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A review of the genus *Bicyrtes*
(Hymenoptera: Sphecidae, Nyssoninae,
Bembicini)

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Abstract. *Bicyrtes* is a moderate-sized bembicine sand wasp which is restricted to the New World. The 27 known species include 4 new ones: *B. brasiliانا* (Brazil), *B. chilicola* (Chile and Peru), *B. paranae* (South America), and *B. venezuelae* (Venezuela). Some characters not previously used are found in the descriptions and the key to species, amplified by 46 illustrations.

Bicyrtes Lepeletier 1845:53 was described with *servillii* Lepeletier as the monotype. However, this species had been described previously by Say (1824:336) as *Monedula ventralis*, one of two common species of *Bicyrtes* in the United States. The nomenclatural history of *Bicyrtes* and its relatives was given by Bohart and Menke (1976:53).

The first comprehensive key to the genus was by Handlirsch (1889:501). Improvements in it were made by J. Parker (1929:165), Willink (1947:555) (South America only), and Bohart and Horning (1971:20) (North America only). In view of several new species, some new synonymy, some previously unused characters, and extensions of geographical ranges, a new key is offered here.

All workers have put considerable reliance on color patterns, particularly for females, which have fewer "structural" characters than males. Therefore, the key to females must be used with caution (see note on variation of color pattern in *B. capnoptera*). "Structural" characters, such as shape of the male labrum (in *cingulata*), legs, propodeal flanges, male antennal structure, male genitalia, shape of male T-VII, and female pygidial plate are emphasized in the key.

Technically, this New World genus can be recognized by the scarlike (but not depressed) midocellus, 6-4 palpal formula, and lateral propodeal angles projecting backward as flanges. Ordinarily, the white or yellow, medially interrupted, bands on most terga can be used for recognition. However, a few species such as *simillima* may have lateral tergal spots only. Also, species of *Bicyrtes* such as *angulata*, *fodiens*, *venezuelae*, and *capnoptera* may have complete bands.

Some species average larger or smaller than others. Thus *B. quadrifasciata*, *B. simillima*, and *B. pexa* usually have females of about 17 mm in

length, whereas *B. insidiatrix* females are seldom more than 12 mm long. Of course, there is considerable size variation, which may result from amount of food available to the larvae. *Bicyrtes* provision with bugs, usually nymphs or adults of Pentatomiidae, Coreiidae, or Reduviidae.

Four new species are included in the key, *B. paranae*, *B. venezuelae*, *B. brasiliانا*, and *B. chilicola*. This brings to 26 the total number of described species.

Terms used in the key, which may be unfamiliar, are: F-I *etc.*, flagellomeres; propodeal flange, flattened and posteriorly directed lateral projection; T-I *etc.*, terga; S-I *etc.*, sterna; clasper, gonostyle. Geographical ranges for the species are given in the male key.

Type depositories for species are in the following institutions, identified by the pertinent city.

American Museum of Natural History (New York)
Argentine National Museum (Buenos Aires)
Austrian Natural History Museum (Vienna)
Belgian Museum of Natural History (Brussels)
British Museum of Natural History (London)
California Academy of Sciences (San Francisco)
Carnegie Museum (Pittsburg)
Cornell University (Ithaca)
Florida State Collection of Arthropods (Gainesville)
Humboldt Museum (Berlin)
Kansas University Snow Museum (Lawrence)
Laval University Provancher Collection (Quebec)
Miguel Lillo Institute, Argentina (Tucuman)
Swiss Natural History Museum (Geneva)
University of California Bohart Museum (Davis)
University of Denmark Zoology Museum (Copenhagen)

U.S. National Museum of Natural History (Washington)

I would like to thank the curators of the above institutions for sending me types or giving me access to collections under their care. Types studied are indicated by an asterisk in the synonymy listed. Special help has been given by several curators: Arnold Menke (Washington), Lynn Kimsey (Davis), Lionel Stange (Gainesville), and Woj. Pulawski (San Francisco).

Key to species of the genus *Bicyrtes*

1. Males, flagellum with 11 articles, abdomen with 7 visible terga 2
— Females, flagellum with 10 articles, abdomen with 6 visible terga 27
2. Forebasitarsus stout, less than 4x as long as broad (Figs. 10, 11, 12), midfemur spinose beneath apical half (Fig. 1), scutum usually with a pair of yellow spots on anterior one-third 3
— Forebasitarsus slender, 5 to 8x as long as broad; midfemur and scutum various 5
3. Forebasitarsus with posterior edge black and with a fine, short fringe (Fig. 12), clasper broadened at distal one-third (Fig. 21) (South America)
..... *odontophora* (Handlirsch)
— Forebasitarsus posterior edge not black but with scattered setae and dense fringe (Figs. 10, 11), clasper evenly curved (Figs. 23, 24) 4
4. Forebasitarsus roughly triangular, expanded toward apex (Fig. 10), hindfemur with a few short, erect hairs basad (Fig. 4); foretarsomere V without unusual modifications (South America) *paranae* R. Bohart
— Forebasitarsus nearly straight-sided (Fig. 11), hindfemur with a dense fringe of hairs on basal two-thirds (Fig. 6), foretarsomere V with a transparent and roughly circular ventral membrane as part of a distinctive pattern (Fig. 15) (Brazil) *brasiliiana* R. Bohart
5. Midcoxa with an inner posterior projection or spine (Fig. 13); propodeal lateral angle or flange pointed, not a rounded wedge (as in Figs. 39, 40) .6
— Midcoxa simple; propodeal lateral flange narrowly or broadly rounded (about as in Fig. 41) 8
6. Labrum strongly bent out subapically; scutum without a discal pair of spots anteriorly; midcoxal projection large, flattened; F-XI hooklike (Fig. 16) (Brazil, Argentina) *cingulata* (Burmeister)
— Labrum smoothly convex; scutum with a discal pair of spots anteriorly; F-XI simple 7
7. Markings black, red, and yellow; midtibia depressed subapically in edge-on view; clasper abruptly narrowed (but not "rat-tailed") at distal one-third (Fig. 19) (South America)
..... *angulata* (F. Smith)
— Markings black and yellow; midtibia not depressed subapically; clasper slender and tapering (Venezuela, Colombia) *colombica* Fritz
8. S-VI with a polished basal hump or bump, clasper with hair brush on outer one-third (Fig. 20), T-VI distinctly angled out laterally 9
— S-VI without a polished hump, clasper and T-VIII various 11
9. Hindfemur with a short but thick fringe posteriorly (Fig. 5), scutum with a pair of anterodiscal spots, midfemur serrate on distal one-half beneath (Mexico) *diodonta* (Handlirsch)
— Hindfemur without noticeable fringe, scutum without anterodiscal spots or only tiny ones, midfemur with apical notch beneath but otherwise only carinate 10
10. T-VII all black and angled laterally, swelling (bump) of S-VI nearly circular (South America)
..... *paraguayana* (Strand)
— T-VII with yellow spots and a definite lateral tooth, swelling of S-VI subcarinate and longitudinal (Brazil, Argentina) *lilloi* Willink
11. Midtibia compressed subapically in edge-on view (Fig. 17); legs red and yellow; mesopleuron yellow-marked; basal two or three flagellomeres all red; propodeal flange broadly rounded, not much projecting (Argentina, Brazil)
..... *tricolorata* J. Parker
— Midtibia not compressed subapically in edge-on view, other characters various 12
12. Legs, including femora, tibiae and tarsi all rust-red, flagellum red toward base, mesopleuron all black (e. and s. U.S.) *insidiatrix* (Handlirsch)
— Legs at least partly yellow or black beyond coxae, mesopleuron various 13
13. Midfemur with a distinct basal tooth (Fig. 3); hindtibia swollen subapically in inner view; F-V to IX roundly produced beneath (U.S., n. Mexico)
..... *ventralis* (Say)
— Midfemur sometimes a little expanded and sharp-edged basally but without a definite tooth, hindtibia not swollen subapically, F-V to IX not produced beneath 14
14. Hindcoxa with a tooth or protruding angle at inner apex; midfemur with thin and sharp-edged basal expansion (Fig. 2) (U.S., Mexico)
..... *fodiens* (Handlirsch)

- Hindcoxa without a tooth or protruding angle at inner apex, midfemur various 15
15. Submarginal cell I brown with a small, clear apical area, labrum usually black (w. Texas, New Mexico, Arizona, south to Costa Rica) *viduata* (Handlirsch)
- Submarginal cell I not brown, labrum not usually all black 16
16. T-V-VI with little, if any, pale markings, mesothoracic dorsum usually all black 17
- T-V-VI or VII with pale markings, mesothoracic dorsum various 18
17. Midcoxa with thick inner fringe of whitish hair, lateral tergal spots rounded, clasper slender toward apex but not "rat-tailed" (Brazil, Argentina) *simillima* (F. Smith)
- Midcoxa without unusual pubescence, tergal spots narrowed or forming disconnected bands posteriorly, clasper "rat-tailed" toward apex (as in Fig. 24) (U.S. e. of Rocky Mts.) *quadrifasciata* (Say)
18. F-IV expanded toward apex in profile and meeting F-V which is enlarged slightly toward base, clasper with fringe covering outer one-third 19
- F-IV not swollen in profile and not meeting an enlarged F-V, clasper various 21
19. Scutellum, metanotum, mesopleuron all black, clypeus yellow with broad basal black mark (French Guiana, Brazil) *pexa* J. Parker
- Scutellum, metanotum, mesopleuron with pale markings, clypeus various 20
20. Hindfemur with irregular posterior margin, concave in part (Fig. 7), foretarsus relatively slender (compare Figs. 8, 9), clypeus whitish with large broad basal black mark (Mexico, Caribbean Islands through Central America to Argentina) *discisa* (Taschenberg)
- Hindfemur with posterior margin slightly but smoothly convex; foretarsus relatively stout (compare Figs. 8, 9), clypeus usually light yellow, occasionally whitish, with small basal black mark (Venezuela) *venezuelae* R. Bohart
21. Scutellum with a medially interrupted anterior yellow band, scutum with elongate anterodiscal spots (as in Fig. 42), clasper "rat-tailed" toward apex (w. Texas, Mexico, West Indies to Argentina) *variegata* (Olivier)
- Scutellum without anterior yellow band, other characters various 22
22. T-VII narrowly rounded at apex, with a strong lateral tooth (Fig. 14); clasper slender in dorsal view (Fig. 22) (Paraguay, Argentina) *anisitsi* (Strand)
- T-VII without lateral tooth, clasper less slender. 23
23. Midfemur somewhat expanded and sharply edged beneath near base (as in Fig. 2), F-IV-VIII with orange tyli, F-I slightly shorter than scape (U.S., n. Mexico) *capnoptera* (Handlirsch)
- Midfemur not appreciably expanded toward base, flagellum various 24
24. Scutellar spots pointing inward anteriorly (as in Fig. 45); clasper fringed along outer edge, tapering to a point (Cuba, Virgin Islands, Bahamas, Dominica, Florida) *spinosa* (Fabricius)
- Scutellar spots not pointing inward anteriorly, clasper various 25
25. Flagellum mostly orange beneath, with a series of orange tyli on F-III to F-IX; clasper with outer one-third covered with fringelike hair (as in Fig. 20) (Argentina) *mendica* (Handlirsch)
- Flagellum all black at least beyond F-I, clasper with fringe of hair along lateral edge (as in Fig. 23) 26
26. Labrum and clypeus all yellow, femora and tibiae all yellow; rake spines of foretibial I mostly longer than foretibial II; T-VII slightly concave posteriorly (Chile, Peru) *chilicola* R. Bohart
- Labrum, at least, all dark or mottled, femora and tibiae with some dark markings; rake spines of foretibial I not longer than foretibial II; T-VI rounded posteriorly (Arizona, Mexico) *affinis* (Cameron)
27. Pygidial plate well defined, measured by a lateral carina, longer than scape (Figs. 26, 28, 29); lateral propodeal flange rounded (as in Fig. 41) 28
- Pygidial plate not well defined, or lateral carina not as long as scape; lateral propodeal flange various 31
28. S-VI, as seen in perpendicular view of T-VI, crescentic, not angularly protruding (Fig. 26) 29
- S-VI, as seen in perpendicular view of T-VI, angularly flared (Figs. 28, 29) 30
29. F-I and several following flagellomeres yellow to orange beneath; F-I about as long as scape, body markings various *capnoptera* (Handlirsch)
- F-I and following flagellomeres black; F-I considerably longer than scape; clypeus, labrum, and tibiae all yellow *chilicola* (R. Bohart)

30. Pygidial plate long and narrow (Fig. 29), S-II sometimes bispinose, hindcoxa not toothed at inner apex *anisitsi* (Strand)
 — Pygidial plate stouter (Fig. 28), S-II not bispinose, hindcoxa toothed at inner apex
 *fodiens* (Handlirsch)
31. Propodeal flange pointed rather than rounded (Figs. 39, 40), T-VI with a distinct median carina or ridge (Fig. 27) 32
 — Propodeal flange rounded rather than pointed (Fig. 41), T-VI various 34
32. Legs and scape extensively red
 *angulata* (F. Smith)
 — Legs and scape not extensively red 33
33. Clypeus entirely, and labrum at least partly, yellow; forebasitarsus sometimes all or partly yellow
 *colombica* Fritz
 — Clypeus largely and labrum entirely black, forebasitarsus black (Fig. 30) .. *cingulata* (Burmeister)
34. Legs extensively red 35
 — Legs mostly black and yellow, not mostly red 36
35. Legs almost wholly red, forewing radial vein black, mesopleuron black *insidiatrix* (Handlirsch)
 — Legs red and yellow, forewing radial vein dark red basad, remainder red, mesopleuron yellow-marked *tricolorata* J. Parker
36. Forewing submarginal cell I brown except for a small apical clear spot *viduata* (Handlirsch)
 — Forewing submarginal cell I not almost entirely brown 37
37. T-III yellow markings much closer together than those on T-IV *quadrifasciata* (Say)
 — T-III yellow markings not much closer together than those on T-IV 38
38. Scutellum with a nearly complete anterior yellow band (Fig. 42), scutal discal spots narrow and attenuate (Fig. 39), propodeal flange broadly rounded (as in Fig. 41) *variegata* (Olivier)
 — Scutellum without spots or with lateral ones, scutal spots and propodeal flange various 39
39. Clypeal black mark basal, bipartite (Fig. 35); T-VI spots, if any, widely separated; propodeal flange narrowly rounded; scutum with discal yellow spots elongate, longer than broad
 *odontophora* (Handlirsch)
- Clypeal black mark (if any) not bipartite, or T-VI spots not widely separated, other characters various
 40
40. T-I to V with widely separated yellow spots, scutum without discal spots, T-VI black, propodeal flange narrowly rounded *simillima* (F. Smith)
 — Tergal spots mostly close or joined medially, other characters various 41
41. Clypeus with black marks along its lower rim (Fig. 36) or more extensive apicad; propodeal flange broadly rounded *ventralis* (Say)
 — Clypeal black marks basal or absent, propodeal flange various 42
42. Scutum all black except for tiny posterolateral dot; mesopleuron all black except for dot behind pronotal lobe; flagellum yellow toward base; F-I all yellow; clypeus yellow with basal mark, with coarse and separated punctures
 *pexa* J. Parker
 — Scutum more fully marked, mesopleuron usually marked with medial spot, other features various 43
43. Flagellum dull reddish beneath toward base, clypeus smooth and all yellow or nearly so, scutum with mediodiscal pale spots .. *mendica* (Handlirsch)
 — Flagellum black beneath toward base, other characters various 44
44. Scutellar spots pointing inward anteriorly (Fig. 45); scutal spots large and stout (Fig. 45), labrum all yellow, clypeus usually with a basal black spot
 *spinosa* (Fabricius)
 — Scutellar spots oval or squarish but not pointing inward anteriorly, their size various; other characters various 45
45. Clypeus with a basal black spot which is triangular and longer than broad (as in Fig. 34), or short and broad 46
 — Clypeus without a basal black spot, or with spot at least as broad as long, not short and basal 47
46. Forebasitarsus margined with black along posterior edge (Fig. 31); clypeus with black markings, if any, along apical edge; labrum usually all black; apicomedia carina of S-VI as long as scape, T-VI black *affinis* (Cameron)
 — Forebasitarsus not black margined; clypeus with broad basal black mark, sometimes bipartite, labrum yellow; apicomedia carina of S-VI shorter than scape (Fig. 38); T-VI with two yellow spots *paranae* R. Bohart

47. T-V spots narrow to linear, not rounded; all tergal bands weak, sometimes widely broken medially; T-VI black, scutal dots small, scutellar spots also small, foretarsal I black-rimmed or red-spotted *paraguayana* (Strand)
 — T-V spots rather large, rounded, other characters various 48
48. Scutal spots large and posteriorly pointed, about as long as scape or longer (Fig. 43); scutellar spots large and usually pointing inward; clypeal black mark small, T-VI various 49
 — Scutal spots small or merely dots, shorter than scape; scutellar spots narrow; clypeal black mark various; T-VI sometimes spotted 50
49. Hindleg almost all black on inner side, T-VI black, clypeal black mark small but irregularly rounded and about as broad as long
 *diodonta* (Handlirsch)
 — Hindleg with tibial inner black streak stopping short of apical red mark, T-VI usually spotted, clypeal black mark small but triangular
 *venezuelae* R. Bohart
50. Clypeal black mark large and broad, anterodiscal scutal yellow spots usually small, hindtibial black inner streak complete, forebasitarsus nearly always black rimmed or with red spots (Fig. 33) *discisus* (Taschenberg)
 — Clypeal black mark small and triangular, anterodiscal scutal yellow spots large, hindtibial black inner streak stopping short of apical red spot; forebasitarsus various *lilloi* Willink

Bicyrtes affinis (Cameron)

Bembidula affinis Cameron 1897:371. Holotype female*, Des Arroyos, Guerrero, Mexico (London).

The relatively evenly spaced mesopleural punctation is a character most useful to separate *affinis* from other North American species. Yellow markings are subject to some variation. Among the 32 males in the collection, all have a black apical rim on the clypeus, all have a black or mottled labrum, 31 have the propodeal dorsum black, all have T-VI black, and discal area of the scutum black or (in 2 cases) with minute dots. In the 10 females, 7 have dorsomedian propodeal spots or a narrow band, 7 have small anterodiscal scutal spots, all have foretarsal I black-rimmed (Fig. 31), all have labrum black and clypeus with apical black rim.

Bicyrtes angulata (F. Smith)

Monedula angulata F. Smith 1856:334. Lectotype female* (here desig.), Santarém, Pará, Brazil (London).

I have studied about 10 specimens of each sex, and they seem to be relatively uniform. All have the basal half to two-thirds of the clypeus red, bordered at the extreme base with black in males. The angular propodeal flange is a dominant feature (as in Fig. 39).

Bicyrtes anisitsi (Strand)

Bembidula anisitsi Strand 1910:142. Syntypes, male, female, Villa Mora, Paraguay (Berlin).

Bembidula tridentata Strand 1910:146. Holotype male, Villa Mora, Paraguay (Berlin).

Bicyrtes bradleyi J. Parker 1929:178. Holotype female, Pie de Palo, San Juan, Argentina (Ithaca).

The laterally toothed male T-VII is diagnostic (Fig. 14). It is reminiscent of a similar condition in *Microbembex uruguayensis* (Holmberg), where it occurs in both sexes. Of course there are no lateral propodeal flanges in *Microbembex*. However, these are only weakly developed in *B. anisitsi*. A basic difference between the 2 genera is that *Microbembex* has abbreviated palpi, rather than the standard 6-4 of *Bicyrtes*. In females of both *B. anisitsi* and *B. fodiens* S-VI protrudes beneath T-VI. In *anisitsi*, this peculiarity is angular (compare Figs. 28, 29). I have studied only three males and two females of this distinctive species.

Bicyrtes brasiliiana R. Bohart, new species

Male holotype: Length 15 mm. Holotype male (San Francisco), Barre do Tapirape, Mato Grosso, XII-11-62 (B. Malkin). Paratype male (Davis), same data as holotype except XII-18-62. Black, marked with whitish yellow as follows: scape in front, mandible mostly, clypeus except for broad and irregular basic mark, labrum, frons laterally, narrow postocular strip, pronotum narrowly in front, continued to pronotal lobe and large attached spot, anterodiscal long oval spots, two long lateral scutal marks nearly joining long lateral scutellar marks, wings at base, broad spots on metanotum and dorsum of propodeum, flange of propodeum

apically, large mesopleural spot, fore- and midfemora outwardly, hindfemur likewise except for basal spot (Fig. 6), narrowly interrupted bands on T-I to T-VI, lateral spot on T-VII, lateral spots on S-I to S-V; antennal tip reddish; forewing faintly tinted. Pubescence fine and silvery on clypeus and sterna, some erect black bristles on S-V to S-VII, fore- and hindfemur posteriorly edged with fine pale pubescence (Fig. 6). F-IV to F-VI somewhat enlarged, shiny oval spots beneath F-V-VI, forebasitarsus and following article as in Fig. 11, former nearly parallel-sided, foretarsomeres IV, V ventrally as in Fig. 15, IV with prominent transparent "window", midfemur serrate below (about as in Fig. 1), S-II with small median tooth, propodeal flange broadly rounded, T-VII distinctly angled mediolaterally, clasper with "rat-tailed" apex, fringed laterally (Fig. 24).

Female. Unknown.

The peculiar ventral aspect of foretarsomere V (Fig. 15) with its large clear "window" has not been noted in any other *Bicyrtes*. This condition occurs in both types. Other features which differentiate *B. brasiliensis* from *B. paranae* are the nearly straight-sided forebasitarsus of the former (Fig. 11), and its densely fringed hindfemur (Fig. 6).

Bicyrtes capnoptera (Handlirsch)

Bembidula capnoptera Handlirsch 1889:497. Lectotype female* (desig. Bohart 1970), "Kentucky", U.S.A. (Vienna).

Bembidula mesillensis Cockerell 1898:142. Holotype male*, Las Cruces, New Mexico (Washington).

Bicyrtes annulata J. Parker 1917:67. Holotype female*, Oak Creek Canyon, Arizona (Lawrence).

Bicyrtes tristis C. Fox 1923:435. Holotype male*, presumably from La Paz, Baja California Sud, Mexico (San Francisco).

This common species has the greatest variation in markings of any *Bicyrtes* that I have seen (n=265). More northern U.S.A. specimens have a rather even distribution of black and yellow. More desertic material, and especially from the Imperial Valley of California, have the yellow component extended. Thus in such females the scutum, scutellum, propodeum, and terga may be mostly or all yellow. On the other hand, many specimens from Florida may have the markings red or red-tinted. Characters given in the key, particularly the well developed female pygidial plate (Fig. 26) simplify

identification. Males have the midfemur compressed and somewhat expanded toward base (as in Fig. 2), but without a definite tooth (Fig. 3) as in *ventralis*.

Bicyrtes chilicola R. Bohart, new species

Male holotype: Length 15 mm. Black, marked with sulfur yellow as follows: scape in front, mandible basally, clypeus, labrum, lower and lateral frons, narrow postocular strip, pronotal ridge including lobes, scutum laterally and a pair of lengthwise anterodiscal dots, tegula and post-tegula partly, squarish lateral scutellar spot, elliptical metanotal mark, band across propodeal summit, lateral propodeal flange, large triangle on mesopleuron, legs almost entirely, medially interrupted bands on T-I to VI, S-I to VI extensively. Forewing cells almost entirely clear. Pubescence silvery, hindfemur with a short and thick pubescence along posterior edge, with scattered slightly longer hairs; forebasitarsus with 5 rake bristles, some about 2x as long as width of segment. Punctuation fine and close on head, moderately coarse and close on mesonotum, coarse and somewhat separated on mesopleural yellow triangle, coarse on T-VII. F-I 4x as long as apical breadth, longer than scape; labrum slightly longer than clypeus; forebasitarsus 5x as long as broad; midfemur slightly carinate posteriorly; hindfemur slightly undulate along posterior edge, not markedly incurved; S-II with dull mediobasal ridge; propodeal flange broadly rounded; T-VII not angled laterally, but slightly concave posteriorly; clasper fringed laterally, pointed apically but not rat-tailed.

Female: Length 18 mm. About as in male except: metanotal mark divided medially; coxae partly, trochanters, femora basally, tarsomeres II-V, black; foretarsal rake black; hindfemur pubescence inconspicuous; pygidial plate polished with scattered coarse punctures, posterolateral carinae 1.3x as long as scape.

Holotype male (Gainesville), Valle de Azapa, Tarapacá, Arica, Chile, XI-19-93 (C. Porter). Paratypes: male (Davis), near Molinos, Tarapacá, Arica, Chile, XI-23-93 (C. Porter); female (DAVIS), Peru, Lambayeque, III-18-63.

In the male a combination of characters is distinctive: T-VII black, ending in narrow but slightly concave truncation; clypeus, labrum, femora, and tibiae all medium yellow; flagellum beyond F-I all black; F-I longer than scape; wing membrane clear; rake setae mostly longer than second foretarsomere; hindfemur slightly concave along two-thirds

of basoventral edge, entire edge with fine short but thick pubescence. The female characters are less numerous; T-VI black, with a distinct pygidial plate; clypeus, labrum, tibiae all yellow; clypeus with a few deep punctures; F-I longer than scape; scutum with anterodiscal dots; and size large (for *Bicyrtes*). Relationships with other species are shown in the key. The species name indicates "living in Chile".

Bicyrtes cingulata (Burmeister)

Bembidula cingulata Burmeister 1874:125. Holotype male*, "Cordova", Argentina (Buenos Aires?).

Bembidula micans Handlirsch 1889:477. Holotype male, "Alegre", Espirito Santo, Brazil (Berlin). New synonym.

Bicyrtes cisandina Pate 1936:219. Holotype female, "La Rioja", Argentina (Ithaca).

The peculiar hooklike terminus of the male antenna (Fig. 16), along with the bent-out male labrum are diagnostic features. In females the pointed propodeal flange (Fig. 40), black labrum, and black forebasitarsus (Fig. 30) are distinctive taken together. Of the 10 females I have studied, 8 have T-I all black. Several specimens of both sexes labeled *micans* have T-III and following marked with yellow. Willink (1953:344) awarded these the status of subspecies. However, I consider them merely as a variety (n=33).

Bicyrtes colombica Fritz

Bicyrtes colombica Fritz 1974:13. Holotype male, Río Frío, Magdalena, Colombia (London).

The pointed propodeal flange (Fig. 39), and the midcoxal projection of the male (as in Fig. 13) place this species near *B. angulata* and *B. cingulata*. The 3 species are readily distinguished as indicated in the key. I have studied 8 specimens of each sex.

Bicyrtes diodonta (Handlirsch)

Bembidula diodonta Handlirsch 1889:484. Holotype male*, Orizaba, Mexico (Geneva).

Bicyrtes oribates Pate 1936:220. Holotype male, Compostela, Nayarit, Mexico (Ithaca).

The holotype has a large black spot on the yellow clypeus and somewhat reduced tergal bands. Otherwise it agrees with a male in the Bohart Museum, which has a short fringe on flattened

foretarsal I, uneven mesopleural punctation, a polished median bump on S-V, yellow lateral spots with white apices on S-II to V, and midfemur irregularly serrate below on distal one-half. The male flagellum, with its swollen apex of F-IV and base of F-V is similar to that of *B. discisa* and *B. paraguayana*. The latter also has a bump on S-V. The short and thick posterior fringe on the hindfemur of male *diodonta* (Fig. 5) readily distinguishes it from the other two species, as well as *B. pexa*, which has no bump on S-VI. I have studied only three males and two females.

Bicyrtes discisa (Taschenberg)

Monedula discisa Taschenberg 1870:26. Syntypes, male, female, Rio de Janeiro, Brazil (depository?).

Bicyrtes discisa and five related species have the male flagellum expanded on both sides of the F-IV-V joint. These are *B. discisa*, *B. venezuelae*, *B. pexa*, *B. diodonta*, *B. paraguayana*, and *B. lilloi*. In all of these the male clasper has dense setae on the outer one-third (Figs. 20, 25). Most other species (except *B. mendica*) have the setal fringe essentially lateral (Figs. 19, 21, 23). In *B. diodonta*, *B. lilloi*, and *B. paraguayana*, the male has a median swelling on S-VI. As indicated in the key, *B. pexa* and *B. venezuelae* are separated by several color characters. Also, both *pexa* and *discisa* have the hindfemur posteriorly concave in profile (Fig. 7), unlike *B. venezuelae*. Other peculiarities are discussed under the individual species.

Bicyrtes discisa is relatively abundant, and ranges from Mexico and the Caribbean Islands to Argentina. All males (n=121) have a distinctive white background for the large black basal mark on the clypeus. In females (n=77) all have triangular basal black clypeal marks on a yellow background, mediodiscal scutal spots, and oval spots on T-V and VI. Both sexes have the propodeal flanges rounded (about as in Fig. 41). Females are difficult to separate from *lilloi* except by association with males. Some examples of variation in males are: mediodiscal scutal spots, mostly small, are present in 96%; T-VII is all black in 13%.

Bicyrtes fodiens (Handlirsch)

Bembidula fodiens Handlirsch 1889:499. Lectotype male* (desig. Bohart 1970), Dallas, Texas (Vienna).

Bembidula burmeisteri Handlirsch 1889:500. Holotype female, "Amerika" (Brussels).

The tooth at the inner apex of the hindcoxa is unique (n=104). Other features are the absence of anterodiscal scutal spots, usually all black mesopleuron, and T-I sometimes all black. The male midfemur is a little flattened and expanded toward base (Fig. 2).

Bicyrtes insidiatrix (Handlirsch)

Bembidula insidiatrix Handlirsch 1889:494. Lectotype female* (desig. Bohart 1970), Kentucky (Vienna).

Although the almost entirely red legs are characteristic, markings are somewhat variable. Among the 10 males and 14 females in our collection, nearly all have the labrum black or dark red in contrast to the yellow or red clypeus. All have the flagellum reddish or yellow toward the base, and a black mesopleuron. T-VI is always black or red, and in some specimens T-IV-V are spotted rather than banded. Occasionally, the scutellum may be all yellow or red. Specimens from Florida usually have the markings more red than yellow.

Bicyrtes lilloi Willink

Bicyrtes lilloi Willink 1947:567. Holotype male*, Catamarca, Argentina (Buenos Aires).

This species is similar to *B. paraguayana* since both have a bump on male S-V. One difference in the material I have seen (n=15) is that the last tergum is two-spotted in *lilloi*, all black (n=27) in *B. paraguayana*. Males of the former differ additionally in having the bump of S-V somewhat longitudinally ridged. A further difference from *discisa*, shared with *B. paraguayana*, is the nearly straight posterior margin of the male hindfemur. Females of *lilloi* from Brazil and Argentina are difficult to separate from yellower *B. discisa*.

Bicyrtes mendica (Handlirsch)

Bembidula mendica Handlirsch 1889:490. Holotype female*, Bahia Blanca, Buenos Aires, Argentina (Geneva).

In many respects, *B. mendica* is similar to *B. discisa*. However, in the male, the clasper of the

former is blunt at the apex instead of "rat-tailed". Also, male F-IV and V are not expanded in *mendica*. The all yellow clypeus of the female separates it from most other *Bicyrtes* in this sex. I have studied three males and ten females.

Bicyrtes odontophora (Handlirsch)

Bembidula odontophora Handlirsch 1889:482. Lectotype male* (desig. Bohart 1970), Nauta, Loreto, Peru (Vienna).

The enlarged and black-margined foretarsomere I (Fig. 12) of the male, and the bipartite basal clypeal mark (Fig. 35) of the female are characteristic. The male antenna beneath has F-VI and following narrower than F-V, which bears an orange spot. This is one of the larger species of *Bicyrtes*, its length averaging 17 mm in both sexes (n=32).

Bicyrtes paraguayana (Strand)

Bembidula paraguayana Strand 1910:144. Holotype male, "Sapucay"—Sapucay, Paraguari, Paraguay (Berlin).

Bicyrtes oribates patei Willink 1947:577. Holotype male*, Puerto Iguazú, Misiones, Argentina (Tucuman).

The rounded swelling on S-VI of the male, together with the narrowly rounded propodeal flange distinguish this sex from *B. discisa* (see discussion of characters under *B. discisa*). Females are difficult to separate but the narrowly rounded propodeal flange and all dark T-VI of *B. paraguayana* can be used. In addition, the unusually thin tergal bands, although not unique, contribute to its overall dark appearance. In all males I have seen (n=21), pale markings of the clypeus and frons are yellow (clypeus white in *B. discisa*), T-VII is all black (spotted in *B. lilloi*), and 15 have tiny medi-discal scutal spots (large in *B. diodonta*). In the presumed females (n=12), all have T-VI black, and two have tergal bands rather widely broken medially.

Bicyrtes paranae R. Bohart, new species

Male holotype: Length 14 mm. Black, marked with whitish yellow as follows: scape in front, mandible mostly, clypeus except for broad and irregular basal mark (as in Fig. 35), labrum, frons

laterally, narrow postocular strip, pronotal ridge narrowly, pronotal lobe and attached lateral spot, pair of anterodiscal scutal dots, scutal side and adjacent elliptical scutellar mark, tegula and post-tegula partly, hindwing basally, broad metanotal spot, posterior rim of propodeal enclosure, propodeal flange apically, elongate mesopleural spot, femora and hindtibia in front, fore- and midtibia, tarsi except apically, narrowly interrupted bands on T-I to T-VII, lateral spots of S-II to S-V; reddish are: antennal tip, wing veins mostly; forewing cells clear. Pubescence silvery on clypeus and foretarsus, inconspicuous elsewhere except posteriorly on S-IV-VI where erect dark bristles are nearly half as long as scape. Punctuation fine and close on head and notum, a little coarser and slightly separated on mesopleuron, medium-sized and scattered on T-VII. Flagellomere IV slightly enlarged apically, V to IX flattened beneath, V-VI polished there but not VII-IX; forebasitarsus and following article as in Fig. 10, basitarsus roughly triangular, twice as long as broad, posterior edge with fringe and scattered stouter setae; midfemur serrate below on distal half (Fig. 1), hindfemur with a few short hairs basad (Fig. 4), S-II with a stout medial tooth; propodeal flange broadly rounded (about as in Fig. 41). T-VII slightly angled mediolaterally; clasper fringed laterally, almost "rat-tailed" toward apex (Fig. 23).

Female: Length 13-15 mm. Markings about as in male except: trace spot on vertex next to ocellar bulge; anterodiscal spots slightly larger and longer (Fig. 44); forebasitarsus stout, bearing 3 preapical rake bristles (Fig. 32); T-VI broad, a little narrowed in distal half which bears short pygidial carinae and is extensively polished. S-VI with scattered punctures, medial carina restricted to apical one-third (Fig. 35).

Holotype male (New York), Vila Velha, Paraná, Brazil, II-5-74 (J. G. Rozen, F. C. Thompson). Paratypes, 2 females (New York), same data as holotype; female (Davis), same data as holotype except collected I-31-74; male (London), topotypic, IV-2-70 (O. G. Richards); male (Washington), Paso Yohay, Paraguay, II-15-50 (F. H. Schade); male (Davis), "Colombia"; male (Gainesville), Santa Cruz, Montero, Bolivia, III-14-86 (F. D. Bennett).

This species is related to *B. brasiliana* and *B. odontophora* but *B. paranae* is easily distinguished by the male foretarsus (compare Figs. 10, 11, 12, 15, 18). The female of *B. paranae* is smaller than that of *B. odontophora*, and the former has the pygidium

more extensively polished. Also, *B. paranae* has smaller anterodiscal spots on the scutum.

The triangular shape of the forebasitarsus in the male is the single most diagnostic character (Fig. 10). To this can be added the expanded foretarsomeres II-III, and the spinose male midtibia. Both sexes have a broad basal black mark on the clypeus (often bipartite as in Fig. 35 in females), anterodiscal scutal dots, large yellow mesopleural mark, and two-spotted last tergum. The female S-VI has a short carina apicad and sparse punctuation. Differences with other *Bicyrtes* are indicated in the key.

The species name refers to the Brazilian State of Paraná.

Bicyrtes pexa J. Parker

Bicyrtes pexa J. Parker 1929:179. Holotype female*, French Guiana (Pittsburg).

In addition to the holotype female, I have studied a pair collected at Vila Velha, Paraná, Brazil. All of these have the thorax almost entirely black, only remnants of some yellow marks present. If my female is correctly identified, it differs from the type by having most of the tergal bands narrowly connected (not so in my male), and yellow-marked F-I-II. Also, mine is a little larger, 17 mm long instead of 15. Although Parker did not mention punctuation, my Vila Velha female has unusually coarse punctures on the clypeus.

Bicyrtes quadrifasciata (Say)

Monedula 4-fasciata Say 1824:336. Syntypes, male, female, Pennsylvania (Lost).

Monedula sallei Guérin-Meneville 1844:437, Holotype female, New Orleans, Louisiana (depository?).

In a long series of *B. quadrifasciata* in the Bohart Museum collection (n=110) the increasing distance between the pairs of tergal bands posterad are an easy means of identification, especially among North American species. Some specimens of *B. viduata* may have a similar condition, but they have a brown forewing submarginal cell. This is one of the larger species of the genus, averaging 17 mm in length. Small specimens of males might be confused with *B. capnoptera*, but the midfemur of *B. quadrifasciata* is not at all expanded basally,

and the more terminal tergal bands are more separated.

Bicyrtes simillima (F. Smith)

Monedula simillima F. Smith 1856:333. Holotype male*, Santarem, Pará, Brazil (London).

Bembex? defecta Brèthes 1909:64. Holotype female, no data (depository?).

Bicyrtes quinque maculata J. Parker 1929:175. Holotype male, Carinas, Beni, Bolivia (Washington).

Bicyrtes pullata J. Parker 1929:176. Holotype male*, Chapada, Brazil (Pittsburg).

Bicyrtes orfilai Willink 1952:78. Holotype male*, Rosario, Santa Fé, Argentina (Tucuman).

Although I have seen only a few specimens of each sex of *B. simillima* (n=5), it appears to be quite distinctive, not just in markings, but in size. It is one of the largest *Bicyrtes*, averaging about 17 mm in length. Apparently, the male labrum is usually all black except for a basal dot (n=6). The clypeus may also be black. Both sexes have the scutum all or nearly all black, terga I-IV or I-V with pale yellow lateral spots, female T-VI without indication of a pygidial plate, male hindlegs often all black and male antenna relatively simple. The claspers are quite narrow and have discontinuous short, lateral setae. In some males the lateral propodeal flange may be indented medially. This is true in the type of *B. pullata*. Some variation in details of markings account for the considerable synonymy.

Bicyrtes spinosa (Fabricius)

Bembex spinosa Fabricius 1794:458. Holotype male, "American Islands" (Copenhagen).

The fact that scutellar spots point inward anteriorly is a good diagnostic feature (n=34). Other characteristics (not unique) are the yellow labrum and clypeus, the latter with a basal black mark; slightly elongate anterodiscal scutal spots (large in female); and all black flagellum and pygidium. This species has been thought previously to be found only in the Caribbean Islands. However, I have seen a male from Gainesville, Florida.

Bicyrtes tricolorata J. Parker

Bicyrtes tricolorata J. Parker 1929:171. Holotype male, "Amer. Merid.", South America (Berlin).

Bicyrtes sola J. Parker 1929:180. Holotype female*, Chapada, Brazil (Pittsburg).

I have seen only a few specimens of this species, mainly males. There is a series of males from Argentina (TUCUMAN) which are remarkable for the broad and continuous yellow tergal bands along with many red markings elsewhere. The clypeus is mostly red, as in the unrelated *B. angulata*, and the antenna is extensively red basad. The synonymy of *B. sola* is doubtless correct, but Parker's type has broad yellow tergal bands, slightly interrupted medially on I-IV, continuous on T-V. There is no differentiated pygidial plate. The male antenna is relatively simple, and the claspers are broad with a lateral fringe. The male midtibia is concave toward the apex in profile (Fig. 17), and S-II has a large tooth. This is a large species, rivalling *B. simillima*.

Bicyrtes variegata (Olivier)

Bembex variegata Olivier 1789:292. Holotype male (?), French Guiana (depository?).

Monedula sericea Spinola 1851:315. Syntype females, Chile (depository?).

Bembex guiana Cameron 1912:431. Holotype female*, British Guiana (London).

The complete or nearly complete yellow band across the anterior part of the scutellum (Fig. 42) is diagnostic (n=160). In the original description Olivier included this character. He mentioned the interrupted tergal bands but not the spots on T-VI which customarily occur in females. Therefore, it may be assumed that the type was a male.

Bicyrtes venezuelae R. Bohart, new species

Male holotype: Length 13.5 mm. Black, marked with yellow as follows: scape in front, mandible mostly, clypeus except for small black basal spot, labrum, frons laterally, narrow postocular strip, pronotal ridge and lobe, pair of anterodiscal scutal spots, scutal side and adjacent squarish scutellar spot, tegula and post-tegula partly, broad metanotal spot, posterior rim of propodeal enclosure, propodeal flange apically, large mesopleural spot, femora and tibiae mostly, hindtibial inner surface except for black mark stopping at three-fourths of length (shorter in most paratypes), tarsi mostly, terga I-V with medially interrupted bands, T-VI with large oval spots, S-II to V with lateral spots; forewing cells clear. Pubescence silvery on clypeus, pale to fulvous on vertex and mesopleuron,

black and erect but short on S-V to VII, some setae one-third as long as scape. Punctuation mostly fine and close, a little larger and slightly separated on mesopleuron and T-VII where there is a subapical mostly polished area. Flagellomere IV apically and V basally slightly enlarged, F-V to IX in ventral view flattened and polished; forebasitarsus slender, about 4x as long as broad (Fig. 9), four posterior setae shorter than breadth of tarsomere; midfemur notched toward apex beneath; S-II with short medial tooth, propodeal flange broadly rounded, T-VII faintly angled mediolaterally; clasper with fine dense setae covering outer one-half, almost "rat-tailed" toward apex.

Female: Length 14 mm. Markings about as in male except: F-I often with a medial yellow dot in front; black clypeal spot sometimes a little larger; anteromedial discal spots larger, often as long as scape and pointed posteriorly; forebasitarsus about twice as long as broad, bearing three preapical rake bristles; T-VI with oval yellow spots, punctuation becoming sparse medially.

Holotype male (Davis), Puerto de Cata, Aragua, Venezuela, IV-19-73 (R.M. Bohart). Paratypes (all from Venezuela), male (Gainesville), 13 km sw. Machiques, Zulia, IV-14-81 (E. Grissell); male (Davis), Los Hermonitos Paez, Zulia, VI-26-79 (R. Schuster *et al.*); male (Gainesville), 18 km sw. Carora, Lara, VII-11-88 (C. Porter, L. Stange); 14 males, 5 females (Washington, Davis), 44 km s. Calabozo, Guarico, V-28-85 (A. Menke, J. Carpenter).

This species seems to be closely related to *B. discisa*, but *B. venezuelae* has a stouter male foretarsus (Fig. 9), a more evenly convex posterior edge of the male hindfemur, and a usually yellow rather than white clypeal ground color. The female of *B. venezuelae* differs in a few color characters as outlined in the key.

Bicyrtes ventralis (Say)

Monedula ventralis Say 1824:336. Holotype male, Pennsylvania (Lost).

Bicyrtes servillii Lepeletier 1845:53. Holotype female, Philadelphia, Pennsylvania (depository?).

Monedula parata Provancher 1888:416. Holotype female*, Los Angeles, California (Quebec).

Bembidula meliloti Johnson and Rohwer 1908:376. Holotype male*, Pecos, New Mexico (Washington).

This is one of the two most abundant species in the United States (n=360), the other being *B. cap-*

noptera. The basoventral tooth on the midfemur of male *ventralis* is diagnostic. Similarly, the well-formed pygidial plate of *B. capnoptera* females distinguishes that sex from others in the U.S. Most *B. ventralis* have broad tergal bands, interrupted medially. Some females have all of the tergal bands continuous. There is a strong tendency for the labrum to be black, and for the clypeus to be black-rimmed below (Fig. 36). Rarely, the labrum and clypeus of males may be all black.

Bicyrtes viduata (Handlirsch)

Bembidula viduata Handlirsch 1889:491. Lectotype female* (desig. Bohart 1970), "Huasteca", Mexico (Geneva).

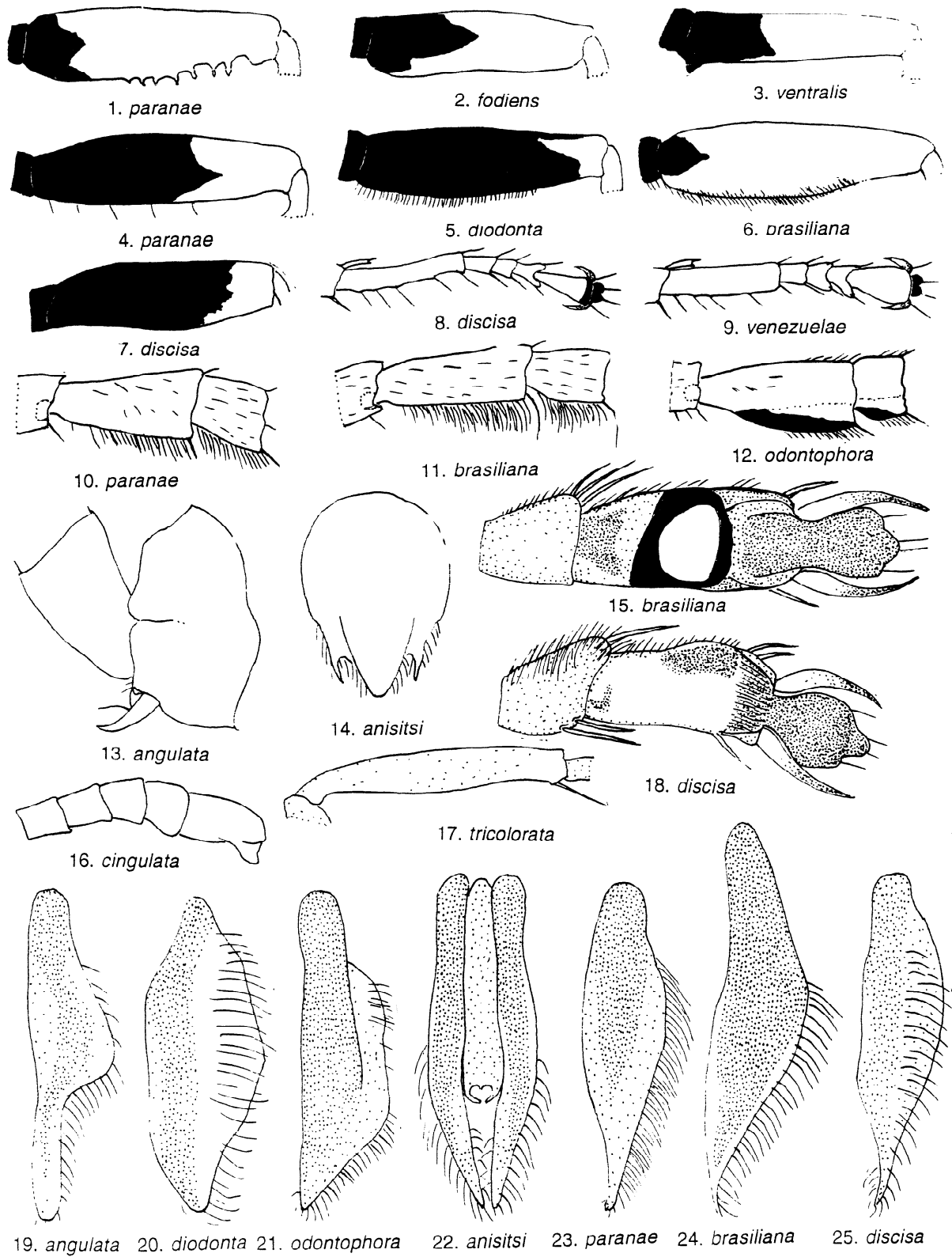
Bicyrtes gracilis J. Parker 1917:68. Holotype male*, Santa Rita Mts., Santa Cruz Co., Arizona (Lawrence).

The darkly stained submarginal cell I with a tiny apical clear "window" seems to be unique among *Bicyrtes*. Otherwise, there is quite a variation in markings (n=190) over its range from southwestern U.S. to Costa Rica. Along with the customary black labrum, more southerly material exhibits a diminution in size and number of pale tergal markings. The male clasper is broad, somewhat "rat-tailed" at the apex, and fringed laterally.

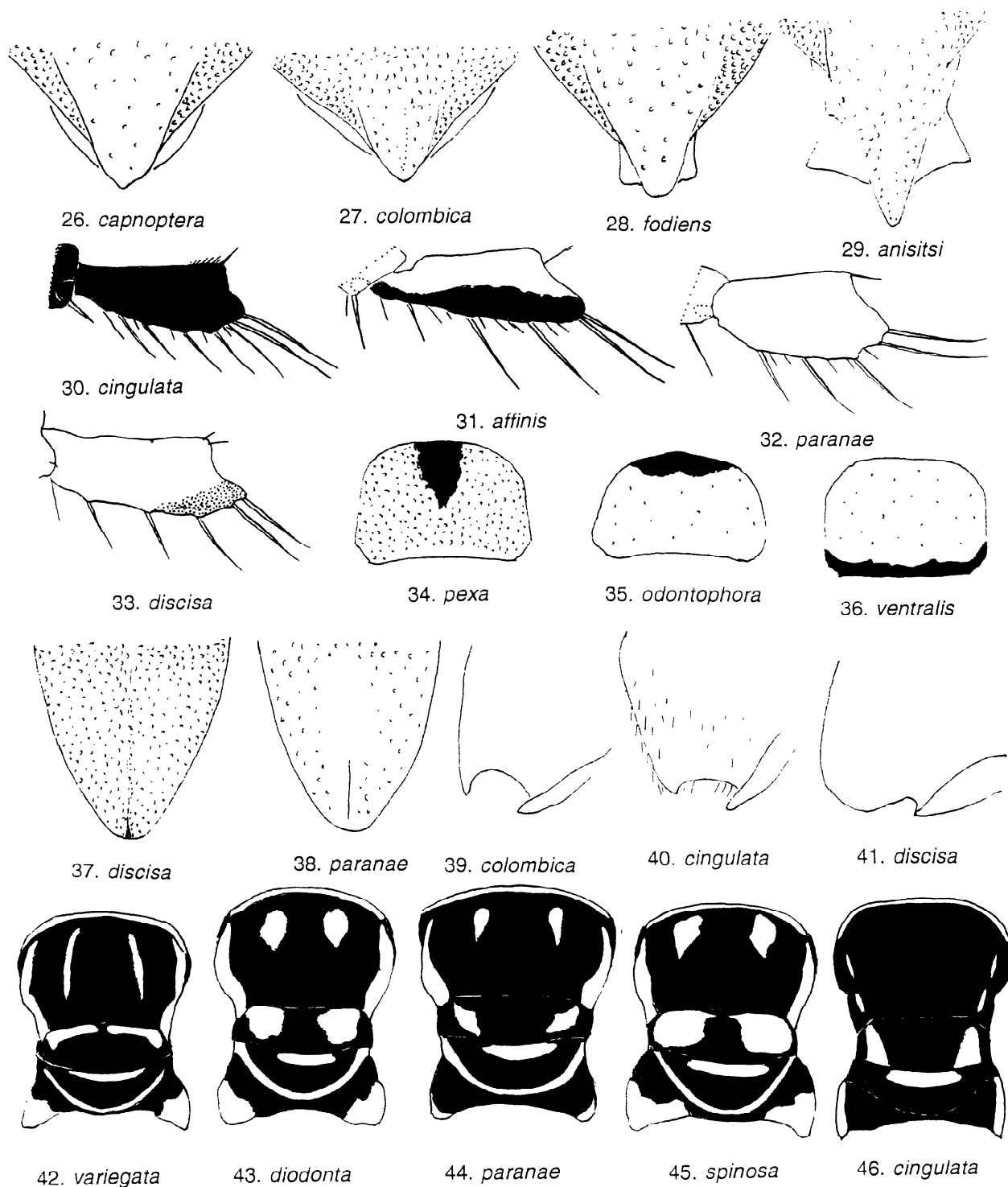
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Figs. 1-25, males. Figs. 1-3, midfemur, outer view. Figs. 4-7, hindfemur, outer view. Figs. 8-9, foretarsi, dorsal. Figs. 10-12, foretarsals I-II, outer view. Figs. 13, right coxa and trochanter. Fig. 14, T-VII. Figs. 15, 18, foretarsals IV-V, ventral. Fig. 16, flagellomeres VII-XI, lateral. Fig. 17, midtibia, lateral. Figs. 19-21, 23-25, right clasper, ventral. Fig. 22, genitalia, ventral.



Figs. 26-46, females. Figs. 26-29, T-VI pygidial area. Figs. 30-33, foretarsomere I. Figs. 34-36, clypeus. Figs. 37-38, S-VI. Figs. 39-41, propodeal flange, inner posterior view. Figs. 42-46, mesonotal and propodeal pattern, dorsal.