

# ***Canalirogas*, a new genus of the subfamily Rogadinae Foerster (Hymenoptera: Braconidae) from the Indo-Australian region**

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**Key words:** Hymenoptera; Braconidae; Rogadinae; Rogadini; *Canalirogas*; Oriental; Wallacea; Papuan; key. A new genus of the tribe Rogadini Foerster (Braconidae: Rogadinae), *Canalirogas* (type species: *Canalirogas balgooyi* spec. nov.) from Indonesia (Sumatra, Bali, Sulawesi, Sula Islands, Halmahera, Irian Jaya), Malaysia (West Malaysia, East Malaysia (Sabah)), and China is described and illustrated. A key to the species of the new genus is added.

## **Introduction**

The Indo-Australian genera of the subfamily Rogadinae Foerster, 1862, are currently being revised by the first author, following a similar study of the Afrotropical genera (van Achterberg, 1991). The second author discovered one specimen of a newly recognized genus, from the Oriental part of China during the research for his thesis (Chen & He, in press). The biology of the new genus is unknown, but the available data on the biology of the tribe Rogadini indicate that they are solitary koinobiont endoparasites of larvae of various Lepidoptera (especially Limacodidae).

For the identification of the subfamily Rogadinae see van Achterberg (1990, 1993), for the tribes see van Achterberg (1991), and for the terminology used in this paper see van Achterberg (1988, 1993). The descriptions of the species are by the first author only, except that of the type species.

## ***Canalirogas* gen. nov.**

(figs 1-12)

**Type species:** *Canalirogas balgooyi* spec. nov.

**Etymology.**— From “canalis” (Latin for “groove, channel”) and “Rogas” (based on the generic name *Rogas* Nees, 1818) because it is a rogadine genus with distinct anterior transverse grooves on third-sixth metasomal tergites (fig. 4). Gender: masculine.

**Diagnosis.**— Length of fore wing 3.1-7.6 mm, of body 3.8-10.3 mm; antennal segments of ♀ 42-61, and of ♂ 32-41, apical segment with distinct spine (fig. 5); length of antenna 1.6-2.1 times fore wing; apex of scapus oblique (fig. 4); maxillary and labial palpi of both sexes slender, at most slightly widened (figs 4, 59); occipital carina remaining removed from hypostomal carina or nearly so, carina nearly complete, only near hypostomal carina absent, but sometimes nearly complete; vertex smooth,

except for some punctures; frons largely flat and smooth except for some rugae (figs 2, 14, 19, 25, 28); malar suture complete, distinct; eyes distinctly emarginate, large (fig. 2); antescutal depression distinct; prepectal carina complete; precoxal sulcus medially impressed and crenulate (fig. 4), anteriorly shallow, and posteriorly absent; notauli narrow, reduced posteriorly; mesoscutum with medium-sized to long medio-posterior median groove (figs 7, 34, 36) or pit; medial carina of metanotum present anteriorly, not protruding dorsally (fig. 7); propodeal areola and median carina absent, only with a reversed V-shaped area (fig. 7); propodeal tubercles absent (fig. 4) or nearly so (fig. 51); vein 1-SR of fore wing short, continuous with vein 1-M; vein m-cu of fore wing shortly antefurcal (fig. 1), more or less slightly curved, gradually merging into vein 2-CU1 (but rarely rather angled), and parallel with vein 1-M (fig. 1); vein r of fore wing not continuous with posterior margin of pterostigma; vein 3-SR of fore wing long (fig. 1), about two-thirds as long as vein SR1; first subdiscal cell of fore wing elongate, vein 1-CU1 short (fig. 1); vein cu-a of fore wing vertical; vein M+CU1 of fore wing straight; marginal cell of hind wing narrow, parallel-sided apically (fig. 1); vein SR of hind wing slightly curved basally and unclerotized, but sometimes distinctly pigmented; vein 1r-m of hind wing oblique; vein M+CU of hind wing longer than vein 1-M; tarsal claws simple, at most slightly serrate medio-ventrally (fig. 8); tarsi slender (figs 10, 11); middle and hind tibial spurs straight and shortly setose (fig. 9); apex of hind tibia with distinct comb of specialized setae at inner side (fig. 9); first tergite with large dorsope, its dorsal carinae present at basal third, reduced posteriorly and posterior half with weak median carina, and without basal flanges (fig. 12); second tergite with indistinct or rather distinct sculptured medio-basal triangular area and distinct medio-longitudinal carina (figs 12, 21, 24, 29, 32, 57, 42); second-sixth tergites with sharp lateral crease and sculptured (fig. 4); third-sixth tergites slightly emarginate medio-posteriorly; third-fifth tergites obliquely striate anteriorly (figs 4, 12), but sometimes indistinct, mainly coriaceous; hypopygium of female in lateral view convex ventrally and large, medio-ventrally without keel, and apically truncate (fig. 4); ovipositor distinctly curved downwards (fig. 4); apical half of ovipositor sheath widened (fig. 4), its length 0.10-0.15 times fore wing; metasoma of dead ♀ often scorpion-like curved up apically.

Distribution.— Oriental, Wallacean, Papuan. The known species are all very closely related, the phylogeny of the species and their biogeography are not easy to understand. Species with less derived metasomal sculpture (i.e. no transverse striae) are known both from New Guinea, North Molluccans (Halmahera), and from Borneo. These species also lack the antero-lateral convexities of fourth and fifth tergites, which also indicates a more basal position. Therefore, *Canalirogas* may equally likely be a Papuan element, which reached the Southeast Asian continent. Or an old Oriental element which reached New Guinea in an early stage and subsequent speciated independently in the Papuan, Wallacean and Oriental (sub)regions. In favour of the latter hypothesis is the derived shape of the first metasomal tergite of the species from New Guinea.

Biology.— Unknown.

Notes.— *Canalirogas* gen. nov. runs in the key by van Achterberg (1991) to the genus *Triraphis* Ruthe, 1855, but *Triraphis* has the tarsal claws with a distinct lobe, the occipital carina reduced medio-dorsally, the hypopygium of female straight ventrally and medium-sized, the propodeum with a median carina, the ovipositor straight, the

sixth tergite smooth, the apex of the scapus truncate, and the first discal and subdiscal cells of fore wing comparatively short. The new genus is similar to the Indo-Australian genera *Macrostomion* Szépligeti, 1900, *Rhogasella* Baker, 1917, and the Palaeotropical genus *Colastomion* Baker, 1917. *Macrostomion* has the fourth-sixth tergites without lateral crease and largely smooth, the first tergite is widened basally, the second tergite has a more distinct medio-basal area, the propodeum has a closed median areola, the hind spurs are glabrous and curved, the hypopygium of the female is normal, nearly straight ventrally, and the ovipositor is straight. *Rhogasella* is very similar but it has the basal third of vein SR1 of hind wing distinctly curved and sclerotized, the ovipositor straight or slightly curved, the hypopygium of ♀ less curved medio-ventrally, and the propodeum without depression medially (but this depression may be indistinct or absent in *Canalirogas*), and the tarsal claws with a lobe. *Colastomion* has a similarly shaped hypopygium to that of *Canalirogas*, and a slightly curved ovipositor, but it differs by the glabrous and curved hind tibial spurs, the sixth tergite without lateral crease, the second tergite with large medio-basal area, the apical tooth of the tarsal claws perpendicular to rest of the claw, the first tergite subpetiolate, and somewhat widened in front of subbasal constriction. The Malagasy genus *Orthorhogas* Granger, 1949, has also the hypopygium enlarged, the ovipositor distinctly curved, and the hind spurs setose, but it has a large medio-basal area of the second tergite, the propodeum with an areola, the prepectal carina absent, and the temples more developed.

#### Key to species of the genus *Canalirogas* nov.

1. Subapical quarter of antenna (of ♀, unknown of ♂) contrastingly white (and 1-5 apical segments brownish); head brownish-orange; OOL about equal to diameter of ocellus (fig. 14); wing membrane rather infuscate; mesoscutum brownish-orange; sixth tergite dark brown sublaterally; scutellum slightly depressed in front of sculpture and distinctly sculptured medio-posteriorly (fig. 15); dorsal half of mesopleuron blackish and its ventral half yellowish; posterior half of third tergite distinctly transversely striate; (Sunda Islands) .....  
..... *C. yvonnae* van Achterberg, spec. nov.
- Subapical quarter of antenna (of ♀, unknown of ♂ of most species, and of ♀ of *C. heijningeni* and *C. infuscatus*) pale brown or brown, similar to medial part of antenna; head (at least partly) pale brownish-yellow, or largely black or dark brown; OOL 0.3-1.0 times diameter of ocellus (fig. 2); wing membrane subhyaline, or if infuscate then mesoscutum black or dark brown, or sixth tergite completely pale brownish-yellow (but of some species completely black(ish) (*C. infuscatus* and *C. nigratus*); scutellum hardly or not depressed medially and slightly sculptured medio-posteriorly; mesopleuron mostly yellowish, if partly blackish then only its anterior half, including ventral part, but rarely completely blackish (*C. infuscatus*); posterior half of third tergite variable, often weakly or not transversely striate..... 2
2. Mesosoma yellowish-orange brown, strongly contrasting with dark brown or black head; fifth tergite completely or partly yellowish, contrasting with dark fourth tergite; vein cu-a of fore wing comparatively far postfurcal (fig. 20); hind basitarsus comparatively slender, 14-16 times as long as wide (fig. 18); metasoma

- (partly) infusate ventrally; occipital carina strong (lamelliform) dorsally (fig. 19); fourth and fifth tergites completely obliquely striate, third nearly as coarsely sculptured as second tergite; (Papuan) .....  
 ..... *C. heijningeni* van Achterberg, spec. nov.
- Mesosoma pale yellowish-brown or (partly) blackish, not or at most somewhat contrasting with (at least partly) similarly coloured head; fifth tergite frequently partly or nearly completely dark brown, if completely yellowish, then similarly coloured as fourth tergite, not contrasting; vein cu-a of fore wing less postfurcal (figs 1, 13, 26, 30, 31, 39, 46); length of hind basitarsus 10-14 times its width (figs 11, 16); if 14 times (fig. 45) then metasoma ventrally yellowish (except for the largely dark brown hypopygium); occipital carina medium-sized, rarely strong; fourth and fifth tergites partly transversely striate posteriorly or coriaceous (but rarely only obliquely striate), and third tergite less coarsely sculptured than second tergite or both tergites finely sculptured; (Oriental, Wallacean, Papuan) ..... 3
  - 3. Hind tibia dark brown dorsally (except narrowly apically and a basal band pale yellowish) and hypopygium dark brown basally; third and fourth tergites without antero-lateral weak depressions, and no weak convexities; first and second metasomal tergites comparatively robust (fig. 24), first tergite 1.3-1.4 times its apical width; occipital carina ends ventrally far removed from hypostomal carina; (Sunda Islands) ..... *C. kahonoi* van Achterberg, spec. nov.
  - Hind tibia yellowish dorsally, if dark brown then hypopygium basally yellowish or whitish; third and fourth tergites usually with shallow antero-lateral depressions, resulting in weak convexities or tubercles (figs 32, 37); first and second tergites less robust (figs 12, 32, 37, 42), length of first tergite 1.4-2.1 times its apical width; occipital carina usually ends at hypostomal carina or nearby, but may be obsolescent ventrally (*C. nigratus*) ..... 4
  - 4. Vein 3-SR of fore wing dark brown, similar to vein r of fore wing or nearly so and mesopleuron largely black or dark brown; fourth and fifth tergites without weak convexities (figs 29, 42); propodeum largely coarsely rugose; mesoscutum largely or nearly completely black and dark brown; hind femur largely dark brown; wing membrane (rather) infusate ..... 5
  - Vein 3-SR of fore wing pale brown, distinctly paler than vein r of fore wing or both veins yellowish (if both veins dark brown then at least one third of mesopleuron yellowish); fourth and fifth tergites with weak convexities or tubercles antero-laterally because of shallow antero-lateral depressions (figs 32, 37); anteriorly propodeum less coarsely rugose than posteriorly; mesoscutum usually partly or completely yellowish; hind femur usually largely yellowish or brown; wing membrane subhyaline or nearly so ..... 7
  - 5. Interspaces between rugae of third metasomal tergite indistinctly micro-sculptured, with or without transverse sculpture posteriorly (fig. 29); hind tibia infusate, except for pale yellowish dorsal stripe; vein cu-a of fore wing less postfurcal (fig. 30); scutellum evenly convex; (Wallacean, Papuan) ..... 6
  - Interspaces between rugae of third tergite hind tergite distinctly micro-sculptured (fig. 42), with transverse sculpture posteriorly; hind tibia largely brown; vein cu-a of fore wing distinctly postfurcal (fig. 46); scutellum rather flattened posteriorly; (Oriental) ..... *C. infuscatus* van Achterberg, spec. nov.

6. Anterior half of propodeum sparsely vermiculate anteriorly; area in front of prepectal carina yellowish; length of eye of ♀ in dorsal view about 5.5 times temple (fig. 28); second metasomal tergite without small area antero-medially (fig. 29); (Wallacean) ..... *C. maculatus* van Achterberg, spec. nov.
- Anterior half of propodeum coarsely vermiculate-rugose anteriorly; area in front of prepectal carina black; length of eye of ♀ in dorsal view about 4 times temple (fig. 49); second tergite with small triangular area medio-anteriorly (fig. 48); (Papuan) ..... *C. nigratus* van Achterberg, spec. nov.
7. Ocelli forming an acute triangle (figs 33, 56), if indistinct then OOL more than 0.5 times diameter of posterior ocellus and sculpture of third and fourth metasomal tergites obsolescent or weak; mesoscutum usually comparatively robust (fig. 34); third tergite (and usually also fourth tergite) with pair of rather tuberculate convexities antero-laterally (figs 32, 55) ..... 8
- Ocelli forming a nearly equilateral triangle (figs 2, 38), if indistinct then OOL less than 0.5 times diameter of posterior ocellus or equal to it, or sculpture of third and fourth tergites distinct; mesoscutum slender (fig. 36); tuberculate convexities of third and fourth tergites usually weak or nearly absent (fig. 12) ..... 9
8. Pterostigma largely dark brown; vein r of fore wing largely yellowish, similarly coloured as vein 3-SR; sculpture of second-fifth tergites distinct (fig. 55); maxillary palp somewhat wider and more compressed (fig. 59); (Papuan) ..... *C. acutus* van Achterberg, spec. nov.
- Apical third of pterostigma and its base yellow; vein r of fore wing (dark) brown and darker than vein 3-SR; sculpture of second-fifth tergites weak (fig. 32); maxillary palp narrower and less compressed (fig. 66); (Wallacean) ..... *C. tuberculatus* van Achterberg, spec. nov.
9. Palpi infusate (except two basal segments of maxillary palp and basal segment of labial palp); fore tarsus (except for fourth segment) dark brown; OOL comparatively long (fig. 62); length of eye in dorsal view about 3 times temple (fig. 62); Wallacean ..... *C. fuscipalpis* van Achterberg, spec. nov.
- Palpi completely pale yellowish; fore tarsus brownish-yellow; OOL comparatively short (figs 2, 38); length of eye in dorsal view 8-9 times temple (figs 2, 38) .... 10
10. Antero-lateral convexities of third and fourth tergites nearly absent (fig. 12); metasoma with well-defined blackish or dark brown pattern dorsally; propodeum more strongly sculptured anteriorly; second tergite usually rather robust (fig. 12) and distinctly sculptured; (Oriental) ..... *C. balgooyi* van Achterberg & Chen, spec. nov.
- Antero-lateral convexities of third and fourth tergites present (fig. 37); metasoma largely yellowish, if infusate or dark brown then dorsal brownish pattern usually ill-defined laterally; propodeum less strongly sculptured anteriorly; second tergite usually comparatively slender and comparatively weakly sculptured (fig. 37); (Wallacean; Papuan) ..... *C. agilis* van Achterberg, spec. nov.
- Note. If ocelli are comparatively small, cf. *C. tuberculatus* spec. nov.

### Species descriptions

*Canalirogas acutus* van Achterberg, spec. nov.  
(figs 54-59)

Material.— Holotype, ♀ (RMNH), "Indonesia: S. Halmahera, 20 km S Payahe, Sagutora, c 125 m, Mal. trap 11, 18.ii.-18.iii.1995, C. v. Achterberg, R. de Vries & Y. Yasir, RMNH'95". Paratypes, 1 ♀ (MZB), topotypic, same date and trap.

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.9 mm, of body 6.7 mm.

Head.— Antennal segments 48, length of antenna 1.8 times fore wing, length of third segment 1.4 times fourth segment, length of third, fourth and penultimate segments 3.6, 2.6, and 2.5 times their width, respectively; occipital carina strong (lamelliform) dorsally (fig. 56), and shortly reduced ventrally, remaining distinctly removed from hypostomal carina; length of maxillary palp 1.9 times height of head, palpi comparatively wide and more compressed than in other species (fig. 59); length of eye in dorsal view 8.0 times temple (fig. 56); OOL:diameter of ocellus:POL = 9:9:5, stemmaticum comparatively acute; frons smooth and without distinct medio-longitudinal groove; vertex sparsely punctulate; length of malar space 0.6 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.4 times its height; side of pronotum weakly crenulate medially, and coriaceous anteriorly and ventrally, remainder largely smooth; epicnemial area with some medium-sized crenulae; mesoscutum rather slender; medio-longitudinal groove of mesoscutum absent, except for a pit; notauli nearly reaching pit, crenulate posteriorly; scutellum without longitudinal depression medially and subposteriorly smooth; surface of propodeum rugose medially and posteriorly, medial area depressed and antero-laterally mainly smooth, except for some punctures.

Wings.— Fore wing: r:3-SR:SR1 = 11:42:62; 1-CU1:2-CU1 = 1:20; 2-SR:3-SR:r-m = 11:21:8; cu-a nearly vertical (fig. 54). Hind wing: M+CU:1-M = 25:19; base of SR comparatively strongly pigmented (fig. 54).

Legs.— Tarsal claws simple, its ventral margin shortly serrate (fig. 57); length of femur, tibia and basitarsus of hind leg 5.7, 10.8 and 10.4 times their width, respectively; length of hind tibial spurs 0.20 and 0.22 times hind basitarsus; length of fore tarsus 1.2 times fore tibia.

Metasoma.— Length of first tergite 1.4 times its apical width, its surface coarsely longitudinally rugose; second tergite antero-medially sparsely coarsely and laterally more densely longitudinally rugose-striate (fig. 55), and with antero-lateral depressions; third tergite (except posteriorly) finely longitudinally rugose-striate; fourth-fifth tergites finely and densely obliquely striate laterally and anteriorly, medio-posteriorly without distinct transverse striation; antero-lateral depressions of third-sixth tergites, and antero-lateral convexities of third-fifth tergites distinct (fig. 55); sixth tergite mainly coriaceous; length of ovipositor sheath 0.12 times fore wing; hypopygium densely longitudinally aciculate.

Colour.— Pale yellowish(-brown); stemmaticum black; antenna (except mainly brown scapus and pedicellus, and pale yellowish apical segments) and pterostigma dark brown; vein C+SC+R and ovipositor sheath brown; vein 1R1 of fore wing pale yellowish; remainder of veins of fore wing (including vein r) brownish-yellow; malar space, fore and middle coxae, mesopleuron, mesosternum, metapleuron, metasoma ventrally, and seventh tergite whitish; wing membrane slightly infuscate.

Variation.— Paratype has antenna with 51 segments; length of antenna of ♀ 1.8

times fore wing; length of fore wing 5.3 mm, of body 7.0 mm; length of first tergite 1.5 times its apical width; length of ovipositor sheath 0.10 times fore wing; stemmaticum yellowish.

Note.— A female of probably another new species from Sulawesi (BMNH: near Morowali) has also widened palpi, but has the mesoscutum, the mesopleuron and the metasoma dorsally black, and the ocelli large.

*Canalirogas agilis* van Achterberg, spec. nov.  
(figs 36–40)

Material.— Holotype, ♀ (RMNH), "Indonesia: [SW.] Sulawesi, nr Bantaeng Borong Rappoa, Gn. Daulu, c 700 m, Mal. trap 16, 4-24.iv.1991, C. v. Achterberg, RMNH'91". Paratypes (22 ♀♀ + 1 ♂): 1 ♀ (RMNH), topotypic, Mal. trap 19, c 690 m; 2 ♀♀ + 1 ♂ (MZB, RMNH), "Indonesia: SE. Sulawesi, nr Sanggona, Base Camp, Gn. Watuwila, Mal. trap 12, c 200 m, 15-19.x.1989, C. v. Achterberg, RMNH'89" (♂ from trap 10, c 225 m, 12-15.x.1989); 2 ♀♀ (RMNH), "Indonesia: C. Sulawesi, Lore-Lindu N.P., c 1100 m, 1°15'S, 120°20'E, 6-9.xii.1985", "nr Dongi-Dongi Shelter, Mal. trap 6, (PW58), C. v. Achterberg, RMNH'86"; 1 ♀ (RMNH), "Indonesia: C. Sulawesi, nr Batui, Seseba, c 375 m, Mal. trap 19b, c 375 m, 6-9.xi.1989, C. v. Achterberg, RMNH'89"; 1 ♀, id., but 24.x-6.xi.1989, trap 19; 1 ♀ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Bunga, c 300 m, 21-31.x.1989, Mal. trap 15, C. v. Achterberg, RMNH'89"; 1 ♀, id., but 1-14.xi.1989; 7 ♀♀ (BMNH, RMNH), "Sulawesi Tengah, nr Morowali, Ranu River area, 27.i-210.iv.1980", "M.J.D. Brendell, BM-1980-280", "Lowland rainforest"; 1 ♀ (RMNH), "Indonesia: [N] Sulawesi, Dumoga-Bone N.P., ca 220 m, 9-19.xi.1985, Mal. trap: forest plot A, 0°34'N, 125°54'E, C. v. Achterberg, RMNH'86"; 1 ♀ (RMNH), "Indonesia: Sula Isl., Mangole, Mandafuhi Camp, c 50 m, 23.x.1993, C. v. Achterberg & Y. Yasir, RMNH'93"; 1 ♀ (RMNH), "Indonesia: Sula Isl., Taliabu, near Tubang, c 50 m, 9-20.ii.1995, Mal. trap 22, C. v. Achterberg & Y. Yasir, RMNH"; 2 ♀♀ (MZB, RMNH), "Indonesia: S Halmahera, 20 km S Payahe, Sagutora, c 125 m, 18.ii-18.iii.1995, Mal. trap 11, C. v. Achterberg, R. de Vries & Y. Yasir, RMNH'95"; 1 ♀ (RMNH), id., but between Payahe & Gita, Woda, Malaise trap 5, c 25 m, 17.ii-17.iii.1995.

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 7.6 mm, of body 10.3 mm.

Head.— Antennal segments 61, length of antenna 1.6 times fore wing, length of third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 3.2, 2.8, and 2.9 times their width, respectively; occipital carina strong (lamelli-form) dorsally (fig. 38), and shortly reduced ventrally, remaining distinctly removed from hypostomal carina; length of maxillary palp 1.9 times height of head; length of eye in dorsal view 8.7 times temple (fig. 38); OOL:diameter of ocellus:POL = 2:5:2; frons smooth and with distinct medio-longitudinal groove; vertex sparsely punctulate; length of malar space 0.9 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.3 times its height; side of pronotum coarsely crenulate medially, and coriaceous-rugose anteriorly and ventrally, remainder largely smooth; epicnemial area with some medium-sized crenulae; mesoscutum slender (fig. 36); medio-longitudinal groove of mesoscutum deep; notauli nearly reaching groove (fig. 36); scutellum with indistinct longitudinal depression medially and subposteriorly mainly smooth; surface of propodeum coarsely vermiculate-rugose medially, medial area not depressed and remainder rugose, but sculpture fading anteriorly and posteriorly.

Wings.— Fore wing: r:3-SR:SR1 = 8:25:41; 1-CU1:2-CU1 = 1:24; 2-SR:3-SR:r-m = 12:25:9; cu-a comparatively oblique (fig. 39). Hind wing: M+CU:1-M = 30:21.

Legs.— Tarsal claws simple, ventral margin distinctly shortly serrate (fig. 40);

length of femur, tibia and basitarsus of hind leg 6.8, 11.9 and 12.6 times their width, respectively; length of hind tibial spurs 0.20 and 0.25 times hind basitarsus; hind basitarsus slightly curved (but straight in paratypes); length of fore tarsus 1.1 times fore tibia.

Metasoma.— Length of first tergite 2.0 times its apical width, its surface coarsely longitudinally rugose; second tergite moderately strongly and finely obliquely striate, and with antero-lateral depressions; third-fifth tergites finely and densely obliquely striate laterally and anteriorly, medio-posteriorly mostly transversely striate; antero-lateral depressions of fourth and fifth tergites distinct, and with convexities antero-laterally (fig. 37); sixth tergite mainly coriaceous; length of ovipositor sheath 0.10 times fore wing.

Colour.— Pale yellowish; stemmaticum black; antenna (except scapus and pedicellus), ovipositor sheath (except basally), pterostigma (but basally narrowly, and its apical third yellow), and veins of fore wing (but M+CU1 largely, anterior half of 1-M, base of 1-SR+M, 3-SR and SR1 yellowish), and vein 1r-m of hind wing dark brown; sixth tergite infuscate; wing membrane subhyaline.

Variation.— Antennal segments of ♀ 43(1), 46(1), 48(3), 49(1), 50(1), 53(1), 54(1), 56(1), 57(1), or 61(1), of ♂ 41(1); length of antenna of ♀ 1.6-1.9 times fore wing, of ♂ 1.5 times fore wing; length of fore wing 4.5-7.6 mm, of body 6.5-10.3 mm; length of first tergite 1.6-2.1 times its apical width; length of ovipositor sheath 0.10-0.13 times fore wing; metasoma usually yellowish, but in melanistic specimens usually most of metasoma dorsally, patch on propleuron, patches on mesopleuron ventrally and antero-dorsally, hind coxa, and hind femur largely, dark brown, or metasoma infuscate dorsally, without distinct pattern, but first tergite (except its apex) may be dark brown as propodeum; second tergite longitudinally or obliquely striate; vein cu-a of fore wing in most specimens distinctly oblique, but in some specimens less obviously so.

*Canalirogas balgooyi* van Achterberg & Chen, spec. nov.  
(figs 1-12)

Material.— Holotype, ♀ (RMNH), "Museum Leiden, W. Malaysia, Pahang, c 80 m, Taman Negara, 102°25'E-4°23'N, 20-26.iv.1975, M.M.J. van Balgooy". Paratypes (54 ♀♀ + 7 ♂♂): 1 ♀ (ZAU), "[China], Guangxi, Longzhou, Nonggang, 22°3'N, 106°8'E, 20.v.1982, He Junhua, no. 821601"; 1 ♀ (BMNH), "China, Hainan I., Tien Fong Mts., v.[19]83, Boucek"; 1 ♀ (BMNH), "India: Karnataka, Mudigere, 26.x-4.xi.1979, J.S. Noyes"; 1 ♀ (BMNH), "W. Nepal: Bardia, 10-24.iii.1983, M.G. Allen"; 3 ♀♀ (MZB, RMNH), "Indonesia: N. Sumatra, Ketambe, c 400 m, near N.P. Gn. Leuser, Mal. trap, i.1995 (1 ♀; iv.1994: 2 ♀♀), Y. v. Nierop & C. v. Achterberg, RMNH'95"; 4 ♀♀ + 1 ♂ (RMNH), "Indonesia: N. Sumatra, Aceh, Bengkulu (Soraya), N.P. Gn. Leuser, Mal. trap, 7-31.i.1995 (1 ♀; ii.1995: 1 ♀; 10-25.iii.1995: 1 ♀ and vi.1995: 1 ♀ + 1 ♂), Y. v. Nierop & Polly, RMNH'95"; 1 ♀ (RMNH), "Malaysia: SE. Sabah, nr Danum Valley Field Centre, c 150 m, W0N0, Mal. trap 5, 26.x-22.xi.1987, C. v. Achterberg, RMNH'87"; 2 ♀♀, id., but 19.iii-19.iv.1988; 2 ♀♀, id., but 5.xii.1987-20.i.1988; 1 ♀, id., but 20.ii-19.iii.1988, C. v. Achterberg & T. Burghouts; 1 ♀ (FRC), id., but Mal. trap 4, c 210 m, 14-26.iii.1987; 1 ♀ (RMNH), id., but Mal. trap 7, E1, c 150 m, 21-25.iii.1987; id., 1 ♂, trap 9, c 175 m, 15-25.iii.1987; 1 ♀, id., but W0, c 150 m, Mal. trap 11, 24.ii-18.iii.1987; 2 ♀♀, id., W12, c 240 m, Mal. trap 12, 24.ii-18.iii.1987; 1 ♀, id., Mal. trap 12b, 19-26.iii.1987; 2 ♀♀, id., W0N1, c 140 m, Mal. trap 13, 24.ii-24.iii.1987; 2 ♀♀ (RMNH), "Malaysia-SW. Sabah, nr Long Pa Sia (West), c 1025 m, 1-13.iv.1987, Mal. trap 6, C. v. Achterberg, RMNH'87"; 6 ♀♀ + 1 ♂ (RMNH, FRC), id., but c 1050 m, 1-14.iv.1987 (4 ♀♀ + 1 ♂; 25.xi-8.xii.1987: 2 ♀♀), Mal. trap 3; 3 ♀♀, id., but c 1020 m, 1-14.iv.1987, Mal. trap 2; 1 ♀, id., c 1010 m, 1-14.iv.1987, Mal. trap 1; 1 ♀, id., but c 1200 m, 2-14.iv.1987, Mal. trap 7; 1 ♀, id., nr Long Pa Sia (East), c 1000 m, 1-13.iv.1987, Mal. trap 4; 3 ♂♂ (RMNH), "Malaysia: Sabah, Kinabalu Park, Poring Hot Spring, c 475 m,



Mal. trap 8, 9-12.iii.1987, C. v. Achterberg, RMNH'87"; 4 ♀♀ + 1 ♂ (BMNH, RMNH), "Brunei: Ulu Temburong, 300 m, ii-iii.1982, M.C. Day"; 3 ♀♀ (BMNH), id. but 16-22.ii.1982; 1 ♀ (BMNH), id., but Base Camp hut, 115°165'E, 6°26'N, 16.ii-9.iii.1982; 2 ♀♀ (BMNH), "Brunei: Labi, mixed dipterocarp forest, 200 m, vii-ix.1979, Gauld"; 1 ♀ (BMNH), "Sarawak, 4th div., Gn. Mulu, RGS Exp., ii.1978, N.M. Collins"; 2 ♀♀ (BMNH), id., but iii.1978; 1 ♀ (RMNH), "Indonesia: W. Bali, nr Negara, rainforst above Batuangung, c 575 m, 4-13.xii.1991, Mal. trap 1, C. v. Achterberg, RMNH'91".

Holotype, ♀, length of fore wing 4.7 mm, of body 6.1 mm.

Head.— Antennal segments 48, length of antenna 1.7 times fore wing, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 2.8, 2.4, and 3.1 times their width, respectively (figs 3, 5); length of maxillary palp 1.5 times height of head; length of eye in dorsal view 8.0 times temple (fig. 2); OOL:diameter of ocellus:POL = 2:6:3; frons smooth, except few striae anteriorly; vertex smooth, with median groove (fig. 2); face coriaceous (especially dorsally), with some punctures, but ventrally largely smooth (fig. 6); clypeus smooth, dorsally somewhat elevated, without distinct groove, its ventral margin not differentiated, depressed; length of malar space 0.7 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.3 times its height; prepectal carina complete but irregular; precoxal sulcus only medially distinctly crenulate (fig. 4), remainder of mesopleuron smooth, except for some fine punctures; mesoscutal lobes smooth, only near notauli with microsculpture; scutellum mainly smooth, subposteriorly with weak sculpture which is a continuation of lateral sculpture (fig. 7); surface of propodeum nearly smooth anteriorly, coriaceous-rugose medially and somewhat coriaceous posteriorly, antero-medially slightly depressed and area surrounded by curved carina (fig. 7).

Wings.— Fore wing: r:3-SR:SR1 = 7:21:32; 1-CU1:2-CU1 = 1:10; subbasal cell regularly setose; 2-SR:3-SR:r-m = 11:21:8. Hind wing: M+CU:1-M = 27:19; 2-SC+R subquadrate (fig. 1).

Legs.— Hind coxa largely smooth, sparsely punctulate; tarsal claws robust, indistinctly serrate medio-ventrally (fig. 8); length of femur, tibia and basitarsus of hind leg 5.9, 9.3 and 9.6 times their width, respectively; length of hind tibial spurs 0.25 and 0.30 times hind basitarsus; length of fore tarsus 1.3 times fore tibia.

Metasoma.— Length of first tergite 1.4 times its apical width, its surface coriaceous and longitudinally rugose and its dorsal carinae converging in basal quarter of tergite, reduced posteriorly (fig. 12); dorsope large, deep; second tergite longitudinally rugose and coriaceous; second suture deep and moderately crenulate; third-fifth tergites obliquely striate and coriaceous, but fourth and fifth tergites transversely striate posteriorly, and with weak convexities antero-laterally; sixth tergite mainly coriaceous; length of ovipositor sheath 0.14 times fore wing; hypopygium densely punctate.

Colour.— Pale brownish-yellow; flagellum pale brown; mesoscutum antero-laterally, propleuron largely, mesopleuron anteriorly, area of precoxal sulcus, side of scutellum and metanotum laterally, propodeum (except medio-longitudinal area), hind coxa largely laterally, first tergite (except apical third), anterior half of second tergite, triangular area of second-fifth tergites and sixth tergite dark brown or blackish; hind femur (except dorsally) infusate subapically; wing membrane mainly subhyaline, but basal half of fore wing partly slightly infusate; parastigma yellowish; pterostigma brown, but apically yellowish; veins brown, but of apical third of fore

wing and most veins of hind wing yellowish (as a result vein r of fore wing much darker than vein 3-SR); palpi and tegulae pale yellowish; ovipositor sheath infusate subapically; stemmaticum dark brown.

Variation.— Antennal segments of ♀ 45(1), 46(5), 47(1), 48(2), 49(1), 50(4), 51(1), 52(3), 53(2), 54(3), 55(2), 58(1), 60(1), or 61(1); of ♂ 32(1), 34(1), 35(2), or 37(1); length of antenna of ♀ 1.7-2.0 times fore wing, length of antenna of ♂ 1.4-1.5 times fore wing; length of fore wing 3.2-6.1 mm (of ♂ 3.1-4.4 mm), of body 4.8-8.9 mm (of ♂ 3.8-5 mm); OOL 0.3-0.7 times diameter of posterior ocellus; length of first tergite 1.4-2.1 times its apical width; first and second tergites may be largely punctate only; length of ovipositor sheath 0.10-0.14 times fore wing; posterior third of third and fourth tergites may be transversely striate; some paratypes have antero-lateral convexities of fourth and fifth tergites more developed than holotype; vertex, occiput and mesoscutum may be completely dark brown; outer side of hind femur may be largely brown; pterostigma, part of parastigma and veins may be largely dark brown or nearly completely dark brown; wing membrane subhyaline or nearly so; hypopygium completely yellowish, largely dark brown (except apically and dorsally) or blackish (id.); mesopleuron nearly completely yellowish, partly or complete anterior half dark brown or black; inner side of hind coxa may be dark brown largely; subapical sculpture of scutellum may be indistinct; metasoma may be largely blackish dorsally (but second tergite laterally, third-fifth tergites laterally (and sometimes posteriorly narrowly), and sixth tergite yellowish); ovipositor sheath may be largely (dark) brown; antenna may be nearly completely dark brown except for narrow yellowish band medially of segments (except of first two), and apical third may be pale brown; mesosternum anteriorly and a ventral streak may be dark brown; striae of frons may be more developed than in holotype. The series from Brunei shows an interesting kind of variation additional to the other specimens examined: the fourth and fifth tergites become mainly transversely and more densely finely striate than normally for the species, however, some specimens still show part of the normal oblique striation. Males lack the oblique striation of the metasoma, the sculpture of the metasoma is comparatively strong, and the tergites are largely yellowish except basally.

Two females from Malaysia (from Pahang, Cameron Highlands; BMNH) are excluded from the type series, but may be melanistic extremes of the form of *C. balgooyi* with reduced sculpture of the metasoma. The length of the first metasomal tergite is 2.1-2.3 times its apical width.

Note.— Named in honour of the collector of the holotype, the specialist of the Malesian flora, Dr M.M.J. van Balgooy (Leiden).

*Canalirogas fuscipalpis* van Achterberg, spec. nov.  
(figs 60-65)

Material.— Holotype, ♀ (RMNH), "Indonesia: C. Sulawesi, Lore-Lindu N.P., c 975 m, 1°15'S, 120°20'E, 3.xii.1985, nr Dongi-Dongi shelter, C. v. Achterberg, RMNH'86", "Indonesia: at light".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.2 mm, of body 5.6 mm.

Head.— Antennal segments 42, length of antenna 1.6 times fore wing, length of third segment as long as fourth segment, length of third, fourth and penultimate seg-

ments 2.8, 2.8, and 1.9 times their width, respectively (fig. 65); occipital carina rather strong (lamelliform) dorsally (fig. 62), and reduced ventrally, ending just above lower level of eyes, and far removed from hypostomal carina; length of maxillary palp 1.5 times height of head; length of eye in dorsal view 2.6 times temple (fig. 62); OOL:diameter of ocellus:POL = 5:5:2; frons nearly smooth but with some rugulae laterally and with short medio-longitudinal groove posteriorly; vertex smooth; length of malar space 0.9 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.4 times its height; side of pronotum coarsely crenulate medially, and coriaceous-rugulose anteriorly and ventrally, remainder largely smooth; epicnemial area with some short crenulae; mesoscutum moderately slender; medio-longitudinal groove of mesoscutum deep, rather long; notauli reaching medio-posterior groove, finely crenulate; scutellar sulcus comparatively shallow; scutellum without longitudinal depression medially and subposteriorly only superficially microsculptured; surface of propodeum rather sparsely rugose medially and anteriorly mainly smooth, medial area shallowly depressed.

Wings.— Fore wing: r:3-SR:SR1 = 10:25:46; 1-CU1:2-CU1 = 4:33; 2-SR:3-SR:r-m = 14:25:12; cu-a moderately oblique (fig. 60). Hind wing: M+CU:1-M = 35:26.

Legs.— Tarsal claws simple, ventral margin not distinctly serrate (fig. 63); length of femur, tibia and basitarsus of hind leg 5.6, 9.4 and 8.5 times their width, respectively; length of hind tibial spurs 0.20 and 0.25 times hind basitarsus; length of fore tarsus 1.2 times fore tibia.

Metasoma.— Length of first tergite 1.4 times its apical width, its surface anteriorly superficially and indistinctly sculptured, nearly smooth, its posterior half moderately irregularly rugose; second tergite moderately strongly sublongitudinally rugose, with finer sculpture in between and with some punctures antero-medially, without antero-lateral depressions; third tergite finely obliquely striate but medio-posteriorly mainly with some punctures, not transversely striate; fourth-fifth tergites superficially punctate-striate, without antero-lateral depressions, and without convexities antero-laterally (fig. 61); sixth tergite mainly coriaceous; length of ovipositor sheath 0.10 times fore wing.

Colour.— Pale yellowish; stemmaticum black; palpi (except first and second segments of maxillary palp and first segment of labial palp), vertex posteriorly, occiput laterally, antenna mainly, propleuron, pronotal side dorsally somewhat, mesopleuron anteriorly, area near precoxal sulcus, mesoscutum narrowly laterally, metanotum, propodeum, telotarsi, fore and middle tarsi, coxae and trochantelli partly, hind femur subapically, first tergite (except narrowly basally and apically), second-fifth tergites (except laterally and posteriorly), sixth tergite, ovipositor sheath, hypopygium largely brown or dark brown; basal half of pterostigma, veins C+SC+R (except apically), 1-M, M+CU1 (except basally), r, and 1+2-CU1 of fore wing dark brown; remainder of veins and pterostigma (brownish-)yellow; wing membrane subhyaline.

*Canalirogas heijningeni* van Achterberg, spec. nov.

(figs 18-22)

Material.— Holotype, ♀ (RMNH), "[Indonesia: Irian Jaya], Neth. Ind.-American New Guinea Expedit., Bernhard Camp, 50 m, 6.ix.1938, J. Olthof". Paratypes (3 ♀♀): 2 ♀♀ (RMNH), topotypic, but vii-xi.1938, and ix.1938; 1 ♀ (RMNH), "Indonesia: S Halmahera, between Payahe & Gita, Woda, Mal. trap 7, c 25 m, 17.ii-17.iii.1995, C. v. Achterberg, R. de Vries & Y. Yasir, RMNH'95".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 6.5 mm, of body 8.2 mm.

Head.— Remaining antennal segments 35 (apical segments missing), length of third segment 1.5 times fourth segment, length of third, and fourth segments 3.2, and 2.2 times their width, respectively; length of maxillary palp 1.7 times height of head; occipital carina strong dorsally (fig. 19), and nearly reaching hypostomal carina; length of eye in dorsal view 8.7 times temple (fig. 19); OOL:diameter of ocellus:POL = 2:6:3; frons smooth, largely flat, and shallowly depressed in front of anterior ocellus; vertex sparsely punctate; length of malar space 0.7 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.3 times its height; side of pronotum coarsely crenulate medially, and rugulose anteriorly and ventrally, remainder largely smooth; epicnemial area sparsely crenulate; notauli complete; medio-longitudinal groove of mesoscutum deep and distinctly shorter than that of *C. balgooyi*; scutellum without longitudinal depression medially and smooth subposteriorly; surface of propodeum coarsely vermiculate-rugose, anteriorly punctate, its medial area hardly depressed, and laterally with small tubercles.

Wings.— Fore wing: r:3-SR:SR1 = 7:21:36; 1-CU1:2-CU1 = 4:20 (fig. 20); 2-SR:3-SR:r-m = 11:21:8. Hind wing: M+CU:1-M = 26:19.

Legs.— Tarsal claws simple, ventral margin slightly serrate (fig. 22); length of femur, tibia and basitarsus of hind leg 7.0, 11.4 and 15.6 times their width, respectively; length of hind tibial spurs 0.20 and 0.25 times hind basitarsus; length of fore tarsus 1.2 times fore tibia.

Metasoma.— Length of first tergite 1.9 times its apical width, its surface and of second tergite very coarsely longitudinally rugose; second tergite with weakly indicated medio-basal area; third and fourth tergites without transverse sculpture posteriorly, coarsely obliquely striate, but of fourth tergite less coarsely than of third; third tergite nearly as coarsely obliquely striate as second tergite, medio-posteriorly mainly punctate; antero-lateral depressions of fourth and fifth tergites absent, and no weak convexities antero-laterally (fig. 21); fifth tergite finely obliquely striate laterally, and medially mainly coriaceous; sixth tergite coriaceous; length of ovipositor sheath 0.12 times fore wing.

Colour.— Yellowish-orange brown; palpi, and fifth-seventh tergites yellowish-brown; head, antenna (its segments without distinct transverse bands, but pedicellus and apical segments comparatively pale), posterior half of first tergite (except laterally), second-fourth tergites dorsally, and widened part of ovipositor sheath dark brown; hind femur and tibia (latter narrowly basally and apically yellowish), and metasoma ventrally (including hypopygium) infuscate; pterostigma, veins 1-M, 1-SR, CU1, C+SC+R and r of fore wing brown, remainder of veins yellowish; wing membrane subhyaline.

Variation.— Paratypes from Irian Jaya are very similar to holotype; length of fore wing 6.6-7.1 mm, of body 8.0-8.4 mm; length of first tergite 1.9-2.1 times its apical width; length of ovipositor sheath 0.11 times fore wing; ovipositor sheath completely dark brown or dorso-apically pale brown; length of hind basitarsus 14-16 times its width; fifth tergite may be partly dark brown basally; first tergite may be dark brown, except basally; some antennal segments may have pale transverse bands; wing membrane somewhat infuscate. The female from Halmahera has the antenna

with 63 segments, segments with faint medial pale band, basal half of antenna dark brown, and its apical half becoming gradually paler apicad; length of fore wing 7.7 mm, and of body 10.3 mm; first tergite completely orange-brown; fifth tergite partly dark brown, and remainder pale yellowish; hind femur brown, slightly darker than tibia; length of first tergite 1.8 times its apical width and length of ovipositor sheath 0.10 times fore wing.

Note.— Named in honour of Mr C. van Heijningen (Leiden), who worked for more than 50 years (1936-87) as technical assistant at the Rijksmuseum van Natuurlijke Historie (RMNH). He made an important contribution to the curation and extension of the Hymenoptera collection at RMNH, and took part in the last Dutch zoological New Guinea expedition.

*Canalirogas infuscatus* van Achterberg, spec. nov.  
(figs 41-46)

Material.— Holotype, ♀ (RMNH), "Malaysia: SE. Sabah, nr Danum Valley Field Centre, c 175 m, Mal. trap 2, 14-26.iii.1987, C. v. Achterberg, RMNH'87".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.3 mm, of body 7.0 mm.

Head.— Remaining antennal segments 29 (apical segments missing), length of third segment 1.3 times fourth segment, length of third, and fourth segments 3.1, and 2.5 times their width, respectively; length of maxillary palp 1.4 times height of head; occipital carina strong dorsally, and remaining rather far removed from hypostomal carina; length of eye in dorsal view 3.9 times temple (fig. 41); OOL:diameter of ocellus:POL = 11:11:6; frons smooth, largely flat, and shallowly depressed in front of anterior ocellus; vertex sparsely punctate; length of malar space 1.1 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.2 times its height; side of pronotum coarsely crenulate antero-medially, and rugulose anteriorly, remainder largely smooth; epicnemial area with some coarse crenulae; precoxal sulcus coarsely crenulate; notauli complete, also posteriorly crenulate; medio-longitudinal groove of mesoscutum deep and distinctly shorter than of *C. balgooyi*; scutellum without longitudinal depression medially and smooth subposteriorly, convex but rather flattened posteriorly; surface of propodeum coarsely vermiculate-rugose, medial area hardly depressed and anteriorly sparsely punctate, and with indistinct lateral tubercles.

Wings.— Fore wing: r:3-SR:SR1 = 13:39:72; 1-CU1:2-CU1 = 2:24 (fig. 46); 2-SR:3-SR:r-m = 19:39:16. Hind wing: M+CU:1-M = 26:23.

Legs.— Tarsal claws simple, ventral margin slightly serrate (fig. 44); length of femur, tibia and basitarsus of hind leg 6.2, 9.1 and 14.2 times their width, respectively; length of hind tibial spurs 0.15 and 0.20 times hind basitarsus; length of fore tarsus 1.2 times fore tibia.

Metasoma.— Length of first tergite 1.5 times its apical width, its dorsal carinae at level of spiracles weak, but remainder strong, its surface and of second tergite coarsely longitudinally rugose; sculpture of second tergite even stronger, with distinct micro-sculpture between rugae and tergite with distinctly developed medio-basal area, punctate (fig. 42); third and fourth tergites without transverse sculpture

posteriorly, coarsely obliquely rugose, but of fourth tergite less coarsely than of third; third tergite less coarsely sublongitudinally rugose as second tergite, with wide coriaceous interspaces, medio-posteriorly with some punctures (fig. 43); antero-lateral depressions of fourth and fifth tergites absent, and no weak convexities antero-laterally; fourth and fifth tergites finely obliquely rugose, with distinct micro-sculpture; sixth tergite densely punctate-rugulose, coriaceous; length of ovipositor sheath 0.15 times fore wing.

Colour.— Pale yellowish-brown; head (except temple ventrally and malar space), pronotal side posteriorly, antenna (but its segments with distinct transverse pale bands, pedicellus and apical segments somewhat paler), hind femur (except baso-dorsally and baso-ventral streaks), hind trochantellus, and tarsi dark brown; mesoscutum, scutellar disc, propodeum (except medially), mesopleuron and mesosternum (except narrowly posteriorly), hind coxa (but with brown stripe dorsally and ventrally) and first-sixth tergites dorsally mainly black(ish); palpi and humeral plate whitish; fore and middle femora, hind tibia largely, and widened part of ovipositor sheath brown; pterostigma and veins dark brown, but vein 1-R1 of fore wing paler brown, and parastigma largely whitish; wing membrane distinctly infusate.

Note.— Sculpture of metasoma, colour of head, and slender shape of hind basitarsus of this species are similar to that of *C. heijningeni*. However, *C. infuscatus* has the second tergite more coarsely sculptured than third tergite, vein cu-a of fore wing less postfurcal, OOL larger, the fifth and sixth tergites, and wing membrane darker, the temples wider and the first tergite more robust.

*Canalirogas kahonoi* van Achterberg, spec. nov.  
(figs 23-26)

Material.— Holotype, ♀ (RMNH), "Indonesia: [S.] Sumatra, N. Bengkulu, N. P. Kerinci, Sebelat, c 50 m, 28.vii.1993, S. Kahono, RMNH'93". Paratype: 1 ♀ (BMNH), "Sarawak: 1st Div., Semongoh For. Res., 1°25'N, 110°17'E, 15-19.xi.1976, P.S. Cranston".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.5 mm, of body 6.0 mm.

Head.— Antennal segments 46, length of antenna 1.7 times fore wing, length of third segment 1.5 times fourth segment, length of third, fourth and penultimate segments 3.2, 2.2, and 2.7 times their width, respectively; length of maxillary palp 1.7 times height of head; length of eye in dorsal view 4.5 times temple (fig. 25); occipital carina medium-sized dorsally, and ventrally absent up to halfway level of eye; OOL: diameter of ocellus:POL = 10:13:7; frons smooth and slightly depressed in front of anterior ocellus; vertex sparsely punctate; length of malar space 0.6 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.3 times its height; side of pronotum with some short crenulae medially, and coriaceous ventrally, remainder largely smooth; epicnemial area with some short crenulae; mesopleuron sparsely punctulate; medio-longitudinal groove of mesoscutum deep and distinctly shorter than of *C. balgooyi*, its surroundings sparsely punctulate and coriaceous; notauli nearly complete; scutellum without longitudinal depression medially and smooth (except general punctulation of scutellum) subposteriorly; surface of propodeum coarsely vermiculate-rugose, medial area slightly depressed and rugose, anteriorly nearly smooth, and medially

coriaceous between rugae.

Wings.— Fore wing: r:3-SR:SR1 = 7:21:36; 1-CU1:2-CU1 = 1:20 (fig. 26); 2-SR:3-SR:r-m = 12:21:9. Hind wing: M+CU:1-M = 24:22.

Legs.— Tarsal claws simple, ventral margin slightly serrate (fig. 23); length of femur, tibia and basitarsus of hind leg 4.5, 8.7 and 10.0 times their width, respectively; length of hind tibial spurs 0.25 and 0.30 times hind basitarsus; length of fore tarsus 1.3 times fore tibia.

Metasoma.— Length of first tergite 1.3 times its apical width, its surface coarsely longitudinally rugose as second tergite; third-fifth tergites coarsely obliquely striate laterally and anteriorly, medially and posteriorly mostly transversely striate; third tergite about as coarse as fourth tergite; antero-lateral depressions of fourth and fifth tergites absent or nearly so, and no weak convexities antero-laterally (fig. 24); sixth tergite finely and densely rugulose, coriaceous; length of ovipositor sheath 0.10 times fore wing.

Colour.— Pale brownish-yellow; most of antennal segments with pale brown band medially; stemmaticum, first tergite anteriorly and medially, second tergite anteriorly and medio-posteriorly, third-fifth tergites dorsally (except laterally and posterior corners), and sixth tergite dorsally (except its lateral margin) blackish; palpi, tegulae, trochanters and trochantelli (except outer side of hind trochantellus), and remainder of metasoma pale yellowish or whitish; pterostigma, veins (but 1-R1, 3-SR and SR1 slightly paler brown), hind coxa (except basally), hind femur (except basally), hind tibia (except pale yellowish basal band and narrow apical part), hind tarsus, antenna (but pedicellus paler brown), ovipositor sheath, hypopygium (except apically) and pair of patches on third-fifth sternites dark brown; remainder of sternites whitish; wing membrane subhyaline.

Variation.— The paratype is a melanistic specimen; it has the mesopleuron anteriorly, the propodeum, the propleuron, and the mesoscutum largely dark brown, and the colour of the dark patches of the body varies from dark brown to brown; the occipital carina ends somewhat above lower level of eye, far removed from hypostomal carina; length of first metasomal tergite is 1.4 times its apical width; vein 3-SR of fore wing about as dark as vein r; and metasomal sternites without dark patches.

Note.— Named after the collector of the holotype, the Indonesian entomologist and excellent counterpart during RMNH expeditions in Indonesia, Mr Sih Kahono (Bogor).

*Canalirogas maculatus* van Achterberg, spec. nov.  
(figs 27-30)

Material.— Holotype, ♀ (RMNH), "Indonesia: SE. Sulawesi, nr Sa[ng]gona, Base Camp, Gn. Watuwila, Mal. tr[ap] 5, c 200 m, 15.x-5.xi.1989, C. v. Achterberg, RMNH'89". Paratypes: 2 ♀♀ (BMNH), "Indonesia: Sulawesi Utara [= North Sulawesi], Dumoga-Bone N. P., Toraut, 20-27.xi.1985 (1 ♀; vii.1985: 1 ♀), [Malaise trap]".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.1 mm, of body 6.2 mm.

Head.— Remaining antennal segments 23, main part of antenna missing, length of third segment 1.3 times fourth segment, length of third, and fourth segments 3.2, and 2.4 times their width, respectively; length of maxillary palp 1.7 times height of

head; length of eye in dorsal view 5.6 times temple (fig. 28); occipital carina medium-sized, reduced ventrally, developed up to lower level of eyes; OOL:diameter of ocellus:POL = 5:6:3; frons smooth, nearly flat, but with shallow median groove; vertex sparsely punctate; length of malar space 0.9 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.4 times its height; side of pronotum with some coarse crenulae medially, and coriaceous ventrally, remainder largely smooth; epicnemial area coarsely crenulate; medio-longitudinal groove of mesoscutum deep and distinctly shorter than that of *C. balgooyi*; notauli complete; mesoscutum moderately robust; scutellum without longitudinal depression medially and distinctly rugose subposteriorly; surface of propodeum coarsely vermiculate-rugose, medial area slightly depressed and anteriorly narrowly smooth.

Wings.— Fore wing: r:3-SR:SR1 = 8:21:32; 1-CU1:2-CU1 = 1:20 (fig. 30); 2-SR:3-SR:r-m = 8:21:8. Hind wing: M+CU:1-M = 24:19.

Legs.— Tarsal claws simple, ventral margin slightly serrate, stronger than in other species (fig. 27); length of femur, tibia and basitarsus of hind leg 6.4, 10.1 and 11.4 times their width, respectively; length of hind tibial spurs 0.22 and 0.25 times hind basitarsus; length of fore tarsus 1.2 times fore tibia.

Metasoma.— Length of first tergite 1.6 times its apical width, its surface (as of second tergite) coarsely longitudinally rugose, and with micro-sculpture between rugae (fig. 29); third-sixth tergites coriaceous and finely obliquely striate laterally and anteriorly, medio-posteriorly mostly transversely striate; antero-lateral depressions of fourth and fifth tergites absent or nearly so, and no weak convexities antero-laterally; length of ovipositor sheath 0.14 times fore wing.

Colour.— Pale brownish-yellow; spurs whitish; stemmaticum, mesoscutum, scutellum (but anteriorly dark brown), mesopleuron (but medially dark brown, and in front of prepectal carina and postero-dorsally yellowish), pair of patches of propodeum anteriorly, and metasoma dorsally (but margin narrowly yellowish) black(ish); vertex, occiput medio-dorsally, antenna (but most segments with narrow pale band medially), face medially and stripe to antennal sockets, mesosternum laterally, hind coxa (except basally), ovipositor sheath, pterostigma and veins (vein r of fore wing only slightly darker than veins 3-SR or 1-R1) dark brown; frons medially, middle femur subapically, tibiae (but hind tibia yellowish dorsally) and tarsi infuscate; wing membrane subhyaline.

Variation.— Antennal segments of ♀ 54(1); length of antenna of ♀ 2.0 times fore wing; length of fore wing 4.1-4.8 mm, of body 6.2-7.5 mm; length of first tergite 1.6-1.8 times its apical width; length of ovipositor sheath 0.13-0.14 times fore wing; paratypes are very similar to holotype, but propodeum may be largely black, except narrow stripe medially and posteriorly.

*Canalirogas nigratus* van Achterberg, spec. nov.  
(figs 47-53)

Material.— Holotype, ♀ (RMNH), "Indonesia: S Halmahera, between Payahe & Gita, Woda, Mal. trap 7, c 25 m, 17.ii-17.iii.1995, C. v. Achterberg, R. de Vries & Y. Yasir, RMNH'95". Paratypes (5 ♀ ♀): 3 ♀ ♀ (MZB, RMNH), "Indonesia: S Halmahera, 20 km S Payahe, Sagutora, c 115 m, 18.ii-18.iii.1995, Mal. trap 13, C. v. Achterberg, R. de Vries & Y. Yasir, RMNH'95"; 2 ♀ ♀ (RMNH), id., but Malaise trap 12, c 125 m.

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore



wing 5.6 mm, of body 9.4 mm.

**Head.**— Antennal segments 58, length of antenna 1.9 times fore wing, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 3.2, 2.6, and 2.3 times their width, respectively; occipital carina strong (lamelliform) dorsally (fig. 49), and shortly reduced ventrally, remaining distinctly removed from hypostomal carina; length of maxillary palp 1.7 times height of head; length of eye in dorsal view 3.7 times temple (fig. 49); OOL:diameter of ocellus:POL = 6:9:5; frons mainly smooth and without distinct medio-longitudinal groove; vertex and stemmaticum sparsely finely punctate; length of malar space 0.9 times basal width of mandible.

**Mesosoma.**— Length of mesosoma 1.3 times its height; side of pronotum coarsely rugose, but coriaceous-rugose ventrally; epicnemial area with some medium-sized crenulae; anterior subalar protuberance densely punctate; mesoscutum slender; medio-longitudinal groove of mesoscutum deep, long (fig. 52); notauli reaching groove and distinctly crenulate posteriorly (fig. 52); scutellum finely punctate, without longitudinal depression medially and subposteriorly narrowly sculptured; surface of propodeum coarsely vermiculate-rugose (anteriorly less coarsely than posteriorly, fig. 51), medial area rather depressed and propodeum slightly tuberculate postero-laterally.

**Wings.**— Fore wing: r:3-SR:SR1 = 6:16:26; 1-CU1:2-CU1 = 1:19; 2-SR:3-SR:r-m = 17:32:12; cu-a rather oblique (fig. 47). Hind wing: M+CU:1-M = 21:18.

**Legs.**— Tarsal claws simple, ventral margin distinctly shortly serrate, because of 3 setae with widened base (fig. 50); length of femur, tibia and basitarsus of hind leg 6.5, 10.4 and 11.6 times their width, respectively; length of hind tibial spurs 0.20 and 0.25 times hind basitarsus; length of fore tarsus 1.25 times fore tibia.

**Metasoma.**— Length of first tergite 1.8 times its apical width, its surface very coarsely longitudinally vermiculate-rugose; second tergite coarsely longitudinally striate, with antero-lateral depressions, and with triangular area weakly developed antero-medially; third tergite coarsely obliquely striate laterally and anteriorly, medio-posteriorly finely transversely rugose; fourth-fifth tergites similar to third tergite but less coarsely rugose; sixth tergite densely punctate; antero-lateral depressions of third-fifth tergites distinct, but without distinct convexities antero-laterally (fig. 48); sixth tergite mainly coriaceous; length of ovipositor sheath 0.14 times fore wing; hypopygium largely micro-striate with dense punctulation.

**Colour.**— Black; inner orbits of eye, clypeus largely, malar space, temple ventrally, propleuron anteriorly, pronotal side medio-ventrally and postero-ventrally, mesopleuron narrowly posteriorly, tegulae, metapleuron anteriorly and ventrally, propodeum laterally, metanotum narrowly posteriorly, propodeum narrowly laterally and posteriorly, base of first tergite, fourth-sixth tergites antero-laterally narrowly, remainder of tergites, sternites (except for hypopygium which is only along its margins whitish, and has its apical third dark brown), palpi, fore and middle coxae, fore and middle trochanters and trochantelli, base and apex of fore femur, basal half and apex of middle femur, part of hind trochanter and trochantellus, base and apex of hind femur narrowly, and hind tibia dorsally, yellowish-white or ivory; hind coxa black; remainder of legs dark brown; antenna mainly dark brown, its apical fifth somewhat paler than basal half of antenna; veins (but vein 1-R1 of fore wing pale brownish) and pterostigma dark brown, and vein r somewhat darker than vein 3-SR;

parastigma mainly ivory; wing membrane infuscate, especially near vein 1-M.

Variation.— Antennal segments of ♀ 51(1), 52(1), 54(1), 55(1), or 58(1); length of antenna of ♀ 1.8-2.0 times fore wing; length of fore wing 4.1-5.6 mm, of body 6.5-9.4 mm; length of first tergite 1.7-1.9 times its apical width; length of ovipositor sheath 0.13-0.14 times fore wing; hind coxa narrowly dorsally and mesopleuron ventro-posteriorly widely brown; propleuron completely, pronotal sides largely and metapleuron largely whitish.

*Canalirogas tuberculatus* van Achterberg, spec. nov.  
(figs 31-35, 66)

Material.— Holotype, ♀ (RMNH), "Indonesia: C. Sulawesi, nr Luwuk, Bunga, c 300 m, 1-14.xi.1989, Mal. trap 16, C. v. Achterberg, RMNH'89". Paratype: (7 ♀♀): 3 ♀♀ (MZB, RMNH), topotypic, but 1 ♀ 21-31.x.1989, and all from Malaise trap 15; 1 ♀ (RMNH), "Indonesia: N. Sulawesi, Dumoga-Bone N.P., c 220 m, Mal. trap: forest plot A, 9-19.xi.1985, 0°34'N 123°54'E, C. v. Achterberg, RMNH'86"; 1 ♀ (BMNH), "Sulawesi, Toraut, 1180 m, 14.iv-14.v.1985, J.S. Noyes"; 1 ♀ (RMNH), "Indonesia, Sula Isl., Taliabu, near Tubang, Mal. trap 22, c 50 m, 9-20.iii.1995, C. v. Achterberg & Y. Yasir, RMNH"; 1 ♀ (RMNH), "Indonesia: Sula Isl., Mangole, near Buya, Mal. trap 15, c 490 m, 2-22.iii.1995, C. v. Achterberg & Y. Yasir, RMNH".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.4 mm, of body 6.1 mm.

Head.— Antennal segments 44, length of antenna 1.6 times fore wing, length of third segment 1.4 times fourth segment, length of third, fourth and penultimate segments 3.4, 2.4, and 2.9 times their width, respectively; length of maxillary palp 1.6 times height of head, rather slender (fig. 66); length of eye in dorsal view 6.8 times temple (fig. 33); occipital carina rather strong, and nearly touching hypostomal carina ventrally; OOL:diameter of ocellus:POL = 3:5:2; frons smooth, flat, slightly depressed in front of anterior ocellus; vertex sparsely punctate; face only sparsely punctate and coriaceous; length of malar space 0.7 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.3 times its height; side of pronotum coarsely crenulate medially, rugulose anteriorly and coriaceous ventrally, remainder largely smooth; epicnemial area with few crenulae; mesoscutum robust (fig. 34); medio-longitudinal groove of mesoscutum deep and distinctly shorter than that of *C. balgooyi*; notauli nearly complete; scutellum without longitudinal depression medially and smooth subposteriorly; surface of propodeum coarsely rugose, medial area slightly depressed, anteriorly sculpture fading.

Wings.— Fore wing: r:3-SR:SR1 = 6:22:34; 1-CU1:2-CU1 = 1:10 (fig. 30); 2-SR:3-SR:r-m = 23:44:17. Hind wing: M+CU:1-M = 24:19.

Legs.— Tarsal claws simple, ventral margin mainly evenly curved (fig. 35); length of femur, tibia and basitarsus of hind leg 5.5, 10.1 and 10.8 times their width, respectively; length of both hind tibial spurs 0.20 times hind basitarsus; length of fore tarsus 1.1 times fore tibia.

Metasoma.— Length of first tergite 1.6 times its apical width, its surface (and that of second tergite) rather finely longitudinally rugose and finely coriaceous; third-fifth tergites mainly densely coriaceous, faintly obliquely striate laterally, not transversely striate; antero-lateral depressions of fourth and fifth tergites distinct (also present on second and third tergites), and with distinct convexities antero-laterally (fig. 32); sixth tergite coriaceous; length of ovipositor sheath 0.10 times fore wing.

Colour.— Pale yellowish; stemmaticum black; antenna, ovipositor sheath (except basally), and sixth tergite dorsally, brown; pterostigma (but basally and posterior third yellow), veins r, 2-SR, m-cu, 1+2-CU1 of fore wing dark brown, remainder of veins yellowish; wing membrane subhyaline.

Variation.— Antennal segments of ♀ 42(1), 44(2), 45(1), or 48(1); length of antenna of ♀ 1.6-1.9 times fore wing; length of fore wing 3.4-4.6 mm, of body 5.1-6.3 mm; length of first tergite 1.5-1.6 times its apical width; length of ovipositor sheath 0.10-0.12 times fore wing; convexities of third-fifth tergites in one paratype less pronounced than in holotype and one female has third-fourth tergites distinctly striate; the female from Dumoga-Bone National Park has the metasoma partly slightly infusate dorsally and the pterostigma largely dark brown.

Note.— A female from New Guinea (BMNH; "Papua-New Guinea, Morobe, Wau, 1000 m, x.1979, I. Gauld") may be a melanistic specimen of *C. tuberculatus*. It has the pterostigma and the metasoma dorsally (except most of the first tergite) dark brown, contrasting with the completely yellowish mesosoma.

*Canalirogas yvonnae* van Achterberg, spec. nov.  
(figs 13-17)

Material.— Holotype, ♀ (RMNH), "Indonesia: N. Sumatra, Ketambe, c 400 m, near N.P. Gn. Leuser, Mal. trap, iv.1995, Y. v. Nierop & C. v. Achterberg, RMNH'95". Paratypes (8 ♀♀): 1 ♀ (RMNH), topotypic, x.1994; 2 ♀♀ (MZB, RMNH), "Indonesia: N. Sumatra, Aceh, Bengkung (Soraya), N.P. Gn. Leuser, Mal. trap, 10-25.iii.1995, Y. v. Nierop & Polly, RMNH'95"; 3 ♀♀ (RMNH, FRC), "Malaysia: SE. Sabah, nr Danum Valley Field Centre, WON1 (but 2 ♀♀: rentice W12), Mal. trap 5, c 150 m, 20.i-20.ii.1988, C. v. Achterberg & T. Burghouts, RMNH'89" (2 ♀♀: Mal. trap 12, c 240 m, 24.ii-18.iii.1987, C. van Achterberg, RMNH'87); 1 ♀ (ZIL), "Malaysia: Sabah, Sipitang, Mendolong, T6/R, 11.v.1988, leg. S. Adebratt": 1 ♀ (?; metasoma missing) (RMNH), Malaysia: Sabah, Kinabalu Park, Poring Hot Spring, 9-12.iii.1987, c 450 m, Malaise trap 7, C. v. Achterberg, RMNH'87".

Description.— (If not mentioned then as *C. balgooyi*), holotype, ♀, length of fore wing 4.6 mm, of body 7.1 mm.

Head.— Antennal segments 54, length of antenna 2.1 times fore wing, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 3.4, 2.8, and 2.7 times their width, respectively; length of maxillary palp 1.4 times height of head; length of eye in dorsal view 7.3 times temple (fig. 14); OOL: diameter of ocellus:POL = 6:6:3; frons with some weak rugae laterally and shallow medio-longitudinal groove; vertex sparsely punctate; length of malar space 1.1 times basal width of mandible.

Mesosoma.— Length of mesosoma 1.2 times its height; side of pronotum coarsely crenulate medially, and rugose anteriorly, remainder largely smooth; epicnemial area coarsely crenulate; medio-longitudinal groove of mesoscutum deep and distinctly shorter than that of *C. balgooyi*; scutellum with longitudinal depression medially and distinctly longitudinally rugose subposteriorly (fig. 15); surface of propodeum coarsely vermiculate-rugose, medial area slightly depressed and sparsely rugose.

Wings.— Fore wing: r:3-SR:SR1 = 7:24:36; 1-CU1:2-CU1 = 1:27 (fig. 13); 2-SR:3-SR:r-m = 12:24:9. Hind wing: M+CU:1-M = 32:25.

Legs.— Tarsal claws simple, ventral margin mainly evenly curved (fig. 17); length of femur, tibia and basitarsus of hind leg 7.6, 10.5 and 11.6 times their width,

respectively; length of hind tibial spurs 0.20 and 0.25 times hind basitarsus; length of fore tarsus 1.1 times fore tibia.

**Metasoma.**— Length of first tergite 1.6 times its apical width, its surface coarsely longitudinally vermiculate-rugose; third-fifth tergites coarsely obliquely striate laterally and anteriorly, medio-posteriorly mostly transversely striate; antero-lateral depressions of fourth and fifth tergites absent or nearly so, and no weak convexities antero-laterally; sixth tergite finely obliquely striate laterally, and medially mainly transversely so; length of ovipositor sheath 0.11 times fore wing.

**Colour.**— Brownish-orange; malar space, basal third of antenna, legs (but outer side of middle and hind trochantelli mostly dark brown and coxae pale yellowish), and ovipositor sheath brownish-yellow; side of pronotum (except anteriorly and ventrally), dorsal half of mesopleuron, propodeum, first tergite, second tergite (except medio-posteriorly), and third-sixth tergites sublaterally, dark brown; mesosternum, ventral half of mesopleuron, metapleuron, second-sixth tergites laterally, seventh-eighth tergites, metasoma ventrally (but hypopygium largely dark brown except basally), palpi, tegulae and parastigma pale yellowish or whitish; pterostigma and most veins dark brown; middle third of antenna dark brown, its apical quarter white, but 3 apical segments mainly brownish; wing membrane weakly infuscate.

**Variation.**— Antennal segments of ♀ 47(1), 50(1), 51(1), 52(1), 54(1), or 56(1); length of antenna of ♀ 2.0-2.1 times fore wing; length of fore wing 3.8-4.6 mm, of body 5.7-7.2 mm; length of first tergite 1.5-1.6 times its apical width; length of ovipositor sheath 0.10-0.12 times fore wing; 1-5 apical segments of antenna of ♀ may be brownish; basal two-thirds of antenna and hind tibia (except basally) may be largely dark brown; seventh tergite may be dark brown laterally; ovipositor sheath yellowish-brown or dark brown; hind leg may be largely infuscate; hypopygium may be nearly completely dark brown; occipital carina nearly complete ventrally or distinctly reduced ventrally.

**Note.**— Named in honour of its collector, the hymenopterist Yvonne van Nierop (Medan).

#### Acknowledgements and abbreviations

We wish to thank Yvonne van Nierop and Arnoud Steeman (Medan) for assembling an important collection of Braconidae from Sumatra, Drs S. Kahono (Bogor) for donating Braconidae from Sumatra, Dr M.M.J. van Balgooy (Leiden) for donating material from Malaysia, and Mr T. Huddleston (London) for his comments on the first draft and the loan of specimens. The Yayasan Sabah (Kota Kinabalu) and LIPI (Jakarta) are acknowledged for their support of fieldwork by the first author, respectively, in Sabah and Indonesia. BMNH stands for the Natural History Museum, London; FRC for Forest Research Centre, Sandakan; MZB for Museum Zoologicum Bogoriense, Bogor; RMNH for Nationaal Natuurhistorisch Museum, Leiden; ZAU for Zhejiang Agriculture University, Hangzhou; and ZIL for Zoological Institute, Lund.

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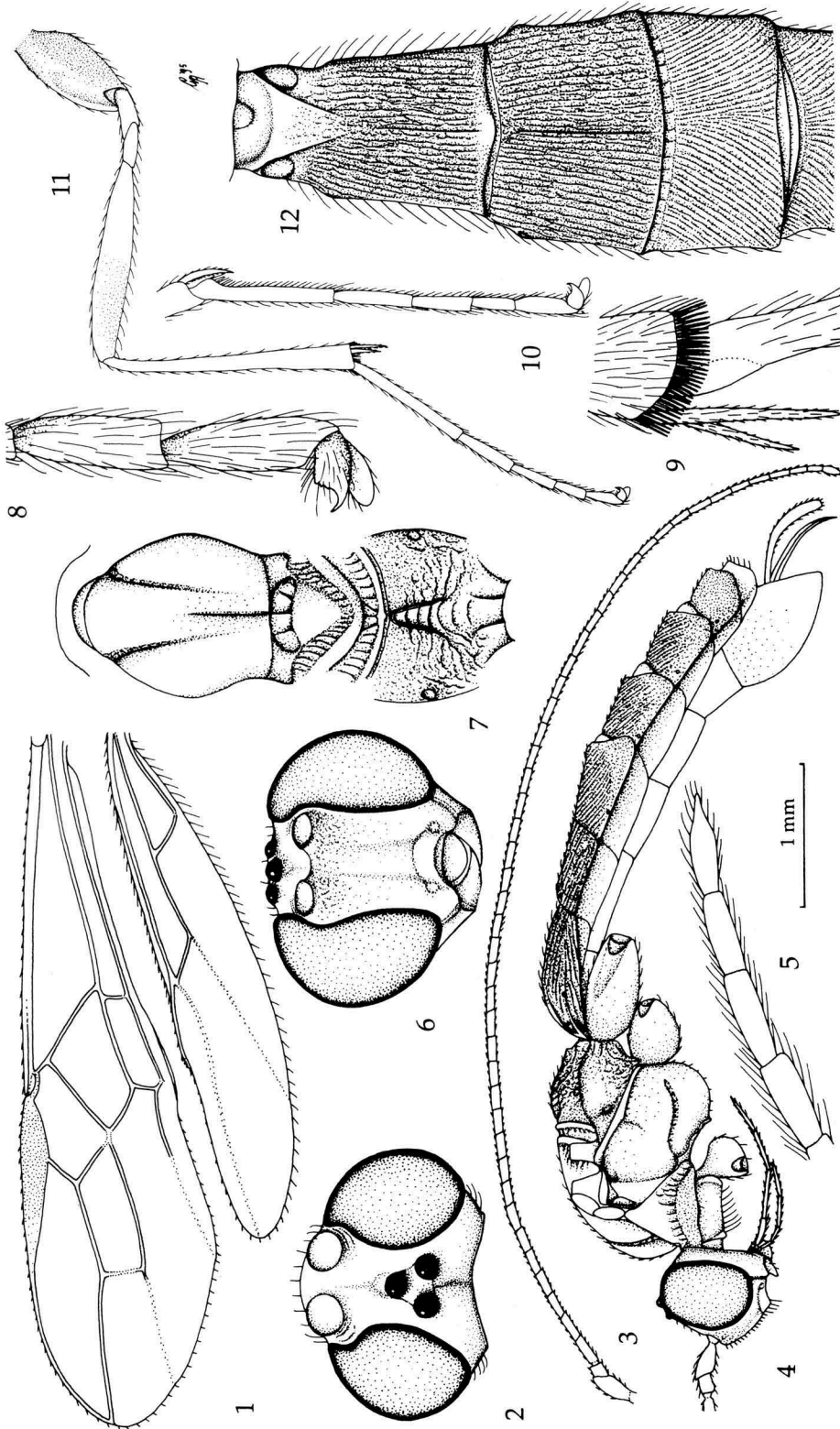
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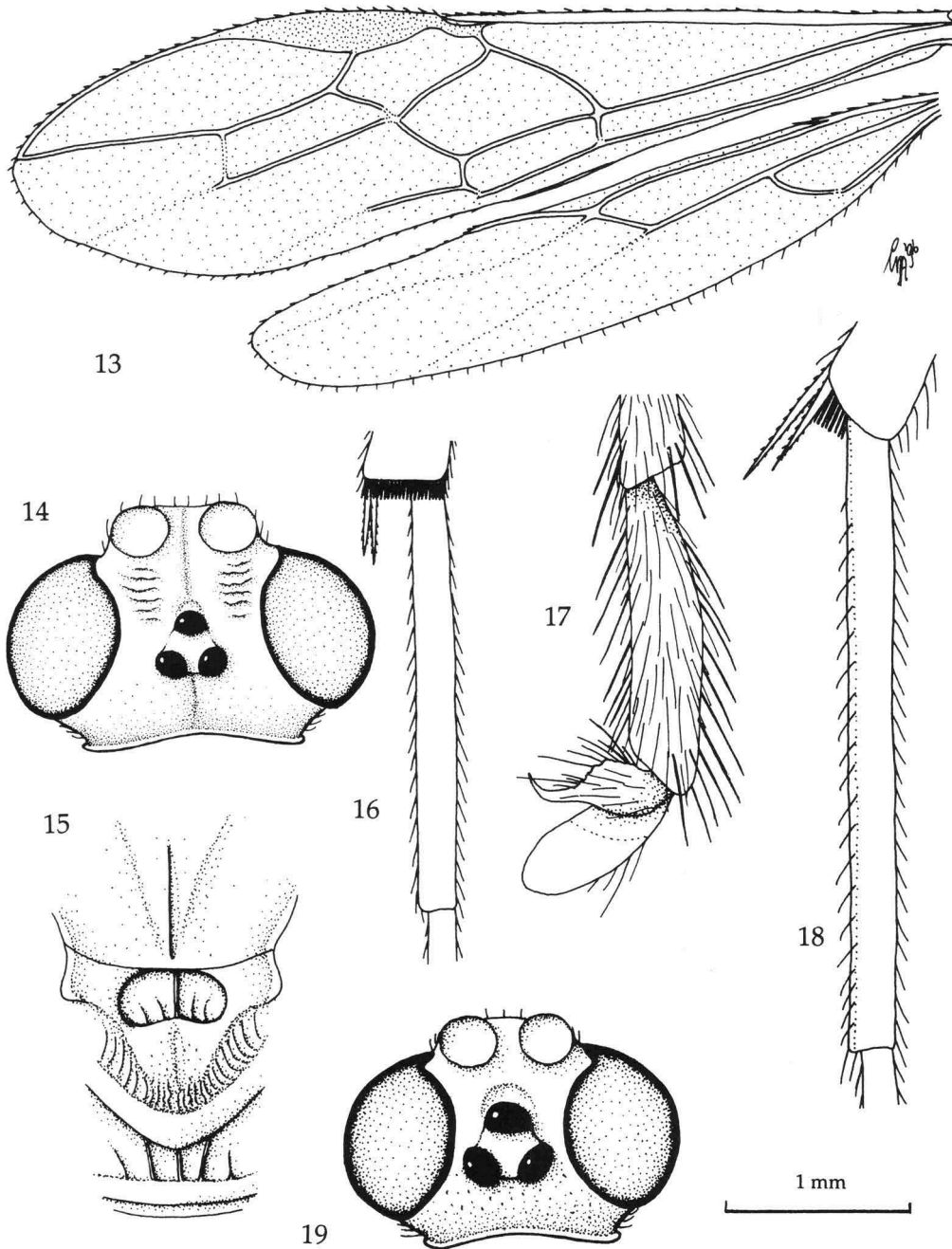
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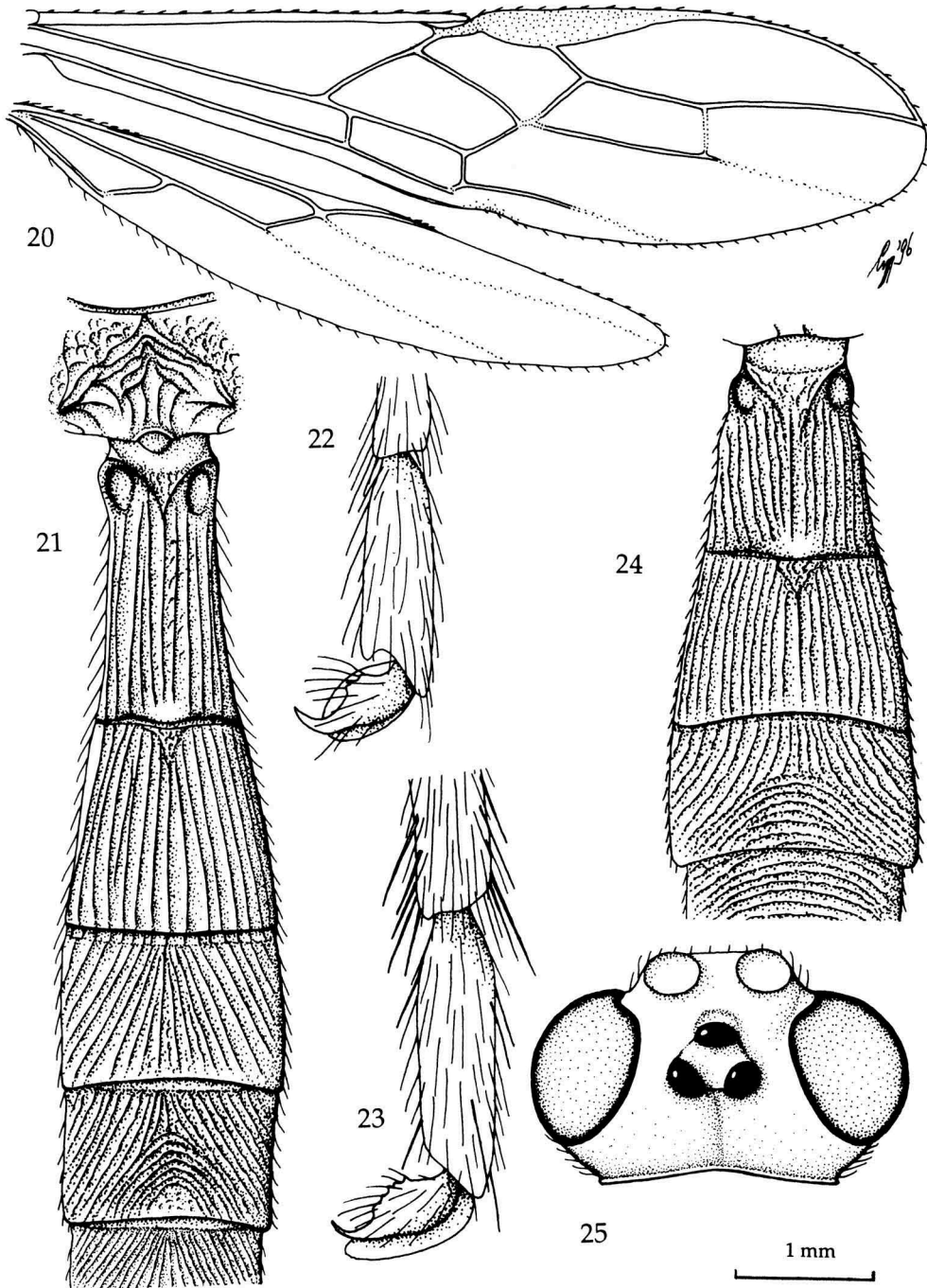
Edited: R. de Jong



Figs 1-12, *Canalirogas bulgooyi* gen. nov. & spec. nov., ♀, holotype. 1, wings; 2, head, dorsal aspect; 3, antenna, lateral aspect; 5, apex of antenna; 6, head, frontal aspect; 7, mesosoma, dorsal aspect; 8, inner hind claw; 9, apex of hind tibia, inner aspect; 10, fore tarsus; 11, hind leg; 12, first-third metasomal tergites, dorsal aspect. 1, 3, 4, 11: 1.0 × scale-line; 2, 6, 7, 10, 12: 2.0 ×; 5, 8, 9: 5.0 ×.



Figs 13-17, *Canalirogas yvonnae* gen. nov. & spec. nov., ♀, holotype; figs 18-19, *C. heijningeni* gen. nov. & spec. nov., ♀, holotype. 13, wings; 14, 19, head, dorsal aspect; 15, scutellum, dorsal aspect; 16, 18, hind basitarsus, lateral aspect; 17, inner hind claw. 13: 1.0 × scale-line; 14: 1.8 ×; 15, 18: 2.0 ×; 16: 2.3 ×; 17: 5.0 ×; 19: 1.4 ×.



Figs 20-22, *Canalirogas heijningeni* gen. nov. & spec. nov., ♀, holotype; figs 23-25, *C. kahonoi* gen. nov. & spec. nov., ♀, holotype. 20, wings; 21, propodeum and first-fourth tergites, dorsal aspect; 22, 23, inner hind claw; 24, first-third tergites, dorsal aspect; 25, head, dorsal aspect. 20, 21: 1.0 × scale-line; 22: 5.5 ×; 23: 7.7 ×; 24: 1.6 ×; 25: 2.7 ×.



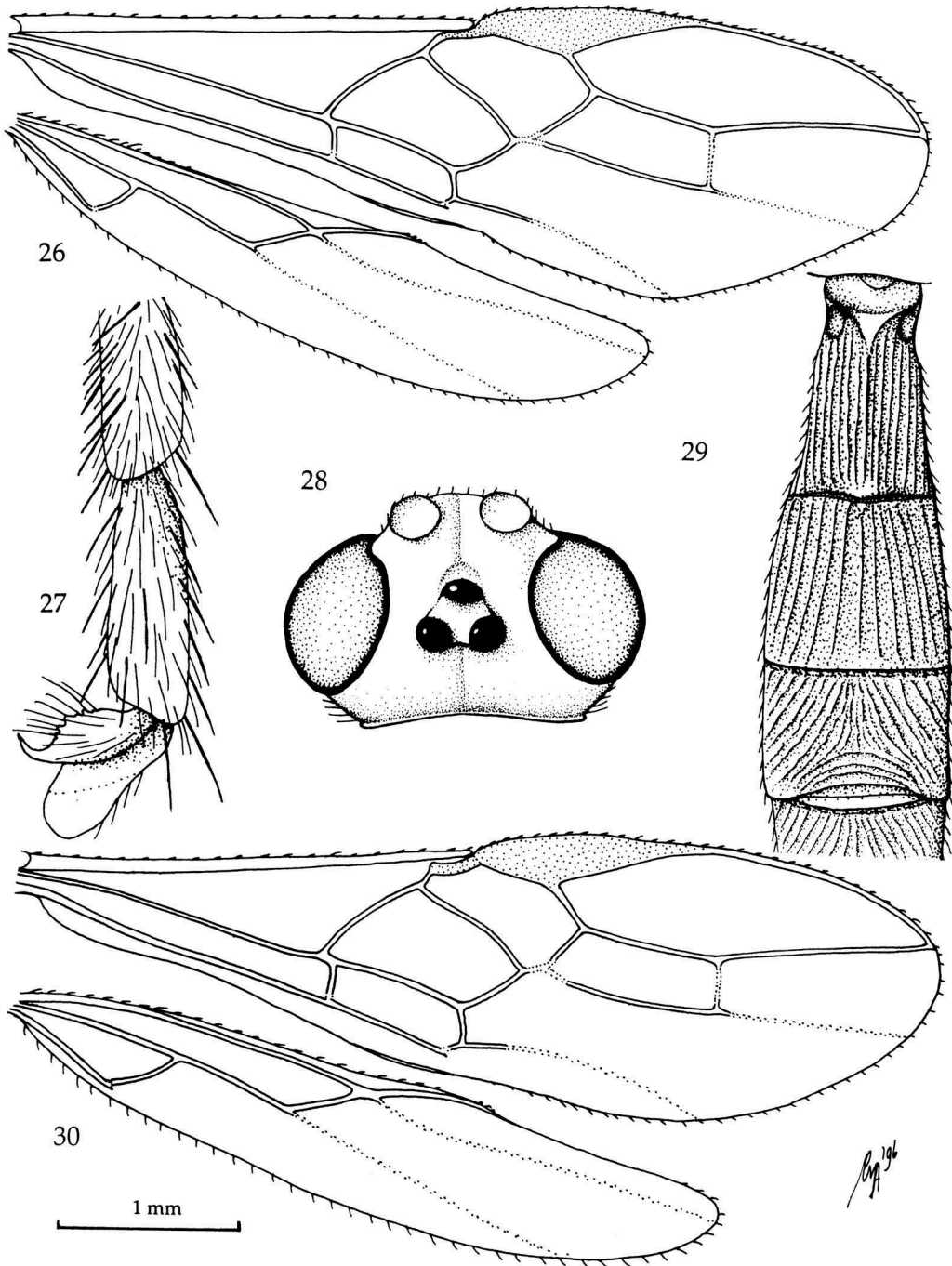
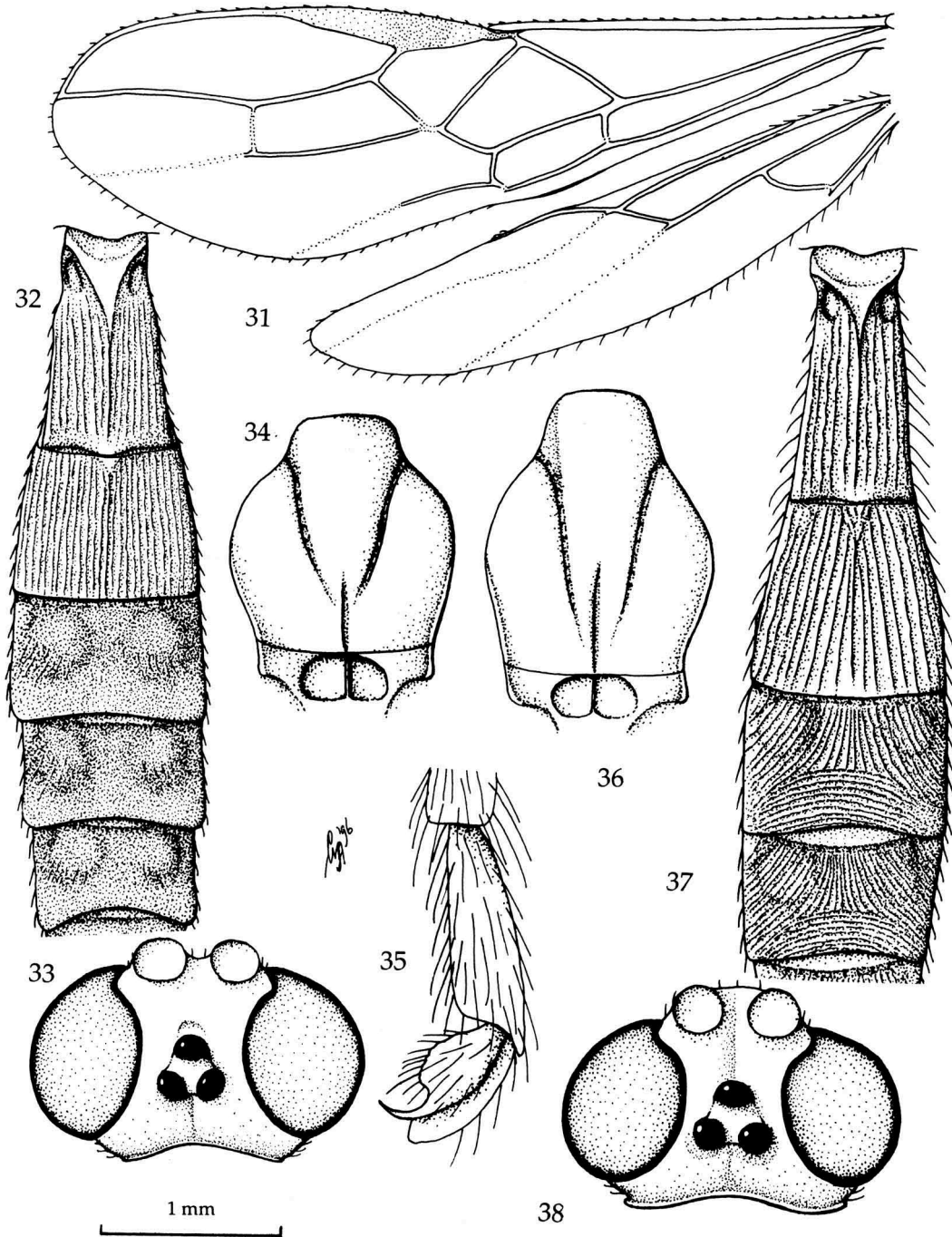
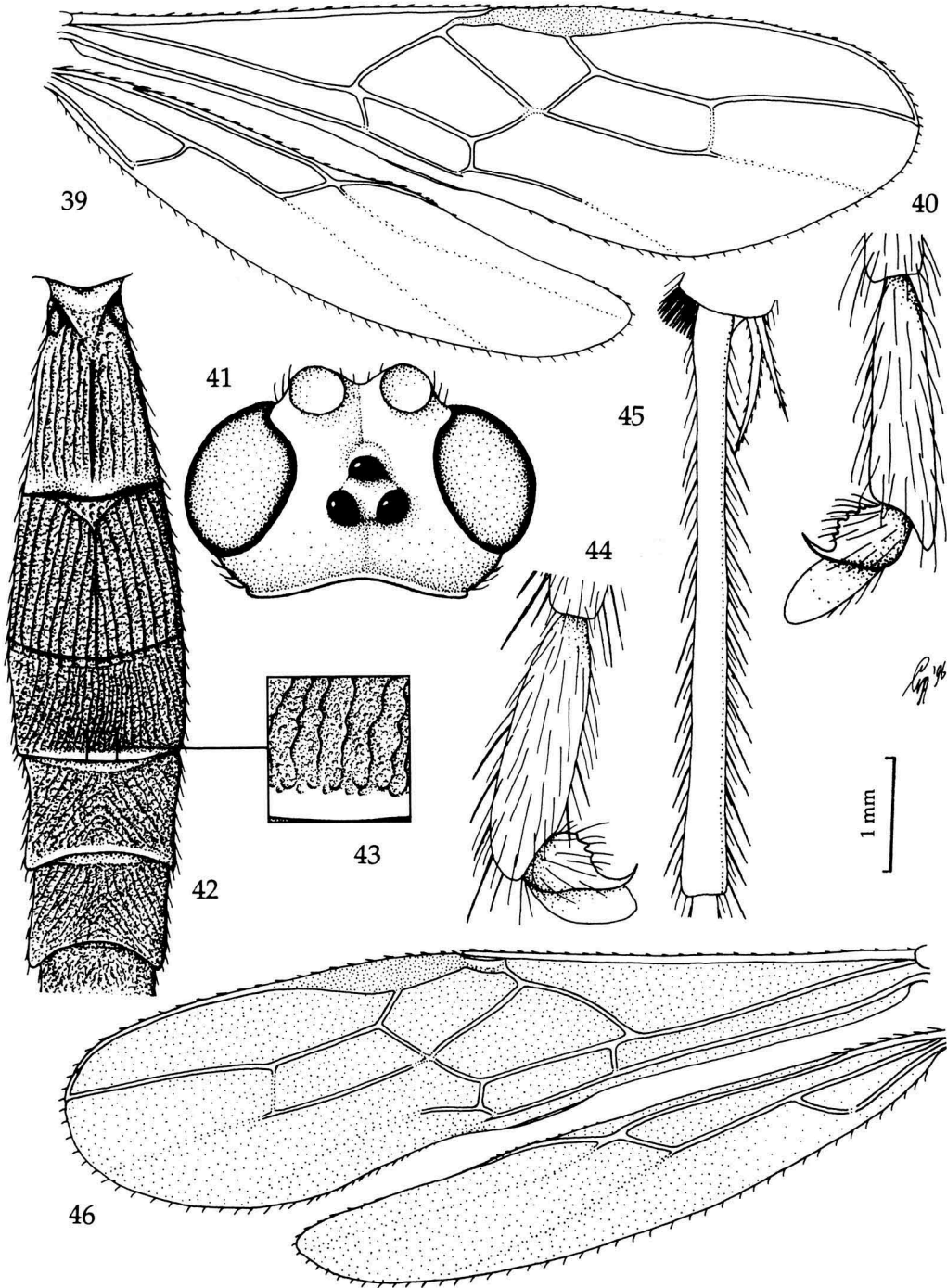


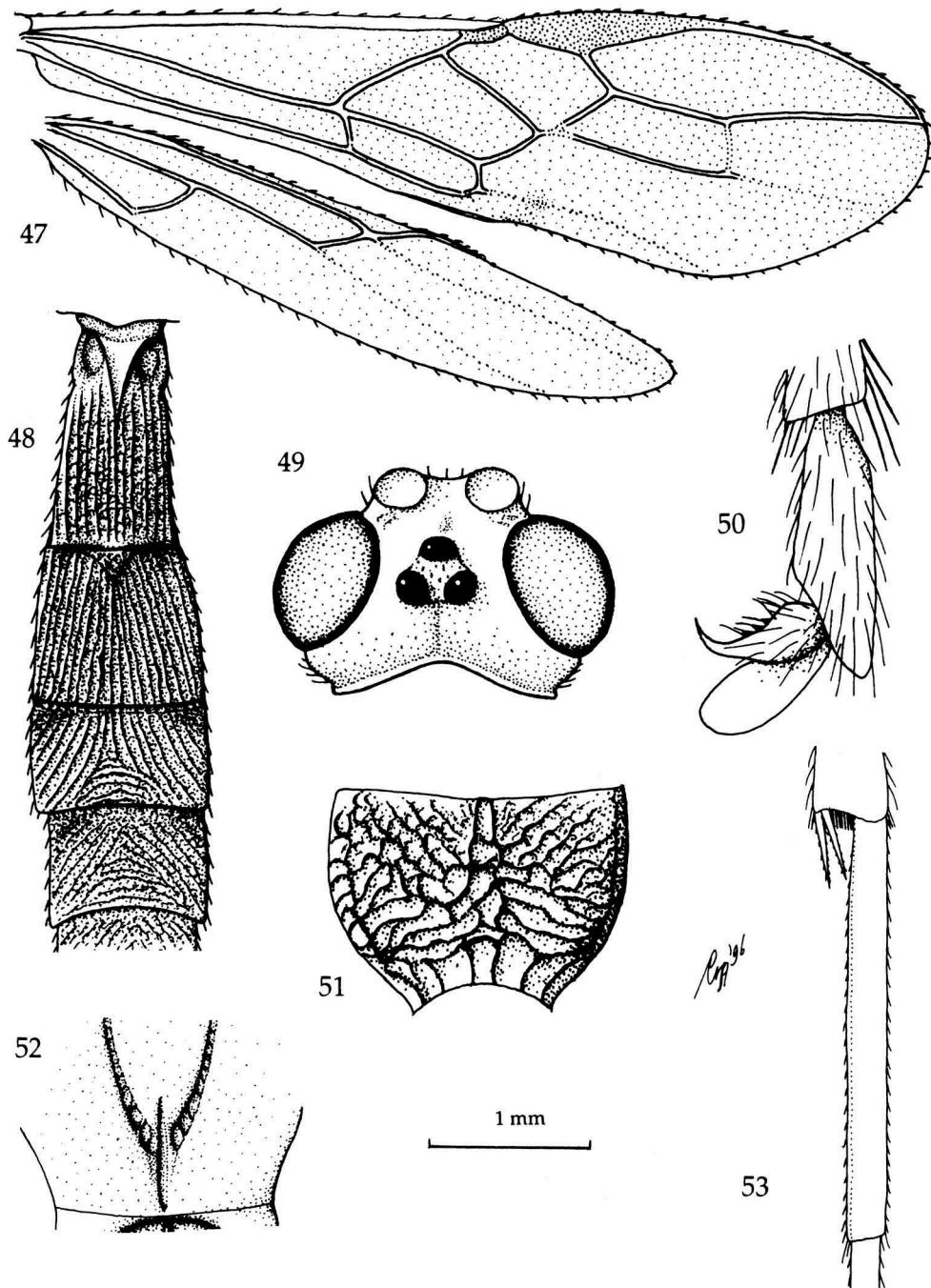
Fig. 26, *Canalirogas kahonoi* gen. nov. & spec. nov., ♀, holotype; figs 27-30, *C. maculatus* gen. nov. & spec. nov., ♀, holotype. 26, 30, wings; 27, inner hind claw; 28, head, dorsal aspect; 29, first-third tergites, dorsal aspect. 26: 1.0 × scale-line; 27: 5.2 ×; 28: 2.0 ×; 29: 1.2 ×; 30: 1.1 ×.



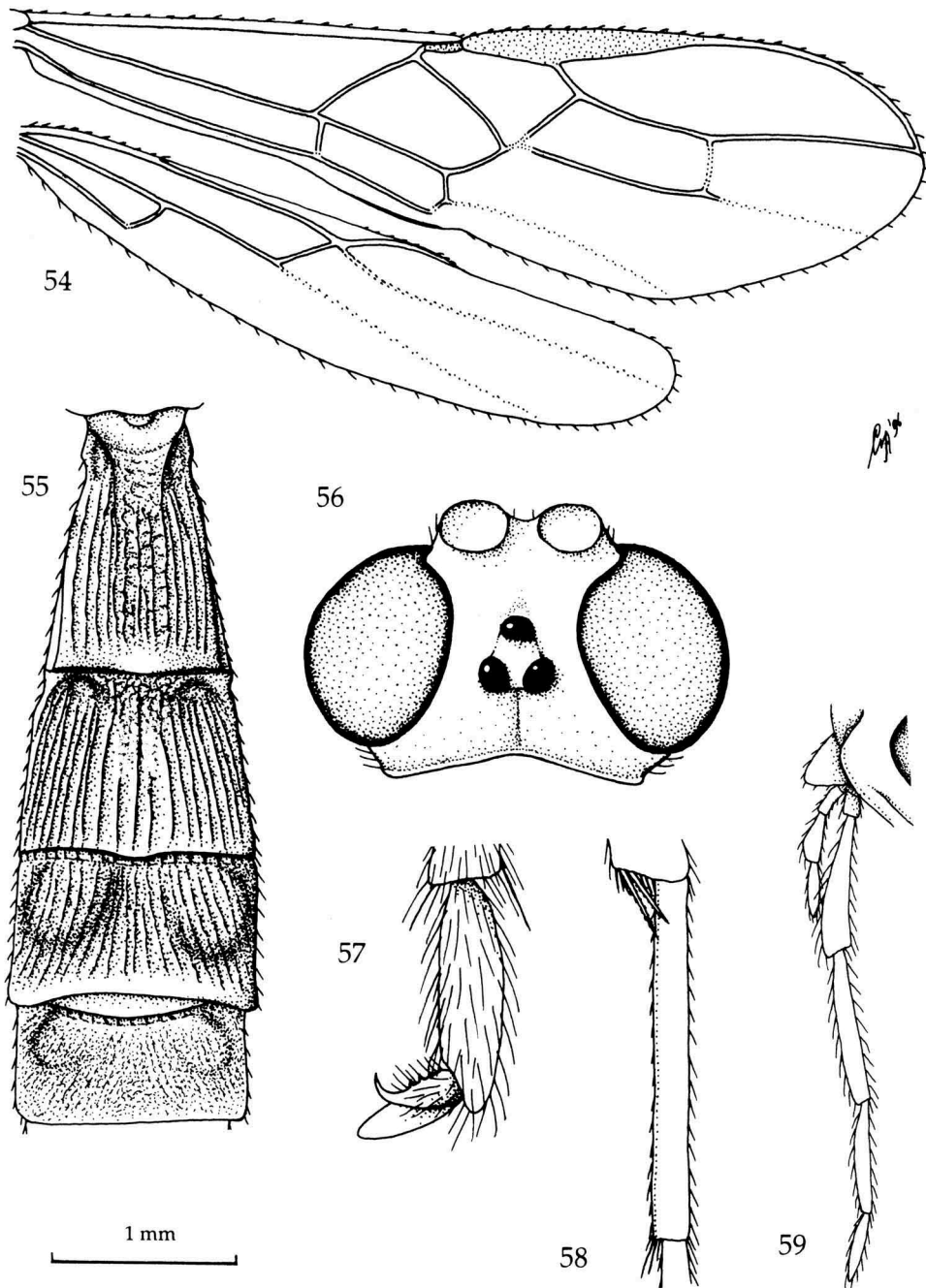
Figs 31-35, *Canalirogas tuberculatus* gen. nov. & spec. nov., ♀, holotype; figs 36-38, *C. agilis* gen. nov. & spec. nov., ♀, holotype. 31, wings; 32, first-five tergites, dorsal aspect; 33, 38, head, dorsal aspect; 34, 36, mesoscutum, dorsal aspect; 35, inner hind claw; 37, first-fourth tergites, dorsal aspect. 31: 1.0 × scale-line; 32, 37: 1.2 ×; 33, 34: 2.0 ×; 35: 5.5 ×; 36, 38: 2.2 ×.



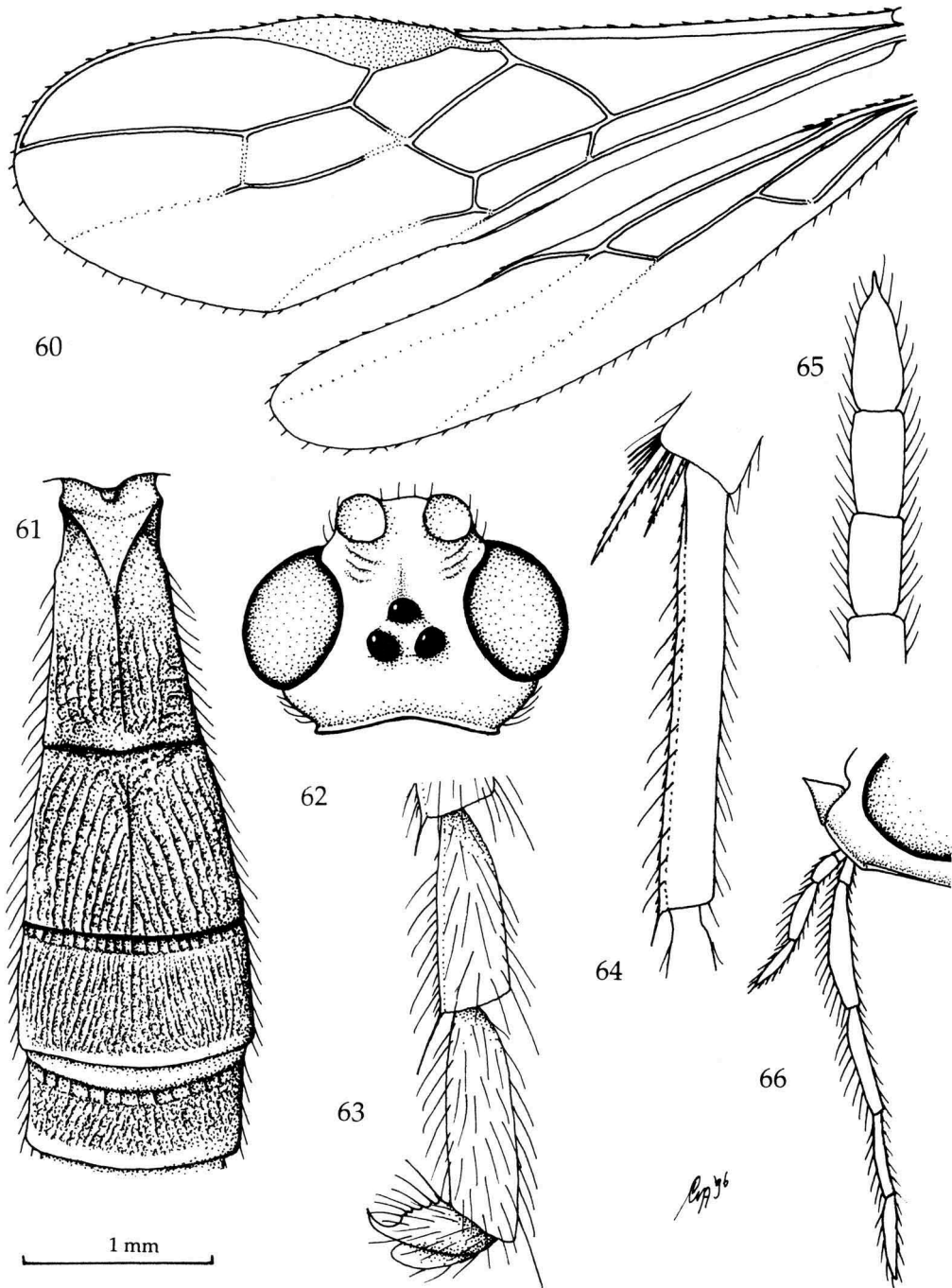
Figs 39-40, *Canalirogas agilis* gen. nov. & spec. nov., ♀, holotype; figs 41-46, *C. infuscatus* gen. nov. & spec. nov., ♀, holotype. 39, 46, wings; 40, 44, inner hind claw; 41, head, dorsal aspect; 42, first-five tergites, dorsal aspect; 43, detail of sculpture of third tergite; 45, hind basitarsus, lateral aspect. 39: 1.0 × scale-line; 40: 6.5 ×; 41: 3.2 ×; 42, 46: 1.6 ×; 43: 8.0 ×; 44: 7.5 ×; 45: 5.0 ×.



Figs 47-53, *Canalirogas nigratus* gen. nov. & spec. nov., ♀, holotype. 47, wings; 48, first-fourth metasomal tergites, dorsal aspect; 49, head, dorsal aspect; 50, inner hind claw; 51, propodeum, dorsal aspect; 52, medio-posterior groove of mesoscutum and posterior half of notauli; 53, hind basitarsus, lateral aspect. 47: 1.0 × scale-line; 48, 49, 51: 1.9 ×; 50: 5.2 ×; 52, 53: 2.1 ×.



Figs 54-59, *Canalirogas acutus* gen. nov. & spec. nov., ♀, holotype. 54, wings; 55, first-fourth metasomal tergites, dorsal aspect; 56 head, dorsal aspect; 57, outer hind claw; 58, hind basitarsus, lateral aspect; 59, palpi, lateral aspect. 54: 1.0 × scale-line; 55: 1.6 ×; 56, 58: 2.3 ×; 57: 5.2 ×; 59: 1.8 ×.



Figs 60-65, *Canalirogas fuscipalpis* gen. nov. & spec. nov., ♀, holotype; fig. 66, *Canalirogas tuberculatus* gen. nov. & spec. nov., ♀, holotype. 60, wings; 61, first-fourth metasomal tergites, dorsal aspect; 62, head, dorsal aspect; 63, outer hind claw; 64, hind basitarsus, lateral aspect; 65, apex of antenna; 66, palpi, lateral aspect. 60: 1.0 × scale-line; 61: 1.7 ×; 62-65: 4.7 ×; 66: 2.0 ×.