

MAYFLIES (EPHEMEROPTERA) OF THE  
CONCHO RIVER, TEXAS

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ABSTRACT—The mayfly fauna of the Concho River, Texas, consisted of 17 species in 7 families as determined from 12 collecting sites sampled at least once monthly for two years for both aquatic nymphs and aerial adults. Nymphs were reared to adults for positive association. *Leucocuta maculipennis* (Walsh) is reported from Texas for the first time. Adult descriptions of *Leptohyphes packeri* Allen and *Leptohyphes vescus* Allen, previously known from only the nymphal stage, are presented.

Prior to this study only two species of mayflies had been reported from the Concho River, Texas, *Callibaetis montanus* Eaton and *Isonychia sicca* Eaton (Traver, 1935). Although a number of species of mayflies are reported from Texas, their distributions in the streams of the state are largely unknown. Only two studies of the mayfly fauna in Texas' rivers have been made. Moore (1950) listed the species collected in Dallas County and in the major rivers between Dallas and San Antonio. Due to the poor taxonomic knowledge of the mayfly nymphs at that time his survey is of limited value. Peters (1977) provided a study of the nymphs of the Guadalupe River in central Texas.

STUDY AREA—The Concho River is part of the upper Colorado River drainage basin. Permanent streams are located in Concho, Tom Green, and Irion Counties of Texas. The area is a transition zone containing parts of two biotic provinces, the Balconian and Kansan (Blair, 1950). Elements of the Chihuahuan Province are also present.

The river system is divided into three sections. Five streams, the South Concho River, Middle Concho River, Dove Creek, Spring Creek, and Rocky Creek are included in the upstream section to the west and south of San Angelo (Fig. 1). The streams originate as springs and seeps along the eroded northwestern margins of the Edwards Plateau from Cretaceous limestone and resemble other springfed streams of the Edwards Plateau. Stream flow alternates between shallow pools and riffles with the substrate varying from cobble and gravel to limestone bedrock. Eight sampling sites were located in this section of the system. Water from these streams flows into a manmade impoundment, Twin Buttes Reservoir, located just southwest of San Angelo.

The middle section of the system includes Twin Buttes Reservoir, Lake Nasworthy, and the series of impoundments produced by small dams through the city of San Angelo. No regular sampling sites were established in this section because of the paucity of mayflies in this disturbed, urbanized area. In addition, no regular sampling sites were located on the North Concho River. The river flow is intermittent; it is dependent upon rainfall rather than springflow.

The Concho River from San Angelo to its junction with the Colorado River flows through an area known as the Lipan Flat. It is largely an alluvial outwash plain of Pleistocene age and is extensively cultivated. The river still alternates between pools and riffles but deposition of sediments in pools and behind numerous small dams is increased. Three sampling sites were located in this section. An additional site was located on the Colorado River downstream from the junction of the Concho River.

METHODS AND MATERIALS—Collections were made at least once monthly at all collecting sites (Fig. 1) from May 1979 to March 1981. Nymphs and adults were collected. Nymphs were preserved in 90% ethyl alcohol and adults in 70% ethyl alcohol. Nymphs were obtained by hand picking and by use of an aquatic dip net. Positive association between nymphs and adults was

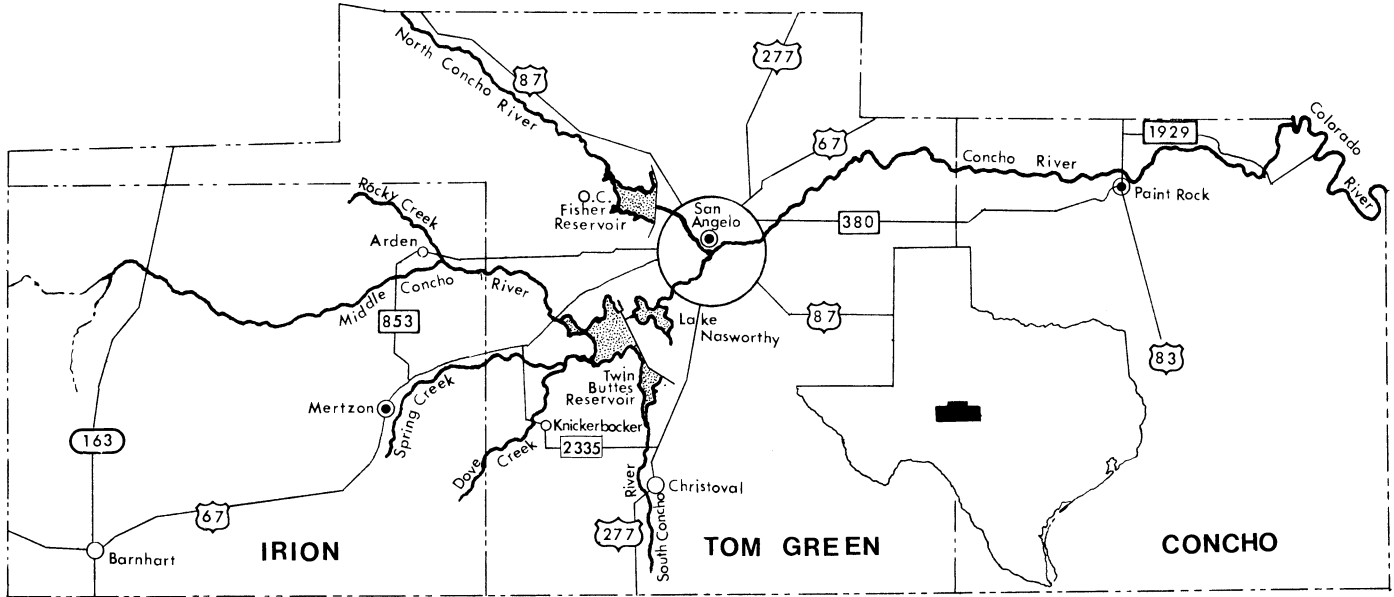


FIG. 1—Study area and location of primary collection sites.

TABLE 1—Ephemeroptera of the Concho River, Texas.

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Oligoneuriidae
<i>Isonychia sicca</i> Eaton
Baetidae
<i>Baetis quilleri</i> Dodds
<i>Baetodes edmundsi</i> Koss
<i>Callibaetis montanus</i> Eaton
<i>Dactylobaetis mexicanus</i> Traver and Edmunds
Heptageniidae
<i>Leucrocuta maculipennis</i> (Walsh)
<i>Stenonema femoratum</i> (Say)
Leptophlebiidae
<i>Choroterpes mexicanus</i> Allen
<i>Leptophlebia bradleyi</i> Needham
<i>Thraulodes gonzalesi</i> Traver and Edmunds
<i>Traverella presidiana</i> (Traver)
Tricorythidae
<i>Leptohyphes packeri</i> Allen
<i>Leptohyphes vesus</i> Allen
<i>Tricorythodes texanus</i> Traver
<i>Tricorythodes</i> spp.
Caenidae
<i>Caenis</i> sp.
Ephemeridae
<i>Hexagenia limbata venusta</i> Eaton

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obtained by laboratory rearing. Adults were also light trapped at the sites using a white cloth and a Coleman lantern.

**RESULTS AND DISCUSSION**—Seventeen species of mayflies were collected from the Concho River system (Table 1). The arrangement follows that of Edmunds, Jensen, and Berner (1976) except for the higher classification of *Isonychia sicca*. *Leucrocuta maculipennis* (Walsh) is reported here for the first time from Texas. The known range previously extended from central Canada through the midwestern United States to Tennessee and Arkansas (Traver, 1935; Burks, 1953; McCafferty and Provonsha, 1978). This was the only species limited to the downstream section of the river system and was collected only from site 1 on the Colorado River and site 2 on the Concho River.

Henry and Kondratieff (1982) reported *Leptophlebia bradleyi* Needham for the first time from Texas. Adult emergence is confined to the months of December, January, and early February and distribution of this species in the study area was limited to the upstream section. Two other species were also limited to the upstream section, *Leptohyphes vesus* Allen and *Baetodes edmundsi* Koss. The distribution of the remaining species was widespread with the exception of *Traverella presidiana* (Traver) which was collected only from sites 2 and 5.

The species of *Leptohyphes* are known primarily from the nymphal stage. Over 70 species are known (Allen and Brusca, 1973). Of these, 15 species are described from a winged stage (Eaton, 1882, 1892; Ulmer, 1919; Needham and Murphy, 1904; Traver, 1943, 1958a, 1958b; Allen, 1967). Only four species are known from both the winged and nymphal stages; three of

these are reported from Peru (Allen, 1967) and one, *L. sabinas* is reported from Mexico and Texas (Traver, 1958a; Allen, 1978). Based upon reared associations, the adults of two species previously known only from the nymphal stage are described below. Representative specimens are deposited at the California Academy of Sciences.

*Leptohyphes packeri* Allen

*Leptohyphes packeri* Allen, 1967: 350; Allen, 1978: 552

*Leptohyphes phalarobranchnus* Kilgore and Allen, 1973: 328

MALE IMAGO (in alcohol).

*Length*—3.5 mm, forewing 3.0-3.5 mm

*Head*—Eyes small, black, lateral, widely separated. Ocelli white, black basally; median ocellus 1/2 diameter of outer ocelli. Antennae white.

*Thorax*—A dark rectangular to square mark dorsally in cervical membrane. Mesonotum and metanotum tan with only narrow blackish lines on some of more prominent carinae. Dark transverse line along anterior margin of mesopleuron and mesosternum. Fore femur with gray stippled longitudinal streaks; darkened subapical maculae on anterior surface. Middle femur with two subapical maculae. Fore tibia and tarsus drab (yellowish-gray); middle and hind white. Foreleg longest, middle shortest. Tibia of foreleg 1.7 times length of femur; 2 1/4 times length of tarsus. Femur of hind leg longest. Tarsal claws similar on foreleg, dissimilar on middle and hind. Fore wings hyaline, longitudinal veins of costal margin dark, remainder light brown. Membraneous continuations of wing root extend beyond mesonotal scutellum as long slender arcuate process. Vein CuP recurved but not converging toward Al at margin (Fig. 2a). Hindwing small, 2 longitudinal veins; recurved costal angulation well developed, long slender, about 1/2 length of hind wing (Fig. 2b).

*Abdomen*—Abdominal tergum 1-8 translucent, dark stipling present on segments 1-4 sometimes 1-5; stipling on segment 1 transverse, narrow medially, widening laterally; stipling on segments 2 and 3 sublateral, on segment 3 slightly more medial than on segment 2; segment 4 and sometimes 5 with stipling medial. Segment 9 and 10 opaque, cream colored. Three well developed caudal filaments, middle longest; all white, slender. Forceps three segmented; second segment longest, third small, round (Fig. 2c). Penes fused, small indentation medially on posterior margin. Lateral area cuspidate, apex directed anteriorly. Two median folds on ventral surface; each penis with a posteriorly directed spine near posterior origin of fold.

*Synopsis*—The shape of the penes of *L. packeri* serve to distinguish it from all other known male *Leptohyphes*.

*Life History Information*—Individuals were collected from both upstream and downstream collecting sites. Subimagoes were collected at predawn light traps; imago swarms were observed and sampled at dawn. Emergence appears to be continuous from July to August. The small, compact swarms of males were located approximately 1-5 meters above the surface of the streams.

*Material Examined*—TEXAS: Eight males, Concho Co., Concho R. at Paint Rock, 30-VII-80; 9 males, Tom Green Co., S. Concho R. at FR 2335,

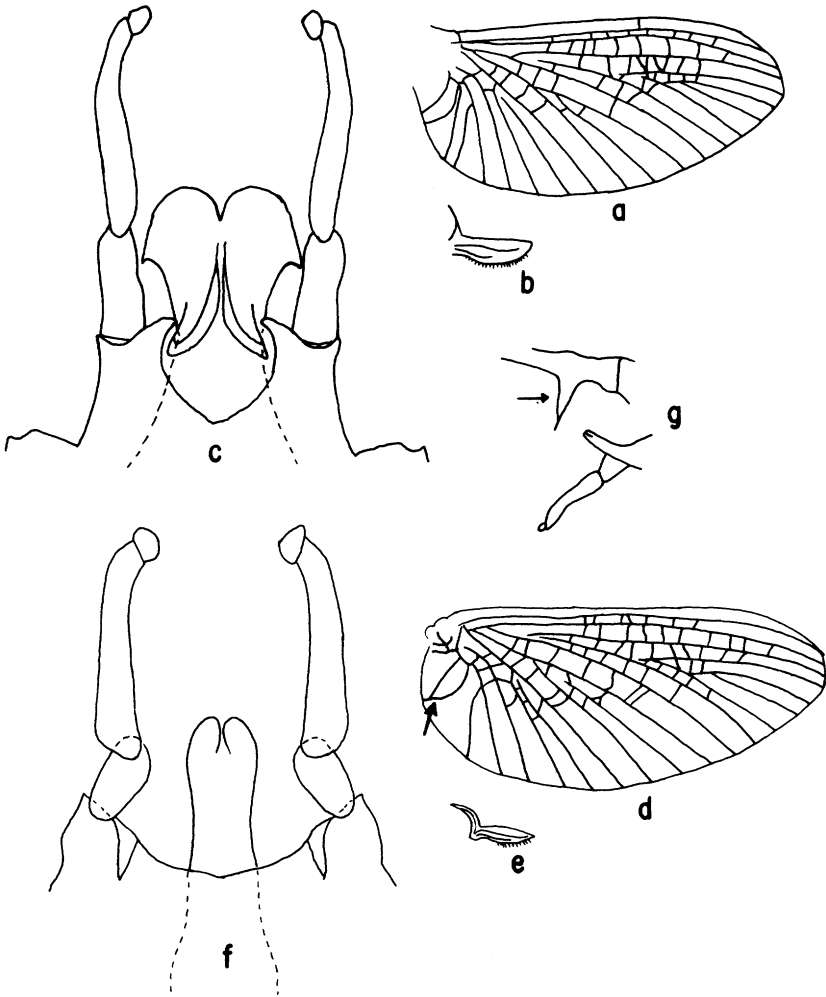


FIG. 2—Wings and genitalia of *Leptohyphes*. *L. packeri* wings; a) front; b) hind; c) genitalia *L. packeri*, dorsal view. *L. vesus* wings; d) front; e) hind. f) *L. vesus* genitalia, dorsal view. g) *L. vesus* genitalia and caudal filament with spike, lateral view.

3 mi N. Christoval, 7-VII-80; 1 male, reared, Tom Green Co., Concho River, FR 380, 8 mi E. San Angelo, 14-VIII-80.

*Leptohyphes vesus* Allen

*Leptohyphes vesus* Allen, 1978: 555

MALE IMAGO (in alcohol).

*Length*—body 3 mm, fore wing 3 mm

*Head*—eyes small, black, lateral, widely separated. Ocelli white, black basally; median ocellus 1/2 diameter of lateral ocelli. Antennae white.

*Thorax*—Dark transverse line separating head from pronotum. Pronotum translucent with dark stippling. Meso and metathorax tan or brown with

only darker brown lines on some of more prominent carinae. All femora tan with anterior and posterior longitudinal dark brown lines. Fore tibia shaded brown, middle and hind white. Tarsal claws similar on fore leg, dissimilar on middle and hind. Fore leg longest, middle shortest. Tibia of fore leg 2 times length of femur and 2.4 times length of tarsus. Longitudinal veins of fore wing dark. Costal margin lightly clouded, clouding darker in basal half. Vein CuP strongly recurved, converging with anal vein near wing margin (Fig. 2d). Crossveins behind R1 47-51. Membraneous continuations of wing roots extend beyond mesonotal scutellum as long slender arcuated processes. Hind wing small, nearly opaque. Two faint longitudinal veins. Recurved costal angulation well developed, long, slender, about 2/3 length of hind wing (Fig. 2e).

*Abdomen*—Tergum and sternum of segment 1-8 translucent. Segments 9-10 opaque, tan with median and sublateral brown streaks on tergum. Caudal filaments three, well developed. At posterior end of second segment of middle filament a ventrally directed spike, subequal to the length of the second segment of the forceps (Fig. 2g), dark brown in apical 2/3. Forceps white, 3 segmented, segment 2 slender, longest, 2 times length of segment 1; apical segment very short, spherical (Fig. 2f). Penes *petersoni* type (Traver, 1958b).

*Synopsis*—*Leptohyphes vescus* can be distinguished from all other *Leptohyphes* adults by the ventrally directed spike on the middle caudal filament and by the convergence of CuP and A1 in the fore wing. The presence of this strong convergence was thought to be a diagnostic characteristic of *Haplohyphes*. Additionally, the adults will key out to *Haplohyphes*, couplet 79, in Edmunds et al. (1976).

*Life History Information*—Individuals were collected only from upstream collecting sites. In the South Concho River both *L. vescus* and *L. packeri* were collected at the same sites and times. Nymphs were always collected from very shallow water flowing over marble-sized gravel substrate. Emergence was from May to October. Subimagos were collected at predawn light traps and imago swarms were observed and sampled at dawn. The observed swarms had the same characteristics as *L. packeri*.

*Material Examined*—TEXAS: Eight males, reared, Tom Green Co., Dove Ck. at FR 2335, Knickerbocker, 19-IX-80; 15 males, swarm, Tom Green Co., Dove Ck. Tweedy Ranch, 1.6 mi SW Knickerbocker, 19-IX-80; 12 males, swarm, S. Concho R., U.S. 277 at Christoval, 13-IX-80; 3 males, same locality, 13-V-80.

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