

34 Compliments
Dick Allen

**NEOCHOROTERPES, A NEW SUBGENUS OF CHOROTERPES EATON
FROM NORTH AMERICA (EPHEMEROPTERA: LEPTOPHLEBIIDAE)¹**

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Abstract

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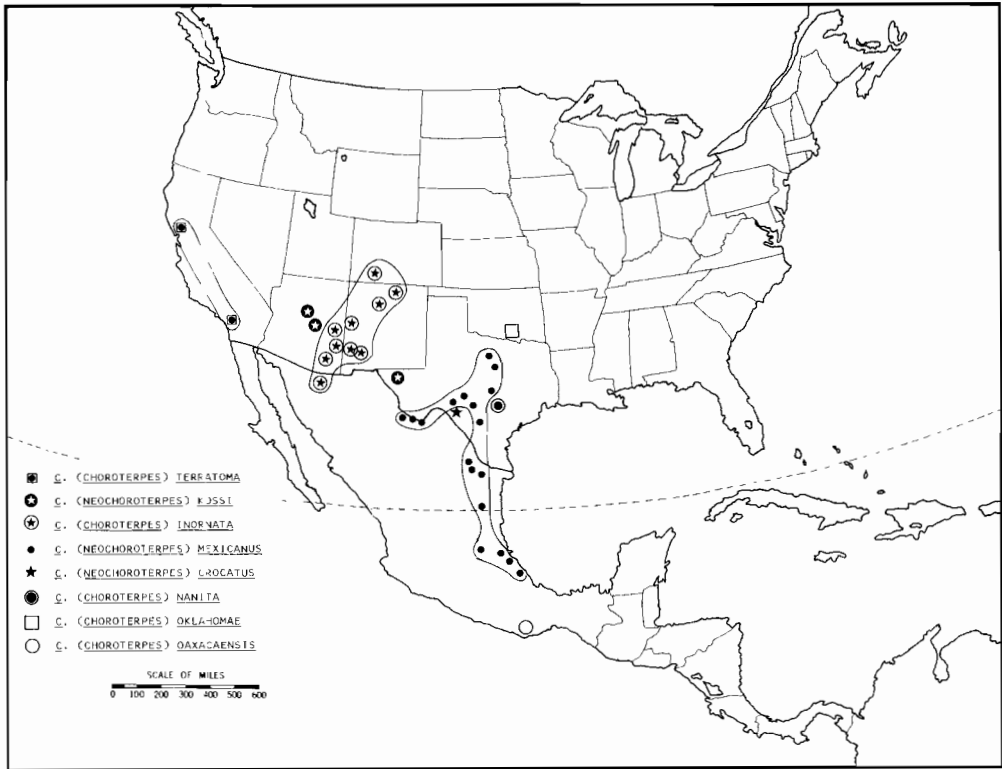
The North American species of *Choroterpes* are discussed and *Neochoroterpes* n. subgen. is established for *C. mexicanus* n. sp., *C. crocatus* n. sp., and *C. kossi* n. sp. A distribution map is included for the southwestern species of *Choroterpes* s. str., and distribution map, key to the nymphs, descriptions of the known stages, and figures are presented for the species of *Choroterpes* (*Neochoroterpes*).

Eaton (1881) erected *Choroterpes* for the European species *C. picteti*, and 21 species are now included in the genus. Peters and Edmunds (1964) placed *Euthraulius* Barnard, 1932, as a subgenus of *Choroterpes* and distinguished the nymphal stages by characters of the gills on segments 2-7 and the adults by characters of the wings. *Choroterpes* s. str. is widely distributed in the world and has been reported from all biogeographic realms except the Australian. *Euthraulius* is known only from the Old World in the Ethiopian, Oriental, and Palearctic regions.

In North America there are 10 described species. Five of these, *Choroterpes basalis* Banks, 1900, *C. albiannulata* McDunnough, 1924, *C. ferruginea* Traver, 1934, *C. fusca* Spieth, 1938, and *C. hubbelsi* Berner, 1946, are from eastern North America. The remaining five species, known from the southwestern United States, together with three new species, are mapped (Map 1). Eaton (1892: 1-16) described *C. inornata* from adults collected in northern Sonora and Arizona, and Kilgore and Allen (1973) associated the nymphal stage based on specimens collected from several localities in southern Arizona and New Mexico. In 1927, Seemann described *C. terratoma* from nymphs and subadults collected in southern California, Traver (1935) described the male and female imagoes, and Day (1956) reported specimens from northern California. *Choroterpes nanita* and *C. oklahomae* were described by Traver (1934) from male imagoes collected respectively from Austin, Texas and Murray Co., Oklahoma. The nymphal stages of both species are unknown. Brusca and Allen (1973) described the nymph of *C. oaxacaensis* from southern Mexico and this is the only North American species currently known only from an immature stage.

Collection and rearing studies in the southwestern United States and Mexico have revealed three additional undescribed species of *Choroterpes*. *Choroterpes mexicanus* n. sp. is widely distributed from southern Mexico to northern Texas and subimagoes have been reared from nymphs collected in Mexico. *Choroterpes crocatus* n. sp. is known from nymphs collected in southwestern Texas, and *C. kossi* n. sp. is known from nymphs collected in western Texas and central Arizona. Adults of *C. mexicanus* would appear to belong in the subgenus *Choroterpes* as the fore wing vein MA is forked one-half the distance from the base to the wing margin (Fig. 2a) and the base of the costal projection of the hind wing is smoothly curved (Fig. 3). The nymphs of *C. mexicanus*, *C. crocatus* and *C. kossi*, on the other hand, could be placed in *Euthraulius* as the gills on segments 2-7 terminate in three long processes (Figs. 12b-c, 13b-c) rather than a long median and a short lateral

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MAP 1. Distribution map of *Choroterpes* s. str. and *Neochoroterpes* in southwestern United States and Mexico.

process as in subgenus *Choroterpes* (Fig. 14b). The nymphs of the *C. mexicanus* group are further distinguished by the fact that in this group the setae on the labrum are scattered (Fig. 10) rather than arranged in transverse rows (Fig. 11) as in the subgenera *Choroterpes* s. str. and *Euthraulius*. A distinct gap in nymphal structure may be accompanied by a much less distinct gap in adult characters. Edmunds (1962) stated, "When groups are separated by a distinct gap in nymphal structure, but this gap is very weakly indicated or absent in the adults, I prefer to call the groups subgenera. The same applies equally when the gap appears only in the adult stage." This philosophy was practiced by Peters and Edmunds (1970) when they established the subgenera *Minyphlebia* for *Isca janiceae*, and *Tanycola* for *Isca serendiba*. The same philosophy is followed here and *Neochoroterpes* n. subgen. is erected for *C. mexicanus*, *C. crocatus*, and *C. kossi*.

Institutions where paratypes are deposited are indicated by the following abbreviations: North Texas State University (NTS); Smithsonian Institution (SI). Types without designation are deposited in the collection of the California State University, Los Angeles, and collections by the author are indicated by the initials RKA.

***Neochoroterpes* n. subgen.**

SUBIMAGO (reared). Body moderate in size. Fore wings opaque; vein R_2 forked about one-fourth distance from base to margin; vein MA forked less than one-half distance from base to margin, fork symmetrical; vein MP_2 independent of MP_1 ; cubital area as in Fig. 2a; cross-veins few; hind wings opaque; costal projection rounded and well developed, apex less than one-half distance from base to margin (Fig. 2b); tarsal claws dissimilar. Genitalia as in Fig. 4; penes divided, broad at base and pointed apically (Fig. 5). Ninth sternum of female entire.

NYMPH. Body moderate in size. Head prognathous; antennae more than 1.5 times maximum length of head; labrum with scattered dorsal setae and anteromedian margin shallowly emarginate (Fig. 10); mandibles as in Figs. 6-7; maxillae with apical and median setae; maxillary palpi long, basal and middle segments subequal and longer than apical segment (Fig. 8); labium as in Fig. 9; labial palpi long, basal segment longest, apical shortest. Legs with setae and spines (Fig. 1); tarsal claws with marginal denticles; tracheal gills on segments 1-7; gills on segment 1 variable, with a single filament (Fig. 14a) or with a lateral branch (Figs. 12a, 13a); gills on segments 2-7 similar with a long median and long lateral processes (Figs. 12b-c, 13b-c); gill lamellae longest on segment 2, shortest on segment 7. Abdominal terga without tubercles; segments 2-9 with posterolateral projections, projections well developed on segments 6-9. Caudal filaments longer than body; filaments with rows of short transverse spines at apex of each segment.

Type-species. *Choroterpes* (*Neochoroterpes*) *mexicanus* n. sp.

The following key will serve to distinguish the nymphs of the subgenus *Neochoroterpes*.

KEY TO THE SPECIES

1. Gill on segment 1 with a lateral branch (Figs. 12a, 13a); abdominal terga light brown to brown with black submedian maculae (Fig. 1); femora light brown with a dark longitudinal streak (Fig. 1) *C. mexicanus* n. sp.
- Gill on segment 1 a single filament, without a lateral branch as in Fig. 14a; abdominal terga dark brown with a pale median longitudinal stripe (Fig. 17), or pale with oblique lateral markings (Fig. 15); femora without markings or with a subapical band (Fig. 19) 2
- 2(1). Abdominal terga pale with oblique lateral maculae on segments 1-8 (Fig. 15); femora yellow and without markings; body less than 6 mm in length; gills on segments 2-7 with thin delicate terminal processes (Fig. 16) *C. crocatus* n. sp.
- Abdominal terga brown with a pale median longitudinal stripe (Fig. 17); femora light brown with a subapical dark macula (Fig. 19); body more than 8 mm in length; gills on segments 2-7 with thick heavy terminal processes (Fig. 18) *C. kossi* n. sp.

***Choroterpes* (*Neochoroterpes*) *mexicanus* n. sp.**

MALE SUBIMAGO. Length: body 5.0-6.0 mm; fore wings 6.0-7.0 mm. General color brown with black markings. Head brown; compound eyes pale above, dark below; ocelli pale, margined with black. Thorax mahogany brown; thoracic nota with a pale median longitudinal stripe and paired sublateral longitudinal black stripes; thoracic sutures pale and margined with black; legs light brown with black markings; fore femora with median and apical black markings; middle and hind femora streaked with black and a prominent black apical macula; tibiae and tarsi streaked with black; wings opaque; longitudinal veins brown. Abdominal terga 1-10 with lateral triangular-shaped black markings (Fig. 1); abdominal sterna pale; genitalia pale and as in Fig. 4; penes (Fig. 5). Caudal filaments light brown with black annulations.

FEMALE SUBIMAGO. Length: body 5.0-6.0 mm; fore wings 6.0-7.0 mm. General color brown with dark markings. Head brown, compound eyes black. Thorax brown, not as dark as male; legs pale, without black markings; wings opaque; longitudinal veins pale. Abdomen brown; abdominal terga 1-8 with black markings, markings more diffuse than in male; abdominal sterna brown. Other characters as in male except for usual sex differences.

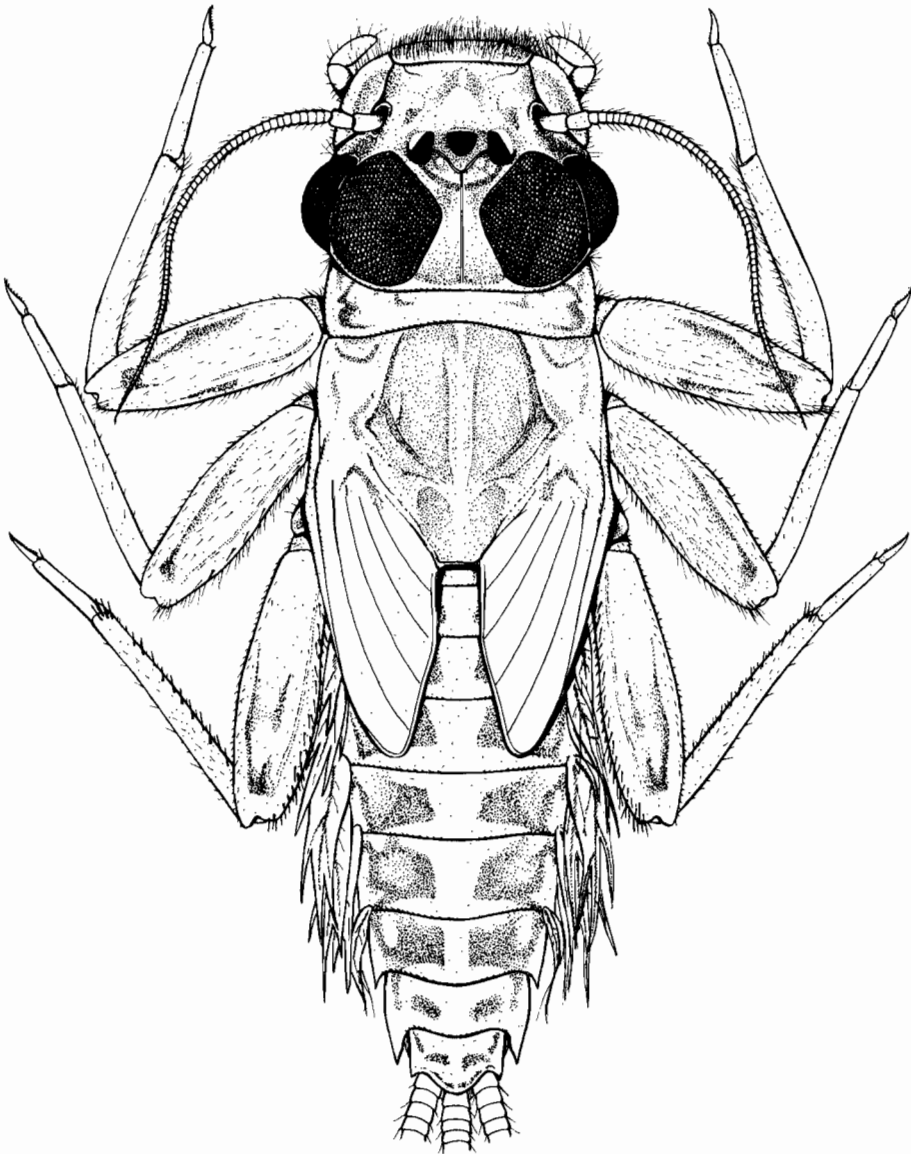
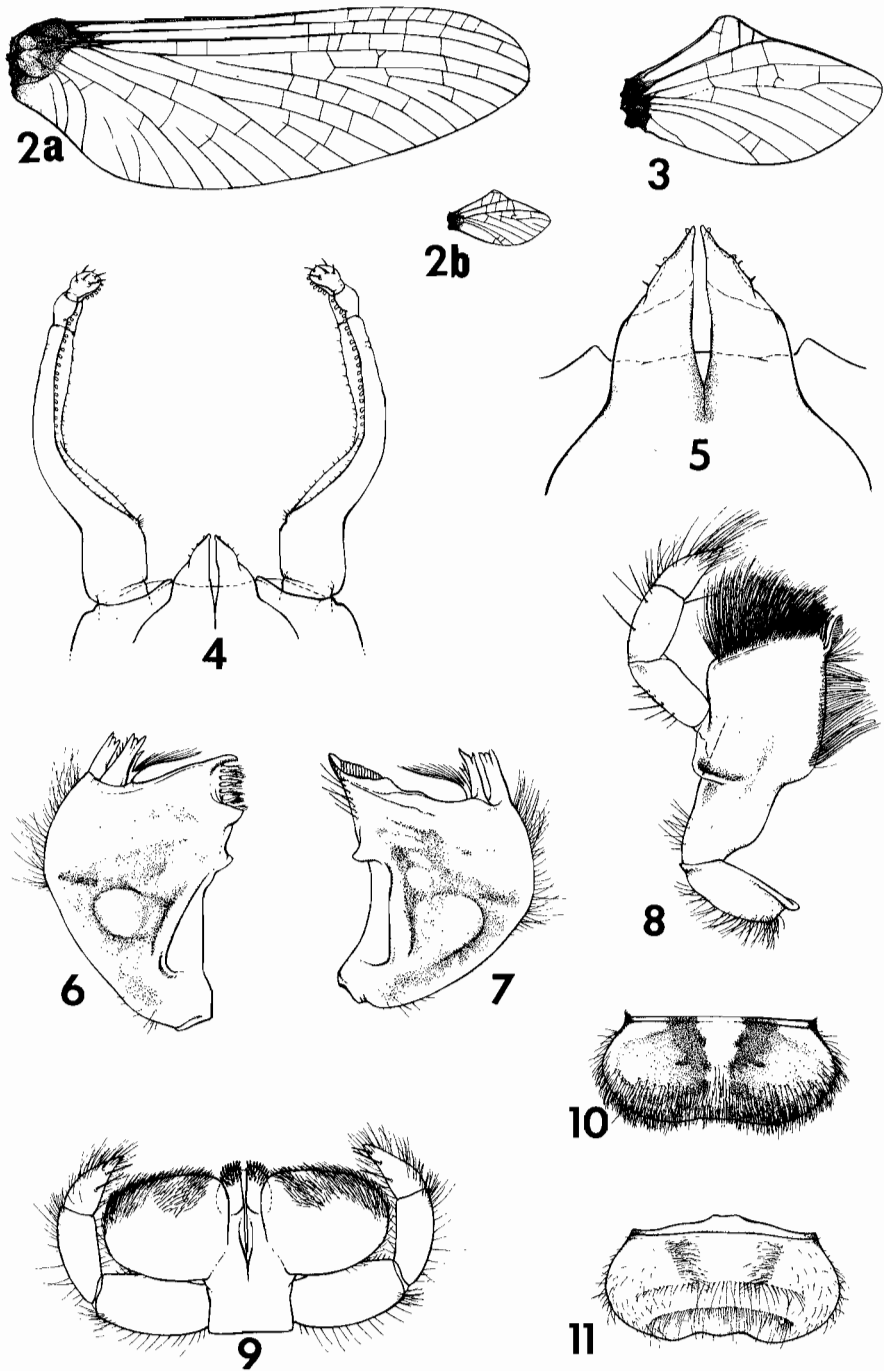
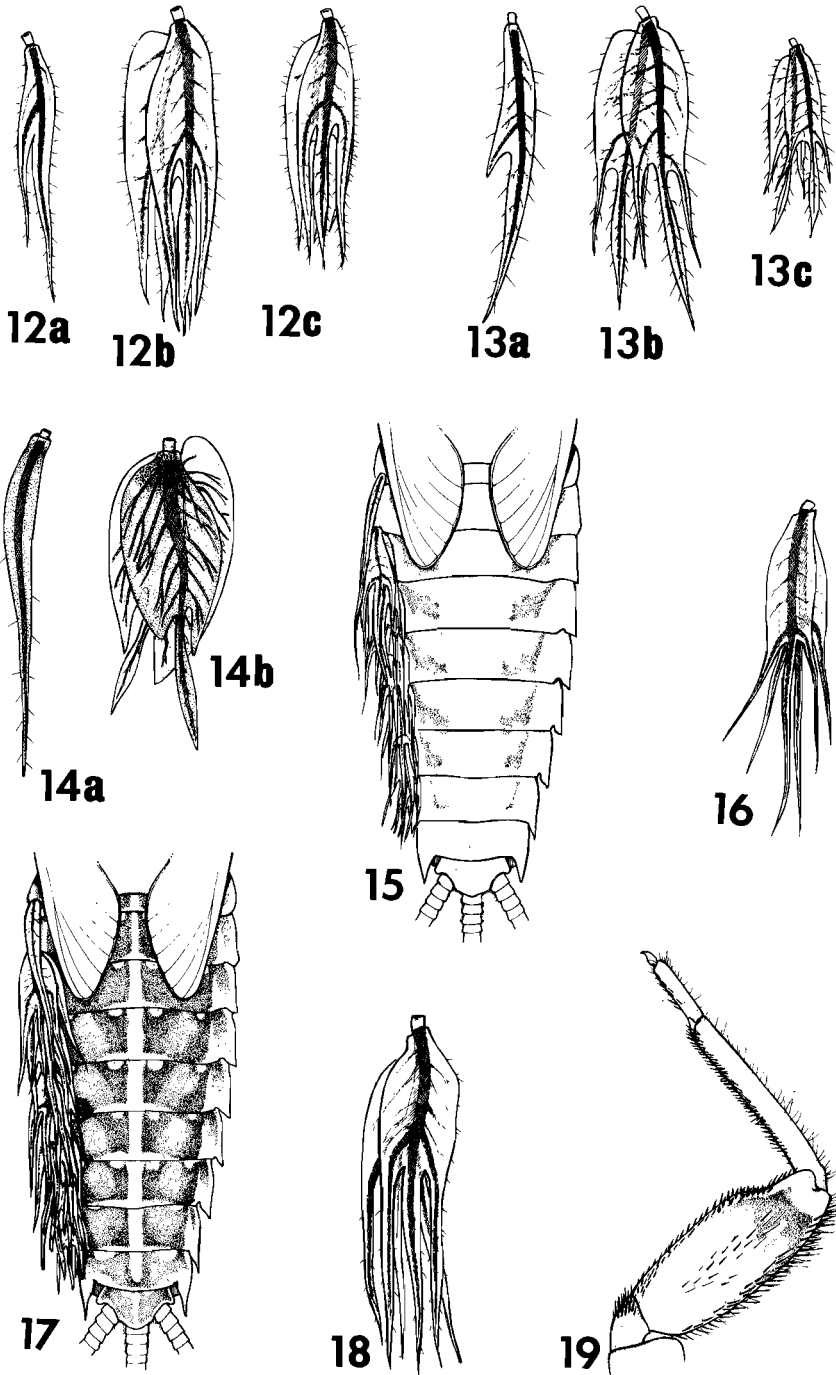


FIG. 1. *Choroterpes (Neochoroterpes) mexicanus*, mature nymph, dorsal view.

MATURE NYMPH. Length: body 7.0–8.0 mm; caudal filaments 9.0–11.0 mm. General color light brown to brown with variable black markings. Head light brown to brown with variable black markings (Fig. 1). Thoracic nota light brown to brown with variable black markings; pronotum usually with paired sublateral and submedian black markings; mesonotal scutum usually suffused with black and often with sublateral black markings; legs pale to light brown with black markings; femora with a black longitudinal streak, length and intensity variable; tibiae and tarsi without markings; tarsal claws with 10–12 marginal denticles. Abdominal terga light brown to brown with black markings; terga 1–8 with large lateral black maculae; terga 9–10 with small anterolateral and submedian black markings; abdominal gills pale, opaque, and with black trachea; gills on segment 1 with a lateral branch, branch variable in length (Figs. 12a, 13a); abdominal sterna pale to light brown. Caudal filaments light brown.



FIGS. 2-10. *Choroterpes (Neochoroterpes) mexicanus*. 2-5, adult structures: 2a-b, wings: a, fore wing; b, hind wing; 3, hind wing (enlarged); 4, male genitalia; 5, penes, dorsal view. 6-10, nymphal mouthparts: 6, left mandible; 7, right mandible; 8, maxilla; 9, labium; 10, labrum. FIG. 11. *Choroterpes (Choroterpes) inornata*, labrum.



FIGS. 12-13. *Choroterpes (Neochoroterpes) mexicanus*, nymphal structures. 12a-c, gills, mature nymph: a, gill 1; b, gill 3; c, gill 5; 13a-c, gills, immature nymph: a, gill 1; b, gill 3; c, gill 5. FIG. 14. *Choroterpes (Choroterpes) oaxacaensis*, gills. a, gill 1; b, gill 3. FIGS. 15-16. *Choroterpes (Neochoroterpes) crocatus*, nymphal structures. 15, abdominal terga; 16, gill 3. FIGS. 17-19. *Choroterpes (Neochoroterpes) kossi*, nymphal structures. 17, abdominal terga; 18, gill 3; 19, right fore leg.

TYPES. Holotype: mature nymph, Rio Sabinas, Nuevo Leon, Mexico, 4-VII-66, R. K. Allen, in collection California Academy of Sciences, San Francisco. Paratopotypes: 86 male subimagoes, 1 female subimago, and 93 nymphs, same data as holotype, 10 male subimagoes and 10 nymphs in collections California Academy of Sciences; Florida A. & M. University, Tallahassee; University of Utah, Salt Lake City; and the Canadian National Collection, Ottawa; remainder in collection California State University, Los Angeles. Paratypes: MEXICO. *Nuevo Leon*: 62 nymphs, Rio Salinas, Cienega de Flores, 6-VII-66, 25-XI-68, RKA; 13 nymphs, Rio Salinas, Sabinas Victoria, 4-VIII-70, RKA; 14 nymphs, Rio Pesqueria, Villa de Garcia, 5-VIII-70, RKA. *Tamaulipas*: 1 nymph, Rio Purification nr. Ciudad Victoria on Highway 85, 6-VII-66, RKA. *Chihuahua*: 11 nymphs, Rio Concho, Ojinaga, 28-VII-70, RKA. *San Luis Potosi*: 3 nymphs, Cueva de la Puente, 40 km E. San Luis Potosi, 16-V-72, W. Elliott, R. Ralph, & M. McEachern (SI); 4 nymphs, Trib. Rio Axtla, 2 mi N. Metalpa, 9-VII-66, RKA. *Vera Cruz*: 8 nymphs, Rio Piedras Negras, Piedras Negras, nr. Poza Rica, 12-XI-68, RKA; 11 nymphs, Rio Paso de Ovejas, Paso de Ovejas, 10-XI-68, RKA. TEXAS. *Bandera Co.*: 6 nymphs, Hondo Cr., 4 mi W. Tarpley, 2-VIII-70, RKA; *Bosque Co.*: 31 nymphs, Bosque Riv., 10-VIII-70, RKA; *Brewster Co.*: 4 nymphs, Rio Grande at Lejitas, 29-VII-70, RKA; *Kimble Co.*: 6 nymphs, Stream, 14 mi N. Harper, 31-VII-70, RKA; *Palo Pinto Co.*: 10 nymphs, Brazos River, 12-IX-70, 17-X-70, 23-III-72, B. Stark (NTS); 3 nymphs, Brazos River, Worth Ranch, 22-XII-67, K. W. Stewart (NTS); *Presidio Co.*: 3 nymphs, Rio Grande, 10 mi E. Redford, 29-VII-70, RKA; *Real Co.*: 2 nymphs, Fio Riv. at Rio Frio, 2-VIII-70, RKA; *Williamson Co.*: 8 nymphs, San Gabriel Riv., 1 mi S. Jonah on Farm Rd. 1660, 10-VIII-70, RKA.

REMARKS. Nymphs and subimagoes are distinguished from all other described species of *Choroterpes* by the abdominal color pattern, and in male subimagoes by the shape of the penes. The nymphal stage is further distinguished by the character of the gill on segment 1 which possesses a lateral branch. The length of the branch is variable, and the degree of development appears to be related to nymphal age. The branch is well developed in mature specimens and poorly developed in young (Figs. 12a, 13a). The degree of development of the lateral processes of gills 2-7, relative to the median process, also appears to be dependent upon the age of the nymph. They are longer, and nearly subequal to the median process, in older nymphs (Figs. 12b-c, 13b-c). Subimagoes emerge in early July in Mexico and nymphs have been collected from March to December in Mexico and Texas.

Choroterpes (Neochoroterpes) crocatus n. sp.

MATURE NYMPH. Length: body 4.5-5.5 mm; caudal filaments 6.5-7.5 mm. General color yellow with black markings. Head yellow. Thoracic nota yellow; legs yellow; tarsal claws with 10-12 denticles. Abdominal terga yellow; terga 1-8 with sublateral oblique black maculae, maculae indistinct on segment 8; terga 9-10 yellow (Fig. 15); gills delicate (Fig. 16); gills on segment 1 a single filament; gills pale and opaque; abdominal sterna yellow. Caudal filaments yellow.

TYPES. Holotype: mature male nymph, Rio Frio River at Cancan on Highway 127, Uvalde Co., Texas, 1-VIII-70, R. K. Allen, in collection California Academy of Sciences, San Francisco. Paratopotype: 1 nymph, in collection California State University, Los Angeles.

Choroterpes (Neochoroterpes) kossi n. sp.

MATURE NYMPH. Length: body 8.5–9.5 mm; caudal filaments 9.0–10.0 mm. General color light brown with gray markings. Head light brown with gray markings. Thoracic nota light brown, often with gray and dark markings; legs light brown with gray markings; femora often suffused with gray and with a gray subapical macula (Fig. 19); tibiae and tarsi suffused with gray; tarsal claws with 10–12 marginal denticles. Abdominal terga brown with a pale median longitudinal stripe and pale margins (Fig. 17); terga often with pale submedian spots; gills robust (Fig. 18); gills on segment 1 a single filament; gills pale and opaque; abdominal sterna light brown. Caudal filaments light brown.

TYPES. Holotype: mature nymph, East Verde River on Highway 87, N. Payson, Gila Co., Arizona, 8–IV–68, R. W. Koss & R. W. Baumann, in collection University of Utah, Salt Lake City. Paratopotypes: 11 nymphs, same data as holotype, 2 each in collections California State University, Los Angeles, California Academy of Sciences, San Francisco, Florida A. & M. University, Tallahassee, Canadian National Collection, Ottawa, and 3 in collection R. W. Koss. Paratypes: 35 nymphs, Oak Creek S. Flagstaff, Coconino Co., Arizona, 9–IV–68, R. W. Koss & R. W. Baumann, 5 each in collections of R. W. Koss, Florida A. & M. University, and California State University, Los Angeles, remainder in collection University of Utah; 1 nymph McKittrick Canyon, Guadalupe Mtns. Natl. Pk., Culberson Co., Texas, 10–I–70, M. E. Sanderson, in collection University of Utah.

REMARKS. The nymphs of *C. (N.) kossi* are nearly mature in early April and the adults probably emerge in late April or early May.

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