PROC. BIOL. SOC. WASH.
91(3), 1978, pp. 590–635

# A REVISION OF THE NEW WORLD SPECIES OF *HEDYCHRIDIUM* (HYMENOPTERA, CHRYSIDIDAE)

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*Abstract.*—*Hedychridium* with its 36 New World species, 24 of which are described as new, is reviewed. The genus is in the subfamily Elampinae, and is the only one with a single median claw tooth. Most of the species are found in western United States and particularly the southwest. Biology of only one New World species is known, but Old World forms are parasitoids on sphecids and bees. Characters of special value are discussed, especially male genitalia, which are figured. Six species groups are defined and a key to species is presented. New species are *antennatum* Kimsey, *argenteum* Kimsey, *arietinum* Bohart, *azurellum* Bohart, *bilobatum* Bohart, *centrale* Bohart, *cornutum* Bohart, *coruscum* Bohart, *crassum* Bohart, *crebrum* Kimsey, *frontis* Kimsey, *frugale* Bohart, *gemmatum* Kimsey, *incisum* Bohart, *leucostigma* Bohart, *lividum* Bohart, *maricopae* Bohart, *menkei* Bohart, *milleri* Kimsey, *mirabile* Kimsey, *nevadae* Kimsey, *olene* Kimsey, *paulum* Bohart, *politum* Bohart, *purum* Kimsey, *rasile* Bohart. A lectotype is established for *Hedychrum discoidale* Buysson.

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The genus *Hedychridium* Abeille de Perrin, 1878, includes about 150 named species of cuckoo wasps, occurring mostly in the Holarctic Region. Many of the species are small, often less than 4 mm long. The New World forms are commonly blue to purple, but a significant number from desert areas of southwestern United States exhibit metallic hues of copper, gold and red; thus rivalling the brilliant species of the Palearctic.

The genus falls in the subfamily Elampinae, characterized by having no female sting, abdominal venter mostly flat to concave, 3 well defined and exposed abdominal segments, tarsal claw with one or more subsidiary teeth, no transverse frontal carina, radial sector with its sclerotized basal part (RS stub) not extending apicad much beyond stigma, and outer veins of discoidal cell not fully sclerotized. Among the elampine genera, *Hedychridium* can be separated by a combination of characters: claw with a median tooth (Fig. 32), median cell of forewing setose, RS stub extending apicad at least as far as stigma, tergum III margin rounded or slightly indented apically (the closely related Ethiopian genus, *Acrotoma*, has a pair of apical teeth).

*Geographic distribution.*—Of the approximately 150 described species of *Hedychridium*, 32 are Nearctic (including the 24 described herein), 4 are neotropical, a few are Ethiopian or Oriental, and the rest are Palearctic. Considering the number of odd specimens which we were unable to readily

identify, it is likely that 10 or 20 more species may be described eventually from the Nearctic fauna. Neotropical species are *guatemalense*, *centrale*, *carinulatum* and *argentinum*. Only the first two of these occur north of Panama, and *guatemalense* even reaches Texas. Unquestionably, additional species will be found in temperate parts of Argentina. Of the Nearctic species, only 4 are known to range east of the 100th meridian. These are *caeruleum*, *dimidiatum*, *crassum*, and *fletcheri*. Three factors may be responsible for this small number: (1) The New World fauna shows many similarities to that of the Palearctic Region. Ancestral forms may have arrived via the Bering Sea passage in fairly recent times and perhaps spread eastward slowly. (2) Desert areas seem to lend themselves to species proliferation, thus favoring the relatively dry west over the more humid east. (3) The large number of presumed hosts in the west, such as *Oxybelus* and *Tachysphex*, may have encouraged speciation in that part of the country.

Three cases of apparently extreme endemism in California may be modified by more intensive collecting. These are *milleri* from Borax Lake, Lake Co.; *coruscum* from the ocean beach near Goleta, Santa Barbara Co.; and *argenteum* from 18 mi W Blythe, Riverside Co. Species which favor the Sonoran deserts of southern and eastern California and Arizona are *arietinum*, *leucostigma* and *lividum*. A species known only from the Chihuahuan desert of New Mexico and eastern Arizona is *semirufum*. An apparent central Sierran endemic is *rasile*. Many of the distributional peculiarities might be explained if more host data were available.

Our ideas of distribution are based largely on the examination of about 4,500 *Hedychridium*.

*Biology*.—According to Móczár (1967), *Hedychridium* species have been reported to be parasitoids in nests of Sphecidae (*Tachysphex*, *Liris*, *Solierella*, *Oxybelus*, *Lindenius*, *Dinetus*, *Astata*, *Psen*) and Apoidea (Halictidae: *Halictus*, and Megachilidae: *Osmia*). These records refer to Palearctic species. Little has been published on New World forms except for the host-parasite records of Parker and Bohart (1968), and the fine work by Carrillo and Caltagirone (1970), both papers on *H. solierellae*.

Carrillo and Caltagirone reported *solierellae* females as entering nests of *Solierella packhami* (Ashmead) in twigs and almond hulls, and *Solierella blaisdelli* (Bridwell) in twigs. One egg per cell was deposited by the chrysidid, and its newly emerged larva usually killed the *Solierella* larva (or caused it to starve). Subsequently, the *Hedychridium* larva fed on the nest provisions, which were paralyzed immatures of lygaeids (*Nysius*). Cocooning took place after 6 days, the prepupal stage lasted 5–6 days, and the adult emerged 12–22 days later.

Parker and Bohart (1968) reared *H. solierellae* from trap nests utilized by *Solierella plenoculoides* (W. Fox) (misidentified as *S. blaisdelli* Bridwell)

in 4 localities in Nevada, and 8 widely scattered areas in California. Some negative significance can be attributed to the fact that Parker and Bohart reported on nearly 7,000 twig nests collected over a 7-year period, but reared only *H. soliérellae* among a total of 21 chrysidid species. This is a strong indication that *Hedychridium* attack primarily ground-nesting hosts.

*Abbreviations and arbitrary measurements.*—In the keys and descriptions certain characters are quite repetitive and for brevity as well as simplification, we have shortened flagellum to "F," abdominal tergum to "T," and abdominal sternum to "S." Thus, the basal flagellomere is F-I, third sternum is S-III, etc. Additionally, the diameter of a median ocellus is MOD, and the sclerotized basal part of the forewing radial sector is the RS stub. In male genitalia the length proportions of digitus to gonostyle are based on measurements as indicated in Fig. 33.

*Characters of special value.*—At first glance, *Hedychridium*, as in other chrysidids, seem to possess an abundance of systematic characters relating to color and punctation. More careful study tends to dissipate such taxonomic euphoria! However, color pattern and puncture distribution do have some significance. The extent of reddish coppery markings, spots on T-II and S-II-III, and color of stigma and wing membrane may all be useful. The sometimes fine punctation of the lower frons, usually associated with a dense mat of silvery pubescence, is a characteristic of several species. Length and width of antennal articles, particularly the pedicel and F-I, are important. Similarly, the lengths of the malar space, subantennal space (distance from antennal socket to clypeal apex), and RS stub must be taken into account. Finally, male genitalia have many intriguing structural features. In addition to length proportions, the shapes of the digitus, cuspis, and aedeagus may be quite distinctive. The aedeagus, especially, may have lateral bristles (Fig. 33), fingerlike lobes (Fig. 42), or a stout armlike projection (Fig. 48).

*Species groups.*—The following rather loose assemblages, except for the last heterogeneous one, seem to have group relationships and share characters as follows:

I (*dimidiatum* group), F-I more than twice as long as broad, pedicel considerably longer than broad, malar space about 0.5 MOD, basal vein strongly curved, lower frons not densely pubescent, posterior mesopleuron partly polished, wings brown stained. Included species: *bilobatum*, *crebrum*, *dimidiatum*, *menkei*, *olene*, *politum*.

II (*amabile* group), F-I more than twice as long as broad, pedicel considerably longer than broad, basal vein nearly straight, posterior mesopleuron completely microridged, tegula brown. Included species: *amabile*, *azurellum*, *cockerelli*, *coruscum*, *maricopae*, *rasile*, *soliérellae*.

III (*crassum* group), F-I long to medium but pedicel nearly as broad as long, flagellomeres unusually cylindrical, basal vein distinctly curved,

punctures of brow (swollen area below midocellus) and rather flat lower frons subequal, frons unusually broad, male genitalia weakly pigmented. Included species: *crassum*, *incisum*, *purum*.

IV (*fletcheri* group), F-I at most twice as long as broad, pedicel considerably longer than broad, basal vein gently curved, brow rather prominent, lower frons with dense pubescence in male at least, digitus relatively long and linear (male of *centrale* unknown). Included species: *centrale*, *fletcheri*, *mirabile*.

V (*frugale* group), F-I less than twice as long as broad, pedicel considerably longer than broad, basal vein nearly straight, contiguous microreticulation between punctures of head and thorax, body small (less than 3 mm long), digitus short and subquadrangular. Included species: *cornutum*, *frugale*.

VI (*gemmatum* group), F-I less than twice as long as broad (usually 1.5 times or less), pedicel considerably longer than broad, basal vein nearly straight, wings lightly smoky or clear, body small (less than 4 mm long), digitus subovate or clubbed. Included species: *antennatum*, *argenteum*, *arietinum*, *frontis*, *gemmatum*, *leucostigma*, *milleri*, *paulum*.

VII (Miscellaneous), Included species: *argentinum*, *caeruleum*, *carinulatum*, *guatemalense*, *lividum*, *nevadae*, *semirufum*.

## Key to *Hedychridium* of the New World

1. F-I more than twice as long as pedicel (Fig. 29) and/or pronotal lobe polished in side view; S-III green or blue 2
– F-I never more than twice as long as pedicel (Figs. 25, 26), usually less than twice; pronotal lobe not extensively polished; S-III various 5
2. Pronotal lobe polished in side view; coarse punctures of brow (swollen area below midocellus) extending in a narrow strip down along eye margins, clypeus sparsely punctate; T-III indented apicomedially *guatemalense* Cameron
– Pronotal lobe punctate in side view; medium coarse punctures of brow extending in a broad band down along eye margins, clypeus closely punctate; T-III various 3
3. T-II much thickened toward apex (Fig. 21) *crassum* Bohart
– T-II not thickened toward apex 4
4. T-III margin rounded apically; F-I less than twice as long as broad; wings whitish *purum* Kimsey
– T-III margin a little incurved apically (Fig. 18); F-I more than twice as long as broad; wings smoky *incisum* Bohart
5. Forefemur rather sharply angled toward base (Fig. 31); S-III brown or with a median green spot *olene* Kimsey
– Forefemur rounded toward base; S-III various 6

6. Metanotum nearly triangular, pointed posteriorly; S-II densely punctate *caeruleum* (Norton)
– Metanotum rounded posteriorly; S-II with punctures well separated 7
7. F-I length more than twice breadth (Figs. 26, 28), head and thorax not closely microreticulate 8
– F-I length less than twice breadth (about twice in exceptional specimens, especially females), and/or head and thorax closely microreticulate (Fig. 11) 20
8. Forewing basal vein reaching MCu at a broadly obtuse angle (as in Fig. 5), mesopleural area above midcoxa completely microridged 9
– Forewing basal vein reaching MCu at a right angle or nearly so (as in Fig. 1), mesopleural area above midcoxa often with a polished spot 15
9. Malar space (shortest distance between eye and mandible socket) much shorter than pedicel (as in Fig. 9), T-II usually blackish medially, pubescence of lower face various 10
– Malar space subequal to length of pedicel (as in Fig. 6), T-II various, pubescence of lower frons dense (viewed from above) 12
10. Pubescence of lower frons dense, whitish *maricopae* Bohart
– Pubescence of lower frons sparse, often fulvous 11
11. T-II closely punctate toward middle and dull; S-II usually brown *soliérellae* Bohart and Brumley
– T-II with punctures about a puncture diameter apart, shiny overall; S-III blue or green in male, usually with green or blue highlights in female *rasile* Bohart
12. T-II greenish to blue or purple, darkened medially 13
– T-II reddish coppery 14
13. Malar space about 2.0 MOD, lower frons more coarsely punctate along eye margins, S-II-III brown *cockerelli* Buysson
– Malar space 1.0–1.5 MOD, lower frons evenly and finely punctate to eye margins, S-II-III in male and S-II in female partly bluish to greenish *azurellum* Bohart
14. Basal vein of forewing as long as RS stub (as in Fig. 5) *amabile* Cockerell
– Basal vein of forewing longer than RS stub (about as in Fig. 2) *coruscum* Bohart
15. T-III rounded over and indented before apical membranous rim, rather pointed, especially in female (Fig. 19); forefemur plainly grooved and carinate ventrally (Fig. 30); male S-II-III green or blue; brow overhanging medially *dimidiatum* (Say)

– T-III not or hardly rounded over apically; forefemur at most weakly carinate, other characters various 16

16. Clypeus of female with a median tooth in side view; male with a longitudinal streak of fine appressed pubescence mediodistally on T-III (Fig. 15); S-II-III green or blue *carinulatum* (Spinola)
– Clypeus of female not dentate; no hair streak on male T-III 17

17. T-III margin somewhat drawn out posteromedially into a rounded point, especially in female (Fig. 16); punctures of pronotum moderate, close and even, only a little larger than those of T-II; S-II-III green or blue *crebrum* Kimsey
– T-III margin broadly rounded posteriorly (Fig. 20); punctures of pronotum coarse, uneven, much larger than those of T-II 18

18. T-II mediobasally with at most a small and indistinctly edged black area; tegula and male S-III green or blue; T-III margin broadly rounded *politum* Bohart
– T-II mediobasally with a large and diffuse, or medium and distinctly edged black area; male S-III brown or mostly so; other characters various 19

19. T-III somewhat pointed (as in Fig. 19), especially in female; tegula green; T-II with a definite basomedial black mark which may be triangular but more often is bilobate (Fig. 22); forefemur sometimes weakly grooved and keeled ventrally *bilobatum* Bohart
– T-III broadly rounded; tegula nearly always brown; T-II more than half covered with an indistinctly edged dark area; forefemur rounded ventrally *menkei* Bohart

20. Subantennal distance subequal to pedicel length (Figs. 10, 14) and/or interocellar area tuberculate 21
– Subantennal distance less than pedicel length (Figs. 11, 12), interocellar area simple 23

21. Vertical side of pronotum with coarse longitudinal ridging; lower frons in both sexes with inconspicuous pubescence; terga purplish and with dark pubescence *nevadae* Kimsey
– Vertical side of pronotum punctate; lower frons in male with dense fine pubescence arising from fine punctation; terga usually greenish to blue, tergal pubescence pale 22

22. Interocellar area tuberculate, T-II extensively black, tegula brown *centrale* Bohart
– Interocellar area simple, T-II not extensively black, tegula greenish *fletcheri* Bodenstein

23. Pronotal punctures separated by obvious microsculpture (shagreening or micropunctation, Fig. 11) 24
– Pronotal punctures not separated by obvious microsculpture 25

24. Pronotum and tergum II with larger punctures sparse, microsculpture extensive and somewhat transverse; F-V of male longer than broad, flagellum moderately slender *frugale* Bohart
– Pronotum and tergum II with larger punctures separated by micropunctured areas of about a macropuncture diameter; F-V of male broader than long, flagellum broadened and flattened *cornutum* Bohart
25. T-II extensively polished, many punctures 3 puncture diameters apart; T-III with fine, transversely oriented microridging; sterna brown *argentinum* (Buysson)
– T-II not extensively polished, most punctures less than 2 puncture diameters apart; T-III not transversely microridged; sterna various 26
26. Forewing stigma pale yellow, flagellum reddish, wings water clear 27
– Forewing stigma brown to black, other characters various 28
27. Mesopleuron densely silvery, obscuring punctation; most of frons densely silvery (Fig. 7) *argenteum* Kimsey
– Mesopleuron with obvious punctation; much of frons moderately silvery *leucostigma* Bohart
28. Lower frons with punctation a little more coarse or irregular toward eye margins; pubescence of lower frons moderate to scanty, often pale fulvous 29
– Lower frons with zone of fine and even punctation extending to eye margins; pubescence of lower frons forming a dense silvery mat on either side 31
29. Basal vein distinctly curved (Fig. 4), S-III brown in both sexes, tegula brown *lividum* Bohart
– Basal vein practically straight (as in Fig. 5), S-III usually bluish or with bluish highlights 30
30. Brow rough overall, punctures practically contiguous; tegula partly bluish or greenish *paulum* Bohart
– Brow smooth overall, punctures separated by small smooth areas; tegula brown *milleri* Kimsey
31. Abdomen, hindcoxa and hindfemur light red without greenish or bluish *semirufum* Cockerell
– Abdomen, hindcoxa and hindfemur marked with green to blue 32
32. Punctures across brow much finer toward compound eyes, brow with a V-shaped median swelling (Fig. 12) *frontis* Kimsey
– Punctures across brow nearly even in size (Fig. 13) 33
33. Brow well developed all across, overhanging scapal basin; tegula bright green or blue; RS stub shorter than basal vein *mirabile* Kimsey
– Brow not well developed; tegula and RS stub various 34

34. F-V about as long as broad or a little longer *gemmatum* Kimsey
– F-V distinctly broader than long (Figs. 23–25) 35
35. Tegula with bluish reflections, male F-V twice as broad as long (Figs. 24, 25), flagellum dark brown, RS stub as long as basal vein *arietinum* Bohart
– Tegula brown, male F-V less than twice as broad as long (Fig. 23), flagellum reddish, RS stub shorter than basal vein *antennatum* Kimsey

## *Hedychridium amabile* Cockerell
(Figs. 6, 33)

*Hedychridium amabile* Cockerell, 1903:262. Female holotype, "Mesilla Park," Las Cruces, New Mexico, USNM, Washington.

*Male (topotype).*—Length 2.5 mm, forewing 1.8 mm; body green with extensive gold and coppery to coppery red; latter especially on vertex, pronotum, mesonotum and terga; tegula brown; abdominal venter brown with coppery highlights, particularly on S-II; wings almost clear. Pubescence pale, inconspicuous except on outer third of lower frons. Punctation fine on lower face, coarse and shallow on brow, medium and slightly separated on vertex and pronotum, mesopleural area above midcoxa microridged, punctures medium fine and 0.5 puncture diameter apart toward middle of T-II. Face (Fig. 6); malar space subequal to pedicel length; flagellum slender, F-I length 2.8 times breadth and 1.6 times pedicel length, F-V length 1.2 times breadth, F-XI 2.2 times; brow evenly rounded from midocellus to lower face; forewing basal vein nearly straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 33), digitus subovoid, three-sevenths as long as gonostyle, aedeagus with lateral bristle row.

*Female (homotype and topotype).*—Length 2.6 mm, F-I length 3 times breadth.

*Distribution.*—We have seen 50 males and 142 females from NEW MEXICO (Las Cruces, Loving, Carlsbad, Pie Town), COLORADO (Colorado Springs), ARIZONA (Portal, Willcox, Tombstone, Wickenburg, Yuma), WYOMING (Lander), IDAHO (Dietrich), CALIFORNIA (Borrego Springs, Glamis, Palo Verde, nr. Blythe, Needles, Vidal Junction, Thousand Palms, Huntington Park, Gorman, Foster Park in Ventura Co., Oso Flaco Lake and Dune Lakes in San Luis Obispo Co., Shafter, Salinas, Alviso, Isleton, Antioch, Davis, Sacramento, Carmichael, Dillon Beach in Marin Co., Lake Tahoe, Independence Lake in Sierra Co., Webber Lake in Nevada Co., Strawberry in Tuolumne Co. Mexican localities are: BAJA CALIFORNIA NORTE (Valle de Trinidad, 66 mi N San Felipe), TAMAULIPAS (Playa Altamira).

*Systematics.*—This gold and coppery red wasp rivals some of the most

beautiful Old World chrysidids. Its group characters are the long F-I, nearly straight basal vein, microridged posterior mesopleuron, broadly rounded T-III, and brown tegula. The markings and long malar space separate this species from others in the group except for *coruscum*. The longer RS stub and presence of lateral bristles on the aedeagus distinguish the more broadly ranging *amabile*.

### *Hedychridium antennatum* Kimsey, new species
(Figs. 23, 34)

*Male holotype*.—Length 2 mm, forewing 1.5 mm; head and thorax green except blue green on metanotum, tegula brown, terga green to purplish dorsomedially, S-II-III greenish blue, wings lightly smoky. Pubescence pale, short and dense on lower face, moderately dense on mesopleuron and T-III. Punctation medium coarse on brow, fine and dense on lower face, medium and separated by small polished areas on pronotum; mesopleural area above midcoxa microridged; punctures toward middle of T-II fine, shallow and about 0.5 puncture diameter apart. Malar space about half as long as pedicel; flagellum moderately stout (Fig. 23), F-I length a little less than breadth and shorter than pedicel, F-V length 0.66 times breadth, F-XI 1.5 times; brow a little prominent medially, forming a triangular swelling; forewing basal vein straight, longer than RS stub, meeting MCu at a strongly obtuse angle; T-III rounded but a little drawn out; genitalia (Fig. 34); digitus clubbed and slightly more than half as long as gonostyle; aedeagus without bristles.

*Female*.—Length 1.5–2 mm, F-I about as broad as long, sterna dark but S-II-III sometimes with blue-green highlights.

Holotype male (UCD), Tucson, Arizona, 27 May 1962 (F. D. Parker and L. A. Stange). Paratypes, 1 male, 2 females, same data as holotype; 1 male, 2 females, ARIZONA: Elfrida, 2 May 1956 (F. Werner, G. Butler, UA); 15 mi N The Gap, 21 September 1966 on *Cleomella* (P. Rust et al., UCD); 3 mi SW Wickenburg, 4 May 1964 (P. Torchio, G. Bohart, USU). An additional specimen has been seen from Nixon, Nevada, 22 June 1962 (R. Bohart, UCD).

*Systematics*.—*H. antennatum* belongs in the *gemmatum* group: F-I length subequal to pedicel and 1.5 times as long as broad, basal vein straight, and aedeagus without bristles. From *frontis* it can be separated by the reddish rather than brown flagellum with F-V definitely broader than long, tegula without green highlights, punctures similar in size all across brow instead of becoming much smaller toward ocular margins, and RS stub shorter than basal vein. The general coloration of *antennatum* is blue overall with green-blue highlights on S-II-III in both sexes. A distinct characteristic of this species is the broadly expanded and almost paddlelike cuspis (Fig. 34).

## *Hedychridium argenteum* Kimsey, new species
(Figs. 2, 7, 35)

*Male holotype*.—Length 3 mm, forewing 2.5 mm; head blue green, flagellum light reddish, pronotum green, rest of thorax blue green to purple dorsomedially, terga and S-II-III green; tegula brown, wings water clear; stigma, basal vein and RS pale amber color. Pubescence dense, short, appressed and silvery on head, thorax, and abdomen; especially dense on mesopleuron, obscuring punctation; punctures fine and scattered on vertex, denser in scapal basin, fine and irregular on pronotum, mesopleural area above midcoxa polished, propodeal side polished, punctures toward middle of T-II fine and shallow, separated by 0.5–1.0 puncture diameter. Face (Fig. 7); malar space half as long as pedicel; flagellum slender, F-I length 1.8 times breadth and equal to pedicel length, F-V length 1.3 times breadth, F-XI 2.0 times; brow rounding evenly from micocellus to lower face; forewing basal vein weakly curved, longer than RS stub, meeting MCu at an obtuse angle (Fig. 2); T-III margin slightly obovate; genitalia (Fig. 35); digitus subovoid, a third as long as gonostyle; aedeagus without bristles.

*Female*.—Unknown.

Male holotype (UCB), 18 miles west of Blythe, Riverside Co., California, 29 April 1952, in nesting site of *Nomadopsis larreae* Timberlake (J. G. Rozen). Paratypes, 1 male (AMNH), same data as type, 1 male topotype, 11 October 1971 (C. Goodpasture, UCD).

*Systematics*.—*H. argenteum* belongs in the *gemmatum* group. It has F-I as long as the pedicel and less than 1.5 times as long as broad, basal vein straight, and no bristles on the aedeagus. It is distinguished by the presence of dense silvery setae covering most of the body, especially the face, mesopleuron and terga; pale red flagellum; and clear wings with yellow venation.

## *Hedychridium argentinum* Buysson
(Fig. 36)

*Hedychridium argentinum* Buysson, 1909:195. Female holotype, "Mendoza," Argentina, MNHN, Paris.

*Male*.—Length 3.5 mm, forewing 3 mm, body blue green but with black infusion in ocellar area, mesonotum, tegula, extensive medial areas of terga; sterna brown, wings smoky. Pubescence pale, inconspicuous on face and elsewhere. Punctation on face coarse and shallow, grading into cross ridging medially; large, shallow and contiguous on pronotum, mesopleural area above midcoxa microridged, propodeal side microsculptured, punctures toward middle of T-II fine and separated by about 3 puncture diam-

eters, sides of T-II and T-III with transverse microridging. Malar space 0.25 times as long as pedicel; flagellum slender, F-I length 1.5 times breadth and 1.2 times pedicel length, F-V length 1.1 times breadth, F-XI 1.8 times; brow rounding into somewhat angularly concave scapal basin; forewing basal vein curved, as long as RS stub, meeting MCu at a slightly obtuse angle, T-III margin broadly rounded, rim indistinct, genitalia (Fig. 36); digitus subovoid, two-fifths as long as gonostyle; aedeagus without bristles.

*Female*.—Similar to male.

*Distribution*.—We have seen only the female type (courtesy Ms. Simone Kelner-Pillault) and a male from Isla Choele Choel, Rio Negro, Argentina, 14 January 1968 (J. and L. Stange, UCD).

*Systematics*.—*H. argentinum* seems to have no close relatives. Essential characters are: F-I a little longer than pedicel, basal vein slightly curved, posterior mesopleuron completely microridged, coarse ridging but inconspicuous hair on lower face, sterna and tegula brown, fine and widely separated punctures on T-II, and transverse microsculpture on T-III.

## *Hedychridium arietinum* Bohart, new species
(Figs. 24, 25, 37)

*Male holotype*.—Length 2.5 mm, forewing 1.6 mm; body greenish blue including S-II-III; tegula bluish, wings almost clear, stigma light brown. Pubescence pale, inconspicuous except for dense short pile on lower face and appressed hair on T-III. Punctation fine on lower face, grading into narrow median strip of cross ridging; medium on brow, vertex and pronotum but punctures separated by polished areas of about one puncture diameter; mesopleural area above midcoxa microridged; punctures toward middle of T-II fine, shallow, well separated by polished areas; propodeal side nearly impunctate, polished. Malar space as long as pedicel; flagellum broad and flattened (Fig. 24), F-I length 1.2 times breadth and a little shorter than pedicel; F-V length 0.5 times breadth, F-XI 1.3 times; brow smoothly and evenly rounded from midocellus to lower face, forewing basal vein nearly straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 37), digitus subovoid, three-sevenths as long as gonostyle; aedeagus without bristles.

*Female*.—Length 2–2.5 mm, tegula mostly brown, flagellum moderately stout (Fig. 25), F-I length 1.2 times breadth, F-V broader than long.

Holotype male (UCD), Thousand Palms, Riverside Co., California, 29 March 1977, on prostrate *Euphorbia* (R. M. Bohart). Paratypes, 11 males, 14 females, CALIFORNIA: Thousand Palms and nearby canyon (R. Bohart, E. Grissell, M. Irwin, P. Marsh, F. Parker, UCD, USNM), Borrego Valley in San Diego Co. (R. Bohart, E. Grissell, C. Goodpasture, M. and J. Wasbauer, P. Timberlake, M. Irwin, UCD, CDFA, UCR), Ogilby Road in

Imperial Co. (M. and J. Wasbauer, UCD, CDFA), 3 mi N Glamis (M. and J. Wasbauer, CDFA): NEVADA: Nixon (R. Bohart, UCD).

*Systematics.—H. arietinum* is one of the very small *Hedychridium* with F-I subequal in length to pedicel, tegula brown (but with blue highlights), basal vein nearly straight and as long as RS stub, and wings practically water clear. More specifically, S-II-III have blue highlights, the dorsum of the body is a luminous greenish blue, and the flagellum is unusually broad. In the male, F-V is twice as broad as long, and in the female it is broader than long.

### *Hedychridium azurellum* Bohart, new species
(Figs. 26, 38)

*Male holotype.*—Length 2.8 mm, forewing 2.2 mm; body greenish blue including S-II and highlights on S-III, ocellar area faintly coppery, tegula brown, metanotum and propodeum purple, wings smoky. Pubescence pale on face to light fulvous elsewhere, inconspicuous except for dense short pile on lower face. Punctation fine on lower face, grading into cross ridging on middle third, coarse and close but shallow and irregular on brow, medium and nearly contiguous on pronotum, mesopleural area above mid-coxa microridged, medium fine and slightly separated toward middle of T-II. Malar space subequal in length to pedicel; flagellum slender (Fig. 26), F-I length 2.5 times breadth and nearly twice pedicel length, F-V length 1.2 times breadth, F-XI 2.0 times; brow slightly swollen; forewing basal vein nearly straight and as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 38); digitus subovoid, two-fifths as long as gonostyle; aedeagus with 3 lateral bristles (3–6 paratypes).

*Female.*—Length 2.0–2.8 mm; F-I length 3 times breadth.

Holotype male (UCD), Deep Springs, Inyo Co., California, 13 May 1974 (R. M. Bohart). Paratypes, 9 males, 9 females collected from May to September: CALIFORNIA: Deep Springs in Inyo Co. (R. Bohart, M. and J. Wasbauer, UCD, USNM, CDFA), Hallelujah Junction in Lassen Co. (R. Bohart, UCD); NEVADA: near Stillwater (F. Parker, UCD; M. Irwin, UCR), Carson Sink in Churchill Co. (R. Bohart, UCD), Mustang (R. Bohart, UCD). An additional 13 males and 9 female specimens have been seen from CALIFORNIA: Adel, Sagehen Creek in Nevada Co., Boca, Independence Lake in Sierra Co., Graegle, Brockway Summit in Placer Co., Carnelian Bay, Hope Valley and Carson Pass in Alpine Co., 11 mi N Bridgeport, Big Pine, Davis, Carmichael, and near Oceano; UTAH: Cornish; WYOMING: Shoshoni.

*Systematics.—H. azurellum* belongs in the *amabile* group which has F-I long, basal vein nearly straight, posterior mesopleuron microridged, tegula brown, and T-III broadly rounded. More particularly, *azurellum* has S-II

and male S-III bluish, malar space moderate (1–1.5 MOD), and lower frons finely punctate to the eye margins. The deep blue to purplish metanotum contrasting with the lighter colored green to coppery and green mesonotum is a useful recognition character.

### *Hedychridium bilobatum* Bohart, new species
(Figs. 22, 39)

*Male holotype.*—Length 4 mm, forewing 3 mm; body greenish blue, tegula green, a sharply defined and bilobed black spot basomedially on T-II (about as in Fig. 22), S-III brown, wings smoky. Pubescence pale, inconspicuous, scanty on lower frons. Punctation coarse on brow, continuing to clypeus in a narrow lateral band, median three-fifths of lower frons transversely microridged, pronotum with close but somewhat irregular moderate punctation, mesopleuron above midcoxa with a polished area, punctures toward middle of T-II fine and separated by 1–1.5 puncture diameters. Malar space half as long as pedicel; flagellum slender, F-I length 2.5 times breadth and 1.6 times pedicel length, F-V length 1.3 times breadth, F-XI 2.5 times; brow slightly overhanging cross ridged part of lower frons, forewing basal vein curved, a little longer than RS stub, meeting MCu at nearly a right angle; apical margin of T-III somewhat angled and drawn out; genitalia (Fig. 39); digitus subovoid, two-fifths as long as gonostyle; aedeagus with a lateral patch of strong bristles.

*Female.*—Length 3.8–5 mm; T-III a little more pointed than in male; T-II black markings usually as in Fig. 22, sometimes more triangular.

Holotype male (UCD), Sagehen Creek, Nevada Co., California, 29 June 1962 (R. M. Bohart). Paratypes, 21 males, 37 females, collected from June to September in CALIFORNIA: Sagehen Creek, Sattley, Boca, Carnelian Bay, Brockway, near Bridgeport, Fresno Meadow in Placer Co., Independence Lake and Sierra Valley in Sierra Co., Sierraville, Salie Keyes Lake in Fresno Co., Paradise Camp and Twin Lakes in Mono Co., Hallelujah Junction in Lassen Co., Grass Lake in El Dorado Co., Blairsden, Cedarville, Samoa, Santa Cruz Island, San Jose, Carmichael, and Davis. Other specimens determined as *bilobatum* are from Nevada (Mt. Rose, Reno), Oregon (Wallowa Co., Lake Co., Tillamock Co., Corvallis), Idaho (Payette National Forest, Lane), Utah (Ogden Peak in Weber Co.), Wyoming (15 mi S Green River), Colorado (Garden of the Gods), and New Mexico (12 mi N Las Cruces).

*Systematics.—H. bilobatum* is a relatively small member of the *dimidiatum* group with long F-I, short malar space, curved basal vein, partly polished posterior mesopleuron, and weak pubescence on the lower frons. It is distinguished from others of the group by the following combination: green tegulae, double line of coarse punctures along eye margins, slightly

angled rather than broadly rounded T-III margin which is not rounded over, brown S-III and sometimes weakly grooved and carinate forefemur. However, most characteristic is the discrete black spot basomedially on T-II. This spot is usually bilobate (Fig. 22) but may be roughly triangular. In the latter case there are usually traces of green in the spot along the midline. As in *menkei* there is a patch of strong bristles laterally on the aedeagus.

## *Hedychridium caeruleum* (Norton)
(Figs. 8, 40)

*Hedychrum caeruleum* Norton, 1879:239. Female holotype, "Dacota," ANSP, Philadelphia.

*Male (specimen from North Dakota).*—Length 3.5 mm, forewing 3 mm; body green with some bluish, including S-II-III; tegula mostly brown, wings smoky. Pubescence pale and inconspicuous on face and elsewhere. Punctation moderately coarse and close on head and thorax, merging with fine cross ridging in scapal basin; mesopleural area above midcoxa microridged; punctures toward middle of T-II moderate and slightly separated; those of sterna moderate and close; propodeal side completely sculptured. Face (Fig. 8); malar space a little longer than pedicel; F-I length 1.8 times breadth and 1.2 times pedicel length, F-V length 1.0 times breadth, F-XI 2.0 times; brow not unusually developed but overhanging sunken scapal basin; forewing basal vein slightly curved, longer than RS stub, meeting MCu at an obtuse angle; metanotum nearly triangular in dorsal view, sharply pointed posteriorly; propodeal projection obliquely truncate; S-II somewhat swollen on either side of middle; genitalia (Fig. 40); digitus subquadrangular, three-eighths as long as gonostyle; aedeagus without bristles.

*Female.*—Length 3.5 mm. F-I 1.9 times breadth, S-III brown.

*Distribution.*—In addition to the type we have seen 1 male and two females as follows: North Dakota: 11 mi W Walcott, 5 July 1962 (J. R. Powers, UCB); Indiana: Wells Co., 11 September 1971 (R. F. Wilkey, CDFA); Iowa: Ames, 24 June 1891 (UCD).

*Systematics.—H. caeruleum* does not seem to be closely related to any other species. Basic characters are the medium long F-I, malar space, and subantennal distance; basal vein slightly curved and longer than RS stub; and closely punctate sterna. Unique features are the pointed metanotum and obliquely truncate propodeal projection.

## *Hedychridium carinulatum* (Spinola)
(Figs. 9, 15, 42)

*Hedychrum carinulatum* Spinola, 1851:411. Male holotype, "Chile," repository unknown.

*Holopyga suturalis* Mocsáry, 1889:140. Syntype females, Chile, HNHM, Hungary; new synonymy, types seen by R. Bohart.

*Male (specimen from Olmué, Chile).*—Length 6 mm, forewing 5 mm; body blue green to purple including tegula and S-II-III, wings brown stained. Pubescence light fulvous, inconspicuous on face and elsewhere except on T-III which has a narrow, longitudinal, medial stripe of fine hair (Fig. 15). Punctation moderate to coarse on head and thorax, punctures of lower face merging with cross ridging medially; pronotal punctures of two sizes, mostly contiguous; mesopleural area above midcoxa polished; punctures toward middle of T-II mostly 0.5 puncture diameter apart. Face (Fig. 9); malar space 0.33 times pedicel length; flagellum slender, F-I length 2.4 times breadth and twice as long as pedicel, F-V length 1.2 times breadth, F-XI 2.6 times; clypeus projecting a little medially; brow slightly swollen and scapal basin a little concave; forewing basal vein strongly curved, as long as RS stub, meeting MCu at almost a right angle; T-III margin rounded to a slight apicomedial concavity; genitalia (Fig. 42), digitus subovoid, three-eighths as long as gonostyle, aedeagus with an inner projection consisting of five or six stout setae.

*Female.*—Length 5–7 mm; F-I length 2.8 times breadth, S-I-III green, medial projection of clypeus dentiform in side view; no hair stripe on T-III.

*Distribution.*—This species is relatively abundant in Chile, where it occurs from Chiloé Province to Coquimbo Province. We have also seen specimens from across the Andean passes in Chubut and Neuquen Provinces of Argentina. We have seen 60 males and 88 females.

*Systematics.—H. carinulatum* does not seem to have any close relatives. This is indicated by the peculiar aedeagal tuft (Fig. 42) and the hair "pencil" on T-III of the male (Fig. 15). Other features are the long F-I, short malar space, strongly curved basal vein, and toothlike median clypeal lobe of the female.

*Hedychrum discoidale* Buysson (1909) from Mendoza, Argentina (UZMC, Copenhagen) was based on 4 males, one of which was labelled lectotype by R. M. Bohart and is here designated as such. This species is remarkably similar to *carinulatum*, even to the hair "pencil" on T-III. The split claws of *discoidale* place it in the genus *Hedychrum.* Other differences from *carinulatum* are rather subtle. In *discoidale* the ocelli are slightly lidded, the scapal basin is finely but not deeply cross ridged, overall punctation is more coarse, notal punctation is closer, and the clypeal apex is less protruding.

### *Hedychridium centrale* Bohart, new species

*Female holotype.*—Length 3 mm, forewing 2.5 mm; body blue-green with black in interocellar area, middle third of scutum, scutellum mostly, large

basomedian area on T-II, small median spot on T-III; tegula and sterna brown; wings lightly brown stained. Pubescence pale, fine and moderately dense on outer third of lower face, otherwise inconspicuous. Punctation fine and close on lower face, coarse and slightly separated on brow, moderate on pronotum but irregularly sized and nearly contiguous, mesopleural area above midcoxa microsculptured and weakly ridged, moderately fine and about a puncture diameter apart toward middle of T-II. Malar space 0.33 times as long as pedicel; interocellar area with a shiny and irregularly punctate tubercle between hindocelli and extending at a lower elevation between midocellus and each hindocellus; flagellum slender, F-I length 1.5 times breadth and 1.3 times pedicel length, F-V length 1.0 times breadth, F-XI 1.7 times; brow somewhat overhanging lower face; forewing basal vein evenly and weakly curved, longer than RS stub, meeting MCu at a slightly obtuse angle; T-III apical margin broadly rounded, a little rounded over.

*Male*.—Unknown.

Holotype female (UCD), Quezaltepeque, El Salvador, 16 July 1963 (D. Cavagnaro, M. Irwin). Paratypes, 6 females, same data as holotype but collected 6 August (UCD, USNM). Two additional females referable to *centrale* are from Mexico: 15 mi NE Guadalajara, Jalisco, 17 September 1970 (R. M. Bohart, UCD); and 23 mi N Manzanillo, Colima, in Malaise trap (M. and J. Wasbauer, CDFA).

*Systematics*.—The prominent brow, moderately long F-I, dense lower frontal pubescence, gently curved basal vein, and well developed subantennal area place *centrale* in the *fletcheri* group. There, the tuberculate interocellar area and black markings of the head, scutum and T-II are distinctive for *centrale*.

## *Hedychridium cockerelli* Buysson

*Hedychridium cockerelli* Buysson, 1906:111. Male (not female) holotype, "South Boulder Canon, Colorado," MNHN, Paris.

*Male holotype*.—Length 2.5 mm, forewing 2 mm; body blue-green with coppery reflections; more bluish on prothorax, metathorax and propodeum; median third of T-II deep purple; tegula and abdominal venter brown; wings smoky. Pubescence pale, short and abundant on either side of lower frons, inconspicuous elsewhere. Punctation fine on outer third of lower frons except for a narrow zone of coarser punctures along eye margin; coarse and shallow on brow, medium and fairly close on pronotum, mesopleural area above midcoxa microridged, punctation fine and nearly contiguous toward middle of T-II. Face about as in Fig. 6; malar space longer than pedicel or F-II; flagellum slender, F-I length 3.5 times breadth and 1.5 times pedicel length, F-V length 1.2 times breadth, F-XI 2.2 times; brow

rounded and slightly prominent; forewing basal vein nearly straight, as long as RS stub, meeting MCu at a strongly obtuse angle.

*Female*.—Unknown.

*Distribution*.—We have seen only the type specimen from Colorado, courtesy of Ms. S. Kelner-Pillault.

*Systematics*.—In the *amabile* group, *cockerelli* has F-I long, basal vein nearly straight, tegula brown, and posterior mesopleuron microridged. More particularly, the malar space is long, lower frons with punctures more coarse toward eye margins, S-III brown, and T-II greenish. *H. cockerelli* is similar to *amabile* and, except for the coarser lower frons punctation, might be considered an extreme bluish color form of it.

### *Hedychridium cornutum* Bohart, new species
(Fig. 41)

*Male holotype*.—Length 2.5 mm, forewing 1.8 mm; body green with extensive coppery on ocellar area, terga and sterna; coppery to red on pronotum, scutum and apex of T-I; tegula green, wings smoky. Pubescence pale, present but not dense on outer third of lower face, inconspicuous elsewhere. Punctation fine to moderate on head and thorax but separated by dense microreticulation (about as in magnified part of Fig. 11); punctures of pronotum mostly 0.7–0.8 puncture diameter apart; mesopleural area above midcoxa microridged; punctures toward middle of T-II about 0.5 diameter apart; microridged area of lower frons limited to a small triangle above antennae. Malar space as long as pedicel; flagellum broadened and flattened (about as in Fig. 24), F-I length 1.2 times breadth and about as long as pedicel, F-V length 0.7 times breadth, F-XI 1.3 times; brow rounding evenly from midocellus to lower face; forewing basal vein nearly straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 41); digitus subquadrangular, two-fifths as long as gonostyle; aedeagus without bristles.

*Female*.—Length 2.5 mm, sterna brown, F-I 1.4–1.6 times breadth, F-V length equal to breadth, markings often extensively coppery to red.

Holotype male (UCB, on permanent loan to CAS), Dune Lakes, San Luis Obispo Co., California, 7 June 1973, on *Croton californicus* (J. Powell). Paratypes, 21 males, 12 females, collected from April to July. Records are all from the southern half of CALIFORNIA: Santa Cruz Island in Santa Barbara Co. (R. Brumley, UCD), 3 mi S Oceano on *Croton californicus* (J. Powell, R. Coville, UCB, UCD, USNM), Oso Flaco Lake in San Luis Obispo Co. (R. Bohart, UCD), Riverside on *Euphorbia albomarginata* (P. Timberlake, UCR, UCD, USNM); 7 mi E Sunnymead (M. Irwin, UCR); Vidal (J. MacSwain, UCB).

*Systematics*.—As discussed under *frugale*, that species and *cornutum* share a dense microreticulation between and within punctures of the head and thorax, as well as small size, coppery to coppery red markings, a nearly straight basal vein, short and quadrangular digitus, and no bristles on the aedeagus. *H. cornutum* differs in the closer and more distinct punctures of the body, particularly the pronotum and T-II. Also, F-I is shorter (1.2–1.6 times breadth), and F-V is much stouter in both sexes. All of the type series have at least some coppery to reddish coloration, especially on the scutum. Eight additional females with blue to green, but without coppery, are presumptive *cornutum*. They are from the California localities of Deep Springs and Owens Lake, Inyo Co.; Mira Loma, Riverside Co.; and Borrego Valley, San Diego Co.

## *Hedychridium coruscum* Bohart, new species
(Fig. 43)

*Male holotype*.—Length 3.5 mm, forewing 2 mm; head and thorax green but marked on top of head, pronotum and mesonotum with extensive coppery to coppery red; terga mostly bright coppery red, S-II mostly greenish, S-III dark with coppery highlights; tegula brown, wings lightly smoky. Pubescence pale, inconspicuous except for short pile on lower face. Punctation fine on lower face, merging with fine cross ridges in middle third; medium and fairly close on brow; medium and contiguous on vertex and pronotum, mesopleural area above midcoxa microridged, fine and slightly separated toward middle of T-II. Face about as in Fig. 6; malar space 1.2 times pedicel length; flagellum slender, F-I length 2.4 times breadth and 1.8 times pedicel length, F-XI 2.5 times; brow rather sharply rounded above scapal basin but not obviously swollen; forewing basal vein nearly straight, longer than RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 43), digitus long ovoid, two-thirds as long as gonostyle; aedeagus without bristles.

*Female*.—Length 2.5–3 mm; F-I length 3 times breadth.

Holotype male (UCD), Goleta, Santa Barbara Co., California, 6 July 1959, in nesting site of *Oxybelus sericeus* Robertson (R. M. Bohart). Paratypes, 10 males, 11 females, same data as holotype but collected from 22 June to 15 July (UCD, UCB, USNM). Additional collectors were C. A. Campbell, F. D. Parker, and P. M. Marsh.

*Systematics*.—This beautifully marked, small chrysidid is quite similar to *amabile*, including the long F-I and long malar space. The only discernible external difference is the short RS stub of *coruscum*. Otherwise, the absence of bristles on the aedeagus, and the differently shaped digitus (Fig. 43) can be used for separation. Although *amabile* is widespread,

*coruscum* is known only from the sand beach locality on the University of California, Santa Barbara campus.

### *Hedychridium crassum* Bohart, new species
(Figs. 21, 44)

*Male holotype.*—Length 5.5 mm, forewing 5 mm; body blue-green, scutum and metanotum partly purple, S-II-III green, tegula brown, wings brown stained. Pubescence pale, inconspicuous in scapal basin. Punctures moderately coarse, dense on clypeus, practically contiguous and similar in size on head, pronotum and T-II; lower frons transversely microridged in middle third; mesopleural area above midcoxa punctate. Malar space a little less than unusually short pedicel; flagellum slender, tapering, each article cylindrical, F-I length 2.2 times breadth and 3 times pedicel length, F-V length 1.6 times breadth, F-XI 4 times; brow starting rather abruptly above scapal basin but not obviously swollen, face unusually flat, forewing basal vein curved, as long as RS stub, meeting MCu at a right angle; T-II strongly swollen across apex (Fig. 21); T-III broadly rounded over apically, somewhat blunt and ending in a darkened membranous rim; T-II-III with traces of a median longitudinal carina; genitalia (Fig. 44) weakly pigmented; digitus slender, two-fifths as long as gonostyle which is unusually slender; aedeagus without bristles.

*Female.*—Length 4–6 mm; body green to purple, face usually green, tegula sometimes a little blue. S-I-III marked with green to blue.

Holotype male (UCD), Hallelujah Junction, Lassen Co., California, 2 July 1968 (R. M. Bohart). Paratypes, 44 males, 30 females from the following localities: CALIFORNIA: Tule Lake, Artois, Williams, Westgard Pass in Inyo Co., Mt. Diablo, Davis, Miami Ranger Station in Mariposa Co., Stockton, Santa Cruz Island, Woodlake, Foster Park in Ventura Co.; NEVADA: Orovada, near Eastgate, Spring Valley, Paradise Valley, Minden, 7 mi E Oreana; OREGON: Summer Lake, Medford, Warner Pass in Lake Co., Corvallis; WASHINGTON: Pullman, Benton Co., Prosser; IDAHO: near Malta, Salyer Cow Camp and Roy Summit in Oneida Co., Sublett Reservation in Cassia Co., 14 mi NE Mountain Home, 12 mi SE Oakley; UTAH: near Snowville, Cedar Hill, Curlew River, Grantsville, Leeds Canyon in Washington Co.; ARIZONA: 10 mi W Jacob Lake, near Portal, Sabino Canyon, Oak Creek Canyon; COLORADO: Moffat Co.; MONTANA: Dixon; NEBRASKA: North Platt, Neligh, 7 mi N Harrison; SOUTH DAKOTA: Vasta; IOWA: Ankeny; MEXICO (GUERRERO): Acapulco. Months of collection are June to September.

*Systematics.*—Among the *Hedychridium* with long F-I, *crassum* can be recognized at once by the swollen margin of T-II (Fig. 21). Otherwise it seems related to *purum* and *incisum*, which are smaller species, by a

combination of characters: pedicel two-fifths to one-third as long as F-I; flagellum unusually cylindrical; basal vein curved; clypeus rather densely punctate, brow punctation moderate, close, and similar to that on lower frons; S-III blue; and male genitalia weakly pigmented. Female *crassum* in collections frequently have the ovipositor exserted and as long as the abdomen.

### *Hedychridium crebrum* Kimsey, new species
(Figs. 16, 45)

*Male holotype*.—Length 3.5 mm, forewing 3 mm; body blue green, a dark spot basomedially on T-II, tegula and S-II-III blue, wings smoky. Pubescence pale, inconspicuous on face and elsewhere. Punctation moderately coarse and close on head and thorax, a little finer and nearly contiguous on terga; mesopleuron above midcoxa and propodeal side completely ridged. Malar space 0.3 times as long as pedicel; flagellum slender, F-I length 2.8 times breadth and 1.8 times pedicel length, F-V length 1.2 times breadth, F-XI 2.5 times; brow rather sharply rounded but not strongly projecting; forewing basal vein curved, as long as RS stub, meeting MCu at a slightly obtuse angle; T-III margin angulate, posterior apex rounded but drawn out (Fig. 16); genitalia (Fig. 45); digitus long ovoid, five-ninths as long as gonostyle; aedeagus without bristles.

*Female*.—Length 3–4 mm, body green to blue or purple, S-II blue or green, S-III partly blue or green.

Holotype male (UCD), Mariposa Canyon, Mariposa Co., California, 18 June 1968 (R. M. Bohart). Paratypes, 7 males, 16 females, OREGON: Medford (A. McClay, UCD); CALIFORNIA: Hornbrook station in Siskiyou Co. (D. Douglas, CDFA), Susanville (T. Haig, CDFA), Davis (S. Miyagawa, M. Irwin, A. McClay, F. Parker, C. Kovacic, R. Bohart, UCD, USNM), Farnham Ridge in El Dorado Co. (J. Leevers, UCD), Clarksburg (R. Bohart, UCD), Tassajara (G. Bohart, UCD), Mariposa (R. Bohart, UCD), 5 mi NE Santa Margarita (R. Thorp, UCD), Thousand Palms (P. Marsh, UCD), Riverside (J. Hall, UCR), Borrego Valley in San Diego Co. (E. Schlinger, UCD), Fish Creek Mts. in Imperial Co. (W. Mason, Canadian National Collection); UTAH: 14 mi E Moab (P. Torchio, USU), Leeds Canyon in Washington Co. (W. Hanson, USU). Dates of collection are April to May in southern California desert areas and June to October in more northerly localities.

*Systematics*.—*H. crebrum* belongs to the *dimidiatum* group which has the malar space less than 0.5 MOD, F-I more than twice as long as broad, pedicel over half as long as F-I, lower frons not densely pubescent and basal vein strongly curved. It is distinguished by having the margin of T-III drawn out posteromedially into a rounded point, especially in females

(Fig. 16), and the pronotal punctures rather even and not much coarser than those of T-II.

## *Hedychridium dimidiatum* (Say)
(Figs. 19, 30, 32, 46)

*Hedychrum dimidiatum* Say, 1824:330. Holotype female, "Pennsylvania," destroyed.

*Chrysis mexicana* Cameron, 1888:460. Holotype female, "Mexico, Zacatecas City," BMNH, London; new synonymy, type seen by R. Bohart.

*Holopyga mexicana* Mocsáry, 1911:448. Holotype male, "Mexico," HNHM, Hungary, nec Cameron, 1888; new synonymy, type seen by R. Bohart.

*Male (specimen from New York).*—Length 6.5 mm, forewing 5 mm; body green to blue, ocellar area dark, tegula brown, a dark spot mediobasally on T-II, S-II-III mostly green, wings brown stained. Pubescence pale, inconspicuous on face and elsewhere. Punctation moderate to coarse, coarse on lower face merging with cross ridging on middle third, coarse and contiguous on pronotum, moderate and slightly separated toward middle of T-II; mesopleural area above midcoxa punctate and partly polished. Malar space 0.25 times as long as pedicel; flagellum slender, F-I length 2.5 times breadth and 2.0 times pedicel length, F-V length 1.1 times breadth, F-XI 2.8 times; brow prominent, overhanging somewhat sunken scapal basin; forefemur creased and carinate along lower outer edge (Fig. 30); forewing basal vein strongly curved, longer than RS stub, meeting MCu at a right angle; T-III distinctly rounded over and indented before apical membranous margin; genitalia (Fig. 46); digitus sublinear, half as long as gonostyle; aedeagus without bristles.

*Female.*—Length 4.5–7.5 mm, F-I length 3 times breadth, S-III brown.

*Distribution.*—We have seen 287 males and 334 females from most of the United States as well as from Canada (Alberta, British Columbia) and Mexico (Jalisco, San Luis Potosí, Morelos, Distrito Federal, Baja California Norte).

*Systematics.*—Group features are the long F-I, short malar space, curved basal vein, partly polished posterior mesopleuron, and weak pubescence on the lower frons. Considering the broad range of *dimidiatum*, it is not surprising that size and markings are variable. In most specimens the punctures of T-II are moderate sized, deep, and separated by about 0.5 puncture diameter. The tegulae are usually brown but in about 10 percent of the specimens there is at least some green. More distinctive characters are the angled and rounded over T-III (Fig. 19), grooved and carinate forefemur (Fig. 30), and usually unmarked base of T-II. The character of the forefemur is otherwise found only in *olene* and *bilobatum* (weakly) among nearctic species. However, it occurs in several European species, such as *ardens* (Coquebert), *incrassatum* (Dahlbom), and *moricei* Buysson.

## *Hedychridium fletcheri* Bodenstein
## (Figs. 10, 27, 47)

*Hedychrum viride* Cresson, 1865:306. Lectotype female, "Colorado Territory," ANSP, Philadelphia; nec Guérin, 1842.

*Hedychridium fletcheri* Bodenstein, 1951:720; new name for *Hedychrum viride* Cresson.

*Male (specimen from Montrose County, Colorado).*—Length 7 mm, forewing 5 mm; head, thorax and terga bluish green, tegula and S-II green, S-III brown, wings smoky. Pubescence pale and short, dense on lower face. Punctation coarse and dense on brow, fine and dense on lower face; dense and both coarse and fine on pronotum; mesopleural area above midcoxa punctate to slightly ridged and partly polished; punctures fine toward middle of T-II, one to two puncture diameters apart; face (Fig. 10), ocello-clypeal distance as long as least interocular distance, subantennal distance unusually long, malar space about 0.6 times pedicel length; flagellum moderately stout (Fig. 27), F-I length 1.8 times breadth and 1.2 times pedicel length, F-V length subequal to breadth, F-XI 2.5 times; brow a little swollen; forewing basal vein curved, longer than RS stub, meeting MCu at a slightly obtuse angle; T-III margin somewhat drawn out; genitalia (Fig. 47); digitus elongate and linear, three-fourths as long as gonostyle; aedeagus without bristles.

*Female.*—About as in male, lower frons not as pubescent.

*Distribution.*—We have seen about 550 males and 1,040 females of this relatively common species. Most of these came from west of the 100th meridian, as far north as Saskatchewan and as far south as Chihuahua and Baja California Norte in Mexico. Some were also collected in Nebraska, Kansas, Minnesota, Texas, Iowa, Indiana, Illinois, Manitoba, and Florida. We have seen no specimens from northeastern U.S.

*Systematics.—H. fletcheri* is the most commonly collected species of the genus in America north of Mexico. It is also rather variable, as might be expected. Large specimens, such as the male described above, are easily recognized by the moderately long F-I (1.7–1.9 times breadth), moderately curved basal vein which meets MCu at an obtuse angle, somewhat prominent brow which overhangs a lower frontal zone of fine punctation bearing silvery pile in the male, and an unusually long face including a subantennal distance subequal to the pedicel length. In small specimens, some only 3 mm long, the above characters may be less pronounced. Especially, F-I may be only 1.5 times breadth. Male genitalia mounts of variant specimens have not indicated the presence of more than one species. Unfortunately, there are no host data for this species. It is possible that different host size or species might account for variation. Most *fletcheri* occur in shades of green to blue. Occasionally a specimen may be purplish or rarely may have considerable coppery markings. Several European species resemble *fletcheri*

in the long and pubescent face of the male. Especially close in other respects also is *jucundum* (Mocsáry) which differs primarily by its extensive reddish markings and mostly dark sterna.

## *Hedychridium frontis* Kimsey, new species
(Figs. 5, 12, 48)

*Male holotype*.—Length 2 mm, forewing 1.5 mm; head and thorax blue green, tegula brown and a little blue, terga blue green to black dorsomedially, S-II greenish blue, S-III brown, wings clear. Pubescence pale; short and dense on lower face; moderate in postocular area, mesopleuron and propodeum. Punctation medium to coarse and dense toward middle of brow, fine and dense on lower face and sides of brow, medium and separated by polished areas on pronotum; mesopleural area above midcoxa rather irregularly punctate; punctures toward middle of T-II fine, shallow and about one puncture diameter apart; T-III with fine, shallow punctures. Face (Fig. 12), malar space 0.3 as long as pedicel; flagellum moderately slender, F-I length 1.3 times breadth, a little shorter than pedicel, F-V length slightly less than breadth, F-XI 1.6 times; brow forming a V-shaped median swelling (Fig. 12); forewing basal vein straight, as long as RS stub, meeting MCu at a strongly obtuse angle (Fig. 5), T-III margin broadly rounded; genitalia (Fig. 48); digitus subovate, four-sevenths as long as gonostyle; aedeagus without bristles but with lateral projection.

*Female*.—Length 1.5–2.0 mm; F-I length equal to that of pedicel; terga usually somewhat violet; coppery tints frequent, especially in ocellar area.

Holotype male (UCD), 18 mi W Blythe, Riverside Co., California, 2 April 1963 (R. M. Bohart). Paratypes, 10 males, 10 females (UCD, USNM, CDFA, CAS, UCR, AMNH, UCB) same data as holotype but some collected by M. Irwin, F. Parker and D. Horning. Other paratype dates are 3 April and 14–16 October. Three male and 4 female paratypes are from Cronise Valley (San Bernardino Co.), Borrego, and Thousand Palms, California. Additional specimens have been seen from Tucson, Arizona; and 36 mi N El Golfo, Sonora, Mexico.

*Systematics*.—Since F-I is subequal in length to the pedicel and 1.5 times as long as broad, and the basal vein is nearly straight, *frontis* is placed in the *gemmatum* group. It is similar to *antennatum* but can be distinguished by the punctures on the brow, which are coarse medially but become fine near the ocular margins. Also, the RS stub is as long as the basal vein. This species is generally greenish to a little coppery and violet in females. S-III is greenish in the male and brown in the female, and the tegulae have greenish highlights. The aedeagus has an elongate lateral arm (Fig. 48), which is quite unlike the situation in any other *Hedychridium* studied.

## *Hedychridium frugale* Bohart, new species
(Figs. 11, 49)

*Male holotype.*—Length 2 mm, forewing 1.6 mm; head and thorax green but marked on top of head, pronotum and mesonotum with coppery to coppery red; terga greenish to violet, T-II mostly violet, tegula and S-II-III brown; wings nearly clear. Pubescence pale, moderate and short on lower face, inconspicuous elsewhere. Punctation fine on lower face, merging with broad median cross ridging; medium and shallow on brow; fine and sparse on vertex, pronotum and terga but separated by dense microreticulation; that on pronotum and T-II giving a transverse effect; mesopleural area above midcoxa microridged; face (Fig. 11); malar space 0.6 as long as pedicel; flagellum slender, F-I length 2.1 times breadth and 1.2 times pedicel length, F-V length 1.2 times breadth, F-XI 2.7 times; brow rounding evenly from midocellus to lower face; forewing basal vein almost straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 49), digitus subquadrangular, two-fifths as long as gonostyle; aedeagus without bristles.

*Female.*—Length 2–2.5 mm, F-I length 2.2–2.5 times breadth.

Holotype male (UCD), Glamis, Imperial Co., California, 8 April 1964 (R. M. Bohart). Paratypes, 32 males, 44 females: CALIFORNIA: near Glamis, Palo Verde, 18 mi W Blythe, Thousand Palms, Borrego Valley, Baker, near Indio, 7 mi SW Kelso, Santiago Canyon in Orange Co., Deep Springs in Inyo Co., 19 mi W Shafter, Sacramento; ARIZONA: 32 mi S Quartzite, 21 mi N Yuma, 3 mi SW Wickenburg. Collection dates range from 22 March to 8 April in southern California deserts, May in Sacramento Valley, April to May in Arizona, and September at Deep Springs. Collection depositories: UCD, USNM, CAS, USU, CDFA, LACM, UCB, UCR.

*Systematics.*—A few species of *Hedychridium* have a pronounced microsculpture or reticulation separating the punctures of the head (Fig. 11) and thorax. Two of these, *frugale* and *cornutum*, are recognized here. They share the following additional characters: small size; basal vein almost straight and as long as RS stub, markings extensively coppery to coppery red, short and subquadrangular digitus (Fig. 41, 49), and no bristles on the aedeagus. From *cornutum* the differentiating characters of *frugale* are the more slender flagellum in both sexes, longer F-I (2.1–2.5 times breadth), much more widely spaced punctures, and a strong tendency for reticulation of thorax and abdomen to give a transverse effect. Some primarily green to blue *Hedychridium* show microreticulation and may be *frugale*, but the concept is here restricted to the forms marked with extensive coppery and coppery red.

## *Hedychridium gemmatum* Kimsey, new species
(Fig. 50)

*Male holotype*.—Length 2 mm, forewing 1.5 mm; head and thorax green, metanotum blue green, terga green grading to purplish medially, S-II-III green, tegula brown, wings clear. Pubescence pale, short and dense on lower frons, obvious on tergum III. Punctation coarse and sparse on brow, fine and dense on lower frons without medial cross ridging, punctures large and medium-sized on pronotum but with polished interspaces, mesopleural area above midcoxa microridged, punctures toward middle of T-II separated by 1–2 puncture diameters. Malar space 0.7 times as long as pedicel; flagellum slender, F-I length 1.4 times breadth and 1.2 times pedicel length, F-V as long as broad, F-XI 1.6 times, brow rounding evenly to lower frons; basal vein straight, longer than RS stub, and meeting MCu at a strongly obtuse angle; T-III margin broadly rounded; genitalia (Fig. 50); digitus subovoid, four-ninths as long as gonostyle; aedeagus without bristles.

*Female*.—Similar to male, ocellar area and notum often a little coppery.

Holotype male (UCD), 18 mi W Blythe, Riverside Co., California, 9 October 1971 (R. M. Bohart). Paratypes, 6 males, 2 females, same data as holotype except for F. Parker and E. Grissell as additional collectors and 16 October 1965 as an additional date (UCD, USNM); 1 female, Borrego Valley in San Diego Co., 19 April 1957 (R. Bohart, UCD), 2 males, Wilcox, Arizona on *Euphorbia* (P. Hurd, UCB). An additional specimen has been seen from Las Cruces, New Mexico.

*Systematics.—H. gemmatum*, *frontis* and *antennatum* are in the same group and share the straight basal vein, F-I about 1.5 times as long as broad and subequal in length to the pedicel, and small size. It is distinguished by a combination of characters: antenna dark, tegula brown, F-V at least as long as broad, punctures coarse all across the rather smoothly rounded brow, and the RS stub shorter than the basal vein.

## *Hedychridium guatemalense* (Cameron)
(Fig. 17)

*Hedychridium guatemalense* Cameron, 1888:459. Holotype female, "Guatemala, Zapote, Panzos," BMNH, London.

*Holopyga kohli* Buysson, 1901:100. Holotype female, "Bresil," Brazil, MNHN, Paris, new synonymy, type seen by R. Bohart.

? *Holopyga pallolimbata* Ducke, 1903:133. Holotype female, "Itaituba am Tapajós," Pará, Brazil, Mus. Belém (?), tentative new synonymy.

*Female (specimen from Guatalón, Guatemala)*.—Length 8.5 mm, forewing 6.5 mm; body green with purple along sulci and basally on T-II-III; tegula purple, S-II-III green, wings brown stained. Pubescence pale fulvous,

inconspicuous on face, scattered on dorsum of body, abundant and mostly appressed on sterna. Punctation coarse and close on brow, almost defining an irregular cross carina; coarse on lower face, merging with a broad, median, cross ridged area; coarse and contiguous on pronotum, lateral lobe polished in side view; mesopleural area above midcoxa and propodeal side extensively polished; moderate, slightly separated and somewhat transverse on T-II-III; S-II moderately punctate, S-III rather closely so. Malar space 0.4 times as long as pedicel; flagellum slender, F-I length 2.9 times breadth and 2.1 times pedicel length, F-V length 1.3 times breadth, F-XI 5 times; brow moderately prominent, lower face slightly concave, ocelli lidded, pronotal lobe carinate dorsally, forewing basal vein strongly curved, as long as RS stub, meeting MCu at a right angle; propodeal projection unusually stout, approaching a right angle; T-III slightly depressed subapically, indented at posterior middle of margin (Fig. 17).

*Male*.—Unknown.

*Distribution*.—We have seen 14 females of this widespread tropical species, including the types of *guatemalense* and *kohlii*. New locality records are: GUATEMALA: Mocá, Guatalón (J. Bequaert, UCD); PANAMA: Barro Colorado Island (C. and M. Rettenmeyer, Kansas State University, UCD; L. Kimsey, UCD); VENEZUELA: Paraitepuy, Bolivar (P. Anduze, UCD); BRAZIL: Belém, Pará (Oliveira and Wygodzinsky, AMNH); ARGENTINA: Oran, Salta (R. Golbach, Tucumán, UCD), Horco Molle (L. Stange, UCD).

*Systematics*.—*H. guatemalense* seems to have no close relatives. Basic characters are the long F-I, strongly curved basal vein, short malar space, and green S-III. Specific characters are the extensively polished lateral pronotum, posterior mesopleuron, and lateral propodeum; lidded ocelli; and apicomedially indented T-III. It is the largest of our *Hedychridium*, slightly surpassing *dimidiatum* and *nevadae*.

## *Hedychridium incisum* Bohart, new species
(Figs. 18, 51)

*Male holotype*.—Length 3.3 mm, forewing 2.5 mm; body blue-green including S-II-III, an ill-defined purple spot basomedially on T-II, wings light smoky. Punctures moderately coarse, dense on clypeus, practically contiguous and similar in size on head, pronotum, and T-II, lower frons microridged above antennal sockets, mesopleural area above midcoxa punctate and narrowly polished. Malar space a little less than unusually short pedicel; flagellum slender, tapering, each article cylindrical, F-I length 2.3 times breadth and 2.2 times pedicel length, F-V length 1.3 times breadth, F-XI 2.5 times; brow rounded, face unusually flat; forewing basal vein strongly curved, as long as RS stub, meeting MCu at a right

angle; T-III margin broadly rounded except for a posteromedial indentation; genitalia (Fig. 51) weakly pigmented; digitus slender, three-fifths as long as gonostyle; aedeagus without bristles.

*Female*.—Length 3.3–4.0 mm, T-III somewhat more drawn out before apical indentation, flagellum reddish toward base.

Holotype male (UCD), Sierra Valley, Sierra Co., California, 24 July 1971 (R. M. Bohart). Paratypes, 3 females, same data as holotype but collected 7 and 11 July 1970. A female which appears to be this species was taken on *Eriogonum fasciculatum*, 9 mi S Warner Springs, San Diego Co., California (R. C. Bechtel, UCD). It is purplish overall.

*Systematics.—H. incisum* shares with *crassum* and *purum* the short pedicel, cylindrical flagellomeres, uniform punctation of brow and lower frons, curved basal vein, and weakly pigmented male genitalia with linear digitus. It differs from *crassum* by smaller size and unswollen T-II, from *purum* by longer F-I and smoky wings. From both of the above the indented posterior margin of T-III is distinctive.

## *Hedychridium leucostigma* Bohart, new species
(Fig. 52)

*Male holotype*.—Length 2 mm, forewing 1.6 mm; body bluish green with some coppery reflections on dorsum of head and thorax; terga partly violet, especially on T-II. S-II-III with coppery and faint bluish reflections; flagellum entirely, tibiae mostly pale reddish; forewing stigma, basal vein and RS translucent yellow, tegula brown, wing membrane water clear. Pubescence slivery white, short and dense on lower face except narrow, median, cross ridged strip; fine silver pubescence easily visible on other body parts, especially terga. Punctation fine and close on lower face, moderate on brow, fine and separated by about a puncture diameter on pronotum and T-II, mesopleural area above midcoxa punctate and a little polished, propodeal side with a large polished area. Malar space half as long as pedicel; flagellum slender, F-I length 1.5 times breadth and a little shorter than pedicel, F-V a little wider than long, F-XI length 2.2 times breadth; brow rounding evenly from midocellus to lower face; forewing basal vein almost straight, slightly longer than RS stub, meeting MCu at an obtuse angle; RS stub extending well beyond distal end of stigma; genitalia (paratype) (Fig. 52), digitus stoutly clubbed, nearly half as long as gonostyle; aedeagus without bristles.

*Female*.—Length 2 to 2.5 mm, S-I-II brown.

Holotype male (UCD), Borrego Valley, San Diego Co., California, 11 April 1969, on *Croton californicus* (R. M. Bohart). Paratypes, 3 males, 8 females, CALIFORNIA: Needles (R. Schuster, R. Brumley, P. Torchio et al., UCD, USU), Borrego Valley in San Diego Co. (R. Bohart, UCD, USNM),

Palo Verde (M. Wasbauer, CSDA), 18 mi W Blythe (R. Bohart, UCD), 6.2 mi N Glamis (M. Irwin, UCD); BAJA CALIFORNIA NORTE: 23 mi N San Luis (M. Irwin, UCR, UCD). Collecting dates of paratypes are in March, April, May and October. An additional female specimen was collected 27 mi SE Tucson, Arizona in May (M. Irwin, UCD).

*Systematics.*—Among the small species of *Hedychridium* with nearly straight basal vein, brown tegula, reddish flagellum, extensively silvered lower frons, and non-bristled aedeagus, *leucostigma* agrees with *argenteum* in having the wings water clear. Also the veins and stigma are pale yellow rather than brown. From *argenteum* it differs in the less heavily silvered mesopleuron, F-I equal to or a little shorter than pedicel instead of a little longer, flagellum considerably stouter and shorter, and RS stub proportionately longer.

### *Hedychridium lividum* Bohart, new species
(Figs. 4, 53)

*Male holotype.*—Length 3 mm, forewing 2 mm; body deep greenish blue, thorax more greenish, face a little purplish; T-II with a large mediobasal black spot covering nearly a third of tergum, S-II with a little blue, S-III dark; tegula brown, wings faintly smoky. Pubescence pale, inconspicuous on face and elsewhere. Punctation rather coarse on lower face, grading into transverse rugae medially, coarse and slightly separated but shallow and irregular on brow, medium and practically contiguous on pronotum, fine and separated by one to two puncture diameters toward middle of T-II, mesopleural area above midcoxa irregularly punctate and partly polished. Malar space half as long as pedicel; flagellum slender, F-I length 1.5 times breadth and 1.4 times pedicel length, F-V length about as long as breadth, F-XI 2 times; brow rounded evenly from midocellus to scapal basin; forewing basal vein curved, as long as RS stub, meeting MCu at nearly a right angle (Fig. 4); genitalia (Fig. 53); digitus subovoid, two-fifths as long as gonostyle; aedeagus with a lateral row of bristles.

*Female.*—Length 2.5–3.5 mm; F-I length 1.5 times breadth.

Holotype male (UCD), Thousand Palms, Riverside Co., California, 29 March 1977, on prostrate *Euphorbia* (R. M. Bohart). Paratypes, 11 males, 5 females, same data as holotype but collected also 2–11 April. Other paratypes, CALIFORNIA: 4 males, 19 mi W Blythe, 11–14 October (R. Bohart, C. Goodpasture, N. Smith, D. Horning, UCD); 3 males, 1 female, Borrego Valley, March to April (E. Grissell, UCD, CAS; M. Wasbauer, CDFA); 3 females, Glamis, April (R. Bohart, P. Marsh, UCD, USNM); 2 males, Deep Springs, Inyo Co., May and September (M. and J. Wasbauer, UCD, CDFA); 1 female, Riverside (P. Timberlake, UCR).

*Systematics.*—Except for the moderate length of F-I (1.5–1.7 times

breadth) and the lightly smoky wings *lividum* could be a member of the *dimidiatum* group. It has a short malar space, strongly curved basal vein, partly polished posterior mesopleuron and weakly pubescent lower frons. T-II has a well developed black area (hence *lividum*: black and blue), and S-III is brown, both of which are features of *bilobatum* and *menkei*. The brown tegula and broadly rounded T-III increase the resemblance to *menkei*. However, the shorter F-I and much more restricted facial cross ridging of *lividum* are separation points.

### *Hedychridium maricopae* Bohart, new species
(Fig. 54)

*Male holotype*.—Length 2.7 mm, forewing 2.0 mm; body greenish blue including S-II-III; T-II with a large, diffusely edged, dark, basomedian area; tegula brown, wings smoky. Pubescence pale, short and dense on lateral third of lower frons, inconspicuous elsewhere. Punctation fine and close in pubescent area of lower frons, blending with cross ridging in middle third, medium and close on brow and pronotum, mesopleural area above midcoxa microridged, punctures toward middle of T-II fine and slightly separated. Malar space 0.3 as long as pedicel; flagellum slender, F-I length 2.5 times breadth and 1.3 times pedicel length, F-V length 1.2 times breadth, F-XI 2.4 times; brow rounded but slightly prominent; forewing basal vein practically straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 54); digitus half as long as gonostyle, subovoid; aedeagus apparently without bristles (two small lateral ones present in paratype from Santa Ynez, California).

*Female*.—Length 2.5–3.0 mm, F-I length 3 times breadth, S-III brown but usually with faint green highlights toward base.

Holotype male (USU), 3 mi SW Wickenburg, Maricopa Co., Arizona, 5 May 1964 (P. Torchio, G. Bohart). Paratypes, 13 males, 15 females, ARIZONA: near Wickenburg (P. Torchio, G. Bohart, USU, UCD), 32 mi S Quartzite (D. Miller, UCD), near Portal (M. Cazier et al., AMNH); IDAHO: Malta (R. Westcott, UIDA); NEVADA: 7 mi E Oreana (T. Haig, CSDA), Nixon (R. Westcott, LACM); CALIFORNIA: Arbuckle on *Portulaca* (J. Carrillo, UCD, USNM), Sacramento (F. Parker, UCD), Davis (M. Irwin, UCD), Turlock (R. Snelling, LACM), Yosemite National Park (M. Irwin, UCR), Santa Ynez (M. Irwin, UCD), Foster Park in Ventura Co. (R. Bohart, UCD), Wyman Canyon in White Mts. of Mono Co. (J. Powell, UCD), Deep Springs in Inyo Co. (M. and J. Wasbauer, R. Bohart, CSDA, UCD), 12 mi SE Ivanpah (P. Hurd, UCB), 7 mi SW Kelso (M. and J. Wasbauer, CSDA), Ogilby Road in Imperial Co. (M. Wasbauer, CDFA). Paratypes were collected in every month from March to November. One additional male which appears to be *maricopae* bears the data: Guanajuato, Mexico, 6,000 feet, 21 December 1963 (M. Tauber, C. Toschi, UCB).

*Systematics.*—The long F-I, nearly straight basal vein, microridged posterior mesopleuron, brown tegula, and broadly rounded margin of T-III place this species in the *amabile* group. The abundant silvery pile of the lower frons and blue male S-III relate it to *azurellum.* From that species *maricopae* differs by its shorter malar space and longer digitus (Fig. 54). A few lateral bristles may be present on the aedeagus but these are weaker than in *azurellum.*

## *Hedychridium menkei* Bohart, new species
(Figs. 13, 55)

*Male holotype.*—Length 3.2 mm, forewing 2.5 mm; body green; a little coppery on face, vertex, and scutum; T-II with a large, diffusely edged, dark, medial area; S-II greenish; S-III and tegula brown; wings smoky. Pubescence pale, inconspicuous, sparse on lower frons. Punctation coarse and shallow on brow, extending downward along eye margins, merging with cross ridging which extends to eyes near clypeus; punctures close and moderate to fine on pronotum; mesopleural area above midcoxa largely polished; punctures toward middle of T-II fine and separated by a puncture diameter. Face (Fig. 13); malar space 0.3 as long as pedicel; flagellum slender, F-I length 2.4 times breadth and 1.4 times pedicel length, F-V length 1.2 times breadth, F-XI 2.3 times; brow evenly rounded, forewing basal vein curved, as long as RS stub, meeting MCu at nearly a right angle; genitalia (Fig. 55); digitus stout linear, three-fourths as long as gonostyle; aedeagus with a lateral patch of strong bristles.

*Female.*—Length 3–4 mm, F-I length 2.3–2.5 times breadth.

Holotype male (UCD), Leland Meadow, Tuolumne Co., California, 5 August 1960 (A. S. Menke). Paratypes, 10 males, 29 females, June to September, CALIFORNIA: Coffee Creek in Trinity Co., Lake Almanor in Plumas Co., Hallelujah Junction in Lassen Co., Yuba Pass in Sierra Co., Sierraville, Sagehen Creek in Nevada Co., Truckee, Carnelian Bay, South Lake Tahoe, Grass Lake in El Dorado Co., Hope Valley and Independence Lake in Alpine Co., Carson Pass in Alpine Co., Leland Meadow and Soda Springs in Tuolumne Co., Cottonwood Creek (9,000 feet) and White Mountains (10,000 feet) in Mono Co., Big Bear Lake in San Bernardino Co. Other records: CALIFORNIA: Davis, Carmichael, Goleta; OREGON: Benton Co., Wallowa Co.; IDAHO: Franklin Co.; BRITISH COLUMBIA: Frazier River, Princeton; UTAH: Iron Co.; WYOMING: Fremont Co.; COLORADO: Denver Co.; ARIZONA: Coconino Co.

*Systematics.—H. menkei* is a medium small species in the *dimidiatum* group with long F-I, short malar space, curved basal vein, partly polished posterior mesopleuron, and weak pubescence on the lower frons. Along with the brown S-III and usually brown tegulae, *menkei* has the lower frons with an extensive cross ridged area which practically reaches the com-

pound eye just above the clypeus (Fig. 13). Another feature of *menkei* is the extensive but indistinctly limited dark area of T-II. As in *politum* and *bilobatum*, the aedeagus has a patch of lateral bristles.

### *Hedychridium milleri* Kimsey, new species
(Fig. 63)

*Male holotype*.—Length 3 mm, forewing 2.6 mm; body greenish blue including S-II-III, tegula brown, wings faintly stained. Pubescence pale, short and moderate on lower face, inconspicuous elsewhere. Punctation on brow coarse, shallow and a little separated; becoming abruptly fine and dense on lower face, merging with medial cross ridging; punctures moderate on pronotum with some punctures separated by polished areas; mesopleural area above midcoxa irregularly microsculptured; punctures toward middle of T-II fine and 1–2 puncture diameters apart. Malar space half as long as pedicel; flagellum slender, F-I length 1.9 times breadth and 1.2 times pedicel length; F-V length 1.3 times breadth, F-XI 2 times; brow rounding evenly from midocellus to lower face. Forewing basal vein almost straight, as long as RS stub, meeting MCu at a strongly obtuse angle; T-III margin evenly rounded; genitalia (Fig. 63); digitus stoutly sausage shaped, four-ninths as long as gonostyle; aedeagus with three small bristles near apex on outer side.

*Female*.—Length 3 mm, F-I length 1.9 times breadth, S-II-III with faint blue highlights.

Holotype male (UCD), Borax Lake, Lake Co., California, June, 1963 (D. R. Miller). Paratypes, 48 males, 3 females, same data as holotype.

*Systematics*.—*H. milleri* is similar to *paulum* and shares with it the medium length F-I, short malar and subantennal space, nearly straight basal vein, slightly smoky wings, posterior mesopleuron completely microsculptured, medium small size (3–4 mm long), and partly bluish S-II-III. Differentiating characters of *milleri* are the slightly separated brow punctures, slightly finer lower frons punctation, and brown tegula. In addition the punctures of T-II are finer, shallower and more widely spaced. These features by themselves might indicate only a local variety of *paulum* but to them must be added the curved digitus (Fig. 63) rather than a clubbed one (Fig. 59).

### *Hedychridium mirabile* Kimsey, new species
(Fig. 56)

*Male holotype*.—Length 4 mm, forewing 2.5 mm; head and thorax green to blue, tinged with coppery on ocellar area and pronotum; terga bright coppery red, becoming greenish on T-I; venter brown; tegula green, wings lightly smoky, pubescence pale, short but abundant on outer third of lower

face. Punctation fine on lower face, grading into medial cross ridging; medium coarse and contiguous on brow and pronotum; mesopleural area above midcoxa irregularly punctate and a little polished; punctures toward middle of T-II medium-sized, deep, separated by about 0.5 puncture diameter. Face similar to that of *fletcheri* (Fig. 10) but subantennal distance shorter and frons a little wider; malar space half as long as pedicel; flagellum slender, F-I length 1.7 times breadth and 1.4 times pedicel length, F-V length 1.2 times breadth, F-XI 2 times, brow roundly overhanging scapal basin; forewing basal vein nearly straight, longer than RS stub, meeting MCu at an obtuse angle; T-III margin rounded but a little drawn out, strongly rimmed; genitalia (Fig. 56); digitus slender, five-sevenths as long as gonostyle, aedeagus without bristles.

*Female*.—Length 3–4 mm, head and thorax green to blue, usually with a strong infusion of coppery red, terga usually coppery red; F-I length 1.8 times breadth.

Holotype male (UCD), Rumsey, Yolo Co., California, 26 April 1966 (R. M. Bohart). Paratypes, 37 males, 28 females, CALIFORNIA: 3–4 mi N Rumsey (M. Irwin, C. Moore, R. Bohart, UCD, USNM), Putah Canyon in Yolo Co. (F. Parker, UCD), Sacramento (F. Parker, R. Bohart, M. Wasbauer, F. Andrews, UCD, CDFA), Davis (F. Parker, R. Bohart, C. Moore, M. Irwin, A. Grigarick, UCD, UCB, LACM, CAS, USU), Grand Island in Sacramento Co. (M. Wasbauer, CDFA, UCD, CSU). Paratypes were collected in April, May and September. This species is found throughout California at low to moderate elevations. A total of 79 males and 78 females have been seen in addition to paratypes, some of them from British Columbia and most of the western states as far east as Wyoming and New Mexico.

*Systematics*.—This is a member of the *fletcheri* group based on a rather prominent brow, dense pubescence on the lower face, F-I less than twice as long as broad and basal vein curved. It is distinguished by having the subantennal distance shorter than the pedicel, RS stub shorter than the basal vein, S-II brown, and T-II-III coarsely punctate. The type series was chosen from individuals having obvious coppery red or reddish purple on at least T-II. However, over half of the specimens seen are green and blue with no reddish markings on the terga. A series collected by J. Powell near Mt. Shasta City included both color forms and intermediates.

## *Hedychridium nevadae* Kimsey, new species
(Figs. 14, 57)

*Male holotype*.—Length 7 mm, forewing 5.5 mm; body, including tegula and S-II-III purple with some blue to green, wings brown stained. Pubescence fulvous to brown, inconspicuous in scapal basin. Punctation mostly coarse, irregular and transverse in scapal basin, coarse and contiguous on

pronotum, a little finer and slightly separated on T-II; vertical side of pronotum with longitudinal ridges in front of lobe, punctate anteriorly; mesopleural area above midcoxa punctate and polished; side of propodeum polished anteriorly, becoming punctate and longitudinally ridged posteriorly. Face (Fig. 14); malar space 0.6 as long as pedicel; mandible nearly simple, F-I length 1.9 times breadth and 1.4 times pedicel length, F-V length 1.1 times breadth, F-XI 1.5 times, brow swollen medially, pronotum with neck area elevated so that horizontal surface extends forward to a median carina and is nearly twice as long in midline as scutellum; forewing basal vein slightly curved, longer than RS stub, reaching MCu at an obtuse angle; T-III apical margin a little blunt medially, membranous rim somewhat uneven; genitalia (Fig. 57), digitus sublinear, half as long as gonostyle; aedeagus without bristles.

*Female*.—Body length 6–7 mm, S-II mostly purple, S-III partly so.

Holotype male (UCD), 2 mi E Lone Pine, Inyo Co.; California, 12 October 1971 (R. M. Bohart). Paratypes: 1 pair, same data as type (except E. E. Grissell an additional collector); 1 male, 3 females, 5–6 mi NE Sparks, Nevada on *Chysothamnus* (R. C. Bechtel, UCD, USNM); 1 pair, Vya, Nevada (F. D. Parker, UCD); 1 male, Great Sand Dunes National Monument, Alamosa Co., Colorado (D. Gwynne, CSU); 1 male, Adel, Oregon, (R. F. Denno, E. E. Grissell, UCD). Paratype dates were from 10 August to 12 October.

*Systematics.—H. nevadae* is a distinctive species and seems unlike any other *Hedychridium* in the western hemisphere. Characters that distinguish it are: subantennal distance greater than 2 MOD; facial and other pubescence sparse, erect and dark; mandibles long and slender, without distinct teeth; and F-I less than twice as long as broad. This is also a large species for the genus, ranging between 6 and 8 mm in length. The color varies from deep green to purple.

## *Hedychridium olene* Kimsey, new species
(Figs. 1, 31, 58)

*Male holotype*.—Length 4 mm, forewing 3.5 mm; body blue green, S-II with a medial green spot, S-III brown, tegula brown and a little green, wings brown stained. Pubescence pale, inconspicuous on face and elsewhere. Punctation moderately coarse on head and thorax, merging with medial cross ridging on lower face, contiguous on pronotum; mesopleural area above midcoxa punctate and polished; punctures toward middle of T-II moderately fine and slightly separated. Malar space a fifth as long as pedicel; flagellum slender, F-I length 2.1 times breadth and 1.4 times pedicel length, F-V length 1.2 times breadth, F-XI 2.5 times; brow rounding evenly from midocellus to lower face; forefemur enlarged and sharply angled

basally, creased along lower margin (Fig. 31); forewing basal vein curved, longer than RS stub, meeting MCu at a right angle (Fig. 1); T-III apical margin evenly rounded; genitalia (Fig. 58); digitus rhomboid, half as long as gonostyle which is unusually broad and bears large sensilla along inner wall, aedeagus with a patch of lateral setae.

*Female*.—Length 4–5 mm, F-I length 2.2 times breadth, S-I-III brown.

Holotype male (UCD), Boca, Nevada Co., California, 16 August 1963 (R. M. Bohart). Paratypes, 10 males and 11 females: CALIFORNIA: Sierraville, Sierra Valley (Sierra Co.), Sagehen Creek (Nevada Co.), Boca, Leland Meadow (Tuolumne Co.), Strawberry and Dodge Ridge (Tuolumne Co.), Antelope Springs (Inyo Co.), Davis, Camatti Canyon (San Luis Obispo Co.), 6 mi S Cottonwood Springs (Riverside Co.); Borrego Valley (San Diego Co.), ARIZONA: Gila Bend; OREGON: 6 mi E Warner Pass (Lake Co.); IDAHO: Leslie. Dates of collection are from 19 April in Borrego Valley to 29 August at Strawberry. Paratypes are in collection of UCD, USNM, UCR, UCB, and WSU.

*Systematics*.—*H. olene* belongs to the *dimidiatum* group. It has F-I more than twice as long as broad, pedicel over half as long as F-I, malar space about half an MOD, basal vein strongly curved, lower frons weakly pubescent, and posterior mesopleuron partly polished. *H. olene* is readily distinguished from related species by the strong subbasal angle of the forefemur with associated crease and ridge (Fig. 31), and the presence of a cluster of bristles on the aedeagus (Fig. 58). Is is the only species of *Hedychridium* with an angled forefemur, but this condition occurs commonly in *Holopyga* and in at least one species of *Hedychrum*.

## *Hedychridium paulum* Bohart, new species
(Fig. 59)

*Male holotype*.—Length 3 mm, forewing 2 mm; body bluish green including tegula and S-II-III; wings smoky. Pubescence pale, inconspicuous on face and elsewhere. Punctation moderate and contiguous on head and thorax, fine and nearly contiguous toward middle of T-II; mesopleural area above midcoxa microridged; malar space 0.7 as long as pedicel; face below brow unusually flat; flagellum moderately slender, F-I length 1.4 times breadth and a little more than pedicel length, F-V slightly broader than long, F-XI length 2 times breadth; brow rounding evenly from midocellus to lower face; forewing basal vein nearly straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 59); digitus stoutly clubbed, four-ninths as long as gonostyle which is broadly rounded apically; aedeagus without bristles.

*Female*.—Length 2.5–3 mm, S-III mostly green.

Holotype male (UCD), Sagehen Creek, Nevada Co., California, 5 July

1966 (R. M. Bohart). Paratypes, 32 males, 130 females collected June to August in the central Sierran localities: Sagehen Creek in Nevada Co., Independence Lake in Sierra Co., and Carnelian Bay in Placer Co. Collectors were R. Bohart, M. Irwin, L. Stange, J. Powell, J. Wasbauer, R. Giblin, and B. Villegas. Several of the Sagehen Creek females were caught as they emerged from burrows of *Pulverro monticola* Eighme (Sphecidae). A series of females were also taken in a nesting site of *Dufourea trochantera* G. Bohart (Halictidae) at Independence Lake.

This relatively abundant species occurs in many other California localities, particularly in the Sacramento-San Joaquin Valley and in the Sierra from Inyo Co. north. It is found along the Sacramento River in the Lower Sonoran Zone and at 10,000 feet elevation in the Hudsonian Zone of White Mountains, Mono Co. Coastal collections have been made at Foster Park, Ventura Co. and Point Arena, Humboldt Co. Out-of-state records are: NEVADA: Mt. Rose, Verdi, Pyramid Lake; OREGON: Mt. Hood, Lake of the Woods; WASHINGTON: Walla Walla; UTAH: Willard Peak in Weber Co.

*Systematics*.—This medium small species seems to have no close relatives. Its basic features are: F-I about 1.5 times breadth, basal vein nearly straight, malar space short, brow closely punctured, face flat with little pubescence, tegula and S-II-III greenish, aedeagus without bristles, and digitus clubbed (Fig. 59). Unlike the other small sympatric species, *menkei*, *bilobatum*, and *rasile*, T-II is not black basomedially, but usually green with a faint coppery discoloration. From the above three the short F-I of *paulum* also provides ready separation. Occasionally, the coppery tint is more extended and intensified, as in a series of rather highly colored specimens collected by J. Powell near Oceano, San Luis Obispo Co.

### *Hedychridium politum* Bohart, new species
(Figs. 20, 28, 60)

*Male holotype*.—Length 4.5 mm, forewing 4 mm; body greenish blue including tegula and S-II-III, wings brown stained. Pubescence whitish to fulvous, inconspicuous on lower frons. Punctation fine to moderate, lower face with moderate punctures grading into transverse microridging in middle third; brow with coarse and close but shallow punctures; pronotum with moderate and fine punctures closely intermixed; mesopleural area above midcoxa punctate and partly polished; T-II with fine punctures separated mostly by one puncture diameter, polished overall. Malar space 0.2 as long as pedicel; flagellum slender (Fig. 28), F-I length 2.2 times breadth and nearly twice pedicel length, F-V length 1.3 times breadth, F-XI 2.5 times; brow rounding evenly from midocellus to lower face; forewing basal vein curved, longer than RS stub, meeting MCu at a right angle; apical margin of

T-III broadly rounded; genitalia (Fig. 60); digitus subtriangular, two-fifths as long as gonostyle which is broadly rounded apically; aedeagus with a lateral patch of bristles.

*Female*.—Length 4–6 mm; S-II blue-green; S-III brown, sometimes tinged with blue-green; T-III margin rather broadly rounded (Fig. 20).

Holotype male (UCD), Sagehen Creek, Nevada Co., California, 13 July 1968 (R. M. Bohart). Paratypes, 22 males, 35 females, same locality as holotype but collected from 23 June to 30 July by R. Bohart, R. Giblin, and M. Irwin. In addition about 125 specimens have been seen from many localities in the California Sierra and from Mt. Pinos in Kern Co.; and out-of-state localities: NEVADA: Mt. Rose; OREGON: Milton, Cornucopia, Crater Lake, Aneroid Lake, Parkdale, Lake of the Woods, Hat Point in Wallowa Co.; IDAHO: Valley Co., Kootenai Co., Butte Co., UTAH: Weber Co., Box Elder Co.; WYOMING: Centennial, 20 mi W Farson, Jenny Lake; COLORADO: Fort Collins.

*Systematics*.—*H. politum* roughly resembles *dimidiatum* and shares with it the long F-I, short malar space, curved basal vein, partly polished posterior mesopleuron, and weak pubescence on the lower frons. Distinguishing features of *politum* are as follows: green tegulae, lower frons mostly punctate, broadly rounded T-III margin which is not rounded over, blue male S-III, simple forefemur, and base of T-II without a black area or with a small and indefinite one. The digitus is uniquely short and broad (Fig. 60), and the aedeagus has a lateral patch of bristles. In most specimens of *politum*, T-II presents an overall polished appearance, hence the name.

## *Hedychridium purum* Kimsey, new species
(Figs. 3, 29, 61)

*Male holotype*.—Length 3.5 mm, forewing 3 mm; head and thorax blue, terga purple, tegula and S-II-III blue, wings somewhat whitish. Pubescence pale, inconspicuous on lower face and elsewhere. Punctation moderately coarse; close on brow; same on lower face but a little finer; slightly separated on pronotum; mesopleural area above midcoxa punctate and a little polished; punctures toward middle of T-II nearly as large as on pronotum, deep, and about 0.5 puncture diameter apart. Face unusually flat; malar space subequal in length to pedicel; flagellum slender, articles cylindrical, F-I length 1.7 times breadth and 2.6 times pedicel length, F-V length 1.4 times breadth, F-XI 3 times (Fig. 29); brow rounding evenly from midocellus to lower face; forewing stigma ending abruptly opposite RS stub, basal vein curved, longer than RS stub, meeting MCu at a right angle (Fig. 3); T-III margin evenly rounded; genitalia (Fig. 61) weakly pigmented, digitus subovoid, four-ninths as long as gonostyle; aedeagus without bristles.

*Female*.—Length 3–4 mm, body color ranging from all green to all purple, F-I about 1.8 times breadth, S-II-III blue.

Holotype male (UCD), Kelton, Box Elder Co., Utah, 15 August 1969 (G. F. Knowlton). Paratypes, 1 male, 7 females collected from 17 April to 15 August as follows: UTAH: near Kelton (G. Knowlton, UCD); ARIZONA: Florence Junction in Pinal Co. (W. Barr, UIDA), Tucson (R. and E. Painter, UA; NEVADA: near Eastgate (E. Linsley, G. Gaumer, R. Bohart, UCD, USNM), 12 mi NE Stillwater (F. Parker, UCD).

*Systematics.—H. purum* belongs in the *crassum* group, the characters of which are listed under that species. The shorter F-I and simple T-II are immediate points of separation, the first character from both *crassum* and *incisum*, the second from *crassum*. Other features are the yellowish-white wings, rather small size (3–4 mm long) and short RS stub which ends abruptly opposite the end of the stigma. There may be several species involved, considering observed variations in size and wing color. Therefore, the concept of *purum* is here limited to specimens with white to yellowish-white wings, a range of 3–4.5 mm in length, blue or green tegula, T-III coarsely punctate and broadly rounded apically, female flagellum with some red or yellow and F-I at least twice as long as pedicel. This group from which the type series was chosen is found in Upper Sonoran areas in Nevada, Utah, California and Arizona. Two other groups (species?) are found only in Lower Sonoran desert areas in California and Arizona.

## *Hedychridium rasile* Bohart, new species
(Fig. 62)

*Male holotype*.—Length 3 mm, forewing 2.4 mm; body greenish blue, mesonotum green; T-II with a large, diffusely edged, dark, basomedial area; S-II-III bluish green; tegula brown, wings smoky. Pubescence pale, sparse on sides of lower frons, inconspicuous elsewhere. Punctation moderate and close on brow, a little finer below and blending with median cross ridging, moderate and contiguous on pronotum, mesopleural area above midcoxa microridged, punctures toward middle of T-II fine and slightly separated. Malar space half as long as pedicel; flagellum slender, F-I length 2.3 times breadth and 1.5 times pedicel length, F-V length 1.2 times breadth, F-XI 2.3 times; brow evenly rounded, forewing basal vein slightly curved, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 62); digitus three-fifths as long as gonostyle, curvilinear; aedeagus without bristles.

*Female*.—Length 3–3.5 mm, F-I length 2.2–2.5 times breadth, S-II brown or more often with a greenish tint.

Holotype male (UCD), Sagehen Creek, Nevada Co., California, 19 June 1974 (R. M. Bohart). Paratypes, 29 males, 24 females collected from June

to August in the following central Sierran localities: CALIFORNIA: Sagehen Creek in Nevada Co., Independence Lake in Sierra Co., Carnelian Bay in Placer Co., Boca and Russell Valley in Nevada Co., Winnemucca Lake and Highland Lake in Alpine Co., Carson Pass in Alpine Co.; NEVADA: Mt. Rose, 8,000 ft meadow in Washoe Co. Collectors were R. Bohart, P. Marsh, D. Poirier, N. Smith, and B. Villegas.

*Systematics.*—*H. rasile* is in the *amabile* group with F-I long, basal vein nearly straight, tegula brown, and posterior mesopleuron microridged. Characters in combination which distinguish *rasile* are: lower frons weakly pubescent, malar space short, male S-III blue, and T-II punctures well separated. The last two features are useful in separating *rasile* from *solierellae*. Although running to different parts of the key on the basis of F-I length, *rasile* and *paulum* are similar and may be collected together in the central Sierra Nevada. The brown tegula of *rasile* is an additional distinguishing feature as well as the unclubbed digitus.

### *Hadychridium semirufum* (Cockerell)

*Holopyga semirufa* Cockerell, 1896:17. Holotype female, "Las Cruces," New Mexico, USNM, Washington.

*Female (specimen from 19 miles north of Rodeo, New Mexico).*—Length 3.5 mm, forewing 2.5 mm, face green, genal and cervical areas bluish purple, thorax dorsally green except metanotum purple, legs red, terga and sterna non-metallic red, tegula brown, wings nearly clear. Pubescence pale, short and dense on lower face. Punctation coarse and shallow on brow separated by polished areas, becoming fine and dense on lower face, medium and separated by polished areas on pronotum, mesopleural area above midcoxa with a small polished spot among microridges, punctures small and separated by one to two puncture diameters toward middle of T-II. Face unusually flat, malar space half as long as pedicel; flagellum slender, F-I 1.7 times as long as broad, as long as pedicel, F-V as long as broad, F-XI 1.7 times; brow rounding evenly to lower face; forewing basal vein almost straight, longer than RS stub, meeting MCu at a strongly obtuse angle; forewing stigma ending before apex of RS stub; T-III margin evenly rounded.

*Male.*—Unknown.

*Distribution.*—We have seen 13 specimens, including the type. These were collected from 14 August to 23 September. Localities are: ARIZONA: 4 mi NW Geronimo on Gila River (R. Dickson, UCR), 16 mi NE Douglas (J. Rozen et al., AMNH, UCD), Wilcox (UCB); NEW MEXICO: 18 mi N Rodeo (C. Moore, P. Hurd, R. Bohart, UCD, UCB), Mesilla (G. Bohart, USU).

*Systematics.*—This is a very distinctive species, unlike any other in the Western Hemisphere. It is distinguished principally by the nonmetallic

red abdomen and legs, as well as by having a straight basal vein that is longer than the RS stub, and a flat face. Red abdominal coloration is found in several European species, including: *lampadum* Linsenmaier and *roseum* (Rossi). However, these have metallic violet hues associated with the red, and otherwise appear quite unrelated to *semirufum*.

### *Hedychridium soliérellae* Bohart and Brumley
(Fig. 64)

*Hedychridium soliérellae* Bohart and Brumley, 1967:234. Male holotype, "Arbuckle, Colusa County, California," UCD, Davis.

*Male (topotype reared from almond hull nest of Soliérella peckhami).*—Length 2.5 mm, forewing 2.0 mm; body green to greenish blue, tegula brown, a large black spot on T-II extending to base; S-III brown; wings lightly smoky. Pubescence fulvous, scanty on face, inconspicuous elsewhere. Punctation coarse and close on brow; moderate on face, merging medially with cross ridging, moderately coarse and close on pronotum, moderate and practically contiguous on T-II; mesopleural area above midcoxa microridged. Malar space half as long as pedicel; flagellum slender, F-I length 2.5 times breadth and 1.4 times pedicel length, F-V length 1.2 times breadth, F-XI 2 times, brow slightly swollen above shallow scapal basin; forewing basal vein almost straight, as long as RS stub, meeting MCu at a strongly obtuse angle; genitalia (Fig. 64); digitus subovoid, three-sevenths as long as gonostyle; aedeagus without bristles.

*Female.*—Length 2.5–3 mm, F-I length 2.8–3.0 times breadth.

*Distribution.*—We have seen about 60 males and 85 females, collected in every month from March to October. The species is widespread in California, where it occurs in the Sacramento-San Joaquin Valley from Colusa Co. (Arbuckle) to Kern Co. (McKittrick); in southern California from San Diego Co. (Borrego Valley) to Orange Co. (Laguna Beach) and San Bernardino Co. (Vidal Junction); in coastal mountains of Monterey Co. (Arroyo Seco); in the central Sierra of Placer Co. (Carnelian Bay) and Nevada Co. (Boca); and in the eastern desert of Inyo Co. (Deep Springs). Out-of-state localities are: NEVADA: Nixon, Patrick, Reno; ARIZONA: Continental, Wickenburg, 32 mi S Quartzite, Santa Catalina Mts., Gila Bend, near Tombstone; UTAH: Wellsville Mts., Delta.

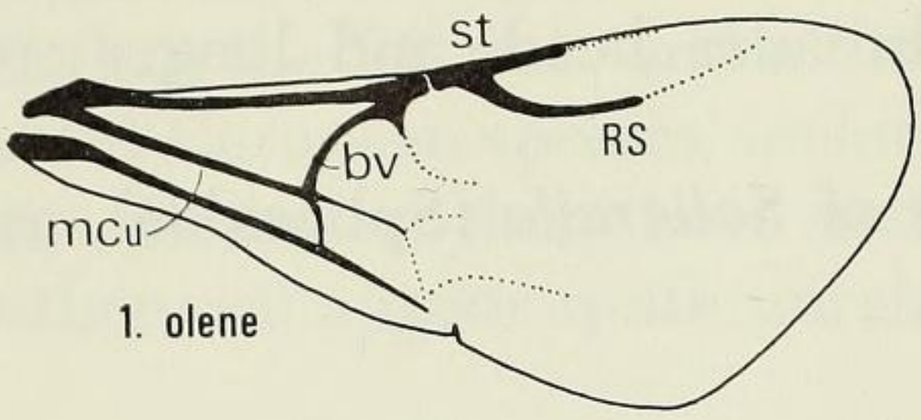
*Systematics.*—As in others of the *amabile* group, this species has F-I long, basal vein nearly straight, tegula brown, and posterior mesopleuron microridged. The short malar space and weakly pubescent lower frons are shared with *rasile*. However, the nearly contiguous punctures of T-II and brown male S-III are distinguishing for *soliérellae*. We have in our collection a single male from the island of Cyprus determined by W. Linsenmaier as *monochroum* Buysson. This European species is parasitic on *Soliérella* ac-

cording to Móczár (1967). It is quite similar to *soliereliae*, but slight observed differences are the shorter but broader head, and longer subantennal distance of *monochroum*.

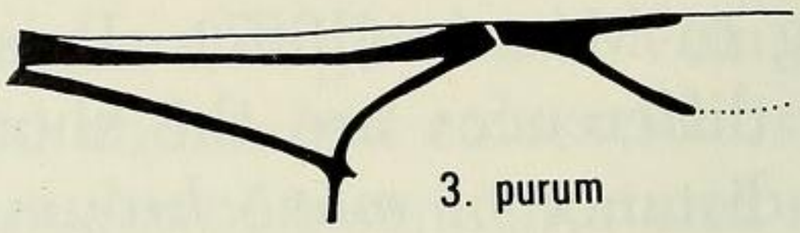
*Biology*.—A parasitoid of three species of *Solierella* (Sphecidae), as discussed in the Introduction.

## Acknowledgments

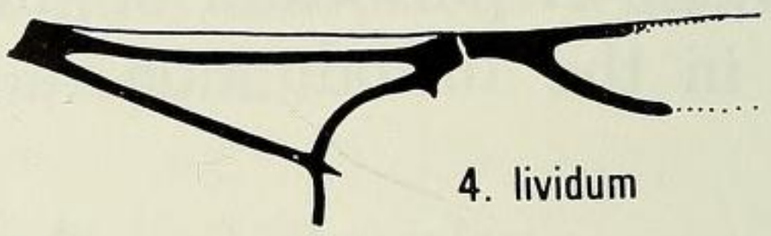
Examination of type specimens has been made possible by individuals in the following institutions: U.S. National Museum (USNM, A. Menke); Museum National d'Histoire Naturelle, Paris (MNHN, S. Kelner-Pillault); Universitetets Zoologiske Museum, Copenhagen (UZMC, B. Petersen); Naturhistorisches Museum, Vienna (Max Fischer); British Museum, Natural History, London (BMNH, C. Vardy); Hungarian Natural History Museum, Budapest (HNHM, L. Móczár); and Academy of Natural Sciences, Philadelphia (ANSP, S. Roback). Other institutions and individuals to whom we are especially indebted are: American Museum of Natural History (AMNH, J. Rozen, M. Favreau); California Department of Food and Agriculture (CDFA, M. Wasbauer); Los Angeles County Museum (LACM, R. Snelling); California Academy of Sciences (CAS, P. Arnaud); University of Arizona (UAZ, F. Werner); University of Idaho (UIDA, W. Barr); University of California at Berkeley (UCB, J. Powell, J. Chemsak), at Riverside (UCR, P. Timberlake, S. Frommer), at Davis (UCD, R. Schuster); Colorado State University (CSU, H. Evans); Utah State University (USU, G. Bohart, W. Hanson); and Washington State University (W. Turner, WSU).



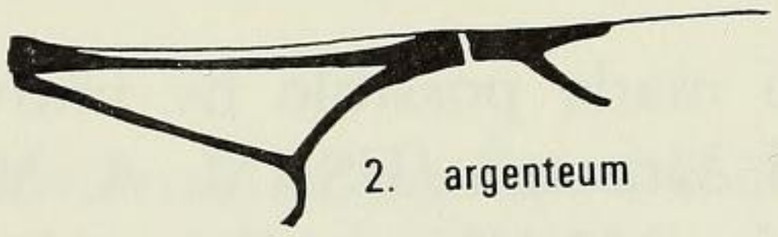

1. olene



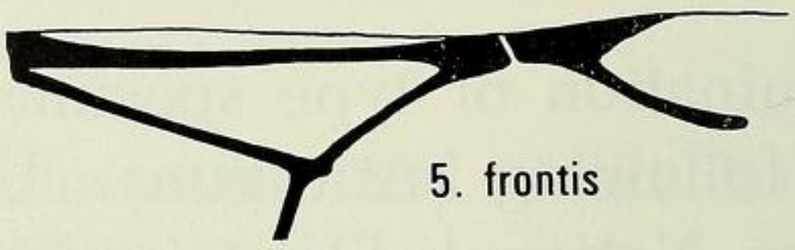
3. purum



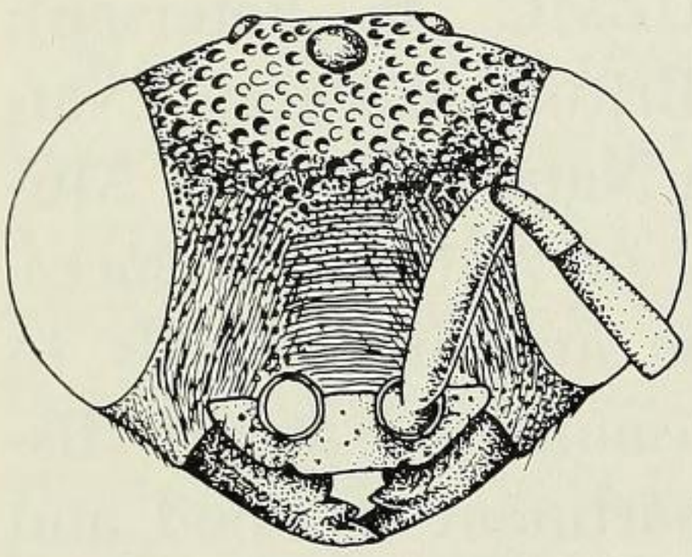
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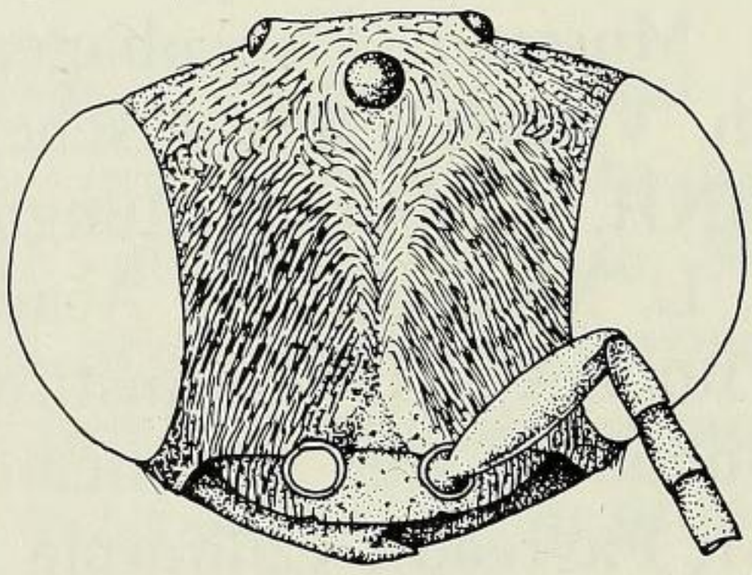
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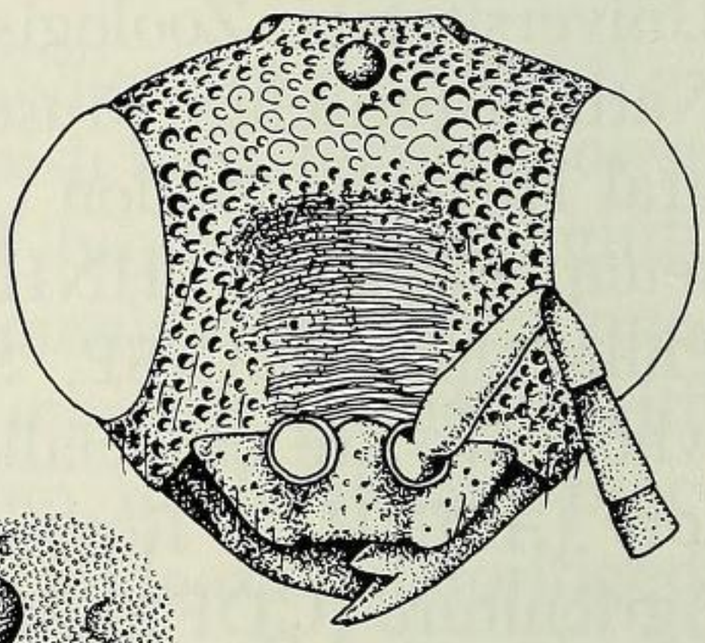
5. frontis



6. amabile



7. argenteum



8. caeruleum



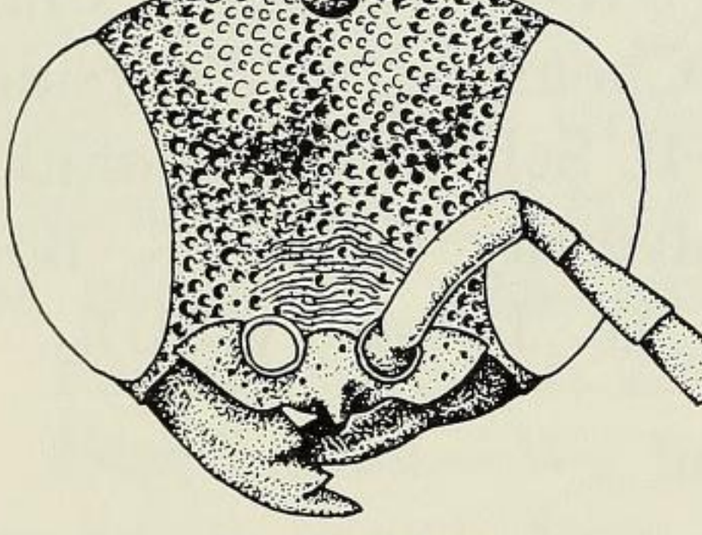
9. carinulatum



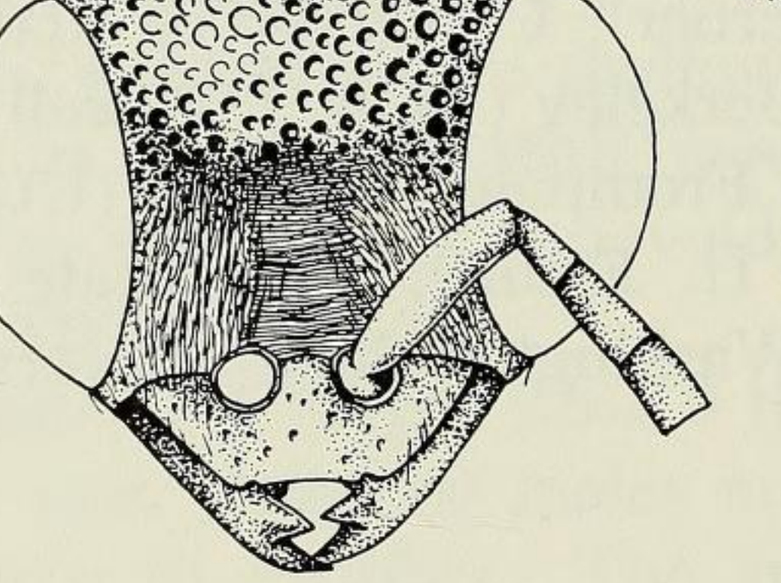
10. fletcheri



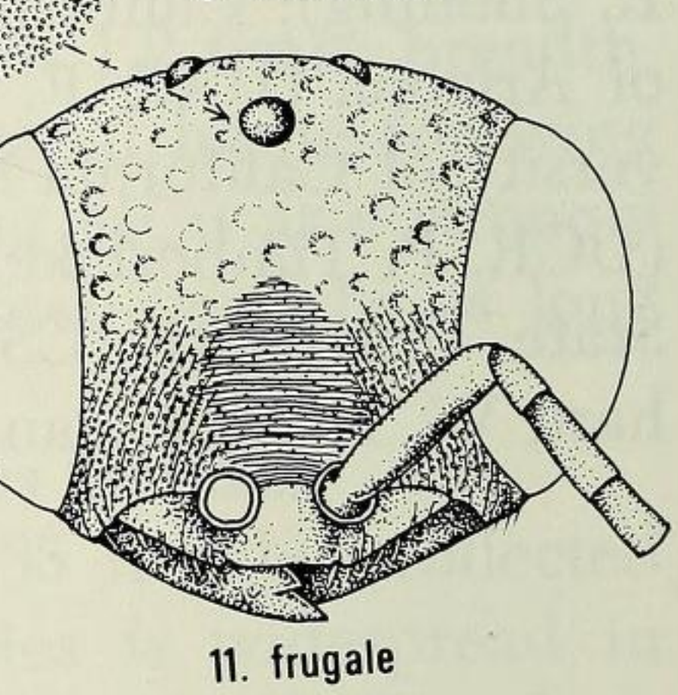
11. frugale



12. frontis

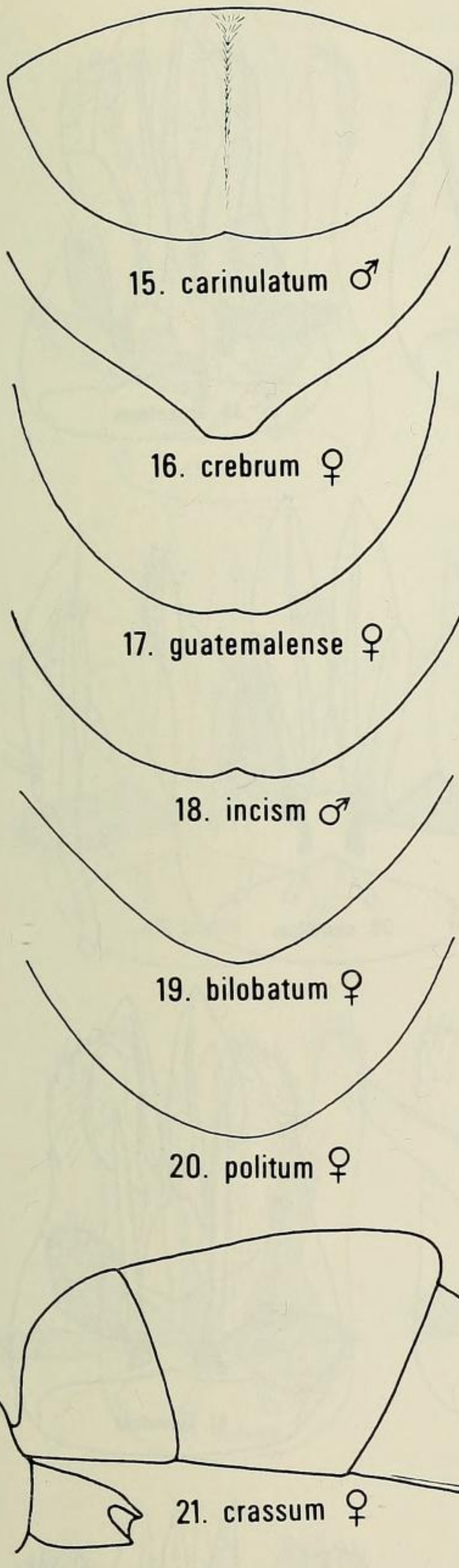


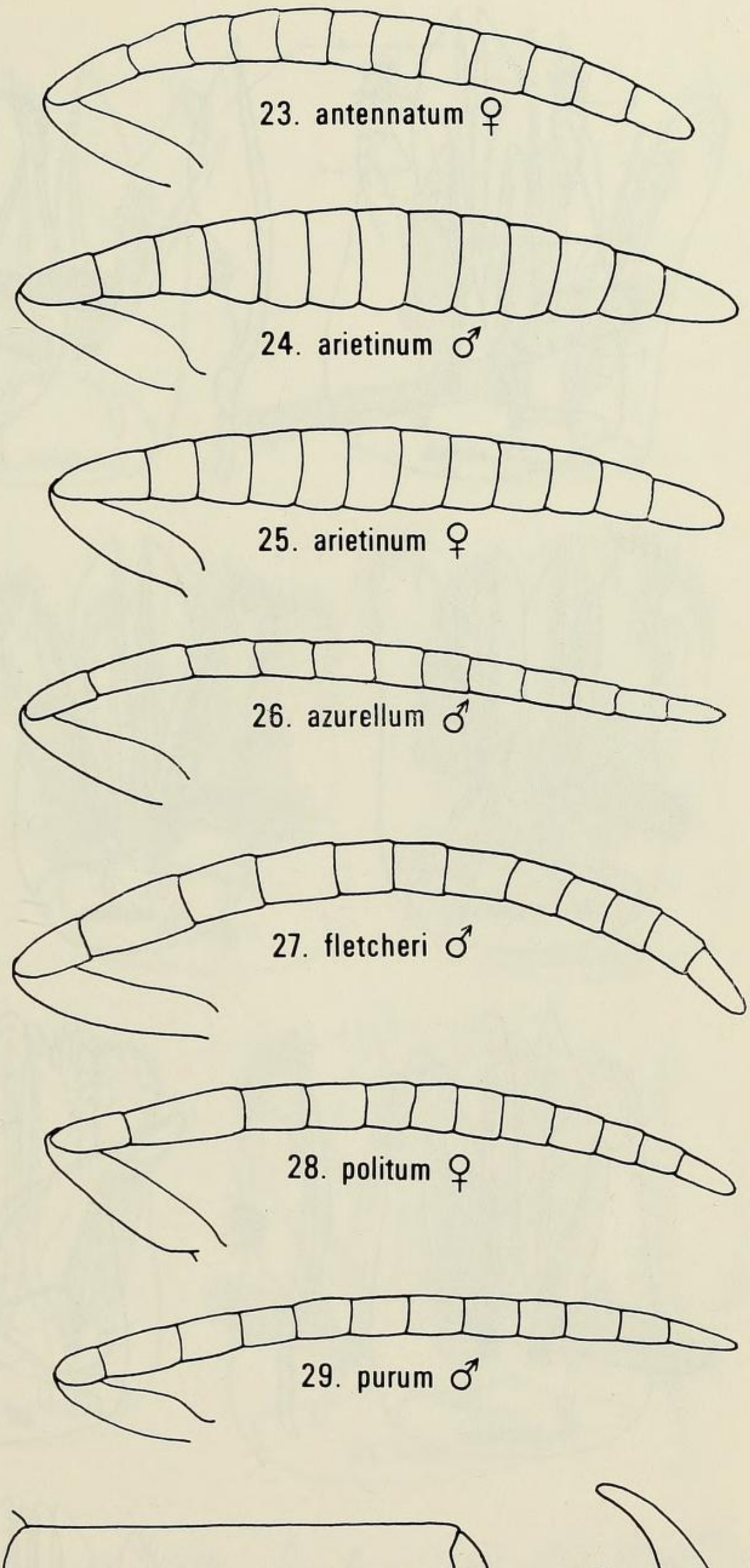
13. menkei



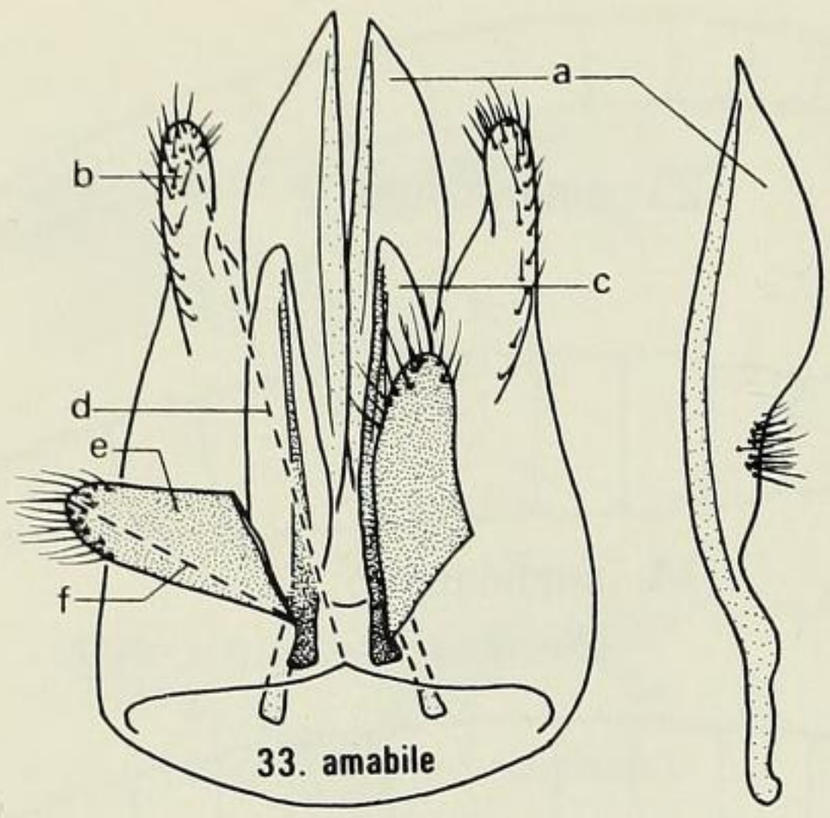
14. nevadae

Figs. 1–5. Forewing venation; MCu: mediocubital vein, bv: basal vein, st: stigma, RS: radial sector stub. Figs. 6–14. Front view of head, males except Fig. 9.

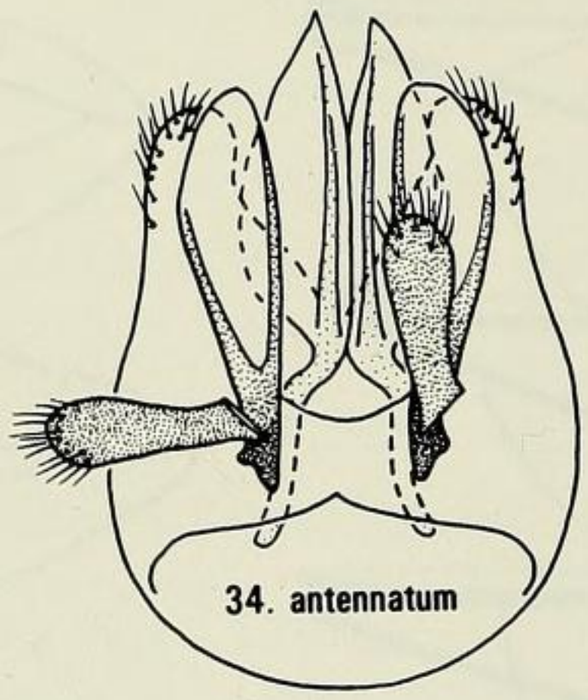


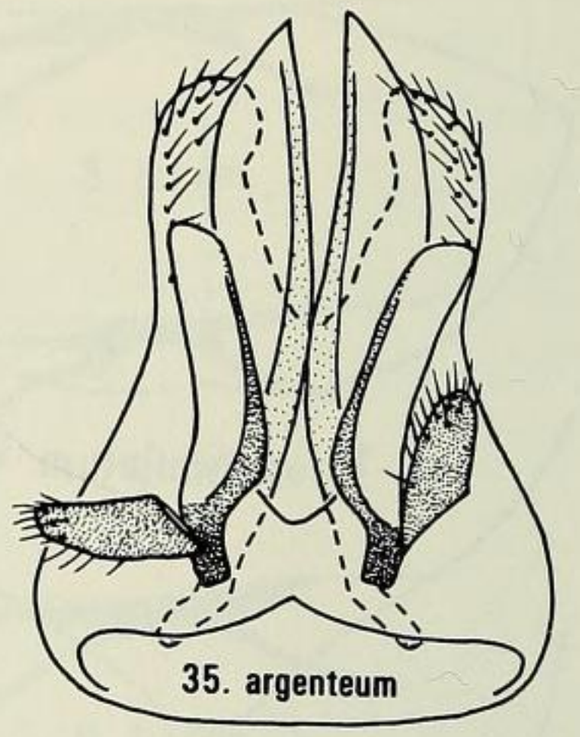

Figs. 15–20. Outline of tergum III. Fig. 21. Lateral view of abdomen. Fig. 22. Pattern of black spot on tergum II. Figs. 23–29. Inner view of antennae. Figs. 30, 31. Outer view of forefemur. Fig. 32. *Hedychridium dimidiatum*, claw, lateral.



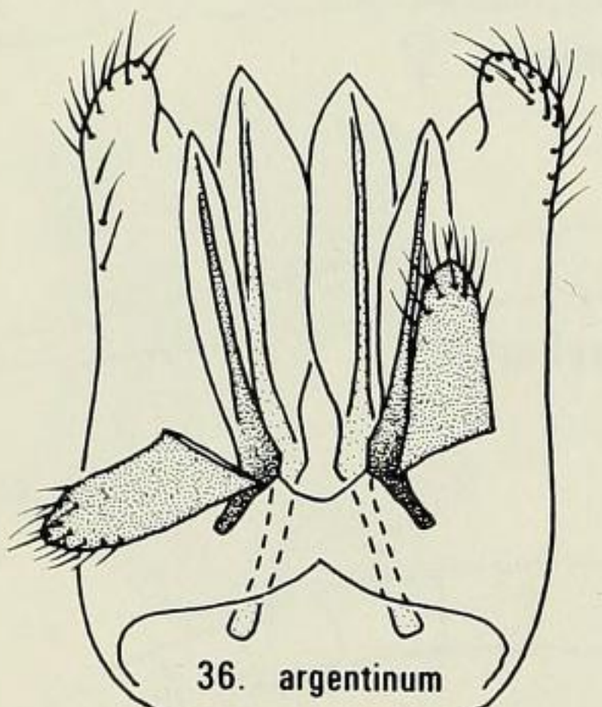

33. amabile



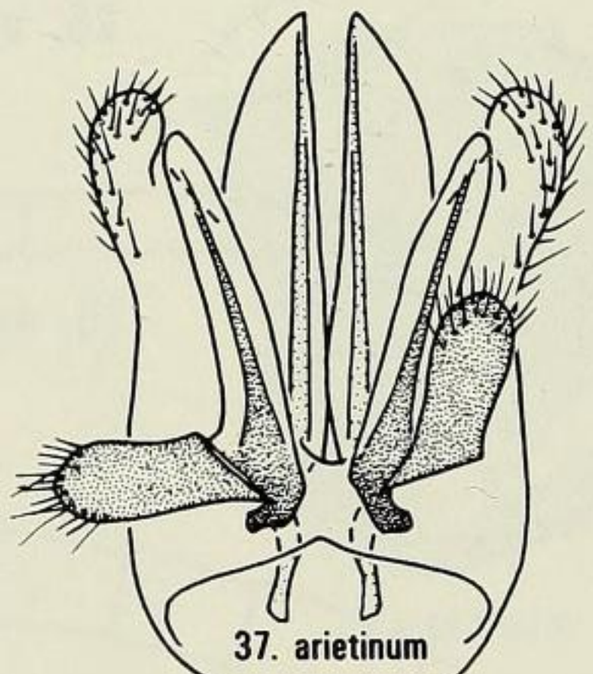
34. antennatum



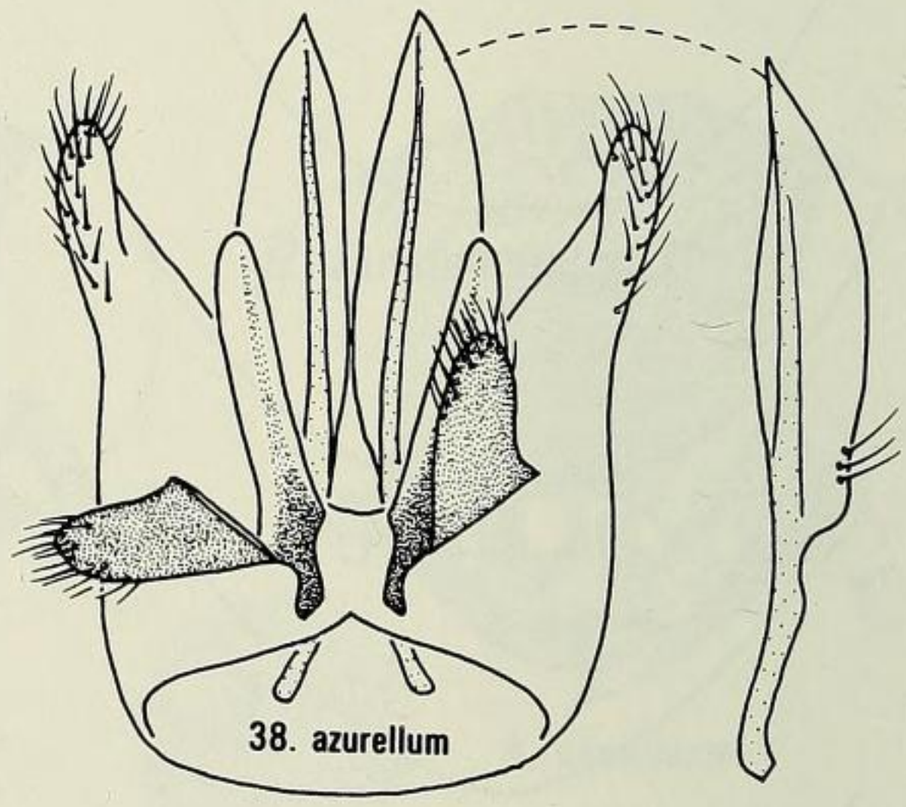
35. argenteum



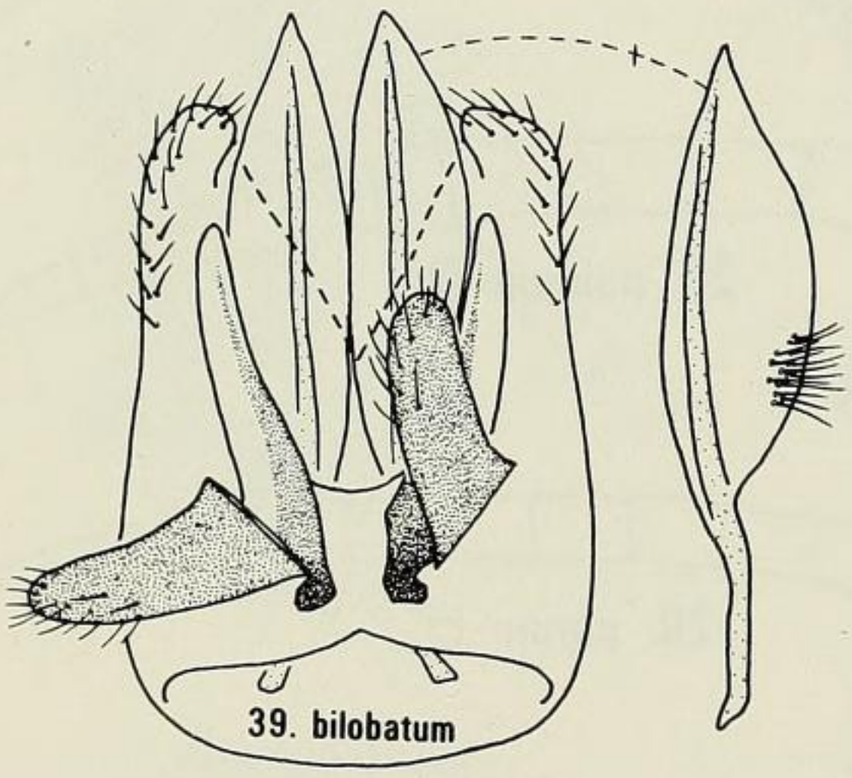
36. argentinum



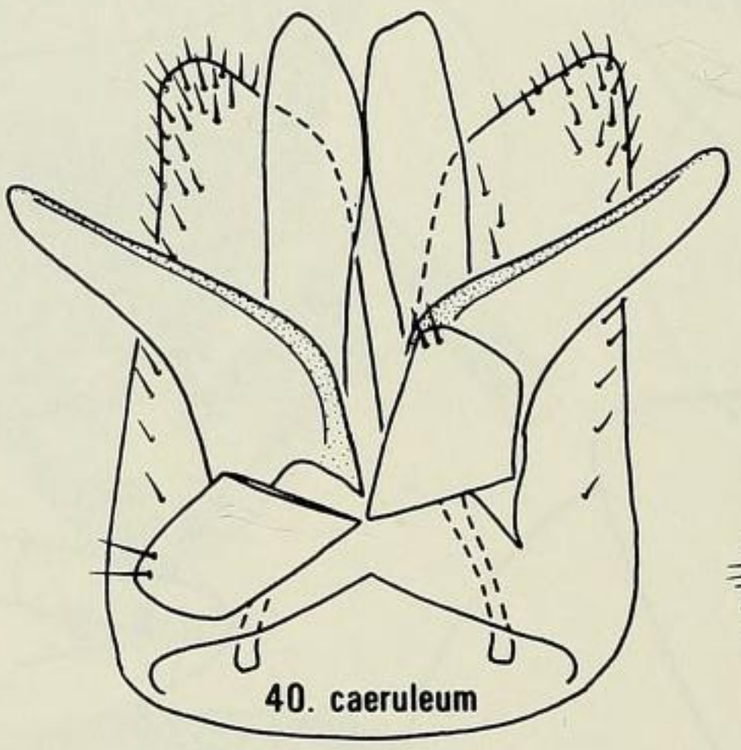
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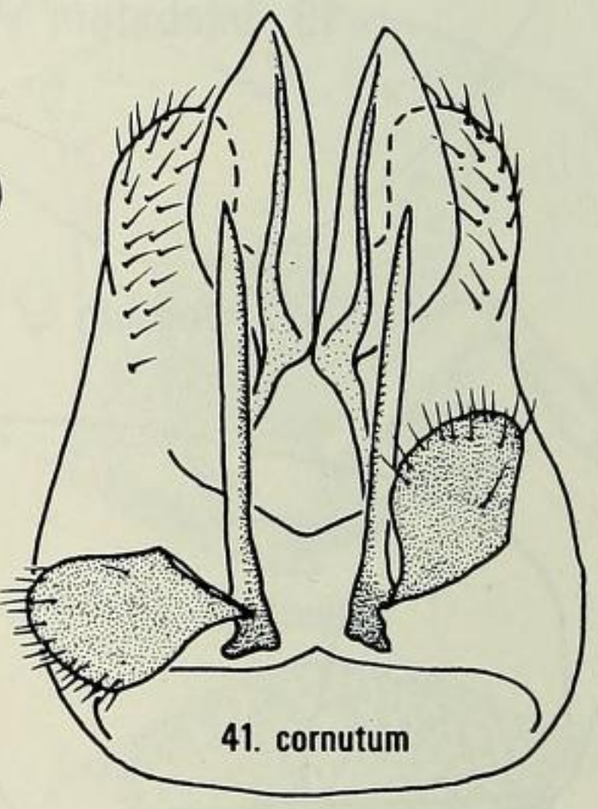
38. azurellum



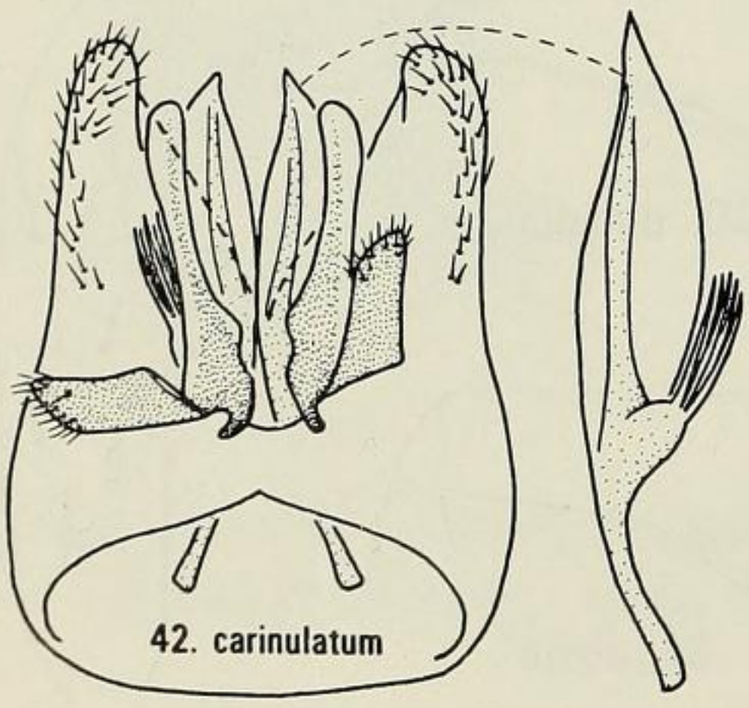
39. bilobatum



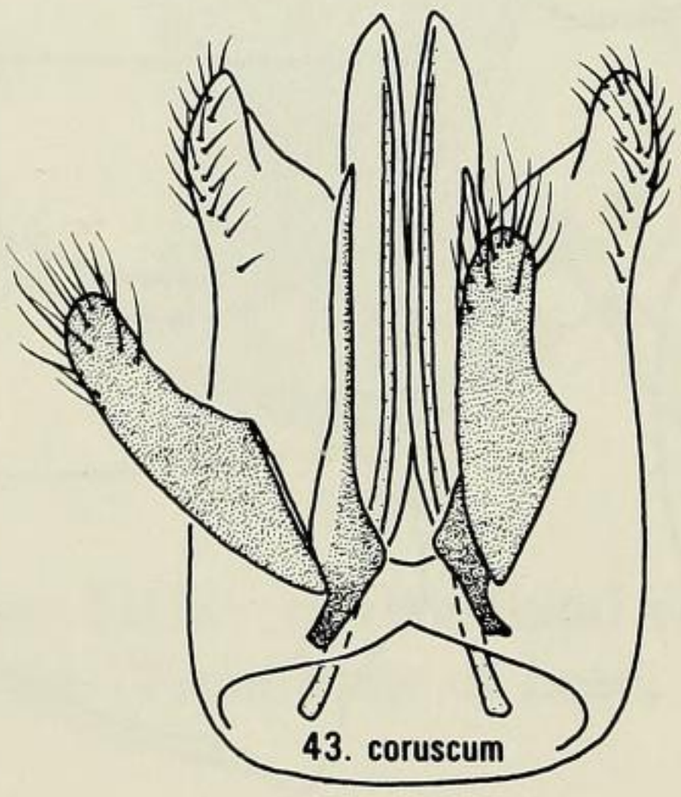
40. caeruleum



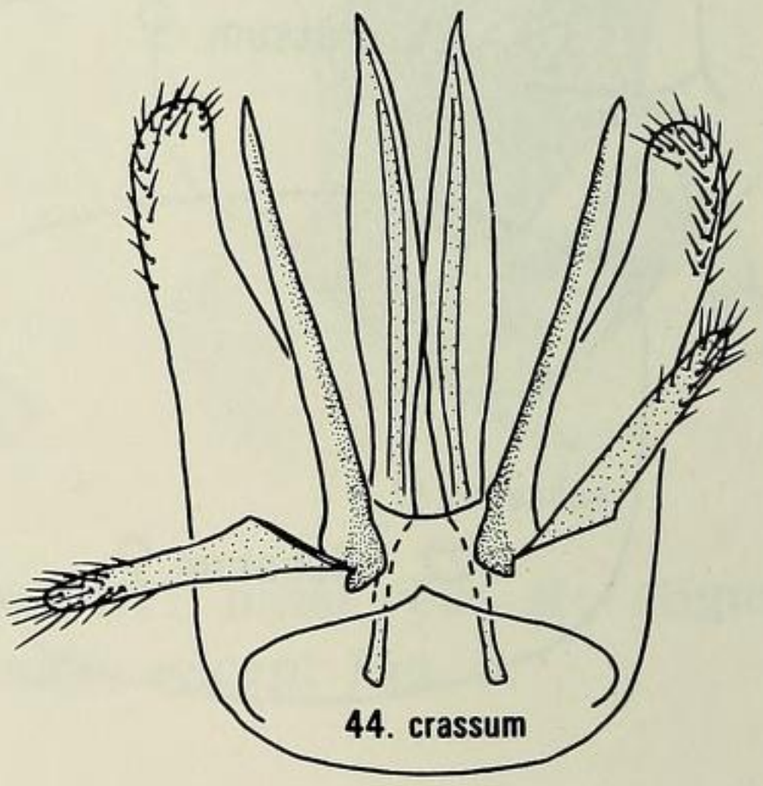
41. cornutum



42. carinulatum

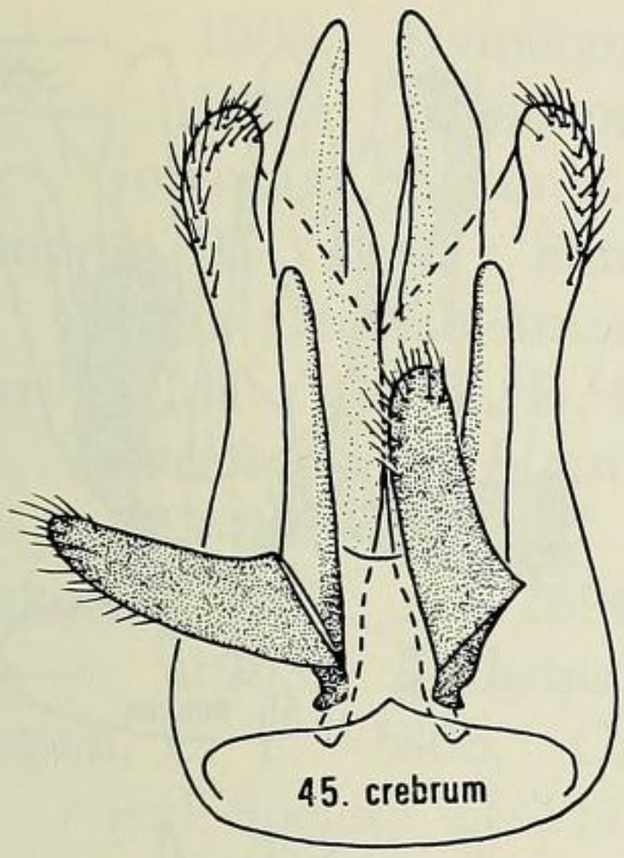


43. coruscum

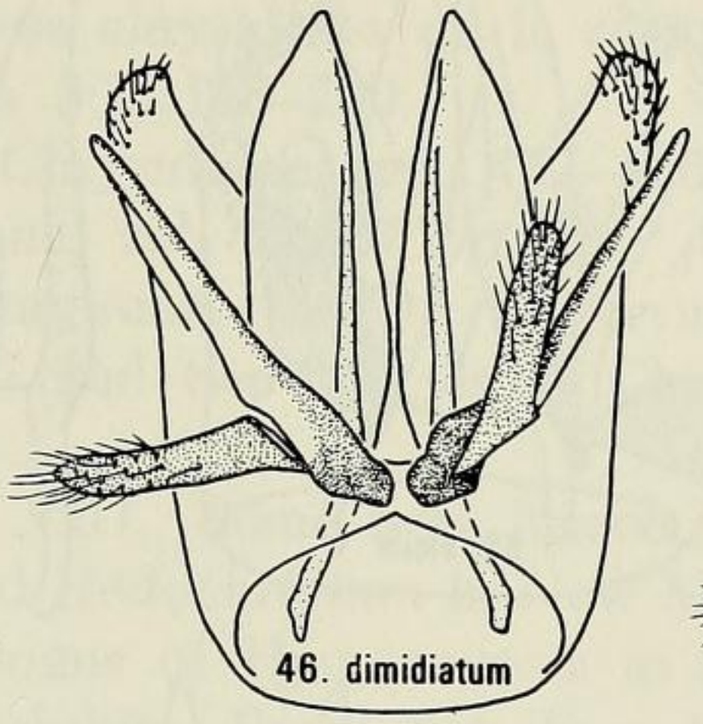


44. crassum

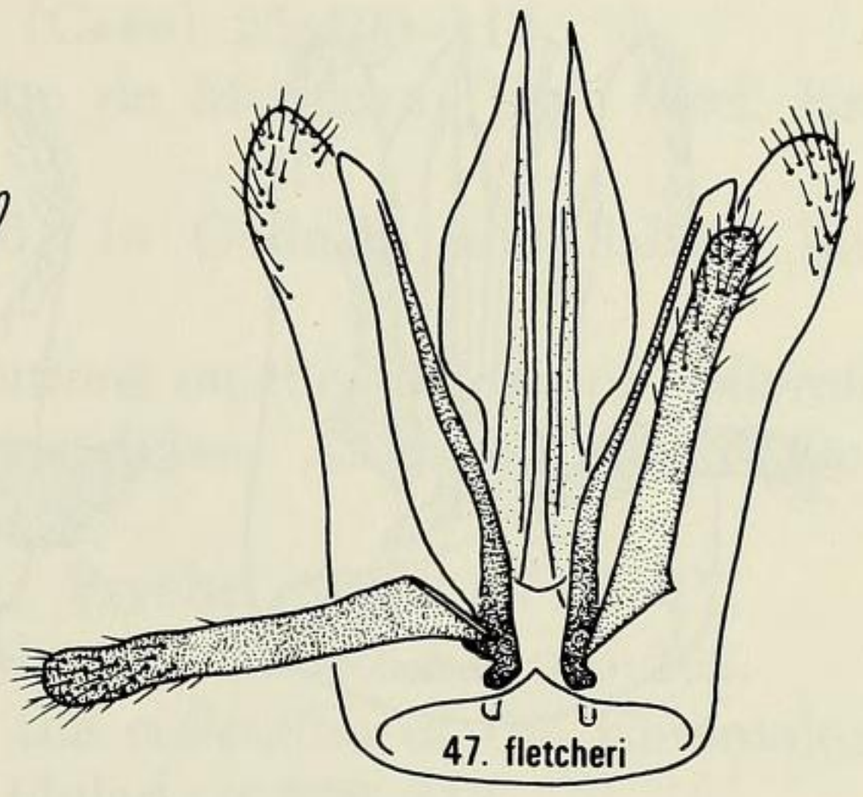
Figs. 33–44. Male genitalia, ventral (34, 35, 37–39, 41, 43, 44 are drawn from holotypes): a, aedeagus; b, gonostyle; c, cuspis; d, gonostyle length; e, digitus; f, digitus length.



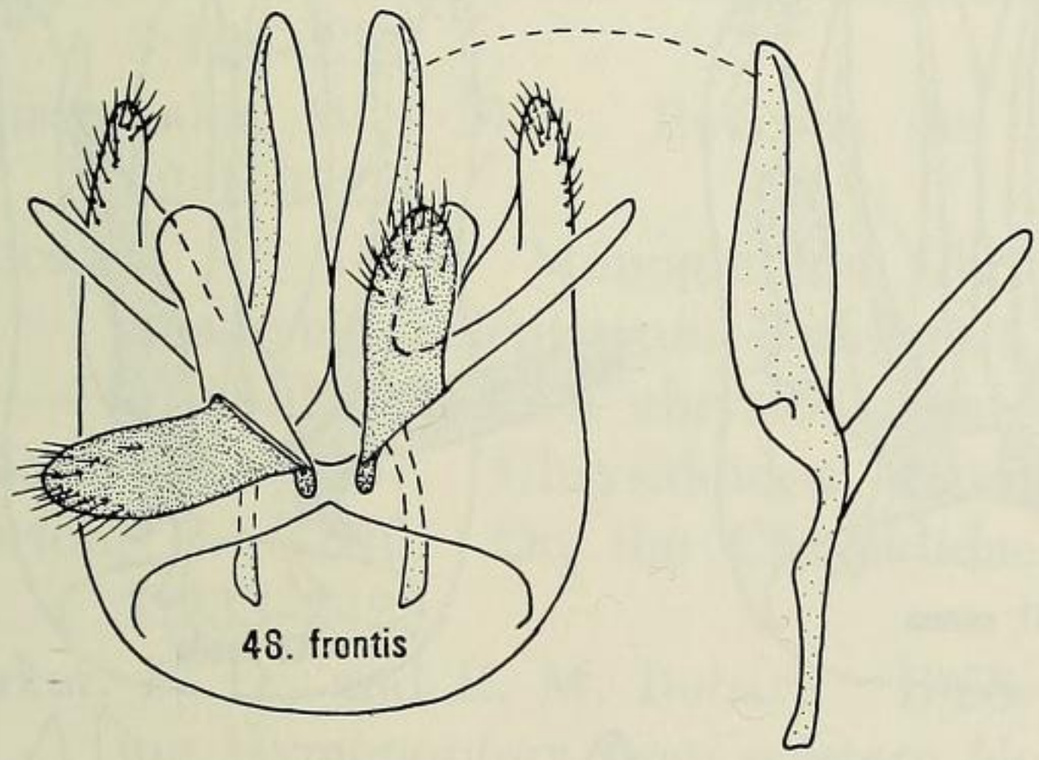
45. crebrum



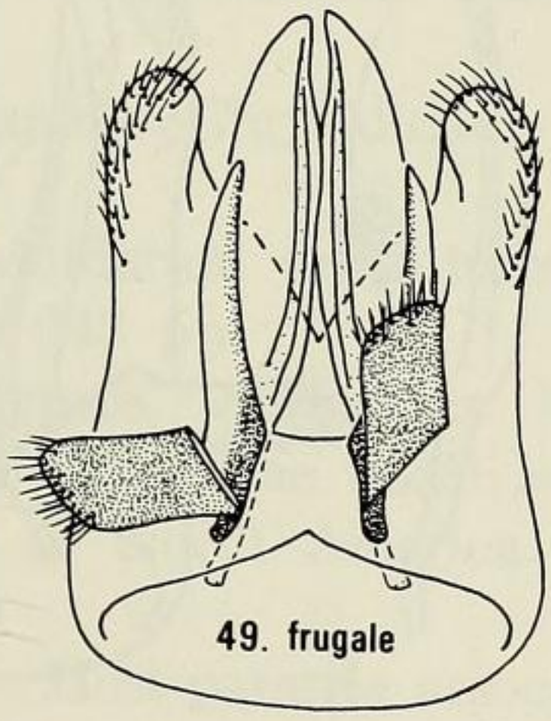
46. dimidiatum



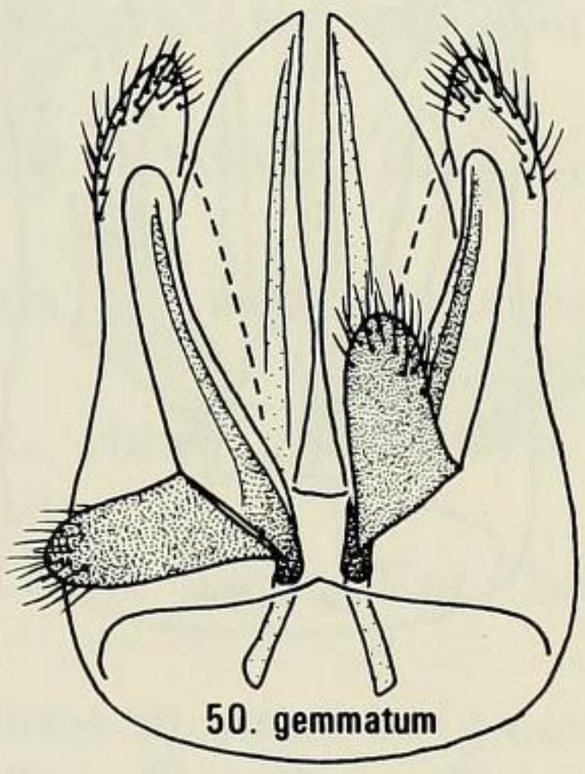
47. fletcheri



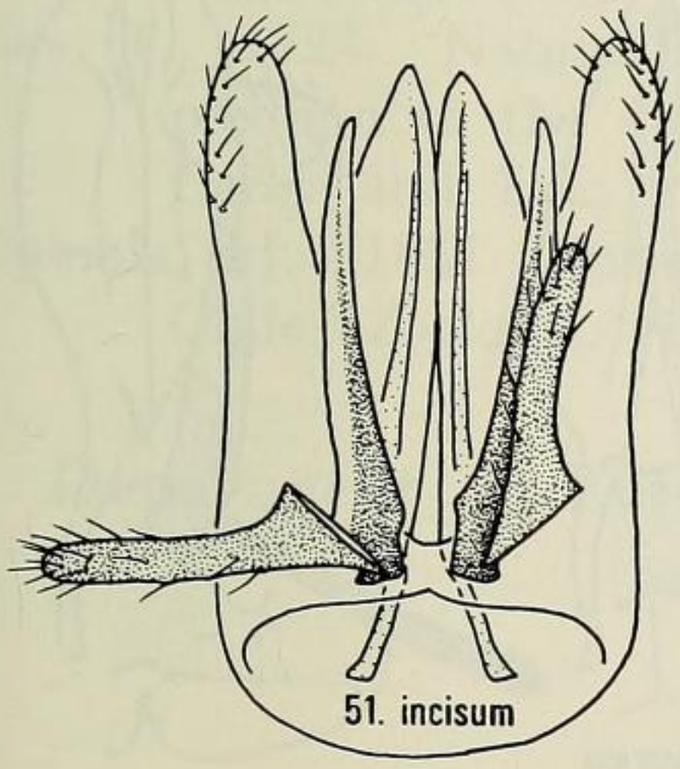
48. frontis



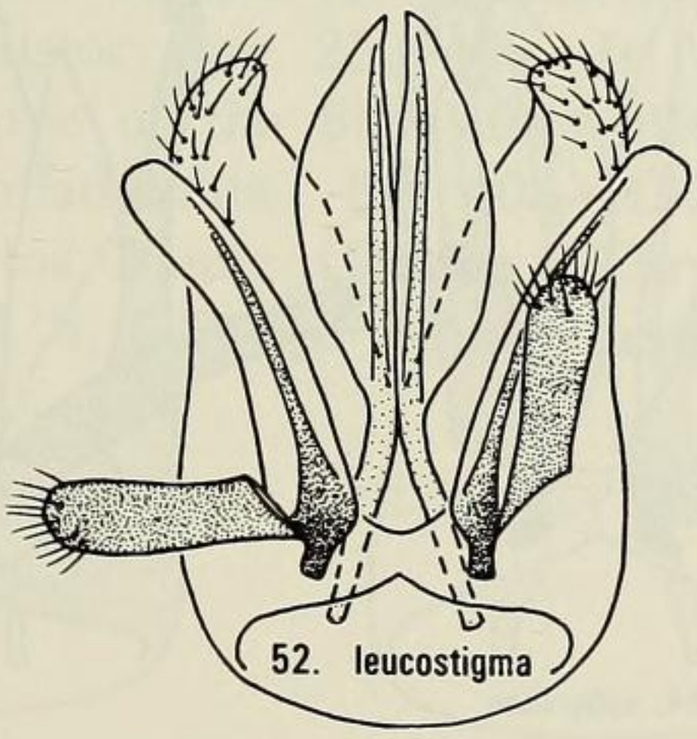
49. frugale



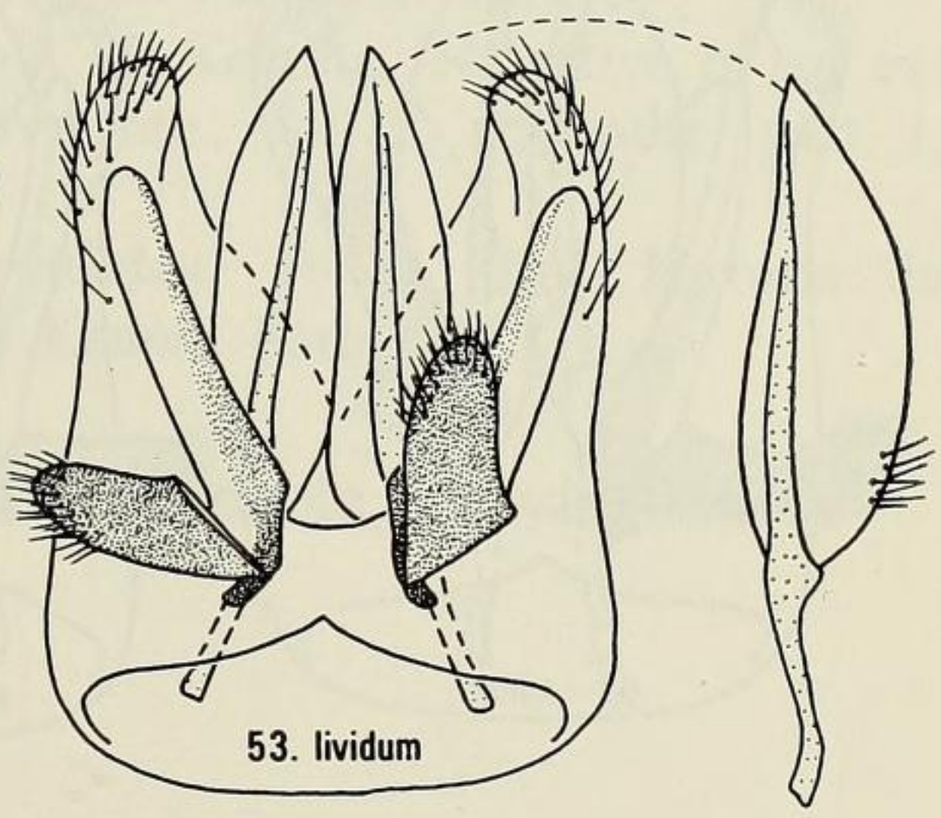
50. gemmatum



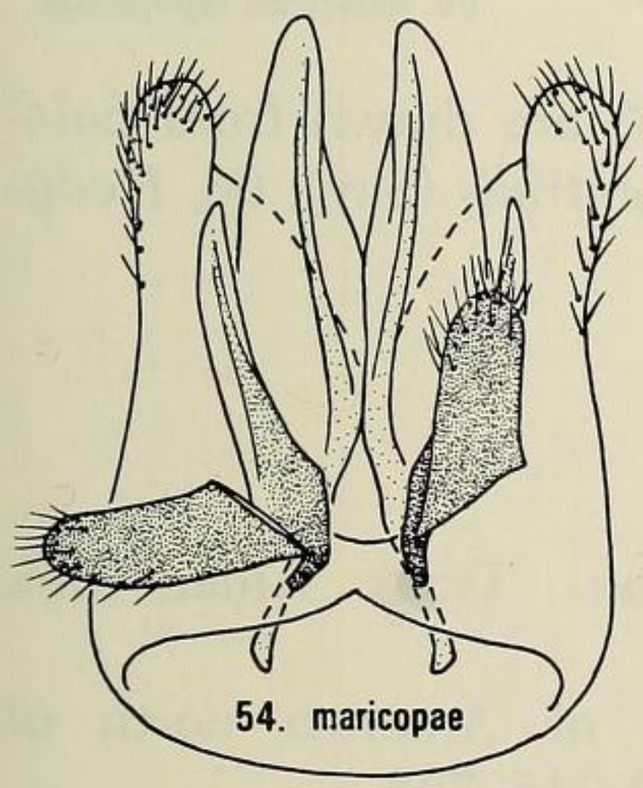
51. incisum



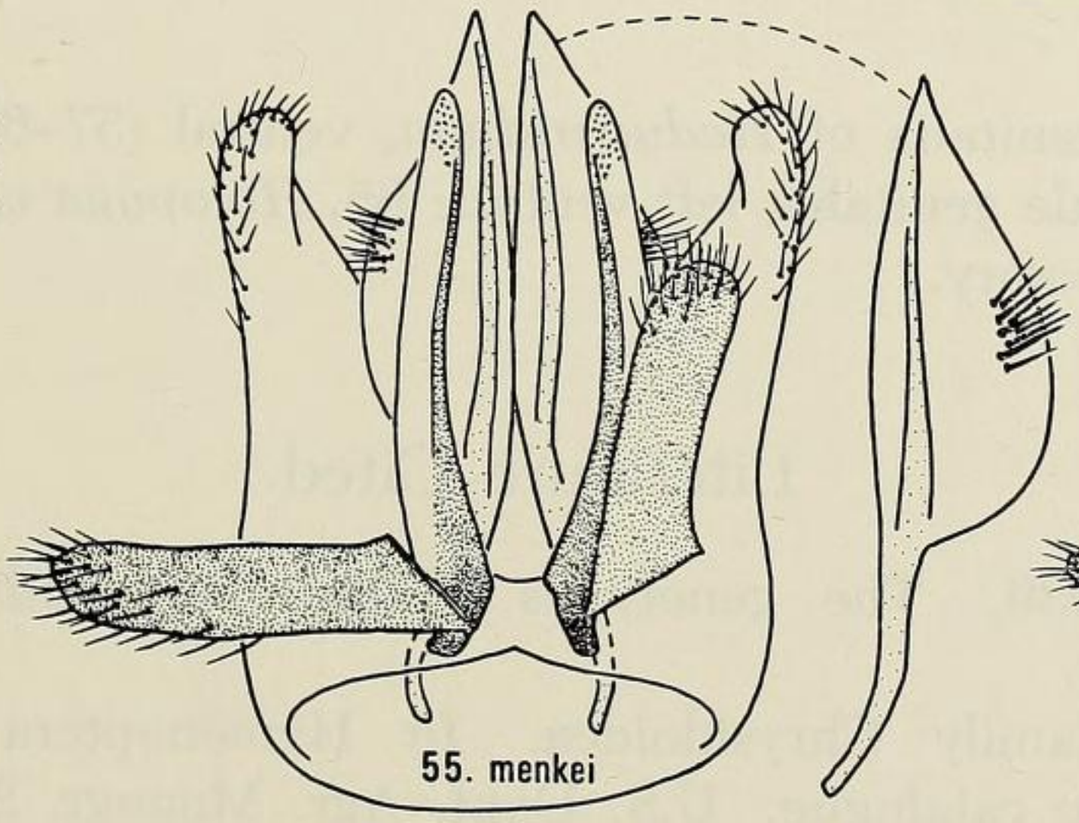
52. leucostigma



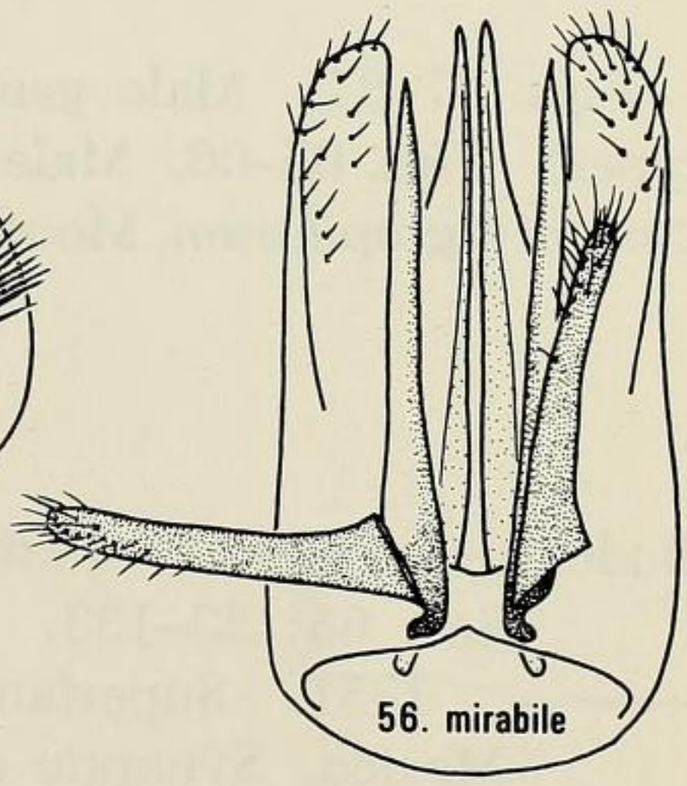
53. lividum



54. maricopae

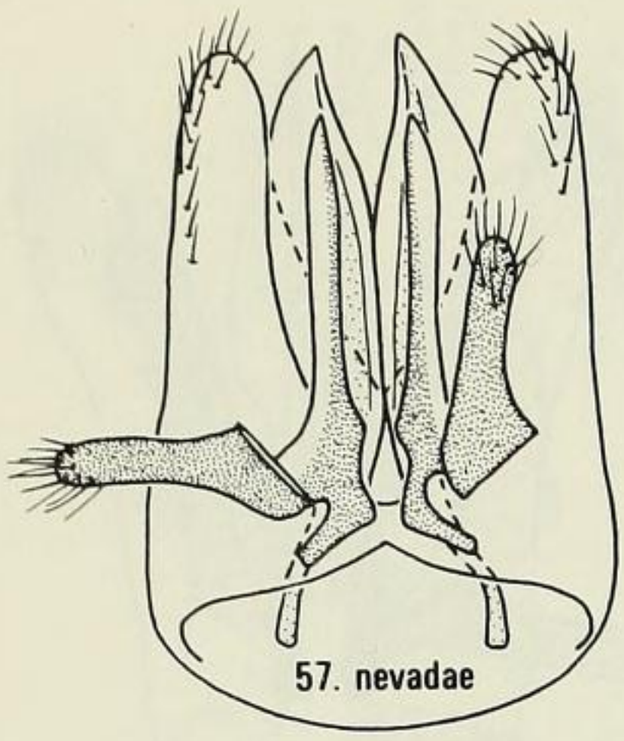


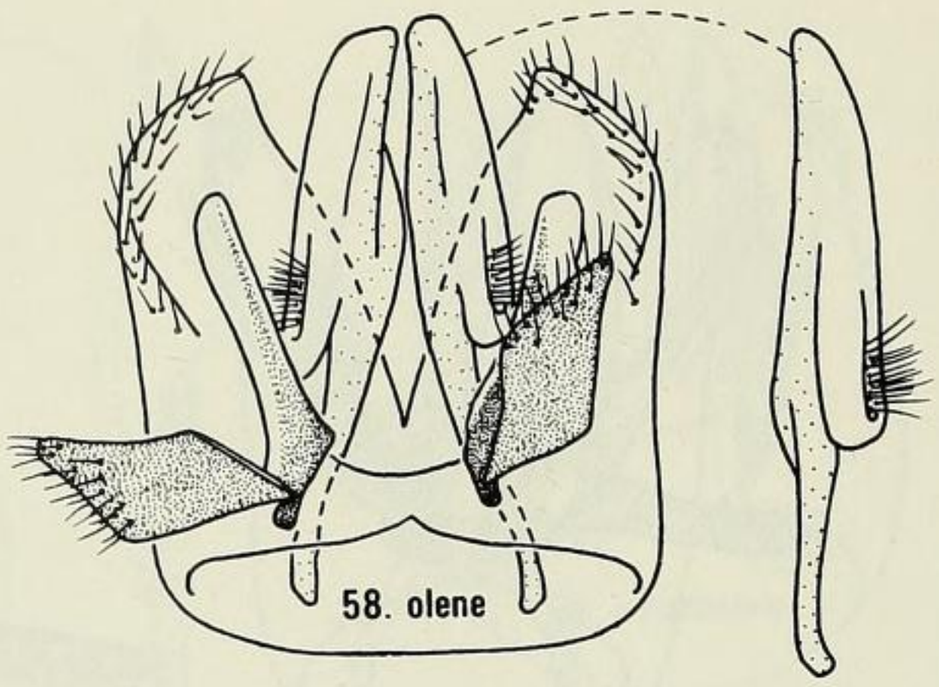
55. menkei

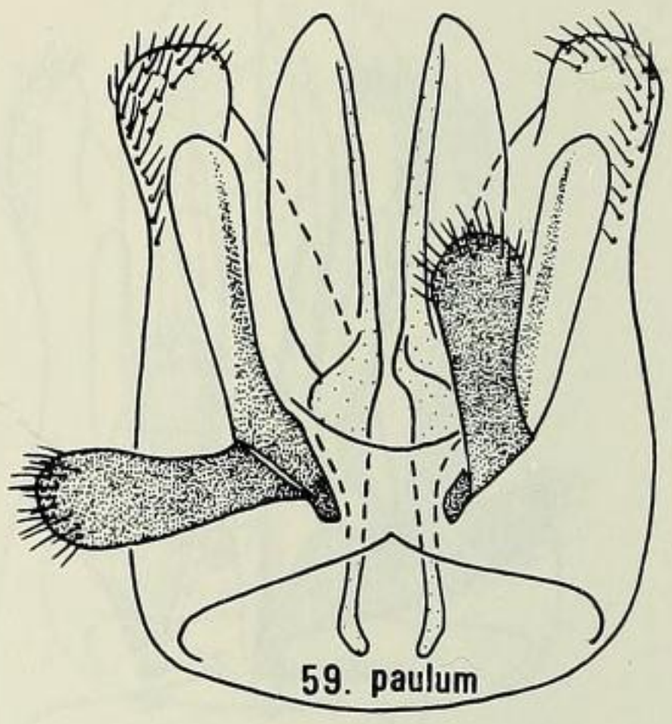


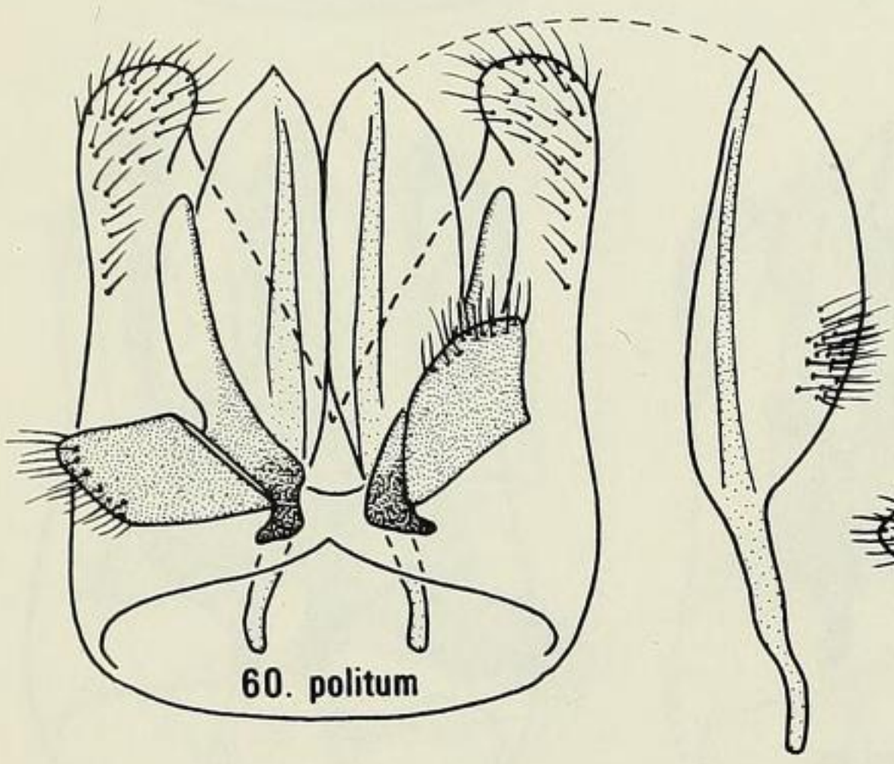
56. mirabile

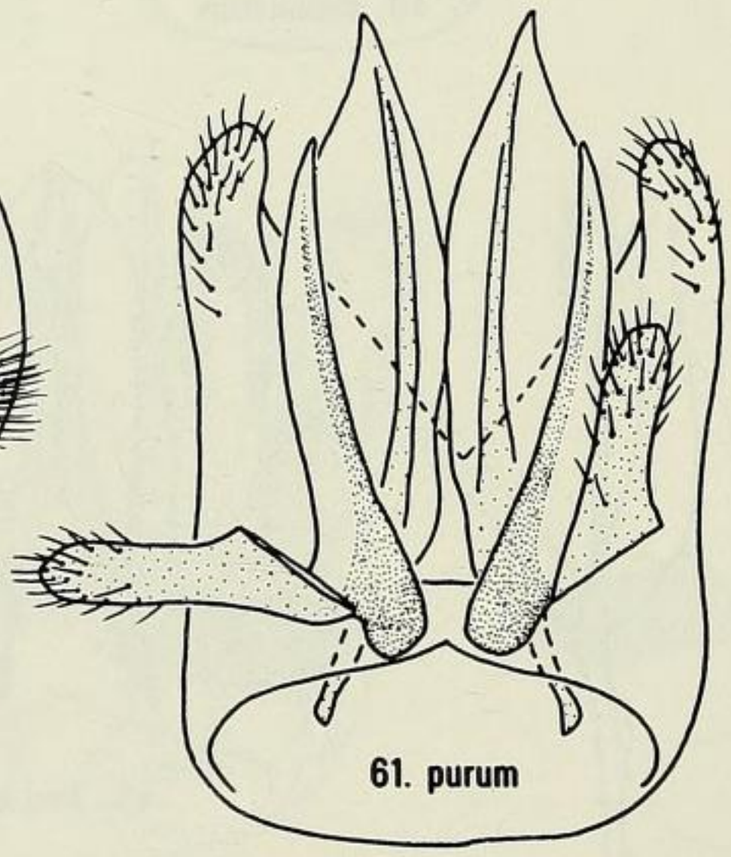
Figs. 45–56. Male genitalia, ventral (45, 48–56 are drawn from holotypes).

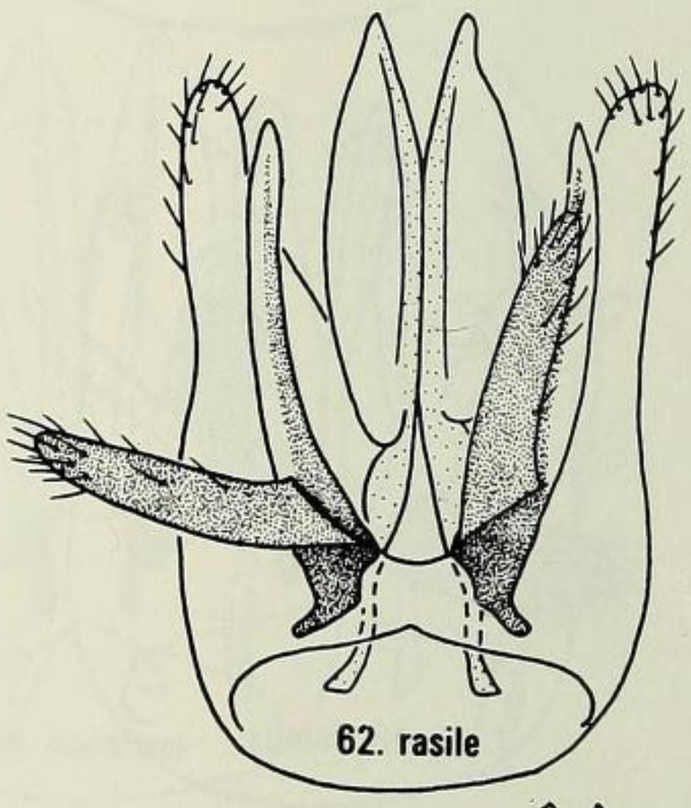

57. nevadae

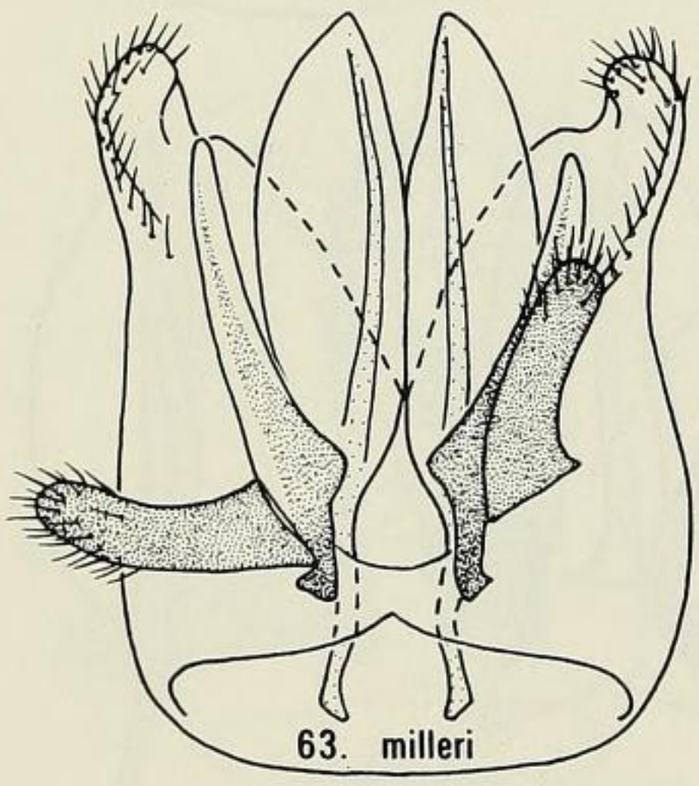

58. olene

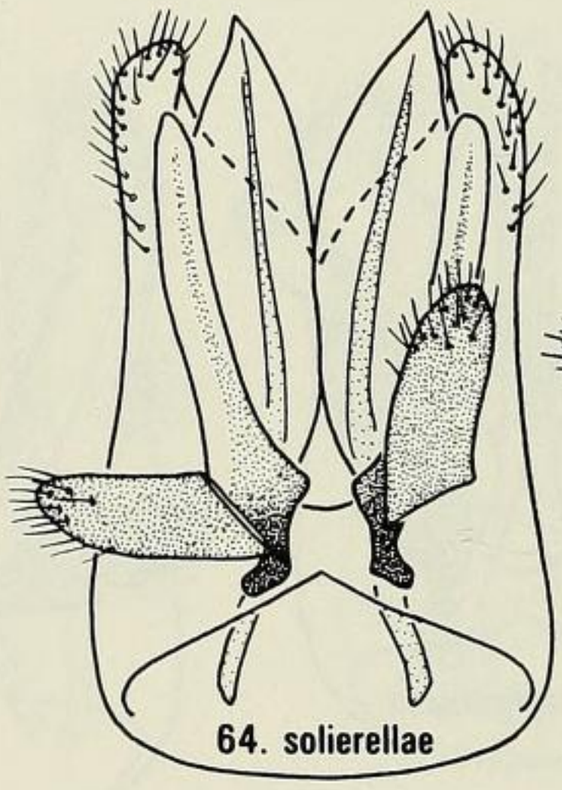

59. paulum

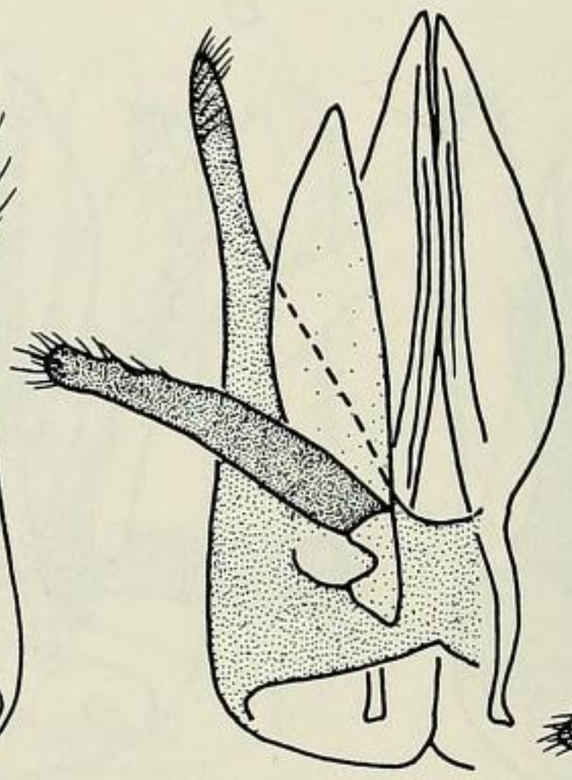

60. politum

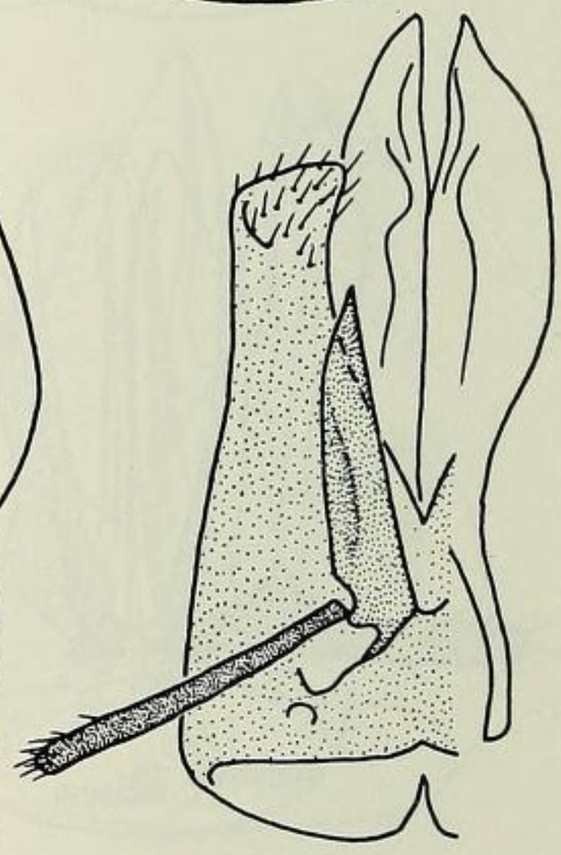

61. purum


62. rasile


63. milleri


64. solierellae


65. Holopyga ventralis


66. Hedychrum nigropilosum

Figs. 57–64. Male genitalia of *Hedychridium*, ventral (57–63 are drawn from holotypes). Figs. 65–66. Male genitalia, left ventral: 65, *Holopyga ventralis* (Say); 66, *Hedychrum nigropilosum* Mocsáry.

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