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THE GENUS *ARRUGADA* (HOMOPTERA: CICADELLIDAE)  
IN BOLIVIA AND PERU

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*Abstract.*—Two species of *Arrugada*, previously described by Osborn, *Arrugada rugosa* (Osb.) and *A. affinis* (Osb.) are treated and a new species *A. breviceps* n. sp. is described.

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The genus *Arrugada* was described by Oman (1936) to include two species *Huleria rugosa* (Osb.) and *H. affinis* (Osb.), previously described by Osborn. A third species, *A. breviceps* n. sp. is described at this time.

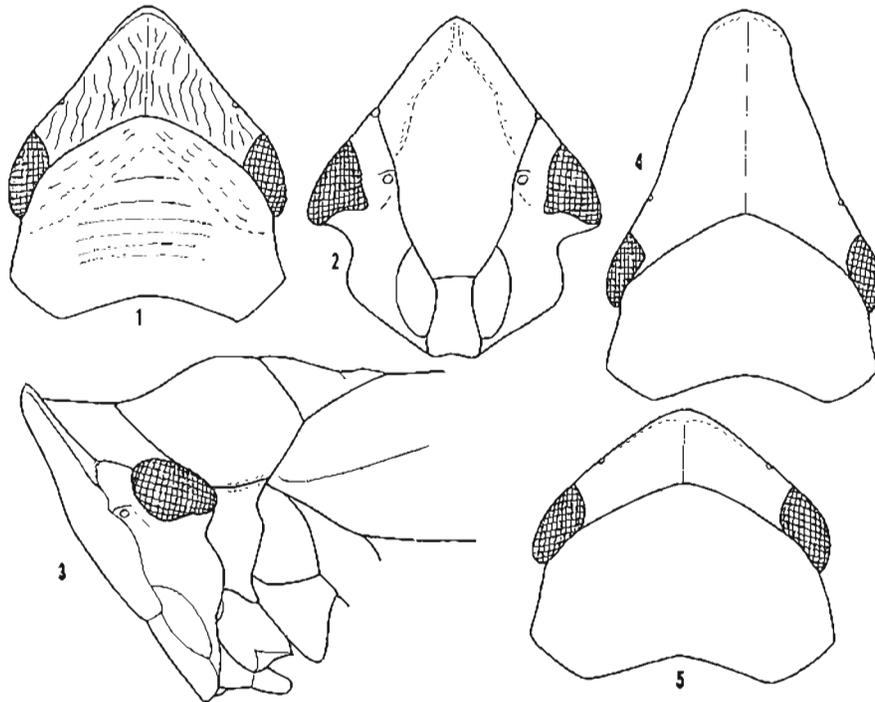
Discussion  
Subfamily Arrugadinae

Large, brown sexually dimorphic leafhoppers.

Body elongate, convex. Head slightly broader than pronotum, anterior margin acute or subacute, slightly upcurved. Entire crown and face, excluding the very anterior margin, strongly and densely rugose with vermiculate irregularly longitudinal ridges and sulci. Face flattish, lower part broad, rounded in outline; anteclypeus strongly expanding apicad; frontoclypeus facial, fairly broad, broadening upwardly, upper margin on either side of a median keel distinctly depressed; lora of normal size, not extending to lateral margins of genae apically; genae broad, strongly rectangularly notched near eyes, episternum entirely concealed; ocellocular area broad with a short and faint ledge above antennal pits; antennae short. Crown in ♂ bluntly or sharply angular, in ♀ strongly produced; coronal suture present as a median groove; ocelli in anterior margin about 3× their own diameter from eyes. Anterior tentorial branches (Fig. 6) sclerified, apex expanded. Pronotum with long carinate lateral margins; disk convex, anterior margin ± vermiculately rugose, basal part shagreened and transversely furrowed. Scutellum large, densely shagreened, base sometimes vermiculately rugose, a transverse subapical sulcus present. Elytra longer than abdomen, narrow, tapering apicad, subcoriaceous, appendix distinct, two long parallel-sided subapical cells, two claval veins, no extra cross veins. Venation of flying wings of the normal Deltocephaline type. Legs of the common Deltocephaline type with well developed spinulation except that the dorsal surface of the fore and middle tibiae is shallowly scored and the setae on the ventral surface of the 1st segment of the hind tarsi (Fig. 14) are not regularly arranged.

Male genitalia of the common Deltocephaline type.

Female genitalia: 1st valvulae (Fig. 30) broad, blade-like; an elongate



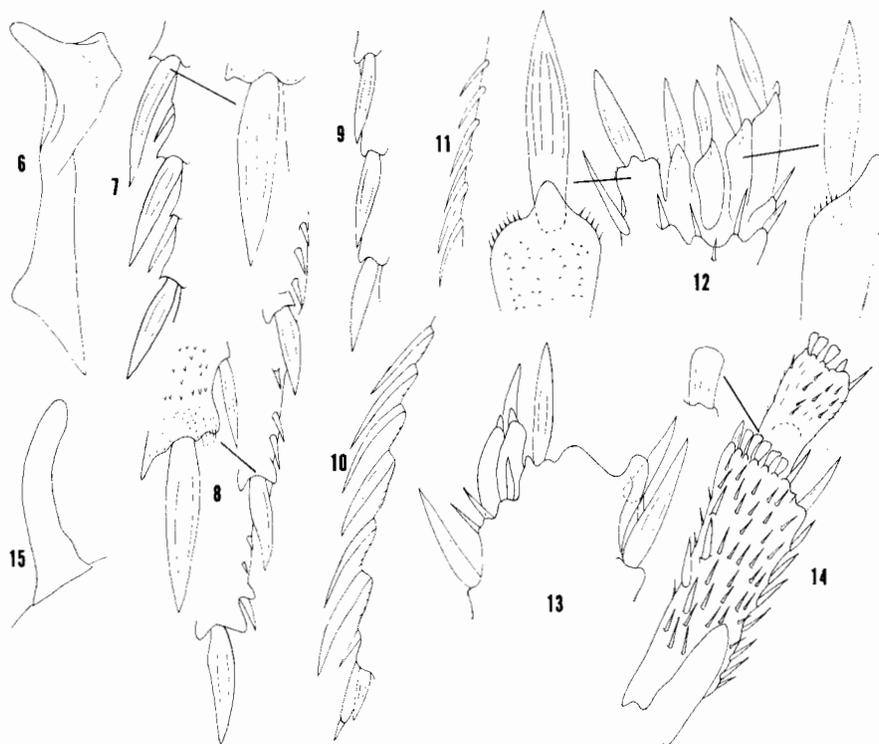
Figs. 1-5. *Arrugada rugosa* (Osb.): 1. Head and pronotum ( $\delta$ ); 2. Face ( $\delta$ ); 3. Head and thorax from side ( $\delta$ ); 4. Head and pronotum ( $\text{♀}$ ).—*A. breviceps* sp. n.; 5. Same ( $\delta$ ).

patch with reticulate pattern with raised cells present on dorsolateral and ventroapical surfaces, these patches separate both from each other apically and from the dorsal and ventral margins; an area with reticulate and finely striated pattern present also along ventral margin. Second valvulae (Fig. 31) broadening apicad, blade-like, ventral margin straight, dorsal margin curved, edentate. Third valvulae (Fig. 32) with short setae along ventral margin.

Biology unknown.

Range neotropical (Bolivia, Peru).

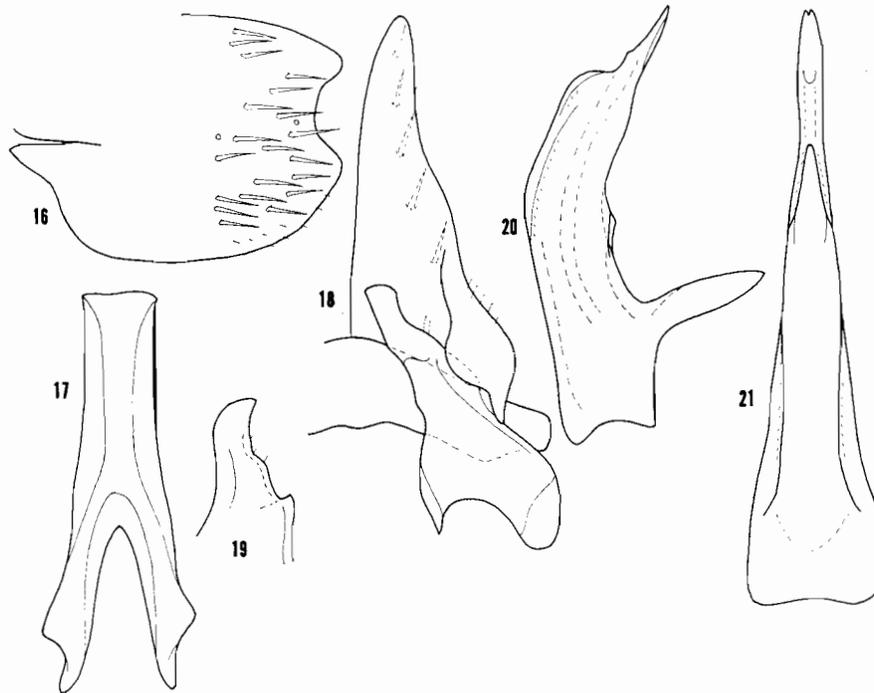
The two formerly known species of the genus *Arrugada*, the only representative of the subfamily, were originally described as members of *Huleria* Ball (Osborn, 1924:404-406). Also Oman (1936:362), who created a new genus, *Arrugada*, for them, regarded it as a relative of *Huleria*. *Huleria* (1st and 2nd valvula of a related genus, *Penhuleria* Beam., illustrated in Figs. 41-43) belongs, however, to the tribe Cochlorhinini within the subfamily Deltoccephalinae and is not a close relative of *Arrugada* for which a



Figs. 6-15. *Arrugada rugosa* (Osborne): 6. Anterior tentorial branch; 7-13. Spinulation of hind tibia (7. row I, 8. row II, 9. row III, 10-11. row IV (lower and upper part), 12. apex in ventral and 13. in dorsal aspect); 14. First and 2nd segments of hind tarsus, ventral aspect.—*Dorycephalus minor* (Osborne); 15. Anterior tentorial branch.

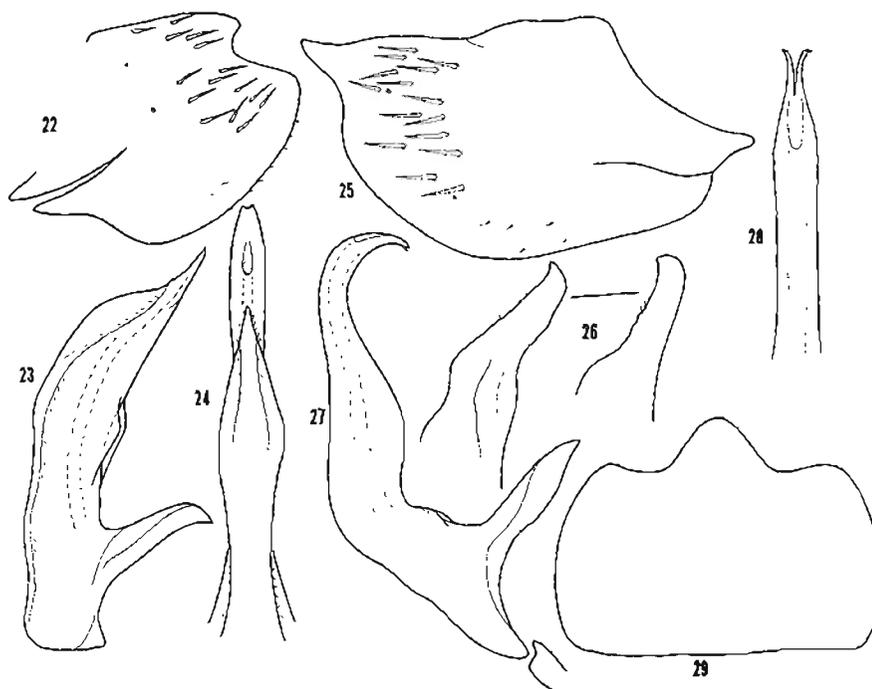
separate subfamily, Arrugadinae, was proposed by Linnavuori (1965:141-142).

Arrugadinae is undoubtedly an offshoot of the Aphrodine group sharing all its principal characters: rugosity, common cephalic structure with sharp anterior margin of head and facial frontoclypeus and long carinate lateral margins of pronotum. It has retained, like Aphrodinae, the ancestral type of chaetotaxy on the ventral surface of the 1st segments of the hind tarsi, while in the other subfamilies of the group there are two longitudinal spine rows on the ventral surface of the named segment. Evans (1947:149), in fact, included *Arrugada* in the Aphrodinae. But Aphrodinae differs from Arrugadinae in several respects (body robust and depressed; different cephalic structure: anteclypeus long and parallel-sided, antennal ledges distinct, anterior tentorial branches membranous; dorsal surface of fore and middle tibiae rounded; ancestral type of male genitalia: valve band-



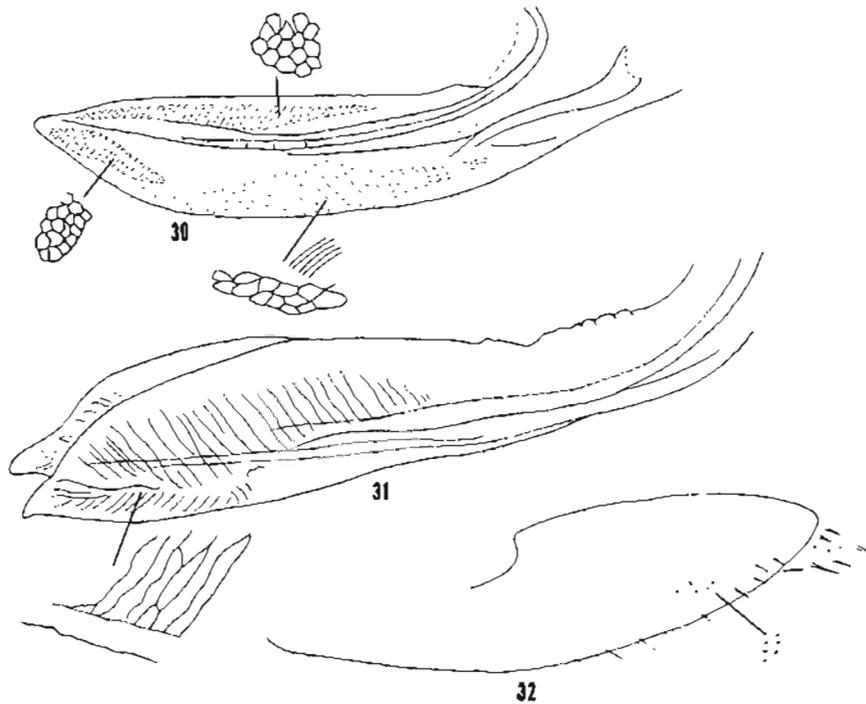
Figs. 16–21. *Arrugada rugosa* (Osb.): 16. Side lobe of pygofer, lateral aspect; 17. Connective; 18. Genital plate and style; 19. Apex of style; 20. Aedeagus in lateral, 21. in ventral aspect.

like and fused with pygofer laterally, genital plates long and parallel-sided and provided with numerous not regularly arranged macrosetae, apophysis of style long and narrow, pygofer without membranous fold laterally; different structure of female genitalia (Figs. 33–34): 1st valvulae with reticulate pattern on apex and dorsolateral surface, 2nd valvulae narrowly blade-shaped and recurved dorsad, apical half of dorsal margin remotely dentate with blunt simple teeth) and uniting of these two groups does not seem to be justified. Moreover, the main range of the Aphrodinae is Holarctic, only a few species are known from the Old World tropics, none from Australia and the Neotropical Region. Eupelicinae (Old World) differs from Arrugadinae in the general habitus (depressed body, spatulate and widely foliaceous head with parallel-sided anteclypeus), structure of the legs (dorsal surface of fore and middle tibiae with stiff marginal setae; hind tibiae shorter and quadrilateral in section, marginal setae shorter and less numerous (in *Eupelix* Gm. row I with 7, row II with 5 and row III with 6 setae, row IV with 3 longer and several very short setae); ventral surface of 1st joint



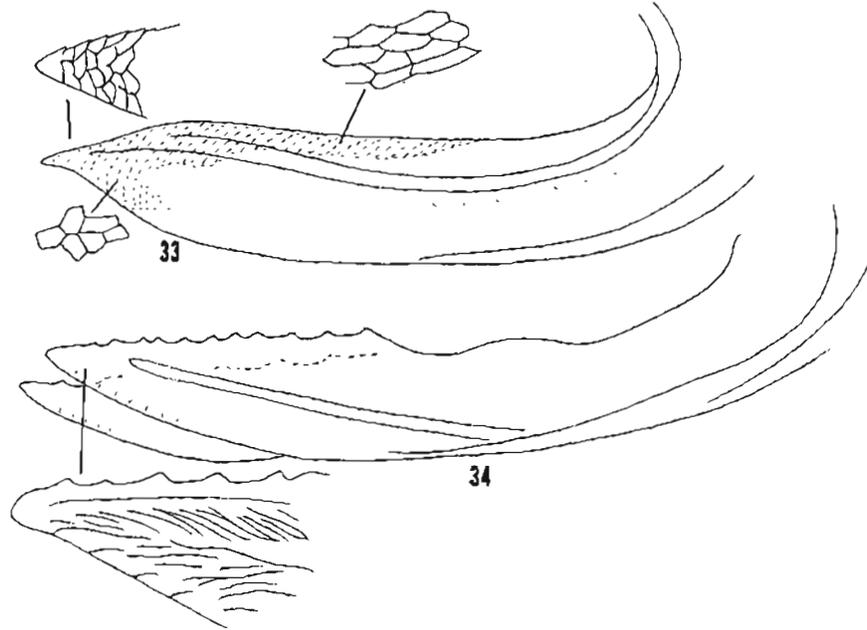
Figs. 22-29. *Arrugada affinis* (Osborne): 22. Side lobe of pygofer, lateral aspect; 23. Aedeagus in lateral, 24. in ventral aspect.—*A. breviceps* sp. n.; 25. Side lobe of pygofer, lateral aspect; 26. Apex of style; 27. Aedeagus in lateral, 28. in ventral aspect.—*A. rugosa* (Osborne); 29. Seventh sternite (♀).

of hind tarsi with two longitudinal rows of spines) and the female genitalia (Figs. 35-36) (1st valvulae as in Aphrodinae, 2nd valvulae very distinctive: dorsal margin with numerous large rounded teeth, each tooth with several denticles, margins of apex finely serrate). The Paradorydiinae (Old World) that, like the Dorycephalinae, are highly specialized leafhoppers living on grasses, have an entirely different, long and very narrow green-colored body and dissimilar structure of the legs (like in the Eupelicinae), the male genitalia (as in the Aphrodinae) and the 1st and 2nd valvulae (Figs. 37-38) (1st valvulae with two areas with reticulate microsculpturing with raised cells, one on dorsolateral surface, separated from dorsal margin with an unsculptured area; one on apicoventral margin, both areas uniting with each other apically; 2nd valvulae narrow and straight, apical part of dorsal margin minutely serrate). The Dorycephalinae (main range Nearctic, one genus with two species in East Europe and Central Asia) have a very different, long narrow and depressed body (sufficiently characterized by

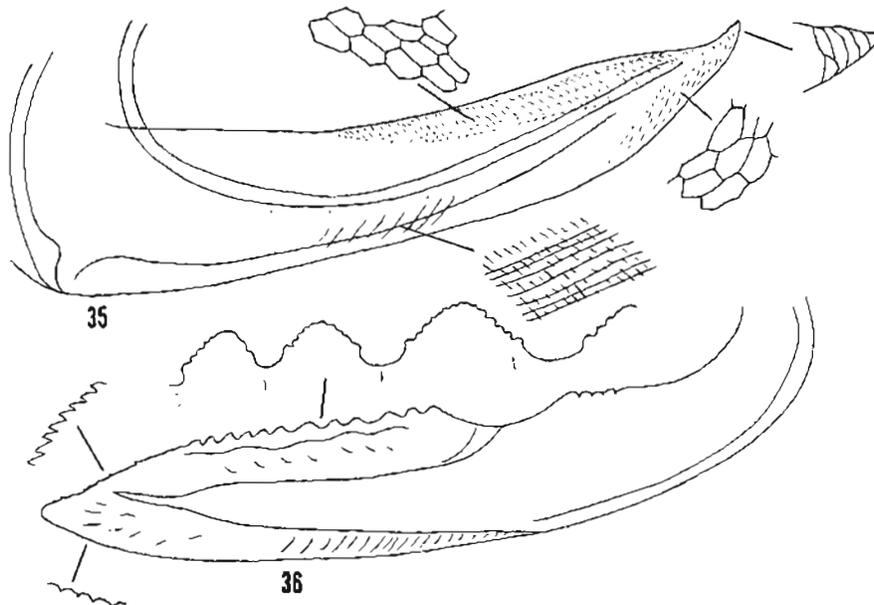


Figs. 30-32. *Arrugada rugosa* (Osb.): 30. First valvula; 31. Second valvula; 32. Third valvula.

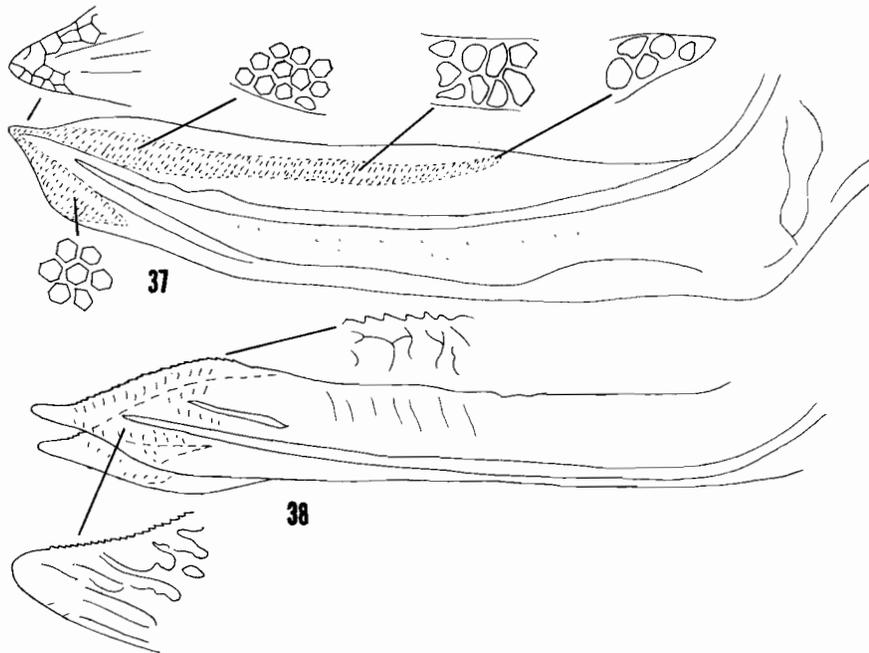
Oman 1949:29-30), an adaptive character connected with living on grasses, a feature that has independently evolved in various Cicadellidae groups. The episternum in the Dorycephalinae is exposed, generally an ancestral character, but this may have been caused by a secondary development connected with the strong prolongation of the head. The episternum is partially visible also in the similarly long-headed Paradorydiinae. In the most ancestral representative of the Dorycephalinae, *Neoslossonia* V.Dz., that also is dark colored, has strong vermiculate rugosities and a median sulcus on the crown and a less obvious sexual dimorphism than the other genera, the genae are broad and the episternum therefore only partly concealed. The dorsal surface of the fore and middle tibiae is rounded and the ventral surface of the 1st hind tarsal segment is provided with two longitudinal rows of spines in the Dorycephalinae, but otherwise the structure of the legs, the male genitalia and the 1st and 2nd valvulae (Figs. 39-40; 1st valvulae with two separate patches with reticulate microsculpturing with raised cells, the patches not touching the dorsal and ventral margins



Figs. 33-34. *Aphrodes costata* (Pz.): 33. First valvula; 34. Second valvula.



Figs. 35-36. *Eupelix cuspidata* (F.): 35. First valvula; 36. Second valvula.



Figs. 37-38. *Paradorydium aurantium* (Nd.): 37. First valvula; 38. Second valvula.

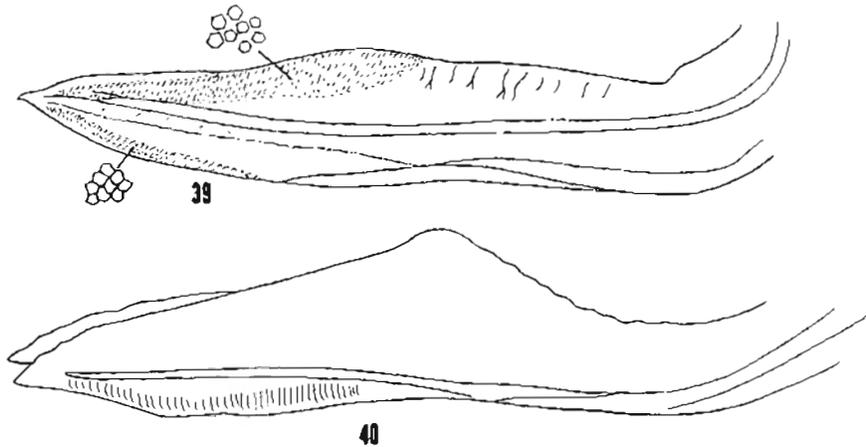
except basally; 2nd valvulae broad and straight, marginally edentate) resembles that of the Arrugadinae. Also the anterior tentorial branches (Fig. 15) are sclerified. It is possible that Arrugadinae and Dorycephalinae are derivatives of a common ancestor, although both groups have long been isolated and developed along different evolutionary lines. Another possibility is that two early dispersals of the Aphrodine stock into the New World have taken place, one into South America leading to evolving of Arrugadinae, one into North America giving rise to Dorycephalinae.

#### Genus *Arrugada* Om.

*Arrugada* Oman 1936:362. Type: *Huleria rugosa* Osb.

General characters as above.

Legs: Spinulation of fore tibiae 5 + 4, of hind knees 2 + 2 + 1. Hind tibiae somewhat flattened, nearly straight; spinulation in Figs. 7-13: row I with about 17 primary setae, one fairly long intercalary seta between two primary setae; row II with 10 primary setae, 2-3 short intercalary setae between two primary setae; row III with 14 primary setae; row IV with 3 thicker setae in apical part and numerous slender setae; distal transverse row on apex of ventral surface with 5 spurs, each composed of an enlarged



Figs. 39-40. *Dorycephalus minor* (Osb.): 39. First valvula; 40. Second valvula.

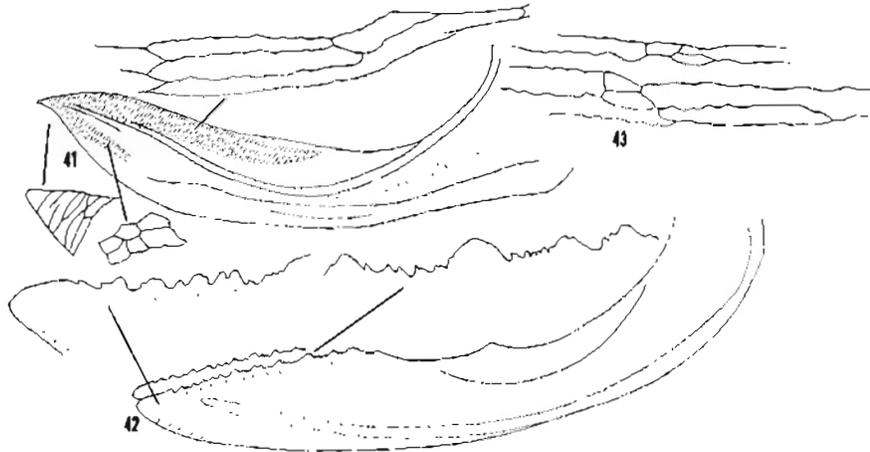
cylindrical base with a terminal seta, setae of the three middle spurs shorter than those of the marginal ones, margins of setal bases fringed apically; setae of proximal row arising from small tubercles. Ventral surface of 1st segment of hind tarsi (Fig. 14) with numerous not regularly arranged setae, margin with thicker spines, apex with a transverse row of spines and platellae; 2nd segment with delicate setae and with a transverse apical row of platellae and spines.

Male genitalia: Genital segment with macrosetae. Pygofer rather short, sclerified; side lobes broad, provided with numerous short macrosetae. Anal tube fairly long, tapering apicad, sclerified, dorsal surface elevated basally. Valve short and broad. Genital plates sharply triangular, lateral margins undulate, a row of short macrosetae arising rather far from lateral margins. Style small, apophysis short and incrassate, preapical angle obtuse, basal part broad. Connective (Fig. 17) long, robust, Y-shaped, articulated. Aedeagus flattened, basal part small, shaft recurved dorsad, apex bifid, dorsal surface with a pair of subbasal triangular lobes; gonopore subapical on ventral surface. Seventh sternite (♀) large, hind margin roundedly produced medially.

1. *A. rugosa* (Osb.)

*Huleria rugosa* Osborn 1924:404-405.

Figs. 1-4. Length ♂ 8 mm, ♀ 9.2 mm. ♂. Pale ochraceous. Face with greenish tinge. Middle of crown and basal part of pronotum embrowned. Two median stripes on scutellum brown. Elytra dark brown. Crown



Figs. 41-43. *Penehuleria acuticephala* Beam.: 41. First valvula; 42. Second valvula; 43. Microsculpturing on dorsal margin of 1st valvula.

sharply triangular,  $2.55-2.64\times$  as long at middle as laterally, twice as broad as long,  $0.6-0.62\times$  as long as median length of pronotum. ♀. Pale ochraceous. Extreme apex of crown black. Median band on crown, basal part of pronotum and markings on scutellum slightly embrowned. Elytra yellowish brown, costal margin paler. Crown strongly produced,  $5.4\times$  as long at middle as laterally, nearly as long as broad (65:66),  $1.4\times$  as long as median length of pronotum.

Male genitalia in Figs. 16-21. Apical margin of side lobes of pygofer broadly and shallowly insinuated. Aedeagus strongly flattened. Seventh sternite (♀) as in Fig. 29.

Material studied: The type series (all males) from Coroico, Yungas, Bolivia, 16.IV.1899, and 1♀ from the same locality, in coll. Osborn, in the Ohio State University.

## 2. *A. affinis* (Osborn)

*Huleria affinis* Osborn 1924:405-406.

Like the preceding but smaller, length 7 mm (♂), and crown shorter,  $2.1-2.4\times$  as long at middle as laterally,  $2.15-2.25\times$  as broad as long,  $0.57-0.6\times$  as long as median length of pronotum.

Male genitalia (Figs. 22-24) nearly as in *A. rugosa*.

Material studied: Bolivia, Chulumani, 1♂, type, 9.XII.1898, in coll. Osborn, the Ohio State University; Cochabamba, Chapare, Alto Palmar, 1,100 m, 1♂, X.1960, F. H. Walz.—Possibly conspecific with *A. rugosa*.

3. *A. breviceps* sp.n.

Fig. 5. Length 9 mm. Like *A. rugosa* but bigger, crown very short,  $1.54\times$  as long at middle as laterally,  $3.25\times$  as broad as long,  $0.4\times$  as long as median length of pronotum, and pronotum shorter.

Male genitalia in Figs. 25–28. Side lobes of pygofer ending in a sharply triangular apex. Shaft of aedeagus narrow, strongly bent dorsad apically, apex distinctly bifid. Apophysis of style rather long. Genital plates as in *A. rugosa*.

Bolivia, Coroico, 1 ♂, type, in coll. Osborn, the Ohio State University.

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