

Digger Wasps of the Genus *Aulacophilus* (Hymenoptera, Sphecidae, Trypoxylini)

A. V. Antropov

Zoological Museum, Moscow State University, Moscow, 103009 Russia

Received March 3, 1998

Abstract—In a review of the Neotropical digger wasp genus *Aulacophilus* F. Smith, three new species are described. *A. carinatus* sp. n. differs from all other known species in coarsely and sparsely carinate postscutellum and lateral parts of mesopleura. *A. chrysotrichus* sp. n. resembles *A. vespoides* F. Smith, differing from the latter in the uniform golden dense pubescence of body, absence of median carina on the dorsal propodeal area and apical aculeolate areola on middle tibiae, and also in completely black antennae. *A. septentrionalis* sp. n. resembles *A. eumenoides* Dücke, differing in well-developed pale pubescence of body and absence of median groove on the dorsal propodeal area. Three previously described species are characterized and a key to *Aulacophilus* species is given. Relations between *Aulacophilus* and allied genera of the tribe Trypoxylini are discussed.

Until recently, three species, reported mostly from S America, were known in the genus *Aulacophilus* F. Smith, 1869. The only brief review of the genus was published by Turner (1916), who provided a key based on original descriptions and examination of holotypes. Unfortunately, Turner's key is unreliable, because the characters used in it (mostly those related to the fore-wing venation) are subject to considerable intraspecific variation and sometimes overlap between species.

This work is based on an examination of the material available in the following collections: The Natural History Museum (London, UK) [BMNH]; California Academy of Sciences (San Francisco, USA) [CAS]; Naturhistorisches Museum Wien, 2. Zoologische Abteilung (Wien, Austria) [NHMW]; Florida State Collection of Arthropods (Gainesville, Florida, USA) [FSCA]; U.S. National Museum of Natural History (Washington, D.C., US) [USNM]; and Zoological Museum of the Moscow State University [ZMUM]. I additionally examined some characters related to the structure of thorax, legs, and propodeum, which were not used by the authors of original descriptions.

It appears expedient, in addition to making a diagnosis of the genus and describing the new species, to characterize the 3 known species, since their descriptions are, in my opinion, insufficient in view of the present-day knowledge.

The following abbreviations are used in this work: *HH* : *HW* : *HL* is the ratio of maximum height of head to its width (in anterior view) and its length (in lateral

view); *IOD*, the ratio of minimum distance between the inner eye orbits at the level of vertex to those measured at the level of apical frontal orbits and at the level of clypeus; *OOD* : *Od* : *POD*, the ratio of distance between the inner eye orbit on vertex and lateral ocellus to diameter of lateral ocellus and to distance between lateral ocelli; *A3* : *AW*, the ratio of the maximum length of antennal segment III to its maximum width at apex; M^{2-1} : M^{2-2} , the ratio of length of the proximal posterior border section of 2nd submarginal cell to the length of its distal section; *PL* : *BL*, the length ratio of the petiolar part of abdominal tergite I (to the end of median groove) to its dilated part in dorsal view; *PW* : *BW*, the ratio of the minimum width of the petiolar part of abdominal tergite I to the maximum width of its dilated part; *d*, the distance between punctures; \emptyset , the diameter of punctures. The number of hind-wing hooks is given in groups, counting from the wing base; when positioned close to the proximal group, the intercalary hook is shown in parentheses together with this group. The ratios were determined at 50× magnification.

GENUS *AULACOPHILUS* F. SMITH, 1869

($\alpha\upsilon\lambda\alpha\varsigma$ + $\phi\iota\lambda\omicron\varsigma$, Greek for groove + adherent)

Aulacophilus F. Smith, 1869: 305, ♀. Type species: *Aulacophilus vespoides* F. Smith, 1869, by monotypy.

Diagnosis. Inner eye orbits only slightly, if at all, diverging ventrally and dorsally; frons convex, ventrally with or without short median carina, without transverse carina between antennal pits. Antennal

segments unmodified, becoming shorter toward apex of antenna. Clypeus strongly convex; its apical protrusion short, lamellar, tridentate in male and straight, convex, or concave in female; supraclypeal sclerite obsolete. Labrum broad-oval in anterior view, with small acute median incision; mandibles without ventral incision, sometimes with weak ventral angle. Occipital carina open, not extending to hypostomal one. Pronotal ridge rounded-transverse, without transverse carina and lateral angles, more or less clearly limbate posteriorly. Mesonotum rounded-convex, slightly raised above the level of pronotum, with developed, ventrally smoothed episternal suture; omaulus, sub-omaulus, hypersternaulus, and acetabular carina lacking. Mesopleura ventroanteriorly with lamellar margin; metapleura almost parallel-sided; metapleural carina not dilated. Propodeum moderately oval-elongate, with flatly truncate apex and deep preapical depression, delimited by sharp ridges and divided by median carina; dorsal field not clearly outlined, with or without median carina or groove; lateral carinae absent. Abdomen with more or less long petiole, formed by narrow tergite I with well-developed median groove, and sternite I, which almost encloses tergite I laterally. Tergite I with spherically swollen apex; tergite II with strongly narrowed base; tergite IV in female rounded-conical in dorsal view, without pygidial field or carina. Middle coxae separated; hind coxae approximate, with complete inner and incomplete outer carinae; in female, without ventral organs. Legs in both sexes unmodified; apices of middle tibiae naked or with densely aculeolate area; tarsal segments 2-4 ventrally bearing apical plantulae; arolia rather large; claws simple. Wings: apex of marginal cell pointed, lying at anterior wing margin; 2 submarginal and 2 discoidal cells present; 1st recurrent vein weakly antefurcal, interstitial, or weakly postfurcal; 2nd recurrent vein entering 2nd submarginal cell in its basal half; *cu-a* antefurcal. Anterior $\frac{1}{3}$ - $\frac{1}{2}$ of fore wing infusate. Hind wing bearing 2 groups of 4-6 (usually 5) hooks and single intercalary hook between them. Body sculpture in all species uniform: sides of mesopleura regularly, more or less densely and coarsely longitudinally-plicate; frons, pronotum, mesopleura anterior to episternal suture and ventrally, and abdominal tergites II-VI dull, uniformly and densely punctate; vertex, mesonotum, scutellum, postscutellum, and swollen part of abdominal tergite I also densely punctate, usually with smooth intervals; abdominal sternites II-V shining, with sparse fine punctation. Abdominal sternite VIII in male strongly com-

pressed laterally near apex, with shallow apical incision and long sparse setae on lateral parts. Male genitalia: parameres not bifid apically, with inner spine; valvae of penis unmodified, hook-shaped; volsellae large, swollen, narrowed apically. Species of moderate size, with body length 9.0-11.0 mm.

Distribution. Species of the genus *Aulacophilus* occur exclusively in the New World tropical area, being found from Central Mexico to Central Brazil and Bolivia (Fig. 1). Being represented in collections only by occasional specimens, species of this genus appear to be rare.

Biology. The biological data on *Aulacophilus* are very scarce, being restricted to a single report from Ecuador (Cooper, 1986). Cooper observed a female, identified as *A. eumenoides* Dücke, entering a dead hollow stem of a herbaceous plant, lying on the ground under a pendent rock. The cavity 5 mm in diameter and 50 mm long contained a single cell with a clay cover, 20 mm above the cavity bottom. The nest had neither a clay-lined bottom nor transverse partitions. The cell contained 53 juvenile spiders 1.0-2.5 mm long, belonging to 3 species of the family Thomisidae. Eggs 1.6 mm long were attached ventrally to the abdomens of two largest spiders. This is not typical of the representatives of the tribe Trypoxylini, which always lay only one egg in each filled cell, and probably resulted from an "error" of the female (provided that one of the eggs did not belong to some nest parasite). In addition, the nest appeared to be incomplete, since its clay cover was positioned very deep in the cavity and was very thin, according to Cooper's description (i.e., the cover could actually represent either the first inner partition of a linear nest, or an incomplete outer cover). Unfortunately, Cooper gave no data on the structure of preimaginal stages or cocoons.

Systematics. The problem of relationships between *Aulacophilus* and other genera of the tribe Trypoxylini was partly considered by Bohart and Menke (1976) in their revision of sphecoid genera of the World fauna, and by Lomholdt (1980) in a description of the Oriental *Aulacophilinus rennellensis*.

Bohart and Menke considered *Aulacophilus* to be separated from other genera of the tribe, whereas Lomholdt believed *Aulacophilus* and *Aulacophilinus* to form a monophyletic group closely related to *Trypoxylon* Latreille and *Pisoxylon* Menke. However, the characters supporting such a pattern of relationships

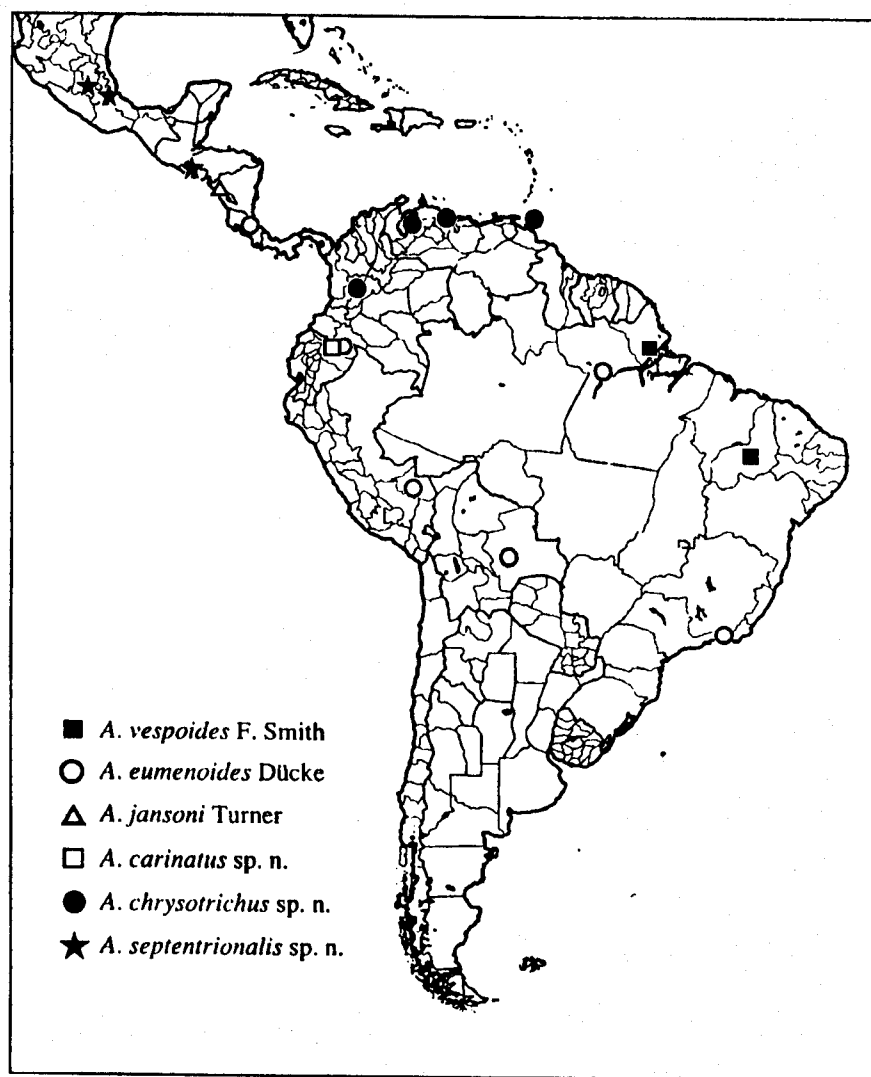


Fig. 1. Distribution of species of the genus *Aulacophilus*.

were misdetermined (two submarginal cells, with *Trypoxylon* and *Pisoxylon* characterized by a single cell), or did not represent autapomorphies (absence of ventral incision of mandibles and pygidial field).

In my opinion, *Aulacophilus* is the most closely related to *Pison jurine*. This is indicated by such characters as: shape of labrum; unmodified mandibles (weak ventral angle observed in *A. vespoides* F. Smith is also found in a number of *Pison* species, e.g., in the Oriental *P. regale* F. Smith, 1852); strongly convex and rather short clypeus; absence of supraclypeus; hook-like valvae of penis without preapical hooks or ventral denticles; parameres not divided into apical lobes; large volsellae; and fore wings with 2 submarginal cells. At the same time, there is no reason to relate *Aulacophilus* and *Aulacophilinus rennellensis*,

the latter being characterized by mandibles noticeably dilated toward apex; clypeus weakly convex and triangularly elongate; valvae of penis not hook-shaped, with numerous ventral denticles; parameres with separated basal lobe; and small volsellae. In addition, the fore-wing submarginal cell complexes evidently have different origins in *Aulacophilus* and *Aulacophilinus rennellensis*. In *Aulacophilus*, the outer cell is formed by merged distal pair of submarginal cells: 2nd (1RS) and 3rd (2RS), following the reduction of the outer vein of the former (1r-m). This is indicated by the interstitial or weakly ante- or postfurcal position of the 1st recurrent vein. In *Aulacophilinus rennellensis*, the submarginal complex of cells is formed through diminution and complete reduction of the entire 2nd submarginal cell, corresponding to the strongly antefurcal position of the 1st recurrent vein.

Concerning the similar structure of abdominal segment I in *Aulacophilus* and *Aulacophilinus rennellsensis*, it should be noted, firstly, that Bohart and Menke (1976) quite correctly considered a mistake Turner's (1916) statement that the petiole of *Aulacophilinus rennellsensis* consists only of sternite I. Secondly, the elongation of abdominal segment I is a distinct trend within the tribe Trypoxylini. However, a long petiole (but without a spherically swollen apical part of segment I and with a less constricted base of segment II) is also characteristic of the Oriental *P. oblitteratum* F. Smith, 1857, *P. pistillum* Menke, 1988, and *P. woji* Menke, 1988, Australian *P. difficile* Turner, 1908 and *P. icarioides* Turner, 1908, and also of representatives of many groups of species within the genus *Trypoxylon*. The similarity in abdomen structure between *Aulacophilus* and *Aulacophilinus rennellsensis* is an evident case of parallelism. I have found no autapomorphies supporting the separate position of *Aulacophilinus rennellsensis* among the genera of Trypoxylini; in my opinion, this species should be considered a specialized representative of the genus *Pison*.

At the same time, the genus *Aulacophilus* has the following autapomorphies: regularly and densely carinate sides of mesopleura; preapical propodeal depression delimited by sharp carinae; and flatly truncate apex of propodeum.

Aulacophilus vespoides F. Smith, 1869

Aulacophilus vespoides F. Smith, 1869: 305, Brazil [BMNH], holotype examined.

Aulacophilus vespoides F. Smith: Turner, 1916: 592, Brazil.

Aulacophilus vespoides F. Smith: Bohart, Menke, 1976: 338, Brazil, Peru [the latter actually belongs to *A. eumenoides* Dücke].

Material. 1 ♀: "Brasília, Capta (D. Swainson)" [BMNH, holotype no. 21.525]; 1 ♀: "Macapá, 15.XI.1990 (Dücke)" [NHMW]; 1 ♀: "Brasil: PI: Canto do Buriti. 18–22.XI.1991 (S.T.P. Amarante, C.F. Martins)" [CAS].

Description. Female. Median clypeal lobe with apical protrusion, angular medially and laterally (Fig. 2, 1); frons ventrally with low median tubercle; dorsal part of occipital carina narrower than $\frac{1}{3}$ the diameter of lateral ocellus. Mandibles with ventral angle in basal third. $HH : HW : HL = 103 : 126 : 62$; $IOD = 50 : 97 : 50$; $OOD : Od : POD = 13 : 7 : 10$; all ocelli of the same size; $A3 : AW = 16 : 7$.

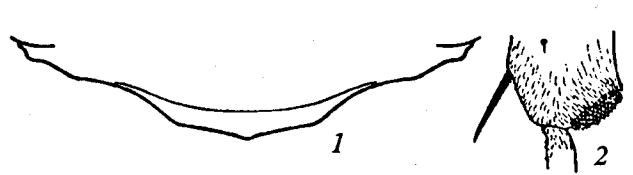


Fig. 2. *Aulacophilus vespoides* F. Smith, female: (1) anterior margin of clypeus, (2) apex of middle tibia.

Pronotal ridge without median depression, narrowly limbate posterolaterally. Admedian lines obsolete. Scutellum flat, without median carina. Outer surface of middle tibiae with apical aculeolate field (Fig. 2, 2). $M^{2-1} : M^{2-2} = 13 : 37$; 1st recurrent vein interstitial or weakly postfurcal; hind-wing hooks in groups of $5+(1+6)$, $5+(1+5)$, or $5+1+5$.

Dorsal field of propodeum open, with narrow median carina; posterior side of propodeum with narrow and shallow groove, ventrolaterally delimited by distinct carinae, with short preapical depression.

Petiole abruptly dilating into posterior part of abdomen; $PL : BL = 70 : 46$; $PW : BW = 18 : 42$; abdominal sternite I strongly flattened, with oval apical depression.

Middle part of clypeus shining between punctures; frons densely punctate ($d \leq \emptyset$); vertex more sparsely punctate, shining; pronotum with the same sculpture as frons; mesonotum and scutellum shining, densely punctate ($d \leq \emptyset$), with punctures merged into longitudinal striae. Postscutellum raised, without longitudinal plication and with very fine punctation, concealed by pubescence. Mesopleura rather finely and densely carinate (> 12 longitudinal carinae ventrally to scrobe), very finely punctate ($d \geq \emptyset$) ventrally and slightly more coarsely punctate ($d \approx \emptyset$) anterior to episternal suture. Inner dorsal surface of hind coxae obliquely carinate; dorsal propodeal field with punctation denser and finer than that of vertex ($d \approx \emptyset$), with shining intervals mostly concealed by pubescence. Sides of propodeum more sparsely punctate ($d \geq \emptyset$), with dense vertical rugosity dorsally and posteriorly. Dilated part of abdominal tergite I densely and finely punctate ($d \approx \emptyset$), with smooth intervals; other tergites with as dense but noticeably finer punctation, semi-dull; sternites (except for smooth petiole) more sparsely and unevenly punctate, mainly shining.

Pubescence well developed. Clypeus, ventral part of frons laterally and between antennae, mesopleura ventrally and anterior to episternal suture, and sides and posterior part of propodeum, all with silver hairs.

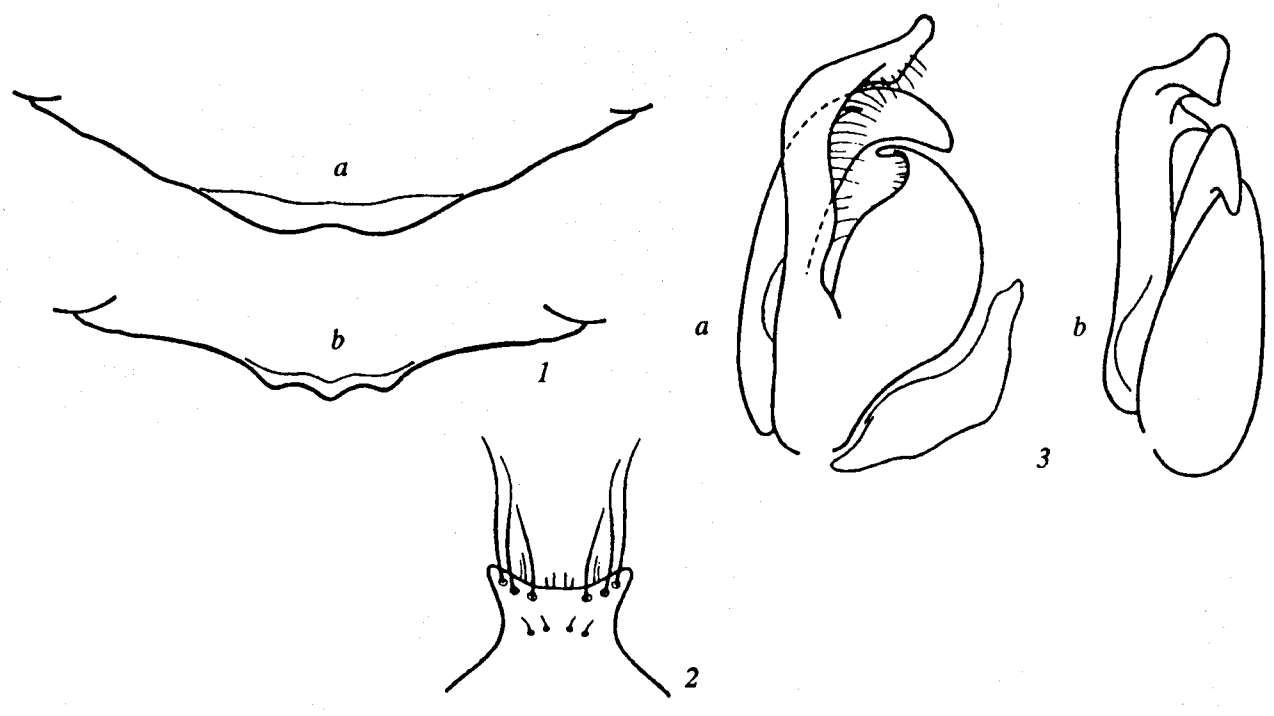


Fig. 3. *Aulacophilus eumenoides* Dücke [(1a) female; (1b, 2, 3) male]. (1) Anterior margin of clypeus; (2) apex of abdominal sternite VIII; (3) genitalia: (a) lateral (left side), (b) ventrolateral (left side) view.

Middle part of frons, frontal orbits, pronotal ridge and humeri posteriorly, sides and posterior half of scutellum, almost entire postscutellum, dorsal propodeal field basally and medially, and apical bands of abdominal tergites I–V, all with dense golden pubescence.

Body mostly black. Clypeal protrusion, most part of mandibles, antennal segments I–III and basal half of IV, humeri posteriorly, tegulae, apex of propodeum, and translucent margins of abdominal segments, all reddish brown. Legs mostly brown.

Male unknown.

Differential diagnosis. *A. vespoides* is most similar to *A. chrysotrichus* sp. n. in golden pubescence of body, pubescent dorsal field of propodeum, mostly reddish brown mandibles, and pale humeri. It differs from the latter (females) in the following: base of antennae and most part of humeri reddish brown; all ocelli of equal size; $OOD > 1.5 Od$; ventral angle of mandibles in basal third; densely aculeolate apical field on middle tibiae; propodeum with silver pubescence (except for dorsal field), with densely striate lateral parts, separated by short but distinct carinae from its posterior part, and with dorsal field divided by narrow median carina; inner dorsal surface of hind coxae obliquely carinate; apex of abdominal sternite I with clear oval depression.

Aulacophilus eumenoides Dücke, 1904

Aulacophilus eumenoides Dücke, 1904: 97, ♀, Brazil.

Aulacophilus eumenoides Dücke: Turner, 1916: 591, Brazil.

Aulacophilus eumenoides Dücke: Bohart, Menke, 1976: 338, Brazil, Trinidad [the latter actually belongs to *A. chrysotrichus* sp. n.].

Material. 1 ♀: "Bolivia: Santa Cruz Saavedra, Estacion Exp. General, 21.I.1980 (L. Stange), on *Baccharis* sp." [FSCA]; 1 ♂: "Obidos, 21.XI.1907 (Dücke)" [NHMW]; 1 ♀: "Turrialba. CR4964," 1 ♀: "RdJaneiro. Brazil, 1.1939 (YelFevServ, MESBrazil, R.C. Shannon)," 1 ♀: "EQUADOR: N.-P., Santa Cecilia, 25–31.III.1969 (P. & P. Spangler)" [USNM]; 1 ♀: "Peru: Madre de Dios Province: Albergue Lodge on Rio Madre de Dios 15 km E of Puerto Maldonado, 20.VI.1983 (G. Hunter)" [CAS].

Description. Female. Median clypeal lobe with oval lamellar apical protrusion, concave in the middle (Fig. 3, 1a); frons ventrally with short median carina; width of occipital carina dorsally almost half the diameter of lateral ocellus; $HH : HW : HL = 107 : 134 : 65$; $IOD = 42 : 98 : 51$; $OOD : Od : POD = 8 : 8 : 9$; mandibles without ventral angle; $A3 : AW = 19 : 7$.

Pronotal ridge clearly limbate posteriorly, without median depression. Admedian lines almost obsolete. Base of scutellum with shining median carina. Middle tibiae having neither apical aculeolate field nor shining areola. $M^{2-1} : M^{2-2} = 14 : 31$; 1st recurrent vein antefurcal; hind-wing hooks in groups of 5+1+5.

Dorsal field of propodeum differing only in sculpture; median groove present; posterior part of propodeum with deep median groove, ventrolaterally delimited by short carinae. Preapical depression of propodeum much shorter than maximum width of hind femur.

Petiole gradually continuing into dilated posterior part of abdomen; $PL : BL = 100 : 60$; $PW : BW = 15 : 43$; abdominal sternite I convex along its entire length, without apical depression.

Frons and vertex dull, densely punctate ($d \leq \emptyset$); pronotal ridge and mesonotum densely punctate ($d < \emptyset$); with punctures on lateral and posterior parts of mesonotum merged into longitudinal grooves. Punctuation of scutellum very dense basally ($d < \emptyset$) and sparser in the middle ($d \approx \emptyset$), with punctures merged into longitudinal grooves and shining intervals between punctures. Postscutellum weakly carinate laterally, very densely punctate ($d < \emptyset$), with shining intervals between punctures. Sides of mesopleura finely and densely carinate (13–15 longitudinal carinae below scrobe). Dorsal propodeal field naked, densely punctate ($d < \emptyset$), with micro-alveolate sculpture; laterally micro-alveolate without punctuation, dull. Posterior part of propodeum micro-alveolate, transversely carinate; sides of propodeum micro-alveolate dorsally, micro-alveolate and more or less densely punctate ventrally ($d \geq \emptyset$). Dorsal surface of abdominal tergite I with very fine and dense transverse striation; its dilated part dull, finely and densely punctate ($d < \emptyset$); tergites II–V dull, with even finer and denser punctuation; sternites finely but sparsely ($d \approx 1.5-2\emptyset$) punctate, shining.

Pubescence poorly developed. Clypeus, ventral part of frons along inner eye orbits to frontal orbits and dorsally to antennal pits in the middle, sides of propodeum near bases of hind coxae, and apex of dilated part of abdominal tergite I (mainly laterally), all with more or less dense silver pubescence. Rest of body with very short, recumbent, mostly brown pubescence, not concealing the sculpture.

Body mostly black. Apical $1/2-2/3$ of mandibles, apex of propodeum, lateral margins of abdominal ter-

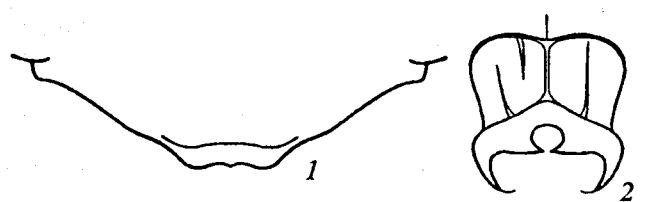


Fig. 4. *Aulacophilus jansonii* Turner, female: (1) anterior margin of clypeus, (2) apical part of propodeum in posterior view.

gite I, and base of tergite II reddish brown. Middle and hind femora more or less brown.

Male basically resembling female, differing in tridentate apical protrusion of median clypeal lobe (Fig. 3, 1b), somewhat smaller body, and different proportions: $HH : HW : HL = 106 : 90 : 51$; $IOD = 37 : 81 : 42$; $OOD : Od : POD = 7 : 7 : 8$; $A3 : AW = 15 : 6$; $PL : BL = 80 : 50$; $PW : BW = 14 : 37$. Abdominal sternite VIII (Fig. 3, 2) having rather sharp lateral parts bearing long setae. Parameres dilated apically (Fig. 3, 3), angularly protruding inward, with thick preapical inner spine; volsellae with long and narrowed apical part.

Differential diagnosis. *A. eumenoides* resembles *A. septentrionalis* sp. n. in mostly black mandibles, entirely black humeri, and propodeum with short preapical depression and glabrous, not outlined dorsal field. It differs from the latter in brown pubescence of body (except for clypeus and apical part of propodeum), $OOD = Od < POD$, and narrow median groove on dorsal field of propodeum.

Aulacophilus jansonii Turner, 1916

Aulacophilus jansonii Turner, 1916: 592. ♀, Nicaragua [BMNH], holotype examined.

Aulacophilus jansonii Turner: Bohart, Menke, 1976: 338, from Mexico [belongs to *A. septentrionalis* sp. n.] to Nicaragua.

Material. 1 ♀: "Nicaragua, Chontales (Janson)" [BMNH], holotype no. 21.526.

Description. Female. Median clypeal lobe with apical protrusion, rounded laterally and concave in the middle, bearing small apical denticle (Fig. 4, 1); frons with distinct median groove and small triangular protrusion near antennal pits, and with clear small pit almost in the middle. Width of occipital carina dorsally about $1/3$ the diameter of lateral ocellus; $HH : HW : HL = 107 : 126 : 56$; $IOD = 40 : 96 : 50$; $OOD : Od : POD = 9 : 8 : 8$; mandibles without ventral angles; $A3 : AW = 20 : 6$.

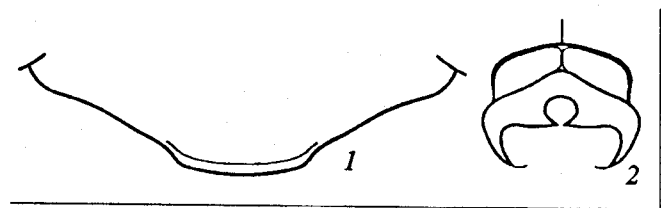


Fig. 5. *Aulacophilus carinatus* sp. n., female: (1) anterior margin of clypeus; (2) apical part of propodeum in posterior view.

Pronotal ridge with smoothed median tubercle and thin concave posterior edging, best visible medially and hardly extending to humeri. Admedian lines of mesonotum thin, extending as far as $\frac{1}{3}$ of its length. Anterior half of scutellum with median carina. Middle tibiae without apical aculeolate field. $M^{2-1} : M^{2-2} = 14 : 30$; 1st recurrent vein weakly postfurcal; hind-wing hooks in groups of 5+1+5 or 5+1+6.

Dorsal field of propodeum differing only in sculpture anteriorly and clearly raised above lateral parts posteriorly; without median carina, and with narrow median groove, somewhat dilated in posterior third. Posterior part of propodeum with deep median groove. Preapical depression of propodeum not shorter than maximum width of hind femur, with 1–2 thin carinae in each half (Fig. 4, 2).

Petiole gradually continuing into dilated posterior part of abdomen; $PL : BL = 80 : 60$; $PW : BW = 15 : 45$; abdominal sternite I convex along nearly its entire length, slightly flattened near apex.

Frons and vertex dull, densely punctate ($d < \emptyset$); pronotum densely punctate ($d < \emptyset$), laterally along posterior margin with punctures merged into grooves. Mesonotum and scutellum with as dense but coarser punctation, with shining intervals in the middle and posteriorly; posterolaterally with punctures merged into longitudinal grooves; postscutellum finely punctate, with indistinct longitudinal carinae laterally. Sides of mesopleura densely carinate (15–16 carinae ventrally to scrobe), shining; mesopleura anterior to episternal suture and ventrally with the same punctation as pronotum, semi-dull. Dorsal part of metapleura with fine oblique-longitudinal rugosity. Dorsal propodeal field distinguishable by dense ($d < \emptyset$) punctation with shining intervals; posteriorly with smoothed transverse rugosity. Sides of propodeum microalveolate, transversely carinate anteriorly and posteriorly; posterior part of propodeum finely transversely-carinate. Swollen part of abdominal tergite I finely and

densely punctate ($d \leq \emptyset$), shining; other tergites with as dense but finer punctation, dull. Abdominal sternite I shining; sternites II–V with sparser punctation than that of tergites ($d \geq 1.5-2\emptyset$).

Pubescence mostly dark, short, and recumbent. Clypeus and ventral part of frons densely covered with silver hairs; abdominal tergite I apically and sternite I basally with similar, but slightly golden-tinted hairs.

Body mostly black. Apical margin of propodeum, petiole, and apical rims of abdominal segments I–V brown.

Male unknown.

Differential diagnosis. *Aulacophilus jansoni* clearly differs from all the known congeners in the preapical depression of propodeum, which is no shorter than the maximum width of the hind femur, with each half divided by 1–2 longitudinal carinae. In addition, unlike other species, *A. jansoni* has the dorsal propodeal field (especially its clearly raised posterior part) noticeably separated from sides of propodeum.

Aulacophilus carinatus Antropov, sp. n.

Material. Holotype, ♀: "EQUADOR, Napo Prov., Limoncocha, 5.VI.1977 (Dave L. Vincent)" [USNM].

Description. Female. Median clypeal lobe with apical protrusion, slightly rounded anteriorly and delimited by clear lateral angles (Fig. 5, 1); frons with weak median depression in the middle; vertex transversely depressed. $HH : HW : HL = 91 : 114 : 49$; $IOD = 45 : 87 : 43$; $OOD : Od : POD = 11 : 7 : 6$. Occipital carina dorsally narrower than $\frac{1}{3}$ the diameter of lateral ocellus; mandibles without ventral angles; $A3 : AW = 15 : 6$.

Pronotal ridge with small median depression posteriorly; base of mesonotum with short admedian lines; scutellum flat. Outer apical surface of middle tibiae with aculeolate field, divided by narrow longitudinal carina. $M^{2-1} : M^{2-2} = 12 : 23$; 1st recurrent vein interstitial; hind-wing hooks in groups of 4+1+5.

Dorsal field not separated from rest of propodeum and distinguishable only by denser and coarse sculpture, with distinct median carina. Preapical depression of propodeum shorter than maximum width of hind femur (Fig. 5, 2); posterior part of propodeum delimited ventrolaterally by short and coarse carina, with deep median groove.

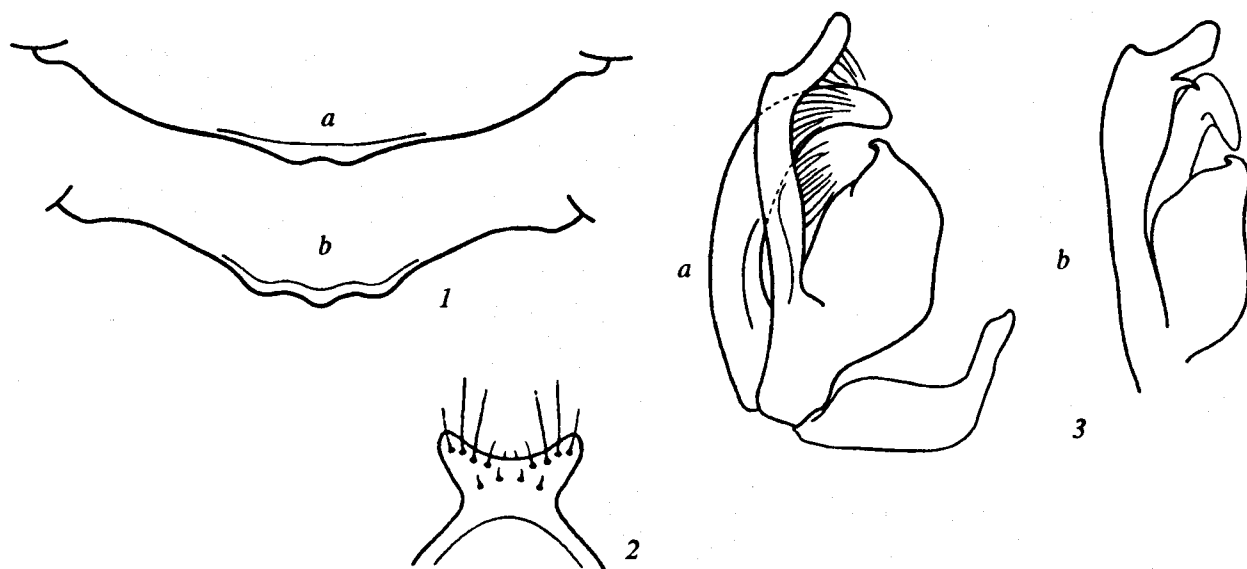


Fig. 6. *Aulacophilus chrysotrichus* sp. n. [(1a) female; (1b, 2, 3) male]. (1) Anterior margin of clypeus; (2) apex of abdominal sternite VIII; (3) genitalia, (a) lateral (left side), (b) ventrolateral (left side) view.

Petiole gradually continuing into dilated posterior part of abdomen; $PL : BL = 80 : 40$; $PW : BW = 12 : 30$; abdominal sternite I smooth, flattened near apex, with rounded apical convexity.

Clypeus, frons, vertex, and pronotum densely punctate ($d < \emptyset$); mesonotum and scutellum with as dense but coarser punctation, with punctures merging into longitudinal grooves in posterior part of scutellum. Postscutellum shining, with coarse longitudinal carinae. Mesopleura coarsely and sparsely carinate (no more than 9–10 longitudinal carinae ventrally to scrobe), shining; very finely and densely punctate anterior to episternal suture and ventrally. Dorsal propodeal field distinguishable by uneven punctation and irregular radial rugosity against dull micro-alveolate background; micro-alveolate laterally. Sides of propodeum micro-alveolate, with sparse transverse carinae anteriorly and posteriorly; posterior part of propodeum micro-alveolate, with weak plication, curved upward. Swollen part of abdominal tergite I finely and densely punctate ($d \leq \emptyset$), shining; other tergites with as dense but finer punctation, dull. Abdominal sternite I shining; sternites II–V with sparser punctation than that of tergites ($d \geq 1.5\emptyset$); sternite VI additionally bears occasional punctures of greater size.

Pubescence of body weak, mostly sparse. Clypeus, ventral part of frons (including frontal orbits), and apical part of propodeum covered with dense silver

hairs. Temples, ventral part of mesopleura, and abdominal tergites (except basal one) covered with minute recumbent silver hairs; vertex, pronotal ridge, mesonotum, scutellum, and mesopleura anterior to episternal suture with longer brown hairs; apex of abdominal tergite I almost naked.

Body mostly black. Apical protrusion of clypeus, apical half of mandibles, entire antennal segments II–V and ventral parts of segments VI–IX reddish brown; scape, tegulae, middle and hind femora (partly), and apical margin of propodeum red-brown.

Male unknown.

Differential diagnosis. *Aulacophilus carinatus* sp. n. clearly differs from all the known congeners in considerably coarser and sparser longitudinal plication on sides of mesopleura and in coarsely longitudinal-carinate postscutellum.

Etymology. The species name reflects the very coarse lateral carination of mesopleura (*carinatus*, Latin for carinate).

Aulacophilus chrysotrichus Antropov, sp. n.

Material. Holotype, ♀: "COLOMBIA: Tol. Armero, malaise trap, 30.I–5.II.1977 (E.L. Peyton)" [USNM]. Paratypes: 1 ♀, 1 ♂: "VENESUELA: Mérida Puente Real 7 km W of Lagunillas, 16.VII.1991 (C. Porter, L. Stange)," 1 ♂: "VENESUELA: Mérida

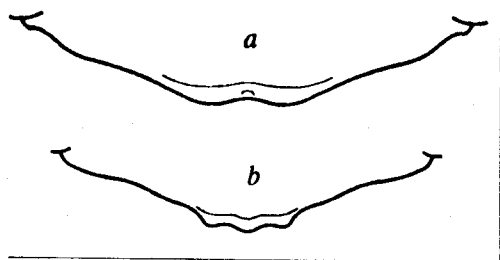


Fig. 7. *Aulacophilus septentrionalis* sp. n., anterior margin of clypeus: (a) female, (b) male.

3 km S of Lagunillas, 20.VII.1988 (C. Porter, L. Stange)" [FSCA]; 1 ♀: "COLOMBIA: Tol. Armero, malaise trap, 30.I–5.II.1977 (E.L. Peyton)" [ZMUM]; 2 ♀: "COLOMBIA: Tol. Armero, malaise trap, 26–30.I.1977 (Peyton & Suarez)," 1 ♂: "Venezuela, Carabobo, Los Guayos, 450 m, 12.XII.1981 (J.L. Garcia), en flores de hierbs de Boca Euphorbia sp." [USNM].

Description. Female. Median clypeal lobe with apical protrusion, rounded laterally and clearly concave medially (Fig. 6, 1a); frons ventrally with short median carina, shining tubercle above it, and smoothed punctate groove running from tubercle to median ocellus. $HH : HW : HL = 100 : 124 : 52$; $IOD = 37 : 91 : 48$; $OOD : Od : POD = 8 : 8 : 7$. Occipital carina dorsally no wider than $1/3$ the diameter of lateral ocellus; mandibles without ventral angle; $A3 : AW = 18 : 7$.

Pronotal ridge without median depression or tubercle, with narrow posterior edging, almost obsolete medially. Mesonotum without admedian lines; scutellum flat, without median carina. Middle tibiae without apical aculeolate field, but with smooth area positioned between short and stout anterior spine and a pair of finer posterior ones. $M^{2-1} : M^{2-2} = 12 : 25$; 1st recurrent vein weakly postfurcal; hind-wing hooks in groups of 4+(1+5) or 5+(1+5).

Dorsal field of propodeum not outlined, with wide (almost equal to diameter of anterior ocellus) and shallow median depression dilated posteriad. Posterior part of propodeum not delimited by ventrolateral carinae, with narrow and shallow median groove. Preapical depression of propodeum shorter than maximum width of hind femur.

Petiole gradually continuing into dilated posterior part of tergite I; $PL : BL = 77 : 52$; $PW : BW = 15 : 40$. Abdominal sternite I convex basally and apically and flattened in the middle, without apical depression.

Frons dull ($d < \emptyset$); vertex somewhat less densely punctate, with smooth intervals; punctation of pronotum finer than that of frons, concealed by dense pubescence. Mesonotum densely punctate ($d \approx \emptyset$), with punctures merging into longitudinal grooves, separated by shining carinae; scutellum with similar but finer sculpture. Postscutellum convex, without longitudinal plication, with very fine and indistinct punctation, obscured by dense pubescence. Mesopleura anterior to episternal suture and ventrally with the same sculpture as on postscutellum; laterally with 13–14 rather fine longitudinal carinae below scrobe. Inner dorsal surface of hind coxae finely punctate. Dorsal field and sides of propodeum shining, densely punctate, without oblique striation, mostly concealed by dense pubescence. Abdominal tergite I with indistinct transverse rugosity and sparse, fine, and irregular punctation; its dilated part finely, uniformly, and densely punctate ($d \approx \emptyset$), with shining intervals; tergites II–VI with similar but finer punctation, dull; sternites shining, with sparser ($d \approx 1.5\text{--}3\emptyset$) punctation, especially in the middle.

Pubescence of body well developed. Clypeus, ventral part of frons to frontal orbits, and mesothorax ventrally covered with dense silver hairs (with slight golden tint on frontal orbits). Entire pronotal ridge, humeri posteriorly, mesopleura anterior to episternal suture, scutellum laterally, entire postscutellum, propodeum (except for sides in anterior half), distal end of median groove of petiole, abdominal tergite I apically, tergite II basally, and apical rims of tergites II–V, all covered with dense golden hairs.

Body mostly black. Apical $1/2\text{--}2/3$ of mandibles, small ventral spots on antennal segments I–VIII, humeri posteriorly, tegulae, apex of propodeum, abdominal tergite I basally and along lateral margins, and tergite II basally, all red-brown. Tarsi, tibiae, partly fore and middle femora, and apical margins of abdominal segments II–V brown.

Male. In general resembling female, differing in tridentate apical protrusion of median clypeal lobe (Fig. 7, 1b), somewhat smaller body, and proportions: $HH : HW : HL = 88 : 77 : 50$; $IOD = 35 : 73 : 36$; $OOD : Od : POD = 8 : 5 : 8$; $A3 : AW = 12 : 5$; $PL : BL = 67 : 35$; $PW : BW = 10 : 31$. Abdominal sternite VIII (Fig. 6, 2) with rather wide lateral parts, bearing moderately long setae. Parameres not dilated apically (Fig. 6, 3), with outer preapical angular protrusion and fine inner spine; volsellae with short and narrowed apical part.

Variability in both sexes is mostly manifested in proportions of petiolar and dilated parts of abdominal tergite I ($PL : BL = 1.55-1.91$; $PW : BW = 0.32-0.4$) and related to the body size: smaller specimens usually have relatively longer and wider petioles.

Differential diagnosis. *A. chrysotrichus* sp. n. resembles *A. vespoides* sp. n. in golden pubescence of body, largely pale coloration of mandibles and humeri, and propodeum with short preapical depression and non-outlined dorsal field. It differs from the latter (judging from females) in the following: antennae almost entirely black; humeri darker brown; lateral ocelli larger than median one; $OOD = Od$; apices of middle tibiae naked; propodeum with exclusively golden pubescence and having neither median carina nor oblique lateral striation and carinae laterally to preapical depression; inner dorsal surface of hind coxae without carinae; apex of abdominal sternite I not depressed.

Etymology. The species name emphasizes the golden tint of body pubescence ($\chi\rho\upsilon\sigma\omicron\varsigma$, Greek for golden; $\tau\rho\iota\chi\upsilon\omicron\varsigma$, Greek for haired).

Aulacophilus septentrionalis Antropov, sp. n.

Material. Holotype, ♀: "El Salvador, 2 1/2 mi. W of Quezaltepeque, 3.VII.1961 (M.E. Erwin)" [ZMUM]; Paratype: ♂: "Mex." [USNM]; 1 ♀: "Mexico: Vera Cruz: Cordoba, 20.VII.1966 (M.R. and R.C. Gardner)" [CAS].

Description. Female. Median clypeal lobe with smooth median stripe and wide apical protrusion, rounded laterally and broad-concave medially (Fig. 7, 1a); frons ventrally with short median carina, small but distinct depression in the middle, and narrow smoothed stripe running from this depression to median ocellus. $HH : HW : HL = 104 : 120 : 56$; $IOD = 42 : 92 : 50$; $OOD : Od : POD = 10 : 8 : 8$. Occipital carina dorsally narrower than 1/2 the diameter of lateral ocellus; mandibles without ventral angle; $A3 : AW = 17 : 7$.

Pronotal ridge without median incision or tubercle, with very narrow posterior edging along its entire width; admedian lines obsolete. Scutellum flat, basally with smoothed median stripe. Middle tibiae without apical aculeolate field, but with shining areola, delimited by single short and stout anterior spine and 2 finer posterior ones. $M^{2-1} : M^{2-2} = 12 : 28$; 1st recurrent vein antefurcal; hind-wing hooks in groups of $5 + (1 + 5)$.

Dorsal field of propodeum not outlined, without median groove or carina. Posterior part of propodeum not delimited ventrally by longitudinal carinae, with narrow but deep groove. Preapical depression of propodeum shorter than maximum width of hind femur.

Petiole gradually continuing into dilated posterior part of abdomen; $PL : BL = 100 : 50$; $PW : BW = 19 : 41$. Abdominal sternite I smooth, convex basally and apically, flattened in the middle, without distinct apical depression.

Body mostly dull, with smooth intervals only on scutellum, postscutellum, and abdominal sternites. Head and thorax densely punctate ($d < \emptyset$); postscutellum convex, without coarse longitudinal carinae; mesopleura very densely carinate (16-17 longitudinal carinae ventrally to scrobe); inner dorsal surface of hind coxae without carinae. Dorsal field of propodeum densely punctate ($d < \emptyset$) basally and in the middle and less densely ($d \approx 2-3\emptyset$) punctate laterally, with micro-alveolate sculpture among punctures. Sides of propodeum micro-alveolate, with very fine punctures ($d \approx 1.5-3\emptyset$), without plication; posterior part of propodeum with denser punctation ($d \approx 1-1.5\emptyset$) and fine transverse rugosity. Abdominal tergite I shining laterally and ventrally and with dense transverse micro-striation dorsally; its dilated part very finely and densely punctate ($d \approx \emptyset$); other tergites with similar but even finer punctation; sternites with coarser and noticeably sparser ($d > 1.5\emptyset$), irregular punctation.

Pubescence rather poorly developed. Clypeus, ventral part of frons (including frontal orbits), apex of propodeum laterally, abdominal tergite I apically, and narrow lateroapical stripes on tergites I-V, all covered with dense silver hairs. Pronotal ridge and humeri posteriorly, scutellum and postscutellum laterally, and apex of propodeum above preapical depression covered with slightly golden hairs. Mesothorax anterior to episternal suture and ventrally, and abdominal tergite II basally with dense but shorter, recumbent hairs.

Body mostly black. Preapical parts of mandibles, tegulae, apex of propodeum, abdominal tergite I basally and along lateral margins, tergite II basally, and apical rims of tergites II-VI and sternites II-V, all red-brown.

Male. Generally resembling female, differing in tridentate apical protrusion of median clypeal lobe (Fig. 7, 1b), somewhat smaller body, and different proportions: $HH : HW : HL = 110 : 95 : 55$; $IOD = 40 :$

85 : 55; $OOD : Od : POD = 9 : 8 : 7$; $A3 : AW = 15 : 6$; $PL : BL = 83 : 54$; $PW : BW = 16 : 42$. The structure of genitalia remaining unknown because of the apical part of abdomen absent in the paratype.

Differential diagnosis. *A. septentrionalis* sp. n. most resembles *A. eumenoides* in densely carinate mesopleura, propodeum with short preapical depression and non-outlined naked dorsal field, absence of well-developed golden pubescence of body, mostly black mandibles and entirely black humeri, and undepressed apex of abdominal sternite I. It differs from the latter in distinct patches of silver or slightly golden pubescence on pronotum and mesopleura, $OOD > POD \geq Od$, and absence of median groove on dorsal propodeal field.

Etymology. The species name reflects the distribution area of this species in relation to the generic area (*septentrionalis*, Latin for northern).

Key to Species of the Genus Aulacophilus (Males of A. vespoides F. Smith, A. jansoni Turner, and A. carinatus sp. n. Unknown)

1. Preapical depression of propodeum no shorter than maximum width of hind femur. Dorsal field of propodeum clearly distinguishable from other parts, its posterior portion distinctly raised above the level of lateral parts of propodeum. Outer apical surface of middle tibiae without aculeolate field. Nicaragua
..... *jansoni* Turner, 1916 (female)
- Preapical depression of propodeum considerably shorter than maximum width of hind femur. Dorsal field of propodeum not delimited from other parts or distinguishable only by its denser or coarser sculpture 2
2. Mesopleura with no more than 9–10 coarse longitudinal carinae below scrobe; postscutellum coarsely longitudinal-carinate. Dorsal field of propodeum entirely naked, with strongly developed median carina. Pronotal ridge with small median depression posteriorly. Outer apical surface of middle tibiae with aculeolate field, divided by narrow longitudinal carina. Apex of abdominal tergite I almost naked; apex of abdominal sternite I with oval depression. Mandibles reddish brown in apical half and black in basal half; humeri entirely black. Ecuador
..... *carinatus* sp. n. (female)
- Mesopleura with more than 12 longitudinal carinae below scrobe; postscutellum without coarse longi-

tudinal carinae (rarely with 1–2 weak lateral carinae). Dorsal field of propodeum without coarse median carina (with very fine carina or only median groove); in some species with more or less developed recumbent pubescence. Pronotal ridge without posterior median depression. Most part of mandibles reddish brown or black. Apex of abdominal tergite I with dense golden or silver pubescence ... 3

3. Dorsal field of propodeum pubescent; pubescence of body mostly golden; most part of mandibles reddish brown, only bases black; humeri more or less pale 4
- Dorsal field of propodeum naked; pubescence of body mostly silver (or slightly golden) or brown; most part of mandibles black, only apices dark red; humeri entirely black 5
4. Antennae reddish brown basally. All ocelli of the same size; $OOD > 1.5 Od$. Dorsal field of propodeum with narrow median carina, with golden pubescence; rest of propodeum with silver pubescence. Sides of propodeum densely striate, separated by clear carinae laterally to preapical depression. Outer apical surface of middle tibiae with aculeolate field; inner dorsoposterior surface of hind coxae with oblique carinae. Apex of abdominal sternite I with oval depression. Humeri mostly reddish brown. Brazil *vespoides* F. Smith, 1869 (female)
- Antennae entirely black. Lateral ocelli larger than median one; $OOD = Od$. Dorsal field of propodeum without median carina, pubescence of propodeum exclusively golden. Sides of propodeum densely punctate, without oblique striation and without carinae laterally to preapical depression. Outer apical surface of middle tibiae without aculeolate field; inner dorsoposterior surface of hind coxae finely punctate, without carinae. Apex of abdominal sternite I not depressed. Humeri brownish posteriorly. Venezuela, Columbia, and Trinidad
..... *chrysotrichus* sp. n. (female, male)
5. Entire body (except for clypeus and apical part of propodeum) without pale pubescence. $OOD = Od < POD$. Dorsal field of propodeum with narrow median carina. Bolivia, Brazil, Costa Rica, Peru, and Ecuador *eumenoides* Dücke, 1904 (female, male)
- Distinct patches of pale pubescence present on pronotum and mesopleura. $OOD > POD \geq Od$. Dorsal field of propodeum without median carina. Mexico, Salvador *septentrionalis* sp. n. (female, male)

ACKNOWLEDGMENTS

I express my sincere gratitude to all the colleagues for the material provided, and especially, to Prof. A.P. Rasnitsyn (Palaeontological Institute, Russian Academy of Sciences, Moscow) for his help in obtaining the type specimens from the British Museum collections.

The work was supported by the Smithsonian Institution, Washington, D.C., US.

REFERENCES

1. Bohart, R.M. and Menke, A.S., *Sphecid Wasps of the World. A Generic Revision*, Berkeley: Univ. of California Press, 1976.
2. Cooper, M., A Note on the Biology of *Aulacophilus eumenoides* Dücke (Sphecidae), *Sphecos*, 1986, vol. 11, p. 16.
3. Dücke, A., Zur Kenntnis der Sphegiden Nordbrasilien, *Z. System. Hymenopterol. Dipterol.*, 1904, vol. 4, pp. 91-98.
4. Lomholdt, O.C., The Sphecidae (Hymenoptera) of the Rennell and Belona Islands, *The Natural History of Rennell Island, British Solomon Islands*, Copenhagen, 1980, vol. 8, pp. 27-32.
5. Menke, A.S., *Pison in the New World: a Revision (Hymenoptera: Sphecidae: Trypoxylini)*, *Contrib. Amer. Entomol. Inst.*, 1988, vol. 24, no. 3.
6. Smith, F., Descriptions of New Genera and Species of Exotic Hymenoptera, *Trans. Entomol. Soc. London*, 1869, part VI, pp. 301-311.
7. Turner, R.E., Notes on the Wasps of the genus *Pison*, and Some Allied Genera, *Proc. Zool. Soc. London*, 1916, pp. 591-629.