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The Description of *Banacuniculus* Buffington, New Genus (Hymenoptera: Figitidae: Eucoilinae)

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Abstract.—The **new eucoiline genus *Banacuniculus*** is described to accommodate several species previously placed in *Ganaspidium*: ***Banacuniculus hunteri* (Crawford), new combination**; ***B. merickeli* (Miller), new combination**; ***B. nigrimanus* (Kieffer), new combination**; ***B. utilis* (Beardsley), new combination**; these species are all redescribed. The following **new species** are described: ***Banacuniculus brautigani***, ***B. beardsleyi***, ***B. dis***, and ***B. strykeri***. As is the case with *Ganaspidium*, species of *Banacuniculus* are parasitoids of some of the most pestiferous species of leaf-mining Agromyzidae (Diptera) and have been investigated for use as biological control agents of *Liriomyza trifolii* (Burgess). Additional phylogenetic, host range, and distributional data, and a key to all species are provided.

Key words.—*Liriomyza*, Agromyzidae, new species, new genus, species revision, parasitoid.

While revising *Ganaspidium* Weld (Hymenoptera: Figitidae: Eucoilinae), Buffington (2010) determined that some species of eucoiline wasps that had been historically included within *Ganaspidium* would render that genus polyphyletic if they remained within the genus. Buffington et al. (2007) supported this observation, where *Ganaspidium pussillae* Weld was recovered as a separate clade from *G. hunteri* (Crawford) and *G. utilis* Beardsley. Buffington (2010) further examined the characters of the mesosoma in both *G. hunteri* and *G. utilis*, revealing additional data supporting the removal of these two species from *Ganaspidium*. Buffington (2010) placed these two species, as well as *G. merickeli* (Miller) and *G. nigrimanus* (Kieffer), as *incertae sedis* pending the erection of a new genus to accommodate them. This paper provides the description of *Banacuniculus* Buffington, new genus, to accommodate these species. Included in this description is a redescription of the previously named species *Banacuniculus hunteri* (Crawford), new combination; *B. merickeli* (Miller), new combination; *B. nigrimanus* (Kieffer), new combination; and *B. utilis* (Beardsley), new combination. Four new species are also described: *Banacuniculus brautigani* Buffington, *B. beardsleyi* Buffington, *B. dis* Buffington, and *B. strykeri* Buffington.

Species of *Banacuniculus* are koinobiont endoparasitoids of agromyzid fly larvae (Diptera: Agromyzidae). Beardsley (1986, 1988) provided the first taxonomic work on eucoiline parasitoids of agromyzids in Hawai'i, and associated host remains with several species that he considered *Ganaspidium*, chiefly *G. hunteri* and *G. utilis*. The latter was described in Beardsley (1988) and has been shown to be an instrumental species in controlling pestiferous *Liriomyza* (Johnson 1987; Lynch and Johnson 1987; Mason and Johnson 1988; Rathman et al. 1991, 1995).

Banacuniculus is nested within the *Gronotoma* genus group (Buffington et al. 2007) and shares several synapomorphies with

those genera, including a complete parascutal impression, a large scutellar plate with a centrally placed midpit, protuberance on the clypeal and malar spaces, and remnants of notauli on the mesoscutum. Only the clypeal and malar protuberances are shared with *Ganaspidium*; all the other features are shared with other *Gronotoma* group genera (further discussed below).

MATERIALS AND METHODS

List of depositories

BPBM -Bernice B. Bishop Museum, Honolulu, HI, USA (N. Evenhuis).

CASC -California Academy of Sciences, San Francisco, CA, USA (R. Zuparko).

CNCI -Canadian National Collection of Insects, Ottawa, Canada (J. Read).

KSCU -Kansas State University, Manhattan, KS (G. Zolnerowich).

TAMU -Texas A&M University Insect Collection, College Station, TX, USA (E. Riley).

UCDC -Bohart Museum, University of California at Davis, Davis, CA, USA (L. Kimsey).

UCRC -University of California at Riverside, Riverside, CA, USA (S. Triapytsin).

USNM -National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (M. Buffington).

Additional sources of specimens.—Extensive collections from Texas were made available for my examination by Ricardo Hernandez (Department of Entomology, TAMU) and from Kansas by Robert Kula (Systematic Entomology Laboratory, Washington, DC) and Gregory Zolnerowich (Kansas State University, Manhattan, KS).

Specimen illustration and observation.—Methods for the imaging of specimens using light microscopy follow those of Buffington and van Noort (2007, 2009). For specimens too small for light microscopy, an environmental scanning electron microscope (ESEM) was used to image characters; specimens were shot uncoated in a Philips XL-30 ESEM machine, with lanthanum hexaboride electron source (LaB6). The instrument was operated in low vacuum mode with water vapor as the imaging gas and backscatter imaging with one-half of the diode active. Specimen mounting and lighting techniques follow Buffington and Gates (2009). Slide mounts were prepared with PVA mounting medium, cured for 72 hours at 43°C, and photographed with a JVC KW-75C camera on a Leica DMRB compound microscope. Specimens were examined with a Leica M10 stereomicroscope, illuminated with a pair of florescent desk lights.

Descriptive format.—Diagnoses focus on features that are easily recognizable by other observers, and closely related species that may have similar gross morphologies are distinguished. Terminology for all descriptive characters as well as phylogenetic characters are defined in Buffington (2009) and are not repeated here; surface sculpture terminology follows that of Harris (1979). Following the descriptions are summaries of general distribution, biology and comments on nomenclatural issues (when applicable). The species descriptions are generated by a database application, vSysLab (Johnson 2008), designed to facilitate the generation of taxon by character data matrices and to export the data both as text and as input files for other applications. A link to a distribution map is included in each species description. New species are designated are accompanied by a ZooBank registration number.

SYSTEMATIC TREATMENT

Banacuniculus Buffington, new genus

urn:lsid:zoobank.org:act:CD614635-1C08-459E-8E28-8B2EBE9972A5

Type species: *Banacuniculus hunteri* (Crawford), by present designation.

Diagnosis.—Malar space and ventral clypeal margin with distinct conical protuberances. Notauli lacking, setal tracks present where notauli are located in related taxa. Parascutal impression complete, terminating anteriorly at the point of origin of the notaular setal tracks. Scutellar plate nearly circular with midpit located in center of plate; plate lacking tubercles; setae-bearing pits present, encircling midpit. Setal band at base of syntergum of metasoma complete. Similar to *Ganaspidium* but easily separated based on the morphology of the scutellar plate: *Ganaspidium* always has a pair of tubercles on the anterior half of the plate, and the plate is not circular but oblong. *Banacuniculus* is also similar to *Microstilba*, *Nordlanderia*, and *Disorygma*, but distinguished based on notauli being absent and the hairy ring of syntergum present (notauli present and hairy ring of metasoma absent in *Microstilba*, *Nordlanderia*, and *Disorygma*); similar to *Agrostocynips*, but with pronotol plate less than one-half the width of the head (nearly as wide as head in *Agrostocynips*) and genal carina absent (present ventrally in *Agrostocynips*).

Description.—*Head*. Nearly glabrous with a few scattered setae on lower face, clypeus, inner margins of compound eyes and gena; ocellar hair patches absent. Ventral 1/4 of lower face with admedial clypeal furrows converging towards the clypeus; point of convergence resulting in the formation of distinct conical protuberance protruding from anterior margin of clypeus. Orbital furrows absent. Malar sulcus ranging from simple to compound. Malar space smooth to distinctly strigose, with large conical protuberance present. Genal carina absent.

Antennae: Female: 13 segments, moniliform, clavate; segments 3–13 sub-equal in length; rhinaria present only on the last 7 segments. Male: 15 segments; segments 3–15 sub-equal in length; rhinaria present on segments 3–15. Segment 3 modified, curved outwardly, excavated laterally.

Pronotum: Pronotal plate narrow, with setae present along dorsal margin; dorsal margin rounded; pronotal fovea open. Lateral pronotal carina absent. Pronotal triangle absent. Pronotal impression absent. Lateral aspect of pronotum smooth, glabrous in most species.

Mesoscutum: Smooth and glabrous; no sculpture present. Parascutal impression complete, lined with setae, extending from the tegula to point along anterior margin of mesoscutum where notaular setal line originates. Notauli, mesoscutal keel, parapsidal ridges and parapsidal hair lines absent; notaular setal line present.

Mesopectus: Upper and lower part of mesopleuron completely smooth and glabrous. Mesopleural triangle present, faintly indicated (often only visible in the space immediately anterior to the mesopleural spiracle). Mesopleural carina simple. Precoxal carina of lower part of mesopleuron present anteriorly and posteriorly, absent ventrally. Surcoxal depression reduced, smooth.

Scutellum: Scutellar plate ranging from small to large; midpit centrally placed; rim of plate translucent; dorsal surface of plate smooth in most species; setae-bearing pits present around midpit. Dorsal surface of the scutellum reticulate to smooth; rounded posteriorly and laterally; posterior carina present or absent. Laterodorsal and posterior projections absent. Lateral bars as long as wide; ventral lobe absent. Scutellar fovea oval, smooth and deep.

Metapectal-propodeal complex: Posterior 1/3-1/4 of metapectus setose. Spiracular groove with a well-defined dorsal margin, reduced ventral margin. Posterior margin of metapectus smooth, not ridged. Metapleural ridge and submetapleural ridge absent. Anterior impression of metepimeron absent; anterior impression of metepisternum present, reduced. Anteroventral cavity rounded, setose. Propodeum

covered in dense, appressed setae. Lateral propodeal carinae semi-parallel, bowed at junction with auxiliary propodeal carinae; auxiliary propodeal carinae distinct. Nucha glabrous, reticulate.

Wings: Hyaline; setose. R_1 complete, pigmented along anterior margin of wing; marginal cell not truncate, as deep as long. Apical fringe present, short (Fig. 3C).

Legs: Fore and mid coxa subequal in size, hind coxa twice the size of either fore or mid coxa. Fore coxa variously setose; mid and hind coxa with distinct anterior and posterior dorsoventral setal bands. Femora with sparse setal lines; tibiae and tarsomeres with dense, appressed setae. Length of hind tarsomere 1 equal to 0.5× the combined length of remaining hind tarsomeres.

Metasoma: Female: Subequal in size to mesosoma. Base of syntergum with hairy ring present, comprised of dense, appressed setae and a ring of thin, erect setae; remainder of metasoma glabrous. Micropunctures present on posterior 1/3 of the syntergum, and on remaining terga. Terga posterior to syntergum gradually directed ventrally, resulting in a 70 degree angle between syntergum and remaining terga. Ovipositor with series of sub-apical serrations (seen only in large specimens). Male: as in female with the terga posterior to syntergum abruptly angled ventrally, resulting in a 90 degree angle between syntergum and remaining terga.

Distribution.—Neotropical Region: Chile, Argentina, Panama, Costa Rica, Southern Mexico; Nearctic Region: Northern Mexico, continental United States, southern Canada; Hawaiian Islands.

Biology.—Several species of *Liriomyza* have been recorded as hosts (Beardsley 1986; Johnson 1987; Hara and Matayoshi 1990; Acosta and Cave 1994; present study). *Banacuniculus hunteri* and *B. utilis* have been evaluated for their usefulness in biological control of pestiferous leafmining flies (Johnson 1987; Lynch and Johnson 1987; Mason and Johnson 1988; Rathman et al. 1991; Rathman et al. 1995). Petcharat and Johnson (1988) studied the larval stages of *Banacuniculus utilis*.

Etymology.—The name translates in Latin to 'miner hunter': *bana*, hunter; *cuniculus*, miner. The name refers to the host preference of species of *Banacuniculus*, which putatively all attack leaf mining agromyzid flies. The gender is masculine.

Included species.—

Banacuniculus beardsleyi Buffington, new species.

B. brautigani Buffington, new species.

B. dis Buffington, new species.

B. hunteri (Crawford), Beardsley (1986). *Eucoila hunteri* Crawford, 1913: 310, holotype in USNM. *Ganaspidium hunteri* (Crawford): Beardsley (1986, 1988), Buffington (2004, 2010).

B. merickeli (Miller), new combination. *Nordlanderia merickeli* Miller, 1989: 158–159, 162, holotype lost.

B. nigrimanus (Kieffer). *Eucoela nigrimanus* Kieffer, 1907:138, holotype in CASC. *Ganaspidium nigrimanus* (Kieffer): Buffington (2004).

B. strykeri Buffington, new species.

B. utilis (Beardsley). *Ganaspidium utilis Beardsley*, 1988: 44–46, holotype in BPBM.

KEY TO SPECIES OF *BANACUNICULUS*

1. Dorsal surface of scutellum completely smooth and glabrous (Figs 2F and 3B); posterior margin of scutellum lacking a carina (Fig. 2F) 2
- Dorsal surface of scutellum distinctly sculptured, ranging from rugulose to striate (Fig. 1D); posterior margin of scutellum with (Fig. 1E) or without (Fig. 1D) a distinct carina 4
2. In lateral view, scutellar plate extending to posterior margin of scutellum (Fig. 3B); in dorsal view, the scutellar plate completely obscures the dorsal surface of the scutellum 3

- In lateral view, scutellar plate not extending to the posterior margin of scutellum (Fig. 2E); in dorsal view, much of the dorsal surface of the scutellum visible . . . . . ***B. nigrimanus* (Kieffer)**

3. Dorsal surface of the scutellar plate horizontally strigose anterior of scutellar midpit . . . . . ***B. beardsleyi*, n. sp.**
- Dorsal surface of scutellar plate entirely smooth anterior to the scutellar midpit . . . . . ***B. utilis* (Beardsley)**

4. Posterior margin of the scutellum without a well-developed and distinct posterior carina, resulting in a broadly rounded posterior margin of the scutellum, lacking a distinct transition from the dorsal surface to the latero-postero surface (Fig. 1D) **5**
- Posterior margin of the scutellum with a well-developed and distinct posterior carina, separating the dorsal surface of the scutellum from the latero-postero surface (PC, Fig. 1E) **6**

5. Lateral aspect of pronotum and ventral half of mesopleuron covered with long, thin, white setae (PHP, Fig. 1B); metasoma at least twice as long as mesosoma . . . . . ***B. brautigani* n. sp.**
- Lateral aspect of pronotum and ventral half of mesopleuron largely glabrous (in some specimens, there may be short setae present along the anterior margin of the pronotum) (Fig. 1C) . . . . . ***B. dis*, n. sp.**

6. Dorsal surface of scutellum distinctly rugulose to coriaceous over its entirety (Fig. 2A) **7**
- Dorsal surface of scutellum longitudinally striate, frequently smooth and glabrous anteriorly just posterior to the scutellar fovea . . . . . ***B. merickeli* (Miller)**

7. Scutellar plate flat to slightly convex surrounding the midpit (Fig. 2A) . . . . . ***B. hunteri* (Crawford)**
- Scutellar plate distinctly concave surrounding the midpit (Fig. 2C) . . ***B. strykeri*, n. sp.**

Banacuniculus beardsleyi Buffington, new species

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urn:lsid:biosci.ohio-state.edu:osuc_concepts:253198

Fig. 1F.

Description.—Malar sulcus simple. Malar space smooth. Malar protuberance smooth, short, not extending beyond length of ventral margin of malar space. Clypeal protuberance short, not overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate flat, horizontally striate, setal bearing pits present surrounding midpit. Carina along posterior margin of scutellum absent. Dorsal surface of scutellum entirely smooth. Midpit of scutellar plate in center of plate; plate large, obscuring dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch absent. Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long.

Metasoma sub-equal in size to mesosoma (in lateral view).

Diagnosis.—This species resembles both *B. nigrimanus* and *B. utilis* in the morphology of the dorsal surface of the scutellum, but is easily separated from these species by the presence of the horizontally striate scutellar plate

Etymology.—Named in honor of my late mentor Jack Beardsley.

Link to Distribution Map.—http//hol.osu.edu/map-full.html?id=253198

Biology.—Unknown.

Type Material.—Holotype, female: **MEXICO**: Mexico, SIN, Mazatlán, 27.III.1979, L. D. French, USNM ENT 00655548 (deposited in UCDC).

Banacuniculus brautigani Buffington, new species

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urn:lsid:biosci.ohio-state.edu:osuc_concepts:253199

Figs 1 A and B.

Description.—Malar sulcus compound. Malar space partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance smooth, elongate, extending beyond length of ventral margin of malar space. Clypeal protuberance elongate, overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate gently convex, smooth; setal bearing pits surrounding midpit. Carina along posterior margin of scutellum absent. Dorsal surface of scutellum entirely rugulose/wrinkled. Midpit of scutellar plate in center of plate; plate small, revealing dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch present. Mesopleuron entirely smooth. Lateral aspect of pronotum covered in long, thin, white setae. Marginal cell of forewing as deep as long. Metasoma distinctly larger than mesosoma (longer and deeper) when viewed laterally.

Diagnosis.—This species differs from all other *Banacuniculus* by the presence of an entirely setose lateral aspect of the pronotum and the presence of a metasoma that is roughly two times the size of the mesosoma (PHP, Fig. 1B).

Etymology.—Named in honor of the author Richard Brautigan who wrote many poems and short stories on the nature and culture of California.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=253199

Biology.—Unknown.

Type Material.—Holotype, female: **UNITED STATES**: CA, Riverside Co., 3.5mi S Palm Desert, Nance (Coyote) Canyon, alluvial soil, Philip L. Boyd Deep Canyon Research Center, 12.IV.1975, J. D. Pinto, USNM ENT 00655348 (deposited in UCRC).

Banacuniculus dis Buffington, new species

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urn:lsid:biosci.ohio-state.edu:osuc_concepts:253201

Figs 1 C–D and 3 E–F.

Description.—Malar sulcus compound. Malar space partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance smooth, elongate, extending beyond length of ventral margin of malar space. Clypeal protuberance elongate, overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate gently convex, smooth; setal bearing pits surrounding midpit. Carina along posterior margin of scutellum absent. Dorsal surface of scutellum entirely rugulose/wrinkled. Midpit of scutellar plate in center of plate; plate small, revealing dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch absent. Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma sub-equal in size to mesosoma in lateral view.

Diagnosis.—This species can be confused with *Banacuniculus hunteri*, but can be separated by the lack of a posterior carina of the dorsal surface of the scutellum.

Etymology.—Named after *Dis*, Dante Alighieri's name for the City of Hell in *The Inferno*. As used here, the name refers to the hell-like conditions this species seems to thrive in the desert Southwest.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=253201

Biology.—Unknown.

Type Material.—Holotype, female: **UNITED STATES**: CA, Imperial Co., 5km from Gordons Well exit at I-8, Sand Highway, Algodones

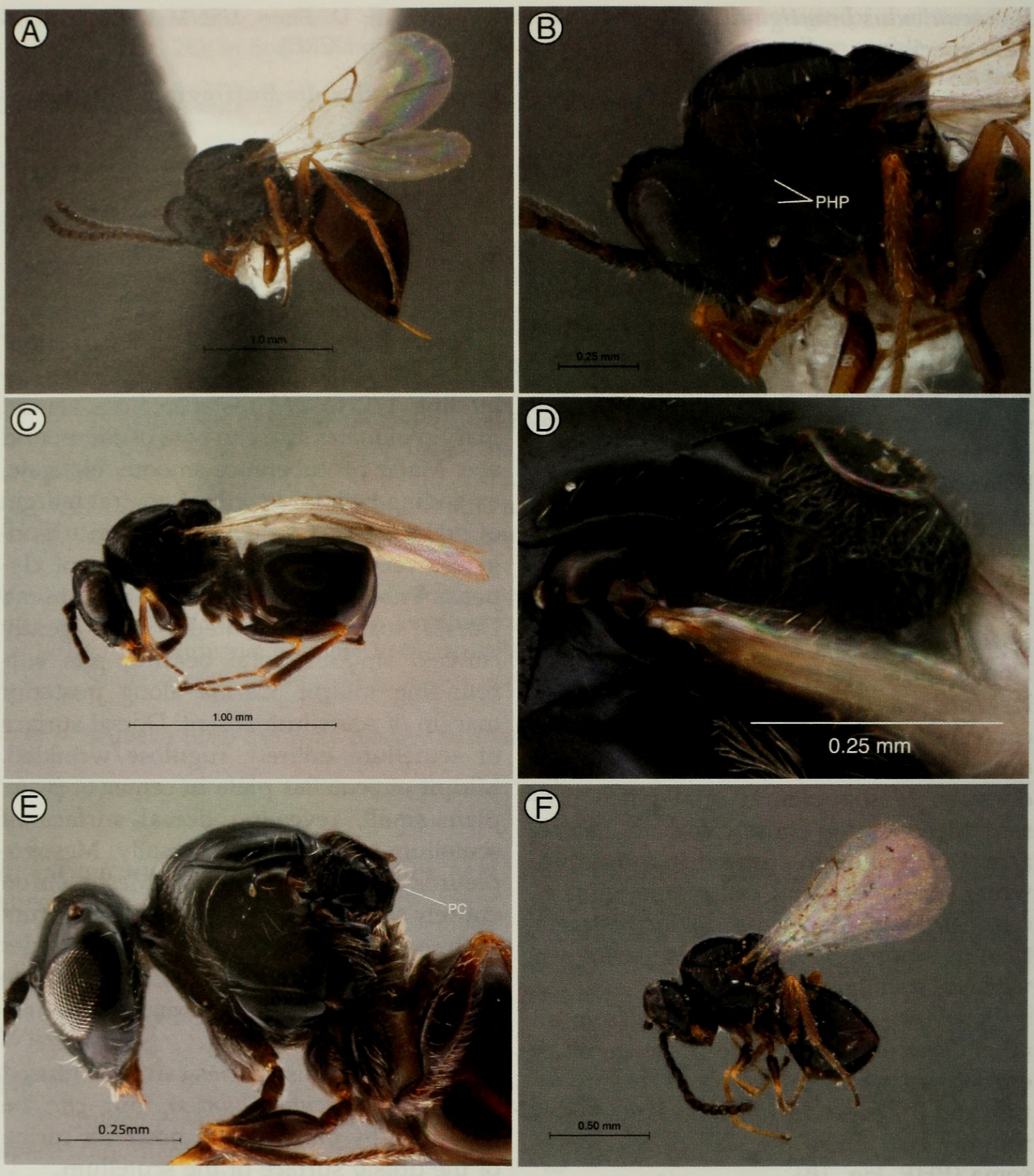

Fig. 1. A, *Banacuniculus brautigani*, n. sp., lateral habitus of holotype; B, *B. brautigani* n. sp., closeup of head and mesosoma; C, *B. dis* n. sp., lateral habitus; D, *B. dis* n. sp., poster-dorsal view of scutellum and scutellar plate; E, *B. merickeli* (Miller), closeup of head and mesosoma; F, *B. beardselyi* n. sp., lateral habitus of holotype. Abbreviations: PHP, pronotal hair patch; PC, posterior carina of the scutellum.

Dunes, 32°45.5′N 114°57′W, 24.VII.2008, S. L. Heydon, USNM ENT 00655716 (deposited in UCDC). *Paratypes*: (2 females, 3 males) **UNITED STATES**: *CALIFORNIA*. Inyo Co., 6km E Big Pine, 24.V.1994, S. L. Heydon (1 female, USNM ENT 00655523 (UCDC)); Inyo Co., Eureka Valley, Joshua Flat, 24.V.1994, S. L. Heydon (1 male, USNM ENT 00655522 (UCDC)); Riverside Co., 2mi NW Oasis, 15.V.1974, N. J. Smith (1 female, USNM ENT 00655486 (UCDC)); Solano Co., 6km SE Suisun City, Suisun Marsh, 14.VI.1993, S. L. Heydon & L. Guo (1 male, USNM ENT 00655454 (UCDC)). *MONTANA*. Silver Bow Co., Butte, 23.VII.1983, J. D. Pinto (1 male, UCRC ENT 196933 (UCRC)).

***Banacuniculus hunteri* (Crawford), new combination.**

urn:lsid:biosci.ohio-state.edu:osuc_concepts:253431

Eucoila hunteri Crawford, 1913: 310. Holotype in USNM.

Ganaspidium hunteri (Crawford): Beardsley (1986), Buffington (2010).

Figs 2 A and B.

Description.—Malar sulcus compound. Malar space partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance striate, elongate, extending beyond length of ventral margin of malar space. Clypeal protuberance elongate, overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate flat, smooth; setal bearing pits present surrounding midpit. Carina along posterior margin of scutellum delicate, defining transition from dorsal surface of scutellum from posterior surface. Dorsal surface of scutellum entirely rugulose/wrinkled. Midpit of scutellar plate in center of plate; plate small, revealing dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch absent. Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma subequal in size to mesosoma in lateral view.

Diagnosis.—This species is separated from all other *Banacuniculus* by simultaneously possessing a densely crenulate dorsal surface of the scutellum and a distinct posterior carina of the scutellum.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=253204

Biology.—Recorded parasitizing *Liriomyza trifolii* (Burgess) and *L. sativae* Blanchard (Lynch and Johnson 1987).

Material Examined.—Holotype, female: **UNITED STATES**: TX, Dallas Co., cotton, Dallas, 19.V.1912, Hunter, USNM ENT 00655719 (deposited in USNM). *Paratype*: **UNITED STATES**: TX, Dallas Co., cotton, Dallas, 19.V.1912, Hunter (1 female, USNM ENT 00653537 (USNM)). *Other material*: (23 females, 12 males) **CANADA**: 2-25Y BRI-91, no date (1 female, USNM ENT 00652564 (CNCI)). *ALBERTA*. Calgary, 1. VII.1956, O. Peck (1 female, USNM ENT 00655545 (CNCI)); Lethbridge, Oldman River, 22.VI.1956, O. Peck (8 females, 2 males, USNM ENT 00652563, 00653555, 00653558, 00653559, 00653560-00653562, 00653566, 00653568, 00653569 (CNCI)); Lethbridge, Oldman River, 22.VI.1956, sweeping, O. Peck (1 female, USNM ENT 00653570 (CNCI)); grass, Elkwater Lake, 21.VII.1956, O. Peck (2 males, USNM ENT 00653567, 00653578 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 5.VII-16.VII.1991, H. Goulet (1 male, USNM ENT 00653585 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 5.VIII.1991, H. Goulet (1 female, 1 male, USNM ENT 00653581, 00653582 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 8.VII.1991, H. Goulet (1 male, USNM ENT 00653565 (CNCI)); nr. mouth of Blakiston Creek, flowery prairie, Waterton Lakes National Park of Canada, 8.VII.1991, H. Goulet (2 females, 3 males, USNM ENT 00653572-00653576 (CNCI)); nr. mouth of Blakiston Creek, flowery prairie, Waterton Lakes National Park of Canada, no date, H. Goulet (1 female, USNM ENT 00653580 (CNCI)). *BRITISH COLUMBIA*. 57km N Princeton, hwy. 5, pine/grass, Kentucky-Alleyne Park, 10.VII.1986, H. Goulet (1 female, USNM ENT 00653571 (CNCI)). *NEW BRUNSWICK*. Kouchibouguac National Park of Canada, 7.VII.1977, M. Ivanochko (1 female, USNM ENT 00653579 (CNCI)). *NOVA SCOTIA*. sandbar, South Harbour, 28.VI.1983 (1 male, USNM ENT 00653577 (CNCI)). **UNITED STATES**: *COLORADO*. Boulder Co., University of Colorado Mountain Research Station (Science Lodge), 5.VII-6.VII.1961, W. R. M. Mason (1 female, USNM ENT 00653556 (CNCI)); Clear Creek Co., Mt. Evans, Doolittle Ranch, 8.VII.1961, S. M. Clark (1 female, USNM ENT 00653557 (CNCI)); Grand Co., 7km E Winter Park, Rollins Pass Road, 3.VIII.1999, S. L. Heydon & S. M. L. Heydon (1 male, USNM ENT 00655515 (UCDC)). *IDAHO*. Cassia Co., #8, Burley, 27.VI.1932, D. E. Fox (1 female, USNM ENT 00653510 (USNM)). *NEW MEXICO*. Valencia Co., 20mi W Los Lunas, along

streambed, Carrizo Creek, 1.VIII-23.VIII.1977, Malaise trap, S. Peck & J. Peck (1 female, USNM ENT 00653584 (CNCI)). *OREGON*. Lake Co., 15km N Lakeview, Bull Creek Campground, 20.VII.1994, S. L. Heydon (1 female, USNM ENT 00655445 (UCDC)). *UTAH*. Uintah Co., Vernal, 1912, C. N. Ainslie (1 female, USNM ENT 00653538 (USNM)).

Banacuniculus merickeli (Miller), new combination.

urn:lsid:biosci.ohio-state.edu:osuc_concepts: 253432

Nordlanderia merickeli Miller, 1989: 158–159, 162. Holotype lost.

Figs 1E and 3D.

Description.—Malar sulcus compound. Malar space partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance smooth, elongate, extending beyond length of ventral margin of malar space. Clypeal protuberance elongate, overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate gently convex, smooth; setal bearing pits surrounding midpit. Carina along posterior margin of scutellum delicate, defining transition from dorsal surface of scutellum from posterior surface. Dorsal surface of scutellum smooth anteriorly, longitudinally striate posteriorly. Midpit of scutellar plate in center of plate; plate small, revealing dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch absent. Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma subequal in size to mesosoma in lateral view.

Diagnosis.—This species is separated from all other *Banacuniculus* by having a longitudinally striate dorsal surface of the scutellum; in all other species in the genus, the dorsal surface of the scutellum is either entirely smooth, or variously crenulate-rugose.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=253207

Biology.—Unknown.

Material Examined.—*Other material*: (13 females, 9 males) **CANADA**: *ALBERTA*. grass, Writing-On-Stone Provincial Park, 24.VIII.1990, McCorquodale (1 female, USNM ENT 00653589 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 14.VII.1991, H. Goulet (2 males, USNM ENT 00653587, 00653588 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 5.VII-16.VII.1991, H. Goulet (1 female, USNM ENT 00653583 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 5.VII.1991, H. Goulet (1 female, 1 male, USNM ENT 00653586, 00655612 (CNCI)); nr. mouth of Blakiston Creek, flowery prairie, Waterton Lakes National Park of Canada, 8.VII.1991, H. Goulet (1 female, USNM ENT 00655580 (CNCI)). **MEXICO**: DF, 12mi W Texcoco de Mora, 2300m, 28.X.1982, screen sweeping, A. Gonzalez (1 female, UCRC ENT 196943 (UCRC)). MOR, El Zarco, 1.VI.1954 (1 unknown, USNM ENT 00653532 (USNM)). **NICARAGUA**: Rivas Dept., San Juan del Sur, 11°15'N 85°52'W, 21.VII.1994, L. J. Clark (1 female, USNM ENT 00655504 (UCDC)). **UNITED STATES**: *CALIFORNIA*. San Bernardino Co., S of Barton Flats, 2090m, 19.VI-26.VI.2007, Malaise trap, F. Reuter (1 male, USNM ENT 00655317 (USNM)); Stanislaus Co., romaine lettuce, Modesto, 8.XI.1944, C. Weber (1 female, USNM ENT 00655437 (UCDC)). *COLORADO*. Larimer Co., Fort Collins, 25.V.1995, C. F. Baker (1 female, USNM ENT 00655344 (USNM)); Larimer Co., Fort Collins, VI-1895, C. F. Baker (1 female, USNM ENT 00653528 (USNM)). *NORTH DAKOTA*. Hettinger, Mott, no date, sweeping, C. N. Ainslie (1 female, USNM ENT 00653519 (USNM)). *NEW MEXICO*. Quay Co., along rt. 66, within city limits, Tucumcari, 4.IV.2003, sweeping, M. Buffington (1 male, USNM ENT 00655334 (USNM)); Quay Co., along rt. 66, within city limits, general vegetation, Tucumcari, 4.VI.2003, sweeping, M. Buffington (1 male, USNM ENT 00655331 (USNM)). *NEVADA*. Lander Co., summit above Austin, 2430m, 8.VIII.1999, S. L. Heydon & S. M. L. Heydon (1 female, USNM ENT 00655440 (UCDC)). *TEXAS*. Val Verde Co., Seminole Canyon State Historical Park, 1400ft, 15.IV.1999, J. M. Heraty (1 female, UCRC

ENT 196938 (UCRC)). *WYOMING*. Big Horn Co., northern Big Horn Mts., alpine meadow, Sheep Mountain, 22.VII.1988, H. Goulet (1 male, USNM ENT 00655581 (CNCI)); Platte Co., Chugwater Creek, Chugwater, 16.VIII.1986, J. D. Pinto (1 male, USNM ENT 00655614 (USNM)); Platte Co., town center, Chugwater, 16.VIII.1986, J. D. Pinto (1 male, UCRC ENT 196936 (UCRC)); Platte Co., town center, Chugwater, 16.VIII.1996, J. D. Pinto (1 male, UCRC ENT 196935 (UCRC)); Sheridan Co., Bighorn Mountains, 24mi W Dayton, 20.VIII.1983, G. Gordh (1 male, UCRC ENT 196934 (UCRC)); Teton Co., Granite Canyon, 1987/060, Teton National Forest, 3.VII.1987, J. A. Jackson (1 female, USNM ENT 00655347 (USNM)).

Comments.—Miller (1989) described two species of eucoiline wasps that he placed in *Nordlanderia* Quinlan. Though the location of the type specimens for these two species is unknown (Miller, pers. comm.), it is clear from the scanning electron micrographs accompanying the descriptions that one species, *B. merickeli* (Miller) possesses the diagnostic features of *Banacuniculus* but not all of the defining features of *Nordlanderia*; therefore, this species is transferred to *Banacuniculus*. Communication with the original describer of the species suggests the holotype may yet surface; I am reticent to designate a neotype at the present time until it can be fully verified that the holotype is lost.

Banacuniculus nigrimanus (Kieffer), new combination.

urn:lsid:biosci.ohio-state.edu:osuc_concepts: 253433

Eucoela nigrimanus Kieffer, 1907: 138. Holotype in CASC.

Ganaspidium nigrimanus (Kieffer): Buffington (2004, submitted).

Figs 2 D–F.

Description.—Malar sulcus simple. Malar space smooth; partially striate, striations extending to 1/4 distance from ventral margin of malar space to base of compound eye. Malar protuberance smooth, short, not extending beyond length of ventral margin of malar space. Clypeal protuberance short, not overhanging anterior margin of clypeus. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate flat, smooth; setal bearing pits present surrounding midpit. Carina along posterior margin of scutellum absent. Dorsal surface of scutellum entirely smooth. Midpit of scutellar plate in center of plate; plate small, revealing dorsal surface of scutellum when viewed dorsally. Mesopopleural setal patch absent. Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma subequal in size to mesosoma in lateral view.

Diagnosis.—This species is very similar to *B. utilis* but can be easily separated by the small relative size of the scutellar plate; in *B. utilis* the plate is enormous, covering the entire dorsal surface of the scutellum when viewed dorsally. In *B. nigrimanus*, the plate is much smaller, revealing the majority of the dorsal surface of the scutellum.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=251126

Biology.—Recorded parasitizing *Liriomyza huidobrensis* (Blanchard) (based on label data).

Material Examined.—Holotype, male: [first label] Claremont Cal. Baker, [second label] 5695, [third label] *Eucoela nigrimanus* Kieffer (in Kieffer's hand), [fourth label] California Academy of Science Type No. 10573. [Note: this 'Baker number' could not be located in the Baker notes housed at the USNM]. *Other material*: (60 females, 14 males) **CANADA**: *ALBERTA*. Medicine Hat, 14.VII.1956, O. Peck (1 female, USNM ENT 00655592 (CNCI)); Waterton Park, 18.VI.1956, O. Peck (1 male, USNM ENT 00655579 (CNCI)); montaine prairie, Waterton Lakes National Park of Canada, 5.VIII-16.VIII.1991, Malaise trap, H. Goulet (1 female, USNM ENT 00655620 (USNM)); montaine prairie, Waterton Lakes National Park of Canada, 8.VII.1991, H. Goulet (1 male, USNM ENT 00655613 (CNCI)); nr. Mt. Galway, montaine prairie, Waterton Lakes National Park of

Canada, 5.VIII-16.VIII.1991, Malaise trap, H. Goulet (1 female, USNM ENT 00655622 (CNCI)); nr. Mt. Galway, subalpine prairie, Waterton Lakes National Park of Canada, 9.VII.1991, Malaise trap, H. Goulet (1 female, USNM ENT 00655621 (CNCI)). **MEXICO**: BCS, road, vicinity of La Ventana, 8.III.1963, P. H. Arnaud (1 male, USNM ENT 00655424 (CASC)). SON, tomatoes, Heroica Nogales, 23.III.1943 (1 female, USNM ENT 00653520 (USNM)). **UNITED STATES**: *ARIZONA*. Graham Co., desert, 2.4km W on hwy 366 from hwy 191 (666), 1160m, 27.VI-28.VI.1991, Malaise trap, J. E. O'Hara (2 females, USNM ENT 00655596, 00655597 (CNCI)). *CALIFORNIA*. Amador Co., 3km N Silver Lake, Martin Meadow, 22.VII.1993, L. S. Kimsey & R. B. Kimsey (1 female, USNM ENT 00655488 (UCDC)); Imperial Co., 11.3km NW hwy 78, Coachella Canal Road, Algodones Dunes, 25.III.2008, sweeping, S. L. Heydon (1 female, USNM ENT 00655525 (UCDC)); Inyo Co., 31km ENE Big Pine, 25.V.1994, S. L. Heydon (6 females, 2 males, USNM ENT 00655498, 00655499, 00655506-00655507, 00655508, 00655509, 00655510-00655511 (UCDC)); Inyo Co., Grays Meadow Campground, 6000ft, 17.VII.1985, A. S. Menke (1 female, USNM ENT 00655343 (USNM)); Nevada Co., 6km NW Hobart Mills, Sagehen Creek Field Station, 29.VII.2002, sweeping, S. L. Heydon (2 females, USNM ENT 00655434-00655435 (UCDC)); Nevada Co., Hobart Mills, 10.VII.1978, R. M. Bohart (1 female, USNM ENT 00655449 (UCDC)); Riverside Co., vegetation/wash, Wiley Well Campground, 176m, 1.V.2008, sweeping, M. Gates (1 female, USNM ENT 00653530 (USNM)); San Bernardino Co., 1mi N of crossing of 2N93 Service Road and hwy 38, H97-20, San Bernardino Mountains, 2350m, 24.VI.1997, J. M. Heraty (1 male, UCRC ENT 197000 (UCRC)); Solano Co., 6km SE Suisun City, Suisun Marsh, 14.VI.1993, S. L. Heydon & L. Guo (3 females, 1 male, USNM ENT 00655453, 00655455-00655456, 00655469 (UCDC)). *COLORADO*. Grand Co., 22km NNW Kremmling, Chimney Rock, 4.VIII.1999, S. L. Heydon & S. M. L. Heydon (3 females, USNM ENT 00655436, 00655441, 00655501 (UCDC)); Grand Co., 22km NNW Kremmling, hwy 40 & road 27, 4.VIII.1999, S. L. Heydon & S. M. L. Heydon (2 females, USNM ENT 00655439, 00655539 (UCDC)); Larimer Co., Fort Collins, 18.VIII.1893, Baker (1 female, USNM ENT 00653512 (USNM)); Park Co., 6km S Lake George, along Fish Creek, 7.VII.1992, S. L. Heydon (1 female, 1 male, USNM ENT 00655470, 00655475 (UCDC)). *FLORIDA*. Charlotte Co., Placida, 11.IV.1952, O. Peck (1 female, USNM ENT 00655594 (CNCI)). *KANSAS*. Geary Co., watershed 2D, Konza Prairie Biological Station, 5.V-12.V.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655711 (USNM)); Geary Co., watershed C, Konza Prairie Biological Station, 26.VIII-2.IX.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655712 (USNM)). *NEW MEXICO*. Doña Ana Co., Mesilla, no date (1 female, USNM ENT 00653536 (USNM)); Quay Co., along rt. 66, within city limits, general vegetation, Tucumcari, 4.VI.2003, sweeping, M. Buffington (2 females, USNM ENT 00655332-00655333 (USNM)); Valencia Co., 20mi W Los Lunas, along streambed, Carrizo Creek, 23.VIII.1977, Malaise trap, S. Peck & J. Peck (3 females, USNM ENT 00655573-00655574, 00655583 (CNCI)). *NEVADA*. White Pine Co., 45km SSE Eureka, 19.VII.1995, S. L. Heydon & R. M. Bohart (1 female, USNM ENT 00655513 (UCDC)). *OREGON*. Lake Co., 15km N Lakeview, Bull Creek Campground, 20.VII.1994, S. L. Heydon (10 females, 2 males, USNM ENT 00655442-00655444, 00655446-00655447, 00655448, 00655457, 00655458, 00655459, 00655460-00655461, 00655465 (UCDC)); Lake Co., Alkali Lake, 21.VII.1994, S. L. Heydon (1 female, 1 male, USNM ENT 00655477, 00655492 (UCDC)). *TEXAS*. Brewster Co., lowland desert springs, Big Bend National Park, 21.VII.1977, L. Masner (1 male, USNM ENT 00655600 (CNCI)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 30.IV.2008, Hernandez (1 unknown, USNM ENT 00655029 (USNM)); Presidio Co., Big Bend Ranch State Park, 27.X-1.IV.1989, Malaise trap, D. Judd (1 female, USNM ENT 00655571 (CNCI)). *UTAH*. Emery Co., nr. Goblin Valley State Park, Wild Horse Creek, 2.VIII-7.VIII.1997, Malaise trap, M. Wasbauer & J. Wasbauer (1 male, USNM ENT 00655450 (UCDC)); Emery Co., nr. Goblin Valley State Park, Wild Horse Creek, 2.VIII-7.VIII.1997, M. Wasbauer & J. Wasbauer (1 female, USNM ENT 00655524 (UCDC)); Washington Co., Pinto, no date, C. N. Ainslie (1 female, USNM ENT 00653531 (USNM)); Wayne Co., 6mi W Caineville, along Fremont River, 4700ft, 29.VI.1993, J. D. Pinto (1 female, UCRC ENT 196937 (UCRC)); Wayne

Co., vegetation, 11 km E Torrey, 7.VIII.1996, L. A. Baptiste (1 female, USNM ENT 00655438 (UCDC)). *WYOMING*. Big Horn Co., northern Big Horn Mts., alpine meadow, Sheep Mountain, 22.VII.1988, H. Goulet (4 females, USNM ENT 00655575-00655577, 00655578 (CNCI)).

Banacuniculus strykeri Buffington, new species

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urn:lsid:biosci.ohio-state.edu:osuc_concepts:253208

Fig. 2C.

Description.—Malar sulcus compound. Malar space partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance striate, short, not extending beyond length of ventral margin of malar space. Clypeal protuberance short, not overhanging anterior margin of clypeus. Midpit of scutellar plate in center of plate; plate large, obscuring dorsal surface of scutellum when viewed dorsally. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate concave, radially striate; setal bearing pits surrounding midpit. Carina along posterior margin of scutellum present, distinctly cleft, defining transition from dorsal surface of scutellum from posterior surface. Dorsal surface of scutellum entirely rugulose/wrinkled. Mesopopleura setal patch absent. Mesopleuron striate within confines of mesopleural triangle, remainder of sclerite smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma sub-equal size to mesosoma in lateral view.

Diagnosis.—Differs from other species by the large scutellar plate, the presence of the radial striations on the surface of the scutellar plate, and by the reduced malar and clypeal protuberances.

Biology.—Reared from an isolated puparium of *Liriomyza lathyri* Seghal in Marquette, MI (holotype specimen).

Etymology.—Named in honor of my son, Stryker Buffington.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=253208

Type Material.—Holotype, female: United States, MI, Marquette Co. 46°50.627'N 87°51.300'W, 16 August 2006, R. Priest. Lot # RJP1755.2.1, USNM ENT 00655717. Deposited in USNM. *Paratypes*: **UNITED STATES**: 1 female, 2 males: *COLORADO*. Fremont Co., Phantom Canyon, 29-31/5/1987, G. Hevel, 1 female USNM ENT 00653511 (USNM). *MICHIGAN*. Washtenaw Co., Ann Arbor, 7/12-21/1982, R. Wharton, 2 males USNM ENT 00655520-00655521 (TAMU).

Comments.—The scutellar morphology and the distribution patterns of this species are striking features. More *Banacuniculus* species are likely to occur in the Midwestern United States.

Banacuniculus utilis (Beardsley), new combination.

urn:lsid:biosci.ohio-state.edu:osuc_concepts:253430

Ganaspidium utilis Beardsley, 1988: 44–46, holotype in BPBM.

Synonymized with *Ganaspidium nigrimanus* (Kieffer) by Buffington (2004); revised status: Buffington (2010).

Figs 3 A–C.

Redescription.—Malar sulcus simple. Malar space smooth; partially striate, striations extending 1/2 to 2/3 distance from ventral margin of malar space to base of compound eye. Malar protuberance smooth, short, not extending beyond length of ventral margin of malar space. Clypeal protuberance short, not overhanging anterior margin of clypeus. Midpit of scutellar plate in center of plate; plate large, obscuring dorsal surface of scutellum when viewed dorsally. Tubercles of scutellar plate absent. Dorsal surface of scutellar plate flat, smooth, setal bearing pits present surrounding midpit. Carina along posterior margin of scutellum absent. Dorsal surface of scutellum entirely smooth. Mesopopleural setal patch absent.

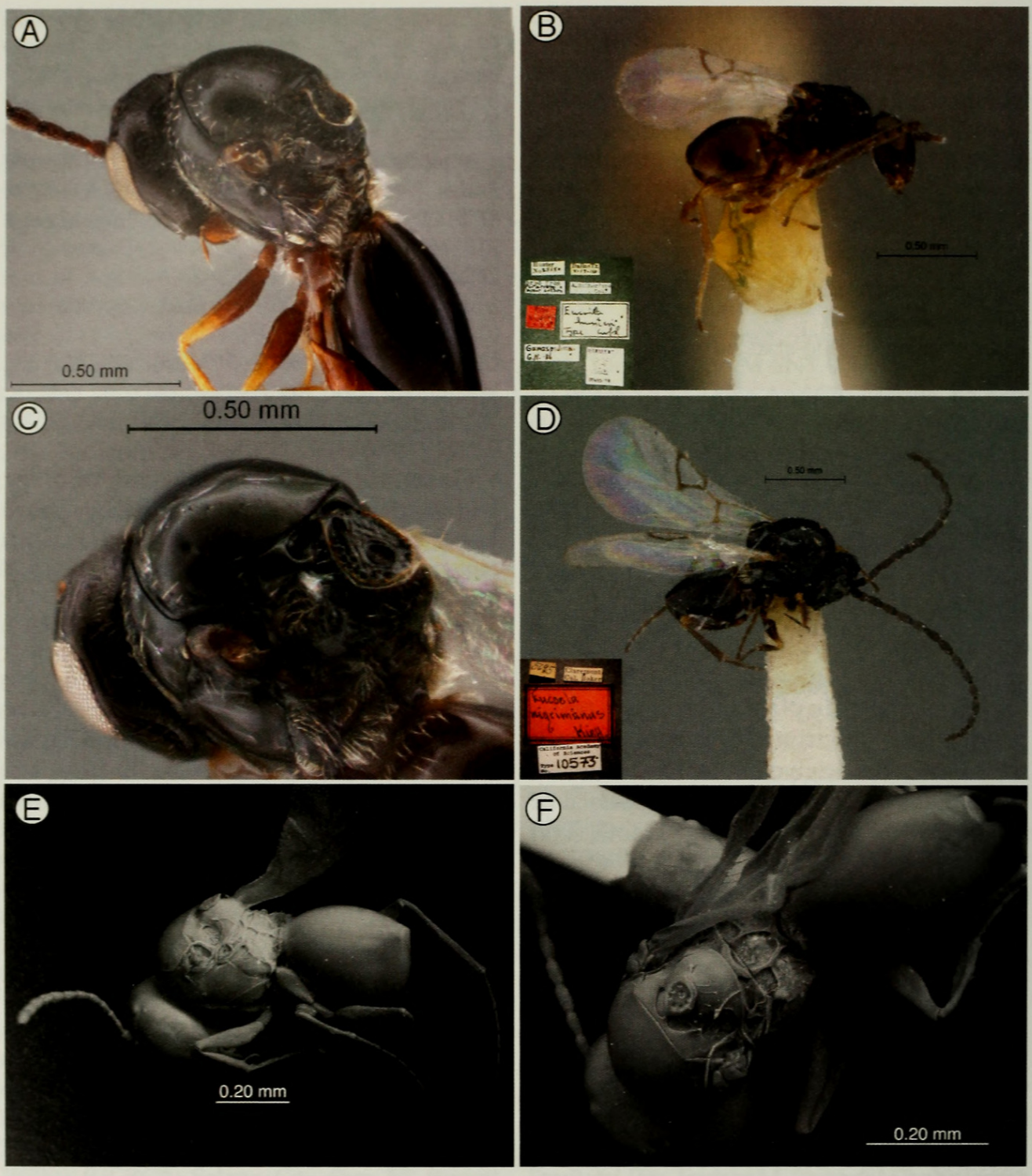

Fig. 2. A, *Banacuniculus hunteri* (Crawford), postero-dorsal view of mesosoma; B, *B. hunteri*, lateral habitus of holotype with inset of specimen labels; C, *B. strykeri*, n. sp., postero-dorsal view of scutellum and scutellar plate; D, *B. nigrimanus* (Kieffer), lateral habitus of holotype with inset of specimen labels; E, *B. nigrimanus*, lateral habitus of non-type specimen; F, *B. nigrimanus*, postero-dorsal view of scutellum, scutellar plate, and propodeum.

Mesopleuron entirely smooth. Lateral aspect of pronotum with some short setae anteriorly, remainder glabrous. Marginal cell of forewing as deep as long. Metasoma sub-equal size to mesosoma in lateral view.

Diagnosis.—Differs from *Banacuniculus nigrimanus* by having a large scutellar plate, and from *B. beardsleyi* by having a smooth dorsal surface of the scutellar plate; from the other species of *Banacuniculus* by characters in the beginning of the key.

Distribution.—Canada: Alberta; Guam; Guatemala: Esquintia; Mexico: Baja California, Chiapas, Morelos, Oaxaca, Sonora, and Zacatecas; Nicaragua: Rivas; United States: Arizona, California, Kansas, New Mexico, Oregon, Texas and Utah.

Link to Distribution Map.—http://hol.osu.edu/map-full.html?id=251127

Biology.—Recorded parasitizing *Liriomyza trifolii* (Hara and Matayoshi 1990; Johnson 1987; Beardsley 1986; this study), *L. sativae* (Johnson 1987) and *L. huidobrensis* (Blanchard) (Johnson 1987). This species has also been evaluated for its usefulness in biological control of pestiferous leafmining flies (Johnson 1987; Lynch and Johnson 1987; Mason and Johnson 1988; Rathman et al. 1991; Rathman et al. 1995). Petcharat and Johnson (1988) studied the larval stages.

Material Examined.—Holotype, female: [first label] USA. HI, Oahu. Nanakuli, X.3.1977, [second label] P.D. Mothershead, reared ex *Liriomyza* pupae from cucumber leaves. Deposited in BPBM. *Other material*: (176 females, 41 males) *Other material*: (176 females, 40 males, 1 unknown) **CANADA**: *ALBERTA*. Waterton Park, 18.VI.1956, O. Peck (1 female, USNM ENT 00655599 (CNCI)). **GUAM**: watermelon field, II-1989, pan trap, L. Yudin (3 females, UCRC ENT 196967-196969 (UCRC)). watermelon field, IX-1989, pan trap, L. Yudin (2 females, UCRC ENT 196970-196971 (UCRC)). **GUATEMALA**: Escuintla Dept., Escuintla, 20.VIII.1975, N. L. H. Krauss (1 male, USNM ENT 00653533 (USNM)). **MEXICO**: BC, 57km S Bahía de los Ángeles, 22.VII.1994, S. L. Heydon (1 male, USNM ENT 00655487 (UCDC)). BCS, 10km W San Ignacio, 24.III.1980, E. Fisher & J. Pinto (1 female, UCRC ENT 196944 (UCRC)). BCS, Barracas, 18.V.1985, pan trap, P. DeBach (1 female, UCRC ENT 196940 (UCRC)). BCS, Barracas, 20.V.1985, pan trap, P. DeBach (1 female, UCRC ENT 196939 (UCRC)). BCS, La Paz, 20.X.1983, J. D. Pinto (1 female, 1 male, UCRC ENT 196941-196942 (UCRC)). Chiapas, 14.VII.1983, A. Gonzalez (1 female, UCRC ENT 196951 (UCRC)). MEX, Naucalpan de Juárez, 18.V.1984, G. Gordh (1 female, UCRC ENT 196950 (UCRC)). MOR, Cuernavaca, III-1965 - V-1965, N. L. H. Krauss (1 female, 1 male, USNM ENT 00653515, 00653522 (USNM)). NL, Ciénega de Flores, 10.VII.1983, A. Gonzalez (1 female, 1 male, UCRC ENT 196952-196953 (UCRC)). OAX, Puerto Escondido, 29.V.1963, E. R. Oatman (1 female, UCRC ENT 196954 (UCRC)). OAX, Yagul, 13.VII.1984, G. Gordh (1 female, 1 male, UCRC ENT 196948-196949 (UCRC)). SON, 1.XI.1947 (1 unknown, USNM ENT 00653534 (USNM)). SON, San José de Guaymas, 4.X.1900, L. O. Howard (1 female, USNM ENT 00653535 (USNM)). ZAC, Monte Escobedo, 12.VII.1983, G. Gordh (3 females, UCRC ENT 196945-196947 (UCRC)). **NICARAGUA**: Rivas Dept., San Juan del Sur, 11°15'N 85°52'W, 15.IV.1998, L. J. Clark (1 female, USNM ENT 00655502 (UCDC)). Rivas Dept., San Juan del Sur, 11°15'N 85°52'W, 2.II.1998, Malaise trap, J. Clark (1 female, 1 male, USNM ENT 00655534, 00655537 (UCDC)). Rivas Dept., San Juan del Sur, 11°15'N 85°52'W, 25.VI.1998, L. J. Clark (1 female, USNM ENT 00655503 (UCDC)). **UNITED STATES**: *ARIZONA*. Cochise Co., Huachuca Mts., Ash Canyon Road, 15.III-30.IV.1994, Malaise trap, McFarland (1 female, USNM ENT 00655595 (CNCI)); Graham Co., desert, 2.4km W on hwy 366 from hwy 191 (666), 1160m, 27.VI-28.VI.1991, Malaise trap, J. E. O'Hara (1 female, USNM ENT 00655585 (CNCI)); Pima Co., Tucson, 11.IV.1896, Baker (2 females, USNM ENT 00653526, 00653539 (USNM)); Santa Cruz Co., Patagonia, 4.VI.1995, E. Wilk & B. Brown (1 female, USNM ENT 00655586 (CNCI)); Santa Cruz Co., juniper/oak/grassland, Sonoita, 29.IX-13.X.2006, Malaise trap, E. E. Grissell (1 female, USNM ENT 00655316 (USNM)). *CALIFORNIA*. Imperial Co., 14.4km WNW Glamis, 6.4km NW hwy 78, 2008AI126, Algodones Dunes, 22.IX-15.XI.2008, Malaise trap, E. Dreyfus (1 female, USNM ENT 00655519 (UCDC)); Los Angeles Co., Eaton Canyon, oak/scrub, Pasadena, 1000ft, 26.VI. 2002, A. Owens & J. George (1 female, UCRC ENT 56868 (UCRC)); Los Angeles Co., Forrestal Nature Preserve, coastal sage scrub, Rancho Palos Verdes, 20.IV-24.V.2003, Malaise trap, J. George (6 females, 4 males, USNM ENT 00655318, 00655319, 00655320-00655325, 00655329, 00655330 (USNM)); Los Angeles Co., Forrestal Nature Preserve, coastal sage scrub, Rancho Palos Verdes, 5.IV-20.IV.2003, Malaise trap, J. George (1 female, USNM ENT 00655339 (USNM)); Orange Co., T6S R10W S17, Huntington Beach, 3.IV.1969, lab reared, R. D. Gbeden &

D. W. Ricker (1 female, 1 male, UCRC ENT 196959-196960 (UCRC)); Riverside Co., Moreno Valley, University of California Experiment Station, 5.IX.1978, J. LaSalle (1 female, UCRC ENT 196963 (UCRC)); Riverside Co., N of Oasis, G95/155, Thousand Palms Canyon, 17.IX.1995, M. Gates (1 male, UCRC ENT 196962 (UCRC)); Riverside Co., PEET 001-08-14-01/MT3, Santa Rosa Plateau Ecological Reserve, 500m, 30.VII-14.VIII.2001, Malaise trap (4 females, USNM ENT 00655335-00655336, 00655338, 00655342 (USNM)); Riverside Co., Santa Rosa Mts., Santa Rosa Spring Campground, 6400ft, 10.IX.1964, E. I. Schlinger (1 female, UCRC ENT 196958 (UCRC)); San Bernardino Co., N of Silverwood Lake, Summit Valley, 27.VII.1996, M. Gates (1 female, UCRC ENT 196961 (UCRC)); San Diego Co., Rancho Santa Fe, 8.VIII.1979, C. Melton (2 females, UCRC ENT 196965-196966 (UCRC)); San Diego Co., Torrey Pines Park, 60m, 19.VI.1996, D. C. Hawks (1 female, UCRC ENT 196999 (UCRC)); San Diego Co., melon, Escondido, 4.VI.1964, E. R. Oatman (1 female, UCRC ENT 196957 (UCRC)); San Diego Co., pole beans, Escondido, 5.IX.1963, E. R. Oatman (1 female, UCRC ENT 196955 (UCRC)); San Diego Co., pole beans, Escondido, 9.VII.1964, E. R. Oatman (1 female, UCRC ENT 196956 (UCRC)); Santa Barbara Co., 45km NW Santa Barbara, Sedgwick Reserve, 308m, 24.VI-8.VII.1997, Malaise trap, E. S. Schlinger (2 females, USNM ENT 00655541, 00655549 (UCDC)); Santa Barbara Co., Santa Barbara, 11.VI.1997, E. Schlinger (1 female, USNM ENT 00655538 (UCDC)). *HAWAII*. Honolulu Co., tomato field, O'ahu (Oahu) Isl., 28.X.1976, R. Buckhart (8 females, 3 males, USNM ENT 00655601-00655607, 00655608, 00655609, 00655610-00655611 (USNM)). *KANSAS*. Geary Co., watershed 20B, Konza Prairie Biological Station, 12.IX-21.IX.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655701 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 16.VIII-26.VIII.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655702 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 2.IX-12.IX.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655703 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 20.VII-30.VII.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655705 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 27.V-6.VI.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655706 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 30.IX-11.X.2005, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655700 (USNM)); Geary Co., watershed 20B, Konza Prairie Biological Station, 30.VII-9.VIII.2005, Malaise trap, Zolnerowich & Metlevski (2 females, USNM ENT 00655707, 00655708 (USNM)); Geary Co., watershed 20C, Konza Prairie Biological Station, 18.V-22.V.2006, Malaise trap, Zolnerowich & Metlevski (1 female, USNM ENT 00655704 (USNM)). *NEW MEXICO*. Valencia Co., 20mi W Los Lunas, along streambed, Carrizo Creek, 23.VIII.1977, Malaise trap, S. Peck & J. Peck (6 females, 2 males, USNM ENT 00655582, 00655584, 00655587, 00655588, 00655589, 00655590, 00655593, 00655598 (CNCI)). *OREGON*. Lake Co., nr. pond, 22km N Lakeview, 20.VII.1994, S. L. Heydon (1 female, USNM ENT 00655433 (UCDC)). *TEXAS*. no date, Hernandez (8 females, 2 males, USNM ENT 00655227, 00655228, 00655229, 00655230-00655236 (USNM)); Cameron Co., Brownsville, no date, R. A. Vickery (1 female, USNM ENT 00653521 (USNM)); Cameron Co., TAM Veracruz hot pepper, Brownsville, 17.X.2007, Hernandez (1 female, USNM ENT 00655184 (USNM)); Hidalgo Co., Cuban Hots hot pepper, Edinburg, 12.XI.2007, Hernandez (1 female, USNM ENT 00655281 (USNM)); Hidalgo Co., Cuban Hots hot pepper, Edinburg, 27.XI.2007, Hernandez (1 female, USNM ENT 00655271 (USNM)); Hidalgo Co., Cuban Hots hot pepper, Edinburg, 30.X.2007, Hernandez (1 male, USNM ENT 00655262 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 1.IV.2008, Hernandez (1female, USNM ENT 00655116 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 10.I.2008, Hernandez (3 females, USNM ENT 00655259, 00655265, 00655268 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 12.XI.2007, Hernandez (9 females, 2 males, USNM ENT 00655243-00655247, 00655276, 00655280, 00655282, 00655283, 00655284, 00655287 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 13.XII.2007, Hernandez (3 females, 1 male, USNM ENT 00655239, 00655266, 00655270, 00655272 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 14.V.2008, Hernandez (2 females, USNM ENT 00655043, 00655057

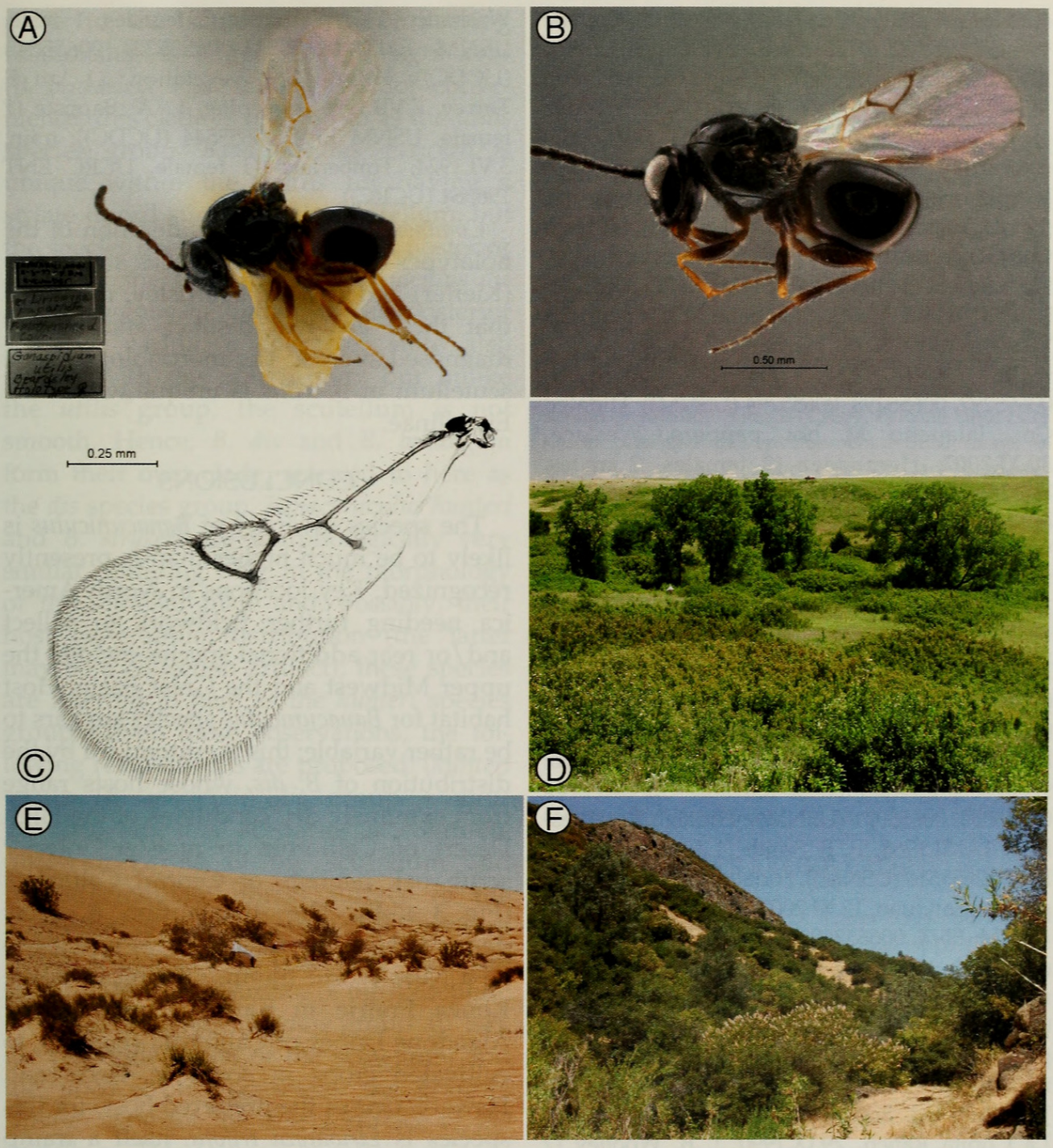

Fig. 3. A. *Banacuniculus utilis* (Beardsley), lateral habitus of holotype with inset of specimen labels; B, *B. utilis*, lateral habitus of non-type specimen; C, *B. utilis* forewing, non-type specimen; D, habitat photo of the Konza Prairie Preserve, Kansas; E, habitat photo of Algodone Dunes, California; F, habitat photo of Cold Canyon Preserve, California.

(USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 16.X.2007, Hernandez (2 females, 1 male, USNM ENT 00655251, 00655286, 00655296 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 19.IX.2007, Hernandez (14 females, 4 males, USNM ENT 00655196, 00655197, 00655198, 00655199, 00655202-00655207, 00655208, 00655209, 00655215, 00655255-00655257, 00655258, 00655263 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 19.X.2007, Hernandez (3 females, 1 male, USNM ENT 00655185, 00655186, 00655250, 00655285 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 2.XI.2007, Hernandez (3 females, USNM ENT 00655248, 00655290, 00655291 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 20.XII.2007, Hernandez (5 females, USNM ENT 00655238, 00655264, 00655267, 00655269, 00655273

(USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 25.X.2007, Hernandez (1 female, USNM ENT 00655249 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 26.VI.2008, Hernandez (1 female, 1 male, USNM ENT 00655058, 00655072 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 28.XI.2007, Hernandez (1 female, USNM ENT 00655279 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 29.V.2008, Hernandez (1 female, USNM ENT 00655070 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 30.X.2007, Hernandez (4 females, 1 male, USNM ENT 00655288, 00655289, 00655292, 00655293, 00655294 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 30.XI.2007, Hernandez (2 females, 2 males, USNM ENT 00655240-00655242, 00655275 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 6.IX.2007, Hernandez (4 females, USNM ENT 00655210-00655212, 00655254 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 8.X.2007, Hernandez (9 females, 2 males, USNM ENT 00655187, 00655188, 00655189, 00655190, 00655191, 00655192, 00655194, 00655195, 00655252-00655253, 00655295 (USNM)); Hidalgo Co., Jalapeño M hot peppers, Weslaco, 9.VI.2008, Hernandez (2 females, USNM ENT 00655059, 00655071 (USNM)); Hidalgo Co., Weslaco, 17.XII.1968, F. F. Smith (1 female, USNM ENT 00653518 (USNM)); Hidalgo Co., serrano hot pepper, San Juan, 12.XI.2007, Hernandez (1 male, USNM ENT 00655260 (USNM)); Hidalgo Co., serrano hot pepper, San Juan, 18.X.2007, Hernandez (1 female, 1 male, USNM ENT 00655140-00655141 (USNM)); Hidalgo Co., serrano hot pepper, San Juan, 3.X.2007, Hernandez (2 females, USNM ENT 00655200-00655201 (USNM)); Jim Wells Co., 8mi W Ben Bolt, area 4, N end of La Copita Ranch, 29.IX.1990, J. B. Woolley (2 females, USNM ENT 00655340, 00665341 (USNM)); Jim Wells Co., Ben Bolt, La Copita Ranch, 26.IX-30.IX.1990, Malaise trap, Wharton & Woolley (1 female, USNM ENT 00655591 (CNCI)). *UTAH*. Emery Co., nr. Goblin Valley State Park, Wild Horse Creek, 2.VIII-7.VIII.1997, Malaise trap, M. Wasbauer & J. Wasbauer (4 females, USNM ENT 00655533, 00655536, 00655540, 00655542 (UCDC)); Emery Co., nr. Goblin Valley State Park, Wild Horse Creek, 4.VII-7.VII.1997, Malaise trap, M. Wasbauer & J. Wasbauer (1 male, USNM ENT 00655535 (UCDC)); Emery Co., nr. Goblin Valley State Park, Wild Horse Creek, 4.VII-7.VII.1997, M. Wasbauer & J. Wasbauer (2 females, 1 male, USNM ENT 00655531-00655532, 00655543 (UCDC)); Wayne Co., vegetation, 11 km E Torrey, 7.VII.1996, sweeping, L. A. Baptiste (1 female, USNM ENT 00655544 (UCDC)); train, 3.VI.1924, Timberlake (1 female, UCRC ENT 196964 (UCRC)).

Comments.—After reconsideration of the holotypes of both *Banacuniculus nigrimanus* (Kieffer) and *B. utilis* Beardsley, it is clear that these are two distinct and readily diagnosed species. The morphology of the scutellum in *B. utilis* is unique within the Eucoilinae.

CONCLUSIONS

The species diversity of *Banacuniculus* is likely to be much higher than is presently recognized. Key locations in North America needing further fieldwork to collect and/or rear additional species include the upper Midwest and the Great Basin. Host habitat for *Banacuniculus* species appears to be rather variable; this is epitomized by the distribution of *B. dis*, whose hosts range from extremely dry conditions of the High Desert of California to moister, interior scrub oak habitats of Central California (Fig. 3 E–F). The distribution *B. utilis* demonstrates the ability of this species to be a New World tramp, ranging from the Konza Prairie in Kansas (Fig. 3D) and Algodone Dunes of California (Fig. 3E), to cultivated crops in southern Texas and Hawai'i. One of the preferred hosts for this species is *Liriomyza trifolii*, itself a tramp species of considerable agricultural importance in commodities such as tomato, cucumber and melon (Johnson 1987).

The phylogenetics of *Banacuniculus* species are not quantitatively analyzed here, but there are some morphological features that allow for a cautious suggestion of relatedness among species. The entirely smooth dorsal and lateral surface of the scutellum (Fig. 2F) in *B. beardsleyi*, *B. nigrimanus*, and *B. utilis* is not only rare within Eucoilinae, but unites these species. Based on the relative size of the scutellar

plate to the scutellum, the following relationship is suggested: (*B. nigrimanus* (*B. beardsleyi* + *B. utilis*)), and for convenience, this clade is referred to as the *utilis* species group. *Banacuniculus merickeli* is unique within the genus for having a striate dorsal surface of the scutellum, but the species does possess a distinct posterior carina of the scutellum. *Banacuniculus dis* and *B. brautigani* both lack the posterior scutellar carina, a character state also shared with the *utilis* group; but unlike the *utilis* group, the scutellum is not smooth. Hence, *B. dis* and *B. brautigani* form their own clade, referred to here as the *dis* species group. *Banacuniculus hunteri* and *B. strykeri* are morphologically very similar, differing only in the morphology of the scutellar plate and, possibly, their host geographic distribution (the latter may be a collection artifact); these species are referred to here as the *hunteri* species group. Given these observations, the following relationships are proposed: (*hunteri* group (*B. merickeli* (*dis* group + *utilis* group))). In this scenario, a complete posterior carina of the scutellum and rugose/crenulate dorsal surface of the scutellum is pleisiomorphic; *B. merickeli* retains the carina, but possesses the striate state for the dorsal surface of the scutellum; the clade *dis* group + *utilis* group all lack the posterior carina of the scutellum, and the *utilis* group possesses the entirely smooth state for the dorsal surface of the scutellum. This scenario of relationships is merely meant to summarize what appears to be a parsimonious summary of character evolution within *Banacuniculus*; a more thorough survey and analysis of characters is required to corroborate and confirm these relationships.

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