

Revision of the genus *Psenobolus* Reinhard (Hymenoptera: Braconidae: Doryctinae)

C. van Achterberg & P.M. Marsh

Achterberg, C. van & P.M. Marsh. Revision of the genus *Psenobolus* Reinhard (Hymenoptera: Braconidae: Doryctinae).

Zool. Med. Leiden 76 (1), 30.ix.2002: 1-25, figs 1-75.— ISSN 0024-0672.

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Key words: Hymenoptera; Braconidae; Doryctinae; *Psenobolus*; Neotropical; key; new species; *Ficus*.

The genus *Psenobolus* Reinhard, 1885 (Hymenoptera: Braconidae: Doryctinae) is revised and six new species are described and illustrated. As far as is known the species live asinquilines in galled flowers inside the syconia of the genus *Ficus* subgenus *Urostigma* section *Americana* only, the males are known to fight with each other.

Introduction

Recently, Ramirez & Marsh (1996) published two new species belonging to the genus *Psenobolus* Reinhard, 1885 (Hymenoptera: Braconidae: Doryctinae) with highly aberrant fighting males (called “agaonidized” males because of the reduced antenna, legs and wings combined with an enlarged head as in males of Agaonidae). These males are so different from the normal and winged females that it took many years before the connection, established several years ago by William Ramirez in Costa Rica, was accepted by taxonomists (Ramirez & Marsh, 1996). When in 1885 Reinhard described the type species of the genus reared from a fig fruit collected in Brazil (Santa Catharina), he had only normally winged specimens of both sexes available. In this paper we give a revision of the genus, describing six new species; five of them belonging to the *P. pygmaeus* group, in which the males are macropterous and not agaonidized.

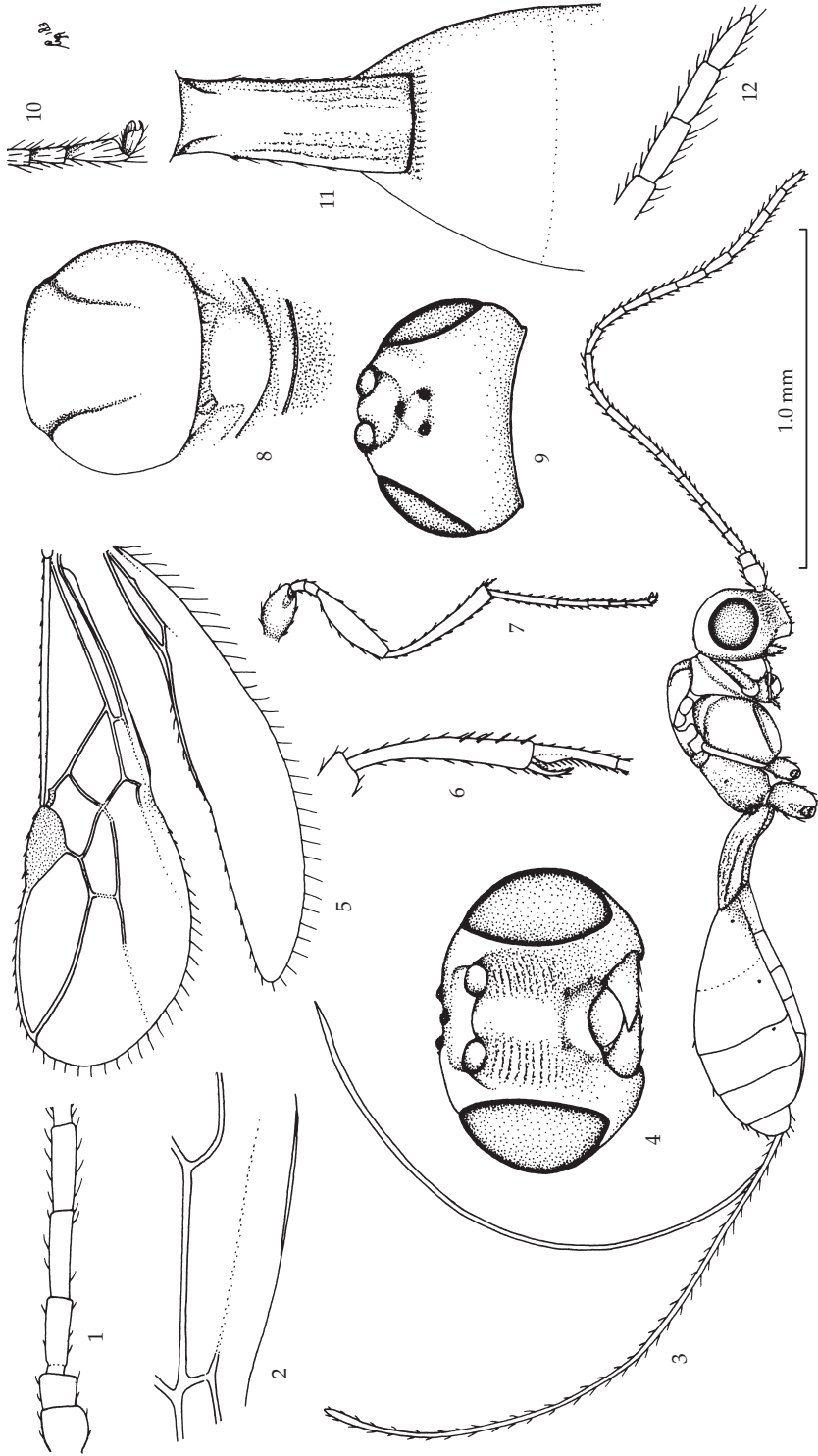
For the recognition of the subfamily Doryctinae, see van Achterberg (1990, 1993, 1997), for a key to the genera of New World Doryctinae, see Marsh (1993, 1997), and for the terminology used in this paper, see van Achterberg (1988).

Key to species of the genus *Psenobolus* Reinhard

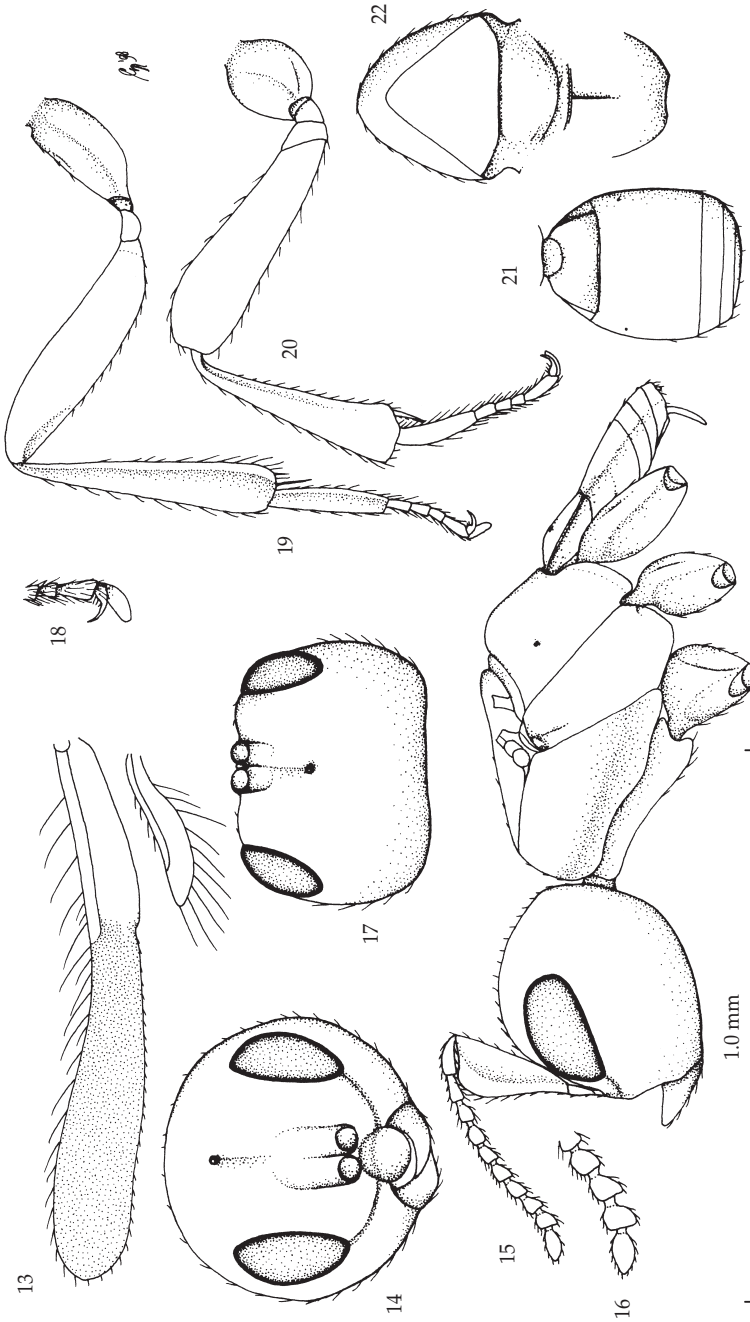
1. Length of ovipositor sheath about 0.3 times fore wing (about as long as metasoma; fig. 64); pronotum more developed anteriorly (fig. 32); scutellar sulcus wide (fig. 34); notauli sculptured and meeting each other posteriorly (fig. 34); propodeum more or less areolate (figs 34, 65); third antennal segment comparatively long and slender (fig. 33) *P. plesiomorphus* spec. nov.
- Length of ovipositor sheath 1.3-2.6 times fore wing (1-2 times as long as body; figs 3, 58, 62, 63, 70, 72, 74); pronotum less developed anteriorly (figs 3, 50); scutellar

- sulcus narrow medially (figs 8, 22, 43, 49, 51); notauli smooth and not meeting each other posteriorly (figs 8, 43, 51); propodeum without areolation (figs 35, 39, 47, 53); third antennal segment comparatively short and less slender (figs 1, 28, 37, 40, 45, 44, 48, 52) 2
2. Brachypterous (figs 13, 15, 55, 56, 59, 60, 68, 69); pedicellus strongly enlarged (figs 15, 23, 28, 56, 60), sometimes triangular (fig. 15, 68); posterior ocelli absent (figs 17, 26, 55, 59); only males 3
- Macropterous (fig. 5, 58, 62, 64, 72); pedicellus small, cylindrical (figs 1, 45, 52, 58); posterior ocelli present (fig. 9); both sexes 5
3. Pronotum widely truncate posteriorly; femora strongly widened (figs 24, 25, 55, 59); pedicellus cylindrical and smaller than scapus (figs 23, 28, 56, 60); tibiae sub-cylindrical (figs 24, 25, 60); scapus enlarged (figs 23, 28, 56, 60); antenna with 9-12 segments; first metasomal tergite narrowed posteriorly (figs 27, 55); eyes minute (figs 23, 26, 28, 29, 56, 60); no ocelli present (figs 26, 29, 55); fore wing subhyaline (fig. 55); mandible larger (figs 23, 28); malar suture absent, no groove to eyes (fig. 23); propleuron medium-sized (fig. 23); fore tarsal segments shortened (fig. 25) 4
- Pronotum deeply triangularly emarginate posteriorly (fig. 22); femora elongate (figs 19, 20, 68); pedicellus very wide lamelliform triangular and much larger than scapus (figs 15, 68); tibiae strongly compressed (figs 19, 20); scapus small (fig. 15); antenna with 12 segments; first tergite strongly widened posteriorly (fig. 21); eyes medium-sized (figs 16, 17, 68, 69); one (median) ocellus present (fig. 17); fore wing (except basally) infusate (figs 13, 68); mandible comparatively small (fig. 16); malar suture present, as oblique shallow groove to eyes (fig. 14); propleuron elongate (fig. 16); fore tarsal segments slender (fig. 20) *P. triangularis* spec. nov.
4. Head about 1.5 times wider than long in dorsal view (figs 26, 55); antenna with 9-11 segments; scapus distinctly swollen and wider than diameter of eye (figs 23, 56); vein M+CU1 of fore wing reduced, resulting in an apically open basal cell of fore wing (fig. 55); antennal sockets almost touching each other (fig. 26) *P. ficarius* Ramirez & Marsh, 1996
- Head slightly wider than long in dorsal view (figs 29, 59); antenna with 12 segments; scapus less swollen and about as wide as diameter of eye (figs 12, 60); vein M+CU1 of fore wing completely sclerotised, resulting in a closed basal cell of fore wing; antennal sockets distinctly separated from each other (fig. 29) *P. parapygmaeus* Ramirez & Marsh, 1996
5. Length of ovipositor sheath 2.2-2.7 times fore wing (at least twice as long as body; figs 58, 62, 63); first metasomal tergite of ♀ 2.5-3.0 times as long as its apical width (figs 35, 39, 61); males (as far as known) are brachypterous and "agaonized" (figs 55, 56, 59, 60); antennal segments of ♀ 21-25; notauli almost reaching scutellar sulcus (cf. fig. 43); (*P. ficarius* group) 6
- Length of ovipositor sheath 1.3-1.9 times fore wing (about as long as body; figs 70, 72, 74); first tergite of ♀ 1.5-2.6 times as long as its apical width (figs 11, 42, 47, 53, 75); males (as far as known) are macropterous and only slightly modified; antennal segments of ♀ 19-28; notauli variable, usually distinctly removed from scutellar sulcus (figs 8, 51); (*P. pygmaeus* group) 8

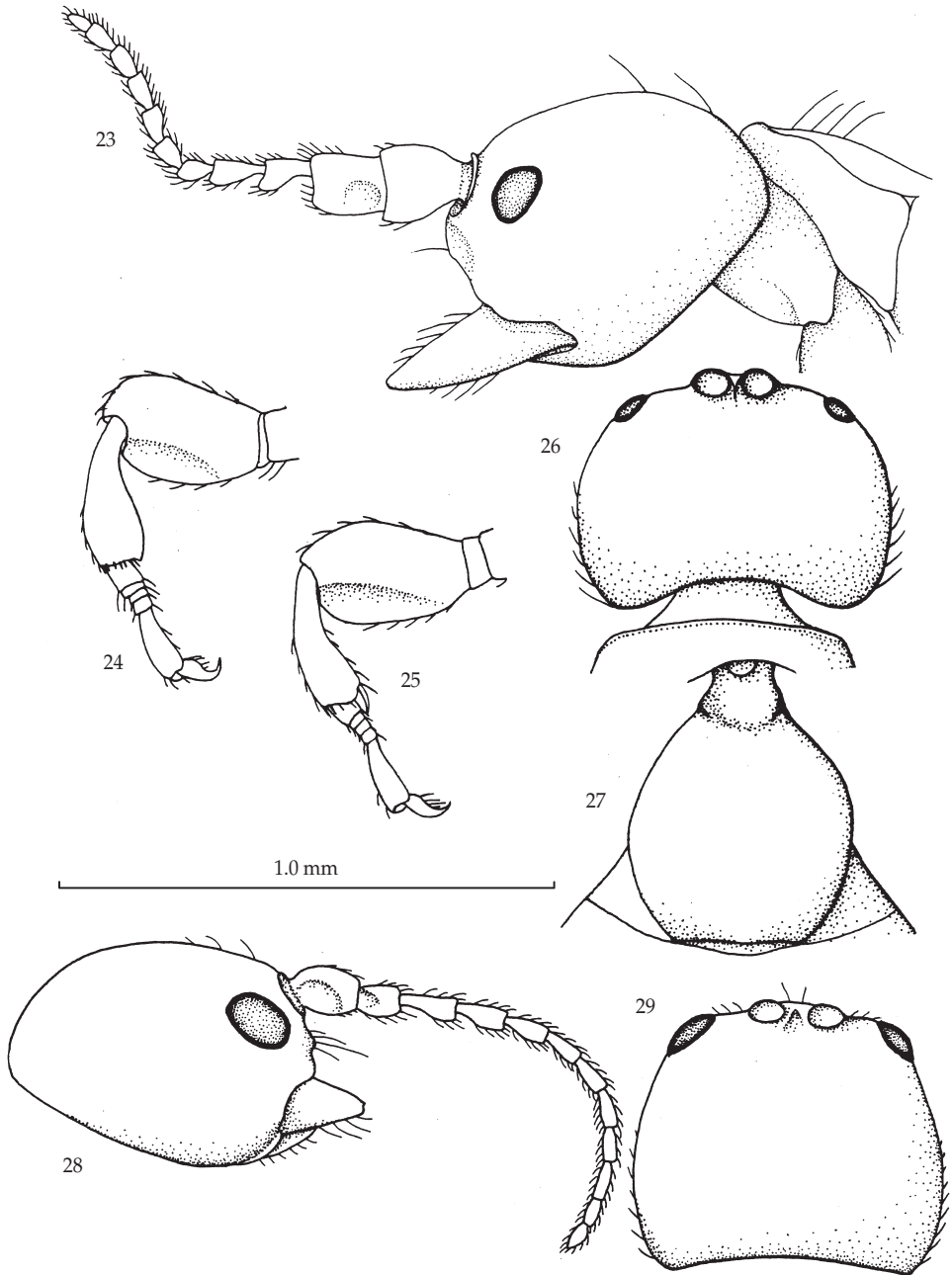
6. Propodeum brownish-yellow (figs 61-63); second tergite without dark brown spot basally (fig. 61); vein m-cu of fore wing shortly antefurcal (figs 37, 38); scapus not or weakly contrasting with yellowish third antennal segment (fig. 62) 7
- Propodeum dark brown (fig. 57); second metasomal tergite with dark brown spot basally (fig. 57); vein m-cu of fore wing interstitial or nearly so; scapus distinctly contrasting with dark brown third antennal segment (fig. 57)
..... *P. ficarius* Ramirez & Marsh, 1996
7. Vein 2-SR of fore wing about twice as long as vein 3-SR (fig. 38); third antennal segment less slender and 0.7-0.8 times as long as fourth segment (fig. 40); length of ovipositor sheath about 2.5 times as long as fore wing (fig. 63)
..... *P. longicaudatus* spec. nov.
- Vein 2-SR of fore wing 1.4-1.5 times as long as vein 3-SR (fig. 36); third antennal segment more slender and 0.8-0.9 times as long as fourth segment (fig. 37); length of ovipositor sheath about twice as long as fore wing (fig. 62)
..... *P. parapygmaeus* Ramirez & Marsh, 1996
8. First metasomal tergite parallel-sided (its length 2.2-2.4 times its apical width) and apically less flattened (figs 11, 42, 75); propodeum partly coriaceous or finely rugulose (figs 43, 75); antennal segments of ♀ 19-28 9
- First tergite more or less widened apically (its length 1.7-2.0 times its apical width) and distinctly flattened apically (figs 47, 53, 71, 73); propodeum partly with very fine oblique striae (fig. 47, 53); antennal segments of ♀ 19-22 10
9. Second metasomal tergite largely smooth, only basally finely striate (fig. 11); vein 2-SR of fore wing 1.4-1.5 times as long as vein 3-SR (fig. 5); notauli absent posteriorly (fig. 8); first tergite and stemmaticum dark brown; antenna of ♀ with 19-20 segments; vertex smooth; length of maxillary palp about 0.5 times height of head (fig. 3) *P. pygmaeus* Reinhard, 1885
- Second tergite largely finely striate (fig. 42); vein 2-SR of fore wing 1.1-1.2 times as long as vein 3-SR (fig. 41); notauli present posteriorly, but narrow and shallow (fig. 43); first tergite and stemmaticum yellowish-brown (fig. 75); antenna of ♀ with (22-)24-28 segments; vertex superficially granulate; length of maxillary palp about equal to height of head *P. woldai* spec. nov.
10. Medio-basal area of second metasomal tergite and large basal patch of fourth tergite dark brown (fig. 71); propodeum largely dark brown and extensively finely striate (fig. 47); notauli usually closer to scutellar sulcus as very fine impressed grooves (fig. 49); vein 2-SR of fore wing 1.5-1.6 times vein 3-SR (fig. 46)
..... *P. stigmatalis* spec. nov.
- Medio-basally second tergite and complete fourth tergite yellowish-brown (fig. 73); propodeum yellowish-brown (rarely somewhat darkened) and sparsely finely striate (fig. 53); notauli remain distinctly removed from scutellar sulcus (fig. 51); vein 2-SR of fore wing 1.2-1.6 times vein 3-SR (fig. 54) *P. pygmaeoides* spec. nov.
- Note.— A male from Trinidad (USNM), with vein CU1a of fore wing somewhat closer to level of vein 2-CU1, vein 2-SR of fore wing about 1.3 times as long as vein 3-SR, antenna with 16 segments, scapus and pedicellus slightly widened (fig. 45), and first tergite rather robust and smooth may belong to *P. pygmaeoides* or to a closely related species.



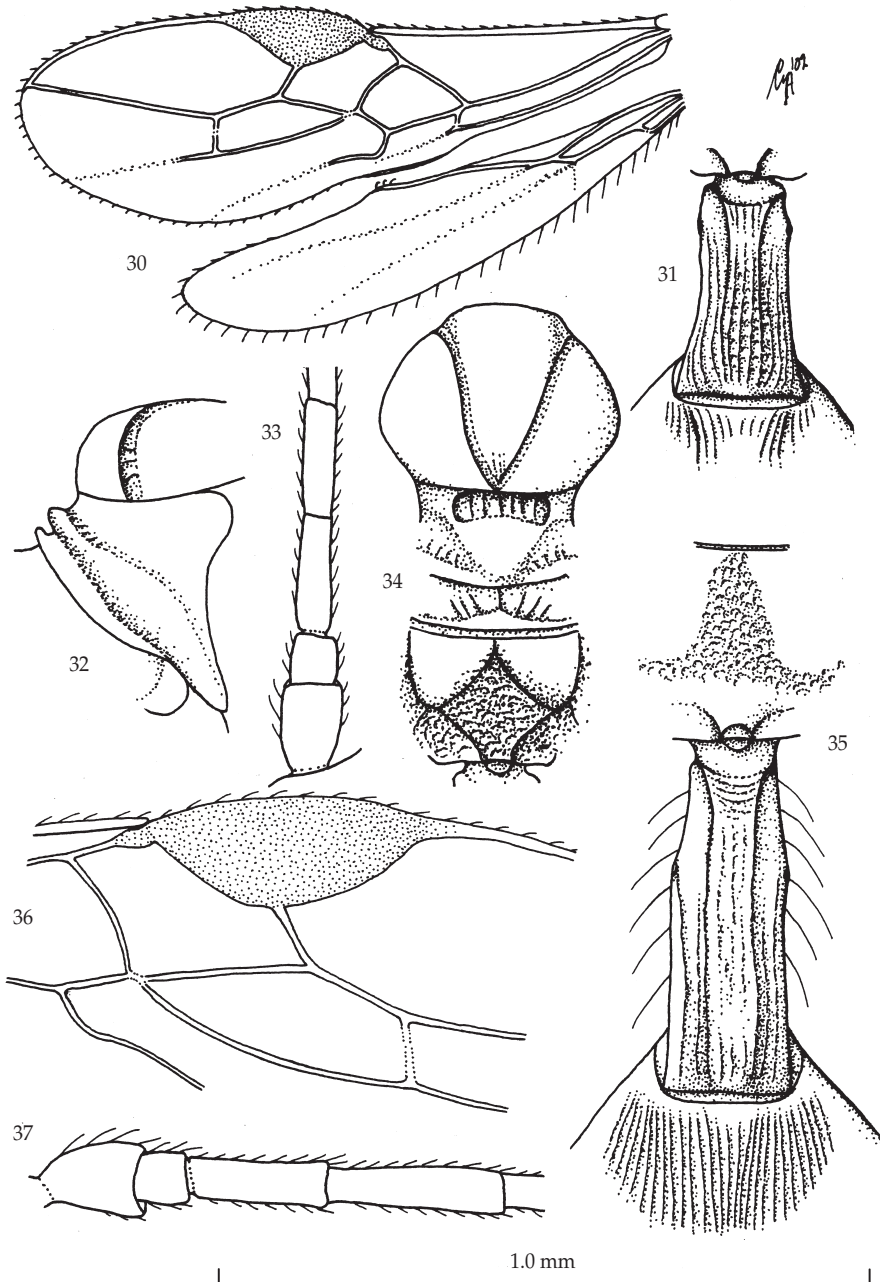
Figs 1-12, *Psenobolus pygmaeus* Reinhard, ♀, lectotype (but 2 and 4 of paralectotype). 1, basal segments of antenna; 2, detail of first subdiscal cell of fore wing; apex of antenna; 3, habitus, lateral aspect; 4, head, frontal aspect; 5, wings; 6, fore tibia; 7, hind leg; 8, mesosoma, dorsal aspect; 9, head, dorsal aspect; 10, outer hind claw; 11, first and second metasomal tergites, dorsal aspect; 12, apex of antenna. 3, 5, 7: 1.0 × scale-line; 1, 2, 6, 10, 12: 2.5 ×; 4: 2.2 ×; 8, 9, 11: 1.8 ×.



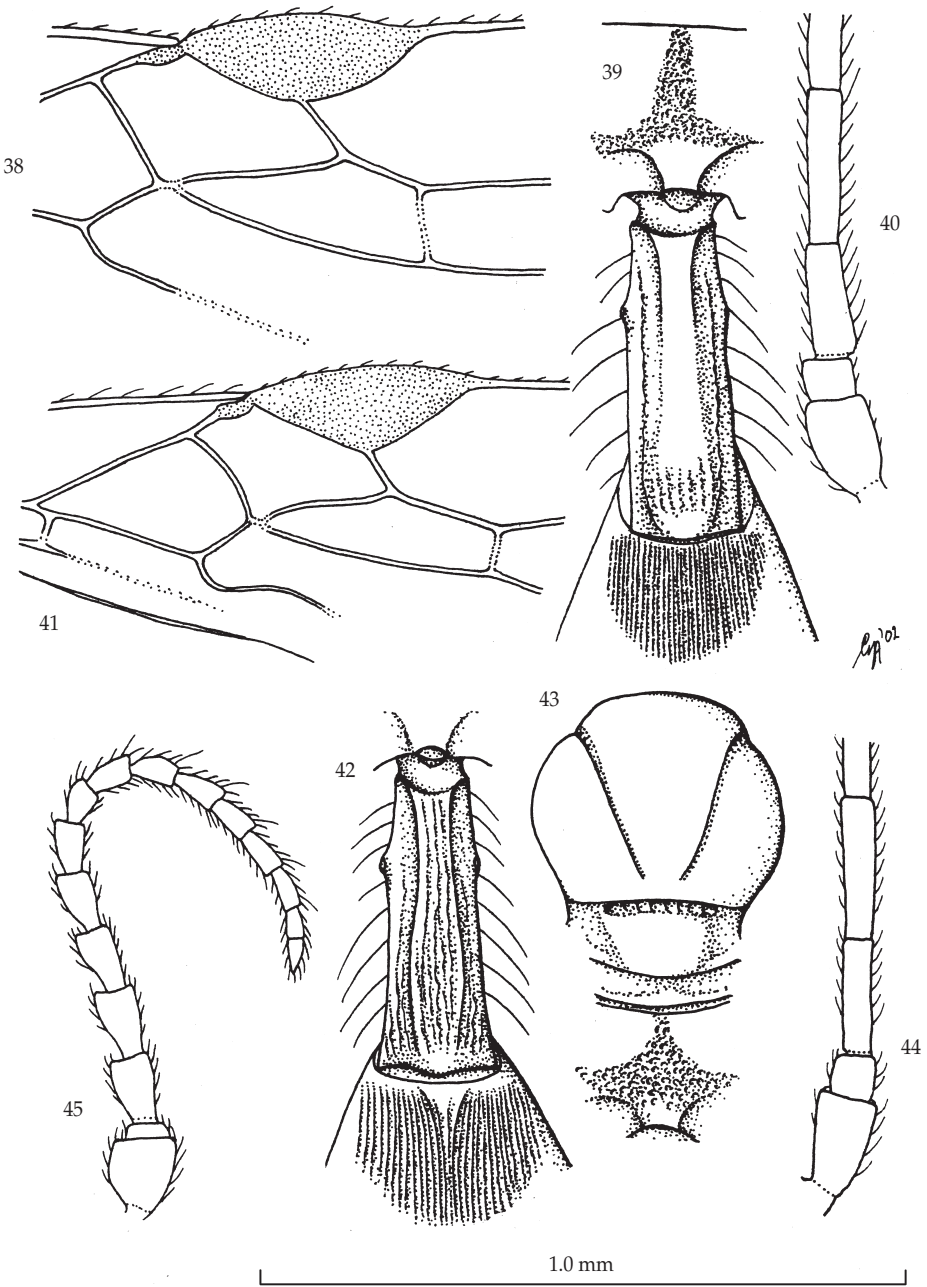
Figs 13-22, *Psenobolus triangularis* spec. nov., ♂, holotype. 13, wings; 14, head, frontal aspect; 15, habitus, lateral aspect; 16, apex of antenna; 17, head, dorsal aspect; 18, outer hind claw; 19, hind leg; 20, fore leg; 21, mesosoma, dorsal aspect; 22, metasoma, dorsal aspect. 13-15; 17, 19-22: 1.0 × scale-line; 16, 18: 1.3 ×.



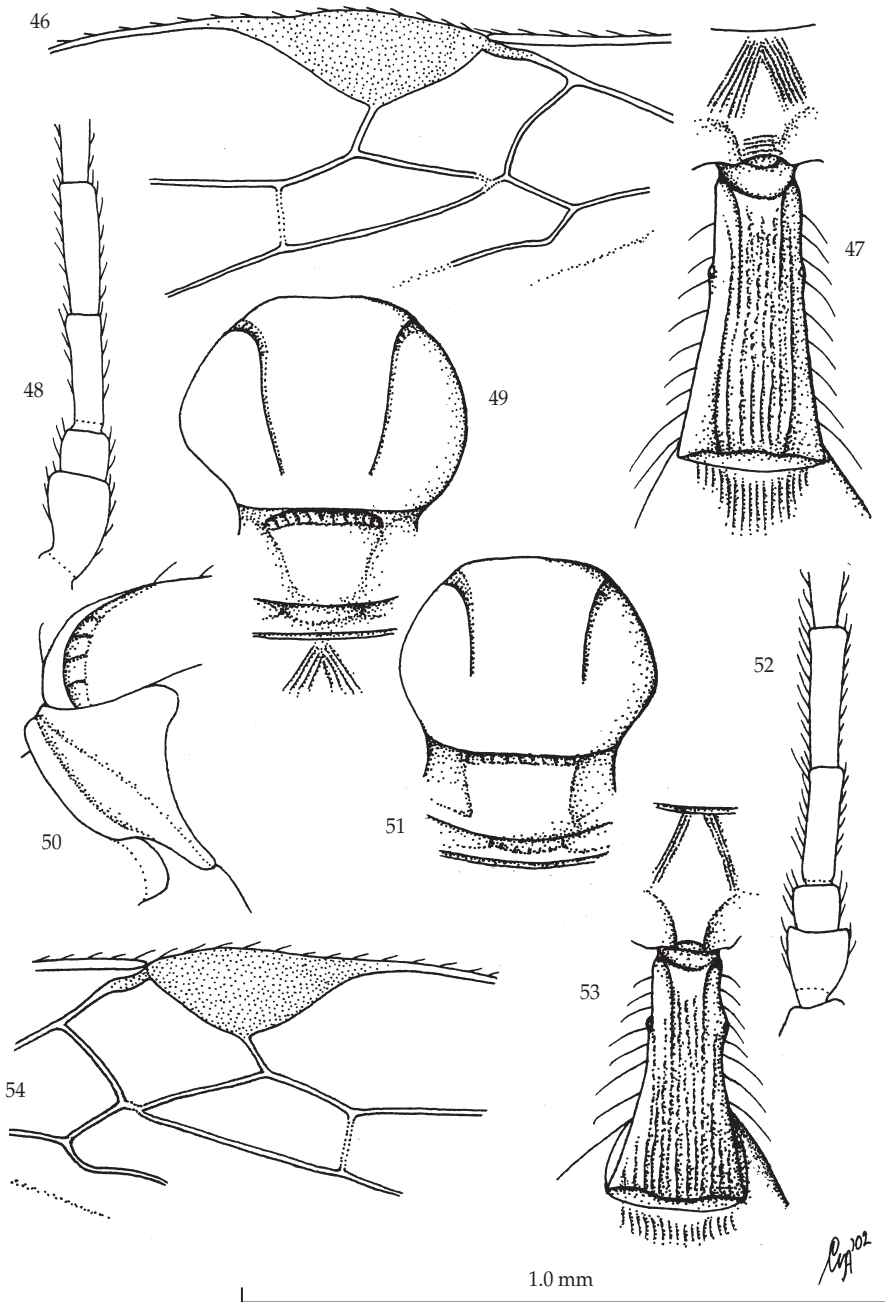
Figs 23-27, *Psenobolus ficarius* Ramirez & Marsh, ♂, paratype; figs 28, 29, *P. parapygmaeus* Ramirez & Marsh, ♂, paratype. 23, 28, head, lateral aspect; 24, middle leg; 25, fore leg; 26, 29, head, dorsal aspect; 27, mesosoma, dorsal aspect. 23-25, 28, 29: 1.0 × scale-line; 26, 27: 1.3 ×.



Figs 30-34, *Psenobolus plesiomorphus* spec. nov., ♀, holotype; figs 35-37, *P. parapygmaeus* Ramirez & Marsh, ♀, paratype. 30, wings; 31, 35, first and second metasomal tergites, dorsal aspect; 32, pronotum, lateral aspect; 33, 37, basal segments of antenna; 36, detail of second submarginal cell of fore wing. 30: 0.7 ×; 31, 34-36: 1.0 × scale-line; 32, 33, 37: 1.5 ×.



Figs 38-40, *Psenobolus longicaudatus* spec. nov., ♀, holotype; figs 41-44, *P. woldai* spec. nov., ♀, holotype; fig. 45, *P.* sp. indet. from Trinidad, ♂. 38, 41, detail of second submarginal cell of fore wing; 39, 42, first and second metasomal tergites, dorsal aspect; 40, 44, basal segments of antenna; 43, mesosoma, dorsal aspect; 45, antenna. 38, 39, 41-43, 45: 1.0 × scale-line; 40, 44: 1.5 ×.



Figs 46-49, *Psenobolus stigmatalis* spec. nov., ♀, holotype; figs 50-54, *P. pygmaeoides* spec. nov., ♀, holotype. 46, 54, detail of second submarginal cell of fore wing; 47, 53, first and second metasomal tergites, dorsal aspect; 48, 52, basal segments of antenna; 49, 51, mesosoma, dorsal aspect; 50, pronotum, lateral aspect. 46, 47, 49, 51, 53, 54: 1.0 × scale-line; 48, 50, 52: 1.5 ×.

Descriptive part

Doryctinae Foester, 1862: Hecabolini Foerster, 1862: *Psenobolina* Enderlein, 1912

Psenobolus Reinhard, 1885

(figs 1-75)

Psenobolus Reinhard, 1885: 246; Shenefelt & Marsh, 1976: 1376; Marsh, 1993: 44, 1997: 213; Ramirez & Marsh, 1996: 67 (including notes on biology). Type species (by monotypy): *P. pygmaeus* Reinhard, 1885 [examined].

Diagnosis.— Length of body 1.3-3.0 mm, of fore wing of ♀ 1.5-1.9 mm; body sparsely setose; head and mesosoma smooth dorsally; antenna with 9-28 segments, length of third antennal segment of ♀ 0.7-1.0 times fourth segment (figs 1, 3, 33, 40, 44), and inserted near middle of head in lateral view (fig. 3); apex of scapus truncate, not protruding ventrally (figs 1, 15, 48, 37, 45); pedicellus evenly cylindrical, not petiolate (fig. 1); occipital carina of ♀ present, but largely or completely absent in brachypterous males; face very short in brachypterous males (figs 14, 15, 23, 28); area above clypeus without pair of deep elongate depressions (fig. 4); antennal sockets of males closer to each other than to eyes (figs 23, 26), but closer to eyes in ♀ (fig. 4); eyes not or slightly emarginate; antescutal depression absent (figs 3, 32, 50); pronotum short, with comparatively wide thin lamella anteriorly (figs 32, 50), without pair of curved teeth or crest dorsally; prepectal carina of ♀ present (complete or only ventrally; fig. 3) and absent in brachypterous males; posterior flange of propleuron present (fig. 3), but absent in brachypterous males (fig. 15); precoxal sulcus narrow and smooth; metapleuron confluent with propodeum; pronotum of ♀ short (figs 3, 50; but medium-sized in *P. plesiomorphus*; fig. 32), and of males short (fig. 23, but long anteriorly in *P. triangularis* (fig. 15); scutellar sulcus present, but narrow, especially in aberrant males (fig. 22); mesosternal sulcus present; scutellum without median carina posteriorly (fig. 8); first subdiscal cell of fore wing in macropterous specimens open ventro-apically (figs 5, 30, 41); vein r-m of fore wing present; vein 3-CU of hind wing absent (fig. 5); veins cu-a of fore wing vertical or nearly so, short (fig. 2); veins m-cu and cu-a of hind wing absent (fig. 5); hind wing of macropterous males without pterostigma; fore tibia with slender pegs (fig. 6); hind coxa rounded ventro-basally (fig. 7); hind tibia of ♀ slightly curved (fig. 7); third and fourth segments of fore tarsus slender (fig. 20), but shortened in males of *P. ficarius* and *pseudopygmaeus* (fig. 25); inner hind spur setose; middle and hind leg of brachypterous males without distinct trochantellus (fig. 19); metasoma inserted ventrally on propodeum, near or between hind coxae (fig. 3); first metasomal segment strongly sclerotised ventrally and tubular at level of spiracles in macropterous specimens, but free and less sclerotised in brachypterous males; dorsope and laterope absent (figs 3, 11); second tergite largely smooth or finely aciculate, without wide medial area (figs 11, 31, 35, 39); second metasomal suture absent; sixth tergite of ♀ truncate, not emarginate (fig. 15); sternites at least partly exposed (fig. 3); ovipositor sheath slender (figs 3, 64, 73); apex of ovipositor strongly darkened (fig. 58); wing membrane of ♀ subhyaline.

Distribution.— Neotropical: nine species.

Psenobolus ficarius Ramirez & Marsh, 1996
(figs 23-27, 55-58)

Psenobolus ficarius Ramirez & Marsh, 1996: 68-71, figs 1-10.

Material.— Type series from **Costa Rica** (Ramirez & Marsh, 1996); 3 ♀♀ + 1 ♂ (TAMU), "Costa Rica: San José Prov., San Geronimo, 28.ii.1993, W. Ramirez B."

Note.— For the description, see Ramirez & Marsh (1996). Known in both sexes from *Ficus velutina* Willd. in Costa Rica. Males are brachypterous and highly aberrant (figs 55, 56), with only 9-10 antennal segments (figs 23, 56) and the head about 1.5 times wider than long in dorsal view (figs 26, 55). Females may have the prepectal carina largely absent laterally (paratypes) or distinctly developed.
Distribution.— Costa Rica.

Psenobolus longicaudatus spec. nov.
(figs 38-40, 61, 63)

Material.— Holotype, ♀ (USNM), "Ecuador, Pich. Prov., via Puerto Quito (at km 113), 24.vi.1976 at bl[ac]klite, J. Cohen". Paratype, 1 ♀ (RMNH), same data.

Holotype, ♀, length of body 2.5 mm, and of fore wing 2.1 mm.

Head.— Antenna with 25 segments, length of third segment 0.7 times fourth segment, third, fourth and penultimate segments 2.5, 4.5 and 3.7 times their maximum width (fig. 40); length of maxillary palp 1.2 times height of head; in dorsal view length of eye 3.4 times temple; vertex superficially granulate; temples directly narrowed behind eyes; OOL:diameter of posterior ocellus:POL = 6:2:4; face largely coriaceous laterally and medially smooth; clypeus smooth and flat, its ventral margin not upcurved; width of hypoclypeal depression 0.5 times minimum width of face; length of malar space 0.8 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.7 times its height; prepectal carina distinct laterally; mesopleuron smooth; metapleuron weakly coriaceous and with some rugae; notauli distinct, narrow, complete and smooth, remain distinctly removed from each other posteriorly, and reaching scutellar sulcus; scutellar sulcus shallow and rather narrow, finely crenulate; surface of propodeum medially very finely and densely rugulose and remainder largely smooth.

Wings.— Fore wing: r:3-SR:SR1 = 5:7:34; 2-SR:3-SR:r-m = 12:7:5 (fig. 38); m-cu shortly antefurcal; CU1a distinctly below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.8, 8.1 and 7.0 times their maximum width; hind tibia and tarsus somewhat curved; only inner hind tibial spur distinct and 0.25 times as long as hind basitarsus.

Metasoma.— Length of first tergite 3.0 times its apical width, parallel-sided, rather flat apically, its surface largely smooth, with some sculpture and longitudinal ruga laterally and dorsal carinae up to basal 0.3 (fig. 39); second tergite largely finely striate, except laterally (fig. 39); length of ovipositor sheath 2.52 times fore wing (and 3.5 times as long as metasoma).

Colour.— Brownish-yellow; antenna (except three basal segments), pterostigma,

first tergite and ovipositor sheath more or less dark brown; palpi, legs and tegulae pale yellowish.

Distribution.— Ecuador.

Note.— Paratype has 25 antennal segments, length of first tergite 2.6 times its apical width and length of ovipositor sheath 2.62 times fore wing.

Psenobolus parapygmaeus Ramirez & Marsh, 1996
(figs 28, 29, 35-37, 59, 60, 62)

Psenobolus parapygmaeus Ramirez & Marsh, 1996: 71-72, fig. 11.

Material.— Type series from **Costa Rica** (Ramirez & Marsh, 1996); 2 ♀♀ (USNM, RMNH), “**Mexico**: Nayarit, 18 km SW Compostella, 20.vii.1974, black light, M.E. & P.D. Perkins”; 1 ♀ (USNM), “**Mex[ico]**, Guerrero, La Providencia, 15.iii.1926”, “in wild fig”, “G.F. Ferris”; 1 ♀ (TAMU), “**Mexico**: Chiapas, 19 km N Mapastepec, 12.viii.1991, 550 m, R. Jones & C. Mayorga”; 1 ♀ (TAMU), “**Mexico**: Chiapas, 4 mi E Cintalapa, 11.vii.1991, at light, R.W. Jones”; 4 ♀♀ (CNC, RMNH), “**Mex[ico]**: Chis., 20 mi N Huixtla, 1.vi.1969, 3000 ft, W.R.M. Mason”; 2 ♀♀ (USNM, RMNH), “**Nicaragua**, ex *Ficus* fruits”, “Tomatoya, Jinotega, 25.x.[19]80, em. fruta de matapoto, M. Rizo”; 1 ♀ (CNC), “**Brazil**: Mato Grosso, Sinop, x.1974, mal. trap, M. Alvarenga”.

Note.— For the short description, see Ramirez & Marsh (1996). Known in both sexes from a *Ficus* spec. in Costa Rica, Mexico and Nicaragua. Males are brachypterous and highly aberrant, with 12 antennal segments (figs 28, 59, 60) and the head slightly wider than long in dorsal view (figs 29, 50).

Distribution.— *Brazil, Costa Rica, *Mexico, *Nicaragua.

Psenobolus plesiomorphus spec. nov.
(figs 30-34, 64-67)

Material.— Holotype, ♀ (UCD), “**Brazil**: Ro., Fazenda Rancho Grande, 62 km s. Ariquemes, 2.xii.1991, mercury vapor [lamp], S.L. Heydon”. Paratype, 1 ♂ (UCD), same data.

Holotype, ♀, length of body 1.9 mm, and of fore wing 1.7 mm.

Head.— Antenna with 22 segments, length of third segment 0.9 times fourth segment, third, fourth and penultimate segments 3.5, 4.0 and 3.0 times their maximum width (fig. 33); length of maxillary palp 0.8 times height of head; in dorsal view length of eye 2.8 times temple; vertex superficially granulate; temples roundly narrowed behind eyes; OOL:diameter of posterior ocellus:POL = 6:2:3; face largely coriaceous and rather matt; eyes slightly emarginate and in lateral view elliptical (in other species round: fig. 3); clypeus micro-sculptured and flat, its ventral margin upcurved; width of hypoclypeal depression 0.6 times minimum width of face; length of malar space 0.6 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.7 times its height; pronotum more developed anteriorly than in other species (fig. 32); prepectal carina distinct laterally; mesopleuron smooth; metapleuron largely smooth dorsally and rugose ventrally; notauli distinct, moderately narrow, complete and largely smooth, meeting each other posteriorly, and reaching scutellar sulcus (fig. 34); scutellar sulcus moderately deep and wide, distinctly crenulate (fig. 34); surface of propodeum anteriorly distinctly areolate and

largely smooth, posteriorly largely densely and finely rugulose (fig. 34).

Wings.— Fore wing: r:3-SR:SR1 = 5:9:31; 2-SR:3-SR:r-m = 12:9:5 (fig. 30); m-cu shortly antefurcal; CU1a far below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.8, 8.1 and 6.0 times their maximum width; hind tibia somewhat curved; hind basitarsus straight; outer and inner hind tibial spurs 0.10 and 0.25 times as long as hind basitarsus, respectively. Metasoma.— Length of first tergite 1.6 times its apical width, slightly widened apically and more strongly angulate latero-ventrally than in other species, weakly convex apically, its surface longitudinally carinate, with some microsculpture, and dorsal carinae complete (fig. 31); second tergite shortly finely striate, largely smooth (fig. 31); length of ovipositor sheath 0.58 times fore wing (and as long as metasoma).

Colour.— Brownish-yellow; propodeum, pterostigma and veins largely brown; antenna (except five basal segments), stemmaticum, first tergite and ovipositor sheath more or less dark brown; palpi, trochanters and trochantelli whitish; remainder of legs and tegulae pale yellowish.

Distribution.— Brazil.

Note.— Paratype (figs 66, 67) ♂ very similar to ♀ holotype: has 26 (right) and 27 (left) antennal segments, basal antennal segments as slender as of ♀, and femora more robust (length of hind femur 3.2 times its maximum width; fig. 67).

Psenobolus pygmaeoides spec. nov.
(figs 50-54, 72, 73)

Psenobolus pygmaeus; Ramirez & Marsh, 1996: 67.

Material.— Holotype, ♀ (CNC), "Panama: C[anal] Z[one], Barro Colorado Is[land], ix.1982, H. Wolda". Paratypes 13 ♀♀ (CNC, RMNH, USNM): topotypic, iv.1982 (1 ♀), viii.1982 (2 ♀♀), ix.1982 (7 ♀♀, partly Las Cumbres), xi.1982 (2 ♀♀), xii.1982 (1 ♀). Excluded from type series: 13 ♀♀ (UCD, RMNH, USNM), "Brazil: RO, Fazenda Rancho Grande, 62 km S Ariquemes, 2.xii.1991, mercury vapor [lamp], S.L. Haydon".

Holotype, ♀, length of body 2.1 mm, and of fore wing 1.7 mm.

Head.— Antenna with 21 segments, length of third segment 0.8 times fourth segment, slender, third, fourth and penultimate segments 3.0, 3.7 and 3.5 times their maximum width (fig. 52); length of maxillary palp 0.9 times height of head; in dorsal view length of eye 3.0 times temple; vertex superficially granulate; temples directly narrowed behind eyes; OOL:diameter of posterior ocellus:POL = 4:1:2; face laterally finely granulate, medially largely smooth and shiny; eyes not emarginate; anterior tentorial pits close to each other (separated by about diameter of pit or somewhat more); clypeus smooth and flat, its ventral margin slightly upcurved; width of hypoclypeal depression 0.5 times minimum width of face; length of malar space 0.9 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.5 times its height; prepectal carina distinct laterally; mesopleuron smooth; metapleuron largely smooth dorsally and rugose ventrally; notauli distinct anteriorly and reaching halfway mesoscutum, absent posteriorly, and largely crenulate (fig. 51); scutellar sulcus shallow and moderately wide, finely crenulate (fig. 51); surface of propodeum smooth except for very fine oblique aciculae,



55



56

Figs 55, 56, *Psenobolus ficarius* Ramirez & Marsh, ♂, paratype. 55, habitus, dorsal aspect; 56, habitus, lateral aspect.



57



58

Figs 57, 58, *Psenobolus ficarius* Ramirez & Marsh, ♀, paratype. 57, habitus, dorsal aspect; 58, habitus, lateral aspect.

not areolate and postero-laterally depressed and somewhat rugulose and smooth medially (fig. 53).

Wings.— Fore wing: r:3-SR:SR1 = 5:11:38; 2-SR:3-SR:r-m = 15:11:7 (fig. 54); m-cu shortly antefurcal; CU1a moderately far below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.6, 7.7 and 7.2 times their maximum width; hind tibia somewhat curved, and hind basitarsus straight or nearly so; outer and inner hind tibial spurs 0.1 and 0.2 times as long as hind basitarsus, respectively.

Metasoma.— Length of first tergite 2.0 times its apical width, distinctly widened apically, flattened apically, its surface largely longitudinally rugulose, dorsal carinae complete, but fine apically (fig. 53); second tergite narrowly finely striate basally (fig. 53); length of ovipositor sheath 1.88 times fore wing (and 2.4 times as long as metasoma).

Colour.— Yellowish-brown; metasoma (except first tergite) and four basal antennal segments brownish-yellow; antenna (except four basal segments), ovipositor sheath, first tergite, pterostigma (also basally) and veins 1-M and 1-SR of fore wing more or less dark brown; stemmaticum slightly darkened; palpi, trochanters and trochantelli whitish; remainder of legs and tegulae pale yellowish.

Distribution.— Panama, ?Brazil.

Notes.— The paratype ♀♀ are very similar to the ♀ holotype: antennal segments of ♀ 20(1), 21(2), 22(5) or 23(1); length of body 1.8-2.2 mm, of fore wing 1.5-1.9 mm; vein 2-SR of fore wing 1.3-1.6 times vein 3-SR; length of first tergite 1.8-2.0 times its apical width; length of ovipositor sheath 1.26-1.88 times as long as fore wing.

The specimens from Brazil are excluded from the type series because they deviate somewhat (e.g., stemmaticum completely dark brown and vein 2-SR of fore wing usually about 1.2 times as long as vein 2-SR instead of 1.3-1.6 times and first tergite often darker brown, but these differences (except colour of stemmaticum) are variable in the series and likely all belong to the same species.

The new species is easily confused with *P. pygmaeus* (as was done by Ramirez & Marsh, 1996), but differs by the shape of the first tergite, the presence of the prepectal carina laterally, the more elongate second submarginal cell of fore wing, the superficially granulate vertex, having usually more antennal segments (up to 23), and the stemmaticum only slightly darker than vertex, the longer maxillary palp and the ovipositor sheath, the somewhat more slender basal segments of antenna and the anterior tentorial pits close to each other (separated by about diameter of pit or somewhat more).

Psenobolus pygmaeus Reinhard, 1885
(figs 1-12)

Psenobolus pygmaeus Reinhard, 1885: 247; Shenefelt & Marsh, 1976: 1376 (lectotype designation by P.M. Marsh).

Material.— Lectotype, ♀ (ZMB), "a[us] Feigen [= from *Ficus* fruits]", "Brasil, St. Catar.", "Type", "Coll. H. Reinhard", "26774", "pygmaeus Rhd", "Lectotype *Psenobolus pygmaeus* Rein. by P. Marsh". Paralectotypes: 5 ♀♀ + 4 ♂♂ (ZMB): not examined except 1 ♀.

Lectotype, ♀, length of body 1.7 mm, and of fore wing 1.5 mm.

Head.— Antenna with 20 (left) and 19 (right) segments, length of third segment 0.8 times fourth segment, third, fourth and penultimate segments 3.0, 3.3 and 2.7 times their maximum width (figs 1, 3, 12); length of maxillary palp 0.5 times height of head; in dorsal view length of eye 2.4 times temple; vertex smooth; temples roundly narrowed behind eyes; OOL:diameter of posterior ocellus:POL = 16:4:7; face transversely rugose, but medially smooth; clypeus largely smooth and flat, its ventral margin not upcurved; length of malar space 0.7 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.5 times its height; prepectal carina largely absent laterally; mesopleuron smooth; metapleuron and propodeum indistinctly coriaceous; anterior two thirds of notauli distinct, narrow and smooth, posteriorly absent and remain far removed from each other posteriorly, and from scutellar sulcus (fig. 8); scutellar sulcus shallow and narrow, without distinct crenulation (fig. 8); surface of propodeum shiny and indistinctly coriaceous (fig. 3).

Wings.— Fore wing: r:3-SR:SR1 = 3:7:28; 2-SR:3-SR:r-m = 10:7:4 (fig. 5); m-cu interstitial; CU1a far below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.4, 6.9 and 6.3 times their maximum width; hind tibia somewhat curved (fig. 7); hind basitarsus straight; only inner hind tibial spur distinct and 0.25 times as long as hind basitarsus.

Metasoma.— Length of first tergite parallel-sided and 2.3 times its apical width, rather flat apically, its surface largely smooth, with some micro-sculpture (fig. 11); second tergite largely smooth, with short and weak striation basally (fig. 11); length of ovipositor sheath 1.23 times fore wing (and 1.8 times as long as metasoma).

Colour.— Brownish-yellow; stemmaticum, antenna (except five basal segments), pterostigma, first tergite and ovipositor sheath more or less dark brown; palpi rather whitish.

Male.— Macropterous and similar to female according to original description, except for the enlarged five basal antennal segments, the more slender metasoma, and the more robust femora.

Distribution.— Brazil.

Note.— Paralectotype has fore wing 1.9 mm, body 2.2 mm, length of ovipositor sheath 1.29 times fore wing, third antennal segment 0.7 times fourth segment, surface of first tergite more sculptured and dorsal carinae up to basal 0.8 and metanotum obliquely striate.

Psenobolus stigmatalis spec. nov.
(figs 46-49, 70, 71)

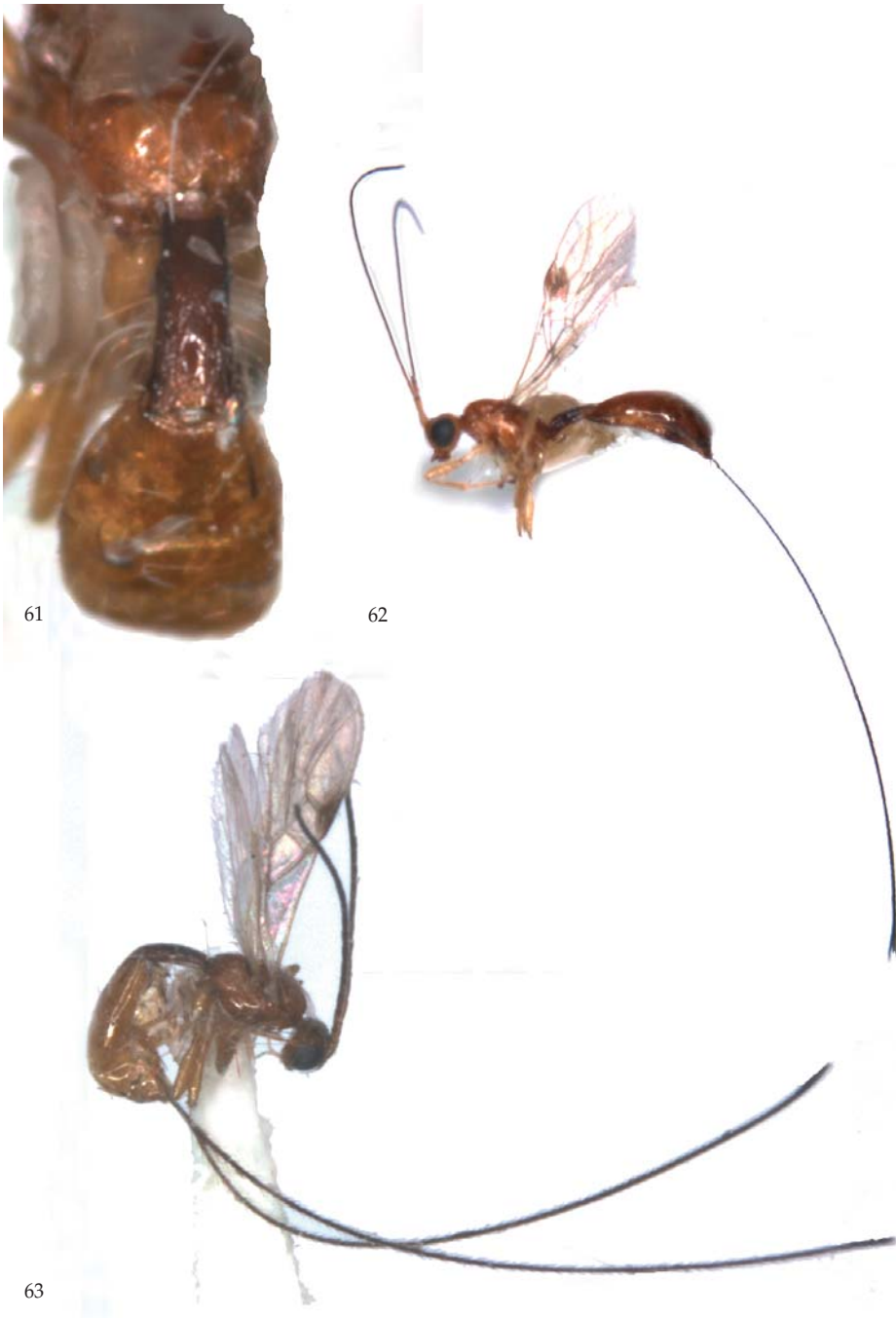
Material.— Holotype, ♀ (CNC), “Brazil, Linhares, E. Santo, ix.1972, M. Alvarenga”. Paratype: 1 ♀ (CNC), same data as holotype. Excluded from type series: 1 ♀ (USNM), “Brazil”, “Collection Ashmead”, “Type” [incorrect!], “*Psenobolus pygmaeus* Reinh.”; 1 ♀ (TAMU), “Costa Rica: Puntarenas, San Vito, Estac. Biol. Los Altures, 1500 m, iv.1992, P. Hanson”.

Holotype, ♀, length of body 2.0 mm, and of fore wing 1.9 mm.

Head.— Antenna with 22 segments, length of third segment 0.8 times fourth segment, third, fourth and penultimate segments 2.7, 3.5 and 3.5 times their maximum width (fig. 48); length of maxillary palp equal to height of head; in dorsal view length of eye 3.1 times temple; vertex very superficially granulate; temples directly narrowed



Figs 59, 60, *Psenobolus parapygmaeus* Ramirez & Marsh, ♂, paratype. 59, habitus, dorsal aspect; 60, habitus, lateral aspect.



Figs 61, 63, *Psenobolus longicaudatus* spec. nov., ♀, holotype; 62, *P. parapygmaeus* Ramirez & Marsh, ♀, Mexico. 61, propodeum and first metasomal tergite, dorsal aspect; 62, 63, habitus, lateral aspect.

behind eyes; OOL:diameter of posterior ocellus:POL = 6:2:2; face largely smooth and shiny, sublaterally slightly sculptured; eyes not emarginate; clypeus smooth and flat, its ventral margin slightly upcurved; width of hypoclypeal depression 0.5 times minimum width of face; length of malar space 0.4 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.6 times its height; prepectal carina distinct laterally; mesopleuron smooth; metapleuron largely smooth dorsally and rugose ventrally; notauli distinct and finely crenulate anteriorly and shallow posteriorly, narrow, nearly complete and largely smooth, remaining far removed from each other posteriorly, and close to scutellar sulcus; scutellar sulcus shallow and moderately wide, finely crenulate; surface of propodeum extensively finely obliquely striate, but smooth antero-laterally and medially, not areolate and posteriorly finely transversely rugulose (fig. 47).

Wings.— Fore wing: r:3-SR:SR1 = 5:8:37; 2-SR:3-SR:r-m = 13:8:5 (fig. 46); m-cu shortly antefurcal; CU1a moderately far below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.2, 8.1 and 7.2 times their maximum width; hind tibia and hind basitarsus rather curved; outer and inner hind tibial spurs 0.1 and 0.2 times as long as hind basitarsus, respectively.

Metasoma.— Length of first tergite 1.9 times its apical width, distinctly widened apically, flattened apically, its surface largely longitudinally striate, only basal half of dorsal carinae distinct (fig. 47); second tergite only basally finely striate (fig. 47); length of ovipositor sheath 1.35 times fore wing (and 2.5 times as long as metasoma).

Colour.— Brownish-yellow; first tergite, propodeum (except latero-posteriorly), small basal patch of second tergite and larger patch at base of fourth tergite, stemmaticum only near ocelli, and antenna (except six basal segments), and ovipositor sheath more or less dark brown; pterostigma (but pale basally and apically) and veins largely brown; palpi, trochanters and trochantelli whitish; tegulae, and remainder of legs pale yellowish.

Distribution.— Brazil, Costa Rica.

Notes.— The paratype is very similar to the holotype: has length of body 2.1 mm, length of ovipositor sheath 1.46 times fore wing and 2.0 times as long as metasoma, and stemmaticum completely dark brown.

The excluded female from Costa Rica and the Ashmead specimen from Brazil have the notauli less developed posteriorly (but intermediate in Brazilian female) and are very similar; most likely all belong to the same species. The specimen from Costa Rica has the fourth antennal segment dark brown.

Psenobolus triangularis spec. nov.
(figs 13-22, 68, 69)

Material.— Holotype, ♂ (INBio), "49, J.A. Ugalde 93", "Inst. Mac. de Biodiversidad, S. Rosa", "S. Domingo, Prov. Hered, Costa Rica, 1200 m, ix.1993, J.A. Ugalde, L.N. 217300 526200 # 2465". Paratypes: 5 ♂♂ (INBio, RMNH); same data as holotype.

Holotype, ♂, length of body 1.3 mm, and of fore wing 1.0 mm (brachypterous).

Head.— Head 1.4 times wider than long (fig. 17); antenna with 12 segments, apical segments wider and distinctly petiolate (fig. 16), scapus small and cylindrical, with oblique outer apex and pedicellus enormously enlarged, lamelliform and triangular

(fig. 15); length of third segment 1.7 times fourth segment, third, fourth and penultimate segments 2.5, 1.5 and 1.1 times their maximum width (figs 15); palpi absent; only anterior ocellus present (fig. 17); in dorsal view length of eye 0.9 times temple; vertex smooth; temple somewhat roundly widened behind eyes (fig. 17); face largely absent because antennal sockets almost touching clypeus (fig. 14), smooth; clypeus not well differentiated, indistinct; length of malar space 0.7 times basal width of mandible; malar suture long and distinctly oblique.

Mesosoma.— Length of mesosoma 1.5 times its height; propleuron elongate and mesosternum short (fig. 15); pronotum in dorsal view deep triangularly emarginate posteriorly (fig. 22); prepectal carina absent; mesopleuron smooth; pleural sulcus absent; metapleuron smooth and not differentiated from propodeum; notauli absent (fig. 22); surface of propodeum smooth and convex (fig. 22).

Wings.— Fore wing: brachypterous and no cells present (fig. 13).

Legs.— All tibiae strongly flattened, especially basally “band-like” (fig. 19); length of femur, tibia and basitarsus of hind leg 3.8, 5.0 and 5.2 times their maximum width; only inner hind tibial spur distinct and 0.3 times as long as hind basitarsus.

Metasoma.— Length of first tergite distinctly widened apically and 0.5 times its apical width, rather flat, its surface smooth (fig. 21); second tergite smooth, without short and weak striation basally (fig. 21).

Colour.— Pale yellowish; metasoma after first tergite and mandible brown; veins and apical 0.6 of fore wing dark brown.

Variation.— Antennal segments 12 (2), length of fore wing 0.8-1.0 mm, and of body 1.2-1.3 mm.

Distribution.— Costa Rica.

Note.— Despite the female is unknown this species is described here because it is very aberrant. The combination of the small scapus with the very large triangular pedicellus is unique among the family Braconidae (fig. 15).

Psenobolus woldai spec. nov.
(figs 41-44, 74, 75)

Material.— Holotype, ♀ (CNC), “Panama: Canal Zone, Las Cumbres, iv.1982, H. Wolda”. Paratypes (7 ♀ ♀): 1 ♀ (RMNH), same data but iii.1983; 4 ♀ ♀ (UCD, RMNH), “Panama: Canal Zone, Barro Colorado I[island], 28.v.1980, Henk Wolda” (2 ♀ ♀, but other two 25.iii.1980 or 7.v.1980); 1 ♀ (CNC), id., but iii.1979; 1 ♀ (USNM), “Panama: Canal Zone, Barro Colorado I[island], 4.iv.1959, H.S. Dybas”.

Holotype, ♀, length of body 2.2 mm, and of fore wing 1.7 mm.

Head.— Antenna with 24 segments, length of third segment 0.8 times fourth segment, third, fourth and penultimate segments 3.3, 4.3 and 2.8 times their maximum width (fig. 44); length of maxillary palp equal to height of head; in dorsal view length of eye 3.2 times temple; vertex superficially granulate; temples directly narrowed behind eyes; OOL:diameter of posterior ocellus:POL = 5:2:2; face laterally finely granulate, medially largely smooth and shiny; eyes not emarginate; clypeus smooth and flat, its ventral margin not upcurved; width of hypoclypeal depression 0.6 times minimum width of face; length of malar space 0.6 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.7 times its height; prepectal carina distinct laterally; mesopleuron smooth; metapleuron largely smooth dorsally and rugulose



igs 64-67, *Psenobolus plesiomorphus* spec. nov., 64, 65, ♀, holotype and 66, 67, ♂, paratype; figs 68, 69, *P. triangularis* spec. nov., ♂, paratype. 64, 66, 68, habitus, lateral aspect; 65, 67, 69, habitus, dorsal aspect.



Figs 70, 71, *Psenobolus stigmatalis* spec. nov., ♀, holotype; figs 72, 73, *P. pygmaeoides* spec. nov., ♀, holotype; figs 74, 75, *P. woldai* spec. nov., ♀, holotype. 70, 72, 74, habitus, lateral aspect; 71, 73, 75, habitus, dorsal aspect.

ventrally; notauli distinct anteriorly and shallow posteriorly, narrow, complete and largely smooth, almost meeting each other posteriorly, and reaching almost scutellar sulcus (fig. 43); scutellar sulcus shallow and moderately wide, finely crenulate (fig. 43); surface of propodeum anteriorly largely smooth except for very finely rugulose median triangle, not areolate and posteriorly finely rugulose laterally and smooth medially (fig. 43).

Wings.— Fore wing: r:3-SR:SR1 = 5:13:35; 2-SR:3-SR:r-m = 15:13:6 (fig. 41); m-cu shortly antefurcal; CU1a far below level of 2-CU1.

Legs.— Length of femur, tibia and basitarsus of hind leg 3.3, 7.6 and 7.5 times their maximum width; hind tibia and hind basitarsus somewhat curved; outer and inner hind tibial spurs 0.1 and 0.2 times as long as hind basitarsus, respectively.

Metasoma.— Length of first tergite 2.6 times its apical width, parallel-sided, weakly convex apically, its surface largely rugulose, with pair of fine longitudinal carinae between complete dorsal carinae (fig. 42); second tergite largely finely striate (except posteriorly; fig. 42); length of ovipositor sheath 1.77 times fore wing (and 2.2 times as long as metasoma).

Colour.— Brownish-yellow; first tergite, pterostigma (but pale basally) and veins largely brown; antenna (except eight basal segments), and ovipositor sheath more or less dark brown; palpi, trochanters and trochantelli whitish; antenna basally, remainder of legs, metasoma behind first tergite and tegulae pale yellowish.

Distribution.— Panama.

Notes.— Paratype males are very similar to ♀ holotype: length of body 2.2-3.2 mm, and of fore wing 1.7-2.3 mm; antennal segments of ♀♀ 24(2), 26(3) or 28(1), length of first tergite 2.4-2.6 times as long as its apical width; usually only anterior half of the second tergite aciculate-striate, length of ovipositor sheath 1.75-1.94 times fore wing.

A ♀ from Ecuador ((USNM), "Ecuador, Pich. Prov., via Puerto Quito (at km 113), 24.vi.1976 at bl[ac]klite, J. Cohen") is excluded because it has 22 antennal segments, the pterostigma completely dark brown, the second tergite less sculptured and the ovipositor sheath 1.4 times as long as fore wing. Most probably it belongs to a closely related species.

Named in honour of its collector, Dr H. Wolda (Panama, Canal Zone) who collected many new species of Braconidae in Panama.

Acknowledgements and abbreviations

We wish to thank the following curators of collections: Dr M. Sharkey (CNC = Canadian National Collection of Insects, Ottawa), Dr J.A. Ugalde (INBio, San José, Costa Rica), Dr L. M. Kimsey (UCD = University of California, Davis), Dr R. A. Wharton (TAMU = Texas A & M University, College Station), and Mrs A. Kleine-Möllhof (ZMB = Zoological Museum of the Humboldt University, Berlin) for the loan of specimens, Dr W. Ramirez for the gift of reared specimens and Dr M.R. Shaw (Edinburgh) for his critical remarks. RMNH stands for Nationaal Natuurhistorisch Museum, Leiden and USNM for National Museum of Natural History, Smithsonian Institution, Washington D.C.

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Received: 4.ii.2001

Accepted: 5.iv.2002

Edited: M.J.P. van Oijen

