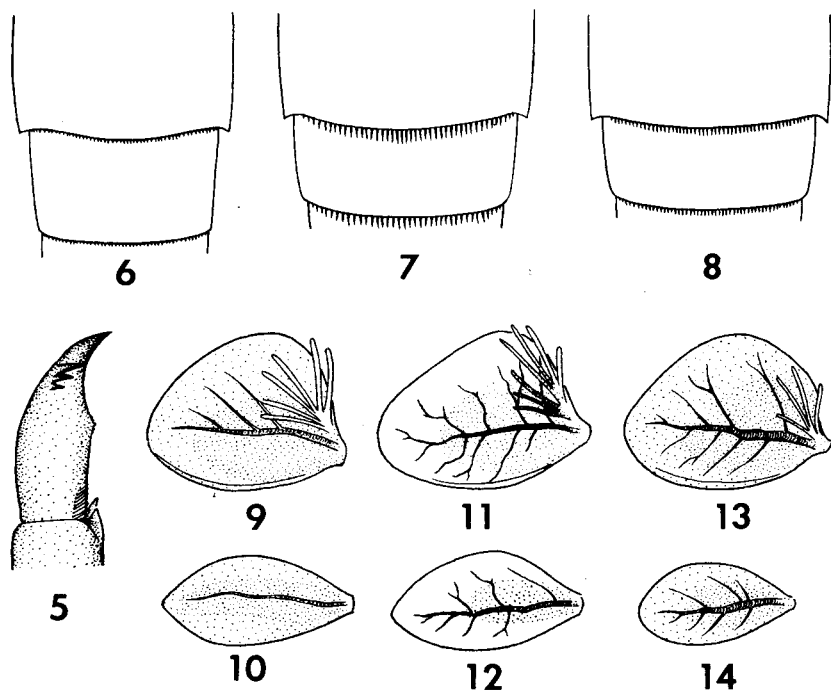


Fig. 2. — *Heptagenia minerva*, male larva.



Figs. 3 and 4. — *Heptagenia persimplex*, male larva. 4. ventral abdomen.

Individuals vary primarily in color pattern and this character must therefore be used with caution. The absence of a continuing pattern on abdominal tergites 8-10 (Fig. 1) is quite consistent; however, other dorsal patterning may vary somewhat (often with more open white areas especially in more mature individuals). The venter of the abdomen ranges from being free of any markings to having well developed maculations sublaterally and medially along the anterior margin of each sternite. These ventral patterns vary within the same sex, same instar, and same geographic population. The interantennal color patch of the male head is more distinctive in Indiana specimens and less so in Arkansas specimens in which areas laterad of the antennae are also well



Figs. 5 - 14. — Larval structures of *Heptagenia*. 5. Tarsal claw, *H. inconspicua*. 6-8. Tergites 7 and 8. 6. *H. inconspicua*. 7. *H. minerva*. 8. *H. persimplex*. 9 and 10. *H. inconspicua* gills. 9. Gill 5. 10. Gill 7. 11 and 12. *H. minerva* gills. 11. Gill 5. 12. Gill 7. 13 and 14. *H. persimplex* gills. 13. Gill 5. 14. Gill 7.

pigmented. In general, the female appears more tapered-elongate than does the male. Proximity of the compound eyes of the male increases with maturity, but they are always at least as close together as are the lateral ocelli. Gill tracheation is not as well developed in the males (rarely obscure) as in the females, and the male gills also are slightly narrower and more clouded. Although ventral gill tracheation is usually absent, up to 2 branches were found in some gills of a few specimens.

Diagnosis — Any attempt at diagnosing *H. inconspicua* (and other described larvae of *Heptagenia*) is severely hampered by the lack of information concerning the larvae of most *Heptagenia* species. The following, therefore, is somewhat presumptive and based on the limited number of larvae which presently can be definitely correlated with species. The presence of claw pectination and the absence of filamentous gill tufts on gill 7 would readily distinguish *H. inconspicua* from *H. diabasia*, *pulla*, *marginalis*, and *flavescens* according to Burks (1953). The abdominal color pattern should also distinguish *H. inconspicua* from most other described larvae, but since this can be

highly variable, it should not be relied on heavily. Relative closeness of the male compound eyes and the presence of the interantennal patch have worked well in diagnosing this species in the field. Reduced tracheation of the gill lamellae may prove to be useful in keying this species. The lack of filamentous tufts on gill 6 may also prove to be useful.

Material Examined — INDIANA: 20 larvae, Warren Co., Kickapoo Cr., 2.5 mi W Independence, V-21-76; 24 larvae, Union Co., East Fork Whitewater R. at Brownsville, VIII-31-73; 4 larvae, Shelby Co., Big Blue R., 2 mi N Marion, VIII-22-75; 5 larvae (reared), Perry Co., Trib. of Deer Cr. on St. Hwy. 66, 8 mi N of Brdg. on Deer Cr., V-17-73; 6 larvae, Wayne Co., Greens Fork, Whitewater R., 3 mi S Green Fork, VIII-27-74; 32 larvae, Benton Co., Sugar Cr. at state line rd. 3 mi NW Freeland Park, V-25-76. ARKANSAS: 5 larvae, Boone Co., Bear Cr. at SR 14, 3 mi W Jct. 281 and 14, V-28-74; 6 larvae, Montgomery Co., Crooked Cr. S of Little Mo. Falls, Ouachita Nat'l For., V-31-74; 28 larvae (4 reared), Montgomery Co., Ouachita R. at Rocky Shoals Boat Camp, U.S. Hwy. 270, VI-1-74; 30 larvae, Montgomery Co., Little Missouri R. at Albert Pike Rec. Area, V-30-74.

Heptagenia minerva McDunnough, 1924

This species is known from extreme eastern North America, however, in 1974 I found this species common in western Arkansas.

Size — Male: body up to 5 mm, caudal filaments up to 5 mm; female: body up to 5 mm, caudal filaments up to 6 mm.

Coloration — Ground color beige to light cream with tan, brown, and purplish-brown markings. Dorsal pattern of male typically as in Fig. 2; diagonal bars between compound eyes brown; general tan pattern often blending with ground color and little demarked; sublateral transverse bars of posterior margins and sublateral triangular or diagonal bars of abdominal tergites purplish-brown. Caudal filaments tan with alternating brown and light brown annulations at joints. Dorsal pattern of female as in male but less developed. No ventral patterns present in male or female.

Head — Head distinctly wider than long, hind margin slightly emarginate, wider than mesothorax. Compound eyes of male widely separated, more than separation of lateral ocelli (Fig. 2). 12-15 pectinate spines at crown of maxillary galea-laciniae. 2-3 setae at base of mandibular canines.

Thorax — Pronotum distinctly produced laterally as in Fig. 2. Tarsal claws with median tooth followed apically by pectinate row of 2-4 small spines (similar to Fig. 5).

Abdomen — Marginal spicules of posterior margin of abdominal tergites relatively well developed in comparison to tergite length as in Fig. 7. Lamellate gills translucent only in part with dorsal and apical areas clear as in Fig. 11; filamentous gill tufts well developed on gills 1-5 (Fig. 11), minutely

developed on gill 6, and absent on gill 7 (Fig. 12); dorsal and ventral gill tracheation well developed on all gills (Figs. 11 and 12); shape of gill 5 as in Fig. 11; shape of gill 7 as in Fig. 12. Caudal filaments lacking long setae.

Variability — The color pattern of the male dorsal abdomen (Fig. 2) may vary considerably particularly as concerns the degree and development of the sublateral purplish-brown markings. These markings appear always to be present on segments 2 and 3 but may be simply marginal stripes or diagonal bars. Brown diagonal bars located between the compound eyes in both sexes may appear somewhat faded and diffuse in some individuals. Pectinate spines of the crown of the maxillae vary in number but I have not found fewer than 12. Sometimes there are only one or two ventral tracheal branches in the gill lamellae, but there appears always to be at least one present.

Diagnosis — This species evidently has many distinguishing features. Generally, its body appears more robust and laterally developed than in most other *Heptagenia* larvae. The lack of filamentous gill tufts on gill 7 together with the presence of reduced tufts on gill 6 will distinguish it from *H. diabasica*, *pulla*, *marginalis*, *flavescens* (Burks 1953), and *H. inconspicua* and *persimplex* described herein. Other characteristics which may prove to be useful include the widely separated compound eyes of the male, the purplish abdominal maculations, the well developed tergal spicules, and the absence of setae on the caudal filaments.

Material Examined — ARKANSAS: Six larvae (2 reared), Montgomery Co., Caddo R. 0.5 mi E Cox Springs at SR 8, V-31-74; 4 larvae, Montgomery Co., Ouachita R. at Rocky Shoals Boat Camp at U.S. Hwy 270, VI-1-74; 2 larvae, Polk Co., Mine Cr. at For. rd. 25, 8 mi SE Dallas, Ouachita Nat'l. For., VI-1-74.

Heptagenia persimplex McDunnough, 1929

This species is known from the midwestern U.S. It is very distinctive for the genus in the adult stage, but has sometimes been confused with *Anepeorus simplex* Walsh.

Size — Male: body up to 4.5 mm, caudal filaments up to 4 mm; female: body up to 5.5 mm, caudal filaments up to 5 mm.

Coloration — Ground color white with light brown markings. Dorsal pattern of male and female typically as in Fig. 3. Ventral pattern of male and female typically as in Fig. 4, otherwise white. Caudal filaments pale with some light brown annulations.

Head — Head distinctly wider than long, hind margin straight. Compound eyes of male separated by approximately same distance as separation of lateral ocelli (Fig. 3). 10-12 pectinate spines at crown of maxillary galea-laciniae. 3-4 setae at base of mandibular canines.

Thorax — Pronotum not as wide as head and not distinctly produced laterally (Fig. 3). Tarsal claws with medial tooth followed apically by inner pectinate row of 3-4 small spines (similar to Fig. 5).

Abdomen — Marginal spicules of posterior margin of abdominal tergites moderately developed as in Fig. 8. Lamellate gills (Figs. 13 and 14) translucent throughout, moreso basally and ventrally as in Fig. 13; filamentous gill tufts moderately developed on gills 1-5 (Fig. 13), absent from gills 6 and 7 (Fig. 14); dorsal and ventral gill tracheation well developed on all gills (Figs. 13 and 14); shape of gill 5 as in Fig. 13; shape of gill 7 as in Fig. 14. Cerci with long setae along medial margins for nearly entire length; median terminal filament with long setae laterally for nearly entire length.

Variability — Abdominal color patterns may vary slightly from Figs. 3 and 4 among individuals; however, mottling on all tergites is present in all specimens examined. Gills appear to be slightly more translucent in females than in males. A complete account of variability is obviously not possible at this time based on the limited number of specimens before me.

Diagnosis — The ventral abdominal color pattern (Fig. 4) should prove to be diagnostic for *H. persimplex*. The small size and reticulately patterned dorsum (Fig. 3) may also be of some value. As in *H. inconspicua*, gill 6 lacks a filamentous tuft, but unlike in *H. inconspicua*, gill tracheation (Figs. 13 and 14) is well developed. The pronotum of *H. persimplex* is not produced as in *H. minerva*, and as in *H. perfida*.

Material Examined — INDIANA: 2 larvae (reared), Crawford Co., Stinking Fork, Blue R. at SR 66, 0.5 mi S Sulfur Springs, V-14-76; 6 larvae (4 reared), same locality as above, V-19-77.

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