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SOME MEXICAN AND COSTA RICAN MAYFLIES

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Specimens described in this paper have come to me from several different sources. The Costa Rican ones were collected by Mr. D. L. Rounds. Those from Mexico were presented by Dr. Lewis Berner of the University of Florida, and Dr. Stanley Mulaik of the University of Utah.

Genus *Leptohyphes* Eaton

Eyes relatively small and remote, in both sexes. Fore wing widest in region of MA-MP; no prominent cubito-anal lobe as in males of *Tricorythodes*; cross veins more numerous than in that genus, ranging in number from 43 to about 136 in area behind R_1 ; CuP strongly arcuate. Hind wing present in male, in most species absent in female; no cross veins, usually but two longitudinals; costal angulation prominent, usually long, slender, somewhat arcuate. Membranous processes from wing roots extend beyond mesonotal scutellum, in most species. Claws on fore leg of male dissimilar in some species, similar in others; dissimilar on all legs of female and on second and third leg of male. Fore tibia of male two to three times length of femur. Subanal plate of female very slightly emarginate apically. Three principal types of male genitalia. Tails three, in both sexes. Type of genus: *L. eximius* Eaton.

In the four species here described, hind wing absent in female; membranous processes present; cross veins in fore wing quite numerous (70-82 behind R_1 in male, up to 100 in female).

***Leptohyphes sabinas*, sp. nov.**

Synopsis: fore claws of male dissimilar; genitalia of the *peterseni* type (see Figs. 4, 5).

Species represented by: one male which has almost completely

shed the subimaginal cuticle; one female imago; 7 male and 9 female subimagos many of which have begun to shed the cuticle: in alcohol.

Size: Male; body 4 mm., fore wing $4\frac{1}{2}$ to 5 mm. Female; body $4\frac{1}{2}$ mm., fore wing $5\frac{1}{2}$ to 6 mm.

Male: holotype (cuticle almost completely shed). Head blackish or purplish black; antennae pale. Pronotum blackish with reddish tinge; pale areas include median and submedian streaks and five or six oval spots on each side arranged around black lines. Margins black. Prosternum yellowish gray, anterior half with dark shading. Mesonotum quite dark reddish brown, contrasting with adjoining anterior and lateral pale streaks; scutellum lightly shaded with blackish; membranous processes gray. Gray shading on pleura above and anterior to each leg. Mesosternum dark red-brown, central sclerites outlined with black, and shaded with purplish black interspersed with tiny pale dots. Metanotum somewhat paler than mesonotum; outlined narrowly in black. Two reddish brown spots at apex of each trochanter. All femora reddish brown, washed and streaked with purplish brown, which tends to form diffuse pre-apical bands; apex widely pale. Fore femur with blackish brown anterior margin and longitudinal streak. Fore tibia purplish black, paler at extreme apex; very pale reddish brown at base, so that knee is pale. Tibiae of other legs yellowish white, shaded with pale gray near middle. Fore tarsus gray, basal joint whitish, distal joint pale gray, joinings pale. Other tarsi pale yellowish white.

Membrane of fore wing very faintly tinted with pale fawn-color; veins reddish brown; all cross veins behind R_1 fairly distinct; humeral cross vein and C and Sc preceding it, grayish brown. Membrane in basal half of costal margin somewhat more deeply tinted; longitudinals here deeper in color; apical half paler, opaque. 78-80 cross veins behind R_1 . Basal area of hind wing as far as oblique upright vein, and including costal projection, tinted faintly with fawn-color. Middle abdominal segments partially translucent, pale yellowish; apicals opaque, pale reddish brown; much gray shading. Wide transverse gray bands occupy most of each tergite, leaving pale lateral areas and a pale band adjacent to posterior margin, which is narrowly black; on basal and middle segments, dark bands tend to form a row of darker blotches next to pale lateral area. Narrow pale discontinuous middorsal line on tergites 1-7; obsolescent on 8 and 9; on 10, replaced by narrow geminate black line. Narrow dark dashes along pleural fold. Gray shading on sternites tends to be arranged in three longitudinal rows; i.e., narrow blotches laterally near pleural fold, and a central area, where narrow dark gray submedian streaks surround pale ganglionic spots; small

pale dots on each side of submedian streaks. Tails dark gray, not darker at joinings. Have not yet attained full length of imaginal stage.

Female imago: Slightly stouter than male. Abdomen yellowish, filled with eggs. Head and pronotum more blackish than in male. Wings and legs much as in male. About 93 cross veins behind R₁. Meso- and metathoracic shading darker than in male. Tails paler gray. Subanal plate extends as far as apex of 10th tergite.

Subimagos: Do not differ greatly from descriptions above, except for their more teneral condition; the duller wings do not as yet show color in the veins. Three of the females are darker than the allotype.

Holotype male (cuticle partially shed), Sabinas Hidalgo, Park Chapultepec, Nueva Leon, Mexico, Dec. 16, 1940 (H. H. Hobbs, Jr.). Specimen in private collection of J. R. Traver. *Allotype* female imago, same data. In collection of J. R. Traver. *Paratypes*: 7 males and 9 female subimagos; same location, Dec. 16 and 17, 1940; same collector. Two males and two females in collection of Dr. L. Berner, who sent me the specimens; others in private collection of J. R. Traver.

Dr. H. H. Hobbs Jr., collector of these specimens, sent the following field notes to Dr. Berner: "Sabinas Hidalgo, Park Chapultepec, Nueva Leon. Warm stream (21.5 C.); rapid current flowing over rocky bottom. Stream issues from two caves. *Chara*, *Hydrocotyl* and filamentous algae abundant. Nymphs from beneath stones. Mayflies emerging by the hundreds." Dated Dec. 16, 1940.

It seems very probable that it is this species, *sabinas*, which Burks (1953) records as occurring around the lights in San Antonio, Texas. I was permitted to examine these Texas specimens, and made rather careful notes while studying them. I find that these notes correspond very well with specimens of *sabinas*. The range of this species may thus be extended into Texas. As far as I know, Burks' paper is the only published record of the occurrence of *Leptohyphes* in the United States. However I have in my collection nymphs from the Savannah River in South Carolina, taken by Mr. Thomas Dolan IV, which seem to be of this genus.

L. sabinas appears very similar to *nigripunctum* Traver from Venezuela. However, the blackish head and pronotum, dark brown mesosternum, reddish brown femora and dark gray tails of *sabinas* contrast with the grayish head, whitish pronotum, dark gray mesosternum, yellow femora and whitish tails of *nigripunctum*. *L. sabinas* likewise resembles *petersemi* Ulmer from Brazil; this latter

species (from original description) has yellowish brown thoracic nota, and a more marked tendency toward formation of several rows of dark blotches on abdominal segments. Perhaps *sabinas* might be considered the northern counterpart of *peterseni*.

Leptohyphes bernerii, sp. nov.

Synopsis: fore claws of male similar, blunt (see Fig. 6); genitalia of the *peterseni* type; thorax unusually deep and large.

Species represented by: 23 male imagos and 8 female imagos. One female and two males are mounted entire, others in alcohol. Specimens had been dried before immersion in alcohol, and abdomens of all are much shriveled.

Size: Male; body $2\frac{1}{2}$ –3 mm. (shrunken), fore wing $3\frac{1}{2}$ –5 mm., tails 9–13 mm. Female; body too shrunken for accurate measurement, fore wing 6– $6\frac{1}{2}$ mm., tails 6 mm.

Male imago: holotype. Head light reddish brown; posterior and lateral margins, frontal carina, and two submedian streaks, black. Eyes black. Antennae yellowish; black dot at apex of second joint. Pronotum reddish brown, margined and shaded with grayish black. Meso- and metathorax light reddish brown; mesonotal shield hardly deeper in color than adjoining areas; both scutella and lateral margins preceding these, heavily shaded with blackish; paler area precedes mesonotal scutellum. Narrow oblique black marks above leg bases. Mid-region of anterior half of mesosternum sooty gray, some gray banding also on mid-areas of remainder of thoracic sternum. Femora yellowish to pale reddish brown; blackish somewhat triangular pre-apical spot and basal blackish longitudinal streak, these markings most distinct on second and third legs. Fore tibia pale smoky gray, still paler at base; tarsus paler gray, darker distally; tibiae and tarsi of other legs yellowish, outer margins of tibiae narrowly reddish brown; knees dark red-brown; all trochanters light reddish brown.

Wing membrane pale fawn-colored; veins pale reddish brown, cross veins finer than longitudinals but most are easily visible; membrane of basal half of costal margin, and Sc and R in this area, deeper in color; humeral cross vein and space preceding it, likewise darker red-brown. 70–73 cross veins behind R_1 . Hind wing as in Fig. 2; costal projection and area of membrane preceding the upright vein tinted with fawn-color. Abdomen pale reddish brown. Heavy blackish transverse bands on basal and middle tergites, leaving pale anterior and lateral margins; apical tergites with narrow black lateral and posterior margins; median black streak on 9 and 10. Sternites somewhat paler than tergites; pale grayish

band occupies middle of each segment. Interrupted black dashes next to pleural fold faintly indicated. No other markings determinable. Tails yellowish white, not darker at joinings. Genitalia pale reddish brown (see Fig. 4).

Female imago: allotype. Larger and stouter than male. Black markings on thorax and abdominal tergites more pronounced; wing membrane and veins of costal area more deeply tinted; 93–100 cross veins behind R_1 . Legs rather darker reddish brown than in male; black femoral markings more distinct; tibiae of second and third legs with narrow gray longitudinal streak composed of minute blackish freckles set close to gether.

Holotype: male imago, Metlac, Mexico, Dec. 25, 1940 (H. H. Hobbs Jr.). Specimen in private collection of J. R. Traver. *Allotype*: female imago, same data. *Paratypes*: 22 males and 8 females, all imagos, same data; 3 males and 2 females in collection of Dr. L. Berner, for whom the species is named.

The following notes on the locale of this species are recorded by Dr. Hobbs: "Clear swift stream at Metlac, State of Orizaba (?). Origin of stream in snowfield of Mt. Orizaba. Very cold water. . . . Late in P.M. (of Dec. 25, 1940) just before dark they emerged from rapids by the thousands."

The similar blunt fore claws of the male place *berneri* in the same group as the two species following; brief notes on the distinguishing features of these three species follow the descriptions.

Leptohyphes zalope, sp. nov.

Synopsis: fore claws of male similar, blunt; genitalia of the *peterseni* type.

Species represented by: 9 male imagos (two mounted, others in alcohol).

Size: Male; body 3–3½ mm., fore wing 4¼–4½ mm., tails 11–13 mm.

Male: holotype (mounted on slide, with one paratype; wings present on holotype). Head dark red-brown above, heavily shaded with black; black bands from median to lateral ocelli and across back of head between ocelli. Antennae yellowish white. Pronotum rather dark red-brown, heavily shaded and margined with blackish. Mesonotum bright chestnut brown, wide slightly paler median stripe; scutellum gray-shaded, bordered and preceded by paler areas. Metanotum paler red-brown, grayish black laterally; dark streaks and shading on thoracic pleura around bases of legs. Thoracic sternum dark red-brown, paler transverse band between meso- and metasterna. Fore leg deep smoky gray; three dark gray

longitudinal bands on femur, composed of closely placed tiny dark dots; paler streaks between dark bands; pre-apical band. Tibia darker than femur, pale at base so that knee is pale reddish brown; tarsus paler than tibia, joinings narrowly paler. Other femora pale reddish brown, gray-streaked and with faint pre-apical bands. Tibiae yellow with faint red-brown tinge; a few small dark dots near mid-area; tarsi yellowish; all coxae reddish brown with some dark shading, one darker dot an anterior angle. (Third leg missing from holotype; described from a paratype).

Membrane of fore wing faintly but distinctly fawn-colored, deepest along costal strip; veins light red-brown, cross veins almost as distinct as longitudinals; 72-78 behind R_1 . Pale ground color of abdomen almost obscured by heavy dark gray bands; apical segments distinctly tinged with reddish brown. Posterior margins of tergites *very narrowly* blackish; deep smoky patches on each side near pleural fold; mid-dorsal line pale margined by interrupted black streaks. Sternites with faint brownish tinge added to gray banding; pale gray mid-ventral streak bordered by short black submedian lines ending in small white dots; anterior margins of basal and middle sternites white on each side of gray mid-line; dark gray patches border pleural fold on sternites 2-6; on sternites 1 and 2, black dash on pleural fold. Tails pale slate gray; most segments very narrowly pale at base and even more narrowly darker at apex, giving a dot-and-dash appearance. Genitalia yellowish; distal joints of forceps missing, from all specimens.

Holotype: male imago (mounted on slide). Taken four miles south of the Rio Papagayo Bridge on the Rio Zalope, Mexico, January 4, 1948 (Dr. S. Mulaik). Specimen in private collection of J. R. Traver. *Paratypes*: 8 males; one mounted, others in alcohol; same data. It is perhaps worth noting that in some of the paratypes the pronotum is dark slate gray rather than reddish brown as in the holotype.

Leptohyphes priapus, sp. nov.

Synopsis: fore claws of male similar, blunt; genitalia of the *peterseni* type.

Species represented by: 25 male imagos; two mounted on slides, others in alcohol.

Size: Male; body 4-5 mm., fore wing 5-5½ mm., tails 10-14 mm.

Male imago: holotype (mounted on slide). Head yellowish to pale reddish brown; narrow black line on posterior margin; antennae yellowish. Thorax largely rather bright reddish brown; median area of pronotum more yellowish, lateral areas with paler spot and oblique black lines; very narrow paler median line on mesono-

tum; narrow dark pencilings on pleura. Thoracic sternum yellowish in center, bordered by dark reddish brown. No fore legs remaining on specimen, no middle legs, one hind leg, which is light reddish brown. See note under Paratypes. Wings as in Fig. 1. Wing membrane distinctly tinged with fawn-color, especially in basal half, deepest along costal strip. Veins and cross veins light reddish brown, cross veins quite distinct; 73-82 behind R_1 . Hind wing as in Fig. 3. Ground color of abdomen yellowish, banded with light reddish brown; dark brown spot on each side of tergite 1; anterior margins pale, a *very narrow* dusky line on posterior margins of middle tergites, also on 7 and 8. On basal and middle tergites, pale submedian lines which diverge to rearward. A narrow white line appears to mark pleural fold; just below this line, on sternites 2-6, rather prominent brown patches, largest on 2, becoming progressively smaller toward 6. Light brown bands on sternites 1-6 paler midventrally than laterally, giving effect of a pale median strip; ganglionic area of sternite 7 quite deep orange in color. Very little difference in color between dorsal and ventral surfaces. Tails very pale yellow, not darker at joinings. Genitalia yellowish; both forceps and penes relatively long and slender (see Fig. 5).

Many paratypes are very similar to holotype. In others, the pronotum is noticeably paler than remainder of thorax, which part in turn is duller red-brown than in holotype. Last three abdominal segments, sometimes also the apical half of 7, are dark red-brown and plainly opaque. Although no specimen had a fore leg attached, one such leg found in the vial is by reason of its similarity to the other legs almost certain to belong. All legs pale reddish brown; femur and knee of this fore leg slightly darker in color.

Holotype: male imago (mounted on slide), Rio Pedregoso, Costa Rica, February 1939 (D. L. Rounds). In private collection of J. R. Traver. *Paratypes*: 24 male imagos; same data.

SUMMARY

Recognition characters of all species of *Leptohyphes* north of the Amazon River, descriptions of which have been published.

L. priapus: Entire body and legs (unmarked) reddish brown, abdomen much paler than thorax; fore claws of male similar, blunt; tails pale yellowish. Wing (σ) 5-5½ mm. Costa Rica.

L. zalope: Head and thorax reddish brown, abdomen grayish; fore leg deep smoky gray, with streaks and apical band; fore claws of male similar, blunt; tails pale slate gray. Wing (σ) 4¼-4½ mm. Mexico.

L. berneri: Entire body pale reddish brown, thorax and abdomen concolorous, both heavily shaded with black; thorax unusually large and deep; fore femur yellowish with streaks and apical spot; fore claws of male similar, blunt; tails yellowish. Wing (♂) 3½–5 mm. Mexico.

L. sabinas: Head and pronotum blackish, remainder of thorax red-brown; abdomen pale yellowish, heavily gray-shaded; fore femur reddish brown, with streaks and apical band; fore claws of male dissimilar; tails dark gray. Wing (♂) 4½–5 mm. Mexico.

L. nigripunctum: Head grayish, pronotum whitish, meso- and metanota bright red-brown; abdomen yellowish white, gray-banded; fore femur yellow, with streaks and apical band; fore claws of male (probably) dissimilar; tails whitish. Wing (♂) 4 mm. Venezuela. Genitalia, *peterseni* type.

L. brevissimus Eaton: Head, thorax and abdomen dark pitch brown; fore femur light pitch brown. Only female known. Wing (♀) 4½–5½ mm. Guatemala.

L. costaricanus Ulmer: Head and pronotum dark brown, black-marbled; remainder of thorax dark chestnut brown; abdomen smoky brown, paler ventrally; fore leg grayish brown; tails whitish; no membranous processes. Only female known. Wing (♀) 4½ mm. Costa Rica. (I believe this species to be a *Tricorythodes*; cross veins few in number, arranged as in *Tricorythodes*; CuP not strongly arcuate).

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EXPLANATION OF PLATE

Fig. 1. *Leptohyphes priapus*, wings of male paratype (wings of *sabinas*, *berneri* and *zalope* very similar). Fig. 2. *L. berneri*, hind wing of male paratype (*sabinas* and *zalope* very similar). Fig. 3. *L. priapus*, hind wing of male paratype. Fig. 4. *L. berneri*, genitalia of male paratype. Fig. 5. *L. priapus*, portion of genitalia of male paratype. Fig. 6. Left fig.—fore tarsus of male *L. berneri* paratype: Center fig.—claws of same, different aspect: Right fig.—*L. priapus*, third tarsus of male paratype.

