

THE NORTH AMERICAN SPECIES OF *CINYGMA*
(EPHEMEROPTERA: HEPTAGENIIDAE)

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Abstract

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A key to species for adults and figures of the three North American *Cinygma* are presented. New distribution records are given; the range of *C. lyriformis* McDunnough is extended to Alaska and the genus in the Palearctic is discussed. Nymphs are undescribed except for *C. integrum* (Eaton). The life history of the latter is given for Oregon. Nymphs of all size classes are present throughout the year but adult emergence is restricted to mid May to mid July. Nymphs apparently are restricted to a submerged wood habitat.

The three species in the genus *Cinygma* in North America are restricted to the mountainous regions of the west. Species are distinct and adults are easily identified if named specimens are available for comparison. The published literature however is not adequate to provide positive identification. The only coverage of all North American species (Traver 1935) gives a key to species which is based largely on color pattern. This is not satisfactory for poorly marked or alcohol faded specimens. In addition, the two *C. dimicki* illustrated by Traver (1935, fig. 99) appear very similar to *C. integrum*. The descriptions in Traver are extensive and useful and should be consulted for further information. Nymphs of *C. integrum* have been described (McDunnough 1933) but nymphs of the other species are unknown. When reared material for all species becomes available it is probable that characters for separating species will be easily found considering the color and other differences present in the adults. Edmunds *et al.* (1976) list the life cycle as unknown; they provide general information and keys to the genus.

This paper is based on specimens that have been collected or otherwise become available to me over the past 10 years, and also on material in the Canadian National Collection, Ottawa. In this paper, drawings of several specimens of each species are given to show variation, both of individuals and of preparations. All genitalia except Fig. 1 F (ventral view of a pinned specimen) are cleared slide mounts seen from dorsal view. The magnifications indicated in the captions indicate relative magnifications of the drawings; the extensive size variation of individuals in the same species can thus be seen. The abdomens are diagrammatic and not to scale.

***Cinygma* Eaton 1885**

Genotype: *Cinygma integrum* Eaton: Mount Hood, Oregon.

In North America the genus is known from Alaska, Alberta, British Columbia, Idaho, Wyoming, Nevada, California, Washington, and Oregon. *Cinygma* is Holarctic and Oriental in distribution (Edmunds *et al.* 1976). Adults are recognized by the medium body size (8-12 mm wing length), by the stigmatic crossveins which are divided into two rows of cellules by a vein which runs parallel between the costa and subcosta, by the basal tarsal segment of the front leg which is two-thirds to seven-eighths as long as the second, and by the penes which are fused in the basal half (Fig. 1 A-G). The penes also have characteristic ventral hooks or spines prominently shown in Fig. 1 D, E (arrow). Nymphs are characterized by three caudal filaments, the labrum which is one-eighth the width of the head, and the gills on segment one in which the lamellar portion is small and one-half the length of the fibrillar portion. The nymph of *C. integrum* was described by McDunnough (1933) based on reared material from British Columbia.

KEY TO NORTH AMERICAN SPECIES OF *Cinygma*

Adults

- 1a. Male with penes distinctly lyre-shaped, with a deep median notch and with apices directed outward (Fig. 1 F, G); both sexes with a jagged, blackish band on the posterior margin of each dorsal abdominal segment (Fig. 1 J); known distribution: Alberta, Oregon?, Alaska *Cinygma lyriformis* McDunnough
- 1b. Penes of male bilobed, not lyre-shaped (Fig. 1 A-E); dorsal abdomen not as in Fig. 1 J 2
- 2a. From dorsal view, each lobe of penes with a distinct notch (Fig. 1 C, D, E, arrow); dorsal abdomen of both sexes with at least some segments showing a pair of submedian bean-shaped or comma-shaped light markings (Fig. 1 H, arrow); known distribution: Washington, Oregon, British Columbia, Idaho, possibly Nevada *Cinygma integrum* (Eaton)
- 2b. From dorsal view each penis lobe smoothly rounded, no indication of a notch (Fig. 1 A, B); each abdominal segment with posterior and lateral dark lines (Fig. 1 I); known distribution: Oregon, Idaho, possibly California *C. dimicki* McDunnough

***Cinygma lyriformis* (McDunnough) 1924: 226**

This species was described from adults collected 30 July at Banff, Alberta. Allen (1955) records the species from Mary's River, Benton Co., Oregon, collected 26 May. I have not seen these specimens. I also have a specimen from Steese Hwy. (near Fairbanks), Mile 35 to 97.2, Alaska, 4 July 1968, Goeden and Jewett, Coll. The nymph has not been described and nothing is known of the biology of this species.

C. lyriformis is intermediate in color between the yellow *C. dimicki* and the brown *C. integrum* (pinned specimens). The abdomen appears ringed but the dark lines are dorsal only. The pattern of each segment (Fig. 1 J) is hyaline with a posterior blackish band, a pair of median lines extending forward, and lateral to these, a pair of triangular anterior projections. The markings appear blackish. There is no lateral pleural line as in *C. dimicki*.

A large pinned male (wing length 12 mm) without magnification appears as follows: eyes black, the thorax light chocolate brown, the abdomen pale yellow with dorsal rings on segments 1-6, the wings are clear and the veins lightly pigmented, the terminal segments of the abdomen are darker than the thorax, the caudal filaments are light brown, and the foreleg is brown with two darker bands on the femur. Ventrally the ganglia of the abdomen are dark and the sternites light yellow. A male in alcohol has lost all of the yellow color, and the ganglia are not distinct. Basic markings are as above.

***Cinygma dimicki* McDunnough 1934: 182**

C. dimicki was described from adults collected at Rock Creek, Philomath, Benton Co., Oregon, 1 May. I have adults from Oregon, Lane Co., Watershed 10, M.J. Andrews Forest, 6 mi NE Blue River, 10 Aug. 1972, N.H. Anderson, Coll. Another is from the same area, Mack Creek, 17 August 1975, E. Grafius, Coll. Allen (1955) did not list any additional localities for Oregon but Jensen (1966) recorded the species from Challis, Custer Co., Idaho, collection date 7 July. Day (1956) gives a probable record from California. Edmunds *et al.* (1976) reported that males swarmed over smooth water in the late afternoon and early evening, and that males were spaced about 3 ft apart and hovered or flew slowly in vertical motions. The nymph and its biology are unknown.

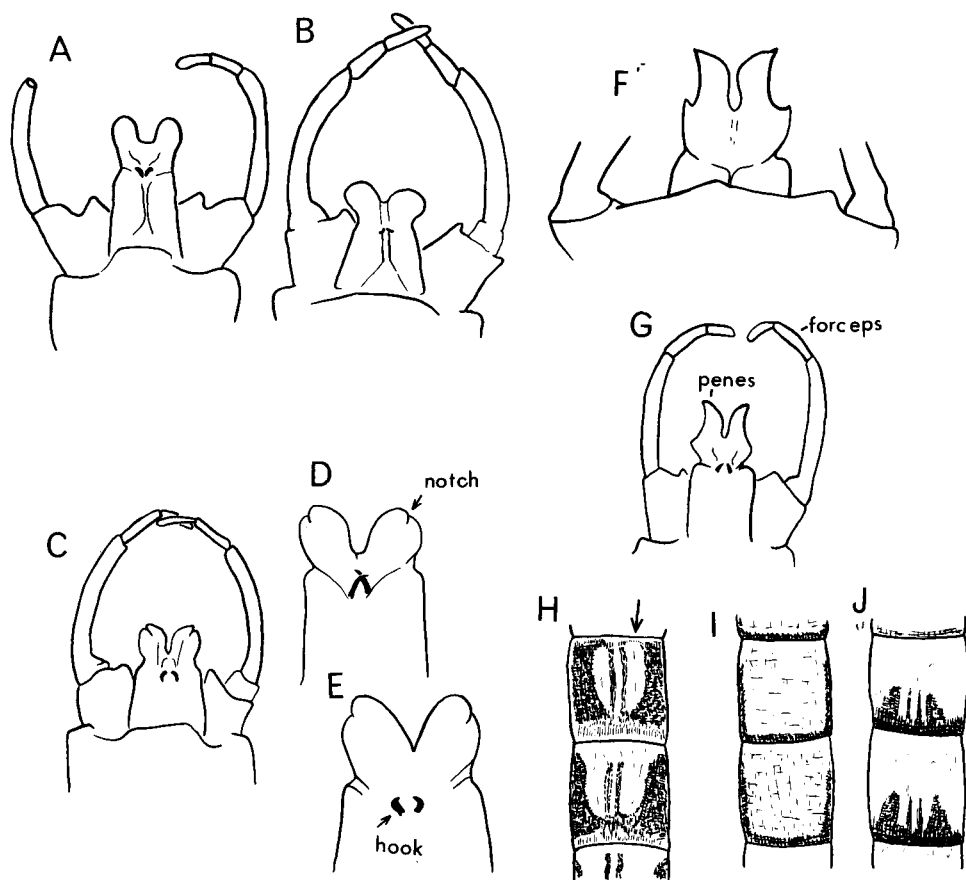


FIG. 1 (magnifications indicate relative sizes). A, *Cinygma dimicki* paratype (Oregon) 1×; B, *C. dimicki* (Oregon) 2×; C, *C. integrum* (Oregon) 1×; D, *C. integrum* (Oregon) 2×; E, *C. integrum* (Oregon) 2×; F, *C. lyriformis*, ventral view of pinned paratype (Alberta) 2×; G, *C. lyriformis* (no locality) 1×. Not to same scale, dorsal abdomens of adult males: H, *C. integrum*; arrow—see key; I, *C. dimicki*; J, *C. lyriformis*.

A striking feature in the material at hand is the size difference between specimens. The forewing of one specimen is 9 mm, in another just over 11 mm, but the body bulk makes the latter appear nearly twice as large as the former.

A pinned male, without magnification, appears light yellow-tan from the eyes to the tip of the abdomen including the caudal filaments. The fore femora have two brownish bands; the abdomen shows clearly the longitudinal pleural lines and irregular brown markings dorsally, but there is not a ringed appearance. The ventral abdomen is yellow. The wings are clear with distinct veins. Specimens in alcohol agree, retaining the dark markings, but the yellow color is lost.

Cinygma integrum Eaton 1885: 248

C. integrum is the type of the genus and was first collected from Mount Hood, Oregon. This is the widespread and common species of the genus, being known from Oregon, Washington, British Columbia, and Idaho. Undetermined nymphs from bordering areas may belong to this species.

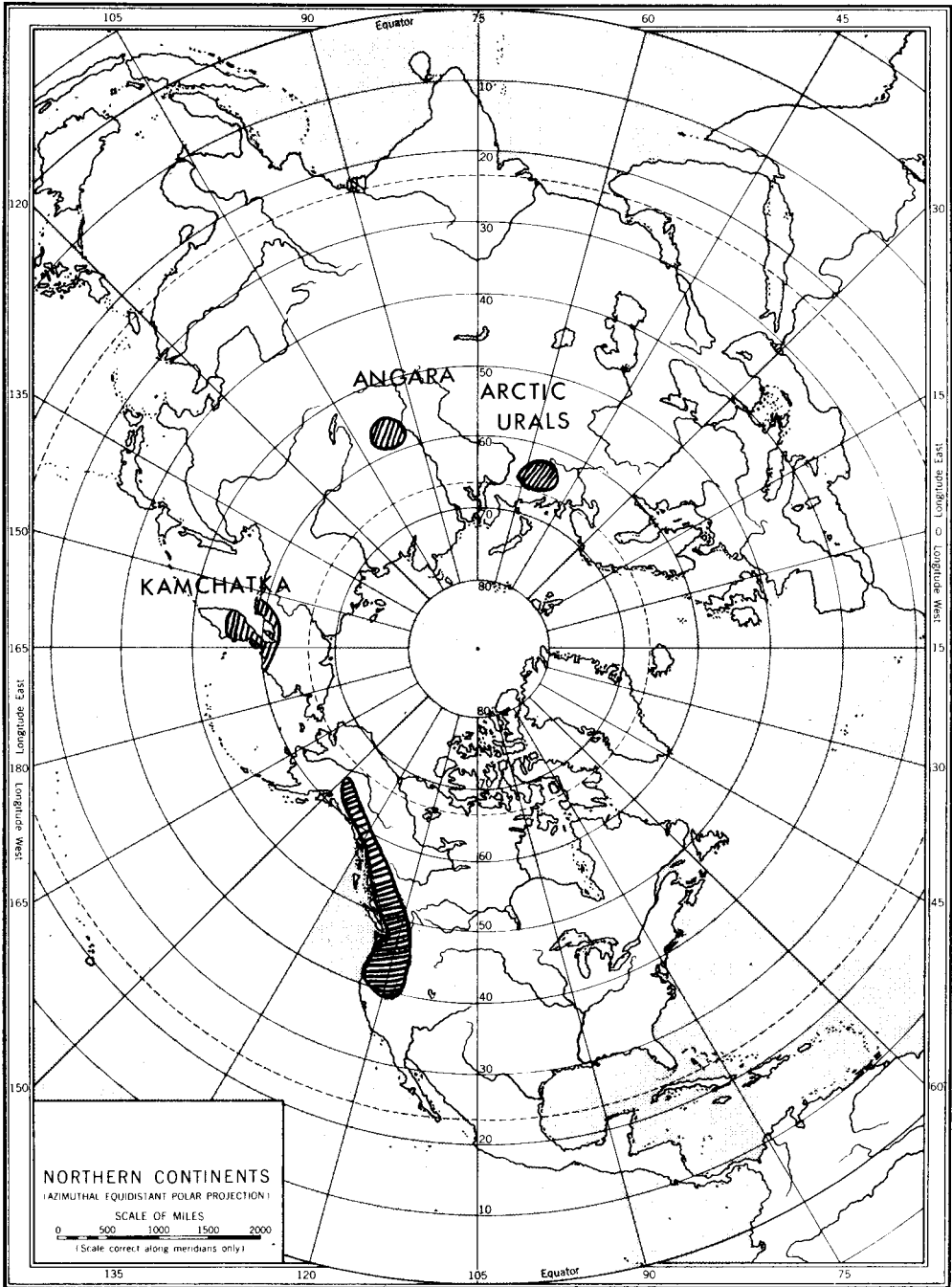


FIG. 2. Distribution of the genus *Cinygma* (questionable records from Japan not included).

Edmunds *et al.* (1976) report the life history of the species as unknown; I made the following observations at Oak Creek, Benton Co., Oregon (see Lehmkuhl and Anderson 1970 for description of area). Over 100 quantitative benthos samples were taken from the study area and nymphs of *C. integrum* were found to be entirely restricted to submerged wood in still or slow water. N.H. Anderson (pers. comm.) reports nymphs from riffle areas if wood is present.

Size distribution of nymphs through the year and observations on adults are as follows:

Nymphs: September, none in samples; October, 3–4 mm; November, none in samples (severe flooding); December, 5–10 mm; January, none in samples (severe flooding); February, none in samples (severe flooding); March, 2–7 mm; April, 2–10 mm; May, 2–9 mm; June, 2–9 mm; July, 3–8 mm; August, 3–8 mm. Adults (from an emergence trap at Oak Creek) were present from 19 May to 7 July 1968.

Based on the above, the species appears to have a long period of hatching since 2 mm nymphs were almost always present. There is a late spring and early summer emergence. The rather distinct period of adult emergence in Oak Creek would indicate a univoltine cycle. Cast skins from specimens which emerged in the laboratory were found free in the water, indicating nymphs do not climb emergent objects to transform to the winged state.

In alcohol, this is a black-eyed, brownish species with very distinct paired comma-shaped markings on some or most of the dorsal abdominal segments. The wings are clear with black veins. Pinned specimens, without magnification, appear darker than the other species; the eyes are black, the thorax dark brown, and the abdomen appears to have broad irregular brown rings on the middle segments. Brown bands on the fore femora are indistinct. The wings are clear with light brown longitudinal veins.

Discussion

This genus is distinctive in both the adult and immature stages, but its worldwide distribution has been uncertain because of the difficulty of bringing material together. Tschernova (1976) records *Cinygma abnorme* (formerly *Heptagenia abnormis* Tschernova) from Altai, upper Yenisei Basin (Angara River; 58N, 97E) and the upper and lower reaches of the Amur and Kamchatka (Fig. 2). She notes that the species is rarely found and concludes that "only one member of *Cinygma* found in the nymphal stage is currently known from the USSR". However, the genitalia figured in Tschernova (1964) of *Ecdyonurus peterseni* Lest. (fig. 60-1) is strikingly similar (but not identical) with that of *Cinygma lyriformis* McDunnough. The lyre shape and the ventral hooks (Fig. 1 F, G) are present in both. This species is listed as being from cold pure rivers in the arctic Urals and the Pechora River (Fig. 2).

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