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A new species and new distribution records for Braconidae from Mountain Lake Biological Station in southwestern Virginia and a redescription of *Pentapleura foveolata* Viereck

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Abstract

One new species of Alysiinae, *Coelinius wrayi* Kula, is described. *Pentapleura foveolata* Viereck, also in Alysiinae and previously known only from a male collected at the type locality in Connecticut, is redescribed based on six females and two males collected at Mountain Lake Biological Station (MLBS) in Virginia. Morphological variation for *Alysia* (*Alysia*) *salebrosa* Wharton is discussed given variation observed in specimens from MLBS. Sixty-two species of Braconidae collected at MLBS in August of 2009 are listed along with 12 species reported previously from MLBS. Host use for the 62 species is discussed; 31 are in Alysiinae or Opiinae, subfamilies that exclusively contain parasitoids of cyclorrhaphous flies. Fifteen species are reported from Virginia for the first time. Problematic couplets in a key to species of *Spathius* Nees for North America (Marsh & Strazanac 2009) are discussed using specimens from MLBS.

Key words: *Alysia*, biodiversity, *Coelinius*, Eastern Deciduous Forest, parasitoid, taxonomy

Introduction

Mountain Lake Biological Station (MLBS) is a research and teaching field station operated by the University of Virginia and located on Salt Pond Mountain in Giles County, Virginia. The station occupies 259 hectares of Eastern Deciduous Forest and is bordered by Jefferson National Forest (40,470 hectares), including 4,250 hectares of National Forest Service designated Wilderness. Also adjacent to MLBS is 1,012 hectares of land managed by the Wilderness Conservancy at Mountain Lake. Thus, MLBS and its environs encompass a wide variety of habitats subjected to minimal anthropogenic disturbance (http://www.mlbs.virginia.edu/about).

The vascular plants of Giles County have been surveyed (Thorne & Cooperrider 1960; Cooperrider & Thorne 1964), with 1,026 species documented in Cooperrider & Thorne (1964). Nearly half of those species (i.e., 504) were reported from sites on Salt Pond Mountain, including MLBS. The bryophytes of MLBS and its environs have also been surveyed extensively (Blomquist 1937; Patterson 1940a, b, c; Patterson 1943; Patterson 1944; Sharp 1944; Studlar 1980; Studlar 1982a, b), as have several groups of fungi (Linder 1937; Meyer 1943; Graff 1947; Miller 1965). Some insect groups have been surveyed for MLBS and surrounding areas. Milne and Milne (1944) reported 660 species of insects, including 22 species of Braconidae (Hymenoptera), collected using light traps operating at MLBS primarily in July of 1938 and 1940. Byers (1951) published a list of 21 species of Odonata collected July 23 to August 26, 1949 at and in areas near MLBS. Stephenson *et al.* (1985) reported insect abundance at the ordinal level for individuals collected using flight intercept traps that operated from June 11 to July 2, 1984 in areas near MLBS. Lastly, Byers (2002) reported 226 species of Tipulidae (Diptera) collected haphazardly at and in areas near MLBS over a 32-year period of time.

In August 2009 the author sampled insects in mixed hardwood and coniferous forest (Figs. 1–3) at MLBS. The objective of the sampling was to discover new species and geographic distribution records for braconids as part of an on-going survey of the braconid fauna of MLBS and its environs. The purpose of this article is to report the results of that sampling effort.

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FIGURES 1–3. Sampling sites at Mountain Lake Biological Station, Giles County, Virginia, U.S.A. 1. Spring Road. 2. Spring Trail. 3. Hunter's Branch.

Material and methods

Malaise traps, SLAM traps, and/or yellow pan traps were deployed in mixed forest near Spring Road (Fig. 1), Spring Trail (Fig. 2), and Hunter's Branch (Fig. 3) on MLBS grounds. The Spring Road site was dry relative to the Hunter's Branch site where traps were set in mesic forest near a stream. The Spring Trail site was near a spring. One Malaise trap (Sante Traps, Lexington, Kentucky, U.S.A.) each was set at the Spring Road and Spring Trail sites. One Malaise trap (J. W. Hock Company, Gainesville, Florida, U.S.A.) and three SLAM traps (MegaView Science Co., Ltd., Taichung, Taiwan) were set at the Hunter's Branch site. The Spring Road and Hunter's Branch sites were also sampled using ~75 yellow pan traps at each site. Pan traps were not set at the Spring Trail site. The Malaise and SLAM traps operated August 3 or 4 to August 15, 2009; the yellow pan traps operated August 9–10, 2009. Specimens were maintained in 85% ethyl alcohol until they were dehydrated chemically using hexamethyldisilazane (Heraty & Hawks 1998) and point-mounted.

Specimens were examined using a Leica M205 A stereomicroscope with 25X oculars. They were identified to genus using keys in Wharton *et al.* (1997) and to species using the resources listed in Table 1. Several specimens were identified to genus and sorted to morphospecies but not identified to species for one of the following reasons: (1) they are in species-rich groups requiring revision, (2) specimens for comparison were not available for examination, or (3) only males were collected. All MLBS specimens are deposited in the Smithsonian Institution National Museum of Natural History, Washington, D.C., U.S.A. (USNM). All primary and secondary type specimens listed in Table 1 are housed in the USNM except the holotype and paratypes of *Alysia* (*Alysia*) *salebrosa* Wharton are at the Canadian National Collection of Insects, Ottawa, Ontario, and the holotype for *Coelinidea muesebecki* Riegel is at the Illinois Natural History Survey, Champaign, U.S.A. Except for one specimen of *Macrocentrus impressus* Muesebeck, braconids determined to species by C. F. W. Muesebeck (formerly Systematic Entomology Laboratory, Washington, D.C.) and reported in Milne and Milne (1944) could not be located in either the USNM or the insect collection at MLBS and thus were not examined.

Measurements were taken using an ocular micrometer as in Wharton (1977) with additions and modifications as in Kula and Zolnerowich (2005) and Kula (2009b). Body length was measured as in Kula (2009a). The following abbreviations are used in the descriptions: head length (HL), head width (HW), temple width (TW), face width (FW), face height (FH), eye length (EL), eye height (EH), flagellomere 1 length (F1L), flagellomere 2 length (F2L), mesosoma length (ML), mesoscutum width (MW), mesosoma height (MH), scutellar sulcus length (SSL), scutellar sulcus width (SSW), tergum 1 length (T1L), tergum 1 width (T1W), and terga one through eight (t1…t8). Terminology for anatomical features, surface sculpture, and setation follows Sharkey and Wharton (1997) except axilla is as in Karlsson and Ronquist (2012), subalar groove is as in Marsh (2002), and carinulate is as in Harris (1979). Setiferous and setose both refer to areas bearing setae, setiferous areas "not necessarily with dense setae" and setose areas "with dense setae" (Sharkey & Wharton 1997). Eyes sparsely bearing setae not longer than the width of a single facet are described as virtually glabrous. Forewing stigma shape is described as apparently elongate for specimens with the distal portion tapering into R1a so that the distal endpoint of the stigma cannot be discerned unequivocally. The numbering of teeth for alysiines follows Kula (2008). Data on mandibular sculpture, setation, and tooth shape were taken for alysiines as described in Kula *et al.* (2009). When a range of intraspecific variation is reported, the most common condition is the first condition mentioned except for color. Color is difficult to describe efficiently, and therefore, it was described as concisely as possible without regard to mentioning the most common condition first. See Kula *et al.* (2009) for comments on describing color for specimens in natural history collections. Exact label data are reported for all specimens examined. Label data for holotypes are formatted as in Kula and Zolnerowich (2008). Asterisks indicate new state distribution records.

Scanning electron micrographs were captured using a Philips XL30 ESEM environmental scanning electron microscope and a Hitachi TM3000 Analytical TableTop Microscope. Some specimens were sputter-coated with gold/palladium alloy, but others were uncoated. Habitus images were obtained using a Visionary Digital imaging system. The system consisted of an Infinity Optics K2 long distance microscope affixed to a Canon EOS 40D digital SLR camera. A Dynalite M2000er power pack and Microptics ML1000 light box provided illumination. Image capture software was Visionary Digital's proprietary application with images saved as TIF with the RAW conversion occurring in Adobe Photoshop Lightroom 1.4. Image stacks were montaged with Helicon Focus 4.2.1. Wing images are paintings prepared in Adobe Photoshop CS4. Original sketches were made from specimens using a Leica MZ APO stereomicroscope with a camera lucida. Sketches were transferred to digital format with a

Cannon LiDE 700F scanner. Painting was done with a Wacom Intuos4 pressure sensitive tablet and Adobe Photoshop in CS4. Final image plates were prepared using Adobe Illustrator CS4.

Results and discussion

Braconidae of Mountain Lake Biological Station

Seventy-four species of Braconidae are known from MLBS (Table 1). This includes 13 species from Milne and Milne (1944); only one of those species, *Austrozele uniformis* (Provancher), was collected through this research. The 14 species listed in Milne and Milne (1944) currently constitute 13 due to subsequent nomenclatural changes. The eight species in Milne and Milne (1944) identified to genus and listed as morphospecies only were not included in Table 1 because they were not available for comparison with specimens from this research. Seven hundred and forty-five specimens of Braconidae were collected through sampling carried out in this research and represented 62 of the 74 braconid species known from MLBS. Not included in Table 1 were 49 specimens determined as Alysiini (n=3), *Chorebus* Haliday (n=1), *Ephedrus* Haliday (n=1), *Blacus* Nees (n=1), and Microgastrinae (n=43) but not sorted into morphospecies because they are either males or damaged. Of the 62 species, Alysiinae and Opiinae were the two richest subfamilies, with 22 and nine species, respectively. Thus, at least 31 of the 62 species are parasitoids of cyclorrhaphous flies (Wharton 1997a, b). Doryctinae, Aphidiinae, and Microgastrinae were the next highest subfamilies in terms of richness, with six, five, and four species, respectively. Aphidiines are exclusively parasitoids of aphids (van Achterberg 1997a), doryctines are primarily parasitoids of wood-boring beetle larvae (Marsh 1997), and microgastrines are exclusively parasitoids of lepidopteran larvae (Whitfield 1997). The remaining 16 species represent nine subfamilies with no more than three species per subfamily. Six of those species are from the subfamilies Cheloninae (3), Macrocentrinae (2), and Orgilinae (1) and thus are parasitoids of lepidopterans (van Achterberg 1997b; Shaw 1997; Wharton 1997c). Considering those species along with the microgastrines, at least 10 of the 62 species are parasitoids of lepidopterans.

An undetermined species of *Dinotrema* Förster was the most abundant (n=301) (Table 1) followed by an undetermined species of *Orthostigma* Ratzeburg (n=113). Those two species alone accounted for 56% of the specimens collected through this research. *Cratospila neocirce* Wharton (n=45) and an undetermined species of *Aspilota* Förster (n=44) were also abundant relative to the other species collected. Species of *Aspilota*, *Dinotrema*, and *Orthostigma* are primarily parasitoids of flies in the family Phoridae, and their hosts are often associated with fungi (Wharton 1997a; Yu *et al.* 2005). Given the high diversity of fungi at MLBS and its environs (Linder 1937; Meyer 1943; Graff 1947; Miller 1965), and at the sites sampled (especially Hunter's Branch, R. Kula pers. obs.), it is likely that species of *Aspilota*, *Dinotrema*, and *Orthostigma* collected through this research attack phorids associated with fungi. Host use is unknown for species of *Cratospila* Förster (Wharton 1997a; Yu *et al.* 2005). No more than 17 specimens were collected for any of the remaining species.

Specimens of *Spathius* Nees from MLBS could not be identified reliably to species despite a recently published review that included a key to species in North America (Marsh & Strazanac 2009). Species are separated in couplet 3 of the key based on malar space length "at least 3/4 eye height" compared to "at most 1/2 eye height." The malar space:eye height ratios for the two MLBS specimens considered a species near *Spathius calligaster* Matthews are 0.55 and 0.48. They were taken through both options of couplet 3 and best fit the couplets following malar space length "at most 1/2 eye height." Both specimens passed easily to couplet 8, where *Spathius longipetiolatus* Ashmead was differentiated from other species of *Spathius* based on a "smooth and polished" scutellar disc. However, the scutellar disc transitions, anteriorly to posteriorly, from smooth to coriaceous in *S. longipetiolatus* based on examination of the lectotype and paralectotype. Therefore, other features must be used to differentiate *S. longipetiolatus* from congeners. The lectotype of *S. longipetiolatus* is missing the head and metasoma, and the wings and legs are damaged. The paralectotype is missing the wings and metasoma, and the rest of the specimen is damaged and covered with debris. This makes equivocal identification of *S. longipetiolatus* extremely difficult. The vertex of the paralectotype is almost entirely obscured but clearly strigate compared to entirely smooth in the MLBS *S.* sp. nr. *calligaster* specimens. Therefore, I do not consider them conspecific with *S. longipetiolatus*. If both specimens are keyed to couplet 9, they fit *S. calligaster* in that forewing 1CU and 2CU are interstitial; they differ in that t4 is smooth ("acinose" in *S. calligaster* per Marsh & Strazanac 2009), and the lateral

margin of t2+t3 is sharp at the base only ("sharp and distinct" along entire length in *S. calligaster* per Marsh & Strazanac 2009). If both specimens are keyed to couplet 10, they differ from *Spathius evansi* Matthews in that the vertex is smooth (strigate in *S. evansi*) and metatarsomere 3 is subequal to metatarsomere 5 (3 longer than 5 in *S. evansi*). They fit *Spathius elegans* Matthews in that the vertex and t4 are smooth and metatarsomere 3 is subequal to metatarsomere 5; they differ in that 1CU and 2CU are interstitial (i.e., 2CU is intercepted by 2cu-a in *S. elegans*). Thus, the two MLBS specimens of *Spathius* considered a species near *S. calligaster* do not precisely fit *S. calligaster*, *S. elegans*, or *S. evansi* sensu Marsh and Strazanac (2009), but they fit closest to *S. calligaster* based on examination of primary and/or secondary types for the three species. Examination of *S. calligaster* paratypes revealed that 1CU and 2CU are not interstitial (i.e., 2CU is intercepted by 2cu-a) and t4 is smooth in some specimens. Thus, *S. calligaster* sensu Marsh and Strazanac (2009) differs from *S. calligaster* sensu Matthews (1970), although the former authors did not state this explicitly. The specimens of *Spathius* sp. nr. *calligaster* from MLBS key easily to the couplet containing *S. calligaster* in Matthews (1970). However, they do not have the head and mesosoma dorsoventrally compressed, and they lack a dorsal transverse swelling on the pronotum, features Matthews (1970) used to define *S. calligaster.*

Two other species of *Spathius* were collected at MLBS. Both key easily to couplet 16 in Marsh and Strazanac (2009). *Spathius impus* Matthews was differentiated at couplet 16 from other species of *Spathius* based on "ocellar-occipital distance equal to or less than ocellar-ocular distance" and "outer apical margin of hind tibia with 2–3 small spines." The distance is longer in both species, but both have two spines on the outer apical margin of the hind tibia. Both species differ from *Spathius pallidus* Ashmead (couplet 17) in terms of mesopleural sculpture and body color, and both species differ from *Spathius leiopleuron* Marsh and Strazanac (couplet 18) in terms of mesopleural sculpture. *Spathius* sp. 1 fits *Spathius laflammei* Provancher (couplet 18) except it has two spines on the outer apical margin of the hind tibia (3–8 in *S. laflammei*). *Spathius* sp. 2 differs from *S. laflammei* in that the former has the vertex smooth (strigate in *S. laflammei*) and two spines on the outer apical margin of the hind tibia (3–8 in *S. laflammei*).

Two specimens from MLBS were determined as a species near *Ontsira imperator* (Haliday). They differ from specimens in the USNM determined as *O. imperator* in that the MLBS specimens have the metafemur brownish yellow and the metatibia and metatarsus brown, while those features are entirely yellow in the USNM specimens. Also, the scutellar disc is rugose posteriorly in the MLBS specimens, while it is smooth with punctures in the USNM specimens.

One specimen from MLBS was determined as a species near *Diospilus fomitis* Mason. It is similar to *D. fomitis* in that the ovipositor is downcurved apically. Conversely, the MLBS specimen has a sharply defined, pentagonal areola that bears a few rugosities, while the areola in four paratypes of *D. fomitis* in the USNM is either imperceptible (i.e., propodeum entirely areolate-rugose) or a weakly defined pentagon bearing areolate-rugose sculpture. Also, the head, mesosoma, and metasoma are darker brown in the MLBS specimen than in the paratypes of *D. fomitis* examined, and the metatibia and metatarsus are yellowish brown in the former compared to yellow in the latter. However, the lighter coloration observed in the paratypes could be an artifact of specimen preservation.

Fifteen species were reported from Virginia for the first time, but nine of those species are known from at least one state that borders Virginia. Noteworthy new distribution records are as follows (known distribution beyond Virginia in parentheses): *Aphaereta ithacensis* Fischer (CANADA: Ontario; U.S.A.: Michigan, New York, Ohio [Fischer 1966]), *Pentapleura foveolata* Viereck (U.S.A.: Connecticut [Viereck 1917]), *Tanycarpa gracilicornis* (Nees) (Oriental and Palearctic regions [Yu *et al.* 2005]; CANADA: Alberta, Ontario; U.S.A.: Alaska [Wharton 1980]), *Ascogaster provancheri* Dalla Torre (U.S.A.: Alaska, New Hampshire, New Jersey, New York, Ohio [Yu *et al.* 2005]), *Euphoriella pallidifacia* Loan and New (CANADA: Quebec [Loan & New 1972]), and *D. fomitis* (CANADA: Manitoba, Quebec, Saskatchewan [Mason 1968]). The specimens collected at MLBS are the southern-most records for those species.

TABLE 1. Species of Braconidae known from Mountain Lake Biological Station, Giles County, Virginia, U.S.A. Abbreviations and symbols: *=first record for Virginia, †=occurrence based entirely on Milne and Milne (1944), #=number, ID=identification, HT=holotype, LT=lectotype, PT=paratype, PLT=paralectotype, ST=syntype.

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
Alysiinae	*Alysia* (*Alysia*) *salebrosa* Wharton	2	Wharton (1986)	HT ♀ *A.* (*A.*) *salebrosa* PT 4 ♀ *A.* (*A.*) *salebrosa* 1 ♂ Alysia (Alysia) *frigida* Haliday; det. Wharton 1 ♀ *A*lysia (Alysia) *heterocera* Thomson; det. Wharton
	Aphaereta ithacensis Fischer*	1	Wharton (1977)	HT ♀ *A. ithacensis* HT ♀ *Aphaereta juddi* Fischer [=*A. ithacensis*] HT ♀ *Aphaereta dipterica* Fischer HT ♀ *Aphaereta megalops* Wharton PT 7 ♀ 3 ♂ *A. ithacensis* PT 6 ♀ 1 ♂ *A. juddi* PT 6 ♀ 1 ♂ *A. dipterica*
	Aphaereta pallipes (Say)	17	Wharton (1977)	10 ♀ *A. pallipes*; det. Muesebeck
	Aspilota sp. 1	44	-	-
	Aspilota sp. 2	10	-	-
	Aspilota sp. 3	4	-	-
	Aspilota sp. 4	2	-	-
	Aspilota sp. 5	2	-	-
	Chorebus sp. 1	3	-	-
	Chorebus sp. 2	2	-	-
	Coelinius wrayi Kula, new species	2	Riegel (1982)	HT ♀ *Coelinius hopkinsii* Ashmead HT ♀ *Coelinidea muesebecki* Riegel 47 ♀ 29 ♂ *C. hopkinsii*; det. Riegel

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TABLE 1. (Continued)

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
	Cratospila neocirce Wharton*	45	None	6 ♀ 3 ♂ *C. neocirce*; det. Wharton
	Dacnusa sp.	1	-	-
	Dinotrema sp. 1	301	-	-
	Dinotrema sp. 2	2	-	-
	Exotela sp. 1	1	-	-
	Exotela sp. 2	6	-	-
	Mesocrina sp.	1	-	-
	Orthostigma sp.	113	-	-
	Pentapleura foveolata Viereck*	7	Wharton (1980)	HT ♀ *P. foveolata* HT ♂ *Toxares triticaphis* Fitch [=*Pentapleura pumilio* (Nees)] HT ♂ *Gnathospila quadridens* Fischer 10 ♀ *P. pumilio*; det. Stelfox, van Achterberg
	Phaenocarpa sp.	12	-	-
	Tanycarpa gracilicornis (Nees)*	2	Wharton (1980)	1 ♀ 3 ♂ *T. gracilicornis*; det. Stelfox, Wharton 1 ♀ 9 ♂ *Tanycarpa rufinotata* (Haliday); det. Stelfox
Aphidiinae	*Aphidius* sp.	1	-	-
	Ephedrus incompletus Provancher*	1	Pike et al. (1999)	10 ♀ *E. incompletus*; det. Ashmead, Gahan, Muesebeck
	Ephedrus lacertosus (Haliday)*	4	Pike et al. (1999)	HT ♀ *Ephedrus muesebecki* Smith [=*E. lacertosus*] 10 ♀ *E. lacertosus*; det. Mackauer, Stelfox

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TABLE 1. (Continued)

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
	Lysiphlebus sp.	1	-	-
	Praon sp.	6	-	-
Blacinae	*Blacus paganus* Haliday*	2	Achterberg (1988)	5 ♀ 5 ♂ *B. paganus*; det. Stelfox
	Blacus robustus Haeselbarth*	1	Achterberg (1988)	1 ♂ *B. robustus*; det. van Achterberg
Braconinae	*Bracon meromyzae* Gahan†	1	-	None
	Bracon sp.	1	-	ST 2 ♀ 5 ♂ *B. meromyzae*
Cheloninae	*Ascogaster provancheri* Dalla Torre*	16	Shaw (1983)	2 ♀ 1 ♂ 5 ? *A. provancheri*; det. Muesebeck, Shaw
	Chelonus (*Chelonus*) sp.	12	-	-
	Leptodrepana oriens Shaw	8	Shaw (1983)	HT ♀ *L. oriens* PT 10 ♀ 10 ♂ *L. oriens*
Doryctinae	*Heterospilus* sp. 1	1	-	-
	Heterospilus sp. 2	1	-	-
	Ontsira sp. nr. *imperator* (Haliday)	2	Marsh (1966)	29 ♀ 1 ♂ *O. imperator*; det. Marsh
	Spathius sp. nr. *calligaster* Matthews	2	Marsh and Strazanac (2009)	HT ♀ *S. calligaster* HT ♀ *Spathius elegans* Matthews LT ♂ *Spathius longipetiolatus* Ashmead PT 10 ♀ 9 ♂ *S. calligaster* PT 10 ♀ *S. elegans* PT 6 ♀ 7 ♂ *Spathius evansi* Matthews PLT 1 ♂ *S. longipetiolatus*

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TABLE 1. (Continued)

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
	Spathius sp. 1	1	-	HT ♀ *Spathius impus* Matthews HT ♀ *Spathius leiopleuron* Marsh and Strazanac HT ♀ *Spathius pallidus* Ashmead LT ♀ *Spathius sequoiae* Ashmead PT 8 ♀ 6 ♂ *S. impus* PT 8 ♀ 6 ♂ *S. leiopleuron* 10 ♀ *Spathius laflammei* Provancher; det. Marsh, Matthews 10 ♀ *S. pallidus*; det. Marsh, Matthews
	Spathius sp. 2	2	-	As for *Spathius* sp. 1
Euphorinae	*Euphoriella pallidifacia* Loan and New*	1	Loan and New (1972)	None
	Falcosyntretus muesebecki Papp and Shaw*	1	Papp and Shaw (2000)	PT 2 ♀ 1 ♂ *F. muesebecki*
Helconinae	*Aliolus crabilli* Martin	1	Martin (1956)	PT 9 ♀ 1 ♂ *A. crabilli*
	Diospilus fomitis Mason*	1	None	PT 2 ♀ 2 ♂ *D. fomitis*
	Diospilus sp. nr. *fomitis*	1	None	PT 2 ♀ 2 ♂ *D. fomitis*
Homolobinae	*Charmon cruentatus* Haliday†	1	-	None
Hormiinae	*Hormius completus* (Provancher)†	1	-	None
	Oncophanes nigriventris Muesebeck*	1	None	HT ♀ *O. nigriventris* PT 3 ♀ *O. nigriventris*
Macrocentrinae	*Austrozele uniformis* (Provancher)	1	None	35 ♀ *A. uniformis*; det. Ahlstrom, Muesebeck, van Achterberg

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TABLE 1. (Continued)

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
	Macrocentrus ancylivora Rohwer†	1	-	None
	Macrocentrus atratus Muesebeck	2	Muesebeck (1932)	HT ♀ *M. atratus* 7 ♀ *M. atratus*; det. Ahlstrom, Muesebeck, Shaw
	Macrocentrus crambi (Ashmead)†	1	-	None
	Macrocentrus impressus Muesebeck†	1	-	1 ♂ det. Muesebeck
	Macrocentrus instabilis Muesebeck†	2	-	None
Microgastrinae	*Choeras consimilis* (Viereck)	1	None	HT ♀ *Apanteles* (*Pseudapanteles*) *consimilis* 3 ♀ *C. consimilis*; det. Muesebeck
	Diolcogaster sp.	1	-	-
	Glyptapanteles sp.	12	-	-
	Microplitis hyphantriae Ashmead†	1	-	None
	Rhygoplitis sp.	3	-	-
Meteorinae	*Meteorus humilis* (Cresson)†	1	-	None
	Meteorus hyphantriae Riley†	2	-	None
	Meteorus rubens (Nees)†	3	-	None

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TABLE 1. (Continued)

Subfamily	Species	# of Specimens	References for ID	Specimens for Comparison (all USNM except as noted in materials and methods)
	Meteorus sp.	6	-	ST 2 ♀ 1 ? *Meteorus orchesiae* Ashmead [=*M. humilis*] ST 2 ♀ 1 ♂ *M. hyphantriae* HT ♀ *Meteorus mamestrae* Viereck [=*M. rubens*] PT 1 ♀ 2 ♂ *M. mamestrae* 10 ♀ *M. rubens*; det. Shaw
	Zele deceptor (Wesmael)†	6	-	None
Opiinae	*Opius irregularis* Wesmael*	1	None	2 ♀ 1 ♂ *O. irregularis*; det. Fischer
	Opius sp. 1	1	-	-
	Opius sp. 2	1	-	-
	Opius sp. 3	1	-	-
	Opius sp. 4	1	-	-
	Opius sp. 5	2	-	-
	Opius sp. 6	1	-	-
	Opius sp. 7	1	-	-
	Utetes parvifossa Fischer*	12	Fischer (1977)	HT ♂ *U. parvifossa* PT 3 ♂ *U. parvifossa*
Orgilinae	*Orgilus* sp.	1	-	-

Descriptive taxonomy

Alysiini

***Pentapleura foveolata* Viereck**
(Figs. 4–8)

Diagnosis. *Pentapleura pumilio* (Nees) and *Pentapleura quadridens* (Fischer) are known from the Nearctic Region in addition to *P. foveolata*. The forewing stigma is broader and less elongate in *P. pumilio* (Wharton 1980: fig. 21) and *P. quadridens* (Fig. 9) than in *P. foveolata* (Fig. 8). Additionally, the mandible is broader in *P. quadridens* (Fig. 10) than in *P. foveolata* (Fig. 5).

Description. Female. *Body length:* 1.23–1.63 mm. *Head:* HL 0.69–0.76X HW, HW 1.03–1.06X TW, FW 1.20–1.31X FH, EL 0.73–0.80X EH, MNL 1.86–2.20X MNAW, MNAW 1.00–1.20X MNBW, F1L 1.22–1.40X F2L; antenna with 14–16 flagellomeres, maxillary palpus with 6 palpomeres, labial palpus with 3 palpomeres; face smooth, setiferous; frons smooth except rugulose ventromesally, glabrous; gena and vertex smooth, setiferous; occiput smooth, glabrous; eye setiferous; clypeus with apical rim, setiferous; mandible (Fig. 5) with four teeth, margin between first and second tooth with notch resulting in bump at base of tooth 2, outer surface setiferous except excavated distal portion glabrous, rugose except excavated distal portion smooth, tooth 1, 3, and 4 rounded apically, tooth 2 acute apically, tooth 1 forming less than 90° angle and smaller than tooth 3, tooth 3 suborthogonal, tooth 2 elongate and triangular, tooth 4 ventral to tooth 3 and lobelike.

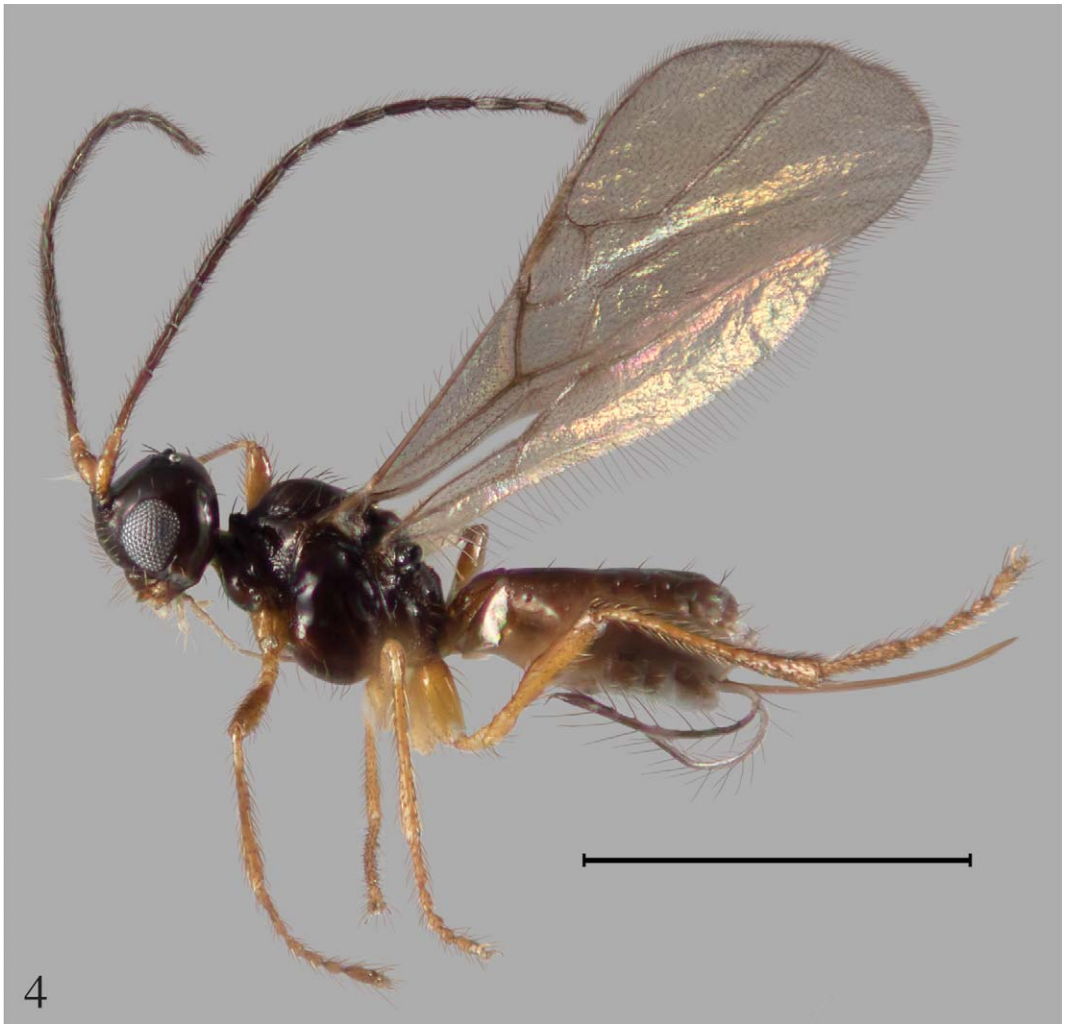
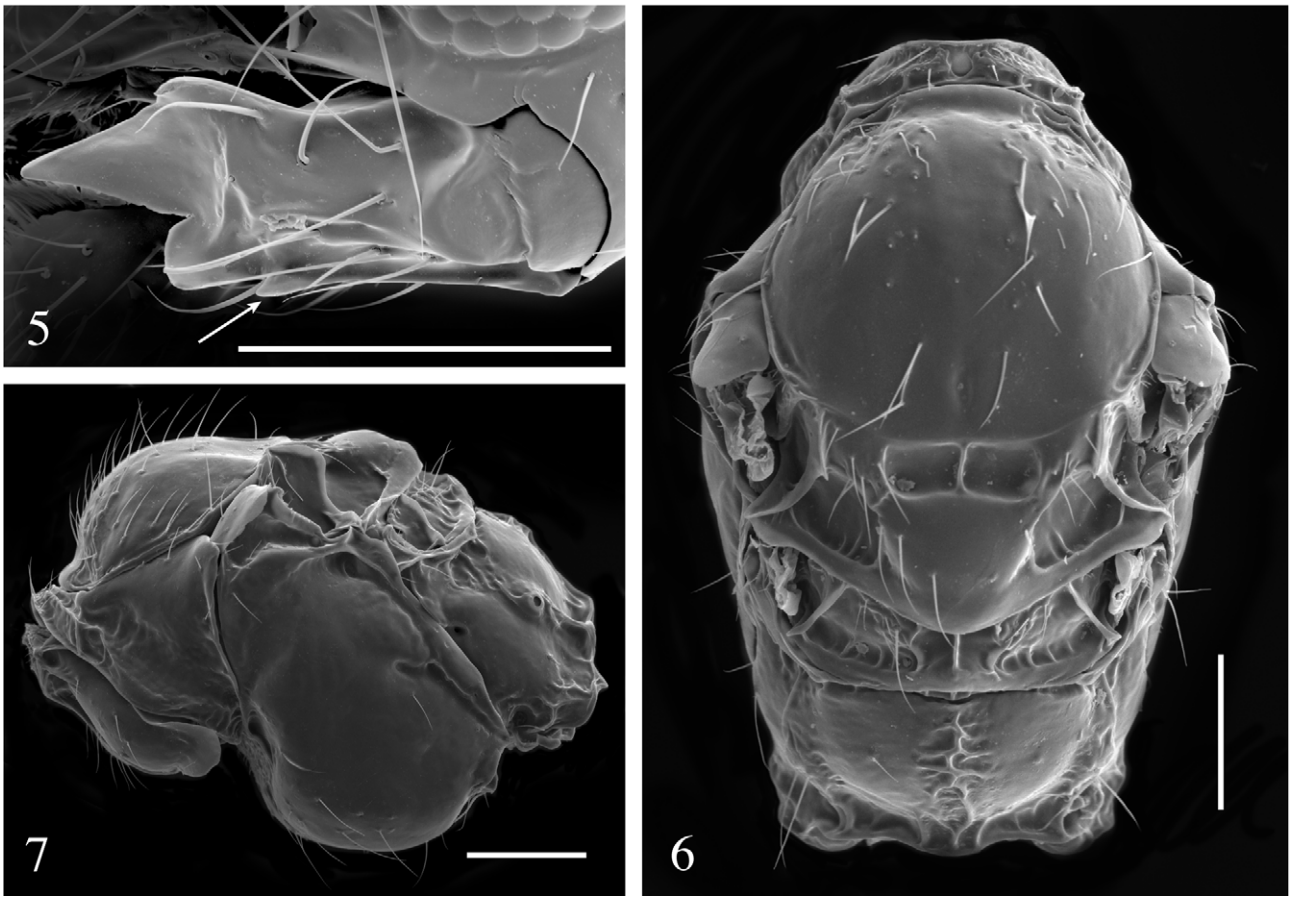


FIGURE 4. *Pentapleura foveolata* Viereck, lateral habitus. Scale bar=1.00 mm.



FIGURES 5–7. *Pentapleura foveolata* Viereck. 5. Mandible, lateral view. Arrow=Additional tooth ventral to tooth 3. 6. Mesosoma, dorsal view. 7. Mesosoma, lateral view. Scale bars=0.10 mm.

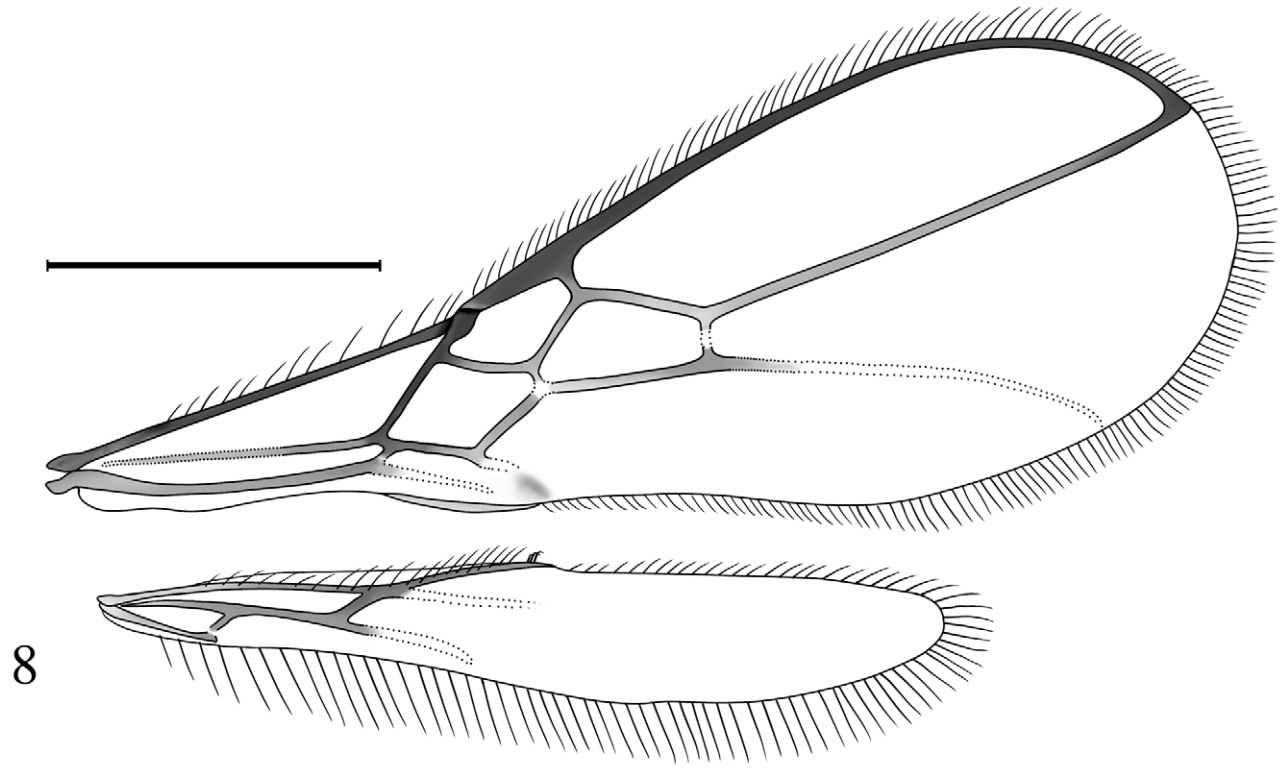


FIGURE 8. *Pentapleura foveolata* Viereck, wings. Scale bar=0.5 mm.

Mesosoma (Figs. 6–7): ML 1.80–2.10X MW, ML 1.27–1.46X MH, MW 0.67–0.71X MH, SSL 0.22–0.38X SSW; pronotal collar anteriorly smooth or with a few rugae and posteriorly crenulate, pronope present, lateral portion of pronotum rugose to rugulose except posterodorsal corner smooth, collar setiferous, lateral portion setiferous along margins but otherwise glabrous; notauli absent, a few rugosities present on anterior declivity where notauli would be located if present; mesoscutal midpit slitlike to oval; mesoscutum (excluding lateral margin and notauli) smooth, setiferous anteriorly, laterally, and where notauli would run if complete; scutellar sulcus bearing median longitudinal ridge; scutellar disc smooth, setiferous; metanotum with ridge mesally; propodeum with band of rugose sculpture mesally and smooth laterally, median longitudinal carina distinct in two specimens, with two to three setae mesally but setae otherwise confined to margins; precoxal sulcus absent; posterior mesopleural furrow smooth or virtually so, at most with a few weak crenulae below episternal scrobe; mesopleuron (excluding precoxal sulcus and posterior mesopleural furrow) smooth except a few crenulae in subalar groove at anteromesal margin mesopleuron, setiferous along margins but otherwise glabrous; metapleuron smooth with a few rugosities ventrally and/or laterally, setiferous.

Forewing (Fig. 8): 2RS length 0.64–0.73X 3RSa length; hyaline; stigma elongate; with following veins complete and tubular: C+SC+R, 1CUa, 1CUb, 1-1A, 1RS, 1M, (RS+M)a, 1m-cu, 1cu-a, r, 2RS, 3RSa, 3RSb, r-m, and 2M; M+CU nebulous proximally transitioning to tubular distally; first subdiscal cell open, 2-1A entirely absent or nearly so, at most represented by nebulous stub proximally, 2cu-a absent, 2CUa present as nebulous stub; vein 3RSb straight to wing margin; vein 1cu-a distad vein 1M or interstitial; vein 1m-cu distad vein 2RS.

Hind wing (Fig. 8): Hyaline; basal and subbasal cells enclosed by tubular veins; R and R1 complete and tubular; RS and 2M spectral; m-cu absent.

Metasoma: T1L 1.27–1.43X T1W; subcylindrical; OL 1.26–1.39X ML; t1 carinulate, dorsal carinae extending posteriorly as separate carinae or joining to form median carina, carinae/carina terminating at midpoint of tergum or nearly reaching posterior margin, dorsope present; t2–t8 smooth; t2–t7 setiferous, setae in roughly single line in posterior half of each tergum, t8 setiferous, pattern indeterminate.

Color: Head (excluding mouthparts and antenna) brown, mandible yellow except tooth 2 mostly brown and margins brownish, palpi whitish yellow, antenna with scape and pedicel brownish yellow, flagellum brown; mesosoma brown; legs yellow; metasoma with t1 yellow, t2 brown, t3–t5 brown with posterior edge slightly darker, t6–t8 yellowish brown.

Male. As in female except: *Body length:* 1.53–1.67 mm. *Head:* FW 1.13–1.33X FH, EL 0.73–0.81X EH, MNL 1.83–2.25X MNAW; antenna with 20 flagellomeres, labial palpus with 2–3 palpomeres.

Mesosoma: ML 1.38–1.50X MH, MW 0.69–0.73X MH, SSL 0.33–0.44X SSW; pronotal collar virtually smooth or entirely crenulate, pronope present or absent.

Forewing: 2RS length 0.61–0.89X 3RSa length.

Metasoma: T1L 1.14–1.29X T1W.

Host. Unknown.

Material examined. *Holotype female:* Top label (white; partially handwritten, partially typewritten)="NewHavenCt [;] 21 Oct. 1903 [;] H L Viereck". Second label (red; handwritten)="CAES [;] 146". Third label (red; partially handwritten, partially typewritten)="TypeNo [;] 66269 [;] USNM". Fourth label (white with black border; handwritten)=Pentapleura [;] foveolata [;] Type ♂ Vier.". *Other material examined:* All U.S.A., 4 ♀ VIRGINIA:Giles Co. Mountain Lake Biol. Station 37°22'25.69"N 80°31'25.41"W forest along Spring Road 4.iii.-15.viii.2009 R.R. Kula Malaise trap (1 used for SEM); 1 ♀ 2 ♂ same data as previous except spring along Spring Trail (USNM, ♀ used for SEM).

Discussion. Viereck (1917) described male *P. foveolata* from the type locality. A body length range of "1.5–2 mm" was indicated in the original description, suggesting it might have been based on multiple males. However, only one male specimen of this species exists in the USNM, and it bears the label "TypeNo 66269 USNM." Also, a unit tray for potential syntypes does not exist in the USNM. Thus, I follow Wharton (1980) and regard the single male in the USNM as the holotype. The description in Viereck (1917) is very short, and while Wharton (1980) provided a diagnosis for *Pentapleura* Förster, he did not redescribe *P. foveolata* as indicated in Yu *et al.* (2005). Therefore, *P. foveolata* is redescribed above to provide data on morphological variation for females and males.

Examination of the holotype for *P. quadridens* revealed intraindividual variation in the number of mandibular teeth. One mandible bears four teeth, with the additional tooth ventral to tooth 3; the other mandible bears five teeth (Fig. 10), with the additional teeth ventral to tooth 3.

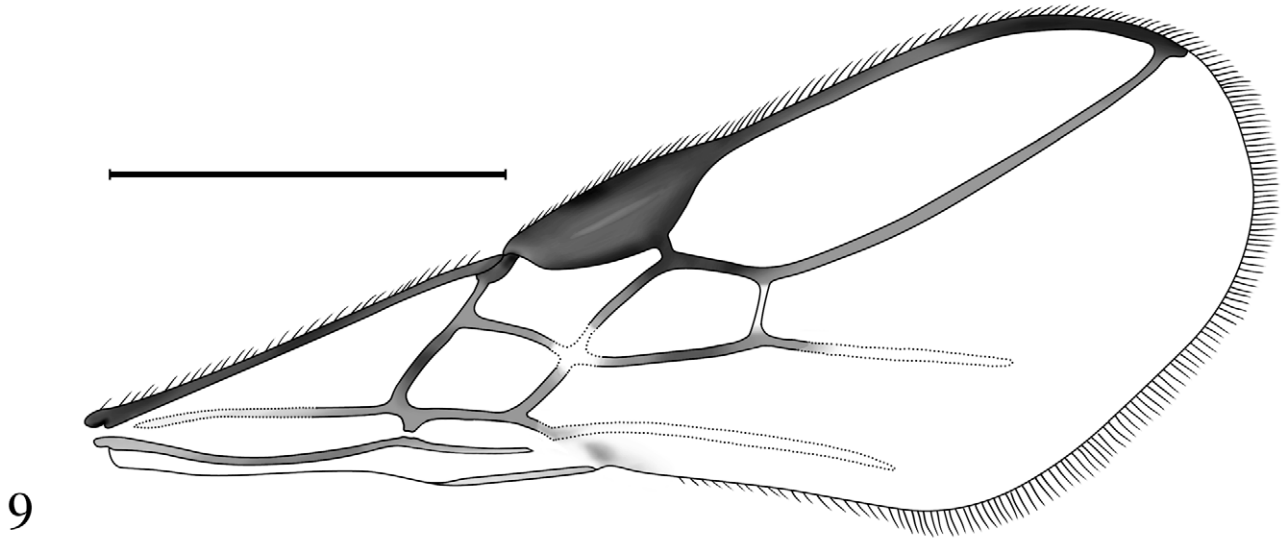


FIGURE 9. *Pentapleura quadridens* (Fischer), forewing. Scale bar=1.00 mm.

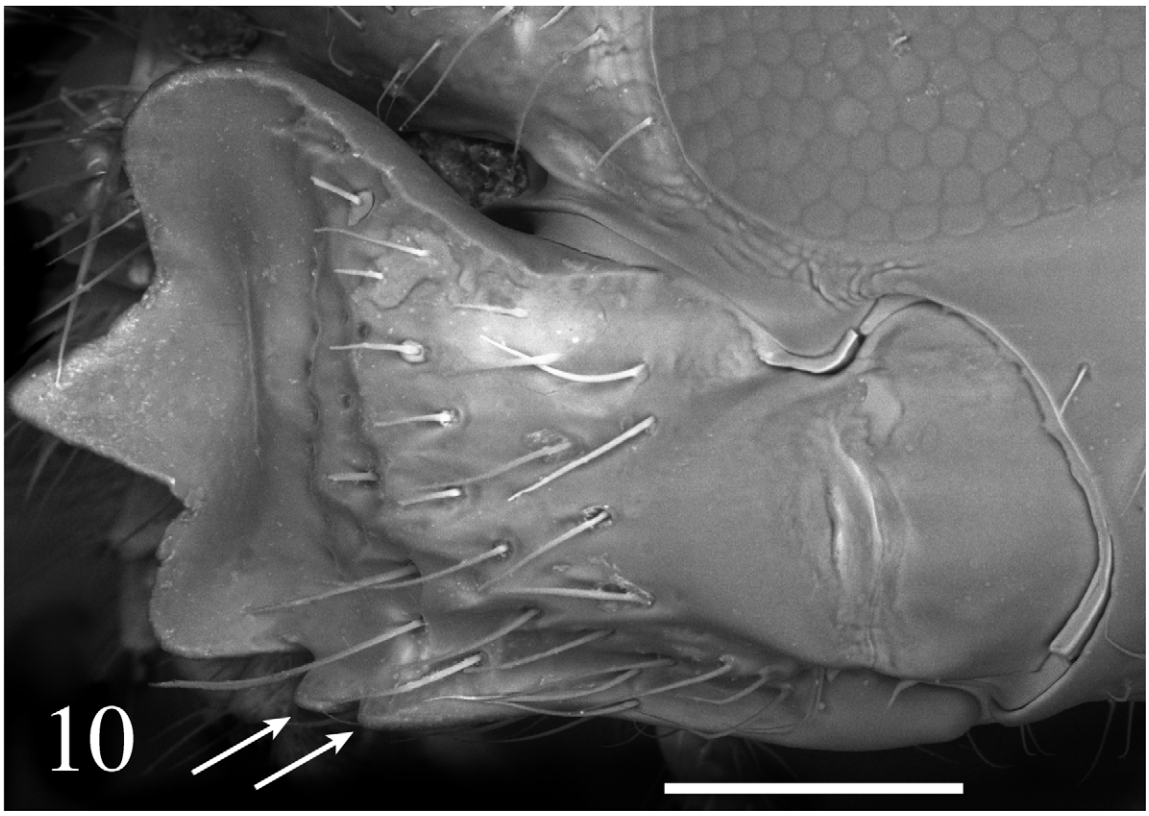


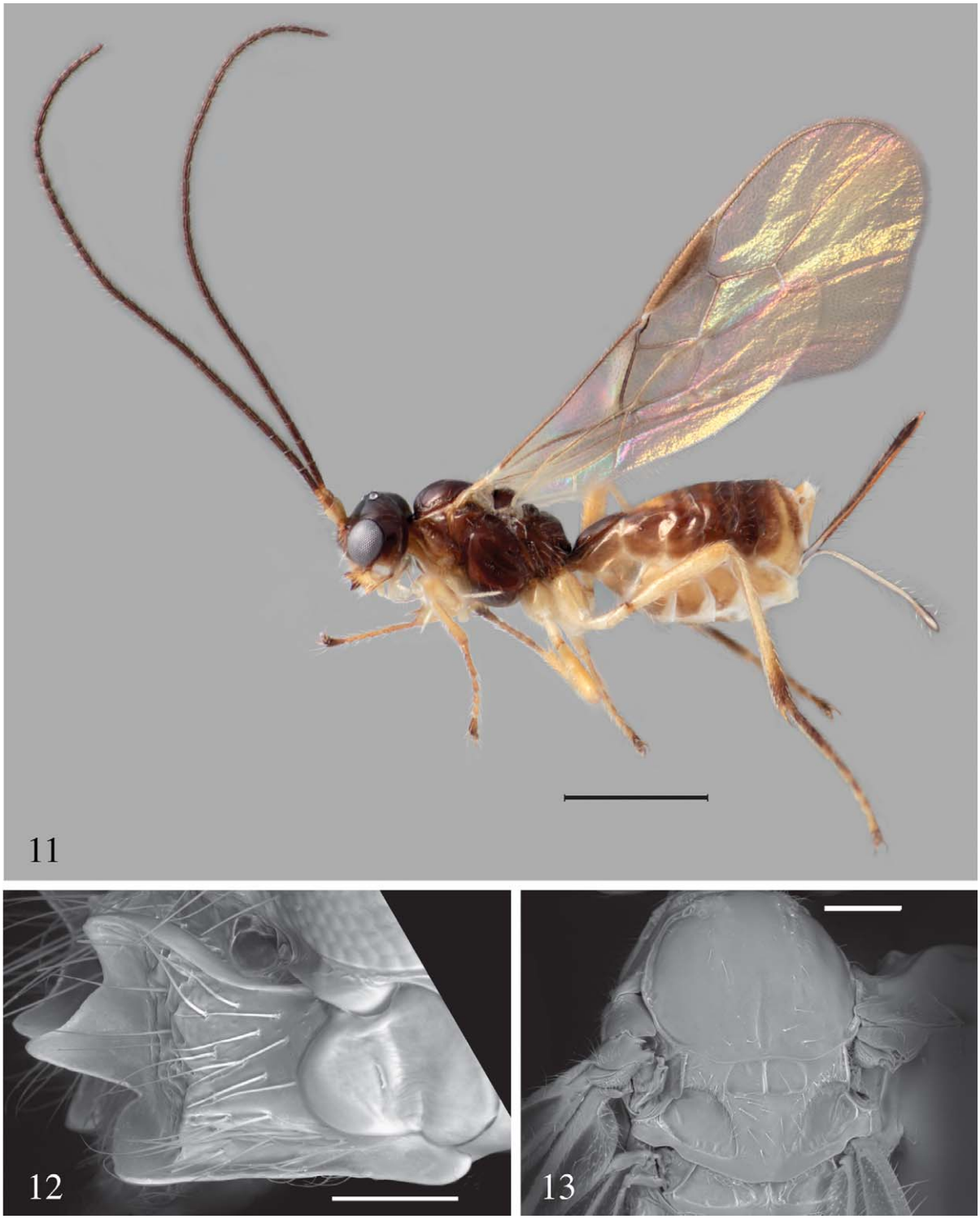
FIGURE 10. *Pentapleura quadridens* (Fischer), mandible, lateral view. Arrows=Additional teeth ventral to tooth 3. Scale bar=0.10 mm.

Alysia (*Alysia*) *salebrosa* Wharton

(Figs. 11–14)

Discussion. The specimens of this species from MLBS were originally misinterpreted as representing an undescribed species because the ovipositor of *A*. (*A*.) *salebrosa* was described as "nearly twice length of mesosoma" in Wharton (1986). The ovipositor length:mesosoma length (OL:ML) ratios for the two MLBS specimens are 1.33 and 1.40. Also, the 2RS length:3RSa length (2RSL:3RSaL) ratio for *A*. (*A*.) *salebrosa* was

reported as "1.16±0.05" in Wharton (1986), but the ratios for the two MLBS specimens are 0.90 and 1.05. The author (RRK) measured the holotype and four paratype females of *A*. (*A*.) *salebrosa* and found that OL:ML ranged from 1.22–1.65 (1.24 in holotype), and 2RSL:3RSaL ranged from 0.97–1.13 (1.13 in holotype). Likely, the quantitative ratios observed here differ from those in Wharton (1986) due to measurement error as discussed in Wharton (1980, 1986). The broad range observed here for OL:ML is also likely due to measurement error. The author (RRK) was not able to find any diagnostic difference between the MLBS specimens and the types of *A*. (*A*.) *salebrosa* examined; therefore, they considered specimens of *A*. (*A*.) *salebrosa*.



FIGURES 11–13. *Alysia* (*Alysia*) *salebrosa* Wharton. 11. Female, lateral habitus. Scale bar=1.00 mm. 12. Mandible, lateral view. Scale bar=0.10 mm. 13. Mesonotum, dorsal view. Scale bar=0.20 mm.

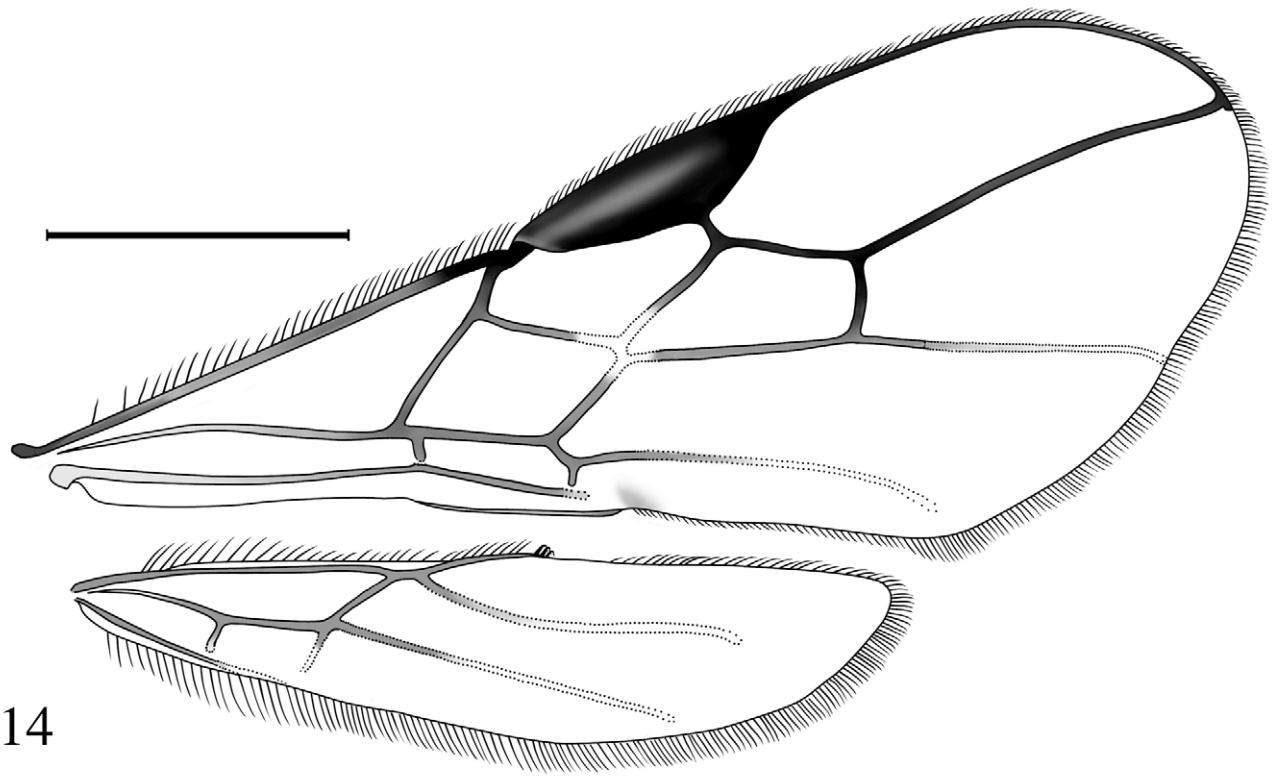


FIGURE 14. *Alysia* (*Alysia*) *salebrosa* Wharton, wings. Scale bar=1.00 mm.

Dacnusini

***Coelinius wrayi* Kula, new species**
(Figs. 15–19)

Diagnosis. *Coelinius wrayi* is most similar morphologically to *Coelinius hopkinsii* Ashmead and *Coelinius muesebecki* (Riegel). The axillae extend posteriorly as thick, blunt protuberances in *C. wrayi* (Fig. 18); they bear flangelike carinae in *C. hopkinsii* (Fig. 20) and *C. muesebecki*.

Description. Male. *Body length:* 4.40–4.90 mm. *Head:* HL 0.87–0.88X HW, HW 0.98X TW, FW 1.63–1.65X FH, EL 0.74–0.81X EH, MNL 2.36–2.70X MNAW, MNAW 0.85–1.11X MNBW, F1L 1.11–1.40X F2L; antenna with 39–41 flagellomeres, maxillary palpus with 6 palpomeres, labial palpus with 4 palpomeres; face punctate, setose; frons mostly smooth, rugose ventromesally, glabrous; gena and vertex smooth with widely spaced punctures, setiferous; occiput smooth except punctate ventrolaterally, setiferous ventrolaterally but otherwise glabrous; eye virtually glabrous; clypeus protruding to degree that apical rim appears absent, punctate, setose; mandible (Fig. 16) with four teeth, outer surface setiferous except teeth glabrous, punctate except teeth smooth and with ridges associated with tooth 1 and 3, tooth 1, 3, and 4 rounded apically, tooth 2 acute apically, tooth 1 and 3 forming less than 90° angle and similar in size and shape, tooth 2 elongate and triangular, tooth 4 between tooth 1 and tooth 2 as flangelike protrusion at base of tooth 2.

Mesosoma (Fig. 17): ML 2.43–2.68X MW, ML 1.82–1.96X MH, MW 0.73–0.75X MH, SSL 0.20–0.30X SSW; pronotal collar smooth anteriorly and crenulate posteriorly, pronope present, lateral portion of pronotum crenulate-rugose ventrally, posteriorly, and in anterior furrow with remainder smooth or coriaceous with punctures, collar setiferous, lateral portion setiferous posterodorsally and along margins with remainder glabrous; notauli present, extending posteriorly on mesoscutum into deep furrow anteriad transscutal articulation, crenulate; mesoscutal midpit represented by rugose furrow spanning from middle of mesoscutum posteriorly to transscutal articulation; mesoscutum (excluding lateral margin, notauli, and midpit) with median lobe punctate and lateral lobes coriaceous mesally and punctate laterally, setose except lateral lobes glabrous mesally; scutellar sulcus

bearing median longitudinal ridge along with crenulae and rugae; axillae extending posteriorly as thick, blunt protuberances (Fig. 18); scutellar disc smooth with widely spaced punctures to punctate, setiferous; metanotum with flange mesally; propodeum areolate-rugose, setiferous; precoxal sulcus present along entire length of mesopleuron, rugose; posterior mesopleural furrow entirely crenulate; mesopleuron (excluding precoxal sulcus and posterior mesopleural furrow) coriaceous except subalar groove and anterior margin crenulate-rugose, setiferous anteriorly, ventral to precoxal sulcus, and diagonally from subalar area to posteroventral corner near mesocoxa; metapleuron areolate-rugose, setose.

Forewing (Fig. 19): Hyaline; stigma with fairly discrete proximal and distal margins, semielliptical; vein r arising from middle of stigma; with following veins complete and tubular: C+SC+R, 1CUa, 1CUb, 1-1A, 2-1A, 1RS, 1M, (RS+M)a, 1m-cu, 1cu-a, 2CUa, 2cu-a, r, 2RS, and 3RS; M+CU nebulous proximally transitioning to tubular distally; 2M transitioning from tubular proximally to nebulous then spectral distally; vein 3RS evenly curved to wing margin; vein 1cu-a distad vein 1M; vein 1m-cu basad vein 2RS.

Hind wing (Fig. 19): Hyaline; basal and subbasal cells enclosed by tubular veins; R and R1 complete and tubular; RS and 2M nebulous proximally transitioning to spectral distally; m-cu absent.

Metasoma: T1L 4.04–4.21X T1W; subcylindrical; t1 areolate-rugose, dorsal carinae not extending beyond dorsope; t2 coriaceous, t3 coriaceous or smooth, t4–t8 smooth; t2–t3 setiferous, setae in no apparent pattern, t4–t8 setiferous, setae located in posterior half of each tergum but otherwise in no apparent pattern.

Color: Head (excluding mouthparts and antenna) brown, mandible yellow except tooth 2 mostly brown and margins brownish, palpi brownish yellow, antenna with scape yellow and pedicel brownish yellow, flagellum brown; mesosoma brown except propleuron yellowish brown and pronotum yellow to brownish yellow anteriorly and brown posteriorly; pro- and mesothoracic legs yellow, metathoracic leg yellowish brown except trochanter, trochantellus, and tarsus yellow; metasoma brown with t1 darker than other terga.

Host. Unknown.

Material examined. *Holotype male:* Top label (white; typewritten)=U.S.A., "VIRGINIA:Giles Co. [;] Mountain Lake Biol. Station [;] 37°22'25.69"N,80°31'25.41"W". Second label (white; typewritten)="forest along Spring Road [;] 4.viii.-15.viii.2009 [;] R.R. Kula Malaise trap" (USNM). *Paratype:* 1 ♂ same data as holotype (USNM).

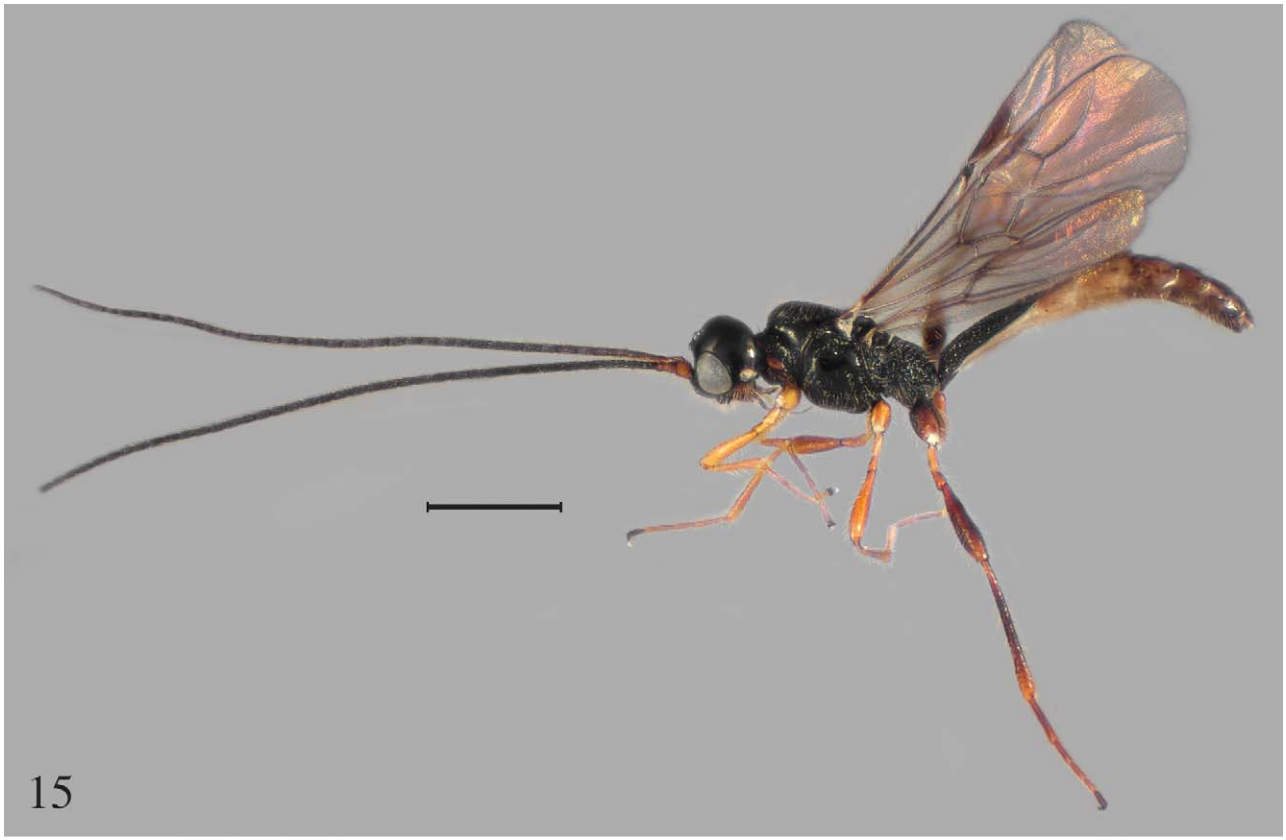
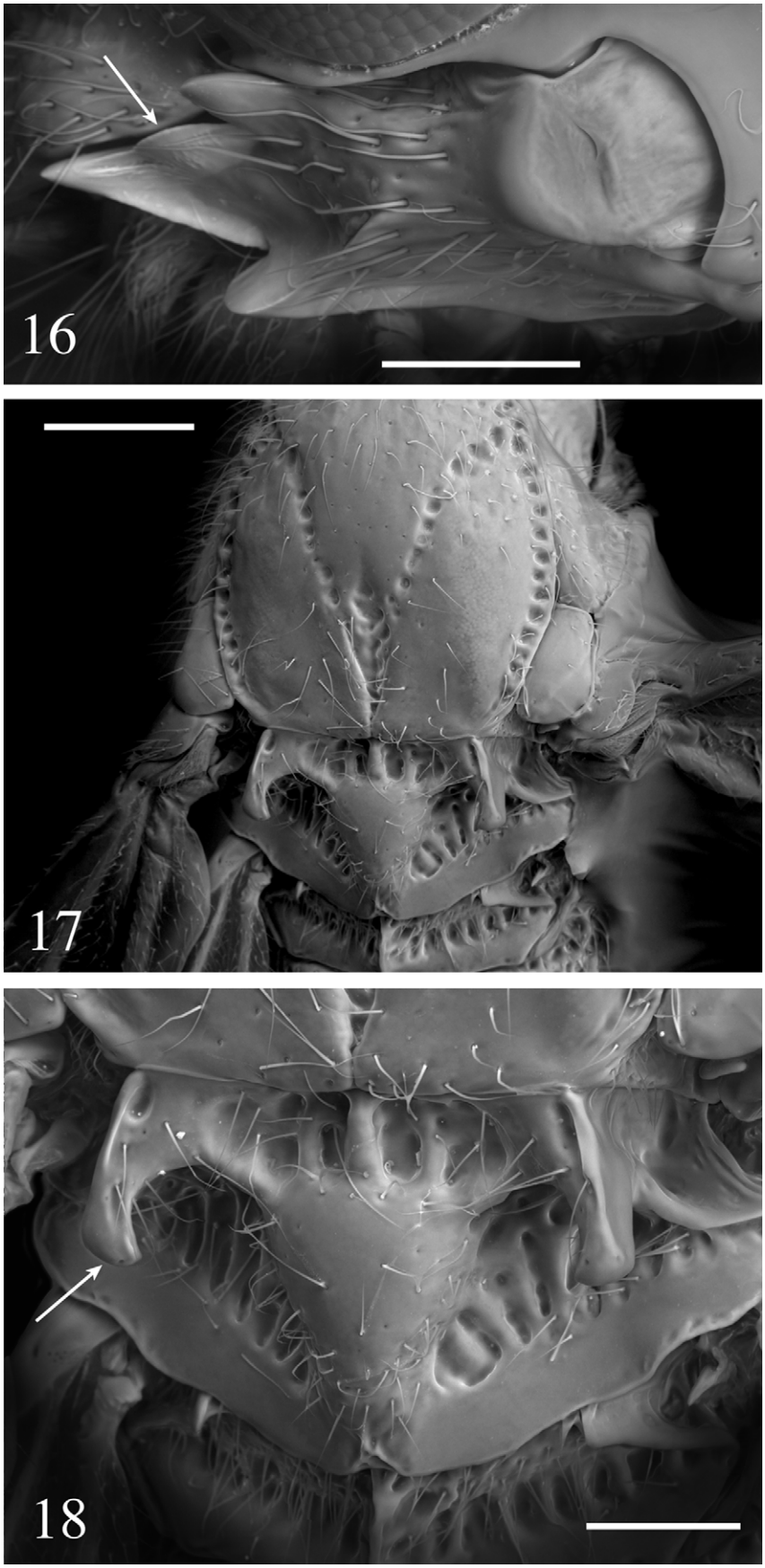


FIGURE 15. *Coelinius wrayi* Kula, new species, holotype, lateral habitus. Scale bar=1.00 mm.



FIGURES 16–18. *Coelinius wrayi* Kula, new species. 16. Mandible, lateral view. Arrow=Additional tooth between tooth 1 and 2. Scale bar=0.10 mm. 17. Mesonotum, dorsal view. Scale bar=0.20 mm. 18. Scutellum, dorsal view. Arrow=axilla. Scale bar=0.10 mm.

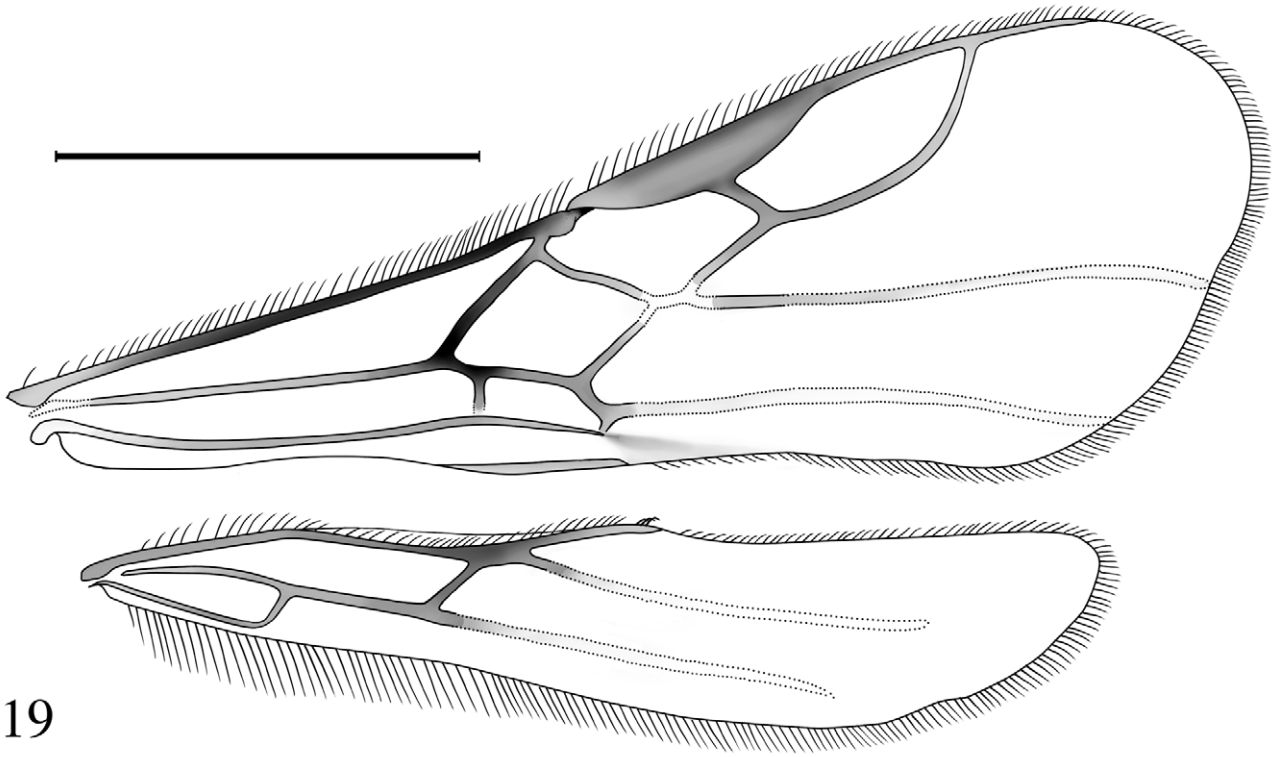


FIGURE 19. *Coelinius wrayi* Kula, new species, wings. Scale bar=1.00 mm.

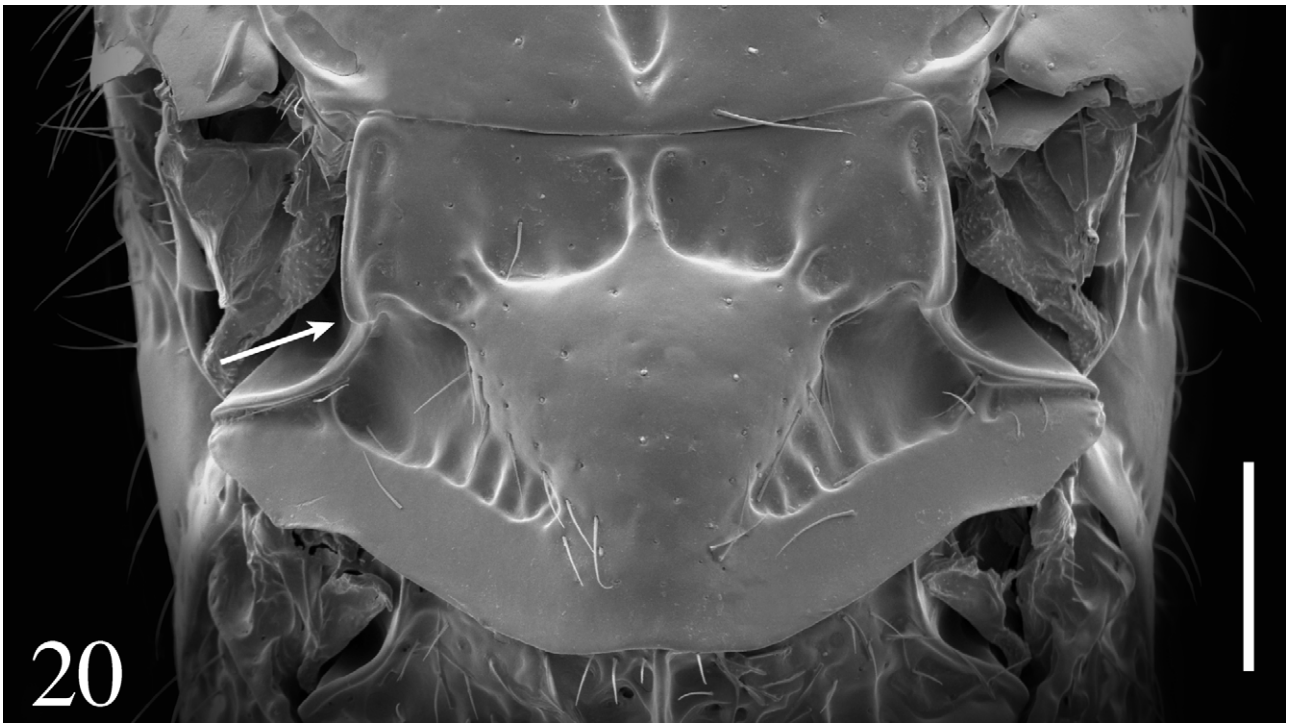


FIGURE 20. *Coelinius hopkinsii* Ashmead, scutellum, dorsal view. Arrow=axilla. Scale bar=0.10 mm.

Etymology. The species is named in honor of Brendan Wray for his assistance to the author as an Intern at the Smithsonian Institution National Museum of Natural History.

Discussion. *Coelinius wrayi* fits *Lepton* Zetterstedt (=*Coelinidea* Viereck) sensu Griffiths (1964). The monophyly of subgenera recognized previously within *Coelinius* sensu lato is questionable except for *Polemochartus* Schulz (Kula 2008). Therefore, *Coelinius wrayi* is not formally assigned to a subgenus at this time.

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Edmund Brodie, III and Eric Nagey, Director and Associate Director of MLBS, respectively, kindly allowed me to collect at MLBS. Mark Larson, formerly Station Manager at MLBS, provided maps and information about MLBS. I appreciate the efforts of Brendan Wray (Intern, Smithsonian Institution, NMNH) and Terry Nuhn (Systematic Entomology Laboratory, USDA-ARS) in dehydrating, mounting, and/or labeling specimens. I am grateful to Andres Garzon-Moreno (Intern, Smithsonian Institution, NMNH) for capturing the scanning electron micrographs. I thank Taina Litwak (Systematic Entomology Laboratory, USDA-ARS) for capturing the lateral habitus images, digitally enhancing all images, and constructing the plates. USDA is an equal opportunity provider and employer.

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