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Reprinted from THE CANADIAN ENTOMOLOGIST, Volume 95, Number 6, June 1963

A Revision of the Genus *Ephemerella*  
(Ephemeroptera: Ephemerellidae)  
VII. The Subgenus *Eurylophella*

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**Abstract**

The fourteen species of the subgenus *Eurylophella* are reviewed with accounts of each species including complete synonymies, synoptic descriptions of nymphs and adults, and distribution. Illustrated keys for nymphs and adults and distribution maps are presented for each species. *Ephemerella bicoloroides* McDunnough is regarded as a synonym of *E. verisimilis* McDunnough. *Ephemerella doris* and *E. trilineata* Berner are of questionable status, being either closely allied to or identical with *E. temporalis*; and the relationship of *E. lithuanica* Kazlauskas to *E. karelica* is uncertain.

**Introduction**

Parts I to VI of this revision are published or in press as indicated in the references cited.

Abbreviations for collections in which specimens are deposited are as follows: AMNH, American Museum of Natural History; ANSP, Academy of Natural Sciences of Philadelphia; CNC, Canadian National Collection; CU, Cornell University; INHS, Illinois Natural History Survey; JRT, J. R. Traver personal collection; MCZ, Museum of Comparative Zoology; OSU, Oregon State University; UM, University of Missouri; UBC, University of British Columbia; VKM, V. K. Mayo personal collection. Specimens without designation are deposited in the collection of the University of Utah.

**Subgenus *Eurylophella* Tiensuu**

(*Ephemerella*) *bicolor-lutulenta* group McDunnough 1930: 55; Traver 1932: 143.

(*Ephemerella*) *bicolor* group McDunnough 1931: 30; Traver 1935: 564; Berner 1950: 153; Burks 1953: 72.

?*Melanameletus* Tiensuu 1935: 15.

*Eurylophella* Tiensuu 1935: 20 (as genus); Edmunds and Traver 1954: 238 (?=*Melanameletus*); Demoulin 1958: 10; Edmunds 1959: 546; type *karelica* Tiensuu, by monotypy.

The species included in the subgenus *Eurylophella* were first recognized as being related by McDunnough (1930) when he made reference to the *bicolor-lutulenta* group. In 1935, Tiensuu erected the genus *Eurylophella* for the species *karelica* represented by a small series of nymphs collected in Finland. The genus *Melanameletus*, with *M. brunnescens* Tiensuu as the type species, was proposed in the same publication. The latter, based upon a single female imago collected near the type locality of *E. karelica*, was placed in the family Siphonuridae. In 1939, Tiensuu noted that J. A. Lestage had informed him (*in litt.*) that *Melanameletus brunnescens* belonged to the Ephemerellidae.

Edmunds and Traver (1954) reduced *Eurylophella* to a subgenus of *Ephemerella* Walsh and placed the genus *Melanameletus* as a questionable synonym of *Eurylophella*. This synonymy cannot be established with certainty until the type is examined. Tiensuu stated that *M. brunnescens* possesses only lateral cerci, whereas all known species of *Ephemerella* have three caudal filaments. He stated that his notes indicate that the terminal filament was absent in nature and was not broken off.

The subgenus *Eurylophella* may be characterized in the male imago by the following combination of characters: (1) third segment of the genital forceps

<sup>1</sup>The research on which this report is based was supported by grants from the National Science Foundation and the University of Utah Research Fund.

nearly twice as long as broad (Figs. 2-13), (2) second segment of genital forceps thick (Figs. 2-13), (3) penes united, swollen at base and narrow at apex (Figs. 2-13), and (4) tibia shorter than tarsi, and third tarsal segment shorter than second. The nymphal stage (Fig. 1) is characterized by having (1) lamellate tracheal gills on segments 4-7 (Figs. 23 and 25), gill on segment 4 semi-operculate and a rudimentary gill on segment 1 (Fig. 24), (2) abdominal segment 9 longer than segment 8, (3) tarsal claws with denticles (Fig. 19), (4) maxilla without palpus (Fig. 29), and (5) paired abdominal tubercles on terga 1-3 blunt (Fig. 1).

#### Taxonomic Characters

The adults of the genus *Ephemerella* are sexually dimorphic, but with few exceptions they lack secondary sexual characters of taxonomic importance. The female imagoes are homogeneous and usually cannot even be placed to subgenus on the basis of structural characters. The adults of some subgenera of the genus have characters on the body or appendages and/or abdominal color characters which permit both sexes to be determined to subgenus; however, for the most part the only reliable and useful adult character is the form of the genital forceps or penes in the male imago. The male genitalia are usually of a single basic pattern in any subgenus and are usually distinctive for any species.

#### Female Imagoes

The female imagoes of the subgenus *Eurylophella* are not usually determinable to subgenus unless they are reared; however, some specimens can be determined to species by a combination of geographic distribution, size, color characters and by the form of the subanal plate (Figs. 49-58), especially if associated males are present.

#### Male Imagoes

The form of the penes of the male imago is very distinctive in the subgenus *Eurylophella*. The penes are swollen basally, narrow apically, and fused nearly to their apices (Figs. 2-13). The species in the other subgenera of *Ephemerella* can usually be distinguished by the male genitalia without removing them from the specimen, but in the subgenus *Eurylophella* the male genitalia of all species are so similar that it is necessary to remove them, clear them in potassium hydroxide, and stain them.

Size has been found to be of limited use as a supplementary character in distinguishing the species of *Eurylophella*. Some species attain a total body and forewing length of only 6-8 mm., while others reach lengths of 10-12 mm., but most species are intermediate in length (8-10 mm.)

Color characters have limited usefulness in this subgenus as they are usually too variable, and the colors also become faded in specimens that have been preserved in alcohol. Some species do have distinctive color patterns that are useful as taxonomic characters.

#### Mature Nymphs

The nymphs of *Eurylophella* are highly specialized and readily distinguishable to subgenus, but as in the adults many species are extremely difficult to distinguish.

Head tubercles are present in female nymphs of all species (Figs. 14-16), but are not necessarily present and often variably developed in male nymphs. These structures are useful as taxonomic characters for distinguishing those species in which the tubercles are either poorly or well developed. In the majority of

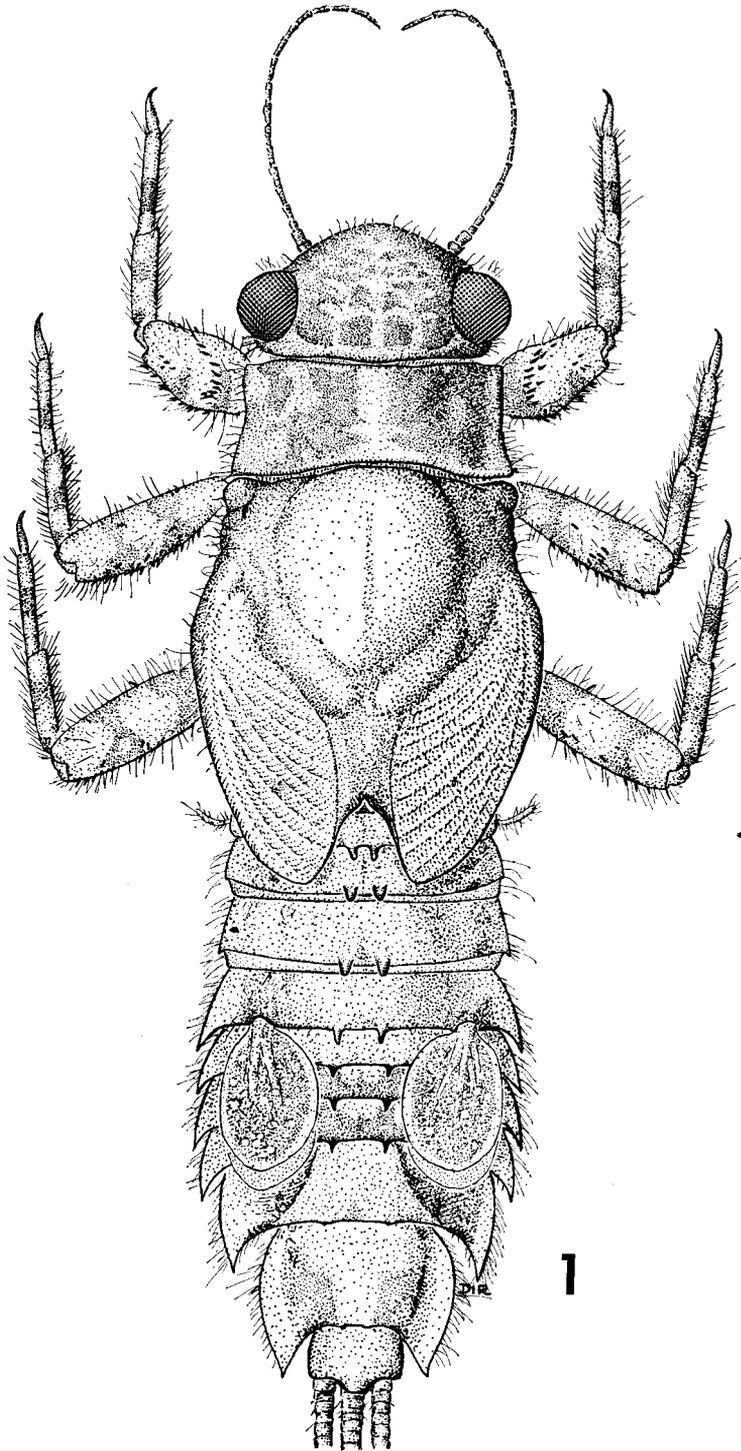


Fig. 1. *Ephemera bicolor*, mature female nymph, dorsal view.

species they are intermediate in development and so variable as to make them of limited taxonomic use. The postero-lateral projections on abdominal segments two and three are developed rather consistently in most species of the subgenus, and nymphs may be separated into three groups on this basis (Figs. 30-32).

The form of the paired dorsal abdominal tubercles is unique in the subgenus *Eurylophella* (Fig. 1) and the structures are useful for distinguishing the species. The length of the tubercles, and the relative width of the tubercles at their bases are variable, but serve as useful taxonomic characters. The bases of some tubercles are more widely separated than others, but in order to determine the relative distance between each pair an ocular micrometer must be employed. High magnification, 90 $\times$ , is advisable, but the relationship of one tubercle to another can be seen with magnifications as low as 30 $\times$ .

Size and color characters, as in the imagoes, are important in distinguishing some species, but generally they are of limited use.

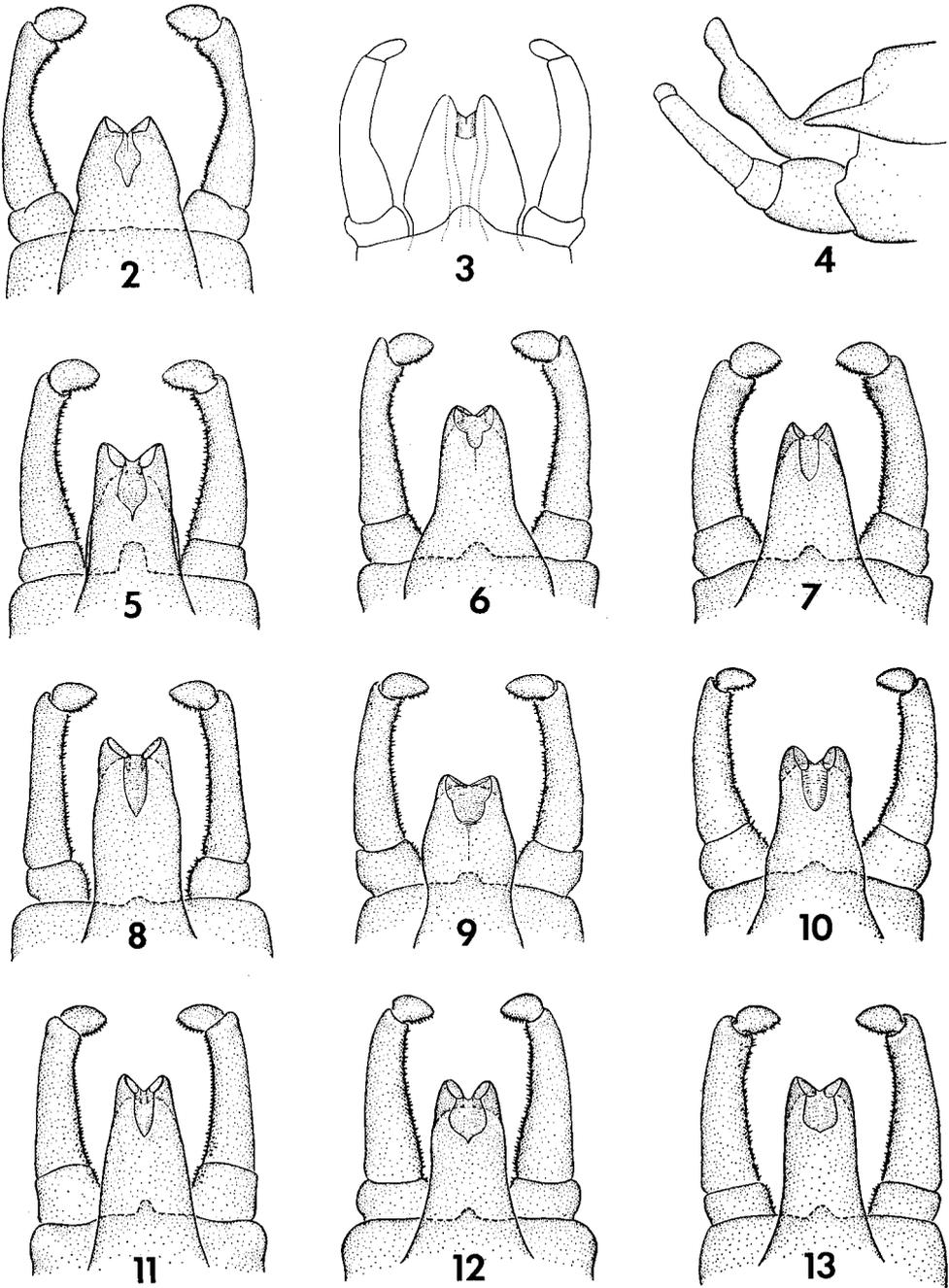
We herein consider the subgenus *Eurylophella* to contain eleven valid species and regard three others as doubtfully valid. The valid species are *Ephemerella bicolor* Clemens, *E. minimella* McDunnough, *E. aestiva* McDunnough, *E. verisimilis* McDunnough (= *bicoloroides* McDunnough, new synonymy), *E. prudentialis* McDunnough, *E. karelica* Tiensuu, *E. funeralis* McDunnough, *E. temporalis* McDunnough, *E. coxalis* McDunnough, *E. lutulenta* McDunnough and *E. lodi* Mayo. We regard *Ephemerella doris* Traver, *E. trilineata* Berner and *E. lithuanica* Kazlauskas as doubtfully valid species for the reasons discussed under the taxonomy of the respective species.

### Keys

The species of the subgenus *Eurylophella* are not separable by means of published keys. The reasons for this difficulty are principally as follows. (1) Inadequate descriptions, or often only comparisons with other species, were presented for many species when they were named. (2) The species are difficult to distinguish from each other, as they possess many common characters with extreme morphological variability. (3) Many species are known from only a few specimens, or from only a small geographic area.

The identity of the specimens used to construct the following keys was established by study of types, topotypes, descriptions, and specimens determined to species by the author of that species. We believe that our keys are not always reliable, especially for male adults, but that they should be more useful than any previously available. The nymphal key is based on fully-grown nymphs with black wing pads and is intended for use only with fully developed nymphs. Young nymphs of some species can be identified with this key, but not those of most. An improved key to the males is needed, but series of reared adults preserved dry and in alcohol would be required for this. Some species are so closely related and morphologically variable as to make it almost impossible to distinguish them on the basis of the adult specimens available. The adults of most species should be determined with caution in the absence of associated or reared nymphs, but special care should be taken with adults of *E. bicolor*, *E. minimella*, *E. aestiva* and *E. verisimilis*. If males are associated with females, the shape of the female subgenital plate is figured for the species from eastern Canada and north-eastern United States.

By cautious use of keys, descriptions, and figures, and with reasonable attention to the likelihood of the occurrence of a species in the area of collection, the identification of small series of adult males or mature nymphs should be possible with reasonable certainty.



Figs. 2-13. Subgenus *Eurylophella*, male genitalia, dorsal view, except as noted. 2, *Ephemera karelica*; 3, *E. lodi*; 4, *E. prudentalis* (lateral view); 5, *E. prudentalis*; 6, *E. lutulenta*; 7, *E. coxalis*; 8, *E. funeralis*; 9, *E. temporalis*; 10, *E. aestiva*; 11, *E. bicolor*; 12, *E. minimella*; 13, *E. verisimilis*.

MALE IMAGOS<sup>1</sup>

1. European species, Lake Ladoga (Ladozhskoye Ozero, Karelian A.S.S.R.) austrad to Poland; second segment of genital forceps expanded at apex (Fig. 2); forewing 11.5-12.5 mm. in length ..... *karelica* Tiensuu  
 North American species; second segment of genital forceps not expanded apically; forewing usually less than 11 mm. in length ..... 2
2. Western North American species, British Columbia austrad to California (Fig. 45); forewing shaded with amber; penes broad, strongly constricted near base (Fig. 3) ..... *lodi* Mayo  
 Eastern North American species, western limits in Saskatchewan, Illinois, Missouri and Alabama (Figs. 46-48); forewing not shaded with amber; penes not strongly constricted near base (Figs. 4-13) ..... 3
3. Penes with a large ventral subapical protuberance and with a large tubercle on styliger plate between forceps bases (Figs. 4-5) ..... *prudentialis* McD.  
 Penes without or with only a small ventral subapical protuberance and with only a medium or small tubercle on styliger plate (Figs. 6-13) ..... 4
4. Body and legs sprinkled with fine black dots; forewing 10-11 mm. in length; penes with a shallow subapical excavation (Fig. 6) ..... *luculenta* McD.  
 Body and legs not sprinkled with fine black dots; forewing 9 mm. or less in length; penes with a deeper subapical excavation (Figs. 7-13) ..... 5
5. Caudal filaments pale and without annulations at apex of each segment; distinct black macula on trochanter, coxa and apex of femur; abdominal sterna without maculae; penes with a long narrow subapical excavation (Fig. 7) ..... *coxalis* McD.  
 Caudal filaments with dark annulations at apex of each segment; often a dark macula on coxa only; abdominal sterna with brown maculae; penes variable (Figs. 8-13) ..... 6
6. Abdomen brown; sterna 2-7 or 3-7 usually with a large dark brown median macula; penes with a long lanceolate submedian excavation (Fig. 8) ..... *funeralis* McD.  
 Abdominal terga brown and sterna pale; sterna 2-7 with four dark dots; penes variable (Figs. 9-13) ..... 7
7. Penes constricted at base and widest near mid-length (Fig. 9) .....  
 ..... *temporalis* McD., *doris* Traver, *trilineata* Berner  
 Penes not constricted at base and widest near base (Figs. 10-13) ..... 8
8. Penes with a rounded oblong subapical excavation (Figs. 10-11) ..... 9  
 Penes with a pointed shield-shaped subapical excavation (Figs. 12-13) ..... 10
9. Penes broad at apex and with a broad basal enlargement (Fig. 10); distribution restricted (Fig. 48) ..... *aestiva* McD.  
 Penes narrower at apex and without a broad basal enlargement (Fig. 11); widely distributed (Fig. 46) ..... *bicolor* Clemens
10. Femora with a distinct dark brown apical macula; penes with a rounded subapical enlargement (Fig. 12); forewing 6-7 mm. in length; distribution as in Fig. 46 ..... *minimella* McD.  
 Femora with only a faint brown apical macula; penes without a rounded subapical enlargement (Fig. 13); forewing 8-9 mm. in length; distribution as in Fig. 46 ..... *verisimilis* McD.

## MATURE NYMPHS

1. European species, Lake Ladoga (Ladozhskoye Ozero, Karelian A.S.S.R.) austrad to Poland; body 12-14 mm. in length; occipital tubercles minute in female as in Fig. 16, absent in male; paired tubercles on abdominal tergum 1 longer and blunter than those on tergum 2; postero-lateral projections poorly developed on abdominal segment 2, moderately developed on segment 3 as in Fig. 31 ..... *karelica* Tiensuu, *lithuanica* Kazlauskas  
 North American species; characters not in combination as above ..... 2
2. Western North American species, Washington austrad to California (Fig. 45); body 11-13 mm. in length; paired tubercles on abdominal tergum 3 acute at apex ..... *lodi* Mayo  
 Eastern North American species, western limits in Saskatchewan, Illinois, Missouri and Alabama (Figs. 46-48); characters not in combination as above ..... 3
3. Postero-lateral projections barely discernible on abdominal segment 2 and poorly developed on segment 3 as in Fig. 30; occipital tubercles minute or absent in both sexes as in Fig. 16; small species, body 6-8 mm. in length ..... 4

<sup>1</sup>The male imago of *E. lithuanica* Kazlauskas is unknown.

British Columbia

- Postero-lateral projections poorly developed on abdominal segment 2 and moderately developed on segment 3 as in Fig. 31, or well developed on segment 2 and very well developed on segment 3 as in Fig. 32; moderate to large species, body 7-13 mm. in length ..... 5
4. Paired tubercles on abdominal terga long and thin; tubercles moderately developed on terga 8-9 (Fig. 34) ..... *minimella* McD.  
 Paired tubercles on abdominal terga short and thick (Fig. 1); tubercles poorly developed or absent on terga 8-9 (Fig. 33) ..... *bicolor* Clemens
5. Inner margin of postero-lateral projections on segment 9 distinctly incurved and paired tubercles on abdominal terga 8-9 well developed (Fig. 43) ..... *funeralis* McD.  
 Inner margin of postero-lateral projections on segment 9 not incurved; if slightly incurved paired tubercles on abdominal terga 8-9 poorly developed (Fig. 40) ..... 6
6. Paired tubercles on abdominal terga 1-3 long and blunt, distinctly curved downward apically (Figs. 35a and 35b); occipital tubercles well developed in females (Fig. 14), not as well developed in males — *temporalis* McD., *doris* Traver, *trilineata* Berner  
 Paired tubercles on abdominal terga 1-3 short, blunt or sharp (Figs. 36a and 36b); occipital tubercles moderately developed (Fig. 15), not as well developed in males ..... 7
7. Bases of paired tubercles on abdominal tergum 2 more widely separated than those on tergum 7, those on tergum 7 separated by less than the length of the tergum at the midline (Fig. 42); tubercles moderately developed on abdominal terga 8-9 (Fig. 42) ..... *prudentialis* McD.  
 Bases of paired tubercles on abdominal tergum 2 usually more narrowly separated than those on tergum 7, those on tergum 7 usually equal to or more widely separated than the length of the tergum at the midline (Fig. 41); tubercles variable on abdominal terga 8-9 ..... 8
8. Postero-lateral projections on abdominal segment 2 poorly developed and moderately developed on segment 3 as in Fig. 31 ..... 9  
 Postero-lateral projections on abdominal segment 2 moderately developed and well developed on segment 3 as in Fig. 32 ..... 10
9. Paired tubercles on abdominal terga 8-9 small, but distinct (Fig. 37); tubercles on abdominal terga 2-3 slender and sharp and with only a few spicules (Fig. 38); postero-lateral projections on abdominal segment 9 project posteriorly; abdominal terga with only short spicules (Fig. 37) ..... *aestiva* McD.  
 Paired tubercles on abdominal terga 8-9 minute or wanting (Fig. 40); tubercles on abdominal terga 2-3 broad and blunt and with numerous spicules (Fig. 39); postero-lateral projections on abdominal segment 9 project slightly medially; abdominal terga with short spicules and long setae (Fig. 40) ..... *verisimilis* McD.
10. Body and appendages sprinkled with fine black dots; occipital tubercles minute to small as in Fig. 16; paired tubercles minute or absent on abdominal terga 8-9 (Fig. 41); widely distributed (Fig. 47) ..... *lutulenta* McD.  
 Body and appendages without fine black dots; occipital tubercles moderately developed (Fig. 15); paired tubercles small but distinct on abdominal terga 8-9 as in Fig. 37; distribution restricted (Fig. 47) ..... *coxalis* ? McD.

### *Ephemerella bicolor* Clemens

*Ephemerella bicolor* Clemens 1913: 336, 1 fig.; Clemens 1915: 123, 1 fig.; McDunnough 1930: 56, fig. 5; Ide 1930: 212; McDunnough 1931: 61, 7 figs.; Neave 1934: 165; Ide 1935: 44; Traver 1935: 584; Lyman 1944: 114; Burks 1953: 74, 3 figs.

This species was described from nymphs and reared male and female imagoes collected in southern Ontario.

*Male Imago* (dry). Length: body 6-8; forewing 6-8 mm. Thorax light brown; legs yellow; a brown macula on each coxa; apex of femora with a brown macula; wings smoky; primary longitudinal veins yellowish brown, intercalaries and crossveins pale (Figs. 17-18). Abdominal terga brown with lateral dark brown maculae; variable brown markings and paired submedian pale stripes often present; abdominal sterna pale; sterna 2-7 with paired submedian dots and paramedian dashes. Penes with a U-shaped subapical median excavation (Fig. 11). Caudal filaments pale with dark annulations at the apex of each segment.

*Female Imago* (dry). Length: body 6-8; forewing 6-8 mm. Subanal plate with a shallow median excavation (Fig. 55). Other characters as in male except for usual sexual differences.

*Mature Nymph* (Fig. 1). Length: body 6-8; caudal filaments 3-4 mm. General color brown. Head with minute occipital tubercles in female (Fig. 16), absent in male; mouthparts as in Figs. 26-29. Femora and tibiae brown with variable pale brown maculae and bands; tarsi pale brown with a broad brown basal band (Figs. 20-22); tarsal claws with 4-6 denticles (Fig. 19). Abdominal terga with paired submedian tubercles on segments 1-9 (Fig. 1); tubercles short and blunt on segments 1-4, short and sharp on segments 5-7, and barely discernible on segments 8-9; bases of paired dorsal abdominal tubercles usually widest apart on segment 5; postero-lateral projections not developed on segment 2, poorly developed on segment 3 (Fig. 44a); abdominal terga light brown with variable brown markings; abdominal sterna light brown. Caudal filaments light brown with variable dark brown basal bands.

*Type Locality*. Go Home Bay, Georgian Bay, Ontario, Canada.

*Type*. No. 32-35, Canadian National Collection, Ottawa, Ontario.

*Distribution*. *Ephemerella bicolor* is known from Nova Scotia and New Brunswick west to Michigan and austrad to North Carolina and to Missouri (Fig. 46). Wright and Berner (1949) reported specimens as *E. "bicolor?"* from Tennessee, and as these specimens are within the known range of this species this determination is probably correct. We have examined specimens of *E. bicolor* from the following localities:

**Michigan**. Douglas Lake, 18/26-VI-48, G. F. Edmunds, Jr. **Missouri**. Roaring River State Park nr. Cassville, 22-IV-55 (UM). **New Brunswick**. Little SW. Mirimichi River, 6-VI-51, E. L. Bousefield; NW. Mirimichi River, 6-VI-51, E. L. Bousefield, and 13-VII-61, T. Dolan; Fredericton, 1-VII-28, W. J. Brown (CNC); Boiestown, 13-VIII-28, W. J. Brown (CNC). **New York**. East Islip, 16-VII-30, H. T. Spieth (AMNH). **North Carolina**. Uharie River, 7 mi. from Asheboro on Route 66, 3-IV-29, J. R. Traver (JRT). **Nova Scotia**. Milford, 26-VI-34, J. McDunnough (CNC); Annapolis Royal, 26-VII-28, W. J. Brown (CNC); Nr. Brooklyn, 22-VI-50, E. L. Bousefield; Annapolis River, 25-VI-50, E. L. Bousefield. **Ontario**. Go Home Bay, Hudson Bay, 12-VI-12, W. A. Clemens (Holotype and Allotype) (CNC); Muskosh Falls, Georgian Bay, 30-VI-25 (CNC); Westboro, 25-VI-37, G. S. Walley (CNC); Smoky Falls, 7-VII-34, G. S. Walley (CNC); Moosonee, 18-VII-34, G. S. Walley (CNC); Prescott, 30-VI-25, F. P. Ide (CNC); Ottawa, 17-VII-26, G. S. Walley (CNC); Southampton, Lake Huron, 20-VI-31, G. S. Walley (CNC); Severn, 21-VI-25, J. McDunnough (CNC); Bobcaygeon, 4-VIII-32, J. McDunnough (CNC). **Quebec**. Knowlton, 25-VI-30, G. S. Walley (CNC); Pattons, 3-VII-28, G. H. Fisk (CNC); Fulford, 22-VI-29, J. McDunnough (CNC); Sweetsburg, 8-VII-29, J. McDunnough (CNC); LaPrairie, 8/9-VII-24, G. S. Walley (CNC); St. Lambert, 4-VII-27, G. S. Walley (CNC); St. Annes, 24-VI-25, F. P. Ide (CNC); Vaudreuil, 22-VI-25, F. P. Ide (CNC); Beauharnois, 19-VI-25, F. P. Ide (CNC); Gauvreau Lake, Wakefield, 11-VI-30, J. McDunnough (CNC); Lachine, 22-VI-30, L. J. Milne (CNC); Cascades Point, 3-VI-30, L. J. Milne (CNC); Mid Yamaska River, Fulford, 22-V-30, L. J. Milne (CNC); Mississquoi River, S. Bolton, 16-VI-28, A. Adams (CNC).

*Taxonomy*. *Ephemerella bicolor* and *E. minimella* are near cognate species, and they form a complex of closely related species with *E. aestiva* and *E. verisimilis*, all of which are nearly indistinguishable morphologically in the adult

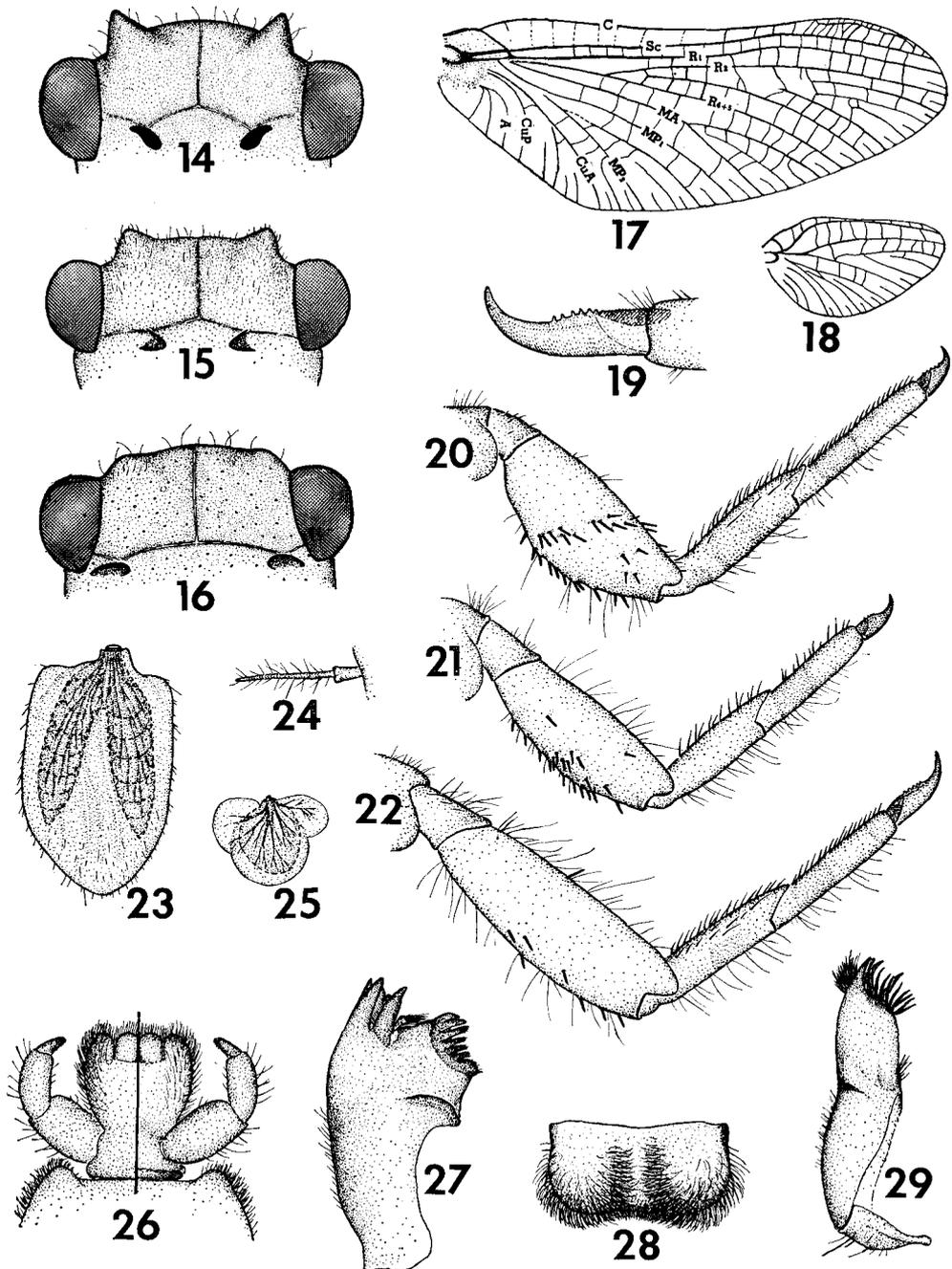


Fig. 14. *Ephemera temporalis*, vertex of head, frontal view. Fig. 15. *E. coxalis*?, vertex of head, frontal view. Figs. 16-29. *E. bicolor*: 16, vertex of head, frontal view; 17, forewing; 18, hindwing; 19, tarsal claw; 20-22, right nymphal prothoracic, mesothoracic and metathoracic legs; 23, gill on segment four; 24, vestigial gill on segment 1; 25, gill on segment 7; 26, labium, dorsal and ventral; 27, left mandible; 28, labrum; 29, maxilla.

stage. *Ephemerella verisimilis* is usually larger in size than the other species and it, and *E. bicolor*, have greater geographical distributions than *E. minimella* and *E. aestiva*. All of these species are distinguishable by only minor differences in the penes (Figs. 10-13). The nymphal stages, though very alike, are more readily determined to species than are the male imagoes. *Ephemerella aestiva* and *E. verisimilis* usually have better developed postero-lateral projections and occipital tubercles than *E. bicolor* and *E. minimella*.

### *Ephemerella minimella* McDunnough

*Ephemerella minimella* McDunnough 1931: 63, 4 figs.; Traver 1932: 612; Burks 1953: 74, 1 fig.

*Ephemerella minimella* was described from a male imago reared from a nymph collected in southern Quebec.

*Male Imago* (dry). Length: body 6-7; forewing 6-7 mm. Thorax brown, often with a dark median stripe on mesonotum; legs yellow; a brown macula on each coxa; apex of femora with a distinct dark brown macula; wings smoky; primary longitudinal veins yellowish brown, intercalaries and crossveins pale. Abdominal terga brown with lateral dark brown maculae; variable brown markings and paired submedian pale stripes often present; abdominal sterna pale; sterna 2-7 with paired submedian dots and paramedian dashes. Penes with a shield-shaped subapical median excavation (Fig. 12). Caudal filaments pale with dark annulations at the apex of each segment.

*Female Imago* (dry). Length: body 6-7; forewing 6-7 mm. Subanal plate with a shallow median excavation (Fig. 57). Other characters as in male except for usual sexual differences.

*Mature Nymph*. Length: body 6.0-7.5; caudal filaments 3-4 mm. General color brown. Head of female with minute occipital tubercles as in Fig. 16, absent in male. Femora and tibiae with variable pale brown markings; tarsi pale with a broad brown basal band, apex brown; tarsal claws with 4-6 denticles. Abdominal terga with paired submedian tubercles on segments 1-9; tubercles long and blunt on segments 1-4, long and sharp on segments 5-7, short and sharp on segments 8-9 (Fig. 34); bases of paired dorsal abdominal tubercles usually widest apart on segment 5; postero-lateral projections not developed on segment 2, poorly developed on segment 3 (Fig. 44b), abdominal terga brown. Caudal filaments light brown with variable dark brown basal bands.

*Type Locality*. Knowlton, Quebec, Canada.

*Type*. No. 3216, Canadian National Collection, Ottawa, Ontario.

*Distribution*. This species is known from only the northern United States and southern Canada from Michigan to New Brunswick and Nova Scotia (Fig. 46). Traver (1935) and Wright and Berner (1949) questionably reported specimens as this species from North Carolina and Tennessee, respectively. On the basis of our present knowledge of the distribution of this species as determined from examination of specimens, it would appear that these were *E. bicolor* Clemens. Specimens have been examined from the following localities:

**Michigan**. Douglas Lake, 18-VI-48, G. F. Edmunds, Jr. **New Brunswick**. NW. Mirimichi River, 7/13-VII-60, T. Dolan. **Nova Scotia**. Smiths Cove, 31-VII-45, 8-VIII-45, J. McDunnough (CNC); Hunter Creek, Baddeck, 24-VII-26, T. N. Freeman (CNC). **Ontario**. Burke Falls, 12-VII-26, F. P. Ide (CNC); Dam at Lake Sasajewun, Algonquin Park, 16-VI-55, B. V. Peterson. **Quebec**. Knowlton, 7-VII-30, L. J. Milne (Holotype) (CNC); Mississquoi River, S. Bolton, 5-VII-29, J. McDunnough (CNC); Sweetburg, 8-VII-29, J. McDunnough (CNC); Laniel, 23-VII-32, W. J. Brown (CNC).

*Taxonomy.* *Ephemerella minimella* is most closely related to *E. bicolor* and these two species are nearly indistinguishable, especially in the male adult stage. The male imagoes of the species differ only in the shape of the apical portion of the penes. The nymphs of these species are identical in the degree of development of the occipital and postero-lateral projections, in body size, general color, dentition on the tarsal claws, and in the number of paired dorsal abdominal tubercles. The nymphs are, however, distinguishable from *E. bicolor* by the degree of development and sharpness of the abdominal tubercles

### *Ephemerella aestiva* McDunnough

*Ephemerella aestiva* McDunnough 1931: 64, 6 figs.; Traver 1935: 580; Burks 1953: 75.

This species was described from all stages collected in southern Quebec.

*Male Imago* (dry). Length: body 5.5-6.5; forewing 6-7 mm. Thorax medium to dark brown; legs yellowish brown, a brown macula on each coxa; wings smoky, costa and subcosta light yellowish brown, other primary longitudinal, intercalaries and crossveins pale. Abdominal terga light or medium brown with lateral dark brown maculae; variable brown markings and a paired submedian pale stripes often present; abdominal sterna pale to light brown; sterna 2-7 with paired submedian dots and paramedian dashes. Penes with a U-shaped subapical median excavation (Fig. 10). Caudal filaments pale with dark annulations at the apex of each segment.

*Female Imago* (dry). Length: body 5.5-6.5; forewing 6-7 mm. General color lighter brown than male, but abdomen darker brown. Subanal plate broad with a very shallow excavation (Fig. 54). Other characters as in male except for usual sexual differences.

*Mature Nymph.* Length: body 7.5-8.5; caudal filaments 4-5 mm. General color brown. Head with moderately to well developed occipital tubercles in both sexes as in Fig. 15. Legs brown with variable light brown markings and with spines and sparse long setae; tarsal claws with 5-7 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles on segments 1-4 long and rather sharp (Fig. 38), tubercles on segments 5-7 long and sharp, tubercles on segments 9-10 barely discernible or absent (Fig. 37); bases of paired dorsal abdominal tubercles widest apart on segments 4-6; postero-lateral projections poorly developed on segment 2, moderately developed on segment 3 (Fig. 44c); abdominal terga brown, often with a wide pale median stripe; abdominal terga not setaceous, but with scattered and marginal spicules (Fig. 37); abdominal sterna light brown, sterna 1-9 with dark brown sublateral maculae. Caudal filaments brown with variable dark brown bands.

*Type Locality.* Vaudreuil, Quebec, Canada.

*Type.* No. 3213, Canadian National Collection, Ottawa, Ontario.

*Distribution.* *Ephemerella aestiva* has a peculiar distribution, being known from Quebec and Ontario austrad to Indiana and Missouri (Fig. 48), but not from the Appalachian region of the United States. Specimens have been examined from the following localities:

**Indiana.** Pigeon River, Mottville, 1-VII-28, H. T. Spieth (AMNH); Pigeon River, Scott, 1-VII-28, H. T. Spieth (AMNH); Greasy Creek, Orland, 10-VII-29, H. T. Spieth (AMNH). **Missouri.** Brice (other data lost). **Ontario.** Lake Sasajawun, Algonquin Park, 11-VI-56, B. V. Peterson. **Quebec.** Vaudreuil, 12-VII-30, G. S. Walley (Holotype) (CNC); Foster, 5-VII-29, J. McDunnough (CNC); Mississquoi River, 1-VII-30, G. S. Walley (CNC); S. Bolton, 30-VI-30, G. S. Walley (CNC); Massawippi River, N. Hatley, 24-VII-29, G. S. Walley and J. McDunnough (CNC); Lachine, 24-VII-30, L. J. Milne (CNC).

*Taxonomy.* *Ephemerella aestiva* and *E. verisimilis* are closely related and nearly indistinguishable as adults. The male imagoes of *E. aestiva* are smaller, 5.5-6.5 mm., than those of *E. verisimilis* which are 7.0-8.5 mm. in length. Color and morphological characters are variable, and the only reliable character for distinguishing imagoes is the form of the penes. The nymphal stages of these species are very similar, but may be distinguished by the shape and degree of development of the dorsal abdominal tubercles and the postero-lateral projections.

***Ephemerella verisimilis* McDunnough**

*Ephemerella verisimilis* McDunnough 1930: 57, 3 figs.; McDunnough 1931: 65, 7 figs.; Traver 1935: 626.

*Ephemerella bicoloroides* McDunnough 1938: 23. New Synonymy.

*Ephemerella verisimilis* was described from all stages collected in northern Quebec, and the nominal species *E. bicoloroides* was named from specimens from Nova Scotia.

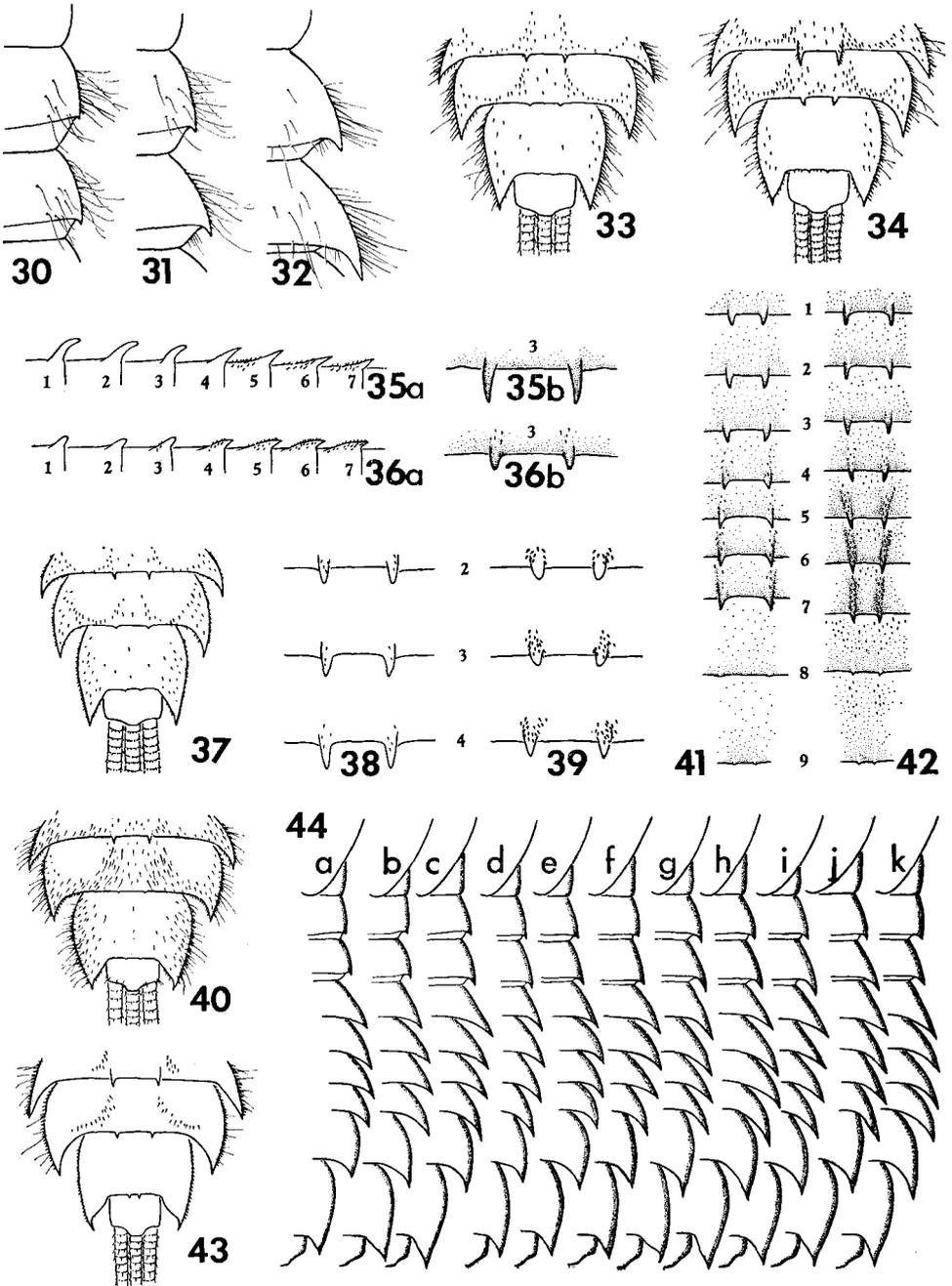
*Male Imago* (dry). Length: body 7.0-8.5; forewing 8-9 mm. Thorax chocolate brown, a darker median stripe on the mesonotum; legs light brown; a brown macula on each coxa; wings smoky, costa and subcosta light yellowish brown, other primary longitudinal, intercalaries and crossveins pale. Abdominal terga brown with lateral dark brown maculae; variable brown markings and paired pale submedian stripes often present; abdominal sterna pale to light chocolate brown; sterna 2-7 with paired submedian dots and paramedian dashes. Penes with a shield-shaped subapical median excavation (Fig. 13). Caudal filaments pale with reddish brown to brown annulations at the apex of each segment.

*Female Imago* (dry). Length: body 7.0-8.5; forewing 8-9 mm. General color lighter brown than male, but abdomen darker brown. Subanal plate with a moderately deep apical excavation (Fig. 58). Other characters as in male except for usual sexual differences.

*Mature Nymph.* Length: body 7.5-9.0; caudal filaments 5-6 mm. General color dark brown with light brown markings. Head with moderately developed occipital tubercles in female as in Fig. 15, barely discernible to moderately developed in male. Legs pale with brown markings and with spines and long setae; tarsal claws with 6-8 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles on segments 1-4 moderately long and blunt (Fig. 39), tubercles on segments 5-7 long and sharp, tubercles on segments 8-10 barely discernible or absent (Fig. 40); bases of paired dorsal abdominal tubercles widest apart on segments 4-7; postero-lateral projections poorly developed on segment 2, moderately developed on segment 3 (Fig. 44d); abdominal terga brown, often with a pale median stripe, and paired submedian tubercles on segments 4-7 usually dark brown; abdominal terga setaceous and with numerous spicules (Fig. 40);

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Fig. 30. *Ephemerella bicolor*, postero-lateral projections on segments 1-3. Fig. 31. *E. verisimilis*, postero-lateral projections on segments 1-3. Fig. 32. *E. lutulenta*, postero-lateral projections on segments 1-3. Fig. 33. *E. bicolor*, abdominal terga 7-10. Fig. 34. *E. minimella*, abdominal terga 7-10. Fig. 35. *E. temporalis*. 35a, abdominal terga 1-7, lateral view; 35b, *E. temporalis*, posterior margin of tergum 3. Fig. 36. *E. lutulenta*. 36a, abdominal terga 1-7, lateral view; 36b, *E. lutulenta*, posterior margin of tergum 3. Fig. 37. *E. aestiva*, abdominal terga 7-10. Fig. 38. *E. aestiva*, posterior margin of terga 2-4. Fig. 39. *E. verisimilis*, posterior margin of terga 2-4. Fig. 40. *E. verisimilis*, abdominal terga 7-10. Fig. 41. *E. lutulenta*, posterior margins of terga 1-9. Fig. 42. *E. prudentalis*, posterior margins of terga 1-9. Fig. 43. *E. funeralis*, abdominal terga 7-10. Fig. 44. Subgenus *Eurylophella*, postero-lateral margins of abdomens. 44a, *E. bicolor*; 44b, *E. minimella*; 44c, *E. aestiva*; 44d, *E. verisimilis*; 44e, *E. prudentalis*; 44f, *E. karelica*; 44g, *E. funeralis*; 44h, *E. temporalis*; 44i, *E. coxalis* ?; 44j, *E. lutulenta*; 44k, *E. lodi*.



abdominal sterna 1-9 with dark brown sublateral maculae. Caudal filaments light brown with variable narrow dark brown basal bands.

*Type Locality.* Bradore Bay, Quebec, Canada.

*Type.* No. 3130, Canadian National Collection, Ottawa, Ontario.

*Distribution.* *Ephemerella verisimilis* is known from northern Quebec to Nova Scotia and austrad to Maryland and Kentucky (Fig. 46). We have examined specimens from the following localities:

**Kentucky.** Quicksand, 8-V-47, P. O. Ritcher and M. W. Sanderson (INHS). **Maine.** Spencer Pond, N. Spencer Bay, Moosehead, 18-VII-39, no collector (INHS). **Maryland.** Paint Branch Creek nr. Bogs, Beltsville, 4-VI-30, A. Rutledge (INHS). **Massachusetts.** Ashfield, 13-V-38, J. G. Needham (JRT); Belchertown, 21-V-38, L. M. Bartlett (JRT). **New Brunswick.** Boiestown, 13-VII-28, W. J. Brown (CNC); Fredericton, 16-VII-28, W. J. Brown (NCC). **New York.** High Rock Point Outlet nr. Eagle Bay, Adirondack Park, 19-VI-41, T. H. Frison and H. H. Ross (INHS); Beaverkill, 2-VI-35, H. T. Spieth (AMNH). **Nova Scotia.** Baddeck Forks, Cape Breton Island, 26-VI-36, T. N. Freeman (Holotype *bicoloroides*) (CNC); Run Lake, Hexcons, 7-VI-47, E. Gorham (JRT); Margaree River, Cape Breton Island, 6-VII-50, E. L. Bousefield. **Ontario.** Joe Lake, Algonquin Park, 7-VII-26, F. P. Ide (CNC); Sand Lake, 1-VII-26, F. P. Ide (CNC). **Pennsylvania.** Scranton, summer 1945, H. K. Townes (JRT). **Quebec.** Ottawa Golf Club, 10-VII-24, J. McDunnough (CNC); Bradore Bay, 25-VII-25, W. J. Brown (Holotype) (CNC); Fulford, 19-VI-30, G. S. Walley (CNC); Knowlton, 12/20-VI-30, G. S. Walley (CNC); Mid Yamaska River, Fulford, 22-VI-29, L. J. Milne (CNC); Thunder River, 24-VI-30, M. J. Brown (CNC); Foster Power Plant, Foster, 11-VI-30, G. S. Walley (CNC).

*Taxonomy.* *Ephemerella bicoloroides* was described from reared male and female imagoes collected in Nova Scotia, while *E. verisimilis* was originally described from northern Quebec. McDunnough (1938) did not adequately describe *E. bicoloroides*, but only compared it with *E. bicolor* Clemens.

We have examined the holotype, the allotype and paratype adults and nymphs of *bicoloroides* and find this species to be indistinguishable from *E. verisimilis* in all stages. The color pattern of the male and female imagoes of each species is identical, including the dark brown maculations on the abdominal terga and sterna, the male genitalia of *bicoloroides* paratypes are inseparable from those of *E. verisimilis*, and the males are comparable in size. The nymphs of *E. verisimilis* and those named as *E. bicoloroides* have many common characters, including color pattern, the degree of production of the postero-lateral projections on segments two and three, the shape of these projections on segments eight and nine, and the degree of development of the paired dorsal abdominal tubercles. McDunnough (*op. cit.*) in describing *E. bicoloroides* did not mention the degree of development of the paired occipital tubercles in the nymphal stage, and unfortunately we have not found female nymphs in the Canadian National Collection for comparison with *E. verisimilis*. The male nymphs of *bicoloroides* lack occipital tubercles, while in the male nymphs of *E. verisimilis* these structures are variable from barely discernible to moderately well developed. Long series of nymphs from the type locality of *E. bicoloroides* are needed in order to determine whether or not this character of the male nymph is of specific or subspecific importance; however, having regard to geographic distribution and morphological characters in all stages, we are here considering the nominal *E. bicoloroides* to be a junior synonym of *E. verisimilis*.

***Ephemerella prudentialis* McDunnough**

*Ephemerella prudentialis* McDunnough 1931: 40, 6 figs.; Traver 1935: 616; Burks 1953: 72, 1 fig.

This species was described from all stages collected in southern Quebec.

**Male Imago** (dry). Length: body 7.5-8.5; forewing 8-9 mm. Thorax brown, often with a pale median stripe; forelegs light brown, middle and hind legs yellowish brown; a brown macula on each coxa; wings smoky; primary longitudinal veins yellowish brown, intercalaries and crossveins pale. Abdominal terga brown, terga 1-9 with dark brown sublateral maculae, posterior margins of segments 1-3 dark brown, terga 1-8 with paired pale submedian stripes bordered on the anterior margin by dark brown paramedian maculae; abdominal sterna yellowish brown, sterna 4-7 with paired submedian dots and paramedian dashes. Penes with a ventral protuberance midway between base and apex (Figs. 4-5) (in dry specimens protuberance may be collapsed to form a depression). Caudal filaments pale with dark annulations at the apex of each segment.

**Female Imago** (dry). Length: body 8-9; forewing 9-10 mm. Thorax ruddy brown, often with a pale median stripe. Subanal plate concave laterally and with a shallow excavation (Fig. 50). Other characters as in male except for usual sexual differences.

**Mature Nymph**. Length: body 8-9; caudal filaments 5-6 mm. General color brown, often with a pale median stripe on head, thorax and abdomen. Head with moderately developed tubercles in female as in Fig. 15, poorly developed in male. Legs pale with variable dark brown markings and dark brown tibial and tarsal bands; tarsal claws with 6-8 denticles. Abdominal terga with paired submedian tubercles on segments 1-10 (Fig. 42); tubercles long and blunt on segments 1-4, long and sharp on segments 5-7, usually small and sharp, barely discernible or absent on segments 8-10; tubercles widest apart on segment 2 and 3; postero-lateral projections poorly developed on segment 2 and moderately developed on segment 3 (Fig. 44e); abdominal terga 1-4 and 8-9 with dark brown sublateral maculae; abdominal sterna pale, sterna 1-9 with dark brown sublateral maculae. Caudal filaments pale, usually with two or three narrow dark brown basal bands.

**Type Locality**. Knowlton, Quebec, Canada.

**Type**. No. 3190, Canadian National Collection, Ottawa, Ontario.

**Distribution**. *Ephemerella prudentialis* is known from southern Ontario and Quebec to Nova Scotia and austrad to North Carolina (Fig. 47). We have examined specimens from the following localities:

**Maine**. Oquossoc, 21-VII-year?, N. Banks; Seeboon Sook, 29-VII-year?, N. Banks; Kellyland, 20-VII-year?, N. Banks; Norway, no date, S. J. Smith (MCZ); Augusta, 29-VII-40, A. E. Brower (MCZ). **Massachusetts**. Stoney Creek, S. Hadley, 27/28-V-52, G. F. Edmunds, Jr. (JRT), 10/20-V-45, J. R. Traver (JRT); Amherst, 30-V-41, L. M. Bartlett (JRT); Holliston, 29-VI-year?, N. Banks (MCZ). **New Brunswick**. Fredericton, 1-VII-28, W. J. Brown (CNC). **North Carolina**. Lake Waccamaw Outlet, Columbus Co., 10-IV-29, J. R. Traver (JRT); Tributary Cape Fear River, 1-IV-30, J. R. Traver (JRT). **Nova Scotia**. S. Milford, 26-VI-34, J. McDunnough (CNC). **Ontario**. Kearney, 23-VI-26, 6-VII-26, F. P. Ide (CNC); Lake Sasajewun, Algonquin Park, 11-VI-55, B. V. Peterson; Sand Lake, 3-VII-26, F. P. Ide (CNC). **Quebec**. Knowlton, 25-VI-29, L. J. Milne (Holotype) (CNC); Pennys Brook, Knowlton, 3/6-VI-30, G. S. Walley (CNC); Fulford, 22-VI-29, G. S. Walley (CNC); Waterloo, 27-VI-29, J. McDunnough (CNC); Covey Hill, 20-VI-29, G. S. Walley (CNC); Gauvreau Lake, 12-VI-30, J. McDunnough (CNC).

*Taxonomy.* *Ephemerella prudentialis* nymphs are similar to those of *E. aestiva* and *E. verisimilis* in the postero-lateral projections on abdominal segments 2 and 3; however, it is readily distinguished from these species in adult and nymphal stages.

#### *Ephemerella funeralis* McDunnough

*Ephemerella funeralis* McDunnough 1925: 210, 2 figs.; McDunnough 1931: 39, 4 figs. (nymph); Traver 1935: 599 (male imago); Traver 1937: 65; Sprules 1940: 62; Howell 1941: 314; Burks 1953: 75, 1 fig.

McDunnough described *E. funeralis* from a single male and several female imagoes, and designated a female as the holotype because he was not certain that the sexes were correctly associated and believed that the females had more structural differences to distinguish the species from the others known in the subgenus. Traver (1935) reared both sexes from nymphs collected in New York.

*Male Imago* (dry). Length: body 7.5-9.0; forewing 7.0-8.5 mm. Thorax medium brown; legs yellow; apex of fore-femora with a light brown macula; wings smoky, primary longitudinal veins yellowish brown, intercalaries and crossveins pale. Abdominal terga reddish brown and with paired narrow pale median stripes; terga 1-4 each with dark brown sublateral maculae; abdominal sterna reddish brown; sterna 2-7 with submedian paired dots and paramedian dashes; sterna 4-7 often with dark ganglionic markings. Penes with a long pointed subapical median excavation (Fig. 8). Caudal filaments light brown at base, pale apically, and with dark annulations at the apex of each segment.

*Female Imago* (dry). Length: body 7.5-9.0; forewing 7.5-8.5 mm. Subanal plate broad at base, narrow at apex and with a shallow median excavation (Fig. 53). Other characters as in male except for usual sexual differences.

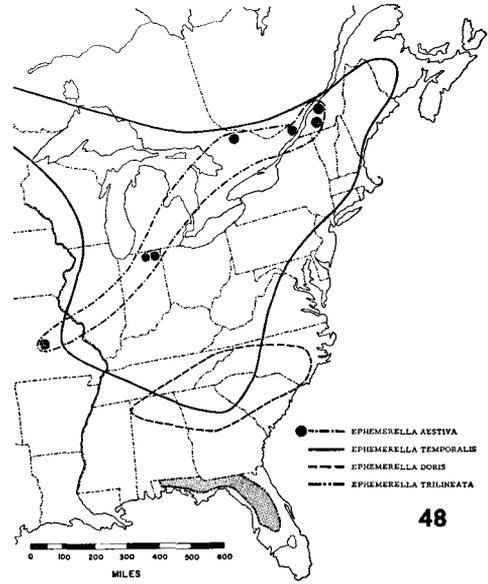
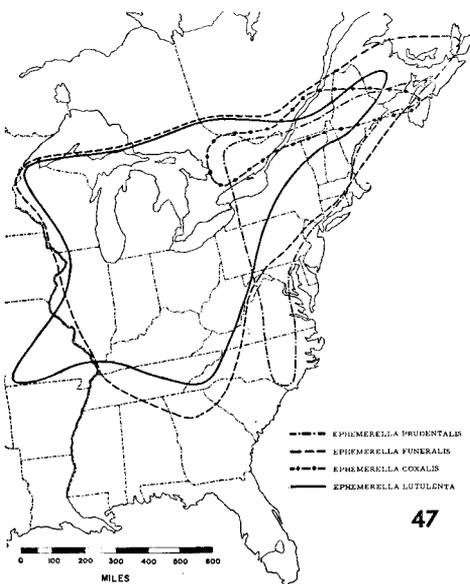
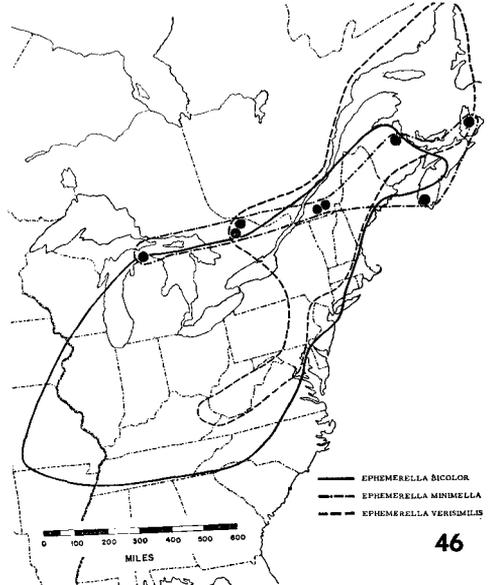
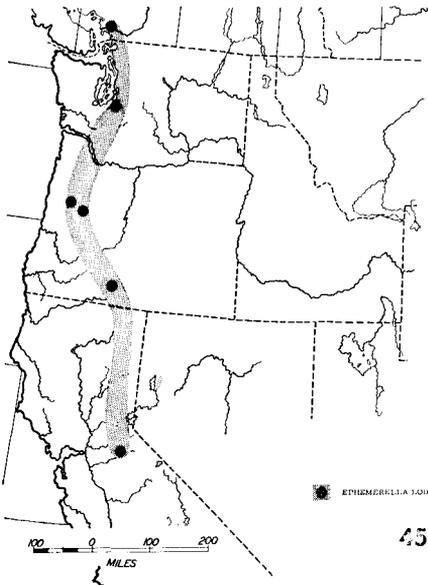
*Mature Nymph.* Length: body 8.0-9.5; caudal filaments 5-7 mm. General color brown. Head with moderately developed occipital tubercles in both sexes as in Fig. 15. Legs light brown with variable darker brown markings, and usually a dark brown transverse tarsal band; tarsal claws with 7-9 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles very long and blunt on segments 1-4, long and sharp on segments 5-7, short and sharp on segments 8-9, short or barely discernible on segment 10; bases of paired dorsal abdominal tubercles usually widest apart on segment 5; postero-lateral projections well developed on segments 2 and 3 (Fig. 44g), projection on segment 9 distinctly incurved (Fig. 43); abdominal terga light brown, terga 1-4 and 8-9 with dark brown sublateral maculae, median portion of segments 5-8 dark brown; abdominal sterna light brown, sterna 1-9 with dark brown sublateral maculae. Caudal filaments pale with variable small dark brown basal bands.

*Type Locality.* Covey Hill, Quebec, Canada.

*Type.* No. 1273, Canadian National Collection, Ottawa, Ontario.

*Distribution.* *Ephemerella funeralis* is known from Michigan to New Brunswick and Nova Scotia austrad to Georgia and South Carolina (Fig. 47). Specimens examined by the authors are from the following localities:

**Indiana.** Newby Gulch, Turkey Run, 9-V-40, B. D. Burks (INHS). **Massachusetts.** Tributary Mill River, Amherst, 6-XI-38, J. R. Traver (JRT); S. Hadley, 12-IV-52, J. R. Traver (JRT). **New Brunswick.** Tracadie River, Gloucester, 4-VIII-50, E. L. Bousefield. **New Hampshire.** Franconia, 1/10-IX-47, B. D. Burks (INHS); Pemigewasset River nr. Woodstock, 22-VI-41, T. H. Frison and H. H. Ross (INHS). **New York.** High Rock Pond Outlet nr. Eagle Bay, Adirondack Park, 19-VI-41, T. H. Frison and H. H. Ross (INHS); McLean,



Figs. 45-48. Distribution of the North American species of the subgenus *Eurylophella*. 45, *E. lodi*; 46, *E. bicolor*, *E. minimella* and *E. verisimilis*; 47, *E. prudentalis*, *E. funeralis*, *E. coxalis* and *E. lutulenta*; 48, *E. aestiva*, *E. temporalis*, *E. doris* and *E. trilineata*.

29-V-31, J. R. Traver (JRT, CNC). **North Carolina.** Ashboro, 3-IV-29, J. G. Needham (JRT). **Nova Scotia.** Baddeck, 2-VII-36, J. McDunnough (CNC). **Ohio.** Waterloo State Forest, Athens Co., 8-VII-47, John Herron. **Ontario.** Kearney, 22-VI-26, F. P. Ide (CNC); Sand Lake, 2-VII-36, J. McDunnough (CNC). **Quebec.** Penneys Brook, Knowlton, 10-VI-30, G. S. Walley (CNC); Bolton Pass Creek, Knowlton, 14-VI-30, G. S. Walley (CNC); Thunder River, 20-V-30, 19-VI-30, W. J. Brown (CNC); Knowlton, 6-V-29, J. McDunnough (CNC); Covey Hill, 23-VI-24, G. S. Walley (Holotype) (CNC). **Tennessee.** Laconte Creek, Gatlinburg, 14-V-39, T. H. Frison and H. H. Ross (INHS). **Wisconsin.** St. Croix River, Gordon, 20-IV-49, T. H. Frison and B. D. Burks (INHS).

*Taxonomy.* The nymph of *E. funeralis* is easily separated from those of the other species of *Eurylophella*. The male imago is not readily distinguishable from some other species in the subgenus.

#### *Ephemerella temporalis* McDunnough

*Ephemerella lutulenta* Clemens 1913: 335 (in part); Clemens 1915: 121 (in part).

*Ephemerella lineata* Clemens 1913: 336 (in part); Clemens 1915: 122 (in part).

*Ephemerella temporalis* McDunnough 1924: 73, 1 fig.; McDunnough 1925: 212; McDunnough 1930: 58, 1 fig.; Ide 1930: 212; McDunnough 1931: 35, 5 figs. (nymph); Traver 1932: 148; Traver 1935: 623; Ide 1935: 44; Traver 1937: 66; Lyman 1944: 114; Burks 1953: 72, 6 figs.

*Ephemerella temporalis* (1924) was described from male and female imagoes collected in Ontario and Massachusetts. In 1931 McDunnough found and described the nymph. He also discovered that part of the nymphal series of *E. lutulenta* and of its synonym *lineata* were *E. temporalis*.

*Male Imago* (dry). Length: body 8-9; forewing 8-10 mm. Thorax medium brown; legs yellowish brown; apex of forefemora with a dark macula; apex of each tarsal segment brown; wings smoky, primary longitudinal veins yellowish brown, intercalaries and crossveins pale. Abdominal terga brown; variable brown markings and paired submedian pale stripes often present; terga 1-4 each with dark brown sublateral maculae; abdominal sterna yellow, sterna 2-7 with paired submedian dots and paramedian dashes. Penes constricted at base and broadly expanded near mid-line (Fig. 9). Caudal filaments pale with dark annulations at the apex of each segment.

*Female Imago* (dry). Length: body 8-9; forewing 8-10 mm. Subanal plate with a shallow excavation (Fig. 52). Other characters as in male except for usual sexual differences.

*Mature Nymph.* Length: body 9-11; caudal filaments 7-9 mm. General color dark brown, often sprinkled with small white dots and a wide pale median stripe on the thorax and abdomen. Head with well developed occipital tubercles in both sexes (Fig. 14). Legs brown, often sprinkled with fine white dots, and usually a dark brown transverse tarsal band; tarsal claws with 6-8 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles very long and blunt on segments 1-3 (Figs. 35a and 35b), tubercles may be blunt or sharp on segment 4, long and sharp on segments 5-7, short and sharp on segments 8-9, short and barely discernible or absent on segment 10; bases of paired dorsal abdominal tubercles usually widest apart on segment 4; postero-lateral projections well developed on segments 2 and 3 (Fig. 44h); abdominal terga brown, often with paired dark brown submedian stripes; abdominal sterna brown, sterna 1-7 with dark brown sublateral maculae. Caudal filaments pale with dark brown basal bands.

*Type Locality.* Ottawa, Ontario, Canada.

*Type.* No. 778, Canadian National Collection, Ottawa, Ontario.

*Distribution.* *Ephemerella temporalis* is the most widely distributed species in the subgenus and is known from Saskatchewan to New Brunswick austrad to Missouri and Georgia (Fig. 48). Specimens examined by the authors are from the following localities:

**Illinois.** Lake Co., Sand Lake, 20-VI-1892, C. A. Hart and "Shiga" (INHS); Cedar Lake, 16-VI-1892, C. A. Hart and "Shiga" (INHS); Mason Co., River below Havana, 21-V-1892, C. A. Hart (INHS); Quiver Lake nr. Havana, 1-VI-1894, F. Smith (INHS). **Indiana.** Beanblossom Cr., Bloomington 26-V-30, H. T. Spieth (AMNH); Lake Wawasee, 9-VI-27, H. T. Spieth (AMNH); Pigeon River, Scott, 1-VII-28, H. T. Spieth (AMNH). **Massachusetts.** Wayland, 16-VI-30, C. A. Frost (CNC). **Missouri.** Maramac Springs, SE. James, 28-IV-56, L. T. Sullivan (UM). **New Brunswick.** Boiestown, 13-VII-28, W. J. Brown (CNC); Fredericton, 28-VI-28, W. J. Brown (CNC). **New York.** Green Lake, 30-V-31, J. R. Traver (JRT). **North Carolina.** Lake Waccamaw outlet, 10-IV-29, J. R. Traver (JRT). **Ontario.** Smoky Falls, 7-VII-34, G. S. Walley (CNC); Dundas, 8-VI-31, G. S. Walley (CNC); Mattagami River, Smoky Falls, 6-VII-34, G. S. Walley (CNC); Lake Shore Pool, Normandale, 13-VI-31, G. S. Walley (CNC); Go Home Bay, 6-VII-32, G. S. Walley (CNC); Severn, 22-VI-25, J. McDunnough (CNC); Bobcaygeon, 26-VI-31, J. McDunnough (CNC); Clear Creek, Miners Bay, 29-V-31, J. McDunnough (CNC); Ottawa, 25-VI-24, F. P. Ide (CNC); Kearney, 8-VII-26, F. P. Ide (CNC); Orillia, 11-VI-25, C. H. Curran (CNC); N. Madawaska River, Algonquin Park, 11-V-55, B. V. Peterson; Westboro, 25-VI-30, G. S. Walley (CNC); Britannia Bay, 8-V-30, G. S. Walley (CNC); Minaki, 7-VII-20, J. McDunnough (CNC); Hogsback, 22-VI-23, R. Ozburn (CNC). **Quebec.** Ottawa Golf Club, 20-VI-24, J. H. McDunnough (CNC); Waterloo, 27-VI-29, J. McDunnough (CNC); Gauvreau Lake, Wakefield, 19-VI-30, J. McDunnough (CNC); Mahon Lake, Wakefield, 11-VI-30, J. McDunnough (CNC); Knowlton, 21/24-VI-29, J. McDunnough (CNC); Vaudreuil, 22-VI-25, F. P. Ide (CNC); Lachine, 16-VI-25, F. P. Ide (CNC); St. Annes, 24-VI-25, F. P. Ide (CNC); Chateauguay, 18-VI-25, F. P. Ide (CNC); Brome Lake, Knowlton, 21-VI-29, G. S. Walley (CNC); Grand Lac Jacques Cartier, Montreal, 13-VII-38, "C. G." (INHS); St. Lambert, 3-VII-27, W. J. Brown (CNC); Cascades Point, 3-VI-30, G. S. Walley (CNC); Lacolle, 1-VII-26, G. H. Hammond (CNC); Aylmer, 23-VI-24, H. L. Viereck (CNC). **Saskatchewan.** Freedman Island, Lac LaRonge, 9-VI-53, D. S. Rawson; Lac LaRonge, 2-VII-53, D. S. Rawson. **South Carolina.** Above Little Landing, Savannah River, 11-V-52, S. S. Roback and T. Dolan (ANSP). **Wisconsin.** La Grange, 31-V-38, H. H. Ross and B. D. Burks (INHS); Lake Geneva, 5-VI-38, H. H. Ross and B. D. Burks (INHS).

*Taxonomy.* *Ephemerella temporalis* is one of the most easily recognized species as a nymph and male adult.

*Ephemerella doris* Traver and *E. trilineata* Berner are known from the southeastern United States with very limited geographic distributions and are here considered to be of questionable taxonomic status. The range of *E. doris* falls within the area from which we have examined typical specimens of *E. temporalis*, but *E. trilineata* is allopatric, being confined to Florida. *Ephemerella doris* was described from a male subimago and several nymphs collected in North Carolina, and after examination of the type series we are unable to distinguish it from *E. temporalis*. Traver (*op. cit.*) named these specimens as new as the nymphs differed in size, and in some minor morphological characters on the body and appendages, from the nymph of *E. temporalis*, but she neglected to compare the

adult stages of the two. *Ephemerella doris* is probably a junior synonym of *E. temporalis*, but we refrain from establishing this synonymy until more material from this area, preferably reared adults, is available.

*Ephemerella trilineata* is not distinguishable from *E. temporalis* or *E. doris* as a nymph or adult, and this population from Florida may eventually be found to be synonymous with or a distinct subspecies of *E. temporalis*.

### *Ephemerella trilineata* Berner

*Ephemerella trilineata* Berner 1946: 67, 1 fig.; Berner 1950: 154, 3 figs.

This species was described from all stages collected in northern and central Florida.

*Male Imago* (in alcohol). Length: body 8-9; forewing 8-9 mm. Thorax light brown with black maculae; legs yellow; each coxa with a black macula and apex of each femur with a ruddy band; each forefemur with a dark spot proximal to the band; wings hyaline; venation pale. Abdomen yellow; terga 1-9 with paired pale submedian stripes, and dark brown lateral and sublateral maculae; abdominal sterna 1-7 with paired submedian dots and paramedian dashes. Penes constricted at base and broadly expanded near mid-line as in Fig. 9. Caudal filaments pale with brown annulations at apex of each segment.

*Female Imago* (in alcohol). Length: body 8-9; forewing 8-9 mm. Similar to male except for usual sexual differences.

*Mature Nymph*. Length: body 9.5-10.5; caudal filaments 6-7 mm. General color dark brown, often sprinkled with small white dots. Head with well developed occipital tubercles in both sexes as in Fig. 14. Legs brown; femora and tibiae brown with pale markings, and usually with a dark brown transverse tarsal band; tarsal claws with 5-7 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles very long and blunt on segments 1-3, tubercles may be blunt or sharp on segment 4, long and sharp on segments 5-7, short and sharp on segments 8-9, short and barely discernible or absent on segment 10; bases of paired dorsal abdominal tubercles widest apart on segments 2-4; postero-lateral projections well developed on segments 2-9; abdominal terga with dark brown median and paired submedian stripes; terga 1-4 and nine with dark brown sublateral maculae; abdominal sterna brown, sterna 1-7 with dark brown sublateral maculae. Caudal filaments pale with dark brown basal annulations and irregular brown basal bands.

*Type Locality*. Hatchet Creek, Alachua Co., Florida, U.S.A.

*Type*. Museum of Comparative Zoology, Cambridge, Massachusetts.

*Distribution*. *Ephemerella trilineata* is known from only central and northern Florida (Fig. 48). We have examined specimens from the following localities:

**Florida**. Gulf Co., Dead Lakes, 21-IV-57, W. J. Westfall; Alachua Co., Santa Fe Lake, 15-XII-47, "Cantrell"; Hatchet Creek, 3-II-41, L. Berner.

### *Ephemerella doris* Traver

*Ephemerella doris* Traver 1934: 208; Traver 1935: 592, 2 figs.; Traver 1937: 65, 82; Howell 1941: 313; Wright and Berner 1949: 295.

*Ephemerella doris* was described from a male subimago and nymphs collected in North Carolina.

*Male Subimago* (Holotype, in alcohol). Length: body 7; forewing 7.5 mm. Thorax light brown with black maculae; legs yellow; each coxa with a black macula; wings hyaline; venation pale. Abdomen yellow, terga 1-9 with dark submedian stripes, and brown lateral and sublateral maculae; abdominal sterna with paired submedian dots and dashes. Penes constricted at base and broad near mid-

line (incompletely developed). Caudal filaments with brown annulations at apex of each segment.

*Mature Nymph* (Paratype). Length: body 9-10; caudal filaments 5.5-6.5 mm. General color brown. Head with well developed occipital tubercles in both sexes as in Fig. 14. Legs brown, and usually with a brown transverse tarsal band; tarsal claws with 5-7 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles very long and blunt on segments 1-3, tubercles may be blunt or sharp on segment 4, long and sharp on segments 5-7, short and sharp on segments 8-9, short and barely discernible or absent on segment 10; bases of paired dorsal abdominal tubercles widest apart on segment 4; postero-lateral projections well developed on segments 2-9; abdominal terga brown; abdominal sterna brown, sterna 1-7 with dark brown sublateral maculae. Caudal filaments pale with dark brown basal bands.

*Type Locality*. Uharie River near Farmer, North Carolina, U.S.A.

*Type*. No. 1292.1, Cornell University Collection, Ithaca, New York.

*Distribution*. *Ephemerella doris* is a Southeastern States species and known from only North Carolina, Tennessee, Georgia and Alabama (Fig. 48). We have examined specimens from the following localities:

**Georgia**. Withalacoochee River nr. Macon, 21/22-III-31, P. W. Fattig (CU) (Paratypes). **North Carolina**. Uharie River nr. Farmer, 6-V-29, J. R. Traver (CU) (Holotype); Waccamaw outlet, 11-IV-29, J. G. Needham (CU) (Paratypes); Neuse River nr. Ft. Barnwell, 9-IV-30, J. R. Traver (JRT).

#### ***Ephemerella coxalis* McDunnough**

*Ephemerella coxalis* McDunnough 1926: 186; McDunnough 1931: 37, 3 figs. (nymph, tentatively associated); Traver 1935: 589; Burks 1953: 73, 2 figs.

This species was described from male and female imagoes collected in southern Quebec. In 1931 McDunnough tentatively assigned to this species a single nymph collected in the Rideau River, Ottawa, Ontario.

*Male Imago* (dry). Length: body 7-8; forewing 8-9 mm. Thorax light to medium brown, pleural area above leg bases with fuscous markings; legs yellow, coxae, trochanters and apices of femora each with a distinct dark brown macula; wings hyaline, primary longitudinal veins yellowish, intercalaries and crossveins pale. Abdominal terga yellow and dark brown; terga 1-3 and 8-10 light brown with scattered pale dots and sublateral black patches; abdominal sterna pale yellowish brown with variable darker sublateral streaks and brown ganglionic markings. Penes with a long narrow subapical median excavation (Fig. 7). Caudal filaments pale, yellowish at the apex of each segment.

*Female Imago* (dry). Length: body 7-8; forewing 8-9 mm. General color darker brown than male. Subanal plate long and narrow with a moderately deep excavation (Fig. 51). Other characters as in male except for usual sexual differences.

*Nymph* ? (not fully mature). Length: body 8.5; caudal filaments 5.5 mm. General color light brown with dark brown maculae. Head of female with moderately developed occipital tubercles (Fig. 15). Legs light brown with variable dark brown markings; tarsi light brown with dark brown bands; tarsal claws with 5-6 denticles. Abdominal terga with paired submedian tubercles on segments 1-9; tubercles on segments 1-4 moderately long and blunt, moderately long and sharp on segments 5-7, barely discernible on segments 8-9; bases of paired dorsal abdominal tubercles widest apart on segments 4-6; postero-lateral projections well developed on segments 2 and 3 (Fig. 44i); abdominal terga light brown with submedian and lateral dark brown markings; abdominal sterna light brown

with sublateral dark brown maculae on segments 1-9. Caudal filaments light brown.

*Type Locality.* Dorval, Quebec, Canada.

*Type.* No. 2070, Canadian National Collection, Ottawa, Ontario.

*Distribution.* We have examined specimens from southern Ontario to Nova Scotia (Fig. 47). Traver (1935) reported nymphs and reared imagoes from North Carolina and Georgia as being close to this species. Wright and Berner (1949) also reported nymphs from Tennessee as questionable *E. coxalis*, and Burks (1953) reported this species from Indiana. The specimens we have examined are from the following localities:

**Maine.** Aquosoc, 18-VII-year?, N. Banks. **Nova Scotia.** S. Medford, 28-VI-34, J. McDunnough (CNC). **Ontario.** Fishers Glen, 1-VII-25, G. S. Walley (CNC); Go Home Bay, 28-VI-32, G. S. Walley (CNC); Rideau River, Ottawa, 17-V-28, "Adams" and W. J. Brown (CNC). **Quebec.** Dorval, 20-VI-25, F. P. Ide (Holotype) (CNC); St. Annes, 24-VI-25, F. P. Ide (CNC); Lachine, 23-VI-25, F. P. Ide (CNC); Coteau du Lac, 25-VII-25, F. P. Ide (CNC); Vaudreuil, 24-VI-25, F. P. Ide (CNC); Brome Lake, Knowlton, 25-VI-28, G. H. Fisk (CNC).

*Taxonomy.* Color characters and the form of the penes enable *Ephemerella coxalis* to be distinguished as a male adult. The nymph which is tentatively assigned to this species, is not fully grown, 8.5 mm., and cannot be readily distinguished from *E. lutulenta* in general structure; however, the specimen lacks the characteristic sprinkling of fine black dots so common in *E. lutulenta* nymphs, and has the occipital tubercles better developed (Fig. 15) than the latter species (Fig. 16).

#### *Ephemerella lutulenta* Clemens

Allied to *Ephemerella*, Nymph No. 5 Eaton 1884: 133, pl. 40, 64; Lestage 1924: 44; Tiensuu 1935: 22.

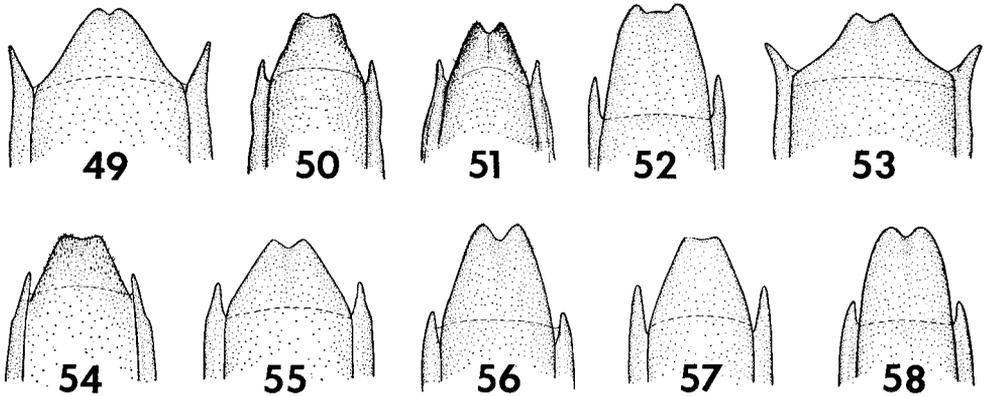
*Ephemerella lutulenta* Clemens 1913: 335; Clemens 1915: 121, 1 fig.; McDunnough 1924: 74; McDunnough 1925: 212; McDunnough 1931: 32, 6 figs.; McDunnough 1931: 33 (= *lineata*); Traver 1935: 609; Ide 1935: 44; Sprules 1947: 44, 75; Wright and Berner 1949: 295; Burks 1953: 72, 2 figs.

*Ephemerella lineata* Clemens 1913: 336, 1 fig.; Clemens 1915: 122.

Clemens (1913) described this species from all stages collected in southern Ontario, and named as *lineata* a female imago and some nymphs collected in this locality. In 1931, McDunnough compared the holotype female of *lineata* with the allotype of *E. lutulenta* and synonymized these names. McDunnough also found that some of the nymphs assigned to *E. lutulenta* by Clemens were *E. temporalis* McDunnough.

*Male Imago* (dry). Length: body 10-11; forewing 10-11 mm. Thorax dark brown and sprinkled with fine black dots; legs yellow and with small black dots, the foretibiae and tarsi smoky; apex of each tarsal segment and tarsal claws dark brown; wings smoky, primary longitudinal veins yellowish brown, intercalaries and crossveins pale. Abdominal terga brown, sprinkled with fine black dots, and with paired submedian pale stripes; terga 1-9 with dark brown sublateral maculae; posterior margins of terga 1-3 dark brown; anterior margins of terga 1-10, but especially 5-8 with paired submedian dark brown maculae; posterior margin of tergum 9 dark brown; abdominal sterna yellow; sterna 2-7 with paired submedian spots and paramedian dashes. Penes with a shallow subapical median excavation (Fig. 6). Caudal filaments pale with brown to black annulations at the apex of each segment.

*Female Imago* (dry). Length: body 9.5-11.0; forewing 10-11 mm. Thorax lighter brown, and abdomen darker brown, than in male. Subanal plate with a



Figs. 49-58. Subgenus *Eurylophella*, female subanal plate. 49, *E. karelica*; 50, *E. prudentalis*; 51, *E. coxalis*; 52, *E. temporalis*; 53, *E. funeralis*; 54, *E. aestiva*; 55, *E. bicolor*; 56, *E. lutulenta*; 57, *E. minimella*; 58, *E. verisimilis*.

deep median excavation (Fig. 56). Other characters in male except for usual sexual differences.

*Mature Nymph.* Length: body 9-12; caudal filaments 7-9 mm. General color brown with scattered white dots and/or a pale wide median stripe on the thorax and abdomen, and sprinkled with fine black dots. Head with minute to small occipital tubercles in female as in Fig. 16, very small or absent in male. Legs pale with variable brown markings and with small black dots; tarsal claws with 9-11 denticles. Abdominal terga with paired submedian tubercles on segments 1-10 (Fig. 41); tubercles moderately long and blunt on segments 1-3 (Figs. 36a and 36b); tubercles variable, blunt or moderately sharp on segment 4, long and sharp on segments 5-7, short and barely discernible, or absent on segments 8-10; bases of paired dorsal abdominal tubercles widest apart on segments 4-7; postero-lateral projections well developed on segments 2 and 3 (Fig. 44j); abdominal terga and sterna sprinkled with fine black dots; abdominal sterna 2-9 with dark brown sublateral maculae. Caudal filaments uniformly brown.

*Type Locality.* Georgian Bay, Ontario, Canada.

*Type.* Canadian National Collection, Ottawa, Ontario.

*Distribution.* *Ephemerebella lutulenta* is known to occur from Wisconsin to New Brunswick and austrad to Missouri, Tennessee and North Carolina (Fig. 47). Specimens examined by the authors are from the following localities:

**Illinois.** Havana, no other data (INHS); Channel Lake, 16-V-38, no collector (reared); McCollams Lake, 9-V-1880, S. A. Forbes (AMNH). **Indiana.** Tri Lakes, 15-IV-29, H. T. Spieth (AMNH); Beech Creek, Solsbury, 6-VI-29, H. T. Spieth (AMNH). **Michigan.** Houghton Lake, 15/18-VI-35, T. H. Frison (INHS); Douglas Lake, 20-VI-48, G. F. Edmunds, Jr. **Missouri.** Roaring River State Park, Cassville, 22-IV-55, R. D. Turner (UM); Westphalia, 12-V-57, "Heisinger" (UM). **New Brunswick.** Fredericton, 28-VI-28, W. J. Brown (CNC). **New York.** Conessus Lake, 18-V-31, P. R. Needham (CU). **Ontario.** Go Home Bay, Bradore Bay, 12-VI-12 (Holotype, *lineata*) (CNC); Gull Lake, Miners Bay, 25-V-31, J. McDunnough (CNC); Honey Harbor, 10-VI-32, G. S. Walley (CNC); Orillia, 4-VI-25, J. McDunnough (CNC); Maitland, 30-VI-31, L. J. Milne (CNC); Wisharts Bay, 4-VI-12 (CNC); Shawanaga Lake, 9-VI-12 (CNC); Pentecost Island, Georgian Bay, 13-VI-12 (CNC); Londons Bay, Georgian Bay, 4-VI-13 (CNC). **Quebec.** Brome Lake, Wakefield, 11-VI-30, J.

McDunnough (CNC); Vaudreuil, 24-VI-30, G. S. Walley (CNC); Gauvreau Lake, Wakefield, 13-VI-30, J. McDunnough (CNC); Lachine, 20/23-VI-25, F. P. Ide (CNC); Laprairie, 14-VI-27, W. J. Brown (CNC); Chateauguay, 18-VI-25, F. P. Ide (CNC); Laconte, 6-VI-41, G. S. Walley (CNC); Ottawa Golf Club, 20-VI-24, J. McDunnough (CNC). **Wisconsin.** Lake Geneva, 5-VI-38, H. H. Ross and B. D. Burks (INHS); St. Croix River, Gordon, 20-VI-34, T. H. Frison and B. D. Burks (INHS).

*Taxonomy.* *Ephemerella lutulenta*, *E. karelica* Tiensuu and *E. lodi* Mayo differ in geographic distribution and are morphologically distinct as male imagoes or nymphs, but they are morphologically similar and probably closely related. The nymphs and adults are very large, usually over 10 mm., and the nymphs have many common characters.

### *Ephemerella karelica* Tiensuu

*Eurylophella karelica* Tiensuu 1935: 21, 8 figs.; Tiensuu 1939: 121 (misspelled, *carelica*);

Edmunds 1959: 546 (?=*brunnescens*); Keffermüller 1960: 443, 6 figs. (adults).

?*Melanameletus brunnescens* Tiensuu 1935: 16, 3 figs.; Tiensuu 1939: 121.

*Ephemerella karelica* Tiensuu, Edmunds and Traver 1954: 238; Edmunds 1959: 546; Sowa 1961: 59, 9 figs.

*Ephemerella karelica* was described from a small series of immature nymphs collected in southern Finland (now U.S.S.R.).

*Male Imago* (in alcohol). Length: body 12-13; forewing 11.5-12.5 mm. Thorax brown; legs brown with dark brown markings on the femora and tarsi; a brown macula on each coxa; wings hyaline, anterior margin of forewing and hindwing brown; primary longitudinal veins brown, intercalaries and crossveins pale. Abdominal terga brown with a pale median stripe bordered by paired dark brown submedian streaks; segments 3-8 each with a dark median streak; pleural area of segments 4-9 expanded laterally, and segments 7-9 with vestiges of nymphal postero-lateral projections; abdominal sterna pale. Penes expanded basally (Fig. 2). Caudal filaments pale with dark annulations at the apex of each segment.

*Female Imago* (in alcohol). Length: body 12.5-13.5; forewing 13-14 mm. Subanal plate concave with a moderately deep median excavation (Fig. 49). Other characters as in male except for usual sexual differences.

*Mature Nymph.* Length: body 12-14; caudal filaments 7-10 mm. General color brown, often sprinkled with fine white dots. Head of female only with minute occipital tubercles as in Fig. 16. Legs pale with brown markings, usually a dark brown tarsal band; tarsal claws with 9-11 denticles. Abdominal terga with paired submedian tubercles on segments 1-10; tubercles long and blunt or moderately sharp on segments 1-3, long and sharp on segments 4-7, short and barely discernible or absent on segments 8-10; bases of paired dorsal abdominal tubercles widest apart on segments 4-7; postero-lateral projections poorly developed on segment 2, moderately developed on segment 3 (Fig. 44f); abdominal terga brown with variable pale markings and sprinkled with fine white dots; abdominal sterna brown and sprinkled with fine white dots. Caudal filaments brown with variable pale bands.

*Type Locality.* Kurkijoki, Lake Ladoga, (Finland) Karelian A.S.S.R.

*Type.* No. 6542, Museum Zoology, Helsinki, Finland.

*Distribution.* *Ephemerella karelica* is known from Karelian A.S.S.R. near the Finnish border austrad to southwestern Poland. We have examined nymphs and adults, from which we have drawn the above descriptions, from J. Goreckie, Poznan Province, Poland, 9/16-V-59, M. Keffermüller.

*Taxonomy.* *Ephemerella lithuanica* Kazlauskas may be synonymous with *E. karelica*. The former was described from nymphs collected between the type locality of *E. karelica* in Finland and the Polish locality visited by Keffermüller (1960). Kazlauskas (1959) did not compare these species, and to do so would have been difficult as *E. karelica* is known only from small nymphs. The taxonomic status of *E. lithuanica* will remain uncertain until reared topotypes of both species become available.

#### ***Ephemerella lithuanica* Kazlauskas**

*Ephemerella lithuanica* Kazlauskas 1959: 168, 12 figs.

This species was described from fully grown nymphs collected in Lithuania. We have not examined specimens, and the original description is inadequate as it does not give characters which distinguish *E. lithuanica* from the other known European species, *E. karelica* Tiensuu.

#### ***Ephemerella lodi* Mayo**

*Ephemerella lodi* Mayo 1952: 179, 2 figs.; Allen and Edmunds 1956: 87; Day 1956: 98.

"*bicolor* nymph" Mayo 1952: 180, 1 fig.

*Ephemerella lodi* was described from male and female imagoes from central California. In this publication Mayo described a *Eurylophella* nymph which she referred to as "*bicolor* nymph". She recognized the possibility that this nymph may be *E. lodi*, but did not declare it as such because no adult had been obtained from it. We consider this possibility a likelihood as, (1) the adults of *E. lodi* are the largest in the subgenus, as are the "*bicolor* nymphs"; and (2) *E. lodi* is the only species in the subgenus known to occur in western North America.

*Male Imago* (in alcohol). Length: body 10-11; forewing 10-11 mm. Thorax reddish brown; legs yellow; wings tinged with amber, primary longitudinal veins yellow, intercalaries and crossveins pale. Abdominal terga 1-3 reddish brown, posterior margin of each segment brown, terga 1-4 yellow, posterior margin of each segment reddish brown, terga 8-9 yellow with sublateral dashes, each tergum with a sublateral black oblique mark; abdominal sterna reddish brown, each sternum with dark brown submedian dots and paramedian dashes. Penes expanded basally (Fig. 3). Caudal filaments yellow with reddish brown annulations at the apex of each segment.

*Female Imago* (in alcohol). Similar to male except for usual sexual differences. Subanal plate concave laterally with a moderate median excavation.

*Mature Nymph.* Length: body 11-13; caudal filaments 8-10 mm. General color dark brown, often with a pale median stripe on the head, thorax and abdomen, and with scattered pale spots and maculae. Head of female with minute paired occipital tubercles as in Fig. 16, male without. Legs dark brown with scattered pale spots and maculae, tarsi banded; tarsal claws with 7-10 denticles. Abdominal terga with paired submedian tubercles on segments 1-10, tubercles moderately long and sharp on segments 1-8, short and blunt on segment 9, barely discernible on segment 10; tubercles widest apart on segments 2-4; postero-lateral projections well developed on segments 2 and 3 (Fig. 44k); abdominal terga often with wide pale sublateral stripes on segments 2-4 and narrow pale submedian stripes on segments 9-10; abdominal sterna 1-9 with dark brown sublateral maculae. Caudal filaments light brown with alternating wide dark brown bands.

*Type Locality.* Dry Creek near Dry Town, Amador Co., California, U.S.A.

*Type.* In collection of Dr. V. K. Mayo, Tucson, Arizona.

*Distribution.* *Ephemerella lodi* is a Pacific Coast species known from southern British Columbia austrad to central California (Fig. 45). The authors have examined specimens of this species from the following localities:

**British Columbia.** Allonette River nr. Haney, N. J. Gilmer (UBC). **California.** Amador Co., Dry Creek nr. Dry Town (1700' elevation), 2-VI-38, V. K. Mayo (VKM, Paratypes). **Oregon.** Benton Co., McFadden Slough, 16-IV-38, L. Seghetti; North Peoria Slough, 16-V-47, E. P. Hughes; Calapooya Pond, 6 mi. E. Corvallis, 20-V-38, L. Mathison (OSU); Marys River, Corvallis, 28-IV-39, G. Bailey (OSU); Rocky Pond, Corvallis, 6-V-37; Rock Creek, Corvallis, 18-IV-38, Frank Allhands; Creek E. of Corvallis, 17-V-38, Don Devlin; Linn Co., Colorado Lake, 28-III-39, "Pillow"; Klamath Co., Williamson River (near mouth), 8-VII-33, R. Dimick (OSU). **Washington.** Pierce Co., Puyallup, 28-V-42, (JRT).

*Biology.* The Oregon records indicate that this is both a stream and pond form. The type locality is Dry Creek, but the species was described from adults and the aquatic habitat is unknown.

#### Acknowledgments

We are most grateful to G. P. Holland and J. E. H. Martin of the Canada Department of Agriculture, Ottawa, for permission to examine the primary types of many species and for the loan of valuable specimens in the Canadian National Collection.

We also express thanks to the following: W. L. Brown of Cornell University, for the loan of primary types; Lewis Berner of the University of Florida, Velma K. Mayo of Tucson, Arizona, and M. Keffermüller of University of Adam Mickiewicz, Poznan, Poland, for the loan and/or gift of comparative material; Willis J. Gertch and Jerome G. Rozen, Jr. (American Museum of Natural History), Herbert H. Ross and Leonora K. Gloyd (Illinois Natural History Survey), Henry Dietrich (Cornell University), P. O. Ritcher and F. F. Hasbrouck (Oregon State University), and G. G. E. Scudder (University of British Columbia) for the loan of specimens from collections under their care; J. R. Traver of the University of Massachusetts and B. V. Peterson of the Canada Department of Agriculture for the loan and/or donation of specimens. We are also grateful to Steve L. Jensen and David J. Rasmussen who prepared the illustrations and maps under the direction of the authors.

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