

NEW HEPTAGENINE MAYFLIES

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This paper presents descriptions of five new species of mayflies belonging to the subfamily Heptageniinae. Three of these species are from Illinois, one from Indiana, and one from Maine. They were segregated from material in the collection of the Natural History Survey; all the types are deposited in the Survey collection. The types of most of the previously described species, which are mentioned in comparing and differentiating these new species, were studied in 1942. Study of these types was made possible by travel funds supplied by the Illinois Natural History Survey.

Genus *Iron* Eaton

Iron namatus new species

Male.—Length of body 9–11 mm., of wing 9–11 mm. General color light brown, with light yellowish-brown or dark brown markings. A member of the *longimanus* group of species. See McDunnough (1938) for notes on the synonymy of the species in this group.

Head yellowish-brown, with variable obscure darker shading between lateral ocelli and antennal bases, and on vertex just dorsal to ocelli; frontal shelf obscurely darkened on meson; antennae tan, darkened at base of flagellum; ocelli black at bases; compound eyes pearl gray, contiguous on meson. Thoracic notum brown, light yellowish-brown at lateral margins, apices of meso- and metanota dark brown except on meson at apices of meso- and metascutella; pleura and sternum brown; mesonotum darkened at anterior margin, and a narrow, oblique, dark brown line on pleuron anterior to base of forewing. Pronotum brown, darker at posterior margin on meson, a short, oblique dark brown line present at each lateral margin; foreleg light brown, a dark brown median spot on femur, and minute dark brown area at base of femur, apex of tibia, and at each tarsal articulation; relative proportions of parts of foreleg; femur 30, tibia 40, first tarsal segment 18, second 16, third 16, fourth 11, fifth 6. Wings hyaline, veins light brown, crossveins in costal interspace wanting at base, weak and incomplete in midregion, well developed in stigmatic area, these costal crossveins almost hyaline, slightly milky; other crossveins in fore- and hindwing light brown; stigmatic crossveins slanted, not anastomosed. Middle and hind legs light brown, conspicuous dark brown median spot on femora. Abdominal tergites dark brown, lighter near anterior margin, so as to give abdomen an annulated appearance; antero-lateral angles light yellowish-brown. Sternites light brown, darkened at posterior margins. Apical abdominal tergites yellowish-brown, dark brown at posterior margins. Genitalia brown, forceps gray-brown; tails uniformly very dark gray-brown, almost black. Penis lobes, fig. 3, with relatively small, weak median spines, apical

notch of each penis lobe narrow, shallow; projection on inner, mesal margin of penis lobes rounded.

Female.—Length of body 9–11 mm., of wing 11–13 mm. Generally slightly lighter in color than male, with brown of male replaced by yellowish-brown, and light yellowish-brown areas of male becoming almost white in female. Abdomen only faintly annulated, rather uniformly light brown. Legs, wings, and tails colored as in male. Terminal abdominal sternites shown in fig. 8.

Nymph.—Length of body of mature specimens 8–11 mm. Dorsal view, fig. 1. Dorsum of abdomen almost unicolorous, but with a pair of slightly darker sub-median dots and a faint band at posterior margins of tergites. Sternites seven and eight each with a pair of round, sub-basal spots, ninth sternite with a dark line at anterior and lateral margins. Gills relatively small for genus, and first and last pairs showing no tendency to converge beneath body.

Holotype, male.—Leonard Springs, near Bloomington, Indiana, April 25, 1946, W. E. Ricker et al. Specimen dry, on pin. *Allotype, female*.—Same data as for holotype. Specimen dry, on pin. *Paratypes*.—Indiana: Same data as for holotype, 10 ♂, 5 ♀ : 7 ♂, 4 ♀ dry, on pins; 3 ♂, 1 ♀ in alcohol; genitalia of 3 ♂ on microscope slides.

Nymphs.—Nymphal material of this species was collected at the following localities, all in Southern Indiana: Leonard Springs, near Bloomington, April 25, 1946, and March 14, 1945; May's Cave, near Bloomington, April 25, 1946; Speed Hollow, Springville, April 26, 1946. All nymphs collected near outlets of springs.

This species is most closely related to *Iron pleuralis* Banks, but differs in having the median spines of the penis lobes short and weak, rather than long and stout; the notch in the apical margin of each penis lobe is, also, shallower and narrower in *namatus* than in *pleuralis*. The apical margin of the forceps base in *pleuralis* is emarginate on the meson, but entire in *namatus*. From *fragilis* Morgan, *namatus* may be distinguished by its larger size and differently colored abdominal tergites.

Iron frisoni new species

Male.—Length of body 8 mm., of wing 9 mm. General color very light yellowish-tan, with thorax darker. A member of the *longimanus* group of species.

Head light yellowish, unmarked; ocelli black at bases; compound eyes contiguous on meson, grayish-brown, darker ventrad; antennae tan. Thorax uniformly light golden-brown, apices of meso- and meta-nota darker brown, lateral suture anterior to wing bases, and pleural suture ventral to wing bases, edged with a narrow, dark brown line; pronotum unmarked; foreleg light yellowish, femur with a dark brown mesal spot, narrow area at apex of tibia and apical tarsal segment slightly darkened; relative proportions of parts of foreleg: femur 23, tibia 34, first tarsal segment 11, second 12, third 10, fourth 8, fifth 4. Wings hyaline, veins C and Sc and humeral crossvein faintly brown tinted, other veins and crossveins colorless; costal crossveins in stigmatic area not slanting, nor anastomosed; stigmatic area of wing opaque, milky; costal crossveins wanting at base, weak and incomplete in mid-

region, well-marked in stigmatic area. Abdomen very light yellowish-tan, almost cream colored; tergites faintly brown tinted at posterior margins; sternites unmarked; apical abdominal tergites light tan; genitalia tan, penis lobes, fig. 4, with mesal hooks long, slender, and

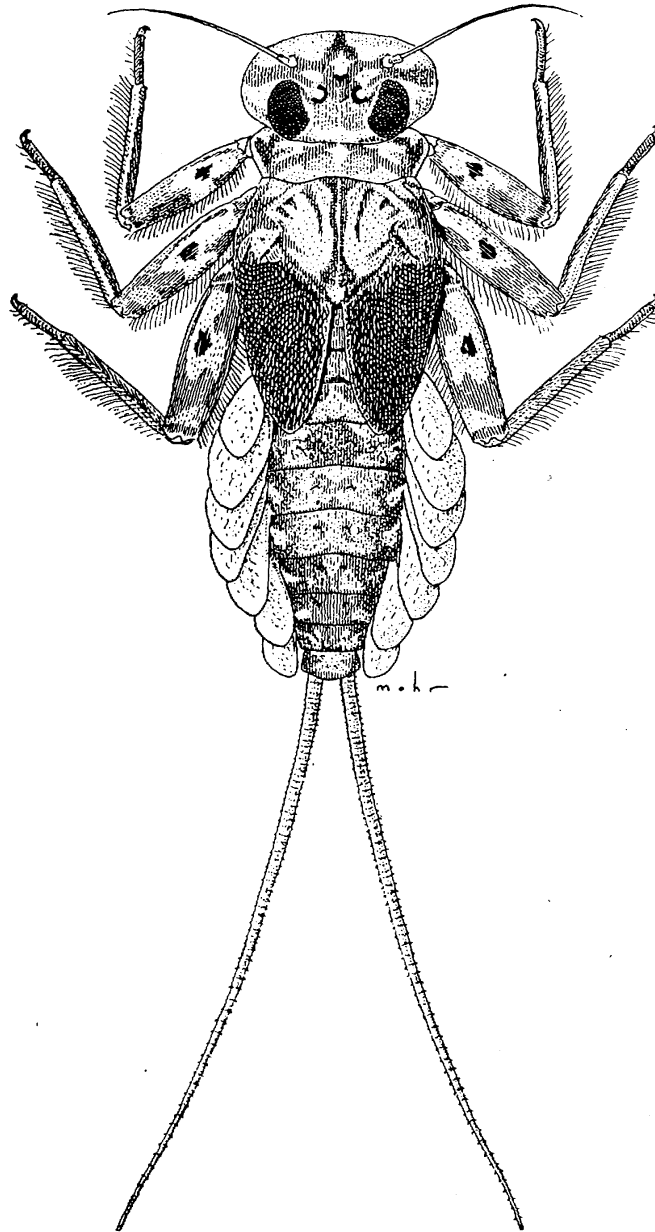


FIG. 1. *Iron namatus*, nymph, dorsal aspect.

with a deep apical notch, apical margin of forceps base dome-shaped, bluntly angled on meson.

Holotype, male.—Mt. Katahdin, Maine, Roaring Brooks, August 26, 1939, T. H. Frison. Specimen in alcohol; genitalia on microscope slide.

The fact that the first tarsal segment of the foreleg is slightly shorter than the second would seem to indicate that this species belongs in the genera *Cinygma* or *Cinygmula*. The type of genitalia, the lack of basal costal crossveins, and the fact that the stigmatic crossveins are not anastomosed, however, refer it to *Iron*. The structure of the genitalia in *frisoni* is closest to that of *longimanus* Eaton, but differs in that the median hooks are longer and more slender, and the penis lobes each have an apical notch; this notch is wanting in *longimanus*. The acutely angled projection on the inner, mesal margin of each of the penis lobes distinguishes this species, also, from *pleuralis* Banks or *fragilis* Morgan.

Genus *Heptagenia* Walsh

Heptagenia diabasia new species

Male.—Length of body 9–13 mm., of wing 8–12 mm. General color light yellow, with darker areas shaded with golden or light reddish-brown. A member of the *elegantula* group of species.

Head light yellowish, with a minute black dot at base of frontal shelf at either compound eye margin; vertex with a vague black spot on meson and diffuse reddish-brown shading just posterior to ocelli. Antennae yellowish; ocelli greenish-gray at bases. Compound eyes pearl gray, separated on meson by a space slightly less than width of median ocellus. Thorax yellowish or cream colored, shading to golden-brown on dorsal meson. Posterodorsal margin of pronotum and posterior margins of meso- and metanota shaded with dark brown; faint, light reddish-brown streaks at lateral margins of mesonotum, and on pleuron dorsal to meso- and metacoxae; meso- and metacoxal sutures, oblique pleural stripe anterior to metacoxa, minute spot on pleuron at base of forewing, and spot just dorsal to metacoxa, black or very dark brown. Foreleg yellowish, with reddish-brown shading on middle and at apex of femur, and at base of tibia; apex of tibia, and tarsal segments at articulations, dark brown; fifth tarsal segment entirely brown; relative proportions of parts of foreleg: femur 35, tibia 43, first tarsal segment 4, second 16, third 14, fourth 10, fifth 5. Wings hyaline, all veins and crossveins light brown; costal and subcostal crossveins slightly thickened, costal crossveins in stigmatic area slanted, occasional veins anastomosed; stigmatic area slightly milky, opaque. Middle and hindlegs yellowish, mesofemur reddish-brown at middle and at apex, metafemur reddish-brown at apex only; minute brown marks at articulations of tarsal segments, with fifth segment completely brown. Abdomen yellowish, posterior margin of each tergite with a narrow, transverse, black line. A black lateral, spiracular hair line extends full length of abdomen, with minute black hair lines extending from this longitudinal one to lateral margin at each spiracle. Apical tergites shaded with golden-brown on dorsum: eighth tergite completely shaded with golden-brown except for two short, yellowish, sub-mesal streaks at anterior margin, ninth tergite shaded on meson, yellowish laterally, and tenth tergite shaded at posterior margin. Occasional specimens have these color markings incomplete, but general pattern always visible. Abdominal sternites unmarked, uniformly pale yellow. Genitalia, fig. 7, tan, with delicate brown shading at margins of structures;

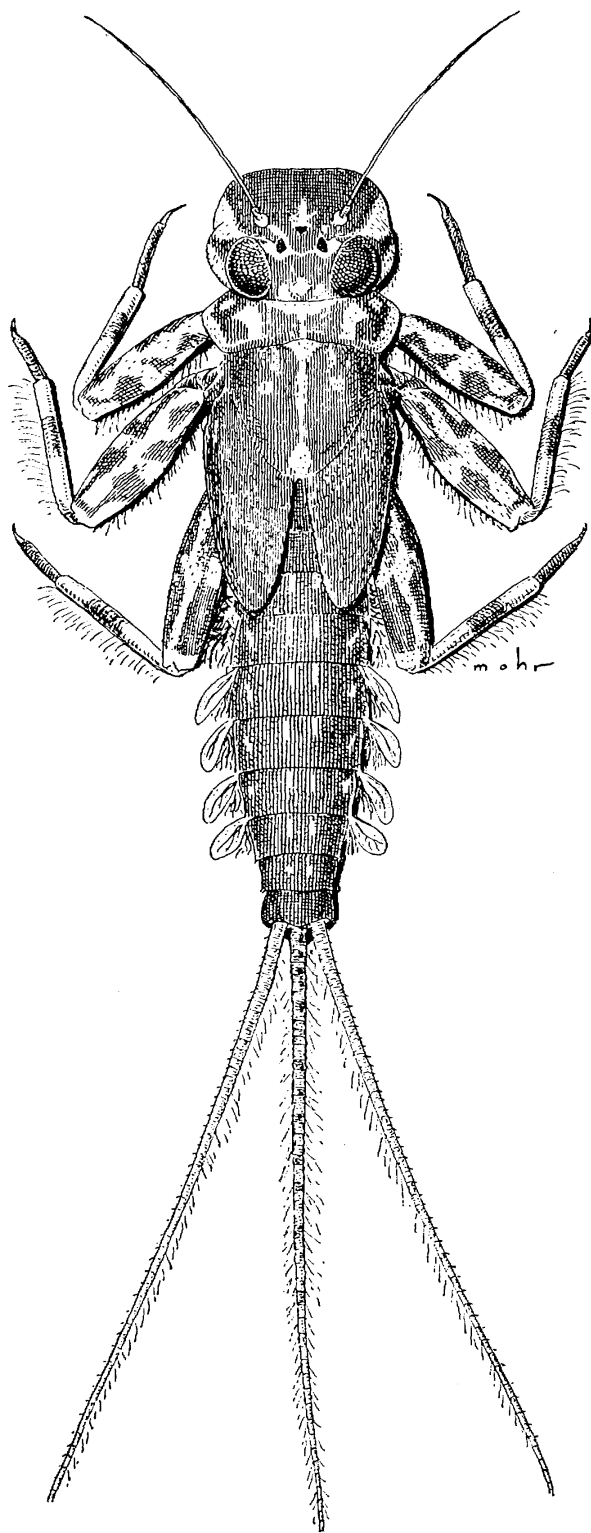


FIG. 2. *Heptagenia diabasia*, nymph, dorsal aspect.

apical margin of forceps base with a median notch; penis lobes with short median hooks and basal hooks which are stout at base. Tails white, joints brown.

Female.—Length of body 9–14 mm., of wing 10–15 mm. Ground color of body lighter than in male, almost white; thoracic notum only slightly darkened, not deeply shaded with golden brown as in male; lateral light reddish-brown thoracic streaks only faintly indicated. Black markings of head, thorax and abdomen same as in male. Apical abdominal tergites lacking dorsal golden-brown shading. Tails white, joints darkened with reddish-brown. Apex of subgenital plate, fig. 5, slightly indented on meson.

Nymph.—Length of body of mature specimens 8–15 mm. Dorsal color pattern as shown in fig. 2; dorsum of abdomen uniformly brown, with only minute dorsal and lateral light-colored markings. Abdominal sternites with a rather wide, longitudinal brown band near each lateral margin, mesal area light yellowish. Gills with dorsal plate relatively slender, subacute at apex; filamentous part conspicuous, projecting above dorsal plate, fig. 10.

Holotype, male.—Rockford, Illinois, June 29, 1938, at light, B. D. Burks. Specimen in alcohol; genitalia on microscope slide. *Allotype, female*.—Havana, Illinois, White Oak Creek, near Matanzas Lake, June 2, 1940, reared from nymph, B. D. Burks. Specimen in alcohol, with nymphal and subimaginal exuviae. *Paratypes*.—Illinois: Same data as for allotype, 4 ♂. Havana, June 1, 1933, at light, C. O. Mohr, 1 ♂. Homer, July 4, 1943, H. H. Ross, 1 ♂. Jerseyville, June 2, 1938, T. H. Frison, 1 ♂. Kankakee, Aug. 3, 1938, Burks & Boesel, 1 ♂. Kappa, June 22, 1943, H. H. Ross, 1 ♂. Mahomet, June 8, 1940, H. H. Ross, 1 ♂. Mazon, Mazon Creek, June 25–27, 1938, B. D. Burks, 3 ♂, 2 ♀, reared from nymphs. Milan, Rock River, June 4, 1940, Mohr & Burks, 5 ♂, 2 ♀, reared from nymphs. Momence, June 22, 1938, Ross & Burks, 1 ♂. Muncie, May 22, 1942, Ross & Burks, 1 ♂. Rockford, June 12, 1938, at light, Ross & Burks, 1 ♂. Iowa: Dennison, June 18, 1940, H. H. Ross, 1 ♂, 1 ♀. Red Oak, July 28, 1946, H. H. Ross, 1 ♂, 2 ♀.

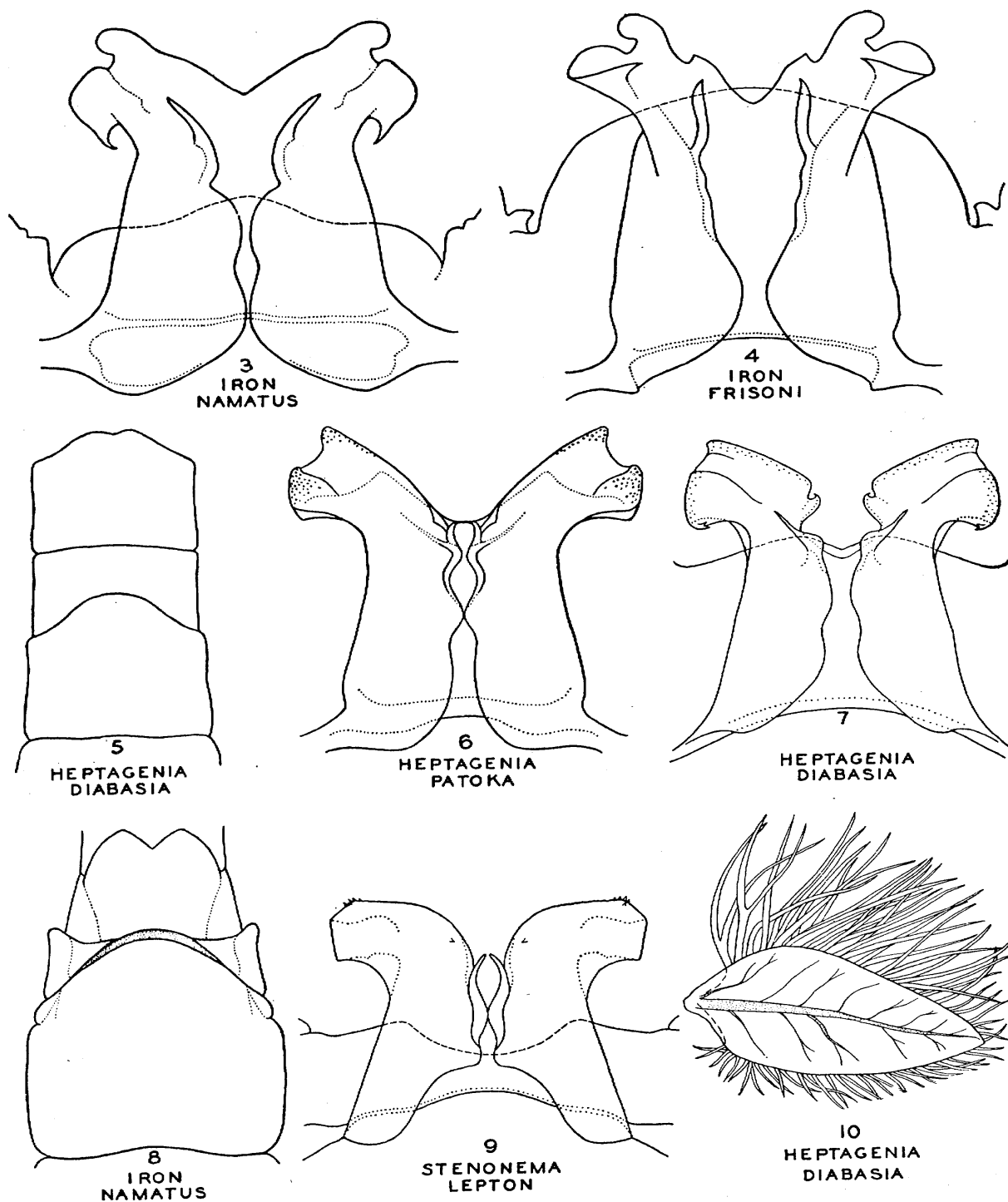
Twenty-two ♂ and 5 ♀ paratypes in alcohol; 1 ♂, 2 ♀ paratypes dry, on pins; male genitalia on microscope slide.

Nymphs.—Material, all from Illinois, was collected at the following localities: Havana, White Oak Creek, near Matanzas Lake, Nov. 5, 1939, and June 2–July 7, 1940; Mazon, Mazon Creek, June 24, 1938.

This species is most closely related to *H. elegantula* (Eaton), described from Colorado, but differs as follows: in the male genitalia of *elegantula* the median hooks of the penis lobes are long, whereas they are short in *diabasia*; also, the basal hooks are uniformly slender in *elegantula*, but are broad near the base in *diabasia*. The two also differ slightly in their color patterns, the head of *elegantula* having the pair of small black dots on the frontal shelf at compound eye margins, of *diabasia*, replaced by a pair of transverse, black stripes.

Heptagenia patoka new species

Male.—Length of body 9 mm., of wing 9 mm. General color tan, heavily marked with yellow-brown and red-brown. A member of the *flavescens* group of species.



FIGS. 3, 4. Male genitalia. FIG. 5. Female apical abdominal sternites. FIG. 9. Male genitalia. FIG. 10. Nymphal gill. FIGS. 6, 7. Male genitalia. FIG. 8. Female apical abdominal sternites.

Head uniformly tan, unmarked except for minute brown dot on meson of vertex between eyes; ocelli dark gray at bases; antennae tan, basal half of flagellum darkened, compound eyes gray shaded with tan, ventral portion darker; eyes separated on meson by a space as great as width of a lateral ocellus. Thorax brown on dorsum, shading to yellowish on pleura, apex of mesonotum and metanotum heavily shaded with brown; an oblique dark brown mark on mesopleuron ventral and anterior to wing base. Pronotum with minute dark brown mark on dorsal meson and at bases of forecoxae; foreleg light tan, a faint reddish-brown median mark and narrow subapical band on femur; tibia with a narrow brown area at apex; tarsal segments edged with brown at articulations, apical tarsal segment gray-brown; relative proportions of parts of foreleg: femur 24, tibia 28, first tarsal segment 3, second 9, third 8, fourth 5, fifth 4. Wings hyaline, light yellowish-tan in costal and subcostal interspaces of forewing; all veins and crossveins of forewing brown, anterior veins and crossveins of hindwing brown, posterior ones hyaline; crossveins in costal and subcostal interspaces of forewing broader and darker brown than others in this wing; humeral crossvein colorless at base, dark brown at Sc; small dark brown spot at bulla; stigmatic crossveins slightly slanted, not anastomosed. Abdomen brown on dorsum, light yellowish-tan on venter; tergites of first three abdominal segments with a pair of yellowish, submesal, rounded spots near anterior margin; following tergites with these spots more elongate, more vague, and considerably darkened, so as to be scarcely distinguishable from dark ground color; a faint, longitudinal, median, yellowish line present on five basal abdominal tergites. Sternites unmarked. Apical abdominal segments tan, genitalia tan, edged with brown, segments of forceps brown at articulations; tails tan, joints brown. Genitalia, fig. 6, with penis lobes relatively elongate and slender, and with median hooks short and slender.

Holotype, male.—Patoka, Illinois, July 19, 1945, Ross & Sanderson. Specimen in alcohol; genitalia on microscope slide.

This species is closely related to *flavescens* Walsh by genitalia, but differs markedly in color: in *flavescens* the abdomen is uniformly tan or brown on the dorsum, and the crossveins in the costal and subcostal interspaces of the forewing are not markedly broader and darker than the other crossveins in the wing; in *patoka* the dorsum of the abdomen is brown interrupted by conspicuous yellowish markings, and the crossveins of the costal and subcostal interspaces of the forewing are broader and darker than are the other crossveins in the wing. In genitalia the two differ in that the penis lobes of *patoka* are narrower and more elongate, with the median hooks much shorter and more slender.

Genus *Stenonema* Traver

Stenonema lepton new species

Male.—Length of body 7–9 mm., of wing 8–10 mm. General color very light yellowish, almost white, with thorax and apex of abdomen darker. A member of the *terminatum* group of species.

Head light yellowish or whitish with four small, irregular black spots at posterior margin of vertex: a small pair at compound eye margins

and a larger, submedian pair; base of antenna whitish, flagellum light tan; ocelli black at bases; compound eyes separated on meson by a space almost as wide as one compound eye. Thorax light tan, two minute brown spots on pleuron ventral to base of forewing. Pronotum unmarked; foreleg whitish, with dark red-brown band at middle and apex of femur and at apex of tibia; minute brown-shaded area at apex of each tarsal segment, claws gray-brown; relative proportions of parts of foreleg: femur 22, tibia 25, first tarsal segment 8, second 12, third 11, fourth 8, fifth 4. Wings hyaline, slightly milky in costal and subcostal interspaces, faintly red-stained and semi-opaque in stigmatic area; all crossveins in forewing brown, those in costal and subcostal interspaces slightly wider than others; veins C, Sc, and R₁ and R₂ brown, others hyaline; crossveins at bulla, in first three interspaces, arranged as 1-1-1 to 2-2-2 in all combinations: never more than two crossveins in an interspace in this area. All veins and crossveins of hindwing hyaline. Middle and hindlegs with rather faint, red-brown band in middle and at apex of femora, claws gray-brown. Abdomen whitish, a minute, dorsal black band at posterior margin of each tergite; spiracular markings wanting; sternites unmarked, apical abdominal tergites light tan, genitalia and forceps white, unmarked; tails white, joints not darkened. Penis lobes, fig. 9, angular, one pair of inner apical spines present, lateral spines wanting.

Holotype, male.—Momence, Illinois, June 22, 1938, Ross & Burks. Specimen in alcohol. *Paratypes*.—Illinois: Same data as for holotype, 5 ♂; same but June 24, 1939, Burks & Ayars, 23 ♂. Specimens in alcohol, genitalia of one male on microscope slide.

This species most closely resembles *S. terminatum* (Walsh), but has only one pair of penis spines (inner apical), rather than two pairs (inner apical and lateral) as does *terminatum*. The first segment of the foretarsus in *lepton* is two-thirds as long as the second, while in *terminatum* the first segment of the foretarsus is from one-third to slightly less than one-half as long as the second. From *bipunctatum* (McD.), *lepton* is readily separable by the color pattern of the abdominal tergites, as well as by minor differences in the male genitalia; *placitum* (Banks) has a different abdominal color pattern and slightly different male genitalia.

LITERATURE CITED

- McDunnough, J. 1938. New Species of North American Ephemeroptera. Can. Ent., 70: 23-34, 1 pl.

PERSONAL BIBLIOGRAPHIES

The editor has received copies of two personal bibliographies in recent months.

BLISS, C. I., Connecticut Agricultural Experiment Station, Box 1106, New Haven 4, Connecticut. Fifty-three titles, chiefly on toxicology and statistical procedures, 4 pages, printed, September, 1946.

HOFFMANN, WILLIAM E., Washington, D. C. One hundred twenty-seven titles on a variety of subjects, mostly entomological and mostly on the Chinese fauna. 8 pages, mimeographed, June 30, 1944.