

TABLE 3. Number of Miridae collected by sweeping samples at Tucker Prairie June to October, 1968.

Month	Sweeping sample number												Totals
	1	2	3	4	5	6	7	8	9	10	11	12	
VI	155	97	24	51	18	14	4	6	8	20	5	0	402
VII	446	205	13	183	20	34	14	38	12	3	7	7	982
VIII	7	27	15	15	14	6	3	29	4	3	1	5	129
IX	12	18	32	44	50	40	7	25	15	11	12	10	276
X	15	3	24	67	72	62	36	55	24	1	21	33	413
Totals	635	350	108	360	174	156	64	153	63	38	46	55	2,202
Percentage	28.8	15.9	4.9	16.3	7.9	7.2	2.9	6.9	2.8	1.7	2.1	2.6	100.0

Samples 1 and 2 from the burned area made up 44.7% of the Miridae collected by sweeping. A combination of any other two samples, i.e., sweeping samples 4 and 5, made up at the most 24.2% of the total. In fact, it would be necessary to combine at least five samples to approximate the 44.7% value of samples 1 and 2 (Table 3).

The collections that accounted for the differences between the burned and unburned areas were taken in June and July. Evidently, near the middle of the growing season the ecology of the burned area offers conditions for a fast build-up of certain species of Miridae and other taxa of Hemiptera and Homoptera, while later in the season there is a return to some condition of equilibrium.

The analyses of variance for Homoptera, Hemiptera, Cicadellidae, and Lygaeidae indicated significant differences between Malaise trap catches. In all cases Duncan's multiple range test showed that Malaise 1 (burned area) collected a number of insects significantly higher than did either of the other two traps. The Fulgoroidea and the Miridae collected from Malaise 1 were nearly twice as numerous as those of either of the other two traps; however, the differences were not significant. In the sweeping samples, the two taken on the burned area produced nearly as many Miridae as the other ten samples combined. Consequently, there is good reason to believe that spring burning had some real effect on populations of several Hemiptera and Homoptera, especially on some Cicadellidae, Lygaeidae, and Miridae.

We have found that the differences in populations observed in this study are more significant from the beginning to the middle of the growing season than later in the year, where they are reduced or not apparent.

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**STUDIES OF THE GYPONINAE: A NEW GENUS,
ACUPONANA, AND TEN NEW SPECIES
(Homoptera: Cicadellidae)¹**

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ABSTRACT

A new gyponine genus, *Acuponana* (Homoptera: Cicadellidae), is described from Central and South America, with ten new species: *A. consensa* (type species), *A. fera*, *A. enera*, *A. erusa*, *A. fona*, *A. gema*, *A. horella*, *A. ciosa*, *A. huera* and *A. grella*.

Genus *Acuponana* n. gen.

Head a little narrower than pronotum, short, broadly rounded, about four times as broad at base as median length, almost parallel margined. Margin of crown thin but not foliaceous. Pronotum declivous. Forewings with normal venation. Hind tibia with four longitudinal rows of spines, inner dorsal row more slender and more closely placed.

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Type species: *Acuponana consensa* DeLong and Freytag.

This genus is intermediate between *Gyponana* and *Ponanella*. In form and appearance it resembles *Ponanella*, but the head is more sharply margined and the male genital structures are similar to those of species of *Gyponana*. The internal male genital structures show excellent diagnostic characters. In *Gyponana* the pronotum is not declivous, the head is distinctly rounded and produced, and the margin of crown is thin and foliaceous. In *Acuponana* the head, although narrower than the pronotum, is proportionately broader than in either *Gyponana* or *Ponanella*. In *Ponanella* the body is short and robust, in *Acuponana* the body is more elongate and slender.

The species of this genus are more closely related to those of *Ponanella* than to those of *Gyponana*, and, with one exception, have been collected in the same countries as *Ponanella*. The material studied has been collected in Mexico, Panama, Venezuela, British Guiana, Brazil, and Peru, representing a tropical Central and South American distribution. Three species have been collected in each of two countries, British Guiana and Panama, two in Brazil, and one each in Mexico, Venezuela, and Peru.

Key to Males of *Acuponana*

1. Aedeagus with two pairs of proximal, short, lateral spines, one basad, arising near apex; pygofer without an apical process (Fig. 23) *jona* n. sp.
 Aedeagus with one pair of spines or none, usually arising apically (Figs. 18, 28); pygofer with apical process or produced at apex 2
2. Plate with apical half gradually narrowed, tapered to a narrow, blunt apex (Fig. 21) *erusa* n. sp.
 Plate broad to near apex, not tapered, broadly rounded at apex or sloping to a blunt point on outer margin (Fig. 26) 3
3. Style with two deep, round excavations on dorsal margin, ventrocaudal margin strongly, roundly produced; apex dorsally produced and pointed (Fig. 36) *horella* n. sp.
 Style not twice excavated on dorsal margin, without a strongly produced, rounded, ventrocaudal protrusion (Figs. 4, 30) 4
4. Aedeagal shaft long and slender, ventrally and laterally, with a short, pointed, apical spur on ventral margin; dorsal margin sharply pointed, without spines at apex (Figs. 28, 29) *gema* n. sp.
 Aedeagal shaft usually shorter and/or broader, either laterally or ventrally, a pair of spines arising at apex and extending basad or laterobasad (Figs. 45, 46) 5
5. Pygofer with short, dorsal spur on apical third, not extending to apex (Figs. 6, 12, 17) 6
 Pygofer with caudal spur (Figs. 44, 49, 54) 8

6. Style with blade serrate on ventral margin, gradually, convexly narrowed on apical half to pointed apex (Figs. 4, 10) 7
 Style with blade not serrate, broadened on ventral margin one-third distance from apex, then concavely tapered to a sharp pointed tip (Fig. 15) *enera* n. sp.
7. Plate three times as long as median width, dorsal margin of pygofer concavely excavated just anterior to pygofer spur, spur extending almost to caudal tip (Fig. 12) *jera* n. sp.
 Plate almost four times as long as median width, dorsal margin of pygofer not concavely excavated just before pygofer spur, spur more dorsally exposed and more distant from caudal tip (Fig. 6) *consensa* n. sp.
8. Pygofer with apical spur with a broad truncated apex (Fig. 57) *grella* n. sp.
 Pygofer with apical spur narrow, rounded at apex (Figs. 55, 56) 9
9. Blade of style with a slight rounded enlargement on ventral margin at half its length, apical half of blade distinctly narrowed, tapered to slender, sharp-pointed apex (Fig. 42)
 *elosa* n. sp.
 Blade of style parallel margined for more than two-thirds its length, at which point a slight pointed tooth on ventral margin, apical third of blade slightly narrowed, not tapered, apex abruptly pointed (Fig. 47) *huera* n. sp.

***Acuponana consensa* n. sp.**

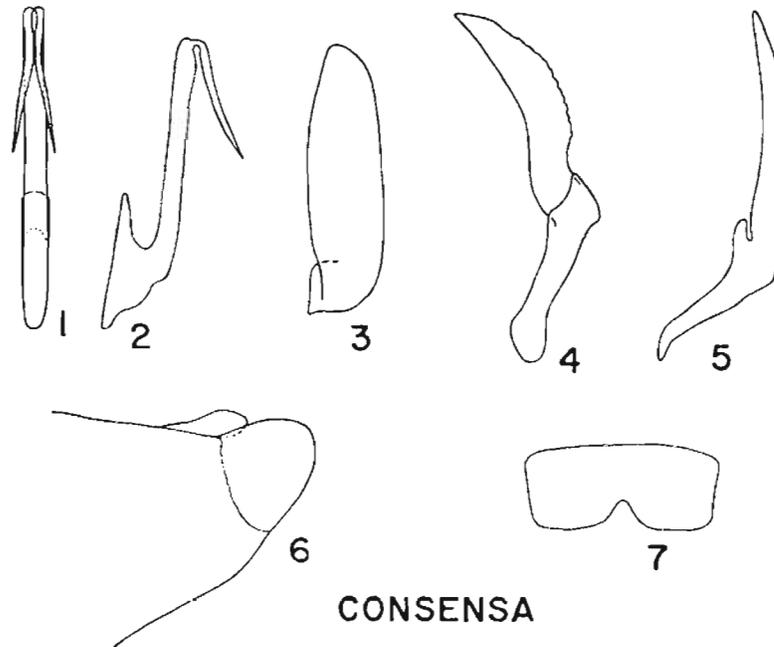
(Figs. 1-7)

Length of male 7 mm, of female 7.5 mm. Crown broadly, roundedly produced: more than two and one-half times as broad between eyes at base as median length. Color: Dull yellow tinged with pale brown, ocelli red. A pair of small, round, black spots on pronotum back of eyes and about half length of pronotum. Forewings yellow, with region along commissure and inner apical and anteapical cells smoky; claval veins beyond apex of scutellum bordered with brown; costal area yellow. Face dull yellow.

Male genitalia with plates almost four times as long as broad, apices tapered and blunt. Apical half of styles blade-shaped, ventral margins convexly curved and serrate, tapered to pointed apices. Aedeagal shaft medium in size with a pair of proximal processes arising near apex on ventral side, extending basally for half length of shaft, and diverging on their apical halves. Pygofer with a small, rounded tip beyond suture and a prominent finger-like process arising on dorsal surface at suture.

Female genitalia with posterior margin of seventh sternum straight and having a median U-shaped emargination extending a third distance to base.

Types. Holotype male, Uruapan, Mich., Mexico, X-1-41, DeLong,



FIGS. 1-7. *A. consensa* n. sp. 1, Ventral view of aedeagus; 2, Lateral view of aedeagus; 3, Ventral view of plate; 4, Lateral view of style; 5, Ventral view of style; 6, Lateral view of apex of pygofer; 7, Ventral view of ♀ seventh sternum. (Figs. 3, 6, not drawn to same scale as Figs. 1, 2, 4, 5.)

Good, Caldwell, and Plummer. Allotype female, same data as holotype. Paratypes: 1 ♂, 2 ♀, same data as holotype. Types in the DeLong Collection. No other specimens have been examined.

***Acuonana fera* n. sp.**
(Figs. 8-12)

Length of male 6 mm, female unknown. Crown short, broadly rounded, appearing parallel margined, almost three times as broad between eyes at base as median length, with conspicuous transverse striae. Color: Dull yellow, ocelli pale red. Pronotum with a pair of small round black spots, one behind each eye, near lateral margin and at one-third length of pronotum. Forewings yellow, subhyaline, veins deeper yellow. A faint brown spot along commissure at end of second claval vein, and smoky coloration on apical portion of forewing.

Male genitalia with plates about three times as long as broad, apices rounded. Style broad, bladelike, apical fourth curved dorsally,

tapered to sharp pointed apex. Straight part of aedeagal shaft curved slightly ventrad at apex, with a pair of apical processes arising near apex on ventral side and extending basally and ventrally one-third length of shaft. Pygofer with a short, blunt, finger-like process arising on dorsal surface and extending almost to its apex.

Type. Holotype male, Trinidad, Rio, Panama, 19-3-12 A. Busck in the U. S. National Museum.

***Acuponana enera* n. sp.**

(Figs. 13-17)

Length of male 6.2 mm, female unknown. Crown short, broadly rounded, about two and one-half times as wide between eyes at base as median length, with conspicuous transverse striae. Color: Crown, pronotum, and scutellum dull yellow, ocelli red; pronotum with a pair of round black spots, one behind each eye, near lateral margin and about one-third length of pronotum. Forewings yellow with a paler spot on corium and on clavus at two-thirds its length. Clavus with a brown spot, darker on anterior margin, near apex of scutellum and extending between claval veins. Apex of forewings brown with a darker brown diagonal band extending from outer apical cell across clavus just anterior to apex.

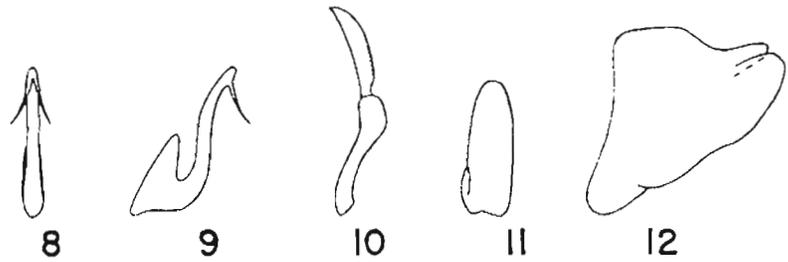
Male genitalia with plates about two and one-half times as long as broad, apices rounded. Style rather broad, apical half bladelike, slightly broadened and angled on ventral margin at about three-fourths its length, then narrowed and sloping to about half distance to apex, slightly bent caudally, then sloping to a pointed apex. Aedeagus with shaft curved ventrally at apex, with two apical processes, two-fifths length of shaft, arising at apex and extending basally and ventrally. Pygofer with a short finger-like process arising on dorsal margin and not extending to apex.

Types. Holotype male, Hacienda Maris, Cusca, Peru, March 12, 1952, F. L. Waytkowski. Paratype: 1 ♂, Panama Camarron, 17-VII-1952, F. S. Blanton. Holotype in the North Carolina State University Collection, paratype in the U. S. National Museum.

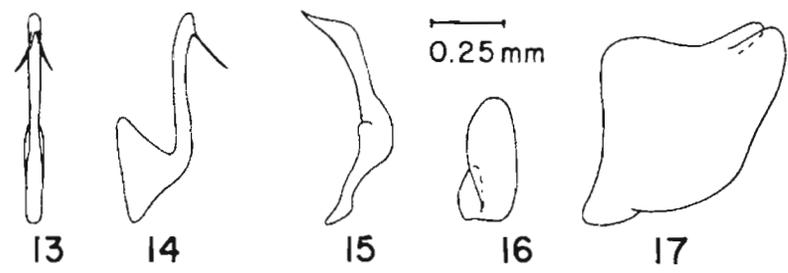
***Acuponana erusa* n. sp.**

(Figs. 18-22)

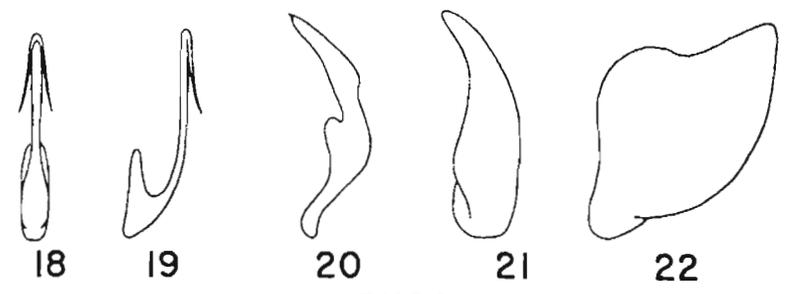
Length of male 5.5 mm, female unknown. Crown broadly rounded, a little longer at middle than next to eyes, twice as wide between eyes at base as median length. Color: Crown, pronotum, and scutellum greenish yellow, ocelli pale, inconspicuous, margin of crown slightly darker. Pronotum with two small round, black spots, one behind each eye, close to lateral margin and at about one-third length of pronotum. Forewings appearing darker, claval area smoky with four faint spots along commissure, one at end of each claval vein, apical portion smoky, with brown coloration along apical margin.



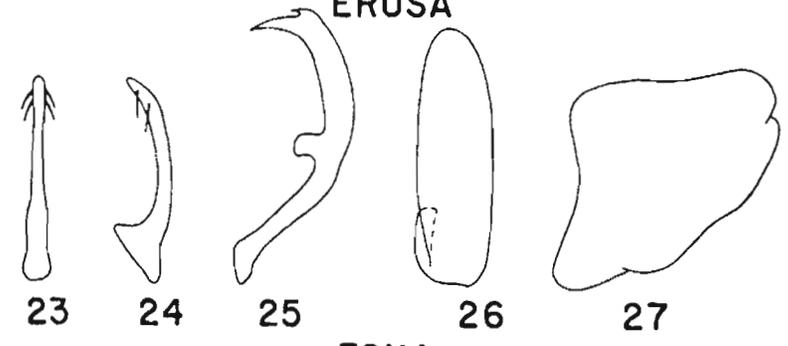
FERA



ENERA



ERUSA



FONA

Male genitalia with plates rather long, concavely curved on inner margins, tapered at apices and bluntly pointed. Style narrow at base of blade then abruptly convexly rounded and broadened on outer margin, gradually narrowed to narrow blunt apex. Aedeagus slender with a pair of narrow processes arising at apex, processes about one-third length of shaft, extending basally along shaft. Pygofer simple, without a heavily chitinized margin.

Type. Holotype male, Brazil, Rio de Janeiro, D. F. Corcovado, X-1958, Seabra e Alvarenga (F.F.U.P.), in the U. S. National Museum.

Acuponan fona n. sp.
(Figs. 23-27)

Length of male 6 mm, female unknown. Crown broadly rounded, longer at middle than next to eyes, more than two and one half times as wide between eyes at base as median length. Color: Brownish yellow with variable intensity but without definite markings.

Male genitalia with plates about four times as long as broad, apices rounded. Style broad with a spine on ventral margin of blade near apex, then concavely notched between this and narrower, sharply pointed apex. Aedeagus short and rather stout with two subapical pairs of short, bristle-like proximal spines. Pygofer simple, without a heavily chitinized margin.

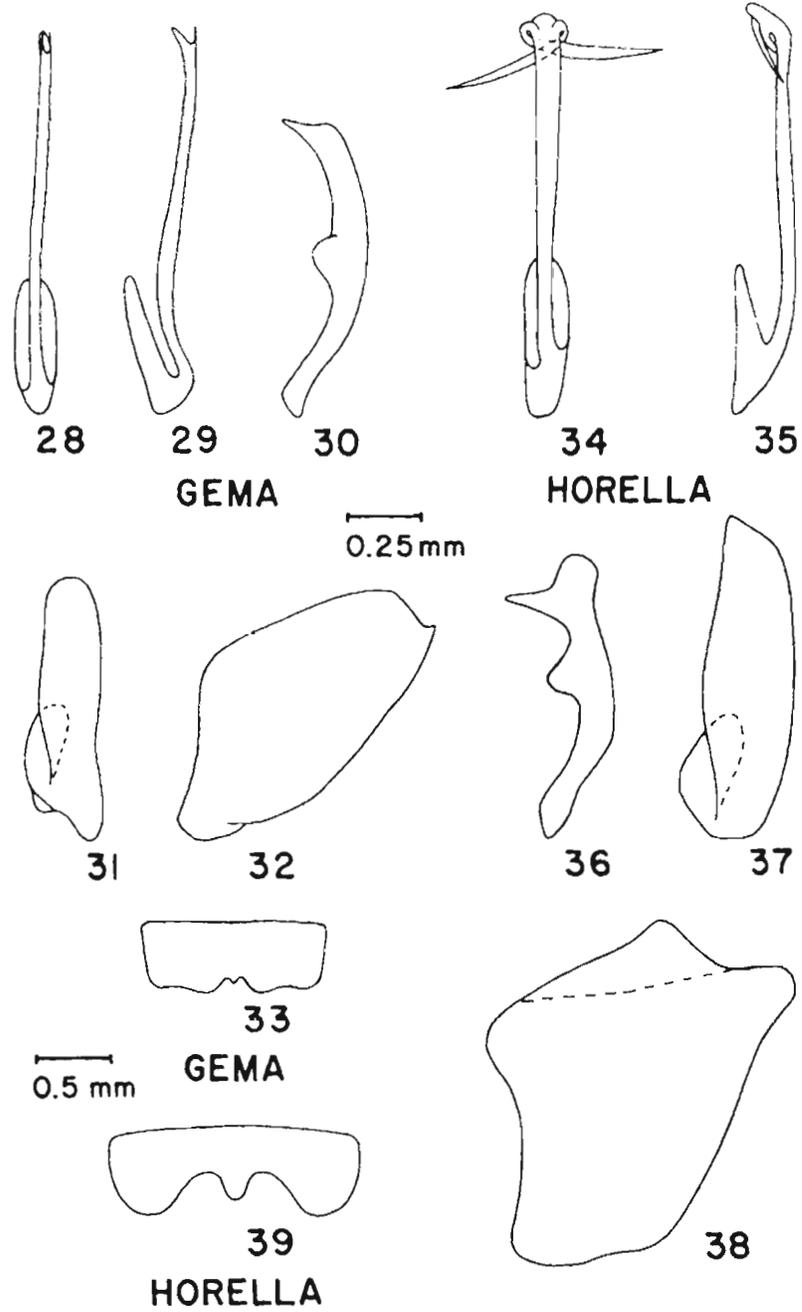
Type. Holotype male, British Guiana, Kutari Sources, Jan-Feb., 1936, G. A. Hudson, B.M. 1936. In the British Museum of Natural History.

Acuponana gema n. sp.
(Figs. 28-33)

Length of male 6 mm, of female 6 mm. Crown short, broadly rounded, appearing parallel margined, more than three times as broad between eyes at base as median length, with prominent transverse striae. Color: Crown, pronotum, and scutellum golden yellow, a pair of round black spots on pronotum, one behind each eye, near lateral margin and about one-third length of pronotum. Forewings brownish yellow, subhyaline, veins yellow, claval portion appearing darker, with a dark brown spot at end of each claval vein at commissure, a brown spot on anterior cross vein of inner anteapical cell.

Male genitalia with plates about four times as long as broad, apices rounded. Style broadened on dorsal margin at middle, then narrowed and produced to a narrowed, dorsally curved, sharp pointed tip.

FIGS. 8-27. Parts as listed of named species. 8, 13, 18, 23, Ventral view of aedeagus; 9, 14, 19, 24, Lateral view of aedeagus; 10, 15, 20, 25, Lateroventral view of style; 11, 16, 21, 26, Ventral view of plate; 12, 17, 22, 27, Lateral view of pygofer. All drawn to the same scale.



Aedeagus curved upon itself near base, shaft slender, apex slightly broadened dorsoventrally and sloping to a sharp pointed apex on dorsal margin. A short "bristle-like" spine arises on ventral margin where apex begins to slope. Pygofer simple, longest on ventral margin.

Female genitalia with lateral angles of seventh sternum rounded to posterior margin, margin slightly produced to median fourth, then angularly excavated about one-fourth distance to base and bearing a short, produced, pointed tooth at its apex.

Types. Holotype male, San Esteban, Venezuela, 22-30-XI-39, Pablo Anduze. Allotype female, same data as holotype. Paratypes: 2♂, 4♀, same data as holotype. Holotype, allotype, and paratypes in the U. S. National Museum. Paratypes in the DeLong Collection.

Acuponana horella n. sp.

(Figs. 34-39)

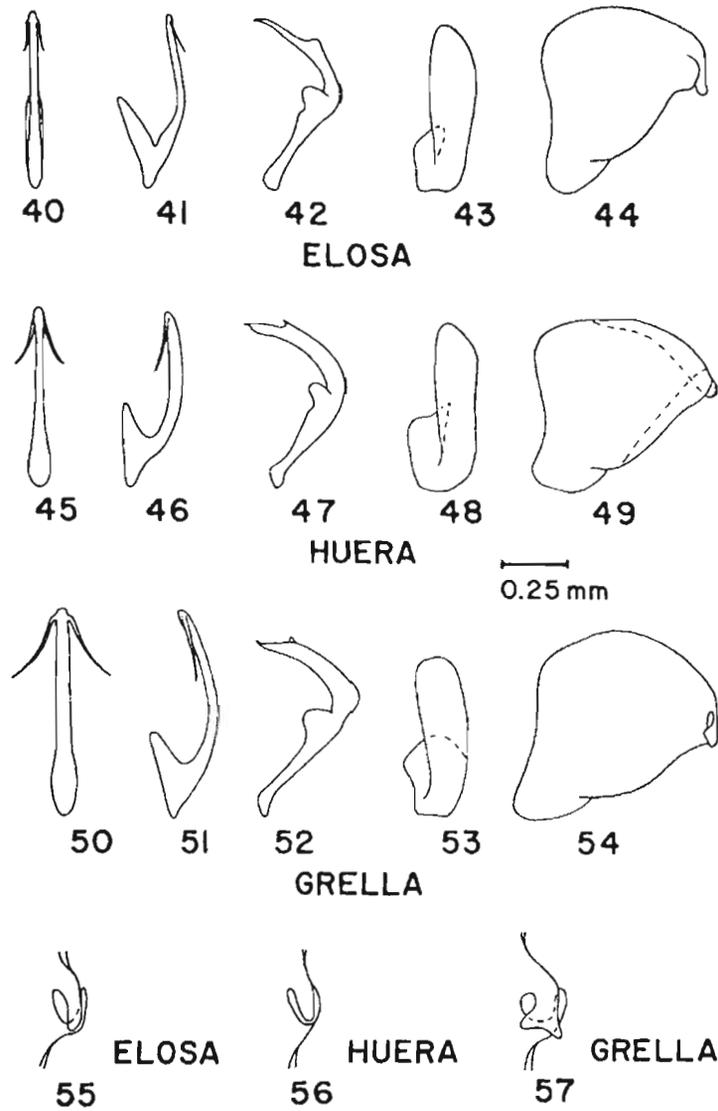
Length of male 6.5 mm, of female 7 mm. Crown short, broadly rounded, three times as broad between eyes at base as median length. Color: Dull yellow, tinged with orange. Ocelli black, a pair of small round black spots on pronotum, one behind each eye close to lateral margin and at about one-third length of pronotum. Forewings with yellow veins, a prominent dark spot on each side of commissure at end of each claval vein.

Male genitalia with plates about four times as long as broad, rounded on inner margins and sloping to form bluntly pointed tips on outer margins. Dorsal margin of style with broad concave excavation on basal half, less broad excavation on apical half; strong rounded protuberance on ventrocaudal margin; dorsocaudal margin produced and pointed. Aedeagus long, slender, with a pair of processes arising at apex, processes about half as long as shaft, curving basally, then laterally to the opposite side, extending laterally for entire length. Pygofer with apex narrow and forming a thick blunt spine extending inward at apex.

Female genitalia with lateral angles of seventh sternum broadly, roundly produced, posterior margin with two broad, deep, round excavations on the median half, excavations extending about half way to base, a produced, apically rounded tooth between excavations extending more than one-third distance to posterior margin.

Types. Holotype male, Chapada Forest, Brazil, Collection C. F. Baker. Allotype female, Chapada, Aug., Collection C. F. Baker. Para-

FIGS. 28-39. Parts as listed of named species. 28, 34, Ventral view of aedeagus; 29, 35, Lateral view of aedeagus; 30, 36, Lateroventral view of style; 31, 37, Ventral view of plate; 32, 38, Lateral view of pygofer; 33, 39, Ventral view of ♀ seventh sternum. All ♂ drawings to the same scale. Both ♀ drawings to the same scale.



FIGS. 40-57. Parts as listed of named species. 40, 45, 50, Ventral view of aedeagus; 41, 46, 51, Lateral view of aedeagus; 42, 47, 52, Lateroventral view of style; 43, 48, 53, Ventral view of plate; 44, 49, 54, Lateral view of pygofer; 55, 56, 57, Caudal apex of pygofer. All drawn to the same scale.

types: 2♀, same data as allotype except April and October; 1♀ Brasilien, Nova Teutonia, 27° 11' B. 52° 23' L, Fritz Plaumann. Holotype and allotype in the U. S. National Museum, paratypes in the DeLong Collection and the North Carolina State University Collection.

Acuponana elosa n. sp.

(Figs. 40-45, 55)

Length of male 5.5 mm, female unknown. Crown broadly, convexly rounded, more than twice as wide between eyes at base as median length, longer at middle than next to eyes. Color: Dull golden yellow, ocelli dark, pronotum with a small round black spot behind each eye at about one-third length of pronotum. Forewings with basal half of clavus orange, two black spots on each side of commissure at ends of claval veins.

Male genitalia with plates three times as long as broad, apices rounded. Style in lateral view rather broad, curved dorsally, blade broadened at middle by a hump on dorsal margin, apical portion narrowed, tapered to a narrow pointed apex. Aedeagus in ventral view slender with a short lateral process arising just before apex on each side and extending basally about one-fourth length of shaft. Pygofer with a heavily chitinized band along the dorsal, apical margin on each side, forming a blunt finger-like process extending ventrally at apex a little beyond ventral margin.

Type. Holotype male, Panama, Mojinga Swp, CZ., 19-XI-1951, in the U. S. National Museum.

Acuponana huera n. sp.

(Figs. 45-49, 56)

Length of male 6 mm, female unknown. Crown broadly rounded, more than twice as wide between eyes at base as median length. Color: Dull yellow, ocelli dark, pronotum with a dark round spot behind each eye almost half length of pronotum. Forewings pale, veins yellow, four black spots along commissure on clavus, one at end of each claval vein.

Male genitalia with plates more than three times as long as broad, rounded at apex. Style rather broad, curved dorsally, broadened on outer margin at more than half its length, with a sharp pointed tooth at caudal end of enlargement, concavely notched between tooth and apical portion, apex abruptly pointed. Aedeagus with apical half slender, a pair of processes about one-third length of shaft arising on laterodorsal margin just before apex, extending basally, apices curved dorsally. Pygofer with the dorsocaudal margin heavily chitinized on each side, the band of chitin increasing in width to rounded apex and extending beyond ventral margin. Pygofer spur caudal, finger-like.

Type. Holotype male, British Guiana, Kutari Sources, Jan., Feb., 1936, G. A. Hudson, B. M. 1936-360, in the British Museum of Natural History.

***Acuponana grella* n. sp.**
(Figs. 50-54, 57)

Length of male 5.7 mm, female unknown. Crown broadly rounded, longer at middle than next to eyes, twice as wide between eyes at base as median length, with conspicuous striae on anterior portion. Color: Crown, pronotum, and scutellum dull golden yellow. Ocelli dark, pronotum with two small black spots, one behind each eye near lateral margin at about one-third length of pronotum. Forewings yellow, subhyaline on outer portion with yellow veins, claval portion appearing darker, with four spots near commissure, one at end of each claval vein, apical portion smoky.

Male genitalia with plates almost three times as long as broad, apices rounded. Style rather broad, enlarged on ventral margin, a spine extending ventrally at angled margin near apex then tapered to a pointed apex. Aedeagus slender with a pair of lateral processes arising at apex of shaft, processes more than one-third length of shaft and extending basally and laterally. Pygofer with a broad, heavily chitinized margin caudally. Pygofer spine caudal, broadened, truncate at apex.

Types. Holotype male, British Guiana, Amazon-Courantyna Divide, Head of Oronoque River, 1937, H. Beddington, B.M. 1937-388. Paratype: 1♂, British Guiana, New River, 750 ft, 4-5 V, 1938, C. A. Hudson, B.M. 1939-370. Types in the British Museum of Natural History.

**CONVERGENT EVOLUTION IN THE LARVAE OF
TWO PENSTEMON-FEEDING GEOMETRIDS
(Lepidoptera: Geometridae)¹**

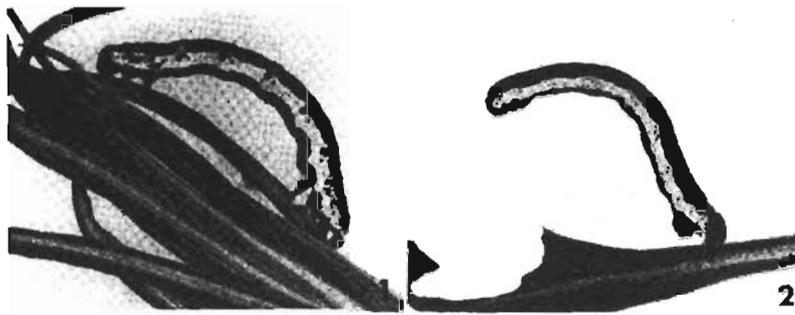
ROBERT W. POOLE
Illinois Natural History Survey, Urbana

ABSTRACT

Convergent evolution is shown to occur in the larvae of two unrelated penstemon-feeding species of Geometridae (Lepidoptera). Both exhibit a striking black and white pattern that is probably adapted to the behavior of grazing by the last-instar larvae on the small penstemon rosettes in the spring. The possible reasons for this pattern are discussed, and the larvae of both species are described and figured.

Convergent evolution is common in geometrid larvae, particularly among different species feeding on the same or similar foodplants. The

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FIGS 1-2. 1, Last-instar larva of *Meris alticola*; 2, Last-instar larva of *Neoterpes graefiaria*.

selection pressures on the larvae to resemble parts of their foodplant must be very strong; many geometrid larvae are notoriously good mimics of their foodplant, most often resembling twigs, needles, or stems. In the genus *Stenoporpia*, four very divergent types of larvae have evolved even though the adults in the genus are all similar (Poole, 1969). These four types of larvae resemble their particular foodplant well, and have also evolved behavior patterns that increase their ability to conceal themselves.

In Arizona, Dr. John G. Franclemont of Cornell University and the author reared two geometrid species, *Neoterpes graefiaria* (Hulst) and *Meris alticola* Hulst, on species of *Penstemon*. The foodplant of *Meris alticola* was *Penstemon virgatus* and of *Neoterpes graefiaria*, *P. barbatus*. The larvae of *N. graefiaria* have not been collected in the field, but larvae of *M. alticola* were commonly collected and observed in the field during the summer of 1965 at the Fort Valley Experimental Station near Flagstaff, Arizona.

BIOLOGY

The habitat at Fort Valley is ponderosa pine forest with open meadows. The adults fly in July following the summer rains. The summer rains cause a great surge in the growth of the herbaceous flora, and the penstemon host of *M. alticola* grows from a small rosette of leaves to a large flower stalk. The eggs of *M. alticola* are laid in midsummer, the young larvae feeding on the flowers of the plant, although some feeding does occur on the leaves. The characteristic larval pattern is present in all instars, including the first. The last-instar larvae overwinter and resume feeding in the spring. In the spring the plants of *P. virgatus* are only small rosettes of leaves, the larvae wandering around grazing on the rosettes. I believe that this behavior pattern is unknown in any other species of geometrid larva. The anal prolegs in *M. alticola* are modified for this last-instar wandering and are larger and stouter than in