

**CERCOBRACHYS CREE: A NEW SPECIES
(EPHEMEROPTERA: CAENIDAE) FROM
WESTERN NORTH AMERICA¹**

Lu Sun², J. M. Webb³, W. P. McCafferty²

ABSTRACT: *Cercobrachys cree*, new species, is described from larvae and reared male adults recently taken from large-river habitats in Saskatchewan, Alberta, and Montana. The new species represents the first record of the genus from Canada, the second species of the genus in western North America, the third species in North America, and the seventh worldwide. The new species appears closely related to *C. serpentis*, the other western North American species; however, larvae differ structurally with respect to ocellar tubercles, labrum, and abdominal posterolateral processes, in addition to the color pattern associated with the operculate gills. The large prairie-river habitats of the new species are discussed.

Mayflies of the family Caenidae that have ocellar tubercles and two-segmented labial palpi in the larval stage are representative of the subfamily Brachycercinae (McCafferty and Wang 2000). *Cercobrachys* Soldán larvae are distinguished from other Brachycercinae in North America by the presence of dense, long, fine setae, especially on the mesosternum and legs, and strongly curved lateral spines on abdominal segment 6 (Soldán 1986). The previously described six species of *Cercobrachys* are known from the Palearctic, Oriental, Nearctic and Neotropical regions (Tshernova 1952, Soldán 1986). In North America, two species have been known: *C. serpentis* Soldán from Idaho and *C. etowah* Soldán from Florida, Georgia, and North and South Carolina (Soldán 1986, Berner and Pescador 1988, Pescador et al. 1999). The *C. serpentis* records for Nebraska given by McCafferty et al. (2001) are actually attributable to yet-to-be described midwestern species of *Cercobrachys*, as has been determined by a current revisionary study being conducted by LS and WPM.

Recently collected specimens of *Cercobrachys* from Saskatchewan, Alberta, and Montana, including reared associations provided by JMW, represent a new species that we describe and diagnose below.

Cercobrachys cree, NEW SPECIES

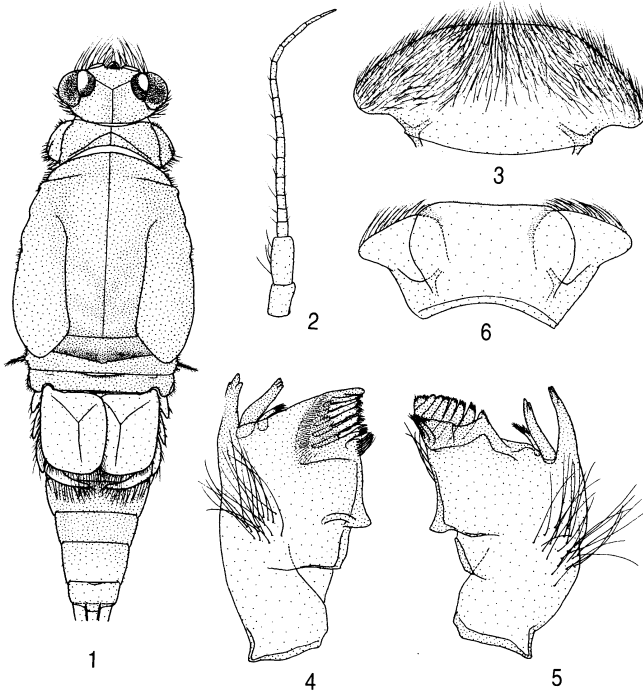
Larva. Body length 3.8-5.5 mm. Caudal filaments length 2.0-2.3 mm. Coloration generally pale yellowish brown and patterned as in Figure 1. Head (Figs. 1, 13) pale yellow. Head capsule with irregular light brownish pattern bordering epicranial suture stem, and with transverse row of approximately 10 to 15 long setae at either side between base of antennae and base of mandible. Compound eyes and ocelli black. Lateral ocellar tubercles short and rounded apically; basal length of ocelli in longitudinal plane two-thirds that of compound eye in same plane; middle ocellar tubercle (Figs. 1, 13) rounded apically and shorter than lateral ocelli by approximately

¹ Received November 5, 2001. Accepted November 27, 2001.

² Department of Entomology, Purdue University, West Lafayette, IN 47907.

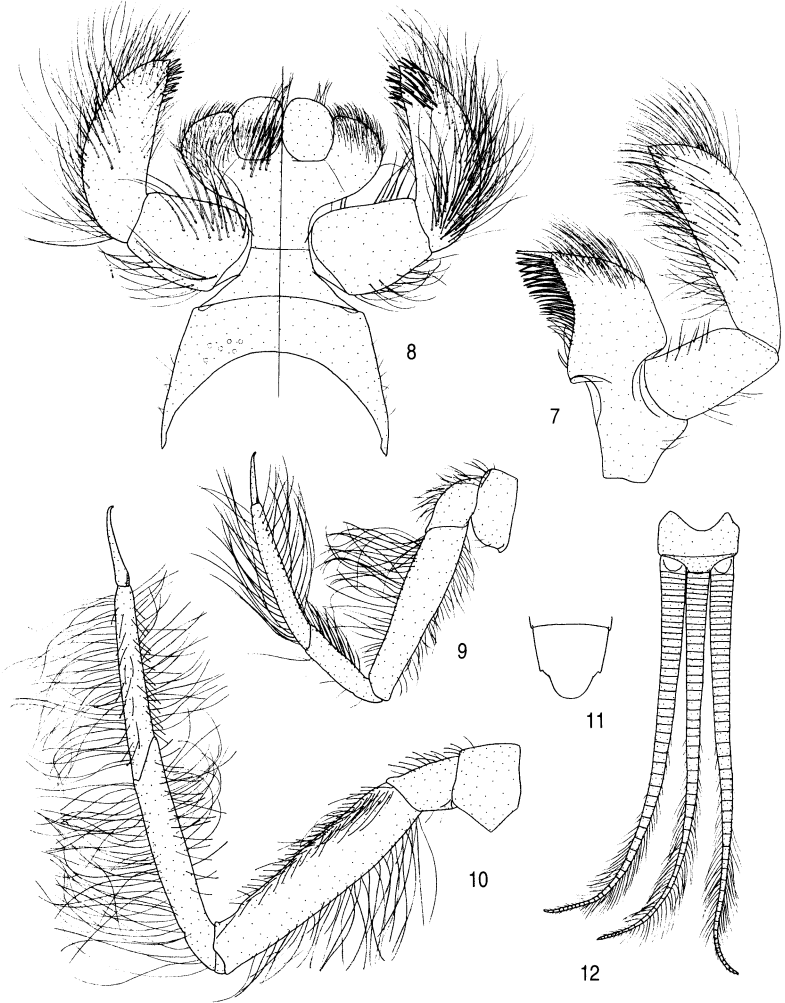
³ Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan S7N 5E2.

one-third. Antennae (Fig. 2) pale; pedicel length ranging from slightly longer to 1.5 times length of scape. Clypeus with moderately long setae. Labrum (Fig. 3) dorsally with dense, moderately long setae; lateral margins convex; medioapical margin straight. Mandibles as in Figures 4 and 5. Hypopharynx (Fig. 6) with superlinguae nearly triangular in lateral aspect. Maxillae (Fig. 7) with palp segment 2 twice length of segment 1, tapering to bluntly pointed apex. Labium (Fig. 8) with palp segment 2 approximately 1.5 times length of segment 1, with tuft of approximately 20 to 25 spines in apical one-fourth to one-fifth of medial margin and inner face, and tapering to short point apically. Thoracic nota and pleura generally pale yellowish brown. Thoracic sterna pale. Lateral margins of pronotum slightly but broadly protruding (Figs. 1, 14). Prosternum and anterior margin of mesosternum with dense, long setae. Metanotum with dark posterior margin. Legs pale, unicolourous. Forefemora (Fig. 9) with row of dense, long setae along inner margin and moderately long setae along outer margin. Foretibiae (Fig. 9) with row of dense, long setae along inner margin. Foretarsi (Fig. 9) approximately 1.5 to 2.0 times length of foretibiae, and with rows of dense, long setae along both inner margin and outer margins. Hindfemora (Fig. 10) with row of dense, long setae along outer margin and row of short setae along inner margin. Hindtibiae and hindtarsi (Fig. 10) with rows of long setae along inner and outer margins, with setae on inner margin shorter on average. Hindtarsi subequal to hindtibiae in length. Hindclaw (Fig. 15) roughened with indistinct series of minute, rounded denticles. Abdomen (Fig. 1) with terga 1 and 2 pale yellowish brown; terga 2 and 3 with anterior margin broadly emarginate and



Figs. 1-6. *Cercobrachys cree* larva. 1. Head and body (dorsal). 2. Antenna. 3. Labrum. 4. Angulate mandible. 5. Planate mandible. 6. Hypopharynx.

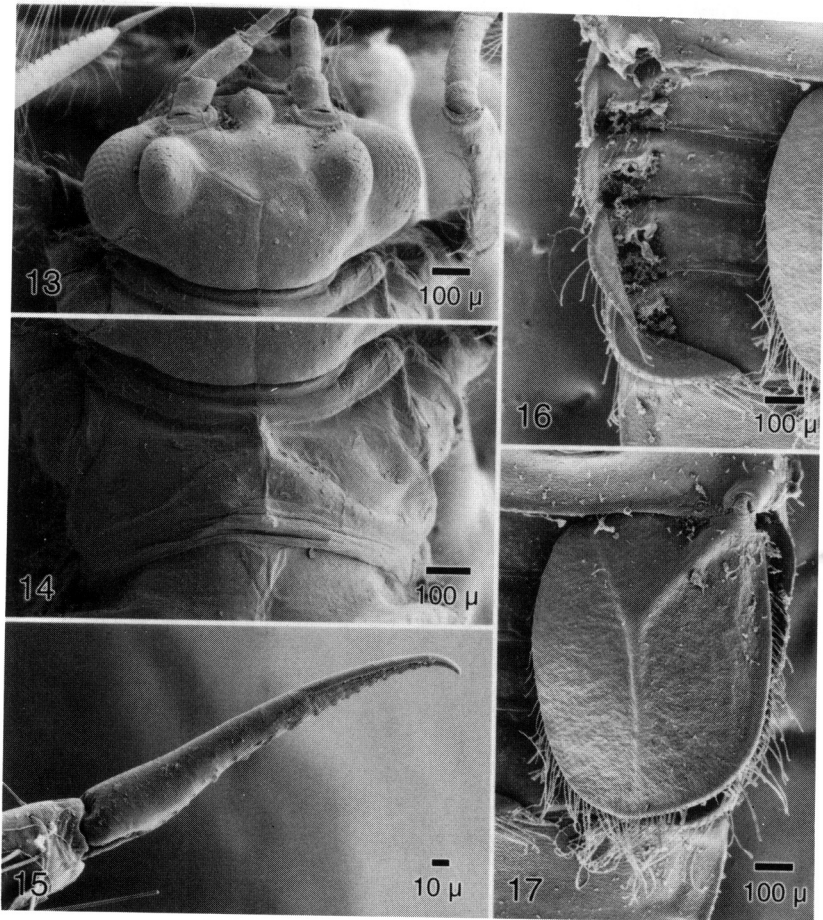
darkened in middle; terga 3-6 white; terga 7 and 8 pale grayish brown, lighter than terga 1 and 2; terga 9 and 10 pale. Sterna 1-7 pale yellowish brown, and 8-9 pale. Abdominal segment 2 (Fig. 1) with lateral edge only slightly protruding, not forming a conspicuous lateral process. Lateral processes on segment 3-6 as in Figure 16; process 6 strongly curved medially (Fig. 16); postero-lateral processes 7-9 (Fig. 1) small and pointed. Sternum 9 (Fig. 11) with posterior margin strongly



Figs. 7-12. *Cercobrachys cree* larva. 7. Maxilla. 8. Labium. 9. Foreleg. 10. Hindleg. 11. Abdominal sternum 10. 12. Caudal filaments.

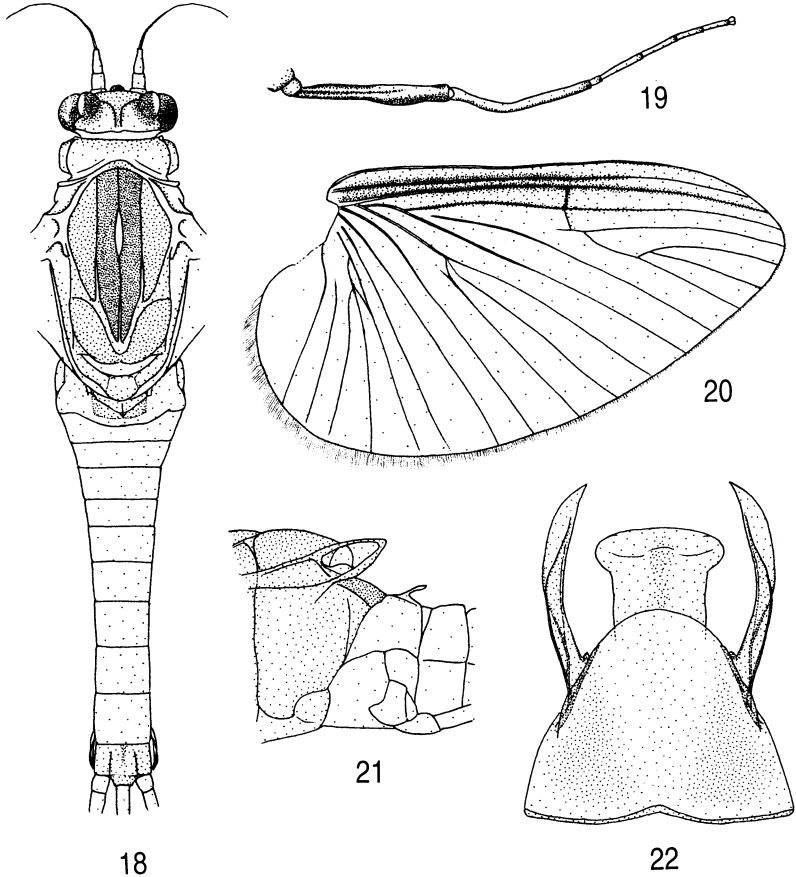
produced and convex. Operculate gills (Figs. 1,17) pale, unicolourous and somewhat translucent; posterior margin slightly rounded, with moderately long, fine setae; outer margin with moderately long, fine setae; inner margin with shorter and less extensive, fine setae anteriorly. Gills 3-6 white. Caudal filaments (Fig. 12) pale; larger more basal segment of distal third of filaments whorled with moderately long, fine setae; such setae absent in basal two-thirds of filaments and on smaller (approximately 10) most distal segments.

Male adult. Body length 4.5 mm. Wings length 3.2 mm. Head (Fig. 18) with epicranial suture narrowly bordered with diffuse black; frons and vertex area adjacent to epicranial sutures pale brown; occiput pale. Compound eyes black. Ocelli rounded apically; lateral ocelli with basal portion and adjacent vertex area black and apical portion clear; middle ocellus black, with



Figs. 13-17. *Cercobrachys cree* larva SEMs. 13. Head. 14. Pronotum. 15. Hindclaw. 16. Abdominal terga and processes 3-6 (left). 17. Operculate gill (right).

basal diameter three-fifths that of lateral ocelli. Antennae white; pedicel approximately 1.5 times length of scape. Pronotum (Fig. 18) pale, diffuse brown along anterior margin; prosternum white. Meso- and metanota (Fig. 18) together yellowish brown, with darker brown in medial longitudinal area of mesonotum; metanotum with small, flat median projection on posterior margin (Fig. 21). Meso- and metapleura pale brown. Meso- and metasterna white. Legs white. Forecoxae (Fig. 19) bordered by diffuse black. Forefemora (Fig. 19) with longitudinal, brown stripes. Foretibiae (Fig. 19) with apex blackish. Foretarsi (Fig. 19) segment 2 approximately 4 times length of segment 1; segments 3, 4, and 5 subequal to each other in length. Wings with Sc and R₁ margined with diffuse black, with R₂ margined somewhat less. Dorsal abdomen (Fig. 18) white, except tergum 10 with brownish borders. Ventral abdomen white, except sternum 9 (Fig. 22) with pair of large, triangulate, brownish stains laterally. Genitalia (Fig. 25) with forceps moderately long, slightly bowed, with apex pointed. Caudal filaments white.



Figs. 18-22. *Cercobrachys cree* male adult. 18. Head and body (dorsal). 19. Foreleg. 20. Wing (right). 21. Metathorax (lateral). 22. Sternum 9 and genitalia.

Material examined. All material cited here is deposited in the Purdue Entomological Research Collection, Purdue University, West Lafayette, Indiana. HOLOTYPE: Larva, Saskatchewan, North Saskatchewan R. at Borden Bridge, VII-27-1999, JMW. PARATYPES: One male adult (lab reared), Saskatchewan, South Saskatchewan R. at Lemsford Ferry, 51 01'23"N, 109 07'56"W, VIII-19-2001, JMW; three larvae, Saskatchewan, South Saskatchewan R. at Lemsford Ferry, 51 01'23"N, 109 07'56"W, VIII-20-2001, JMW. OTHER MATERIAL EXAMINED: Eight larvae, Saskatchewan, South Saskatchewan R. at Lemsford Ferry, 51 01'23"N, 109 07'56"W, VII-30-2000, JMW; eight larvae, Montana, Hill Co., Milk R. at St. Johns Bridge, VII-31-1999, JMW; 10 larvae, Montana, Powder River Co., Powder R. at Hwy 212, VII-17-1990, D. L. Gustafson; two larvae, Alberta, Milk R. N Aden, VII-31-1999, JMW.

Etymology. The specific epithet a noun in apposition and is after the native North American peoples known as the Plains Cree, original occupants of the region that includes the type locality of the new species.

Discussion. Larvae of *Cercobrachys cree* most closely resemble those of *C. serpentis* in that both share character states such as lateral ocellar tubercles with rounded apices and a pronotum with broad protruding lateral margins. Based on our comparison of the nearly mature type material of *C. serpentis* with larvae of the same age class of *C. cree* (in addition to material of fully mature larvae of *C. serpentis* from Idaho that we have in our possession with fully mature *C. cree*), the two species can be differentiated by the following characteristics: 1) the middle ocellar tubercle (Figs. 1, 13) is short and rounded apically, and although sometimes not completely rounded, the apex is never pointed as in *C. serpentis*; 2) the mediobasal margin of the labrum is straight rather than emarginate as in *C. serpentis*; 3) gills 2 (Fig. 1) are pale and unicolorous rather than being pigmented within the Y-ridge forks as in *C. serpentis*; and 4) the posterolateral processes on abdominal segment 7 (Fig. 1) are narrowly based and acute apically rather than being more broadly based and rounded apically as in *C. serpentis*. Larvae of the southeastern North American species *C. etowah* can be easily distinguished from *C. cree* in the larval stage by the presence of a sharply pointed middle ocellar tubercle, cone-shaped lateral ocellar tubercles, and well-developed, pointed lateral processes on the pronotum.

The adults of *C. cree* have a distinctive color pattern on the head (Fig. 18) that allows differentiation from adults of *C. etowah*, the only other North American species currently known in the adult stage. In *C. cree*, the area anterior to the epicranial suture is blackish, the area posterior to the epicranial suture is white, and the black pigment of the lateral ocelli diffuses into the adjacent vertex area. In *C. etowah* adults, the vertex and occiput are evenly light brown, and black pigment is confined between the lateral ocelli, without diffusing into the adjacent vertex area. Furthermore, *C. cree* adults possess a white abdomen and pale legs (with brown-striped forefemora), whereas in *C. etowah*, abdomen and legs are pale brown.

Cercobrachys cree was collected from sandy and silty substrates at the periphery of shifting sand bars and near the shore in large, warm, prairie rivers. In the South Saskatchewan River it has only been collected upstream of a hypolimnion dam. Lehmkuhl (1972) reported that other large river mayflies such as *Raptoheptagenia cruentata* (McDunnough) (reported as *Anepeorus rusticus* McDunnough), *Lachlania saskatchewanensis* Ide, *Acanthomola pubescens* Whiting and Lehmkuhl (as *Epeorus sp.*), and *Analetris eximia* Edmunds (as undescribed genus) were also absent downstream of that dam in the South Saskatchewan River.

C. cree evidently has an extended emergence period, because mature larvae have been collected from throughout mid July to early September in the South Saskatchewan River. Overwintering may occur in the egg stage, because no larvae have been collected in late fall or winter.

ACKNOWLEDGMENTS

We thank A. V. Provonsha and L. M. Jacobus (West Lafayette, Indiana) for critiquing the manuscript. We also acknowledge D. L. Gustafson (Bozeman, Montana) for collecting specimens. Scanning Electron Microscopy was conducted at the Life Science Microscopy Facility, Purdue University. Research was supported in part by NSF Ephemeroptera of North America grant DEB-9901577 to WPM. This paper has been assigned Purdue University ARP Journal No. 16665.

LITERATURE CITED

- Berner, L. and M. L. Pescador.** 1988. The mayflies of Florida, Rev. Ed. Univ. Presses Fla., Gainesville.
- Lehmkuhl, D. M.** 1972. Changes in thermal regime as a cause of reduction of benthic fauna downstream of a reservoir. *J. Fish. Res. Brd. Can.* 29: 1329-1332.
- McCafferty, W. P. and T.-Q. Wang.** 2000. Phylogenetic systematics of the major lineages of pannote mayflies (Ephemeroptera: Pannota). *Trans. Am. Entomol. Soc.* 126: 9-101.
- McCafferty, W. P., T. H. Klubertanz, R. P. Randolph, A. V. Provonsha, H. R. Lawson, and B. C. Kondratieff.** 2001. Mayflies (Ephemeroptera) of the Great Plains. I: Nebraska. *Trans. Am. Entomol. Soc.* 127: 5-29.
- Pescador, M. L., D. R. Lenat, and M. D. Hubbard.** 1999. Mayflies (Ephemeroptera) of North Carolina and South Carolina: an update. *Fla. Entomol.* 82: 316-332.
- Soldán, T.** 1986. A revision of the Caenidae with ocellar tubercles in the nymphal stage (Ephemeroptera). *Acta Univ. Carolinae – Biol.* 1982-1984: 289-362.
- Tshernova, O. A.** 1952. Mayflies (Ephemeroptera) of the Amur River Basin and adjacent waters and their role in the nutrition of Amur fishes. *Trudy Amur. Ichtiolog. Eksped.* 1945-1949: 230-360 (in Russian).