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A review of North and Central American *Paragrilus* Saunders, 1871 (Coleoptera: Buprestidae: Agrilinae)

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Abstract

The buprestid genus *Paragrilus* Saunders, 1871 is reviewed for North and Central America. Of 18 species that are recognized, six are described as new: *P. akersi, P. burkei, P. heliocarpi, P. moldenkei, P. fallorum,* and *P. azureus.* Species fall into three species groups, the *P. rugatulus* group, the *P. trifoveolatus* group, and the *P. aeraticollis* group. Four species are considered to occur in the United States: *P. burkei, P. lesueuri* Waterhouse, *P. rugatulus* Thomson, and *P. tenuis* (LeConte). A key is given to separate species. Lectotypes are designated for *P. laevicollis* Waterhouse and *P. trifoveolatus* Waterhouse. All known adult hosts are in the Malvales (families Malvaceae, Sterculiaceae and Tiliaceae), two species have been reared (*P. lesueuri* and *P. tenuis*), and four species of the *P. rugatulus* group are known to associate with the genus *Sida* in the family Malvaceae.

Key words: *Agrilus*, Buprestidae, Central America, Coleoptera, Malvales, North America, *Paragrilus*, *Sida*.

Introduction

The genus *Paragrilus* Saunders is a moderately large genus in the subtribe Rhaeboscelidina Cobos of the tribe Agrilini Laporte, and subfamily Agrilinae Laporte. Members of the genus are commonly collected, especially the group of species associated with herbaceous weeds in the genus *Sida* L. (Malvaceae). Although there is a much smaller proportion of undescribed species than in the large genus *Agrilus* Curtis and in the leaf-mining Trachini Gory & Laporte (Hespenheide 1996), a few North and Central American species remain to be described, including one that reaches southern Arizona. The descriptions of these species are presented here in the context of a general review of the genus as it occurs north of South America. The review focuses on the species south of the United States, so that the distribution data are incomplete for the one species, *P. tenuis* (LeConte), that is

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widespread in the eastern United States. Adult plant hosts are recorded when known, although only *P. tenuis* and *P. lesueuri* Waterhouse appear to have been reared.

The following collection codens are used throughout the text: AMNH, American Museum of Natural History, New York, N.Y.; AUEC, Auburn University, Alabama; BMNH: The Natural History Museum, London, England; CASC, California Academy of Sciences, San Francisco, CA, U.S.A.; CHAH: Henry A. Hespenheide, University of California, Los Angeles, CA, U.S.A.; CLBC, C.L. Bellamy, Sacramento, CA, U.S.A.; CMNC: Canadian Museum of Nature, Ottawa, Canada; CNCI, Canadian National Collection of Insects, Ottawa, Canada; CSCA, California Department of Food and Agriculture, Sacramento, CA, U.S.A.; DSVC, D. S. Verity, Los Angeles, CA, U.S.A.; EAPZ, Escuela Agricola Panamericana Zamorano, Tegucigalpa, Honduras; EMUS, Utah State University, Logan, UT, U.S.A.; FMNH, Field Museum of Natural History, Chicago, IL, U.S.A.; FSCA, Florida State Collection of Arthropods, Gainesville, FL, U.S.A.; GBFM, Universidad de Panamá; GHNC, G.H. Nelson, [address], U.S.A.; INBC: Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica; LACM, Los Angeles County Museum of Natural History, Los Angeles, CA, U.S.A.; MCZC, Museum of Comparative Zoology, Harvard University, Cambridge, MA, U.S.A.; MNHN, Museum of Natural History, Paris, France; MSUC, Michigan State University, East Lansing, MI, U.S.A.; MUCR, University of Costa Rica, San Pedro, Costa Rica; NEWC, Norman E. Woodley, Washington, DC, U.S.A.; NMPC, National Museum, Prague Czech Republic; OSU, Ohio State University, Columbus, OH, U.S.A.; RLWE, R.L. Westcott, Salem, OR, U.S.A.; SEAN, Museo Entomológico, Léon, Nicaragua; SEMC, Snow Museum, University of Kansas, Lawrence, KS, U.S.A.; SGWC, S.G. Wellso, Bastrop, TX, U.S.A.; STRI: Smithsonian Tropical Research Institute, Ancon, Panamá; TAMU, Texas A & M University, College Station, Texas; TCMC, T. C. McRae, St. Louis, MO, U.S.A.; UNAM, Universidad Nacional Autónoma de México; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A.

Paragrilus Saunders, 1871

Paragrilus Saunders, 1871: 127 (replacement name for *Clinocera* Deyrolle).
Type species: *Agrilus modicus* Solier, 1833 (subsequent designation: Nelson 1987: 71).
Clinocera Deyrolle 1864, 116. (name preoccupied, Meigen 1803, Diptera).
Type species: unavailable (no type species designation)
Rhaeboscelis auct. not Chevrolat, 1837.

The genus has been most recently treated by Cobos (1976) in relation to the other genera in the subtribe Rhaeboscelidina, *Rhaeboscelis* Chevrolat and *Velutia* Kerremans. Examination of the type of *Velutia sericea* Kerremans shows that genus to be doubtfully distinct from *Paragrilus*.

Characters: Overall, members of the genus are relatively elongate and subcylindrical

in form, similar to the genus *Agrilus*, although members of the *P. aeraticollis* and *P. trifoveolatus* groups are more or less flattened dorsally. Colors are typically dark and matte or only weakly shining. Most species are glabrous or inconspicuously setose, although members of the *P. aeraticollis* group are sexually dimorphic in that males possess areas of conspicuous setae on the front.

The front of the head is typically very convex in dorsal view, usually impressed along the midline, especially deeply so in the *P. trifoveolatus* group, one of whose members also possesses a round fovea at the base of the depression. The epistoma is typically depressed and relatively narrow between the antennal insertions, but is broader in the *P. trifoveolatus* group. The ventral margin of the episotoma is produced in some species and is emarginate with more or less sharply acute lateral angles.

The shape and sculpture of the pronotum are the most distinctive features of the species treated here, both in characterizing species groups and in separating species. The genus itself is defined by anterior depressions between the marginal and submarginal carinae which receive the antennae. The posterior angles are usually more or less swollen as a prehumeral callosity and separated from the rest of the pronotal disc by a depression of differing shapes and intensities. In the *P. trifoveolatus* and *P. aeraticollis* groups the prehumeral callosity is produced outward and anteriorly to form a ridge above and roughly parallel to the marginal carina. In the *P. trifoveolatus* group the disc is relatively flattened and has three relatively equal depressions along base which produce an undulating posterior margin. The lateral depressions are relatively weak in the *P. rugatulus* group and stronger and continuing obliquely to the lateral margins in the *P. aeraticollis* group.

The elytra are characterized by a strong posthumeral carina which typically extends to just beyond the posterior coxae, but is longer in a few species. This character is shared with a few species of *Agrilus* (the *A. dissimilis* group; see below). The elytra are usually more or less transversely rugose and relatively unmodified otherwise, except for a subapical raised callosity in a few species. The apices are usually broadly rounded or subtruncate and slightly emarginate.

The ventral surface is relatively unmodified except for the posterior process of the prosternum and form of the hind coxae. The first ventral abdominal segment is produced anteriorly between the hind coxae and usually has carinae on the lateral margins of the process which border depressions for the hind tarsi when the legs are pulled in to the body. Male genitalia are usually distinctive.

The North and Central American species of the genus can be separated into three groups -

P. rugatulus group (*P. exiguus* (Chevrolat), *P. lesueuri* Waterhouse, *P. modicus* (Solier), *P. rugatulus* Thomson, *P. transitorius* Waterhouse, *P. vicinus* Waterhouse) - somewhat varied, but generally more cylindrical and characterized by a convex, rugose pronotum with weak prehumeral callosities; known plant hosts of adults are in the genus *Sida* (Malvaceae).

P. trifoveolatus group (*P. angulaticollis* Waterhouse, *P. impressus* (Chevrolat), *P. laevicollis* Waterhouse, *P. tenuis* (LeConte), *P. trifoveolatus* Waterhouse, *P. fallorum* n. sp., *P. azureus* n. sp.) - usually more flattened above and characterized by having the pronotum often smoother and with three depressions along base which produce an undulating posterior margin.

P. aeraticollis group (*P. aeraticollis* Waterhouse, *P. heliocarpi* n. sp., *P. akersorum* n. sp., *P. moldenkei* n. sp., *P. burkei* n. sp.) - usually more flattened above, the pronotum smooth or rugose, and characterized by males with areas of setae on the front of the head.

Not surprisingly, the species of the *P. rugatulus* group that are associated with the weedy plant genus *Sida* L. in the Malvaceae are very common in collections and all described, often multiply. The most poorly known species are members of the *P. aeraticollis* group, in which 4 of the 5 species are previously undescribed. Known adult hosts in this group are all lianas (*Byttneria* Steud.) or shrubby perennials (*Heliocarpus* L., *Wissadula* Medik.) found in forest gaps or edges, but not usually in more open second growth. Many are widely distributed, but three of the species in the *P. trifoveolatus* group apparently have very localized, possibly relictual distributions.

Key to species

1 Pronotum regularly convex in cross section with relatively weak lateral depressions, sides of prehumeral callosity and pronotum regularly convex, not forming ridge above marginal carina, antennal insertions narrowly separated; generally convex in cross section above; hosts *Sida* ..... *P. rugatulus* species group...2

\- Pronotum weakly convex in cross section with relatively strong lateral depressions, sides of prehumeral callosities extended anteriorly as ridge above marginal carina, more or less explanate; antennal insertions broadly separated; generally flattened above in cross section..... 7

2 Elytral surface irregular, with strong oval callosities near apices; pronotum of one species with medial depression along midline..... 3

\- Elytral surface regular, without or with weak callosities, pronotum various but without medial depression along midline..... 4

3 Pronotum with medial depression along midline, rugae undulate, color black, violaceous or golden; Arizona to Panamá..... *P. lesueuri* Waterhouse

\- Pronotum convex, rugae transverse, color dark blue or blue and violaceous; México? Costa Rica, Panamá..... *P. vicinus* Waterhouse

4 Pronotum nearly smooth; México to South America..... *P. transitorius* Waterhouse

\- Pronotum more or less coarsely, transversely rugose..... 5

5 Pronotum very convex, finely rugose, prehumeral callosities not prominent, separated from disc by indistinct depressions; México to Honduras..... *P. exiguus* (Chevrolat)

\- Pronotum only moderately convex, coarsely rugose, prehumeral callosities prominent, separated from disc by strong, oblique depressions..... 6

6 Pronotum relatively shorter, distinctly wider than long; Costa Rica to South America . ..... *P. modicus* (Solier)

- Pronotum relatively elongate, about as long as wide; Texas to Costa Rica .... *P. rugatulus* Thomson

7 Base of pronotum with shallow medial depression along midline anterior to scutellum and separate broad, shallow lateral depressions separating prehumeral callosities; anterior angles of pronotum usually strongly angulate; front rather deeply impressed along midline above basal fovea, males with front glabrous .... *P. trifoveolatus* species group...8

- Base of pronotum with transverse depression, or with small raised ridge along midline anterior to scutellum, prehumeral callosities separated by strong narrow oblique depressions; anterior angles of pronotum usually rounded, rarely angulate; front usually less deeply impressed along midline above middle; males with areas of setae on front ..... *P. aeraticollis* species group...14

8 Anterior angles of pronotum weakly rounded; eastern North America .... *P. tenuis* (LeConte)

- Anterior angles of pronotum strongly angulate, México and Central America 9

9 Front with prominent round depression in middle between eyes and linear depression along midline above middle, pronotum golden red, transversely rugose on basal half, smoother on anterior half; southern México, Belize ..... *P. impressus* (Chevrolat)

- Front deeply, linearly impressed only along midline above middle, pronotum uniformly smooth or rugose, but not both 10

10 Larger species, >5 mm in length, pronotum smooth. 11

- Smaller species, <5 mm in length, pronotum smooth or rugose. 13

11 Strongly bicolored, red pronotum, black elytra, México (Chiapas) .... *P. angulaticollis* Waterhouse

- Blue or bicolored blue and greenish, Costa Rica or Panamá 12

12 Uniformly blue, Panamá ..... *P. laevicollis* Waterhouse

- Bicolored blue elytra and greenish pronotum, Costa Rica ..... *P. azureus* n. sp.

13 Pronotum rugose, México to Costa Rica. ..... *P. trifoveolatus* Waterhouse

- Pronotum smooth, shagreened, Panamá ..... *P. fallorum* n. sp.

14 Anterior angles of pronotum strongly angulate, pronotum smooth; species strongly bicolored, golden pronotum, black elytra; México to South America .... *P. aeraticollis* Waterhouse

- Anterior angles of pronotum rounded, not angulate, pronotum more or less rugose, species unicolored or weakly bicolored 15

15 Species unicolored, dark blue to violaceous; male genitalia pale 16

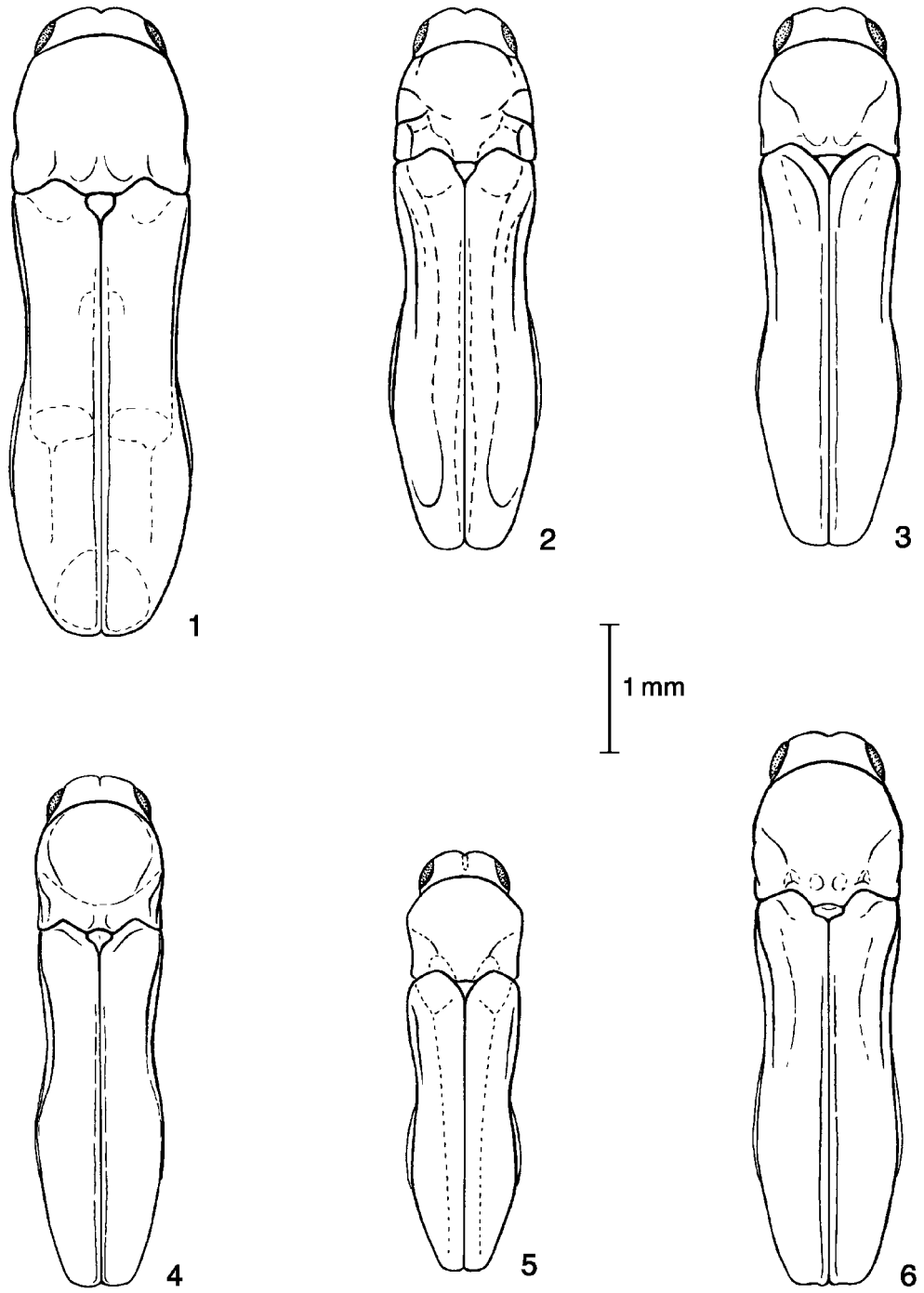
- Species weakly bicolored, golden pronotum, black elytra; male genitalia black 17

16 Pronotum nearly smooth, indistinctly rugose; Costa Rica and Panamá .... *P. akersorum* n.sp.

- Pronotum distinctly transversely rugose; Arizona and México ..... *P. burkei* n. sp.

17 Pronotum finely rugose, polished and strongly shining, Panamá ..... *P. heliocarpi* n. sp.

- Pronotum rugose, shagreened and matte, El Salvador to Panamá .... *P. moldenkei* n. sp.



FIGURES 1-6. North and Central American *Paragrilus*, dorsal view - *P.rugatulus* group - 1. *P. lesueuri* Waterhouse; 2. *P. vicinus* Waterhouse; 3. *P. transitorius* Waterhouse; 4. *P. exiguus* (Chevrolat); 5. *P. modicus* (Solier); 6. *P. rugatulus* Thomson.

***Paragrilus lesueuri* Waterhouse**
(Figs. 1, 19)

Paragrilus lesueuri Waterhouse, 1889: 126.
Paragrilus aureonitens Obenberger, 1919:22 (synonymy: Hespenheide1979: 117).
Paragrilus helferi Obenberger, 1924: 147 (synonymy: Hespenheide1979: 117).
Paragrilus helferi ssp. *cortezi* Obenberger, 1924: 147 (synonymy: Hespenheide1979: 117).
Agrilus novus Dugès, 1891: 31 - **New Synonymy**
Paragrilus novus (Dugès), Obenberger, 1935: 921 - **New Synonymy**
Paragrilus lesueri Cobos, 1976: 32 - **New Synonymy**

Diagnosis: Robust, color variable, head and pronotum usually black, elytra with dark purple reflections, 3.3-5.0 mm long. Head with front very convex, narrowly, deeply impressed along midline; epistoma depressed and medially carinate between antennal insertions, ventral margin produced, emarginate with acute lateral angles; surface coarsely punctate, shagreened. Pronotum convex, prehumeral callosity weakly indicated by shallow lateral depressions; disc raised before scutellum, with narrow transverse depressions on either side along basal margin, depression along midline at and just anterior to middle, surface more or less coarsely transversely rugose, at least on basal half, rugae curving anteriorly at medial depression. Elytra with posthumeral carina extending to just beyond posterior coxae, surface coarsely rugose, with third interval strongly raised, weak raised callosities at basal and apical 1/3, and strong subapical raised callosity, creating an undulating surface; apices broadly rounded-subquadrate. Posterior angles of hind coxae produced, broadly acute, flared. Male genitalia black with transparent tips to lateral lobes (Fig. 19).

Type: **México**: "Jalapa, México, Hoege" (BMNH; Hespenheide 1979); of *P. aureonitens*, Costa-Rica, Surrubres, 300', A. Heyne (NMPC); of *P. helferi*, Costa-Rica, Higuito (San Mateo) (NMPC); of *P. helferi* s. *cortezi*, Costa-Rica (NMPC); of *Agrilus novus*, Tupátaro, México (UNAM).

Distribution: Common - 856 specimens examined, México to Panamá.

Hosts: *Sida* spp.; reared from "stem gall of *Sida* sp." in Guerrero, México.

Discussion: A photograph taken by W.F. Barr of the type of *Agrilus novus* Duges in the collection of UNAM, shows the apical elytral callosities typical of *P. lesueuri*. Cobos (1976) erroneously designated this species type of the genus (Nelson 1987). This species is common in collections and rather variable, especially in color at the southern end of its distribution in Costa Rica, as reflected in the number of synonyms (Hespenheide 1979). Kerremans (1903) lists this species from Arizona based on two specimens, now at the Natural History Museum in London labeled only "Arizona, Lesueur." There is one modern collection of this species in the collection of W.F. Barr also labeled only "Arizona," and it has been collected in Sonora, México, so it can tentatively be considered part of the U.S. fauna.

***Paragrilus vicinus* Waterhouse**
(Figs. 2, 20)

Paragrilus vicinus Waterhouse, 1889: 126.

Diagnosis: Robust, head black with golden reflections, pronotum reddish purple with dark blue reflections, scutellum coppery, elytra with dark blue reflections; 3.4-3.6 mm long. Head with front convex, rather broadly, moderately impressed along midline on upper 2/3; epistoma depressed and very narrow between antennal insertions, ventral margin slightly produced, very shallowly emarginate; surface densely but indistinctly punctate, shagreened. Pronotum convex, prehumeral callosity strongly indicated by narrow, deep lateral depressions; disc rather strongly depressed along basal margin, with raised ridge in front of scutellum; surface coarsely transversely rugose. Elytra with posthumeral carinae extending beyond hind coxae, surface rugose, with third interval slightly raised, a shallow transverse medial depression and strong subapical raised callosity; apices rounded-truncate. Posterior angles of hind coxae broadly acute or subquadrate, flared. Male genitalia black, with transparent tips to lateral lobes (Fig. 20).

Distribution: Local, Costa Rica, and Panamá, possibly México (Chiapas, Vera Cruz).

Host: Unknown, but probably *Sida* spp.

Type: **Panamá**, "V. de Chiriqui,/3-4000 ft./Champion (Lectotype, BMNH; Hespenheide 1979).

Specimens examined: **México**, Vera Cruz, Fortin de las Flores, 28.VI.1975 (OSU), Chiapas, Tuxtla Gutierrez, 20.VI.1955, R.B. & J.M. Selander (AMNH). **Costa Rica**, Puntarenas Pr., 6 km S San Vito, Las Cruces, 1200 m, 8° 48' N 82° 58' W, III.1988, P. Hanson, Malaise (UCR). **Panamá**, Chiriqui, V. de Chiriqui, 2500-4000 ft., Champion (BMNH).

Discussion: I previously synonymized this species with *P. modicus* (Hespenheide 1979), but recent study of the type series and additional material leads me to reconsider them distinct species. The type series of 10 specimens is very uniform in morphology, size and coloration, as is the specimen from nearby Costa Rica. The few widely separated specimens from México lack the apical elytral callosities and differ in other ways from the type series and may not belong to this species. Waterhouse (1889) compared *vicinus* to *transitorius*, to which it is very similar in coloration, but it seems closer to *lesueuri* and *modicus* in the coarsely rugose pronotal sculpture, apical elytral callosities, and male genitalia. Before reexamining the type series, I had in fact thought the few additional, widely scattered specimens might be hybrids between *transitorius* and *lesueuri*. The number and uniformity of the type series argues for retaining the species as distinct, but the questions of distinctiveness and relationships invite further study.

***Paragrilus transitorius* Waterhouse**
(Figs. 3, 21)

Paragrilus transitorius Waterhouse, 1889: 126.
Paragrilus cordai Obenberger, 1924: 150 (synonymy: Hespenheide1979: 118).
Paragrilus modicus ssp. *hansi* Obenberger, 1924: 151 (synonymy: Hespenheide1979: 118).
Paragrilus modicus ssp. *vimmeri* Obenberger, 1924: 152 (synonymy: Hespenheide1979: 118).

Diagnosis: Agriliform, head black with aeneous reflections, pronotum reddish purple, elytra with dark blue reflections, 3.35-4.9 mm long. Head with front convex, broadly, deeply impressed along midline above middle; epistoma depressed and medially carinate between antennal insertions, ventral margin not produced, broadly, weakly rounded; surface finely punctate, shagreened. Pronotum convex, prehumeral callosity moderately well indicated by shallow lateral depressions; disc narrowly raised before scutellum, with small oval depressions on either side along basal margin, surface obsoletely rugose, nearly smooth, shagreened. Elytra with posthumeral carina extending to just beyond posterior coxae, surface weakly rugose, shagreened, with first three intervals weakly raised at base; apices broadly rounded-subquadrate. Posterior angles of hind coxae broadly acute, flared. Male genitalia black with transparent tips to lateral lobes (Fig. 21).

Type: México: "Teapa, Tabasco, March H.H.S." (Lectotype, BMNH; Hespenheide 1979); of *P. cordai*, Guatemala (NMPC); of *P. modicus* s. *hansi*, Costa-Rica, Surrubres, 300', A. Heyne (NMPC); of *P. modicus* s. *vimmeri*, Costa-Rica, Higuito (NMPC).

Distribution: Common - 168 specimens examined, México to South America.
Specimens examined: **Costa Rica**: Heredia Pr., La Selva Biol. Sta., 3 km S Pto. Viejo, 10° 26' N 84° 01' W, 05.04.1980, 16.07.1992, 18.07.1994, 24,26.07.1996, H.A. Hespenheide, at *Sida* (CHAH) ; M/01/016, 02.03.1993 (INBC). **Colombia**, Valle, Rio Jamundi, 10 mi S Cali, 3000' 25.II.1970, H.F. Howden (CMNC).

Host: Adults collected on *Sida* spp.

Discussion: This species is not very variable. The acuminate male genitalia (Figure 21) are very distinctive. See also discussion under *P. vicinus*.

***Paragrilus exiguus* (Chevrolat)**
(Figs. 4, 22)

Aphanisticus exiguus Chevrolat, 1835: no. 146.
Paragrilus exiguus (Chevrolat), Saunders, 1871: 127.

Diagnosis: Slender, black throughout, with faint golden reflections on elytra; 2.7-4.35 mm long. Head with front convex, narrowly, moderately impressed along midline on upper 2/3; epistoma depressed and rather narrow between antennal insertions, ventral margin slightly produced, shallowly emarginate with acute lateral angles; surface finely punctate,

shagreened. Pronotum very convex, almost globose, prehumeral callosity weakly indicated by shallow lateral depressions; disc rather strongly depressed along basal margin, slightly interrupted by narrow raised area before scutellum; surface weakly, finely rugose. Elytra with posthumeral carina extending to beyond posterior coxae, surface rugose; apices broadly rounded-subquadrate. Posterior angles of hind coxae acutely rounded, slightly flared. Male genitalia black with transparent tips to lateral lobes (Fig. 22).

Type: "Type./exigua Chevr./Saunders., 74.18." (BMNH).

Distribution: Southern México (Chiapas, Guerrero, Oaxaca, and Veracruz), Honduras.

Specimens examined: **Honduras**: Fco. Morazan, Esc. Agr. Panamericana Zamorano, 22.05.1988, R.D. Cave (EAPZ).

Host: Unknown, probably *Sida* spp.

Discussion: It is tempting to consider this species as a local, well-marked form of the widely distributed and variable *rugatulus*, but the very consistent body form and different male genitalia make *exiguus* distinct.

***Paragrilus modicus* (Solier)**
(Figs. 5, 23)

Agrilus modicus Solier, 1833: 304.
Paragrilus modicus (Solier), Saunders, 1871: 127.
Paragrilus vavrai Obenberger, 1924: 150 (synonymy: Hespenheide1979: 117).

Diagnosis: Robust, head and pronotum black, elytra with dark purple reflections, [] mm long. Head with front convex, eyes prominent, rather broadly, moderately impressed along midline on upper 2/3; epistoma depressed and rather narrow between antennal insertions, ventral margin slightly produced, subtruncate or shallowly emarginate; surface obsoletely, finely punctate, shagreened. Pronotum broader than long, shallowly convex, almost flattened, prehumeral callosity strongly indicated by narrow, deep lateral depressions; disc rather strongly depressed along basal margin; surface rugose. Elytra with posthumeral carina extending to beyond hind coxae, surface weakly rugose, with third interval raised and weak raised callosities at apical 1/3; apices broadly rounded-subquadrate. Posterior angles of hind coxae subquadrate, slightly flared. Male genitalia dark brown, paler medially, with transparent tips to lateral lobes (Fig. 23).

Type: of *Agrilus modicus*, "Columbia " (MNHN; Hespenheide 1979); of *P. vavrai*, Costa-Rica (NMPC).

Distribution: Costa Rica to South America.

Specimens examined: **Colombia**: Valle, Rio Jamundi, 10 mi S Cali, 3000' 25.II.1970, H.F. Howden (CMNC).

Host: Adults collected on *Sida* spp.

Discussion: This species is very similar to *P. rugatulus* and the two may well only be

geographic variants of a single species. More extensive collections must be made between Costa Rica and Guatemala to determine the relationship of these two forms.

***Paragrilus rugatulus* Thomson**
(Figs. 6, 24)

Paragrilus rugatulus Thomson, 1879: 74.
Rhaeboscelis texana Schaeffer, 1904: 211 (synonymy: Hespenheide1979: 118).
Paragrilus texanus (Schaeffer), Obenberger, 1935: 922.
Agrilus caliginosus Dugès, 1891: 31 - **New Synonymy**

Diagnosis: Robust, somewhat variable, usually black throughout, with faint golden reflections on pronotum; 3.0-5.1 mm long. Head with front convex, rather broadly, moderately impressed along midline on upper 2/3; epistoma depressed and rather narrow between antennal insertions, ventral margin slightly produced, subtruncate; surface punctate, shagreened. Pronotum about as long as broad, convex, prehumeral callosity strongly indicated by narrow, deep lateral depressions; disc rather strongly depressed along basal margin; surface strongly rugose. Elytra with posthumeral carina extending to beyond hind coxae, surface rugose, with third or first three intervals slightly raised and weak subapical raised callosity; apices broad, usually undulate-emarginate. Posterior angles of hind coxae broadly acute or subquadrate, slightly raised. Male genitalia black, paler basally, with transparent tips to lateral lobes.

Type: "Mex." (MNHP; Hespenheide 1979); of *Agrilus caliginosus*, Tupátaro, México (UNAM); of *Rhaeboscelis texana*, Brownsville, Texas (USNM, lectotype designated by Bellamy and Nelson 1989). A photograph of the type of *Agrilus caliginosus* Duges was provided by W.F. Barr and it is unequivocally this species, which is widespread and common in México.

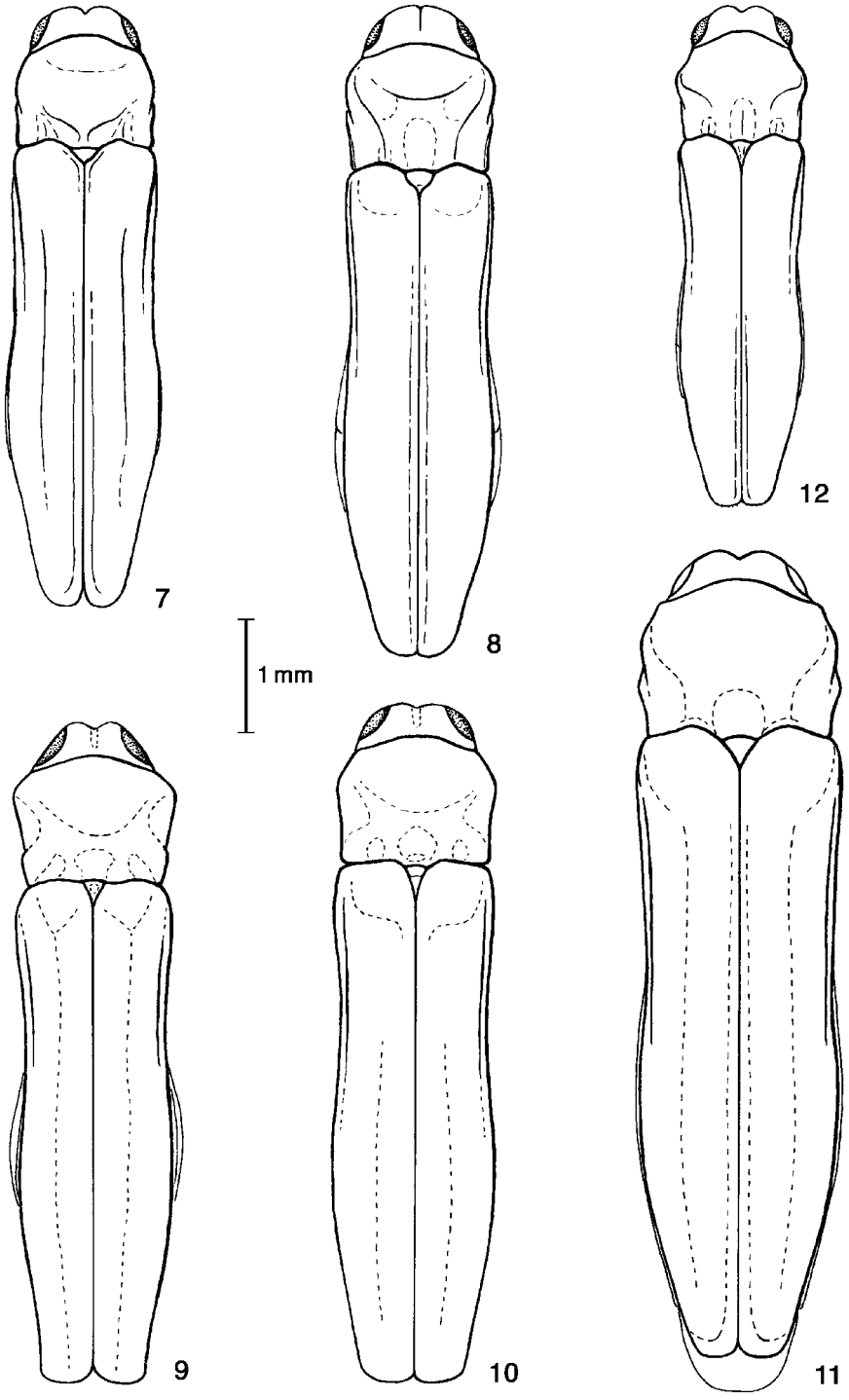
Distribution: Common - 970 specimens examined, Texas to Costa Rica.

Host: Adults collected on *Sida* spp.

Discussion: This species as interpreted here is rather variable in size, as indicated above, and coloration. Although the typical color is given above, some specimens can have the elytra purple or dark violaceous and the pronotum brighter purple to golden; many specimens are completely black.

***Paragrilus tenuis* (LeConte)**
(Figs. 7, 25)

Rhaeboscelis tenuis LeConte, 1863: 82.
Paragrilus tenuis (LeConte), (Obenberger, 1924: 148)
Paragrilus tenuis ssp. *lecontei* Obenberger, 1924: 149 (synonymy: Hespenheide1979: 118).



FIGURES 7-12. North and Central American *Paragrilus*, dorsal view - *P. trifoveolatus* group - 7. *P. tenuis* (LeConte); 8. *P. impressus* (Chevrolat); 9. *P. angulaticollis* Waterhouse; 10. *P. laevicollis* Waterhouse; 11. *P. azureus* n. sp.; 12. *P. trifoveolatus* Waterhouse.

Diagnosis: Agriliform, flattened above, black throughout, except pronotum golden or coppery; 4.85-5.8 mm long. Head with front convex, rather narrowly, strongly impressed along midline on upper 2/3 above rounded fovea; epistoma somewhat depressed between antennal insertions, ventral margin distinctly produced, quadrate, emarginate, angles acute; surface finely punctate, shagreened. Pronotum somewhat flattened, prehumeral callosity small but strongly indicated by narrow, deep lateral depressions; prehumeral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; anterior angles weakly rounded; disc rather strongly depressed along basal margin before scutellum and at base of lateral depressions, surface coarsely rugose, shagreened. Elytra with posthumeral carina extending to beyond hind coxae, surface rugose, with third interval slightly raised; apices broad, rounded-subquadrate, outer angle longer. Posterior angles of hind coxae broadly acute or subquadrate, depressed. Male genitalia dark reddish brown, with transparent tips to lateral lobes (Fig. 25).

Type: Of *Rhaeboscelis tenuis*, "Md" and "tenuis-2" (Lectotype male, Type 2249, MCZ; Paralectotype male, "Md" and "Rhaeboscelis tenuis LeC.," MCZ); Type of *P. tenuis* s. *lecontei*, Angelsea, N.J. (NMPC).

Distribution: New York, New Jersey, Pennsylvania, Maryland, Delaware (Nelson 1987)., Illinois, Florida, North Carolina, Mississippi (Nelson & MacRae 1990), Missouri (MacRae 1991).

Hosts: *Hibiscus moscheutos* L. and *H. palustris* L., swamp rose-mallow or marsh-mallow, and *H. lasiocarpos* Cav., rose-mallow (Malvaceae; Nelson 1987).

Discussion: Because of the focus of this study on the Central American fauna, I did not attempt to see all material of this species, so that the distribution data is probably very incomplete. The biology of this species on *Hibiscus moscheutos* was described in detail by Weiss and Dickerson (1919) and appears to be the only one known for the genus.

Paragrilus impressus **(Chevrolat)**
(Figs. 8, 26)

Aphanisticus impressus Chevrolat, 1835: no. 145.
Paragrilus impressus (Chevrolat), Waterhouse, 1889: 124.
Agrilus impressus (Chevrolat), Saunders, 1871: 116.

Diagnosis: Agriliform, flattened above, black throughout, head with golden reflections, pronotum golden on anterior half, reddish on posterior half, elytra with blue or purple reflections; 4.85-5.8 mm long. Head with front convex, narrowly impressed along midline on upper 2/3 above larger rounded fovea; epistoma somewhat depressed between antennal insertions, ventral margin distinctly produced, quadrate, emarginate, angles very acute; surface finely punctate, indistinctly shagreened. Pronotum somewhat flattened, prehumeral callosity small but strongly indicated by broad, deep lateral depressions; prehu-

meral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; anterior angles rounded-angulate; disc very strongly depressed along midline at basal margin before scutellum and at base of lateral depressions, surface coarsely rugose on basal half, less strongly so or obsolete on anterior half, shagreened. Elytra with posthumeral carina extending as far beyond hind coxae as before, surface finely rugose, with intervals faintly raised; apices broad, rounded-subquadrate, inner angle longer. Posterior angles of hind coxae rounded-subquadrate, depressed. Anterior process of first abdominal segment with very short carina posterior to hind coxae. Male genitalia dark reddish brown, with transparent tips to lateral lobes (Fig. 26).

Type: "Type./impressa Chevr./Saunders., 74.18." (BMNH).

Specimens examined: **México**: Veracruz, 2 mi N Tlacotalpan, 2.VII.1971, Clark, Murray, Hart, Schaffner (TAMU), El Higo, 26.VI.1976, Zaragoza (RLWE); Lake Catemaco, 8-16.VIII.1960, H.F. Howden (CNCI), 10 mi W Pozo Rica, 11.VI.1955, D. Giuliani (CASC); Oaxaca, Temescal, 90 m, 24.VI.1983, M. Kualbars (CHAH, RLWE), 7 mi N Matias Romero, 500', 2.VIII.1974, C.W. & L.B. O'Brien & G.B. Marshall (CLBC), 4 mi N Matias Romero, 500', 27.VI.1971, C.W. & L.B. O'Brien & G.B. Marshall (RLWE); Quintana Roo, Leona Vicario, 5.VI.1992, F.T. Hovore (CHAH). **Belize**: Cayo, Chiquibul Rd, 38 mi S jct w Cristo Rey, 570 m, 26.VI.1992, J. Rifkind, P. Gum (CLBC).

Host: Unknown.

Discussion: This is one of four narrowly distributed species in the *trifoveolatus* group. It is closely related to *trifoveolatus* but differs consistently in the nature of the pronotum and the very different genitalia.

Paragrilus angulaticollis **Waterhouse**
(Fig. 9)

Paragrilus angulaticollis Waterhouse, 1889: 124.

Diagnosis: Agriliform, flattened above, pronotum , head with golden reflections on lower half, pronotum bronzy with reddish reflections medio-laterally, elytra dark bluish violet, black beneath; 5.7 mm long. Head with front narrowly convex, narrowly, deeply impressed along midline on upper 4/5 with deeper linear depression above middle; indistinct protuberances above middle and between eyes and medial depression; eyes flat; epistoma barely depressed between antennal insertions, ventral margin distinctly produced, quadrate, angulate-emarginate, angles narrowly acute; surface densely shagreened. Pronotum shallowly undulate, prehumeral callosity small, weakly indicated by shallow lateral depressions, very strong at lateral margins; prehumeral callosity produced outward and anteriorly to form a carina above and roughly parallel to marginal carina on basal 1/2; anterior angles prominently rounded-angulate; disc very strongly depressed along midline at basal margin before scutellum and at base of lateral depressions, and a shallow trans-

verse depression along midline anterior to middle, surface strongly shagreened on basal half, becoming minutely transversely striolate on anterior half. Elytra with posthumeral carina extending as far beyond hind coxae as before, surface densely shagreened, appearing velvety, with fifth interval faintly raised; apices broad, rounded-subquadrate, slightly flared externally. Posterior angles of hind coxae rounded-subquadrate, depressed.

Type: **México**: "Tapachula, Chiapas, Höge" (BMNH). Known only from the unique male type.

Host: Unknown.

Discussion: This beautiful and distinctive species was mistakenly listed from Guatemala by Obenberger (1935).

Paragrilus laevicollis Waterhouse
(Figs. 10)

Paragrilus laevicollis Waterhouse, 1889: 127.

Diagnosis: Agriliform, flattened above, head with bluish reflections dorsally, pronotum black with bluish reflections on anterior half, dark blue on posterior half, elytra dark blue, black beneath; 5.9 mm long. Head with front somewhat convex, narrowly impressed along midline with deeper linear depression above middle; epistoma narrowly depressed between antennal insertions, ventral margin distinctly produced, quadrate, angulate-emarginate, angles broadly acute; surface finely punctate, indistinctly shagreened. Pronotum weakly convex, prehumeral callosity almost obsolete but indicated by weak lateral depression, depression stronger anteriorly; prehumeral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; anterior angles narrowly rounded-angulate; disc strongly transversely depressed along midline at basal margin before scutellum and more narrowly so at base of lateral depressions, surface indistinctly shagreened on basal half, becoming minutely transversely striolate and more strongly shining on anterior half. Elytra with posthumeral carina extending not quite as far beyond hind coxae as before, surface indistinctly shagreened, with fifth interval faintly raised, forming costa; apices broad, rounded-subquadrate. Posterior angles of hind coxae rounded-subquadrate.

Type: Two specimens mounted on one card with the label "Bugaba, Panamá: Champion" (BMNH). The left-hand specimen is mounted with the dorsal side up and is designated the Lectotype. Both specimens appear to be females.

Host: Unknown.

Discussion: This species, as *angulaticollis*, has not been recollected since Champion's original collections.

***Paragrilus azureus* Hespenheide, new species**
(Figs. 11, 27)

Holotype male: Agriliform, flattened above, head with golden reflections, pronotum and scutellum olive green with golden reflections, elytra dark blue, black beneath; 6.7 mm long. Head with front strongly, angulately convex, narrowly impressed along midline with deeper linear depression above middle; epistoma narrowly depressed between antennal insertions, ventral margin somewhat produced, quadrate, angulate-emarginate, angles broadly acute; surface finely punctate, indistinctly shagreened. Pronotum weakly convex, prehumeral callosity weak, indicated by broad, shallow lateral depression, depression stronger anteriorly; prehumeral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; lateral margins broadening from basal 1/3 to anterior angles, anterior angles rounded-angulate; disc strongly ovately depressed along midline at basal margin before scutellum and deeply, more narrowly so at base of lateral depressions, surface with small linear punctures and shagreened throughout, somewhat more strongly shining at anterior margin. Elytra with posthumeral carina extending as far beyond hind coxae as before, surface indistinctly shagreened, with fifth interval faintly raised, forming broad costa; apices broad, rounded-subquadrate, outer angle somewhat produced. Posterior angles of hind coxae broadly acute, rounded, somewhat depressed. Male genitalia dark reddish brown, with small transparent tips to lateral lobes (Fig. 27).

Holotype male: **Costa Rica**: Prov. Punt[arenas], Rancho Quemado, 200 m, Península de Osa, X.1991, F. Quesada, L-S-292500, 511000 (INBC, barcode CRI001190947).

Paratype: same data as Holotype (INBC, barcode CRI001190948).

Host: Unknown.

Discussion: This is the largest and arguably the most striking of Central American *Paragrilus*. The paratype is also 6.7 mm in length and may be a female. It was first thought to be *laevicollis*, but direct comparison with the type of that species showed *azureus* to be larger, differently colored, the pronotum more heavily punctate, and different in other ways.

***Paragrilus trifoveolatus* Waterhouse**
(Figs. 12, 28)

Paragrilus trifoveolatus Waterhouse, 1889: 127.

Diagnosis: Agriliform, moderately flattened above, variable in color but usually black throughout, except head and pronotum reddish, elytra with faint golden reflections; 3.55-5.0 mm long. Head with front convex, narrowly impressed along midline on upper 2/3 above larger rounded fovea; epistoma somewhat depressed between antennal insertions, ventral margin distinctly produced, quadrate, shallowly emarginate, angles very acute; sur-

face punctate, shagreened. Pronotum somewhat flattened, widest near apex; prehumeral callosity small but strongly indicated by broad, deep lateral depressions; prehumeral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; anterior angles rounded-angulate; disc very strongly depressed along midline at basal margin before scutellum and at base of lateral depressions, surface finely rugose, less strongly so anteriorly, shagreened. Elytra with posthumeral carina extending somewhat beyond hind coxae, surface coarsely rugose, with indistinct costae; apices broad, rounded-subquadrate. Posterior angles of hind coxae rounded, depressed. Anterior process of first abdominal segment with very short carina posterior to hind coxae. Male genitalia dark reddish brown, with transparent tips to lateral lobes (Fig. 28).

Lectotype: **México**, a specimen, probably a female, labeled "Teapa, Tabasco, March H.H.S." (BMNH) also bears the handwritten label "*Paragrilus trifoveolatus* (Type) Waterh." and is designated the Lectotype. A second male specimen labeled "Veracruz, [illegible], Salle Coll." is considered a paratype.

Distribution: Relatively uncommon - only 37 specimens examined, México (San Luis Potosi) to Costa Rica.

Host: Collected by the author on an undetermined species of Malvaceae in Costa Rica.

Discussion: This species resembles *Agrilus crapullelus* Thomson in size, form and coloration. The combination of reddish pronotum and black elytra is a common color pattern in *Agrilus* and shared by three other species of *Paragrilus* in addition to *P. trifoveolatus* - namely, *angulaticollis*, *impressus*, and *fallorum*. As interpreted here, *P. trifoveolatus* is variable in color in México. In fact, Waterhouse describes the species as "uniformly brassy," although the specimen labeled as the type is distinctly bicolored. Some western Mexican specimens (Guerrero, Sinaloa) are nearly uniformly "brassy," or greenish-coppery, or even uniformly greenish. In the absence of series to assess variation and the absence of host data, these are all considered *trifoveolatus* here.

Paragrilus fallorum **Hespenheide, new species**
(Figs. 13, 29)

Holotype male: Agriliform, moderately flattened above, black throughout, except head with faint golden reflections, pronotum reddish-coppery, elytra with fainter coppery reflections; 4.05 mm long. Head with front convex, impressed along midline on upper 2/3 more narrowly above, widening below; epistoma slightly depressed between antennal insertions and below fine V-shaped groove, ventral margin distinctly produced, quadrate, shallowly emarginate, angles acute; surface finely punctate, shagreened. Pronotum somewhat flattened, widest near apex; prehumeral callosity small but strongly indicated by broad lateral depressions; prehumeral callosity produced outward and anteriorly to form narrow ridge above and roughly parallel to marginal carina; anterior angles rounded-angulate; disc

strongly depressed along midline at basal margin before scutellum and less strongly so at base of lateral depressions, slight depressions on either side of midline near apex; surface finely punctate, strongly shagreened. Elytra with posthumeral carina extending somewhat beyond hind coxae, surface coarsely rugose, with indistinct costae; apices broad, rounded-subquadrate. Posterior angles of hind coxae acutely rounded, depressed. Anterior process of first abdominal segment without carina posterior to hind coxae. Male genitalia reddish brown, with transparent tips to lateral lobes (Fig. 29).

Allotype female: 4.3 mm long; not otherwise dimorphic.

Holotype: **Panamá**: Canal Zone, 5 mi SW Gatun, 09° 14' N 79° 58' W, 7.X.1969, H.A. Hespenheide, on *Heliocarpus* (USNM).

Allotype: Same data as Holotype (USNM).

Paratypes: **Panamá**: Canal Zone, same data as Holotype (7, BMNH, CHAH, NMPC), Madden Forest, 27.VII.1969, H.P. Stockwell (1, STRI); Pedro Miguel, 27.VII.1972 (1, CHAH); Pacific Canal Zone, Balboa-Diablo, 4.XI.1972, D. Engleman (1, LACM); Gatun Spillway, 15.X.1973, D. Engleman (1, CHAH); Chiva Road, 21.XII.1975, Engleman (1, CHAH); 1 mi S Gamboa, 6.XII.1969, H.P. Stockwell (1, GBFM); Panamá Pr., Punta Chame, 5.XI.1975, H. Wolda (1, RLWE).

Host: Adults have been collected on *Heliocarpus* (Tiliaceae).

Etymology: This species is named in honor of Louise and the late Richard Fall and their long term support of field and taxonomic entomology (Evans *et al*. 2001).

Discussion: This species is very similar to *trifoveolatus*, but apparently allopatric, and the characters given in the key distinguish it. Specimens vary from 3.6-4.45 mm in length (mean = 4.10 mm, N = 16). Although most specimens are bicolored as described and as discussed under *P. trifoveolatus*, two specimens are a more uniform greenish-brassy.

Paragrilus aeraticollis **Waterhouse**
(Figs. 14, 30)

Paragrilus aeraticollis Waterhouse, 1889: 127.
Paragrilus costaricensis Obenberger, 1919: 21 (synonymy: Hespenheide1979: 117).
Paragrilus costaricensis var. *hoscheki* Obenberger, 1924: 149 (synonymy: Hespenheide1979: 117).

Diagnosis: Broadly agriliform, moderately flattened above and somewhat convex in side view, strongly shining, black throughout, except head and pronotum golden; glabrous, except front densely setose in male, epistoma sparsely short setose in female, 3.25-5.5 mm long. Head with front very convex, very deeply, narrowly impressed along midline on upper 2/3, impression widening beneath; ventral margin of epistoma very shallowly emarginate; surface finely punctate, shagreened. Pronotum flattened, widest near apex; prehumeral callosity narrow but strongly indicated by broad lateral depressions; prehumeral callosity produced outward and anteriorly to form ridge above and roughly parallel to mar-

ginal carina; anterior angles rounded-angulate; disc narrowly depressed along basal margin before scutellum to base of lateral depressions, surface very finely punctate, shagreened. Elytra with fine posthumeral carina extending somewhat beyond hind coxae, surface obsoletely rugose, regularly convex; apices slightly flared, broadly rounded. Posterior angles of hind coxae rounded, depressed. Anterior process of first abdominal segment with short carina posterior to hind coxae. Male genitalia black, with narrow transparent margins to tips lateral lobes (Fig. 30).

Type: **México**: "Teapa, Tabasco, Feb. H.H.S." (BMNH; Hespenheide 1979); of *P. costaricensis*, Costa-Rica, Surrubres, 300', A. Heyne (NMPC); of *P. costaricensis* var. *hoscheki*, "Costarica" (NMPC).

Distribution: Relatively common - 133 specimens examined, México to Panamá, Venezuela.

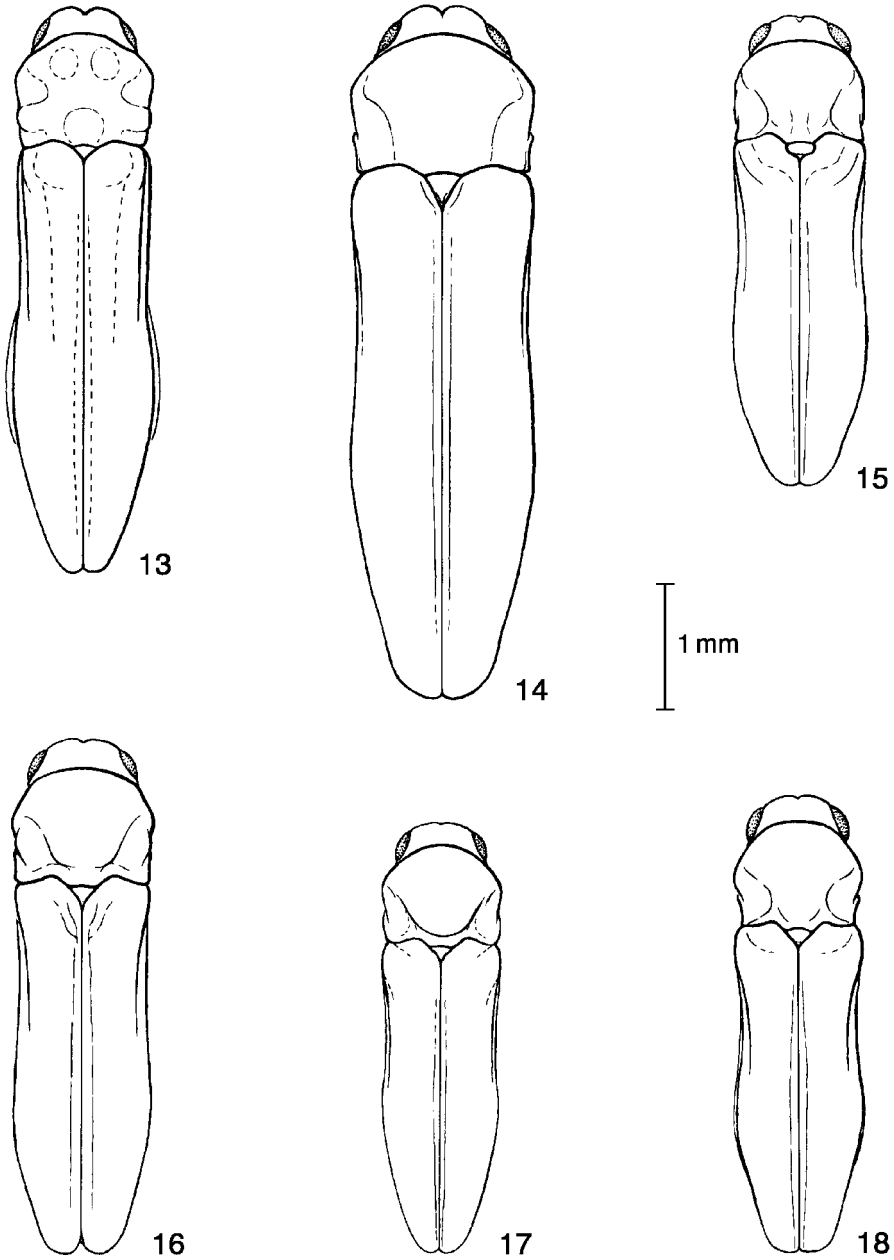
Specimens examined: **Costa Rica**: Heredia Pr., La Selva Biol. Sta., 3 km S Pto. Viejo, 10° 26' N 84° 01' W, 05.04.1980, 10, 13.07.1982, 08.04.1987, 15.08.1996, H.A. Hespenheide, at *Byttneria aculeata* Jacq. (INBC, CHAH). **Venezuela**: Aragua, Pto. de Cata, 8.VI.1983, Clark & Clark (AUEC).

Host: Adults of this widespread species are typically associated with the liana *Byttneria aculeata* Jacq. in the Sterculiaceae (Hespenheide 1983, 1985). Although it has not been reared, *Byttneria* is almost certainly the larval host.

Discussion: Kerremans (1903) lists this species from Texas, but no material of this species has been seen from there.

Paragrilus akersorum **Hespenheide, new species**
(Figs. 15, 31)

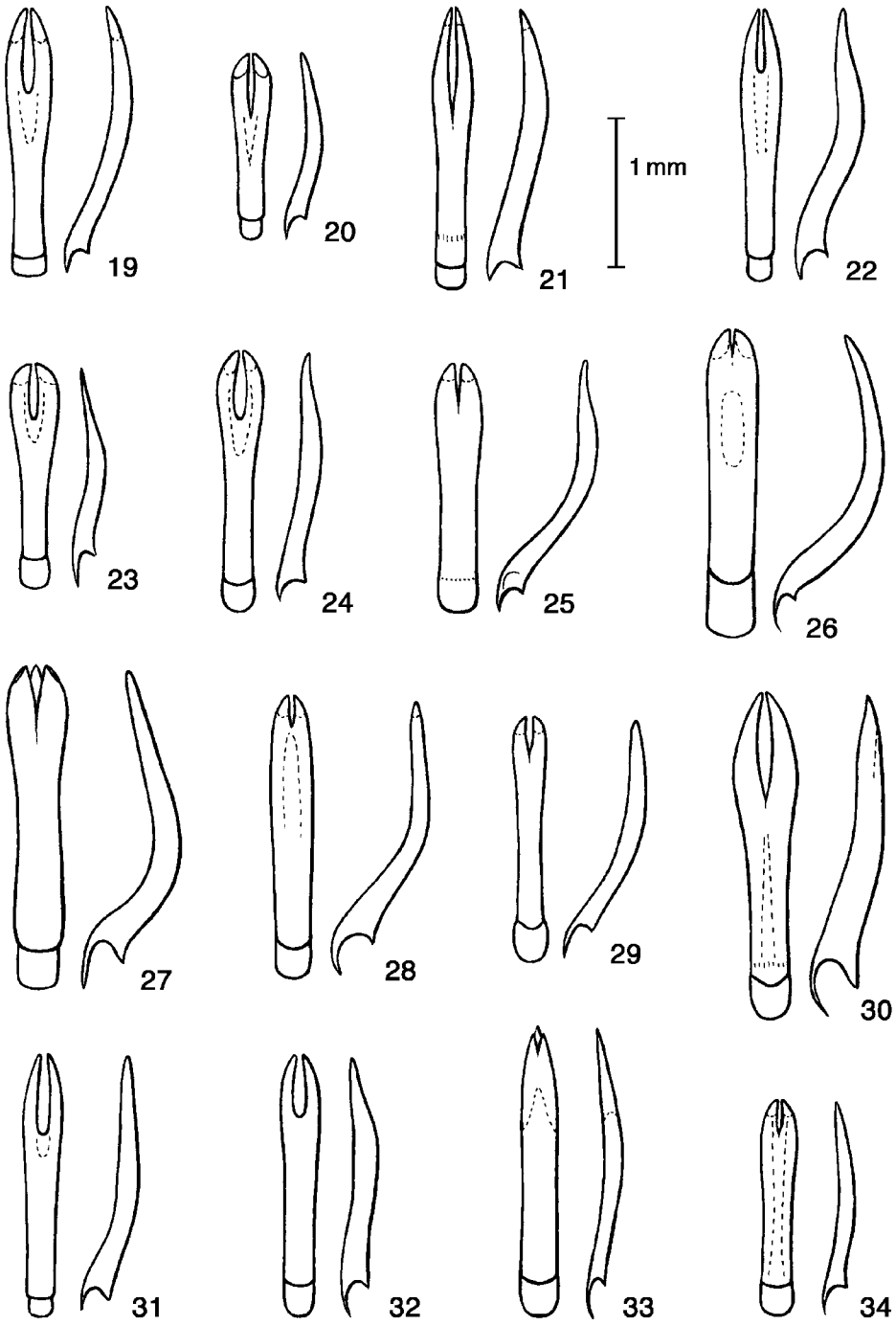
Holotype male: Broadly agriliform, moderately flattened above, pronotum and elytra dark purplish blue, more reddish at apices and margins, head with golden reflections, black beneath; minutely, inconspicuously setose, except front somewhat densely silvery setose on lower half; 3.3 mm long. Head with front slightly convex, narrowly impressed along midline on upper 2/3; ventral margin distinctly produced, quadrate, shallowly emarginate, angles acute; surface finely punctate, shagreened. Pronotum flattened, widest near apex; prehumeral callosity prominent, strongly indicated by broad lateral depressions that extend obliquely to lateral margins; prehumeral callosity produced outward and anteriorly to form ridge above and roughly parallel to marginal carina, ridge carinate for middle 1/3; anterior angles rounded-angulate; disc shallowly depressed along basal margin beyond bases of lateral depressions, except raised before scutellum; surface obsoletely rugose, very finely punctate, shagreened. Elytra with fine posthumeral carina extending somewhat beyond hind coxae, surface obsoletely rugose, regularly convex; apices slightly flared, broadly rounded. Hind coxae very narrow, posterior angles rounded-subquadrate, depressed. Male genitalia pale brownish (Fig. 31).



FIGURES 13-18. North and Central American *Paragrilus*, dorsal view- *P. trifoveolatus* group, cotd. - 13. *P. fallorum* n. sp.; *P. aeraticollis* group - 14. *P. aeraticollis* Waterhouse; 15. *P. akersorum* n. sp.; 16. *P. burkei* n. sp.; 17. *P. heliocarpi* n. sp.; *P.* 18. *moldenkei* n. sp.

Allotype female: As male, except front glabrous, epistoma sparsely short setose, 5.0 mm long.

Holotype: **Costa Rica**: Heredia Pr., La Selva Biol. Sta., 3 km S Pto. Viejo, 10° 26' N 84° 01' W, 16.07.1992, H.A. Hespenheide, *Wissadula* (INBC).



FIGURES 19-34. North and Central American *Paragrilus*, dorsal and lateral views of aedeagi - *P. rugatulus* group - 19. *P. lesueuri* Waterhouse; 20. *P. vicinus* Waterhouse; 21. *P. transitorius* Waterhouse; 22. *P. exiguus* (Chevrolat); 23. *P. modicus* (Solier); 24. *P. rugatulus* Thomson; *P. trifoveolatus* group - 25. *P. tenuis* (LeConte); 26. *P. impressus* (Chevrolat); 27. *P. azureus* n. sp.; 28. *P. trifoveolatus* Waterhouse; 29. *P. fallorum* n. sp.; *P. aeraticollis* group - 30. *P. aeraticollis* Waterhouse; 31. *P. akersorum* n. sp.; 32. *P. burkei* n. sp.; 33. *P. heliocarpi* n. sp.; 34. *P. moldenkei* n. sp.

Allotype: Same data as Holotype (INBC).

Paratypes: **Costa Rica**: Heredia Pr., La Selva Biol. Sta., 3 km S Pto. Viejo, 10° 26' N 84° 01' W, 17.V.1990 (1, CHAH), 14, 15, 19.VI.1991 (7, CHAH), 16, 23, 27.VII., 06.VIII.1992 (8, CHAH), 10, 18.VII.1994, H.A. Hespenheide, *Wissadula* (2, CHAH); VII.1992, INBio-OET (1, INBC, barcode INBIOCRI001229477); Limon Pr., Res Biol Hitoy Cerere, Est Hitoy Cerere, Send Espavel, 220 m, 13-18.V.1999, W. Arana, Red de Golpe (3, INBC, barcodes INB0003103841, -3, -4); Puntarenas Pr., Osa Peninsula, 2.5, 8.0 mi SW Rincon, 08° 42' N 83° 29' W, 22, 28.II, III.1967, 27.II, 28.VII.1968, H.A. Hespenheide (13, CHAH), Rincon, Osa Peninsula, 15.VIII.1966, A.R. Moldenke (6, CHAH). **Panamá**: Canal Zone, Gamboa., 11, 18.VI.1976, E.G. Riley (10, GHNC); Pipeline Road, 22.VI.1974, D. Engleman (4, CHAH); La Pita signal station rd., 9.VI.1976, E.G. Riley (1, GHNC); Cerro Balera., 14.VI.1976, E.G. Riley (1, GHNC); 3 mi NW Gamboa, 09° 09' N 79° 43' W, 17.XII.1969, 3.VIII.1974, H.A. Hespenheide (8, CHAH); 5 mi NW Gamboa, 09° 09' N 79° 43' W, 14, 28.XI, 17.XII.1969, 3.VIII.1974, H.A. Hespenheide (3, CHAH), 26.X.1969, 3.II.1970, H.P. Stockwell (2, STRI); 7 mi NW Gamboa, 09° 09' N 79° 43' W, 29.VI.1971, H.A. Hespenheide (1, CHAH); 2 mi SSE Gamboa, 09° 06' N 79° 42' W, 14.VI.1970, H. Stockwell (2, STRI); 6.5 km SE Gamboa, 09° 04' N 79° 40' W, 2.VIII.1978, H.A. Hespenheide (2, CHAH); Madden Forest, mi 3.5, 09° 06' N 79° 38' W, 15.VI.1971, H.A. Hespenheide (4, CHAH); Madden Forest, mi 5.0, 09° 07' N 79° 38' W, 5.VIII.1970, H.A. Hespenheide (4, CHAH); Cocle Pr. 10 mi SW Penenome, 26.VI.1974, O'Brien & Marshall (1, RLWE); Panamá Pr., Cerro Campana, 850 m, 08° 40' N 79° 56' W, 26.VI.1971, W. Bivin (1, CHAH). In addition to borrowed material, Paratypes from CHAH deposited in BMNH, NMPC, CNC, MUCR, GBFM.

Host: Adults are associated with *Wissadula excelsior* (Cav.) K. Presl (Malvaceae).

Etymology: Named in honor of the late Dr. Gerald and Anna Akers who encouraged my early interest in natural history.

Discussion: This and the next species are rather similar, but apparently widely separated allopatrically. Male specimens vary from 3.2-4.0 mm in length (mean = 3.50 mm, N = 39); females vary from 3.4-4.2 mm in length (mean = 3.74 mm, N = 40).

***Paragrilus burkei* Hespenheide, new species**
(Figs. 16, 32)

Holotype male: Broadly agriliform, moderately flattened above, head with faint golden reflections, pronotum reddish purple, elytra dark blue, black beneath; front somewhat densely silvery setose on lower half except along midline; 4.0 mm long. Head with front convex, shallowly impressed along midline on upper 2/3; ventral margin distinctly produced, quadrate, shallowly emarginate, angles acute; surface finely punctate, faintly shagreened. Pronotum flattened, widest near apex; prehumeral callosity small but promi-

nent, strongly indicated by broad lateral depressions that extend obliquely to lateral margins; prehumeral callosity weakly produced outward and anteriorly to form ridge above and roughly parallel to marginal carina; anterior angles rounded; disc shallowly depressed along basal margin interior to bases of lateral depressions, except raised before scutellum; surface weakly rugose, rugae nearly obsolete at anterior margin, weakly shagreened. Scutellum small, triangular. Elytra fine posthumeral carina extending somewhat beyond hind coxae, surface weakly rugose, regularly convex; apices broadly rounded. Hind coxae very narrow, posterior angles subquadrate. Male genitalia pale brownish (Fig. 32).

Allotype female: As male, except epistoma sparsely short silvery setose, pronotum dark blue, 4.5 mm long.

Holotype: **Arizona**, Cochise Co., 8 mi E Sierra Vista, 11.VIII.1964, H.R. Burke & J. Apperson (TAMU, to be deposited in USNM).

Allotype: **México**: Durango, El Salto, 24.VIII.1960, G.B. Vogt (CLBC).

Paratypes: **México**: Durango, same data as Allotype (3, CLBC); Tamaulipas, Bocatoma, 7 km SSE Gomez Farias, 19-23, 27-28.V.1979, E.G. Riley (3, GHNC); 13.VII.1982, R. Turnbow (1, TAMU); 5 mi SSE Gomez Farias, 19-20.VII.1970, Murray, Phelps, Hart, Schaffner (1, TAMU); 2 mi SE Gomez Farias, 20.VII.1970, Murray, Phelps, Hart, Schaffner (1, SGWC); nr. Gomez Farias, Rio Frio, 05.VI.1983, M. Kualbars (1, RLWE); Tampico, 30.VI.1964, D.S. Verity (3, DSVC); Villa Juarez, 800', 17.VI.1937, M.A. Embury (1, CASC); Nuevo Leon, Santa Rosa Canyon, 28 km W Linares, 17.VII.1988, R. Turnbow (2, GHNC); 7 mi W El Cercado, 2800', 27.VI.1970, E.M. & J.L. Fisher (4, RLWE); 8.6 mi SW Montemorelos on Rayones Rd., 01.VI.1983, R. Anderson (1, RLWE); 21.7 mi E Galeana, 10.VII.1987, B.K. Dozier (1, FSCA); San Luis Potosi, Hwy. 85 8 mi S Cd. Valles, 800', 24.VII.1982, C.W. & L. O'Brien & G. Wibmer (1, RLWE); Hwy. 80 7 mi W El Naranjo, 1800', 19.VI.1983, C.W. & L. O'Brien & G.B. Marshall (2, CLBC); Valles, 29.VIII.1956, R. & K. Dreisbach (1, MSUC); El Salto Falls, 17.VI.1955, R.E. Beer & party (1, SEMC); Veracruz, 5 mi W Palma Sola, 28.VII.1974, Clark, Murray, Ashe, Schaffner (1, TAMU); Puente National [sic], 02.IX.1980, J.B. Karren #21 (1, EMUS); Hwy. 150, 2 mi E Cuitlahuac, 03.VII.1965, G.H. Nelson (1, GHNC); Tolome, nr Rinconada, 27.VII.1955, P. & C. Vaurie (3, AMNH); Oaxaca, 48 mi E La Ventosa, 21.VII.1963, J. Doyen (1, EMEC); Jalisco, 20 mi NE Bahia de Navidad, 14.VII.1982, F.G. Andrews (1, CSCA); Sinaloa, 3 mi E Malpicia, 16-17.VII.1982, J. Cope (1, CLBC); 7 mi N Mazatlan, 22.VIII.1963, E.L. Sleeper (1, CASC); Chupaderos, 17.VIII.1963, E.L. Sleeper (1, CASC); 7 mi S Culiacan, 23.VIII.1960, R.L. Westcott (1, RLWE); 34 mi E Villa Union, 27.VIII.1960, R.L. Westcott (10, RLWC, DSVC); Chiapas, 8 mi E Rizo de Oro, Hwy #190, 22.VI.1985, Askevold & Heffern (1, TCMC), 35 mi W Tuxtla Gutierrez, 16.VIII.1972, G.F. & S. Hevel (1, USNM), Oaxaca border on Pan-Am Hwy, 800 m, 09.VI.1990, H.& A. Howden (1, CMNC); Campeche, km 37, Hwy 24, Campeche-Tenabo, 30.VII.1990, C.W. & L.B. O'Brien (2, SGWC); Yucatan, Tres Linteles, Chichen Itza, 6.VII.1948, C. Goodnight (1, AMNH).

Other specimens examined: **Nicaragua**: Leon, L Asososca, 21.IX.1994, J.M. Maes (7, SEAN).

Host: Unknown.

Etymology: This species is named in honor of one of the collectors of the Holotype, Horace Burke; he and his students have studied the weevil subfamily Anthonominae, whose hosts include the Malvaceae.

Discussion: Male specimens vary from 3.2-4.4 mm in length (mean = 3.76 mm, N = 30); females vary from 3.3-4.55 mm in length (mean = 3.96 mm, N = 28). Although similar in most respects, the Nicaraguan specimens have the pronotum more coarsely rugose and less strongly shining, and the anterior portion of the lateral margins of the pronotum more strongly angulate. These specimens are widely separated geographically from the nearest collections in México and may represent a distinct species.

***Paragrilus heliocarpi* Hespenheide, new species**
(Figs. 17, 33)

Holotype male: Agriliform, shallowly convex above, black throughout, with faint golden reflections above, reflections reddish purple in some lights, pronotum strongly shining; front somewhat densely silvery setose on lower 2/3 except in V-shaped area along midline; 3.5 mm long. Head with front very weakly convex, slightly impressed along midline on middle 1/3; ventral margin indistinctly emarginate; surface finely punctate, except for impunctate polished areas lateral to midline at middle 1/3. Pronotum convex, widest at apical 2/3; prehumeral callosity small but prominent, strongly indicated by broad lateral depressions that extend obliquely to lateral margins; prehumeral callosity narrowly produced outward and anteriorly to form ridge above and roughly parallel to marginal carina, ridge carinate; anterior angles obtusely angulate; disc strongly depressed along basal margin between bases of lateral depressions; surface finely rugose, finely punctate. Scutellum small, broadly triangular. Elytra with fine posthumeral carina extending as far beyond hind coxae as before, surface rugose, sparsely short setose; apices rounded-subtruncate. Hind coxae very narrow, posterior angles subquadrate. Male genitalia conspicuously bicolored, basal 3/4 brownish yellow, apical 1/4 black (Fig. 33).

Allotype female: As male, except front glabrous, epistoma sparsely short setose, 3.6 mm long.

Holotype male: **Panamá**: Canal Zone [= Panamá Pr.], 3.5 km WNW Paraiso, 09° 02’ N 79° 40’ W, 13.VII.1974, H.A. Hespenheide, on *Heliocarpus* (USNM).

Allotype female: Same data as Holotype (USNM).

Paratypes: **Panamá**: Canal Zone, same data as Holotype (13, CHAH), 8.IX.1974, H.A. Hespenheide, (4, CHAH); Jct. K-9 and K-6 rds., 9.VI.1976, E.G. Riley (1, GHNC); Lago Alajuela, area del Canal, 29.V.1978, A. Arauz (1, GBFM); La Pita signal station rd., 8.VI.1976, E.G. Riley (1, GHNC); Madden Forest; 24.XII.1969, H.P. Stockwell (1, STRI);

Madden Dam, 11.V.1978, C.W. & L.B. O'Brien & Marshall (1, RLWE); 3 mi SE Gamboa, 31.VIII.1974, A.R. Ramirez (1, CHAH); 4.5 km W Cocoli, 08° 58' N 79° 38' W, 22.VII.1970, H.A. Hespenheide (2, CHAH); 3 mi W Paraiso, 14.XII.1969, 4.VII.1970, H.P. Stockwell (2, STRI); Chiva Chiva Road, 09° 03' N 79° 34' W, 16.VII.1970, H.A. Hespenheide (3, CHAH); Madden Forest, mi 5.0, 09° 07' N 79° 38' W, 17.VI.1971, H.A. Hespenheide (4, CHAH); 3 mi NW Gamboa, 09° 09' N 79° 43' W, 1.VII.1970, H.A. Hespenheide (6, CHAH); Panamá Pr., 9 mi W Chepo, 09° 09' N 79° 13' W, 9.VII.1971, H.A. Hespenheide (1, CHAH); Pipeline Rd, Km 4.0-6.0 nr Gamboa, 40 m, 21.VI.1995-38, R.S. Anderson, tropical lowland forest (1, CMNC). In addition to borrowed material, Paratypes from CHAH deposited in AMNH, BMNH, CNCI, LACM, NMPC, MNHN.

Host: Adults have been collected on *Heliocarpus*.

Etymology: Named for adult host.

Discussion: This species is quite similar to the next one, but differs conspicuously in the sculpture of the pronotum, as well as in the shape of the male genitalia. Male specimens vary from 3.1-3.65 mm in length (mean = 3.41 mm, N = 20); females vary from 3.1-4.05 mm in length (mean = 3.80 mm, N = 23).

***Paragrilus moldenkei* Hespenheide, new species**
(Figs. 18, 34)

Holotype male: Broadly agriliform, moderately flattened above, black throughout, with faint golden reflections on head and pronotum; front somewhat densely silvery setose on lower 2/3 except in V-shaped area along midline; 3.2 mm long. Head with eyes prominent, front very shallowly convex, slightly impressed along midline on middle 1/3; ventral margin indistinctly emarginate; surface finely punctate, except for impunctate polished areas lateral to midline at middle 1/3. Pronotum flattened, widest near apex; prehumeral callosity small but prominent, strongly indicated by broad lateral depressions that extend obliquely to lateral margins; prehumeral callosity weakly produced outward and anteriorly to form ridge above and roughly parallel to marginal carina, ridge carinate on anterior 1/2; anterior angles rounded; disc deeply depressed along basal margin both exterior and interior to bases of lateral depressions, slightly interrupted by raised area before scutellum; surface weakly concentrically rugose, shagreened. Scutellum broadly triangular. Elytra with posthumeral carina extending somewhat beyond hind coxae, surface rugose; apices slightly flared, broadly rounded. Hind coxae very narrow, posterior angles subquadrate. Male genitalia dark reddish-brown, basal half paler (Fig. 34).

Allotype female: As male, except reflections on pronotum reddish purple, front glabrous, epistoma sparsely short setose, 3.5 mm long.

Holotype male: **Costa Rica**: Guanacaste Prov., Cañas, 15.VII.1966, A.R. Moldenke (USNM).

Allotype female: Same data as Holotype (USNM).

Paratypes: **Costa Rica**: Guanacaste Prov., same data as Holotype (8, CHAH, INBC); OTS Palo Verde Sta., 29 km WSW Cañas, 10° 21' N 85° 21' W, 8, 10, 13.VII.1974, H.A. Hespenheide, on Malvaceae (4, CHAH); 3 km NO de Nacaome P. N. Barra Honda, 100m, VIII.1993, M. Reyes (2, INBC); Vic. Estac. Murcielago, 8 km SW Cuajiniquil, 100 m, VI.1989, GNP Biodiversity Survey (3, INBC, barcodes INBIOCRI001006752, -810); Finca Jenny, 30 km N Liberia, Guan. NP, X.1989, E. Araya & R. Espinoza, 316200, 364400 (14, INBC, barcodes INBIOCRI000081635, -691, -109364, -432, -486, -130572, -591, -674, -678, -680, -682, -980, -131375, -137533); 6 mi S, 6 mi W Cañas, Taboga, 10° 19' N 85° 09' W, 5.VI, 4, 12.VII.1968, H.A. Hespenheide (3, CHAH); Playa del Coco, 10°33' N 85° 42' W, 30.VII.1966, A.R. Moldenke (6, CHAH), 15.VII.1976, H.A. Hespenheide (1, CHAH); 3 km E Playas del Coco, 14.VII.1968, H.A. Hespenheide (11, CHAH); Puntarenas Pr., 10 mi E Puntarenas, 100'. 27.VII.1966, J.B. Karren (1, EMUS); **El Salvador**: S. Vic., 3 mi NW San Vicente, 1900', 9.VI.1974, O'Briens & Marshall (5, RLWE); **Nicaragua**: I. Ometepe, VII.1989, Reinboldt (2, SEAN); **Panamá**: Canal Zone, Jct. K-9 and K-6 rds., 9.VI.1976, E.G. Riley (1, GHNC); Fort Kobbe, 8.VI.1976, E.G. Riley (1, GHNC); Madden Dam, 09° 13' N 79° 38' W, 21, 27.VII, 9.VIII.1971, H.A. Hespenheide (23, CHAH); 27.VII, 9.VIII.1971, W. Bivin (3, CHAH), 28.VI.1974, O'Brien's [sic.] & Marshall (2, SGWC); Madden Lake, 09° 15' N 79° 35' W, 20.X.1973, D. Engleman (2, CHAH); Madden Lake, Boy Scouts C., 29.IX.1973, A.R. Ramirez (2, CHAH); Madden Reservoir, 22.X.1973, 31.VIII.1975, D. Engleman (2, CHAH); 3.5 km WNW Paraiso, 09° 02' N 79° 40' W, 13, 20.VII.1974, H.A. Hespenheide, on *Heliocarpus* (7, CHAH); Chiva Chiva Road, 09° 03' N 79° 34' W, 25.VII.1978, N.E. Woodley (NEWC); 3 mi SE Gamboa, 31.VIII.1974, 1975, A.R. Ramirez (3, CHAH); "Plantation Road, " C29, 6.5 km ENE Gamboa, 09° 08' N 79° 39' W, 5.VIII.1978, H.A. Hespenheide (2, CHAH); "Plantation Road, " C29, 6 km ESE Gamboa, 09° 06' N 79° 39' W, 2.VIII.1978, H.A. Hespenheide (1, CHAH); "N[ew] G[ranada]," F.C. Bowditch Coll. (1, MCZC). In addition to borrowed material, Paratypes from CHAH deposited in AMNH, BMNH, CASC, CNCI, LACM, NMPC, MNHN.

Host: Adults have been collected commonly on *Heliocarpus*.

Etymology: Named in honor of coleopterist Andrew Moldenke who collected the Holotype as, apparently, part of the first series of this species. See comments under the preceding species.

Discussion: Male specimens vary from 2.8-3.5 mm in length (mean = 3.27 mm, N = 70); females vary from 2.85-3.7 mm in length (mean = 3.44 mm, N = 58).

Excluded species:

***Paragrilus dissimilis* (Waterhouse)**

Paragrilus dissimilis (Waterhouse), Kerremans, 1903: 284.
Agrilus dissimilis Waterhouse, 1889: 123.

As reported earlier (Hespenheide 1979) this species is a true *Agrilus*. There is a small group of species of *Agrilus*, including *dissimilis* and at least three undescribed species from México, Costa Rica, and Panamá that possess a posthumeral carina on each elytron but lack the pronotal structure typical of true *Paragrilus*.

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