

LEPTOPHLEBIIDAE OF THE SOUTHWESTERN UNITED STATES AND NORTHWESTERN MEXICO (INSECTA: EPHEMEROPTERA)

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ABSTRACT.—Collections of mayflies of the Leptophlebiidae, genera *Choroterpes* Eaton, *Paraleptophlebia* Lestage, *Thraulodes* Ulmer, and *Traverella* Edmunds from the southwestern United States and northwestern Mexico are reviewed. *Choroterpes* (*Choroterpes*) *oaxacaensis* Brusca & Allen is synonymized with *C. (C.) inornata* Eaton. The nymph described as *Thraulodes* species "D" Allen & Brusca is the nymph of *T. arizonicus* McDunnough. New distributional records extend the known ranges of *C. inornata*, *C. (Neochoroterpes) mexicanus* Allen, *Paraleptophlebia memorialis* (Eaton), *T. arizonicus*, *T. brunneus* Koss, *T. salinus* Kilgore & Allen, *T. speciosus* Traver, *Traverella albertana* (McDunnough), and *T. castanea* Kilgore & Allen.

A study of collections of mayflies belonging to the family Leptophlebiidae from Arizona, New Mexico, and Texas in the United States and from Chihuahua, Sonora, and Sinaloa in Mexico has revealed new distribution records for species in the genera *Choroterpes* Eaton, *Paraleptophlebia* Lestage, *Thraulodes* Ulmer, and *Traverella* Edmunds. Collections by the authors are labeled by the initials C.M.M. and/or R.K.A., and their specimens have been deposited in the California Academy of Sciences, San Francisco. Specimens collected by B. C. Kondratieff and R. W. Baumann were deposited in the collection of Brigham Young University, Provo, Utah.

Genus *Choroterpes* Eaton

The subgenera *Choroterpes* and *Neochoroterpes* Allen occur in the geographic area considered by this manuscript.

Choroterpes (*Choroterpes*) *inornata* Eaton

Choroterpes inornata Eaton 1892: 6; Kilgore & Allen 1973: 321 (nymph).

Choroterpes oaxacaensis Brusca & Allen 1973: 137. NEW SYNONYMY.

Brusca and Allen (1973) noted that the nymphs of *C. nervosa* Eaton and *C. inornata* were unknown and that the nymph described as *C. oaxacaensis* may eventually be found to be the nymph of the former species, as many Central American species occur in tropical Mexico. The nymph of *C. inornata* was described by Kilgore and Allen (1973) from spec-

imens collected in Arizona and New Mexico, and a comparison of these nymphs with the type specimen of *C. oaxacaensis* reveals that they belong to a single species and therefore *C. inornata*.

DISTRIBUTION: This species is now known from southern Mexico (17° N lat.) to southern Colorado (37° N lat.).

NEW RECORDS: Arizona: Santa Cruz Co., Sycamore Canyon, 16.1 km W of Pena Blanca, 17-VIII-86, B. C. Kondratieff & R. W. Baumann. Mexico: Sonora. Rio Cuchujaqui, 16.3 km SE of Alamos, 16-I-1983, R.K.A. & C.M.M.; stream at Hacienda Cochelesi, 41.6 km SE of Aqua Prieta, 12-I-1983, R.K.A. & C.M.M.; Rio Sonora, between Uras and Mazacahui, 14-I-1983, R.K.A. & C.M.M.; stream 21.2 km N of Hwy 11 near Movas, 15-I-1983, R.K.A. & C.M.M. Sinaloa. Rio Arroyo, 53.3 km N of Elota, 14-X-1968, R.K.A.; stream 1.6 km N of El Viola, 18-I-1983, R.K.A. & C.M.M.; Rio Evora Mocerita near Mocerita on Hwy 21, 17-I-1983, R.K.A. & C.M.M. Chihuahua. Rio Pacheco, 69.4 km SW of Colonia Juarez, 27-VIII-86, B. C. Kondratieff & R. W. Baumann.

Choroterpes (*Neochoroterpes*) *mexicanus* Allen

Choroterpes (Neochoroterpes) mexicanus Allen 1974: 163.

DISTRIBUTION: This species has been reported from central Texas (32° N lat.) to Chihuahua and Veracruz, Mexico (19° N lat.).

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NEW RECORDS: Mexico: Chihuahua. Rio Satevo at Gral Trias on Hwy 16, 13-VIII-1977, R.K.A. Texas: Burnet County, San Gabriel River, 16-IX-1975, R. G. McClure; Uvalde County, Nueces River on Hwy 90, 6-X-1973, R. G. McClure.

Genus *Paraleptophlebia* Lestage

This genus reaches its most southern distributional limits in the southwestern United States and only *P. altana* Kilgore & Allen and *P. memorialis* (Eaton) occur in this geographic region.

Paraleptophlebia memorialis (Eaton)

Leptophlebia memorialis Eaton 1884: 98.

Paraleptophlebia memorialis, Edmunds 1962: vii; Kilgore & Allen 1973: 325 (nymph).

DISTRIBUTION: This species is widely distributed in western North America from southern Alberta (53° N lat.) to Arizona and New Mexico (32° N lat.).

NEW RECORDS: Arizona: Apache County, stream at Greer, 27-VI-1966, R.K.A. Cochise County, Herb Martyr Lake, Chiricahua Mtns., 26-VI-1966, R.K.A. Graham County, Wet Creek at Wet Creek Canyon Camp, Pinaleno Mtns., 20-VII-1970, R.K.A.

Genus *Thraulodes* Ulmer

Allen and Brusca (1978) divided the genus into the *brunneus* (*brunneus*, *speciosus*) and the *gonzalesi* (*arizonicus*, *salinus*) groups based on nymphal characters.

Thraulodes brunneus Koss

Thraulodes brunneus Koss 1966: 91; Kilgore & Allen 1973: 325 (nymph).

DISTRIBUTION: This species is known to occur from central Arizona and New Mexico (34° N lat.) to near Cabo San Lucas, Baja California, and Sinaloa, Mexico (23° N lat.).

NEW RECORDS: Mexico: Chihuahua. Rio Satevo at Gral Trias on Hwy 16, 3-VIII-1977, R.K.A. Rio Pacheco, 69.4 km SW of Colonia Juarez, 27-VIII-86, B. C. Kondratieff & R. W. Baumann; Arroyo Mendoza, tributary to Rio Gavilan, Gavilan Ranch, 26-VIII-86, B. C. Kondratieff & R. W. Baumann. Sonora. Rio Chuchujaqui, 16.3 km SE of Alamos, 16-I-1983, R.K.A. & C.M.M.; stream 21.2 km N of Hwy 11 near Movas, 15-I-1983, R.K.A. & C.M.M.; stream W of Locata, 23-VIII-86, B.

C. Kondratieff & R. W. Baumann; Rio Maycoba, W of Maycoba, 21-VIII-86, B. C. Kondratieff & R. W. Baumann. Sinaloa. Stream 1.6 km N of El Viola, 18-I-1983, R.K.A. & C.M.M.

Thraulodes speciosus Traver

Thraulodes speciosus Traver 1934: 201; Mayo 1969: 103 (nymph).

DISTRIBUTION: This species has a narrow latitudinal distribution range as it is known only from central Arizona (35° N lat.) to Chihuahua and southern Sonora, Mexico (27° N lat.).

NEW RECORDS: Arizona. Santa Cruz Co., Sycamore Canyon, 16.1 km W of Pena Blanca, 17-VIII-86, B. C. Kondratieff & R. W. Baumann. Mexico: Chihuahua. Rio Satevo at Gral Trias on Hwy 16, 13-VIII-1977, R.K.A. Rio Pacheco, 69.4 km SW of Colonia Juarez, 27-VIII-86, B. C. Kondratieff & R. W. Baumann; Arroyo Guacomayo, tributary to Rio Gavilan, 26-VIII-86, B. C. Kondratieff & R. W. Baumann. Sonora. Rio Chuchujaqui, 16.3 km SE of Alamos, 16-I-1983, R.K.A. & C.M.M.; stream, 21.1 km N of Hwy 11 near Movas, 15-I-1983, R.K.A. & C.M.M. Vivora Creek, 22.6 km E of Yecora, 21-VIII-86, B. C. Kondratieff & R. W. Baumann.

Thraulodes arizonicus McDunnough

Thraulodes arizonicus McDunnough 1942: 117.

Thraulodes sp. "D" Allen and Brusca 1978: 422 (nymph).

Allen and Brusca (1978) described a species of nymph collected from several localities from Honduras to Nuevo Leon and Sinaloa, Mexico, as *Thraulodes* sp. "D." The nymphal species was given an informal epithet as several Mexican and Central American *Thraulodes* were unknown in the nymphal stage. Traver and Edmunds (1967) described the male imago of *T. arizonicus* as having a distinctive black apical band on tibiae I. The tibiae of the nymphs described as *Thraulodes* sp. "D," and the tibiae of other nymphs recently collected in Arizona and in Chihuahua, Sonora, and Sinaloa, Mexico, have a black band and all are herein assigned as the nymph of *T. arizonicus*. This placement appears to be almost certain as no other *Thraulodes* species from the southwestern United States or northern Mexico is without a known nymph. A mature nymph of *T. arizonicus* is described

and figured by Allen and Brusca (1978: 422).

DISTRIBUTION: This species is now known from Arizona (35° N lat.) to Honduras (14° N lat.). The very broad latitudinal distribution of this species, from the southwestern United States to tropical Mexico and Central America, is essentially the same as the distributions of *Leptohyphes ferruginus* Allen, *L. packeri* Allen, and *Choroterpes inornata*.

NEW RECORDS: Arizona. Santa Cruz Co., Sycamore Canyon, 16.1 km W of Pena Blanca, 17-VIII-86, B. C. Kondratieff & R. W. Baumann. Mexico: Chihuahua. Arroyo Guacomayo, tributary to Rio Gavilan, 26-VIII-86, B. C. Kondratieff & R. W. Baumann; Rio Pacheco, 69.4 km SW of Colonia Juarez, 27-VIII-86, B. C. Kondratieff & R. W. Baumann. Mexico: Sonora. Rio Chuhuajqui, 16.3 km SE of Alamos, 16-I-1983, R.K.A. & C.M.M.; stream, 21.1 km N of Hwy 11 near Movas, 15-I-1983, R.K.A. & C.M.M. Sinaloa. Stream, 1.6 km N of El Viola, 18-I-1983, R.K.A. & C.M.M.; Rio Baluarte at Rosarito, 18-I-1983, R.K.A. & C.M.M.

Thraulodes salinus Kilgore & Allen

Thraulodes salinus Kilgore & Allen 1973: 325.

DISTRIBUTION: This species is now known from Arizona (34° N lat.) to southern Sinaloa (23° N lat.).

NEW RECORDS: Mexico: Chihuahua. Arroyo Guacomayo, tributary to Rio Gavilan, 26-VIII-86, B. C. Kondratieff & R. W. Baumann. Sonora. Rio Bavispe, 5 km SW of Colonia Moralia at dam, 12-I-1983, R.K.A. & C.M.M. Rio Maycoba, W of Maycoba, 21-VIII-86, B. C. Kondratieff & R. W. Baumann. Sinaloa. Rio Elota on Hwy 15 near Elota, 18-I-1983, R.K.A. & C.M.M.; Rio Baluarte at Rosarito, 18-I-1983, R.K.A. & C.M.M.

Traverella Edmunds

Allen (1973) revised the nymphal stages of the North and Central American species, including a key to the species.

Traverella albertana (McDunnough)

Thraulodes albertana McDunnough 1931: 82.

Traverella albertana Edmunds 1948: 142.

DISTRIBUTION: This species has the widest latitudinal distribution of any North American species with a range of more than 26°. Specimens have been collected from Saskatchewan,

Canada (54° N lat.), to Chihuahua, Mexico (28° N lat.).

NEW RECORD: Mexico: Chihuahua. Rio San Pedro at Meoque on Hwy 45, 14-VIII-1977, R.K.A.

Traverella castanea Kilgore & Allen

Traverella castanea Kilgore & Allen 1973: 327.

DISTRIBUTION: This species is now known to occur from Arizona (35° N lat.) to Chihuahua and southern Sinaloa (23° N lat.).

NEW RECORDS: Mexico: Chihuahua. Rio Saltivo at Gral Trias on Hwy 16, 13-VIII-1977, R.K.A. Sonora. Stream 21.1 km N of Hwy 11 near Movas, 15-I-1983, R.K.A. & C.M.M.; Rio Chuhuajqui, 16.3 km SE of Alamos, 16-I-1983, R.K.A. & C.M.M. Rio Macoba, W of Macoba, 22-VIII-86, B. C. Kondratieff & R. W. Baumann. Sinaloa. Rio Baluarte at Rosario, 18-I-1983, R.K.A. & C.M.M.

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LITERATURE CITED

- ALLEN, R. K. 1973. Generic revisions of mayfly nymphs. I. *Traverella* in North and Central America (Leptophlebiidae). Ann. Entomol. Soc. Am. 66: 1287-1295.
- . 1974. *Neochoroterpes*, a new subgenus of *Choroterpes* from North America (Ephemeroptera: Leptophlebiidae). Canadian Entomol. 106: 161-168.
- ALLEN, R. K., AND R. C. BRUSCA. 1978. Generic revisions of mayfly nymphs. II. *Thraulodes* in North and Central America (Leptophlebiidae). Canadian Entomol. 110: 413-433.
- BRUSCA, R. C., AND R. K. ALLEN. 1973. A new species of *Choroterpes* from Mexico (Ephemeroptera: Leptophlebiidae). Kansas Entomol. Soc. 46: 137-139.
- EATON, A. E. 1883-1888. A revisional monograph of recent Ephemeridae or mayflies. Trans. Linn. Soc. London, 2d Ser. Zool., No. 3. 352 pp.
- . 1892. Biologia Centrali-Americana: Insecta, Neuroptera, Ephemeridae. Barnard Quaritch, Ltd., London. 18 pp.

- EDMUNDS, G. F. 1948. A new genus of mayflies from western North America (Leptophlebiidae). Proc. Biol. Soc. Washington. 61: 141-148.
- . 1962. The type localities of the Ephemeroptera of North America north of Mexico. Univ. Utah Biol. Ser., No. 12. 39 pp.
- KILGORE, J. I., AND R. K. ALLEN. 1973. Mayflies of the Southwest: new species, descriptions and records (Ephemeroptera). Ann. Entomol. Soc. Amer. 66: 321-332.
- KOSS, R. W. 1966. A new species of *Thraulodes* from New Mexico (Ephemeroptera: Leptophlebiidae). Michigan Entomol. 1: 91-94.
- MAYO, V. K. 1969. Nymphs of *Thraulodes speciosus* Traver with notes on symbiotid chironomid (Ephemeroptera: Leptophlebiidae). Pan-Pacific Entomol. 45: 103-112.
- MCDUNNOUGH, J. 1931. New North American Caeninae with notes (Ephemeroptera). Canadian Entomol. 63: 254-268.
- . 1942. An apparently new *Thraulodes* from Arizona (Ephemera). Canadian Entomol. 74: 117.
- TRAVER, J. R. 1934. New North American species of mayflies (Ephemera). J. Elisha Mitchell Soc. 50: 189-254.
- TRAVER, J. R., AND G. F. EDMUNDS. 1967. A revision of the genus *Thraulodes* (Ephemeroptera: Leptophlebiidae). Misc. Publ. Entomol. Soc. Amer. 5: 349-395.