

The description of *Preseucoela* Buffington, new genus, with notes on the status of Nearctic species of *Agrostocynips* Diaz (Hymenoptera: Figitidae: Eucoilinae)

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Abstract

The eucoiline genus *Preseucoela* Buffington is described. Also provided is a redescription of *Preseucoela pallidipes* (Ashmead), **new combination**, and the descriptions of *Preseucoela heraty* Buffington, **new species**, and *Preseucoela imallshookupis* Buffington **new species**. One definitive rearing record was found, and indicates hosts for species of *Preseucoela* are agromyzid flies. *Agrostocynips* Diaz, another eucoiline genus parasitic on agromyzids, is discussed. *Agrostocynips robusta* (Ashmead), **new combination**, and *Agrostocynips diastrophii* (Ashmead), **new combination**, are proposed, raising the number of recognized species of *Agrostocynips* to four, and expanding the range of *Agrostocynips* into central North America.

Key words: *Preseucoela*, *Agrostocynips*, Eucoilinae, Figitidae, Cynipoidea, Agromyzidae, new species, new genus, new combination

Introduction

Species of Eucoilinae (Hymenoptera: Figitidae) are parasitoids of Cyclorrhapha (Diptera). Two lineages, the *Gronotoma* group of genera and *Zaeucoila* group of genera (*sensu* Fontal-Cazalla *et al.* 2002) specialize on the leaf-miner family Agromyzidae. Members of these groups have a peculiar habitus, including a compact meso- and metasoma and often possessing distinctive sculptural elements on the mesoscutum and scutellum. Due to these features, most genera in these groups are readily identifiable.

Examination of eucoiline specimens housed in several different museums uncovered three series of specimens representing a new genus and three species (2 new to science) in the *Zaeucoila* group, which are described here. Further examination of type material from the USNM and CASC revealed previously unknown synonymies and new combinations

relevant to the description of this new genus as well as for a related group of agromyzid parasitoids in the genus *Agrostocynips* Diaz.

Materials and methods

All specimens were examined using a Leica MZ8 stereomicroscope; specimens were illuminated with fluorescent desk lamps. Scanning electron micrographs were created on a Phillips XL30 housed in the Central Facility for Advanced Microscopy and Microanalysis, UC Riverside. All SEM images of the newly described genus are stored on Morphbank (www.morphbank.com) and are available to the public. Light microscope images were taken using a JVC KY-70 digital camera mounted on a Zeiss Axioscop 2. Images were subsequently optimized using AutoMontage V.4 (distributed by Syncrosopy). Terminology follows that of Buffington (2002).

List of depositories

- AEI American Entomological Institute, Gainesville, FL. D. Wahl, curator.
CASC California Academy of Arts and Sciences, San Francisco, CA. B. Zuparko, curator.
CSCA California Arthropod Collection, California Department of Food and Agriculture Systematic Laboratory, Sacramento, CA. C. Bellamy, curator.
TAMU Texas A&M Insect Museum, College Station, TX. E. Riley, curator.
UCRC University of California, Riverside, Insect Research Collection, Riverside, CA. D. Yanega, curator.
USNM United States National Museum, Washington DC. D. Smith, curator.

Preseucoela Buffington, new genus

Chrestosema Förster, in part.

Type species: *Chrestosema pallidipes* Ashmead 1894: 68–69, by present designation.

Diagnosis. Orbital furrows meeting malar sulcus with smooth curve. Genal carina absent. Conical projections present on malar space. Pronotal struts present between posterior margin of pronotal plate and anterior margin of mesoscutum. Mesoscutal keel present or absent. Scutellar plate with two distinct tubercles. Scutellar disk lacking projections. R1 of forewing always tubular and pigmented; radial cell always closed.

Differs from *Moneucoela* Kieffer by lacking lateral and posterior projections of the scutellum. Differs from *Zaeucoila* Ashmead and *Agrostocynips* Diaz by lacking genal carinae (reduced but distinct in *Agrostocynips*), and presence of paired tubercles on dorsal surface of scutellar plate (*Zaeucoila* and *Agrostocynips* have multiple tubercles). Differs from *Ganaspidium* Weld by presence of orbital furrows, presence of pronotal struts and possession of a large pronotal plate (pronotal plate in *Ganaspidium* 1/3 to 1/4 as wide as head).

Description. *Head.* Glabrous except for sparse setae along orbital furrows and malar space. Ocellar hair patches lacking. Orbital furrows (Fig. 2, OF) originating above mid-line of toruli; furrow runs along medial margin of compound eye, then parallel to malar sulcus after gently curving medially, resulting in what appears to be two malar sulci (the true malar sulcus being more ventral). Malar sulcus simple. Malar space smooth with a single prominent to reduced conical protuberance. Genal carina absent.

Antenna. Female: 13 segments, moniliform, semi-clavate; segment 3 slightly longer than remaining flagellomeres; rhinaria present on segments 3–13. Male: 15 segments, filiform; rhinaria present on segments 3–15. Segments 4–15 subequal in length. Segment 3 excavated laterally, curved outwardly; segment 3 slightly longer than 4.

Pronotum. Pronotal plate large, half as wide as head, with sparse setae along dorsal margin; pronotal fovea open laterally. Pronotal struts present (Fig. 3, PST); no well defined pronotal triangle. Pronotal impression absent. Lateral aspect of pronotum smooth and sparsely setose. Lateral pronotal carina absent.

Mesoscutum. Smooth with a few sparse setae along anterior margin. Mesoscutal keel present (Fig. 3, MSK) or absent; keel reaching posterior 1/3 of mesoscutum when present, occasionally meeting posterior margin of mesoscutum; keel tapering soon after point of origin at anterior margin of mesoscutum, then maintaining constant width posteriorly. No other sculpture present.

Mesopectus. Upper part and lower part of mesopleuron smooth and glabrous. Dorsal margin of mesopleural triangle distinct, lower margin indistinct. Mesopleural carina simple, well defined. Lower portion of mesopleuron bordered by a ventral carina with a distinct anterior surcoxal depression.

Scutellum. Scutellar plate small, revealing dorsal sculpted surface of scutellar disk (Fig. 3); mid-pit of scutellar plate situated centrally to posteriorly; two distinct tubercles (Figs. 3 and 4, SCT) present anterior of mid-pit, sometimes accompanied by setae. Dorsal surface of scutellum coarsely alveolate with setiferous pits; lateral and posterior margins rounded. Scutellar plate ranging from close to well elevated above surface of scutellar disk (Figs. 5 and 6, arrow). Lateral and posterior projections absent.

Metapectal-propodeal complex. Metapectus glabrous to variably setose (long, thin setae); dense setal patch present, ventrally located near antero-ventral cavity; scattered setae along posterior margin. Spiracular groove with distinct dorsal margin; ventral margin distinct to absent. Posterior margin of metapectus ridged. Metapleural ridge present,

well defined to reduced; submetapleural ridge reduced. Anteroventral cavity present, densely setose. Propodeum covered in longer, moderately dense setae. Propodeal carinae subparallel, merging towards midline halfway between posterior margin of scutellum and dorsal margin of nucha; auxiliary propodeal carinae indistinct. Nucha glabrous.

Wings. Hyaline, densely covered with setae. R1 of forewing always tubular and pigmented; radial cell always closed; radial cell as deep as long. Apical fringe present, short.

Legs. Procoxae slightly smaller than either meso- or metacoxae; all coxae sparsely setose with no apparent banding or patches of setae. Femora sparsely setose, with increased density of appressed setae on tibiae and tarsomeres.

Metasoma. Female: subequal in size to mesosoma. Hairy ring present at base of syntergum; hairy ring broken at extreme dorsal margin and incomplete ventrally; hairy ring comprised of smaller, dense setae anteriorly and longer, singly spaced setae posteriorly; remainder of metasoma glabrous. Micropores present on terga 5–8 (terga posterior to syntergum). Terga posterior to syntergum directed ventrally at 70 degree angle relative to syntergum. Male: as in female but terga posterior to syntergum directed ventrally at 90 degree angle.

Biology. Circumstantial evidence and phylogenetic evidence suggests members of *Preseucoela* are parasitoids of Agromyzidae (see biology section of *P. imallshookupis* and *P. pallidipes* below).

Distribution. Neotropical Region: Argentina, The Bahamas, Bolivia, Colombia, Costa Rica, Dominica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Venezuela, West Indies. Nearctic Region USA: Arizona, New Mexico.

Etymology. *Pres-* named for Elvis Aaron Presley; *-eucoela*, a suffix frequently used by J.J. Kieffer in describing Neotropical eucoiline genera.

Discussion. Phylogenetic evidence (molecular: 28S rDNA, COI mtDNA; external morphology) suggests this genus is a member of the *Zaeucoila* group of genera (Buffington, unpublished). Synapomorphies include: orbital furrows present (somewhat reduced in *Agrostocynips*; presence of struts/braces connecting pronotal plate with anterior margin of mesoscutum; presence of conical protuberances on malar space (also present in *Ganaspidium*); presence of mesoscutal keel (reduced/absent in *P. pallidipes* and *P. heraty*); compact, stout habitus (also present in some, but not all, members of the *Gronotoma* group). The most common host for members of this clade are leaf-mining Agromyzidae (the apomorphic genera *Dettmeria*, *Dicerataspis* and *Lopheucoila* are parasitic on fruit infesting Diptera); ergo, the likely host for species of *Preseucoela* are Agromyzidae (discussed further below). Because species of *Preseucoela* possess a scutellar plate similar to that of *Ganaspidium* (both have narrow glandular release pits; both possess paired tubercles anteriorly), there are often specimens of *Preseucoela* in collections misidentified as *Ganaspidium*. Further, since *P. imallshookupis* possesses a mesoscutal keel (see description below), specimens of this taxon are often found in collections misidentified as *Zaeucoila*.

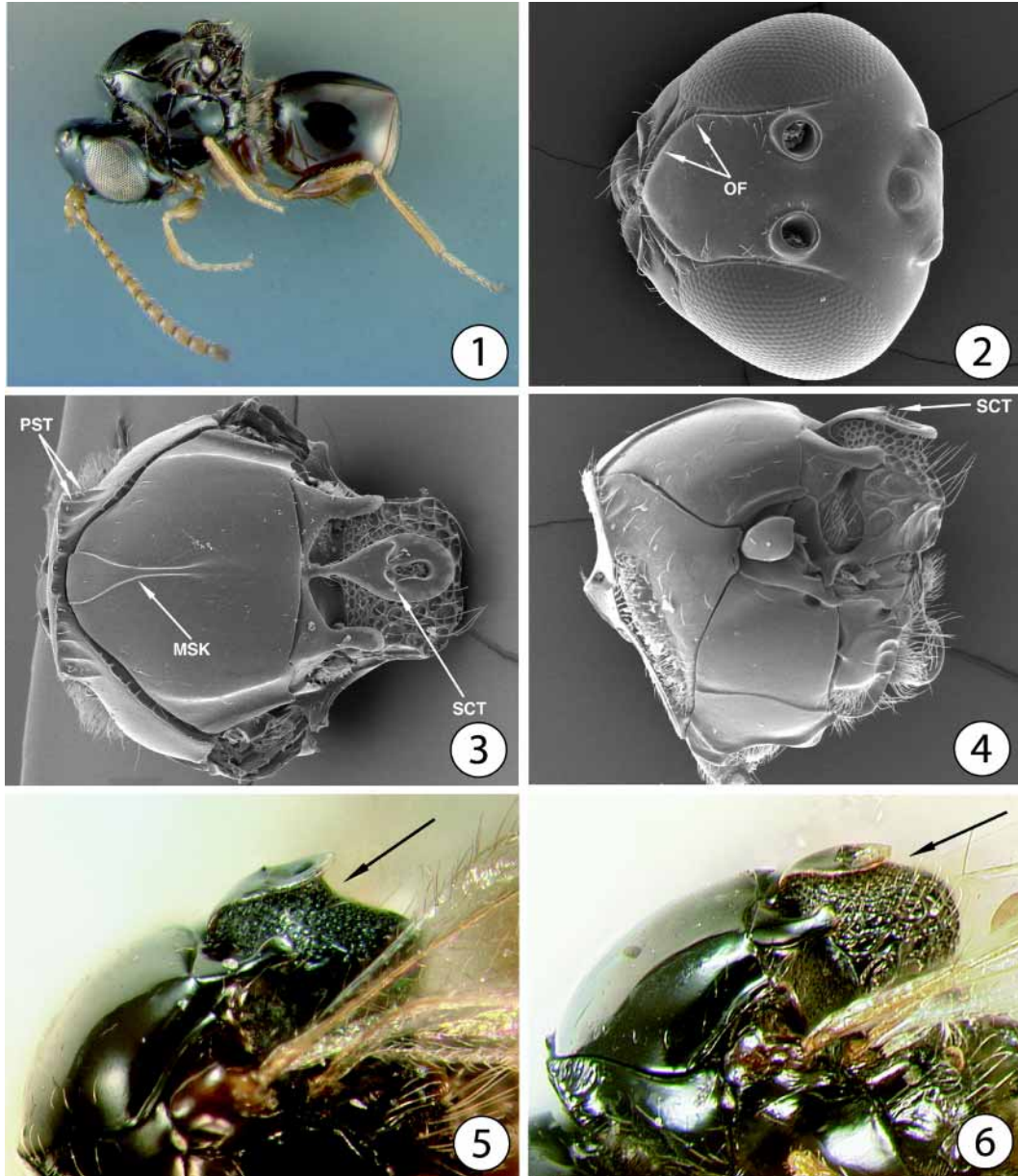


FIGURE 1. Habitus of *Preseucoela imallshookupis* Buffington, n. sp. Figure 2. *P. imallshookupis*; head, anterior view. OF, orbital furrows. Figure 3. *P. imallshookupis*; mesosoma, dorsal view. MSK, mesocutal keel; PST, pronotal struts; SCT, scutellar tubercles. Figure 4. *P. imallshookupis*; mesosoma, lateral view. SCT, scutellar tubercle. Figure 5. *Preseucoela heratyi* Buffington, n. sp.; scutellum, lateral view. Arrow indicates elevated scutellar plate. Figure 6. *P. pallidipes* (Ashmead), n. comb.; scutellum, lateral view. Arrow indicates scutellar plate nearly flush with scutellar disk.

***Preseucoela imallshookupis* Buffington, n. sp.**

(Figs. 1–4)

Description. As in description of genus except as follows: *Pronotum*: Pronotal struts complete, usually 2–3 per side (PST, Fig. 3). *Mesoscutum*: Mesoscutal keel present, issuing from anterior margin of mesoscutum, terminating from middle to posterior margin of mesoscutum (MSK, Fig. 3). *Scutellum*: Scutellar plate only slightly elevated above scutellar disk. Differs from *P. pallidipes* and *P. heratyi* in the possession of a mesoscutal keel.

Etymology. Named for Elvis Presley's 1957 RCA recording *I'm All Shook Up*.

Distribution. Central and South America; the Caribbean.

Material Examined. Holotype female: **COSTA RICA**, Guanacaste. Santa Rosa Park, 8 Dec. 1977. D.H. Janzen, Dry Hill; deposited in the AEI. Paratypes: 4 females, 13 males: **COSTA RICA**, Guanacaste. Santa Rosa Park, various dates between 27 May, 1976 and 13 May 1978. D.H. Janzen, Dry Hill.

Additional Material: **ARGENTINA**: La Puerta, North of Córdoba, 8.XII.1998, ex *Japanagromyza* on Fabaceae (1 female). **BAHAMAS**. Grand Bahama Island, West End, 12 May 1953, Van Voast, A.M.N.H. Bahama Island Expedition, coll. E.B. Hayden & G.B. Rabb (1 female). **BRAZIL**: Chapadados Guimarães, Mato Grosso, 800m, July 1983, M. Alvarenga (1 male). **COLOMBIA**: Magdalena, PNN Tayrona Zaino, 11°20'N 74°02'W, 50m, 3–30.V.2000 M.136, R. Henriquez, Leg. (1 male, 1 female). **COSTA RICA**. Guanacaste. Santa Rosa Park, various dates between 1 Dec, 1976 and 21 May 1977, D.H. Janzen, riparian (5 females, 8 males); Escazú, 22 May 1987, H. & M. Townes (1 female, 1 male). **GUATEMALA**: Yepocapa, Oct. 1948, H.T. Dalmat, collector (1 male); Antigua, 1500–1600m, July 1980, N.L.H. Krauss (2 females). **MEXICO**. Tamaulipas, Gomez Farias, Estacion Los Cedros, 23°03'00''N 99°09'03''W 340m, III.2002, MT, A. Cordoba-Torres; Tamaulipas, Gomez Farias, mountain top, 20.II.1986, R. Wharton (1 female).

Biology. I have examined a single female specimen from La Puerta, near Cordoba, Argentina, whose data label indicates the specimen was reared from *Japanagromyza* sp. (Agromyzidae) (determination by G. Valladares; no host remains with specimen).

***Preseucoela heratyi* Buffington, n. sp.**

(Fig. 5)

Description. As in description of genus except as follows: *Pronotum*: Pronotal struts with no more than one strut per side. *Mesoscutum*: Mesoscutal keel absent. *Scutellum*: Scutellar plate raised high above scutellar disk (Fig. 5, arrow); posterior margin of scutellar disk broadly rounded (Fig. 5). Differs from *P. imallshookupis* by lacking a mesoscutal keel; differs from *P. pallidipes* by having fewer (occasionally absent) pronotal struts on each side and possessing a scutellar plate raised high above the scutellar disk.

Etymology. Named in honor of J.M. Heraty.

Distribution. Central and South America; the Caribbean.

Material Examined. Holotype female: **VENEZUELA**. Tabay, 2,200m 30.IV.1981, H.K. Townes; deposited in the AEI. Paratypes, 1 female: **VENEZUELA**. Tabay, 2,200m 30.IV.1981, H.K. Townes; 1 female: **BOLIVIA**. Yungas, 5km N LaPaz 16°30'S 68°09'W, 2200m, 27.I.1973, Helava.

Additional Material: **BOLIVIA**. Comarapa, 1800m, 14.XII.1984, L. Peña; Unduavi-Corioco, 1800–2200m, 24.XI.1984, L. Peña; Padcaya-Camargo, 3200m, 27.XII.1984, L. Peña. **ECUADOR**. Pich., Tandapi, 1500m, 8.II.1983, L. Huggert (1 female); **UNITED STATES**. New Mexico, Hildago Co. Gray Ranch, 0.5mi S of Culberson Camp, Indian Creek, riparian, N 31°22.48' W 108°36.43' 5–6.VIII.2002, YPT, J. George (1 male). **VENEZUELA**. Yacambú, 1200m, 7.V.1981, H.K. Townes (1 female). **WEST INDIES**. Grenada, St. Georges, 0–200m, August 1976, N.L.H. Krauss. (1 female).

Biology. Unknown.

***Preseucoela pallidipes* (Ashmead), n. comb.**

(Fig. 6)

Chrestosema pallidipes Ashmead 1894: 68–69. **n. comb.**

Eucoila sancti-marci Kieffer 1908: 59. **syn. nov.**

Eucoila transversa Kieffer 1908: 59. **syn. nov.**

Pseudeucoila (*Heptamerocera*) *transversa* (Kieffer) Weld 1952: 239.

Description. As in description of genus except as follows: *Pronotum*: Pronotal struts present, well developed, 2–3 per side. *Mesoscutum*: Mesoscutal keel absent. *Scutellum*: Scutellar plate hardly raised above scutellar disk (Fig 6, arrow); often, the plate is nearly flush with the scutellar disk. Differs from *P. imallshookupis* by lacking a mesoscutal keel; differs from *P. heraty* by possessing a scutellar plate not well elevated above the scutellar disk (*cf.* Figs. 5 and 6).

Distribution. Central and South America; the Caribbean; Southern North America.

Material examined. Holotype female: **WEST INDIES**. St. Vincent, H.H. Smith, 210. USNM holotype #2337. The holotype is in good condition; the locality data label is followed by the USNM holotype label (red paper), followed by the original determination label in Ashmead's hand (white paper), followed by my determination label (white paper).

Additional material: **BOLIVIA**. Chuquisaca, 24.XII.1984, Peña (1 female). **COSTA RICA**. Cartago, Turrialba, Grounds of IICA, 30.V.1976, M. Wasbauer, MT, 5P-8A (1 female); Guanacaste, Santa Rosa Park, dry hill, 23 May 1977 (1 female); Guanacaste, Santa Rosa Park, riparian, 26 Aug 1977 (1 female); Guanacaste, Santa Rosa Park, riparian, 29 Oct 1977 (1 female); Puntarenas Prov., Golfito, Jiménez Estacion El Tigre, Area Administrative, 34 m, 10 Sep–12 Oct 2001, J. Azofeifa, MT, L_S_277800_529600 #65133 (1 female); Puntarenas Prov., Los Alturas, 1600m, 8°57'N 82°49'W, 13.VI.1998,

B. Brown, MT (1 female). **ECUADOR.** Napo Province, Huahua Sumaco, km 44 on Hollin-Loreto Rd, various dates between 15.XII.1989 and 23.XII.1989, MT, M. & J. Wasbauer coll. (with some collections also made with H. Real) (25 females); Napo Province, Huahua Sumaco, km 45 on Hollin-Loreto Rd, various dates between 14.XII.1989 and 18.XII.1989, MT, M. & J. Wasbauer coll. (with some collections also made with H. Real) (12 females); Mitad del Mundo (San Antonio), 10km N of Quito, 14.III.1973, M. Deyrup (1 female). **EL SALVADOR.** Santa Tecla, 900–950m, August 1975, N.L.H. Krauss (1 female). **GUATEMALA.** Antigua, 1500–1600 m, July 1980, N.H.L. Krauss (1 female). **HONDURAS.** Belmopen, July 1975. N.L.H. Kraus (1 female); Fco. Marazan, San Antonio de Oriente Uyuka, 4 Jun 1990 rcol. R. Cave (1 female); Fco. Marazan, San Antonio de Oriente Playa, 21 Nov. 1992.02, rcol. Cordero, second label: *Phaseolus vulgaris* cosecha, third label: ex: larva de *Asphondylia websteri* (1 female); Fco. Marazan, San Juan de Flores, Cantarranas, 24.I.1992.10, rcol. W. Melara, second label: *Phaseolus vulgaris*, third label: Ex: larva de: *Melanagromyza* o *Asphondylia* (1 female); Olancho, Juticalpa, Km NE Teg., El Rincon, 14.I.1986.3, Recl R. Fisher (1 female with unidentified host remains); Olancho, Juticalpa, Candeleros, 14.I.1986.3, rcol. R. Fisher, second label: *Phaseolus vulgaris* R9 (1 female with unidentified host remains). **MEXICO.** Tamaulipas, Gomez Farias, Estacion Los Cedros, 23°03'00''N 99°09'03''W, 540m, III.2002, MT, A. Cordoba-Torres (1 female). **NICARAGUA.** San Marcos, Coll. Baker (2 females); Chinandega, Coll. Baker (1 female). Note: no holotype or lectotype has been designated for *Eucoila transversa* Kieffer; these three specimens were included in Kieffer's original description. After examining all three specimens, I consider these specimens to represent the syntypic series of *Eucoila transversa* Kieffer; all syntypes are at the CAS (#10614). San Marcos, Coll. Baker (1 female); this is the holotype (by monotypy) for *Eucoila sancti-marci* Kieffer; holotype at the CAS (#10602). **PANAMA.** Chiriqui, 2km W Cerro Punta, 1700m, 19.V–8.VI.1977, Peck & Howden (1 female); Chiriqui, Volcan, July 1981, N.L.H. Krauss (2 females). **UNITED STATES.** Arizona, Cochise Co., Chiricahua Mts., 5400ft, Hidden Terrace, 4.5km SW Portal, 16–20.IX.1982, M.A. Crazier (1 female). **WEST INDIES.** Dominica, St. Paul Parish, Springfield, ATRC, 11.VI. 1994, JB Woolley 94/032 (1 female); Dominica, St. Paul Parish, Springfield, ATRC, MT 27.V–12.VI.1994, JB Woolley, 94/017 (1 female); Dominica, Roseau, 0–100m, August 1979, N.L.H. Krauss (1 female); St. Kitts, Basseterre, 0–200m, July 1979, N.L.H. Krauss (1 female); St. Kitts, Basseterre, 0–50m, July 1979, N.L.H. Krauss (1 female). **VENEZUELA.** Quibor Jimenez, Lara, 8.VII.1979, R.W. Brooks, A.A. Grigarick, J. McLaughlin & R. O. Schuster, coll. (1 female).

Biology: I have examined 2 female specimens of *P. pallidipes* reared from unidentified dipterous puparia collected from *Phaseolus vulgaris* L. (specimens provided by R. Cave). I have examined an additional specimen (1 female) with a data label recording the host as *Asphondylia websteri* Felt (Cecidomyiidae) on *Phaseolus vulgaris* L. (specimens provided by R. Cave; host determination unknown; host remains lacking). Eucoilinae

have only been recorded from species of cyclorrhaphous Diptera (Ronquist 1999; Buffington 2002), so it is likely the reference to this specimen having been reared from *Asphondylia websteri* is erroneous. Lastly I have examined a single specimen (1 female) of *P. pallidipes* with a rearing record label indicating the host was '*Melanagromyza* or *Asphondylia*' (label written in Spanish; host remains lacking). Though the accuracy of host identification is unknown, the phylogenetic position of *Preseucoela* within the agromyzid parasitic *Zaeucoila* Group (sensu Fontal-Cazalla et al. 2002) lineage (Buffington, unpublished data), suggests the more likely host would be *Melanagromyza* Hendel.

Key to species of *Preseucoela*

- 1 Mesoscutal keel present and extending past the midline of mesoscutum (Figs. 3 and 4) *P. imallshookupis*
- Mesoscutal keel absent 2
- 2 Pronotal struts reduced to absent; scutellar plate elevated well above scutellar disk (arrow, Fig 5) *P. heratyi*
- Pronotal struts present, well developed; scutellar plate hardly raised above scutellar disk (nearly flush in some specimens) (arrow, Fig. 6) *P. pallidipes*

Notes on Nearctic species of *Agrostocynips* Diaz

To this point, two species have been recognized as belonging to *Agrostocynips*, *A. clavatus* Diaz and *A. enneatoma* (Diaz); *A. clavatus* is the type species, by original designation (Diaz, 1976.)

Upon examination of the types of *Chrestosema robusta* Ashmead and *Ganaspis diastrophii* Ashmead (housed in the USNM), it was clear that these species possessed the diagnostic features of *Agrostocynips*, such as: wide pronotal plate; lack of mesoscutal keel; broad scutellar plate with several dorsal tubercles; lack of orbital furrows; incomplete genal carina (only present ventrally). Hence, these two species are moved into *Agrostocynips*. The importance of this is underscored by the fact that the holotype and paratype of *Ganaspis diastrophii* were collected in West Point, Nebraska, extending the range of *Agrostocynips* well into the Nearctic Region. This range is remarkable considering how few members of the *Zaeucoila* group of genera (of which *Agrostocynips* is a member) can be found north of Mexico (Buffington, pers. obsv.). The holotypes of *A. clavatus* and *A. enneatoma* have not been made available for my examination; the characterization of *Agrostocynips* used here is based on 38 specimens (female and male) collected in Argentina and determined by N. Diaz as *Agrostocynips clavatus* (specimens provided by A. Salvo).

Agrostocynips robusta (Ashmead), **n. comb.**

Chrestosema robusta Ashmead 1894: 68.

Agrostocynips diastrophii (Ashmead), **n. comb.**

Ganaspis diastrophii Ashmead 1896: 184–185.

The original description states ‘Reared from blackberry gall, *Diastrophus cuscutaeformis* O.S.’ All known species of *Agrostocynips* are leaf-miner parasitoids (Diptera: Agromyzidae); it is probable the described specimens (holotype and paratype) emerged from leaf-miners accompanying the vegetation in which the gall was formed.

Acknowledgements

Dr. Göran Nordlander (Swedish University of Agricultural Sciences) made available for my examination museum notes taken by him of the holotype collection of the United States National Museum (USNM) in Washington, D.C. Included in these notes was doubt on the placement of *Chrestosema pallidipes* Ashmead within *Chrestosema* Förster. A. Salvo (Universidad Nacional de Córdoba, Argentina) and J. LaSalle (CSIRO) provided specimens and biological data on *P. imallshookupis*. R. Cave provided specimens and biological data for *P. pallidipes*. The holotypes of *Chrestosema pallidipes* Ashmead, *Chrestosema robusta* Ashmead and *Ganaspis diastrophii* Ashmead were made available for my examination by the kind help of curatorial staff at the USNM, Washington DC. B. Zuparko assisted with loans of Kieffer’s holotypes (*Eucoila sancti-marci* and *Eucoila transversa*) from the CAS, San Francisco, CA. R. Burks, J. Pinto and two anonymous reviewers provided suggestions that greatly improved this manuscript. This project was partially funded by a NSF-PEET grant BSR 9978150 awarded to J. Heraty and J. Pinto.

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