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WATER-STRIDERS OF THE SUBGENUS STRIDULIVELIA
FROM MEXICO, CENTRAL AMERICA, AND THE WEST INDIES
(HEMIPTERA: VELIIDAE)

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The subgenus *Stridulivelia* Hungerford (1929) was created to hold six new species of water-striders, genus *Velia* Latreille, five from South America and one from Panama. Although the latter species, *Velia cinctipes* Champion, lacks the mechanism for stridulation, it is unquestionably congeneric with those members of the subgenus possessing sonorific instruments. In the original subgeneric description, Hungerford designated his new *Velia raspa* as the type species.

The present paper reviews the four species of *Stridulivelia* from the West Indies, Central America, and Mexico. Only one of these four species, *Velia tersa* Drake and Harris from Trinidad, is equipped with sound-producing organs. The subgenus is not known to occur north of Mexico.

The holotype and allotype of the new species described below were selected from a long series of Mexican specimens kindly lent us by the Los Angeles County Museum. Paratypes from this same series

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are deposited in the Los Angeles County museum, the California Academy of Sciences, the U.S. National Museum, and in collections of the authors. The illustrations were made by Mrs. Patricia J. Hogue, of Arlington, Virginia.

Subgenus *Stridulivelia* Hungerford

Velia (Stridulivelia) Hungerford, 1929, Journ. Kansas Ent. Soc., vol. 2, p. 55.

The members of this subgenus possess certain structures that clearly set them apart as a natural group from all other members of the genus *Velia*. These distinguishing features are: (1) general habitus; (2) intersegmental furrows between abdominal segments; and (3) vertical median furrows (one on each side) of abdominal pleurites II-III, II-IV, or II-V. These pleural abdominal sulci, both intersegmental and segmental, are present in both sexes. The presence or absence of the stridulatory organs and the number of abdominal pleurites bearing a median vertical furrow separate the members of *Stridulivelia* into "groups" of species.

The sound-producing mechanism consists of (1) a small subbasal filelike area on the inner face of each hind femur (pl. 1,c) and (2) a closely set row of small pegs near the upper margin of the inferior side of each connexivum (pl. 1,b). The soniferous structures, adapted for rasping performance, are paired (one of each on each side of the body) (pl. 1,b,c) and are similarly developed in both sexes.

In one of the South American members of the subgenus, *Velia alia* Drake (1957), from British and French Guianas, the parts of each pair of stridulating organs are exactly reversed in their positions. In *alia*, the connexivum is equipped with a long narrow, finely or minutely cross-striated rodlike file and the hind femur with a small elongate-oval patch of tiny pegs. Furthermore, the latter species differs from all described forms in having a prominent spiniform process at each humeral angle. The humeral hornlike processes and sound organs are the same in both sexes. The other South American members of the subgenus have the stridulating structures placed and arranged as in the Antillean *V. tersa* (pl. 1). In either type of stridulatory arrangement, sound is effected by the confrication of the stridulating structure of the hind femur with that of the connexivum on the same side of the body. The abdomen, especially the connexivum, serves as a resonator. All members of the subgenus so far described from South America are equipped with the rasping structures.

The metasternal omphalium (pl. 2, a) is large and distinctly gibbose; its hind margin is obtusely angulately rounded. The opening of the metathoracic scent glands is just beneath the median subangulate

apex of the omphalium. The ostiolar sulcus (one on each side) extends from the ostiole anteriorly along the side (note angulate projection of sulcus on each side) of the omphalium and then curves arcuately upwards on the metapleuron in front of and slightly higher than the hind acetabulum. The apex of the sulcus is provided with a tuft of brownish hairs (pl. 2).

According to the present authors' field observations in Panama, Trinidad, and Mexico, the members of the subgenus *Stridulivelia* are inhabitants of both small and large streams. The specimens were netted in flowing water, mostly among emergent vegetation or close to the shore under overhanging vegetation. More than 50 specimens of *V. tersa* were collected in a single school in a very narrow stream in Trinidad.

Key to the Subgenus *Stridulivelia* of Mexico, Central America, and the West Indies

1. Hind femora and connexiva equipped with stridulatory structures in both sexes (pl. 1); male parameres as in plate 3,a *Velia tersa* Drake and Harris
- Hind femora and connexiva without sound-producing structures (pl. 2,b); male parameres as in plate 3,b-d 2
2. Abdominal pleurites II-V with median vertical furrows; apical three-fifths of last antennal segment whitish, testaceous; male parameres as in plate 3,b.
Velia ciuctipes Champion
 Abdominal pleurites II-III or II-IV with median vertical furrows; antennal segments unicolorous 3
3. Abdominal pleurites II-III with median vertical furrows (pl. 2,b); male parameres as in plate 3,e *Velia epeixis*, new species
 Abdominal pleurites II-IV with median vertical furrows; parameres as in plate 3,d *Velia pueblana* Drake

Velia tersa Drake and Harris

PLATES 1, 3,a

Velia tersa Drake and Harris, 1941, Rev. Ent., vol. 12, p. 338.

BRACHYPTEROUS FORM: Dark reddish brown to chocolate brown, with connexiva and appendages yellowish brown; pronotum unicarinate, coarsely punctate, each puncture within clothed with an encircling row of extremely small silvery hairs, also with a fairly large patch of longer silvery hairs in each anterolateral angle of pronotum. Length: 4.70–5.00 mm.; width: 1.10–1.35 mm.

Measurement of antennal segments: I, 1.05 mm.; II, 0.72 mm.; III, 0.50 mm.; IV, 0.50 mm. Legs rather slender, with femora only slightly incrassate; foretibia with a short dark apical comb; middle leg with tarsal segment II much longer than III (50: 30); hind femur slightly thicker in male than female, with five or six short spines on

inferior surface beyond the basal third in male, only three or four spines beyond the middle in female; tibia with short apical spur in both sexes, also with short teeth on inferior surface; tarsal segments II and III subequal, prolonged backwards into a sharp spine in both sexes.

MACROPTEROUS FORM: Pronotum unicarinate; hemelytra slightly longer than abdomen, with dark fuscous veins, clothed basally with silvery hairs, the cells dark fuscous.

This stridulating species is known largely from the type series, netted under the underhanging ledge of a narrow stream, in the western part of Trinidad, British West Indies. Other specimens are also at hand from Venezuela.

The stridulatory organs (pl. 1) and male parameres (pl. 3,a) separate it from all other members of the subgenus occurring in the West Indies, Mexico, and Central America. A male paratype is illustrated.

Velia cinctipes Champion

PLATE 3,b

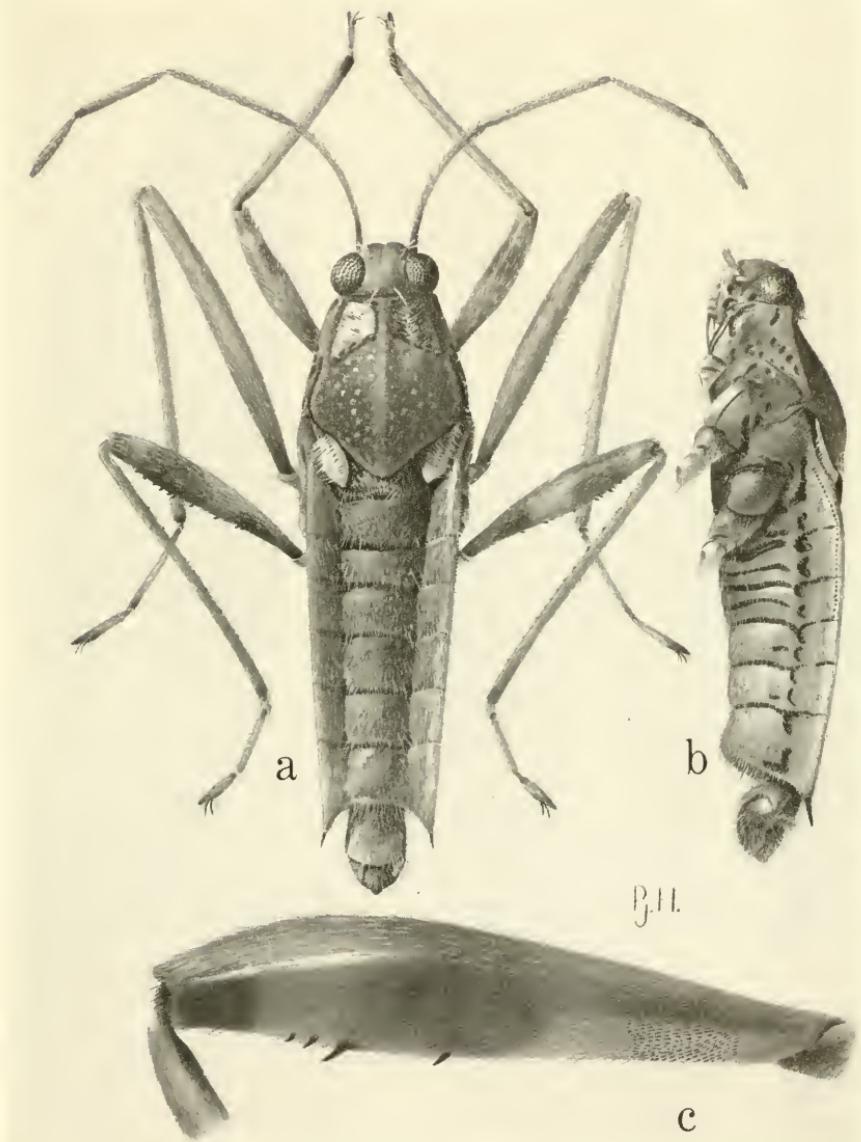
Velia cinctipes Champion, 1898, in *Biologia Centrali-Americanana*, vol. 47 (Rhynchoptera, Heteroptera, vol. 2), p. 143, pl. 9, fig. 9.—Hungerford, 1929, *Journ. Kansas Ent. Soc.*, vol. 2, p. 255.

BRACHYPTEROUS FORM: Elongate, narrow, fuscous, with a large patch of appressed silvery hairs on each side of forelobe of pronotum; body beneath darker; wing pads small, clothed with silvery white hairs; hind femur testaceous, with wide band just behind middle, dark fuscous. Length: 4.75–5.20 mm., width: 1.50 mm.

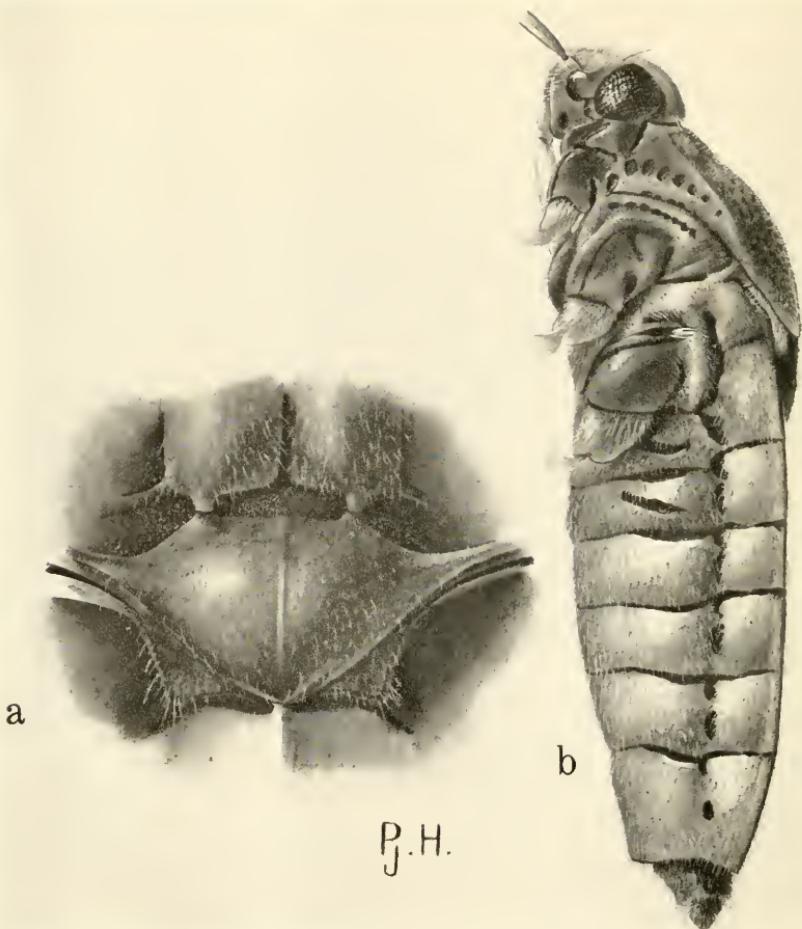
Antennal measurements: segment I, 1.20 mm.; II, 0.95 mm.; III, 0.65 mm.; IV, 0.55 mm. Pronotum with median carina, more convex in macropterous than in brachypterous form; connexivum produced backwards apically into a sharp spine, this spine longer in male than female; abdominal pleura with a pair (one on each side) of median vertical sulci on segments II through IV; male parameres as in pl. 3,a; hind trochanter usually armed with a long spine in male, unarmed in female; hind femur slightly swollen, armed beneath with two rows of moderately large spines, the front row with a larger spine at apical third; tibia beneath with two long rows of dark, closely set teeth, also with a partial third row on basal third; female femur slightly less incrassate than in male, armature absent on basal third, otherwise with armature of both femur and tibia nearly same as in male.

MACROPTEROUS FORM: Front lobe of pronotum with silver patches; hemelytron dark fuscous, with yellowish and silvery hairs on corium; membrane brownish fuscous with a large subapical yellowish lunar spot.

Originally described from an apterous female, netted near Panama



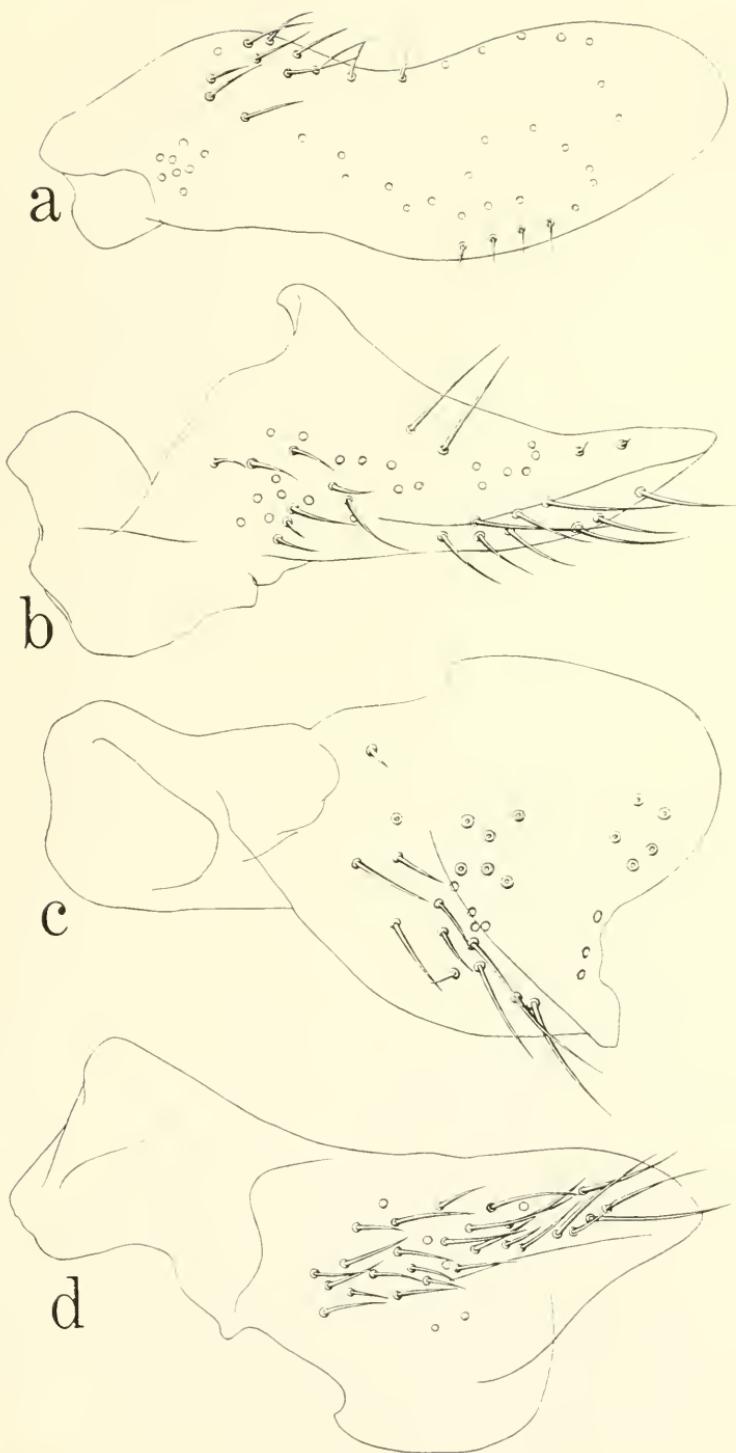
Velia tera Drake and Harris, apterous male paratype: a, dorsal aspect; b, profile showing abdominal sulci or furrows, ostiolar canal on metapleuron, and the row of stridulatory pegs on the connexivum; c, hind femur showing armature of spines and the filelike rasping structure.



Velia epeixis Drake and Menke, new species, female paratype: a, ventral view of metasternal omphalium showing ostiolar canal leading from apex of omphalium to dorsum of metapleuron; b, lateral aspect showing ostiolar canal of scent glands on metapleuron (note hairs at apex of sulcus) and abdominal sulci on segments II and III.

(Explanation of plate 3)

Right parameres of: a, *Velia tersa* Drake and Harris; b, *Velia cinctipes* Champion; c, *Velia epeixis* Drake and Menke, new species; d, *Velia pueblana* Drake.



For explanation, see opposite page.

City. We have many apterous and macropterous specimens of both sexes from Panama, Costa Rica (Punta Arenas), Guatemala (Jutiapa), and Mexico (Puebla, Alvarado, and Guadalajara), all taken near the water's edge in the flowing parts of streams. The whitish testaceous color of the terminal antennal segment in both sexes, the distinct male parameres, and the unusually large spines on the hind trochanter of the male distinguishes this species from its congeners.

***Velia epeixis* Drake and Menke, new species**

PLATES 2, 3,c

BRACHYPTEROUS FORM: Moderately large, slender, chocolate brown, with a large patch of appressed silvery hairs in each anterolateral angle of the pronotum, the pronotum margined on both sides and behind with brown; head brown, with the median longitudinal stripe divided by an impressed median line; body beneath brownish testaceous, with thoracic sterna dark chocolate and pleura with a bluish luster; pronotal pits with short silvery hairs; legs brownish testaceous, with hind femora more or less distinctly banded beyond the middle with dark fuscous; stridulatory organs absent. Length: 5.00 mm., width: (across humeri) 1.55 mm.

Head with the usual impressed median line and basal marks; beak extending to middle of mesosternum; antenna shortly pilose; segmental measurements: I, 1.00 mm.; II, 0.78 mm.; III, 0.65 mm.; IV, 0.52 mm.; pronotum coarsely punctate, rounded behind, with median carina moderately distinct; wing pads small, covered with appressed silvery hairs; sides of thorax and abdomen with numerous sharply and deeply sculptured sulci (pl. 2); labial sulcus with a deep narrow furrow on mesosternum; metasternal omphalium large, tumid, rather sharply subangulately rounded behind; metathoracic scent glands with opening concealed under median part of posterior ledge of omphalium; ostiolar sulcus (one on each side) leading from the ostiole (under hind margin of omphalium) anteriorly in a groove on each side of the omphalium and then upwards in front of the metathoracic acetabulum, with a small tuft of brown hairs at apex of channel (pl. 2,a,b).

Abdominal sterna II and III distinctly carinate on median longitudinal line; pleura II and III each with a median vertical furrow on both sides; connexivum produced backwards into a long sharp spine, which is a little longer in male than female; first male genital segment only moderately transversely concave beneath, parameres as in plate 3,c; legs moderately slender; femora a little stouter in male than in female; foretibia with short apical comb in both sexes; middle legs very long, tarsal segment II longer than III (50:45), tibia beneath

with a thin row of long hairs; hind legs (males) with trochanter unarmed; femur moderately swollen, armed beneath with two long rows of short blunt spines, the front row with the spines more numerous, more closely set, and usually with one or two larger ones near apical third of segment; tibia with two rows of short dark teeth, with an angulate apical spur; tarsal segment II slightly longer than III, hind femur of female not as thick as male, spines not as numerous and unarmed on basal fourth; tibia with two rows of closely set teeth.

MACROPTEROUS FORM: Pronotum more convex and median carina a little more developed than in brachypterous form; backward projection of pronotum, shieldlike; hemelytron dark fuscous, membrane brownish fuscous; veins of corium prominent, dark, with short dark hairs interspersed with short silvery hairs; mesothoracic wings clouded with fuscous; female slightly more robust than male.

Holotype male and allotype female, both apterous, and 16 paratypes: Compostela, Nayarit, Mexico, Aug. 26, 1959, Arnold Menke; 50 additional paratypes: Compostela, Nayarit, Mexico, Dec. 30, 1958, A. S. Menke and L. A. Stange. The following metatypes have been seen: 1 specimen, Bagaces, Guanacaste, Costa Rica, July 13, 1957, D. R. Lauck; 1 specimen, 18 miles northwest of El Camaron, Oaxaca, Mexico, Aug. 20, 1959, A. Menke. The holotype and allotype will be returned to the Los Angeles County Museum along with some paratypes. Additional paratypes are in the private collections of the authors, the U.S. National Museum, and the California Academy of Sciences.

This species resembles *V. pueblana* Drake, but is readily distinguished from it by the vertical furrows on abdominal pleurites II and III only and by the differently shaped male parameres (pl. 3,c). These same characters and the concolorous antennal segments separate it from *V. cinctipes* Champion.

The large series from Compostela was collected from the undersurface of a rock which projected over the water from the bank of a small stream. The undersurface of the rock was approximately 2 to 3 inches above the water surface, and the bugs were netted after splashing water at the underside of the rock.

***Velia pueblana* Drake**

PLATE 3,b

Velia pueblana Drake, 1951, Rev. Ent., vol. 22, p. 376.

BRACHYPTEROUS FORM: Dark brown to dark fuscous brown, pronotum with a triangular patch of appressed silvery hairs on each side of anterior lobe; hind femur with apex and a wide band beyond, middle

dark fuscous; antenna unicolorous; body beneath with some bluish luster. Length: 4.45–5.00 mm.; width: 1.50 mm.

Antennal measurements: segment I, 1.25 mm.; II, 0.85 mm.; III, 0.70 mm.; IV, 0.58 mm. Middle legs with tarsal segment II longer than III (58:54); hind femur (male) slightly incrassate, armed beneath with two rows of moderately large spines; tibia beneath with a double row of small, closely set teeth; trochanter with several dark fuscous teeth; female with hind trochanter unarmed, femora beneath without spines on basal part, the tibia with two rows of dark teeth; abdominal pleurites with vertical furrows on II–IV; male parameres as in plate 3,d.

MACROPTEROUS FORM: Unknown.

This species was described from a series of specimens taken among emergent vegetation in rivers near Puebla, Tampico, and Ciudad de Valles, Mexico, and is not recorded elsewhere. The characters in the key set it apart from other nonstridulating members of the subgenus.