

The Palaeotropical species of the tribe *Cosmophorini* Capek (Hymenoptera: Braconidae: Euphorinae) with descriptions of twenty-two new species

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A review of the known specimens of the tribe *Cosmophorini* Capek, 1958, from the Palaeotropics is given. Twenty-two species new to science are described and figured in this paper. Up to recently (Shaw, 1985; Chen & van Achterberg, 1997) the tribe was unknown from outside of the Holarctic region. Five Oriental species are included into *Sinuatophorus* van Achterberg, gen. nov. (type species: *Sinuatophorus maximus* van Achterberg, spec. nov. from Indonesia). Nine Oriental, two East Palaearctic, two Australian and four Afrotropical new species are included in the genus *Cosmophorus* Ratzeburg, 1848. A key to the Old World species of the *Cosmophorini* is added.

Introduction

For a long time the tribe *Cosmophorini* Capek, 1958, has been known to be a small and rarely collected tribe of the subfamily Euphorinae Foerster, 1862 (or as an independent subfamily) restricted to the Holarctic region (Capek, 1958; Shenefelt, 1969; van Achterberg, 1993). Shaw (1985) mentioned two new species from the Philippines and one new species from New Britain; in addition an undescribed species has been collected in Mexico (S.R. Shaw, pers. comm.). The first species described from outside the Holarctic region is *Cosmophorus rugitergitus* Chen & van Achterberg, 1997, from Oriental China. Recently, the extensive use of Malaise traps in the tropics has yielded a few specimens of *Cosmophorini*, and the first author collected a species by hand netting on a large dead tree fallen down on the island of Sumbawa (Indonesia). Usually every newly discovered specimen from another locality represents a new species, indicating that we are only at the start of discovering the diversity of this group in the tropics. The *Cosmophorini* are koinobiont endoparasitoids of adult bark-beetles (Scolytidae; S.R. Shaw, 1985, M.R. Shaw & Huddleston, 1991), using their large mandibles for arresting the host (fig. 1).

For the identification of the tribe *Cosmophorini*, see van Achterberg (1990, 1993, 1997), a key to the genera is included in this paper, and for the terminology used in this paper, see van Achterberg (1988, 1993). In this paper a key to the Old World species is included; a key to the North American species is provided by Loan & Matthews (1973).

Subfamily Euphorinae Foerster, 1862

Euphoroidae Foerster, 1862: 228, 250.

Euphorinae; Shenefelt, 1969: 5-7 (literature, synonyms); Shaw, 1985: 288-291 (phylogeny); Quicke & van Achterberg, 1990: 37-38 (phylogeny); van Achterberg, 1993: 43-45 (diagnosis); Chen & van Achterberg, 1997: 5-11 (key to genera of China).

Rather large cosmopolitan subfamily; usually characterized by the (sub)petiolate or very elongate first metasomal tergite (with its spiracles submedially situated, or behind middle of tergite), clypeus normal (not part of a cyclostome hypoclypeal depression, but in *Cosmophorini* a pseudo-cyclostome condition occurs because of the enlarged mandibles and back-slanted labrum; fig. 93), and the reduction of vein CU1b of fore wing (van Achterberg, 1993). However, two tribes (*Cosmophorini* and *Centistini* Capek, 1970) have the first tergite sessile, and the *Cosmophorini* and part of the *Centistini* also have the spiracles far in front of middle of tergite. According to Shaw's (1985) hypothesis of the phylogenetic relationships of the genera and tribes of Euphorinae *Cosmophorus* (constituting the only genus of the *Cosmophorini* in his analysis) is the sister-group of the *Syntretini* Shaw, 1985. The character-states used to fit it as a sister-group of the *Syntretini* are partly correlated and reductional characters (Shaw's character 35 (vein cu-a of hind wing reduced) and character 52 (vein 1-1A of hind reduced)) or incorrect (viz. character 27 (scutellar sulcus not foveate, but foveate e.g. in type species of *Cosmophorus* (fig. 97)), and (character 4) the median carina of frons extending to anterior ocellus (but carina is often reduced or absent, and usually remaining removed from anterior ocellus), and (character 26) the nitid mesoscutal sculpture occurs also in *Centistini*). The only remaining character-state (of character 48) is the reduction of vein CU1a of fore wing (only pigmented in *Cosmophorini*). In Shaw's analysis the *Cosmophorini* are not considered to be the sister-group of the

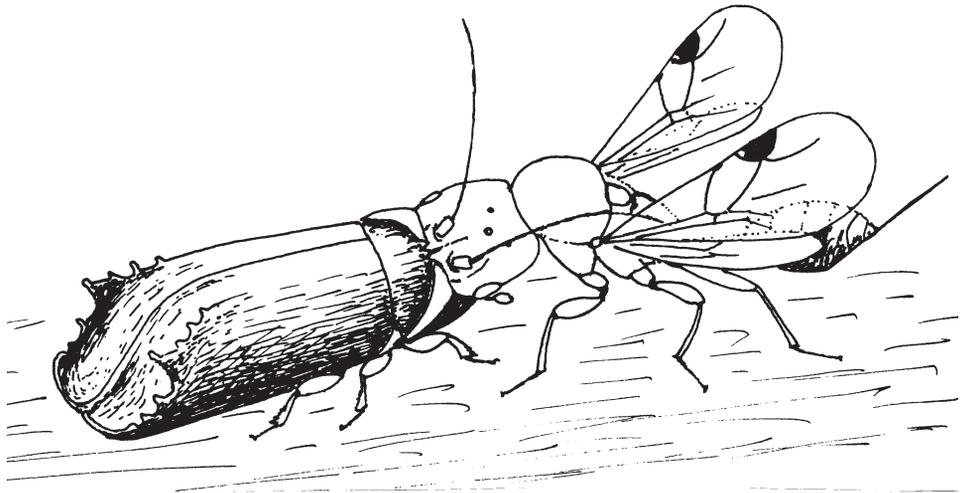


Fig. 1, *Cosmophorus klugii* Ratzeburg arresting a bark beetle with its mandibles before starting oviposition (after Hedqvist, 1998).

Centistini because of the carinate propodeal sculpture of Centistini (character 30; but this is variable both in Centistini and Cosmophorini), the absence of the petiolar notch (character 34; also absent in Cosmophorini), vein 2-M of fore wing present (character 40; vein 2-M absent in Cosmophorini), the laterope present (character 59; laterope is variable in Cosmophorini, but if present then smaller than in Centistini), the spiracle of the first metasomal tergite in front of middle of tergite (character 61; also anteriorly situated in Cosmophorini; figs 37, 63, 94), the lateral crease of second and third tergites absent (character 64; also absent in *Cosmophorus*) and the presence of a subsessile first tergite (character 68; also subsessile in Cosmophorini). It is obvious that the phylogenetic relationships of the Cosmophorini are far from solved by Shaw's analysis (1985). An apparent synapomorphy with the Centistini is found in the shape of the ovipositor (strongly laterally compressed, covered by a ribbon-like sheath); this character-state, and the similar biology makes a position of the Cosmophorini as the sister-group of the Centistini more likely than the position as proposed by Shaw (1985).

Tribe Cosmophorini Capek, 1958

Cosmophorinae Musesebeck & Walkley, 1951: 183 (nomen nudum); Capek, 1958: 153; Shenefelt, 1969: 135-137.

Cosmophorus-group of the subfamily Euphorinae; Tobias, 1966: 623 (phylogeny); Tobias, 1986: 247 (translation (1995): 431-433; key to West Palaearctic species).

Cosmophorini; Capek, 1970: 865-866 (included in the Centistinae); Marsh, 1979: 294-295; Shaw, 1985: 300; Quicke & van Achterberg, 1990: 4; van Achterberg, 1993: 18.

Diagnosis.— Length of fore wing 1-3 mm; antenna inserted on a protuberance in front of eyes (figs 2, 9, 11, 64, 76) and with 12-23 segments; antennal sensillae without internal floor (aberrant for Euphorinae); scapus enlarged and toothed antero-apically (figs 15, 107, 177); labrum slanted posteriorly, resulting in a glabrous and more or less concave pseudo-cyclostome depression (figs 19, 59, 93); maxillary palp with 4 segments, labial palp with 1 segment; temples often enlarged (figs 70, 71, 83, 85, 94); eyes glabrous or sparsely setose; occipital carina present laterally, often absent medio-dorsally, situated below base of mandible ventrally (fig. 3) and remaining separated from hypostomal carina or rarely just meeting near base of mandible; mandible more or less enlarged (figs 66, 72, 84, 93); prepectal carina usually absent except a weak trace behind fore coxa, but sometimes distinct up to lower level of pronotal side; postpectal carina usually absent, area rugose or reticulate, sometimes with irregular carina, but in *C. brevicaudatus* complete and regular; precoxal sulcus present (figs 4, 150, 158, 185), but frequently reduced (fig. 53); notauli absent on disc of mesoscutum (fig. 62); medio-posterior depression of scutellum absent (figs 18, 62); veins SR1 and 1-R1 of fore wing reduced, resulting in an open marginal cell (figs 17, 51, 73); vein 1-SR+M of fore wing absent (fig. 51); first subdiscal cell of fore wing widely open distally (fig. 51); vein cu-a of hind wing absent; vein 1-SC+R of hind wing reduced (figs 51, 81, 90, 131); hind wing with 3 distal hamuli; tarsal claws simple, slender (figs 60, 101); second-fourth segments of fore tarsus more or less shortened and telotarsus only slightly enlarged (figs 157, 165, 180, 183); insertion of metasoma normal (thus no petiolar notch sensu Shaw (1985)); first metasomal tergite parallel-sided or somewhat

widened posteriorly (figs 63, 65, 69, 89, 111, 146) or narrowed apically (fig. 82), ventrally open; dorsope absent; laterope absent or small; spiracles of first tergite situated far in front of middle of tergite, minute; third tergite without sharp lateral crease (fig. 94); third and following tergites smooth, depressed; ovipositor strongly compressed, ribbon-like (as in Centistini, but less wide: figs 19, 55, 91, 173)), largely straight, but may be sinuate posteriorly (fig. 75) or somewhat wavy (fig. 173); ovipositor sheath about as long as metasoma up to as long as fore wing, and (partly) widened, ribbon-like (figs 54, 94).

Biology.— Koinobiont endoparasites of adults of bark- and woodboring Scolytidae (Shaw & Huddleston, 1991). Cocoon made in tunnel of host beetle (Capek, 1957 & 1970). It uses the aberrantly shaped mandibles in combination with the back-slanted labrum to grasp the beetle near the pronotum to held it tightly during oviposition (Seitner & Nötzl, 1925; Hedqvist, 1998; fig. 1).

Key to genera of the tribe Cosmophorini Capek

- 1. Mandible horizontal (only apically so in *S. breviceps* spec. nov.), second tooth at inner side of mandible and in same plane as apical (= upper) tooth, tooth small or obsolescent (figs 10, 59, 66, 72, 78); extended ovipositor of ♀ distinctly sinuate apically (figs 54, 55, 67, 75); posterior half of second tergite entirely sculptured and with complete lateral crease (figs 53, 63, 65, 69, 82); vein 2-SC+R of hind wing long (figs 51, 81); antennal segments 19-23; vertex distinctly depressed medially, and anterior ocellus situated below level of posterior ocelli (figs 9, 59, 64, 68, 71, 77); POL 2.5-4.0 times diameter of posterior ocellus (figs 64, 68, 71) *Sinuatophorus* van Achterberg, gen. nov.
- Mandible more vertical, second tooth situated ventrally to apical tooth of mandible, not in same plane, medium-sized or small, but distinct (figs 93, 104, 107, 109, 126, 133); ovipositor of ♀ straight (fig. 94) or at most somewhat wavy apically (figs 173, 182); posterior half of second tergite largely or entirely smooth, and without lateral crease (figs 94, 102, 115, 129, 179; but completely sculptured in *C. rugotergitus*); vein 2-SC+R of hind wing usually medium-sized to short (figs 92, 126, 131, 136), but long in *C. robustus* spec. nov., *C. depressus* spec. nov. and *C. regius* Niezabitowski (fig. 90); antennal segments 12-19 (up to 22 in *C. regius* Niezabitowski); vertex flattened, without wide groove medially, and anterior ocellus at same level as posterior ocelli (figs 98, 109, 118, 177), but distinctly depressed and with anterior ocellus much lower situated in *C. depressus* spec. nov. and *C. regius* Niezabitowski (fig. 85); POL 1.5-3.5 times diameter of posterior ocellus (figs 98, 118) *Cosmophorus* Ratzeburg, 1848

***Sinuatophorus* van Achterberg, gen. nov.**
(figs 2-19, 51-84)

Type species: *Sinuatophorus maximus* van Achterberg, spec. nov.

Etymology.— From “sinuatos” (Latin for “bend”) and “phorus” (Latin form of Greek “phoras” for “bearing”, because of the sinuately bent ovipositor. Gender: masculine.

Diagnosis.— Antennal segments 19-23; mandible horizontal (only apically so in *S. breviceps* spec. nov.), second tooth at inner side of mandible and in same plane as apical tooth, tooth small or obsolescent (figs 10, 59, 66, 72, 78); vertex distinctly depressed medially, and anterior ocellus situated below level of posterior ocelli (figs 9, 59, 64, 68); vein 2-SC+R of hind wing comparatively long (fig. 51, 81); second tergite entirely sculptured (figs 12, 53, 63, 65, 69); lateral crease of second tergite distinct (figs 12, 53); ovipositor of ♀ distinctly sinuate apically (figs 54, 55, 67, 75, if the ovipositor is not extended, extension results in curving downwards).

Distribution.— Oriental.

Note.— The mandible of *S. breviceps* spec. nov. is less derived than in other species of *Sinuatophorus* gen. nov., but also in comparison to species of *Cosmophorus* except for the position of the second tooth of the mandible. This may indicate that it is not an offshoot of a group within the genus *Cosmophorus*, and that the recognition of the new genus will not make the genus *Cosmophorus* paraphyletic.

Key to species of the genus *Sinuatophorus* nov.

1. Eye in dorsal view about 1.5 times as long as temple (figs 7, 68); teeth of scapus minute, slightly protruding dorsally (fig. 3); marginal cell of fore wing comparatively short and robust (fig. 5); first metasomal tergite robust, its length about 1.6 times its apical width (fig. 65); second tergite sparsely longitudinally rugose, irregular (fig. 65); depression of vertex shallow; frons without distinct carina or lamella (figs 2, 68); mandible brownish-yellow, normal, not plate-like flattened, and with one apical tooth only (fig. 166); area behind mandibular base rugose-striate (fig. 3); Malaysia (Borneo: Sabah) *S. breviceps* spec. nov.
- Eye in dorsal view 0.6-1.0 times as long as temple (figs 11, 16, 64, 71); teeth of scapus medium-sized, distinctly protruding dorsally (figs 10, 15, 64, 71); marginal cell of fore wing comparatively long (figs 17, 51, 73, but shorter in *S. acutidentatus*; fig. 79); first metasomal tergite slender, its length 2.4-2.7 times its apical width (figs 63, 69, 74, 82); second tergite densely longitudinally rugose, regular, and with interconnecting rugulae or punctures (figs 12, 18, 63, 69); depression of vertex deep (figs 9, 59, 71, 77); frons with distinct median carina or lamella (figs 59, 71, 77); mandible, pale yellowish, specialized, plate-like flattened, and with two apical teeth (figs 59, 72, 78); area behind mandibular base largely smooth 2
2. Head in dorsal view less slender (fig. 77); body dark brown or black; length of fore wing 1.8-2.5 mm; head less flattened in lateral view (figs 53, 76); shape of disco-submarginal cell of fore wing variable (figs 51, 79, 81) 3
- Head in dorsal view comparatively slender (fig. 71); body brown; length of fore wing about 1.5 mm; head comparatively flat in lateral view (fig. 70); shape of disco-submarginal cell of fore wing comparatively slender, parallel-sided (fig. 73); Brunei (Borneo) *S. longiceps* spec. nov.
3. Scapus with pair of minute teeth dorsally (fig. 77); third antennal segment about 1.2 times as long as fourth segment (fig. 80); antennal socket with acute tooth (figs 80); mandible comparatively slender (fig. 78); mesoscutum largely glabrous medio-anteriorly; mesosternal sulcus nearly smooth; Indonesia (Sulawesi)
..... *S. acutidentatus* spec. nov.

- Scapus with pair of large lobe-shaped teeth dorsally (figs 15, 57, 83); third antennal segment about 1.6 times as long as fourth segment (fig. 57); antennal socket with large lobe-shaped tooth (figs 64, 83); mandible robust (figs 59, 84); mesoscutum largely setose medio-anteriorly; mesosternal sulcus distinctly sculptured ... 4
- 4. First metasomal tergite constricted posteriorly and comparatively short (fig. 82); vein 1-SC+R of hind wing largely absent (fig. 81); vertex above eye convex in lateral view (fig. 83); disco-submarginal cell of fore wing subparallel-sided (fig. 81); antennal sockets brown; Malaysia (Borneo: Sabah) *S. constrictus* spec. nov.
- First tergite parallel-sided and long (fig. 63); vein 1-SC+R of hind wing pigmented (fig. 51); vertex above eye in lateral view less convex (fig. 53); disco-submarginal cell of fore wing widened anteriorly (fig. 51); antennal sockets mainly pale yellowish; Indonesia (Sumbawa) *S. maximus* van Achterberg, spec. nov.

Sinuatophorus acutidentatus van Achterberg, spec. nov.
(figs 74-80)

Material.— Holotype, ♀ (RMNH), "Indonesia: [East] C[entral] Sulawesi, n[ea]r Luwuk, Salodik, c 400 m, 1-14.xi.1989, Mal. trap 14, C. v. Achterberg, RMNH/89".

Holotype, ♀, length of body 2.7 mm, of fore wing 1.8 mm.

Head.— Head rather deeply emarginate posteriorly (fig. 77), and in lateral view comparatively high (fig. 76); antenna with 19 segments, length of third segment 1.2 times fourth segment; length of third and fourth segments 4.0 and 2.5 times their width, respectively, fourth segment about 35% wider than third segment (fig. 80); scapus hardly protruding dorsally, with medium-sized and acute pair of teeth (fig. 76); length of maxillary palp 0.7 times height of head; occipital carina absent dorsally but distinct laterally; frons concave medially and with strong median carina (fig. 77); vertex distinctly depressed medially (fig. 77); eye in dorsal view as long as temple; OOL:diameter of posterior ocellus:POL = 2:1:4; face largely smooth; clypeus flat and transversely rugose; malar space absent; mandible comparatively slender, flat and gradually narrowed, strongly twisted apically, its inner tooth distinct but small (fig. 78).

Mesosoma.— Length of mesosoma twice its height; side of pronotum smooth, with some crenulae medially and rugosity ventrally and posteriorly; lateral carina of mesoscutum upcurved anteriorly, distinct; precoxal sulcus absent anteriorly, remainder curved, finely and narrowly crenulate, and connected to episternal scrobe, forming one crenulate groove; mesopleuron rugose dorsally, remainder smooth; mesosternal sulcus wide and smooth; metapleuron coarsely rugose-reticulate, but smooth anteriorly; mesoscutum largely glabrous; scutellar sulcus narrow and finely crenulate; dorsal surface of propodeum coarsely reticulate, with weak median carina, and its posterior face short and largely smooth, dorsally limited by a rather strong curved carina.

Wings.— Fore wing: r widened and short; r:3-SR+SR1:2-SR = 1:38:15; cu-a indistinct; 1-CU1:2-CU1 = 1:11; disco-submarginal cell widened anteriorly, rather robust (fig. 79); marginal cell rather robust and short (fig. 79).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.1,



Figs 2-8, *Simuatothorus breviceps* gen. nov. & spec. nov., ♀, holotype. 2, head, dorso-anterior aspect; 3, head, ventro-anterior aspect; 4, mesosoma, ventro-lateral aspect; 5, wings; 6, metasoma, lateral aspect; 7, habitus, lateral aspect; 8, apex of ovipositor, lateral aspect.

7.8, and 7.3 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs 0.2 and 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 2.6 times its apical width, parallel-sided, its surface densely coarsely rugose-reticulate; second tergite completely longitudinally rugose, with interconnecting sculpture, subreticulate (fig. 74); second metasomal suture absent; upper valve of ovipositor with two deep depressions, and two strongly curved parts (fig. 75); length of ovipositor sheath 0.88 times fore wing.

Colour.— Dark brown or blackish; scapus, pedicellus, third antennal segment, antennal socket, tegulae and legs (but all femora rather brownish) pale yellowish; head largely, propleuron, mesoscutum partly, third and following metasomal tergites rather chestnut-brown; pterostigma and most veins rather dark brown; wing membrane slightly infusate.

Sinuatophorus breviceps Quicke & van Achterberg, spec. nov.
(figs 2-8, 65-68)

Material.— Holotype, ♀ (BMNH), "East **Malaysia**, Sabah, Danum Valley Field Centre, vii-viii. 1986, E. Smith".

Holotype, ♀, length of body 1.9 mm, of fore wing 1.5 mm.

Head.— Head rather deeply emarginate posteriorly (fig. 68); antenna incomplete, remaining segments 11, length of third segment 1.3 times fourth segment; length of third and fourth segments 4.0 and 2.3 times their width, respectively, fourth segment about 50% wider than third segment; scapus hardly protruding ventrally, its teeth minute (fig. 2); length of maxillary palp 0.5 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons concave medially and with weak median carina, divided into two parts anteriorly and remaining far removed from anterior ocellus (fig. 68); vertex shallowly depressed medially (figs 2, 68); length of eye in dorsal view 1.5 times temple; OOL:diameter of ocellus:POL = 5:2:5; face largely smooth; clypeus flat and rugulose; length of malar space 0.1 times basal width of mandible; mandible large and gradually narrowed, strongly twisted apically, its inner tooth obsolete (fig. 66).

Mesosoma.— Length of mesosoma 1.7 times its height; side of pronotum smooth, with some crenulae medially and rugulosity ventrally; lateral carina of mesoscutum upcurved anteriorly, distinct; anterior half of precoxal sulcus finely crenulate and connected to episternal scrobe, forming one crenulate groove; remainder of mesopleuron smooth; mesosternal sulcus very wide and distinctly rugose; metapleuron rugose, but smooth anteriorly; mesoscutum largely glabrous; scutellar sulcus medium-sized and finely crenulate; dorsal surface of propodeum coarsely reticulate, with median carina absent, and its posterior face short and largely smooth, dorsally with rather strong curved carina.

Wings.— Fore wing: r:3-SR+SR1 (up to wing margin, apically only faintly pigmented; r wide): 2-SR = 1:10:4; cu-a indistinct; 1-CU1:2-CU1 = 1:4; disco-submarginal cell widened anteriorly (fig. 5 as in *S. maximus*); marginal cell comparatively robust (fig. 5).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.6, 7.2, and 5.5 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs 0.2 and 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 1.6 times its apical width, parallel-sided, its surface densely coarsely rugose-reticulate (figs 6, 65); second tergite completely longitudinally rugose, with interconnecting finer sculpture; second metasomal suture absent; upper valve of ovipositor with one shallow and one deep depression, part of ovipositor posterior to deep depression strongly curved (figs 8, 67); length of ovipositor sheath 0.71 times fore wing.

Colour.— Dark brown; scapus, pedicellus, tegulae and legs (but hind femur except its brown apex) pale yellowish; pterostigma and veins brown; wing membrane slightly infusate.

Sinuatophorus constrictus van Achterberg, spec. nov.
(figs 81-84)

Material.— Holotype, ♀ (ZIL), "[East] Malaysia, Sabah, Sipitang, Mendolong, T51R, 3.v.1988, S. Adebratt".

Holotype, ♀, length of body 3.5 mm, of fore wing 2.4 mm.

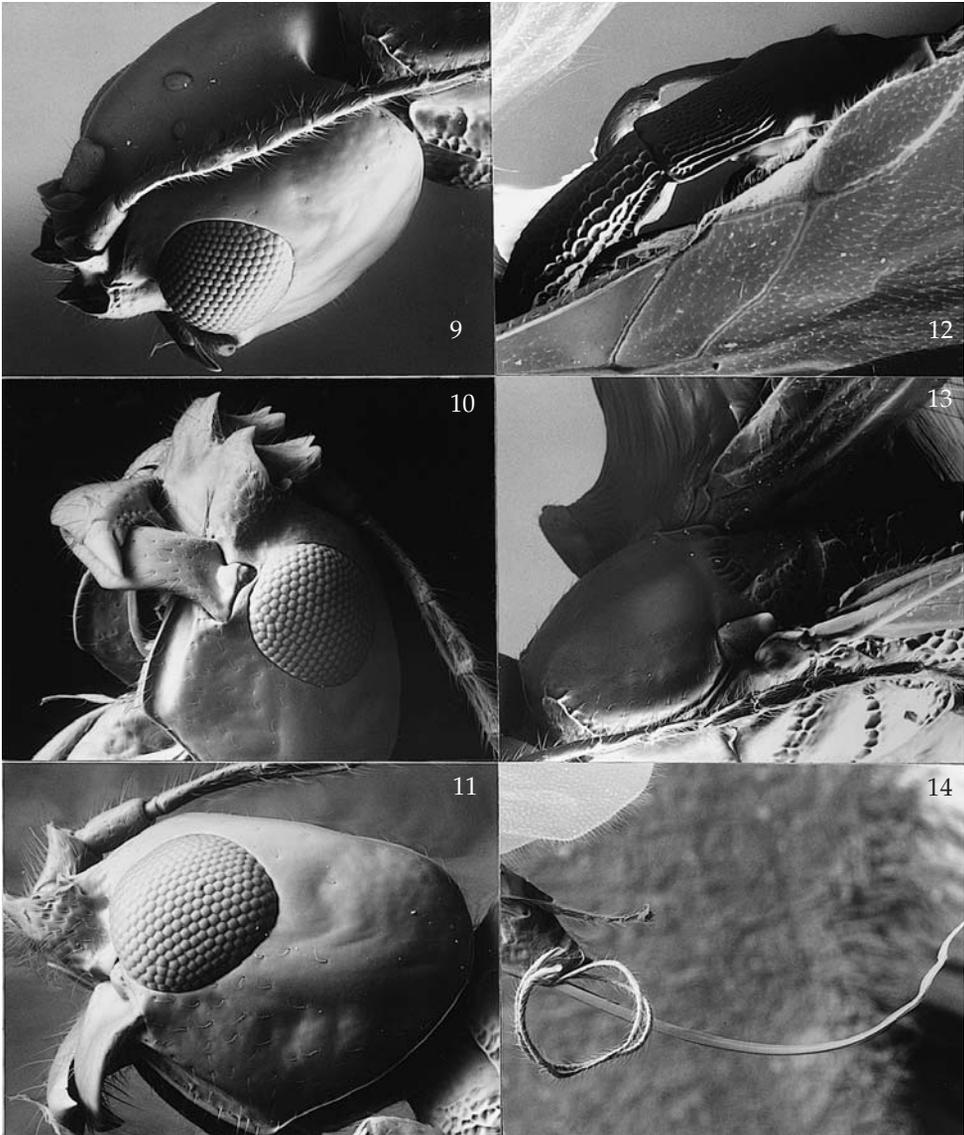
Head.— Head rather deeply emarginate posteriorly, comparatively convex and above eye rather bulbous (fig. 83); antenna compressed, with 22 segments, length of third segment 1.6 times fourth segment; length of third and fourth segments 4.3 and 2.0 times their width, respectively, fourth segment about 50% wider than third segment; scapus strongly protruding dorsally, its teeth large (fig. 83); length of maxillary palp 0.8 times height of head; occipital carina absent dorsally and remainder weakly developed; frons distinctly convex laterally, concave medially and with strong lamelliform median carina, almost reaching anterior ocellus; vertex deeply depressed medially; length of eye in dorsal view 0.7 times temple; OOL:diameter of ocellus:POL = 8:3:10; face and clypeus largely smooth; clypeus flat and rugulose; length of malar space 0.1 times basal width of mandible; mandible large, robust, angularly bent, narrowed and strongly twisted apically, flattened, subhorizontal, its inner tooth small (fig. 84).

Mesosoma.— Length of mesosoma 1.8 times its height; side of pronotum smooth, with some crenulae medially and rugulosity ventrally; lateral carina of mesoscutum upcurved anteriorly, indistinct medially; precoxal sulcus finely crenulate and connected to episternal scrobe, forming a curved crenulate groove; remainder of mesopleuron largely smooth, but punctate-rugose near middle coxa and distinctly rugose antero-dorsally; mesosternal sulcus very wide, shallow and distinctly rugose; metapleuron reticulate-rugose, but smooth anteriorly; mesoscutum largely setose; scutellar sulcus medium-sized and finely crenulate; dorsal surface of propodeum coarsely reticulate and punctate, without distinct median carina, and its posterior face short and finely rugose, dorsally with rather strong irregular carina.

Wings.— Fore wing: r:3-SR+SR1 (upto wing margin, apically only faintly pigmented):2-SR = 1:34:13; cu-a short; 1-CU1:2-CU1 = 1:7; disco-submarginal cell comparatively slender, subparallel-sided. Hind wing: 1-SC+R indistinct, not pigmented; marginal cell comparatively slender (fig. 81).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.1, 9.4, and 10.0 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs 0.25 and 0.30 times hind basitarsus.

Metasoma.— Length of first tergite 2.5 times its apical width, widened submedially, narrowed basally and apically (fig. 82), its surface densely coarsely reticulate-punctate; second tergite completely sculptured, laterally costate, medially mainly reticulate-punctate; second metasomal suture absent; ovipositor extended, and with one downwards curve; length of ovipositor sheath 0.79 times fore wing.



Figs 9-14, *Sinuatophorus longiceps* gen. nov. & spec. nov., ♀, holotype. 9, head, latero-dorsal aspect; 10, mandible, ventro-lateral aspect; 11, head, lateral aspect; 12, first and second metasomal tergites, dorso-lateral aspect; 13, mesoscutum, dorso-lateral aspect; 14, ovipositor, lateral aspect.

Colour.— Dark brown or blackish; scapus, pedicellus, antennal sockets mainly, mandible (but laterally dark brown), tegulae and legs (but fore and middle femora brown or dark brown as hind coxa) pale yellowish; metasoma (except first and second tergites), pterostigma and most veins more or less dark brown; apical 0.4 of fore wing membrane infuscate, remainder subhyaline.

Sinuatophorus longiceps Quicke & van Achterberg, spec. nov.
(figs 9-14, 69-73)

Material.— Holotype, ♀ (BMNH), "Brunei, Ulu Temburong, spring 1992, I. Gauld".

Holotype, ♀, length of body 2.3 mm, of fore wing 1.6 mm.

Head.— Head rather deeply emarginate posteriorly, and comparatively slender, flattened (figs 70, 71); antenna with 20 segments, length of third segment 1.4 times fourth segment; length of third and fourth segments 5.0 and 3.0 times their width, respectively, fourth segment about 50% wider than third segment; scapus moderately protruding dorsally, with two medium-sized teeth (fig. 10); antennal socket with distinctly triangular tooth (figs 10, 71); length of maxillary palp 0.6 times height of head; occipital carina largely absent dorsally and remainder distinct; frons concave medially and with distinct median carina, absent near anterior ocellus (fig. 71); vertex distinctly depressed medially (fig. 71); length of eye in dorsal view 0.7 times temple; OOL:diameter of ocellus:POL = 7:4:11; face largely smooth; clypeus flat and rugulose; no distinct malar space; mandible large and gradually narrowed, flattened, subhorizontal, strongly twisted apically, its inner tooth minute (fig. 72).

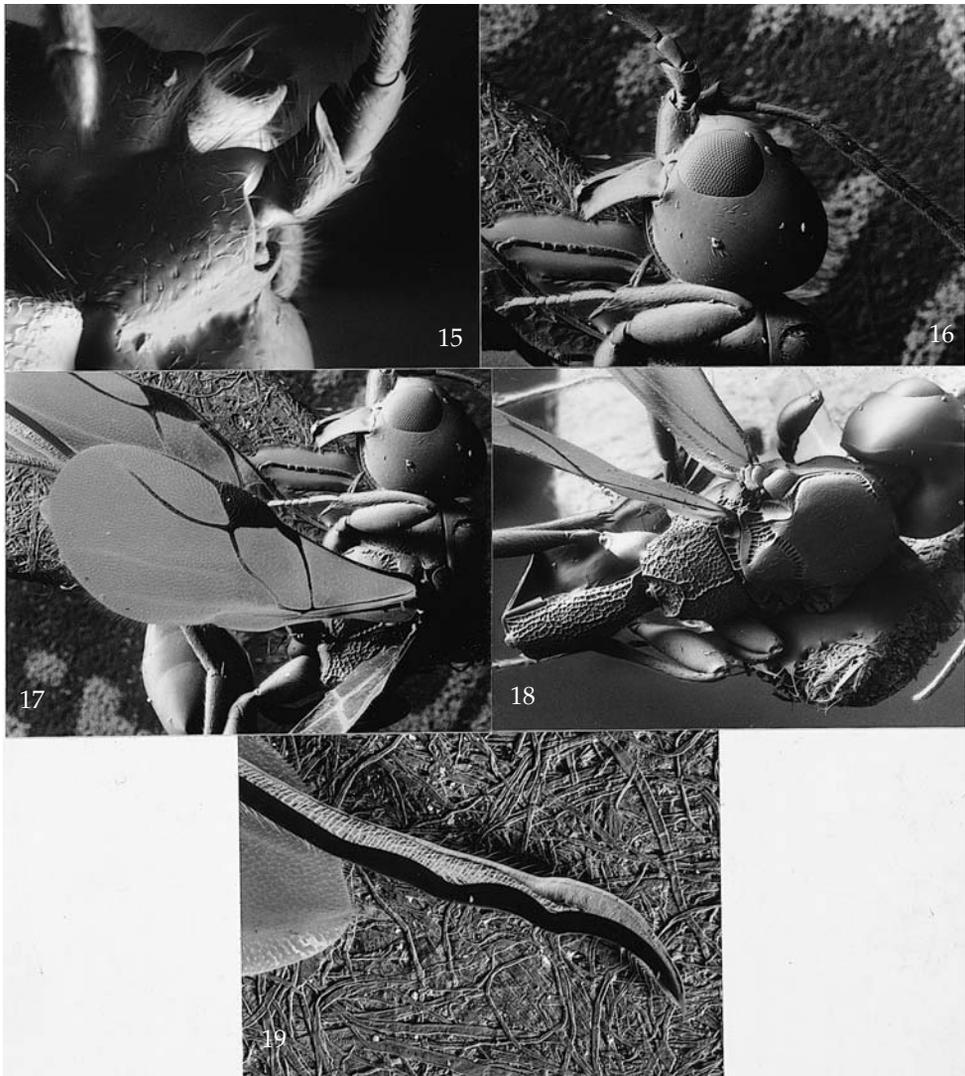
Mesosoma.— Length of mesosoma 1.9 times its height; side of pronotum largely smooth, with some crenulae medially and rugulosity ventrally; lateral carina of mesoscutum upcurved anteriorly, distinct; anterior quarter of precoxal sulcus absent, medially distinctly crenulate and connected to episternal scrobe, forming a curved crenulate groove; remainder of mesopleuron smooth, but distinctly rugose dorsally and with some rugae postero-ventrally; mesosternal sulcus very wide and distinctly rugose; metapleuron rugose, but smooth anteriorly; mesoscutum largely glabrous; scutellar sulcus wide and moderately crenulate; dorsal surface of propodeum coarsely reticulate but medially and posteriorly largely smooth, with median carina largely absent, and its posterior face short and largely smooth, dorsally with rather strong curved carina.

Wings.— Fore wing: r:3-SR+SR1 (up to wing margin, apically only faintly pigmented): 2-SR = 1:31:13; r short and very wide; disco-submarginal cell more slender than of *S. maximus*, parallel-sided (fig. 73); marginal cell slender; cu-a indistinct; 1-CU1:2-CU1 = 1:8. Hind wing: 2-SC+R rather long.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.4, 11.0, and 7.0 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs 0.2 and 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 2.6 times its apical width, nearly parallel-sided, its surface densely coarsely rugose-reticulate (fig. 69); second tergite completely longitudinally rugose, with punctures between rugae; second metasomal suture absent; upper valve of ovipositor with two deep depressions, two parts of ovipositor after deep depression strongly curved (fig. 14); length of ovipositor sheath 0.97 times fore wing.

Colour.— Brown; mandible, scapus, pedicellus, tegulae and legs (but hind femur brownish) pale yellowish; pterostigma and veins brown; wing membrane hyaline, without infusate parts.



Figs 15-19, *Simuatophorus maximus* gen. nov. & spec. nov., ♀, holotype. 15, face, latero-anterior aspect; 16, head, lateral aspect; 17, wings; 18, mesosoma and first metasomal tergite, dorso-lateral aspect; 19, apex of ovipositor, lateral aspect.

Simuatophorus maximus van Achterberg, spec. nov.
(figs 15-19, 51-64)

Material.— Holotype, ♀ (RMNH), "Indonesia: Sumbawa, Gn. Tambora, nr Pancasila, [c.] 800[-1100] m, 24.ix.1993, C. v. Achterberg, RMNH'93, [collected by hand-netting from a medium-sized fallen tree dead for about half a year]".

Holotype, ♀, length of body 4.2 mm, of fore wing 2.7 mm.

Head.— Head deeply emarginate posteriorly (fig. 64); antenna with 22 segments, length of third segment 1.6 times fourth segment, latter much wider than third (fig. 57); length of third, fourth, and penultimate segments 4.7, 2.0, and 1.7 times their width, respectively (figs 16, 52, 57, 58); scapus distinctly protruding ventrally, its teeth large, lobe-shaped (figs 15, 57); length of maxillary palp 0.7 times height of head; occipital carina weak laterally, strong ventrally, absent dorsally; frons and vertex very deeply concave medially (fig. 59, 64) and frons with lamelliform median carina, almost touching anterior ocellus (fig. 64); frons laterally moderately convex (fig. 53; less than in *S. constrictus* spec. nov.); length of eye in dorsal view 0.6 times temple; OOL:diameter of ocellus:POL = 9:5:10; face narrow, depressed laterally, strongly protruding medio-dorsally, its convex part punctate laterally, and antennal socket with distinct tooth at inner side (fig. 59); clypeus narrow, flat and smooth; length of malar space 0.1 times basal width of mandible; mandible strongly enlarged (figs 16, 53, 59), angled medially, flattened, small subapical tooth in same plane as apical tooth and near basal third with a third tooth (fig. 59) and only subapically narrowed, and strongly twisted.

Mesosoma.— Length of mesosoma 1.5 times its height; side of pronotum smooth, with some rugulosity posteriorly; lateral carina of mesoscutum upcurved anteriorly, distinct (fig. 53); anterior and posterior third of precoxal sulcus absent, medially curved upwards, connected to episternal scrobe, and forming one curved crenulate groove (fig. 53); remainder of mesopleuron largely smooth; mesosternal sulcus wide and rather sparsely vermiculate; metapleuron densely rugose; mesoscutum sparsely setose; scutellar sulcus shallow, curved and finely crenulate (fig. 62); dorsal surface of propodeum densely rugose-reticulate, with median carina medium-sized, and its posterior face short, sculptured and with oval areola, dorsally without curved carina (fig. 62).

Wings.— Fore wing: r:3-SR+SR1 (up to wing margin, apically only faintly pigmented): 2-SR = 1:33:11; cu-a short (fig. 51); 1-CU1:2-CU1 = 1:5; marginal cell comparatively slender (figs 17, 51). Hind wing: 2-SC+R long (fig. 51).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.6, 9.0, and 8.5 times their width, respectively; length of fore tibial spur 0.5 times fore basitarsus; length of fore tarsus 1.2 times fore tibia; length of hind tibial spurs 0.25 and 0.30 times hind basitarsus.

Metasoma.— Length of first tergite 2.7 times its apical width, nearly parallel-sided, its surface densely and coarsely reticulate-punctate (figs 18, 63); second tergite completely densely longitudinally rugose-punctate (fig. 63); second metasomal suture absent; upper valve of ovipositor with two deep depressions, part of ovipositor after last depression strongly curved (figs 19, 54, 55); length of ovipositor sheath equal to length of fore wing.

Colour.— Black; scapus, antenna (but 4 basal segments yellowish-brown), antennal sockets, tegula, femora (except apically), hind coxa largely, pterostigma (except small part of apex and of base), veins, parastigma largely and ovipositor sheath dark brown; apical half of wing membrane slightly infusate, remainder hyaline.

***Cosmophorus* Ratzeburg, 1848**
(figs 20-50, 85-186)

Cosmophorus Ratzeburg, 1848: 42; Shenefelt, 1969: 135-137; Capek, 1973: 264; Loan & Mathews, 1973: 207 (Nearctic species); Shaw, 1985: 317-318; Marsh et al., 1987: 65 (catalogue of Nearctic species); Shaw & Huddleston, 1991: 66 (biology); Yang, 1996: 29-30, 301 (Chinese species); Chen & van Achterberg, 1997: 39-40 (Chinese species). Type species (by monotypy): *Cosmophorus klugii* Ratzeburg, 1848 (lectotype designation by S.R. Shaw, 1985).

Cosmophorinus Viereck, 1925: 73 (as subgenus of the genus *Cosmophorus*); Shenefelt, 1969: 135; Shaw, 1985: 317. Type species (designated by Muesebeck & Walkley, 1951): *Cosmophorus hopkinsi* Ashmead, 1896 (information about type supplied by Mr T. Nuhn and Dr D. Smith (USNM)).

Diagnosis.— Antennal segments 12-19, but up to 22 in *C. regius* Niezabitowski; mandible more or less vertical, with two teeth, second tooth medium-sized or small but distinct, and situated ventrally to apical tooth of mandible, not in same plane as apical tooth (figs 93, 104, 107, 109, 133); POL 1.5-3.5 times posterior ocellus (figs 98, 118); second-fourth tarsal segments of fore leg shortened; second tergite largely (except basally) or entirely smooth (figs 94, 102, 115, 129, 179), without lateral crease, but completely sculptured in *C. rugitergitus*; ovipositor of ♀ straight (fig. 94) or slightly sinuate or curved apically, at most somewhat wavy (figs 173, 182).

Distribution.— Holarctic, Oriental, Afrotropical, Australian.

Key to Palaeotropical species of the genus *Cosmophorus* Ratzeburg
(for convenience the Palearctic species have also been included)

1. Vertex with deep median groove, depressed medially (fig. 85); POL about 2.5 times diameter of posterior ocellus and at least twice distance between anterior and posterior ocelli (fig. 85); vein 2-SC+R of hind wing comparatively long (fig. 90); (subgenus *Regiphorus* van Achterberg nov.) 2
- Vertex flattened, without distinct depression medially (figs 21, 27, 98, 118); POL 1.5-2.0 times diameter of ocellus and at most 1.5 times distance between anterior and posterior ocelli (figs 27, 98); length of vein 2-SC+R of hind wing variable, but usually medium-sized or short (figs 92, 131, 136); (subgenus *Cosmophorus* Ratzeburg, 1848) 3
2. Antenna with 16 segments; length of ovipositor sheath about 0.35 times fore wing; length of body about 1.5 mm; apical third of ovipositor straight (fig. 91); precoxal sulcus with two long oblique rugae, and anteriorly without crenulation; propodeum largely smooth; Oriental (Malaysia: Borneo (Sabah))..... *C. depressus* spec. nov.
- Antenna with of 19-23 segments; length of ovipositor sheath about 0.5 times fore wing; length of body about 3 mm; apical third of ovipositor distinctly sinuate; precoxal sulcus crenulate anteriorly or partly absent, without oblique rugae; propodeum more or less rugulose; Palearctic (Europe, China (including Taiwan), Japan) *C. regius* Niezabitowski, 1910
3. Third antennal segment short, distinctly (0.7-0.8 times) shorter than fourth segment (figs 105, 108) and 2.2-3.0 times as long as wide; hind coxa smooth; antenna whitish or yellowish(-brown) subapically; propodeum largely smooth dorsally;

- Vein 2-SC+R of hind wing shorter than vein 1r-m or largely absent (figs 131, 136, 161); second metasomal tergite at most basally sculptured; third antennal segment 0.8-1.3 times as long as fourth segment 9
- 9. Antenna with 16-19 segments (♀ ♂); Palaearctic 10
- Antenna with 13-15 segments (♀ ♂), or with 16 segments and Palaetropical 11
- 10. First metasomal tergite rather robust (fig. vii-51 in Yang, 1996); ovipositor strongly curved downwards *C. qilianshanensis* Yang, 1996
- First metasomal tergite less robust (fig. 25); ovipositor straight (fig. 17) *C. klugii* Ratzeburg, 1848
- 11. First metasomal tergite largely smooth, and nearly parallel-sided (♀), if strongly widened (♂), then brachypterous; antenna with 13-14 segments; Palaearctic *C. roubali* Capek, 1958
- First tergite largely sculptured, if partly smooth then distinctly widened apically; macropterous; antenna with 13-16 segments 12
- 12. Maxillary palp shortened, not extending beyond apex of mandible; ovipositor sheath longer than metasoma; Palaearctic *C. henscheli* Ruschka, 1925
- Maxillary palp medium-sized, distinctly extending beyond apex of mandible; length of ovipositor sheath variable 13
- 13. Head strongly flattened and enlarged in lateral view (fig. 47); length of fore wing 1.8-1.9 mm; mandible robust and distinctly angulate; body dark brown; Palaearctic (including Japan) *C. cembrae* Ruschka, 1925
- Head comparatively convex and less enlarged in lateral view (figs 27, 40); length of fore wing 1.1-1.5 mm; mandible less robust and gradually curved (figs 133, 139, 147, 155, 178, if rather angulate (*C. curvatus*: fig. 164) then body yellowish-brown); Palaetropical and montane Taiwan 14
- 14. Precoxal sulcus finely and narrowly rugose medially and near episternal scrobe, remainder of mesopleuron smooth (but distinctly sculptured dorsally and superficially so above middle coxa in *C. taiwanensis*); second metasomal tergite smooth basally (figs 129, 132); head and mesosoma dark brown or blackish; hind femur comparatively slender (fig. 128), about 4 times as long as wide; scapus small, tooth of antennal socket reaching close to apex of scapus (if scapus positioned close to anterior margin of socket; figs 126, 133); Palaearctic (montane Taiwan) 15
- Precoxal sulcus extensively sculptured, ventrally and dorsally mesopleuron partly irregularly reticulate; second metasomal tergite (usually narrowly and finely) sculptured basally (figs 150, 158, 185); head and mesosoma (brownish-)yellow; hind femur comparatively robust (figs 159, 169), 2.8-3.2 times as long as wide; scapus usually larger, tooth of antennal socket usually not reaching halfway to apex of scapus (figs 135, 145, 162, 184); Oriental 16
- 15. First metasomal tergite robust (fig. 129); femora largely infuscate or dark brown; marginal cell of fore wing comparatively slender (fig. 123); mesopleuron smooth dorsally *C. infuscatus* spec. nov.
- First metasomal tergite comparatively slender (fig. 132); femora yellowish; marginal cell of fore wing comparatively robust (fig. 130); mesopleuron distinctly rugose dorsally *C. taiwanensis* spec. nov.
- 16. First metasomal tergite comparatively robust (figs 22, 138, 141, 146); outer side of

- mandible rather convex (figs 139, 143, 147); fourth antennal segment about as long as the rather robust fifth segment (figs 135, 145); face flat medio-dorsally and with median carina (figs 140, 145) or vein r of fore wing comparatively long (fig. 137); setae of antenna long (fig. 21); Afrotropical or Australian 17
- First tergite comparatively slender (figs 29, 44, 160, 172, 175, 179); outer side of mandible flattened (fig. 164, 176, 178, but rather convex in *C. choui*: fig. 168); fourth antennal segment somewhat longer than fifth segment (figs 177, 184); face more or less concave medio-dorsally and without median carina (fig. 139); setae of antenna rather short to medium-sized (figs 153, 156); Oriental 19
- 17. Vein r of fore wing short (figs 142, 144); face flat medio-dorsally and with median carina (figs 140, 145); tegula pale yellowish; precoxal sulcus connected to base of middle coxa by a rugose or punctate area; marginal cell of fore wing comparatively small (figs 142, 144); scapus without distinct teeth apically (figs 140, 145); frons shallowly concave anteriorly; third antennal segment closely connected to fourth segment (figs 140, 145); Australian (New Guinea) 18
- Vein r of fore wing medium-sized (fig. 137); face depressed medio-dorsally and without median carina (fig. 139); tegula dark brown; precoxal sulcus not connected to base of middle coxa by a rugose area; marginal cell of fore wing comparatively large (fig. 137); scapus with rather small lobe-shaped teeth apically (figs 135, 139); frons nearly flat anteriorly; third antennal segment distinctly separated from fourth segment (fig. 135); Afrotropical (Congo) *C. brevipetiolatus* spec. nov.
- 18. Extended ovipositor approximately 0.5 times as long as fore wing, about as long as metasoma, its sheath approximately 0.3 times length of fore wing; groove between precoxal sulcus and episternal scrobe widely crenulate; first metasomal tergite largely smooth medially (fig. 141); third antennal segment 0.7 times fourth segment (fig. 140)..... *C. brevicaudatus* spec. nov.
- Extended ovipositor 0.7-0.9 times as long as fore wing, distinctly longer than metasoma, its sheath 0.4-0.6 times length of fore wing; groove between precoxal sulcus and episternal scrobe narrowly crenulate; first metasomal tergite densely and rather coarsely sculptured medially (fig. 146); third antennal segment 0.9 times fourth segment (fig. 145)..... *C. mesocaudatus* spec. nov.
- 19. Area below precoxal sulcus nearly completely and coarsely reticulate (fig. 150); third and fourth antennal segments yellow; scapus with indistinct teeth apically (fig. 152); face largely smooth; Indonesia (Mangole) *C. reticulatus* spec. nov.
- Area below precoxal sulcus largely smooth (figs 43, 158, 185); if micro-sculptured then fourth antennal segment dark brown, contrasting with yellowish third segment; apical teeth of scapus (figs 156, 168, 184) and sculpture of face variable ... 20
- 20. Fore tarsus of ♀ comparatively slender (fig. 157); head darker than mesoscutum; first metasomal tergite comparatively robust, approximately 1.5 times as long as its apical width (fig. 129); fourth antennal segment yellowish; Thailand *C. fusciceps* spec. nov.
- Shape of fore tarsus of ♀ variable (figs 165, 179), if comparatively slender (figs 165, 167), then head similarly coloured as mesoscutum; first metasomal tergite comparatively slender, 1.8-1.9 times as long as its apical width (figs 160, 172, 175, 179); fourth antennal segment (dark) brown 21

- 21. First metasomal tergite and third antennal segment yellow; fore tarsus of ♀ comparatively slender (figs 165, 167); head yellowish-brown dorsally; China (Taiwan)22
- First tergite and third antennal segment (except basally) (dark) brown; fore tarsus of ♀ comparatively robust (figs 179, 180); head dark brown dorsally; SE Asia ... 23
- 22. Mandible distinctly widened medially (fig. 164); marginal cell of fore wing comparatively wide (fig. 163); outer side of mandible flattened and smooth medially (fig. 164); vein SR1 of fore wing distinctly curved subbasally (fig. 163) *C. curvatus* spec. nov.
- Mandible less widened medially (fig. 168); marginal cell of fore wing comparatively narrow (fig. 171); outer side of mandible weakly convex and striate medially (fig. 168); vein SR1 of fore wing weakly curved subbasally (fig. 171) *C. choui* spec. nov.
- 23. Mesoscutum largely glabrous; head similarly coloured as mesoscutum; scapus with indistinct teeth (fig. 184); hind femur largely brown; second tergite narrowly sculptured basally (fig. 173); ovipositor comparatively slender (fig. 173); mandible not narrowed submedio-dorsally (fig. 176); Malaysia (Borneo: Sabah) *C. adebratti* spec. nov.
- Mesoscutum largely setose; head dark brown, much darker than mesoscutum; scapus with distinct teeth apically (fig. 178); hind femur pale yellowish; second metasomal tergite widely sculptured anteriorly (figs 44, 179); ovipositor more robust (figs 46, 182); mandible narrowed submedio-dorsally (fig. 178); Indonesia (Mangole) *C. harrysi* spec. nov.

Note.— A female specimen from Brunei (Ulu Temburong; BMNH) has been examined but the specimen was lost during examination in the scanning electron microscope. It is close to *C. harrysi* spec. nov., but differs e.g. by the nearly parallel-sided mandibles in lateral view (figs 38, 39) and the largely smooth face (fig. 39).

Subgenus *Regiphorus* van Achterberg, subgen. nov.
(figs 85-91)

Type species: *Cosmophorus regius* Niezabitowski, 1910.

Etymology.— From “*regius*” (name of the type species) and the second part of the generic name *Cosmophorus* Ratzeburg, 1848. Gender: masculine.

Diagnosis.— Antennal segments 16-23; vertex distinctly depressed and with anterior ocellus situated much lower than posterior ocelli (fig. 85).; POL at least twice as long as distance between anterior and posterior ocelli (fig. 85); vein 2-SC+R of hind wing long (fig. 90).

Cosmophorus (Regiphorus) depressus van Achterberg, spec. nov.
(figs 85-91)

Material.— Holotype, ♀ (ZIL), “[East] **Malaysia**: Sabah, Sipitang, Mendolong, T1B/W4, 25.iv.1988, S. Adebratt”.

Holotype, ♀, length of body 1.6 mm, of fore wing 1.2 mm.

Head.— Head rather deeply emarginate posteriorly (fig. 85); antenna with 16 seg-

ments, third segment as long as fourth segment; length of third and fourth segments 4.0 and 2.4 times their width, respectively, fourth segment about 65% wider than third segment; scapus moderately protruding ventrally, with pair of medium-sized lobe-shaped teeth; antennal sockets with pair of rather large acute teeth; length of maxillary palp 0.8 times height of head; occipital carina absent dorsally but rather well developed laterally and distinct ventrally; frons distinctly concave medially and with strong lamelliform carina, reaching anterior ocellus (fig. 85); vertex with a distinct groove-like depression medially (fig. 85); length of eye in dorsal view 0.7 times temple; OOL:diameter of ocellus:POL = 8:2:7; anterior ocellus situated lower than lateral ocelli, smaller; face distinctly depressed medio-ventrally, smooth; clypeus narrow and smooth; length of malar space 0.1 times basal width of mandible; mandible large, hardly narrowed, somewhat twisted apically, its outer surface partly concave, its second tooth large, situated below first tooth (figs 87, 88).

Mesosoma.— Length of mesosoma 1.6 times its height; pronope vertical, deep, rather long (occupying almost whole pronotum medially); side of pronotum smooth; lateral carina of mesoscutum gradually upcurved anteriorly, distinct; anterior half of precoxal sulcus with two oblique rugae, one runs to middle coxa and is connected to episternal scrobe, as a sparsely crenulate groove; remainder of mesopleuron smooth; mesosternal sulcus very wide and mainly smooth; metapleuron smooth except for some rugae ventrally; mesoscutum largely glabrous and smooth; scutellar sulcus narrow and finely crenulate; dorsal surface of propodeum largely smooth, with median carina weak, short and irregular, and its posterior face rather short, dorsally with rather strong curved carina.

Wings.— Fore wing: r:3-SR+SR1: 2-SR = 1:25:14; r wide; cu-a indistinct; 1-CU1:2-CU1 = 2:5; parastigma relatively distinct; disco-submarginal cell distinctly widened anteriorly. Hind wing: 2-SC+R long (fig. 90).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 2.8, 8.5, and 4.5 times their width, respectively; length of fore tibial spur 0.9 times fore basitarsus; length of hind tibial spurs 0.3 and 0.4 times hind basitarsus.

Metasoma.— Length of first tergite 1.9 times its apical width, slender, subapically gradually widened (fig. 89), its surface rather coarsely rugose-reticulate; second tergite completely smooth; second metasomal suture absent; upper valve of ovipositor without depression, but slightly wavy (fig. 91); length of ovipositor sheath 0.36 times fore wing.

Colour.— Brown; head (but antennal sockets and mandible yellowish-brown) dark brown; pedicellus, tegulae and legs (but middle and hind femora, and base of hind coxa rather brown) pale yellowish; scapus, third and fourth antennal segments, propodeum more or less yellowish-brown; remainder of antenna brown, but apically rather pale brown; pterostigma and veins rather dark brown; wing membrane subhyaline.

Subgenus *Cosmophorus* Ratzeburg, 1848
(figs 20-50, 92-186)

Cosmophorus Ratzeburg, 1848: 42. Type species (by monotypy): *Cosmophorus klugii* Ratzeburg, 1848 (lectotype designation by S.R. Shaw, 1985).

Cosmophorinus Viereck, 1925: 73 (as subgenus of the genus *Cosmophorus*). Type species (designated by Muesebeck & Walkley, 1951): *Cosmophorus hopkinsi* Ashmead, 1896.

Diagnosis.— Antennal segments 12-19; vertex flattened, without wide groove medially, and anterior ocellus at same level as posterior ocelli (figs 21, 27, 98, 118); POL about as long as distance between anterior and posterior ocelli (fig. 98); vein 2-SC+R of hind wing usually medium-sized to short (figs 92, 131, 161), but long in *C. robustus* spec. nov.

Cosmophorus (*Cosmophorus*) *adebratti* van Achterberg, spec. nov.
(figs 173-176, 183-186)

Material.— Holotype, ♀ (ZIL), “[East] Malaysia: Sabah, Sipitang, Mendolong, T3/W5, 31.iii.1989, S. Adebratt”.

Holotype, ♀, length of body 1.5 mm, of fore wing 1.1 mm.

Head.— Head rather weakly emarginate posteriorly, in lateral view distinctly convex; antenna with 15 segments, third segment as long as fourth segment, fifth segment somewhat shorter than fourth segment; length of third and fourth segments 3.5 and 3.0 times their width, respectively, fourth segment about 30% wider than third segment (fig. 184); scapus not protruding ventrally, truncate, without distinct teeth; antennal socket with rather large acute tooth (fig. 184); length of maxillary palp 0.8 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons concave medially and with medium-sized median carina, with two branches anteriorly and remaining far removed from anterior ocellus; vertex nearly flat medially; length of eye in dorsal view 0.8 times temple; OOL:diameter of ocellus:POL = 7:2:3; distance between anterior and posterior ocelli about 2.5 times diameter of ocellus; face weakly depressed medially, largely smooth; clypeus nearly flat and smooth; length of malar space 0.1 times basal width of mandible; mandible large, flattened and gradually curved, not narrowed submedio-dorsally (fig. 176), distinctly twisted apically, its second (= lower) tooth somewhat shorter than upper tooth (fig. 176).

Mesosoma.— Length of mesosoma 1.5 times its height; side of pronotum smooth, with some crenulae medially and some rugulosity ventrally; lateral carina of mesoscutum almost straight and oblique anteriorly, distinct; anteriorly precoxal sulcus narrow, rugose, remainder widely rugose, with rugosity extending to base of middle coxa, and connected to episternal scrobe; dorsally mesopleuron rugose, remainder smooth; mesosternal sulcus very wide, shallow and with some oblique rugae; meta-pleuron reticulate-rugose; mesoscutum largely glabrous; scutellar sulcus rather narrow and with a few crenulae; dorsal surface of propodeum densely reticulate, partly superficially, with median carina absent, and its posterior face short and largely smooth, dorsally with rather strong curved carina.

Wings.— Fore wing: marginal cell slender (fig. 186); disco-submarginal cell somewhat widened anteriorly; r:3-SR+SR1: 2-SR = 3:29:13; cu-a indistinct; 1-CU1:2-CU1 = 1:4. Hind wing: 2-SC+R short (fig. 174).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.0,

10.0 and 5.0 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs 0.25 and 0.35 times hind basitarsus.

Metasoma.— Length of first tergite 1.9 times its apical width, parallel-sided, its surface densely coarsely longitudinally rugose-reticulate (fig. 175); second tergite only basally narrowly striate; second metasomal suture absent; upper valve of ovipositor without depressions, rather slender and rather wavy apically (fig. 173); length of ovipositor sheath 0.84 times fore wing, somewhat longer than metasoma.

Colour.— Dark brown, with propodeum and first tergite darker than remainder of body; scapus, pedicellus, base of third segment, tegulae and legs (except middle and hind femora) pale yellowish; pterostigma and veins dark brown; wing membrane slightly infusate; metasoma ventrally pale yellowish-brown; middle and hind femora yellowish-brown; face, mandible, to some degree temple, and prothorax (except dorsally), brownish-yellow; remainder of antenna brown.

Cosmophorus (Cosmophorus) alboterminalis Quicke & van Achterberg, spec. nov.
(figs 103-105)

Material.— Holotype, ♀ (BMNH), "Thailand: Chiang Mai, 14.viii-14.ix.1984, D. Jackson". Non-type specimen: ?♂ (RMNH), Thailand: Suphanburi, Khao Yai Nat. Pak, Elephant Cross Trail, 900 m, 2.vii.1990, J. Heraty".

Holotype, ♀, length of head and mesosoma 1.9 mm (metasoma missing), of fore wing 1.1 mm.

Head.— Head weakly emarginate posteriorly; antenna with 14 segments, length of third segment 0.7 times fourth segment; length of third and fourth segments 2.0 and 2.3 times their width, respectively, fourth segment about 50% wider than third segment (fig. 105); scapus hardly protruding ventrally, with pair of medium-sized teeth; antennal socket with a rather large and a small tooth (fig. 104); length of maxillary palp about 0.6 times height of head; occipital carina nearly complete, narrowly interrupted dorsally and rather distinct; frons shallowly concave medially and with short and rather strong median carina; vertex slightly convex, nearly flat medially; eye in dorsal view as long as temple; OOL:diameter of ocellus:POL = 7:2:2; face largely smooth; clypeus flat, smooth and with semicircular dorsal carina, with row of long setae; length of malar space 0.1 times basal width of mandible; mandible medium-sized and gradually narrowed, not angulate, slender, and strongly twisted apically, its inner tooth small (fig. 104).

Mesosoma.— Length of mesosoma 1.6 times its height; side of pronotum largely smooth, with some fine crenulae medially; lateral carina of mesoscutum weak, upcurved anteriorly; propleuron evenly convex, with weak transverse carina (but in other specimen only with some reticulation); anterior quarter of precoxal sulcus largely smooth, remainder distinctly crenulate and connected to episternal scrobe, forming a curved crenulate groove; remainder of mesopleuron smooth; mesosternal sulcus not visible because of glue; metapleuron largely smooth, rather rugulose ventrally; mesoscutum largely glabrous; scutellar sulcus narrow and nearly smooth; dorsal surface of propodeum largely smooth, medially and posteriorly finely rugose, with median carina absent, and its posterior face short and largely smooth, dorsally bordered by a medium-sized curved carina.

Wings.— Fore wing: r:3-SR+SR1 (distinctly curved; fig. 103); 2-SR = 1:21:8; cu-a indistinct; 1-CU1:2-CU1 = 1:6; marginal cell robust (fig. 103); disco-submarginal cell widened anteriorly. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 2.7, 10.0, and 5.5 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs about 0.3 times hind basitarsus.

Metasoma.— Missing.

Colour.— Yellowish-brown; pedicellus, antennal socket dorsally, mesoscutum, scutellum anteriorly, tegulae and legs pale yellowish; pterostigma dark brown; veins brown; stemmaticum infuscate; 13th and 14th antennal segments whitish; fifth-tenth segments dark brown; wing membrane subhyaline; remainder of antenna yellowish-brown.

Notes.— Both specimens lost their metasomas during transport for scanning. The non-type specimen is similar, but has 12 antennal segments, the antenna is pale brownish apically and its segments are more slender, and the scutellar sulcus is distinctly crenulate. This specimen is probably the male of the new species.

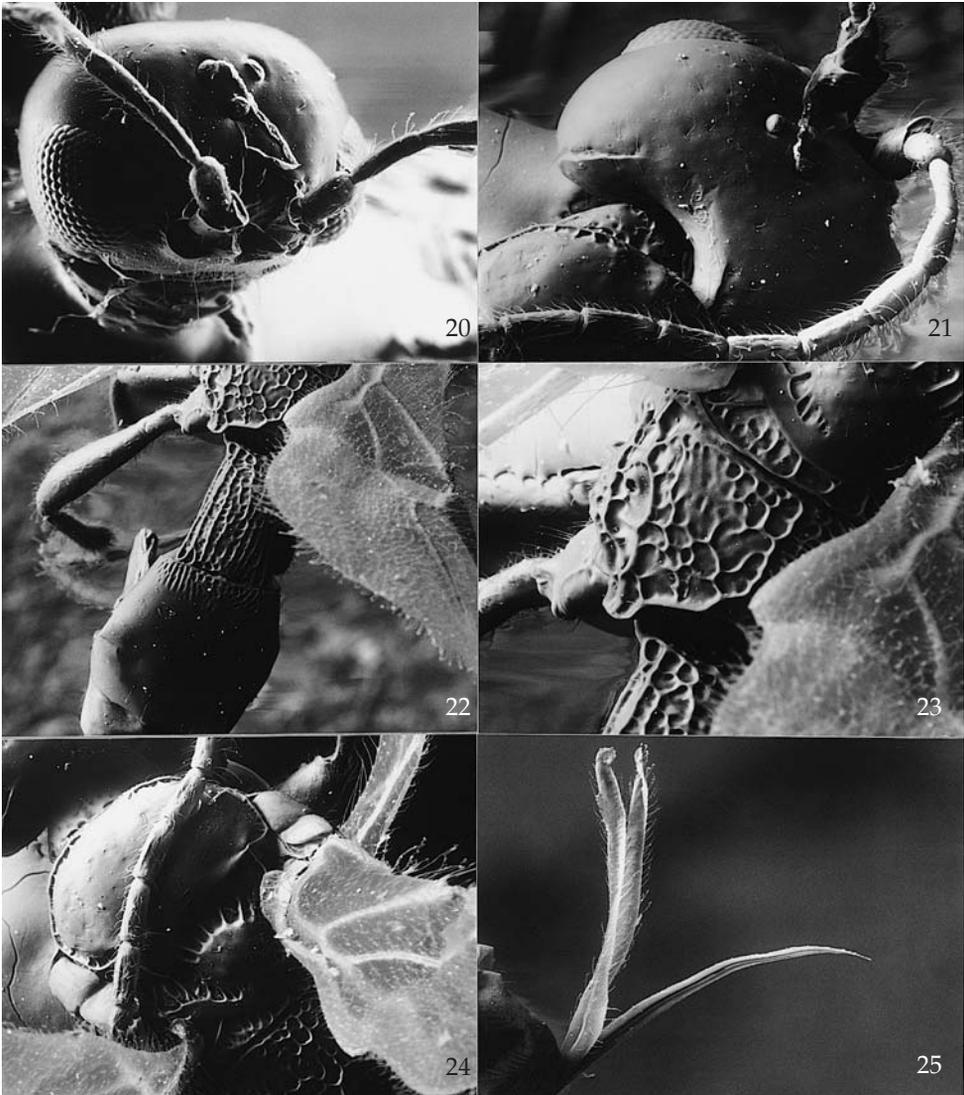
Cosmophorus (Cosmophorus) brevicaudatus van Achterberg, spec. nov.
(figs 140-143)

Material.— Holotype, ♀ (KBIN), "Canopy mission FOG. XL [= fogging of *Xanthophyllum papuana* (Xanthophyllaceae)], 4.v.1994"; "Papua New Guinea, Madang, Baiteta, 5°1'10"S 145°45'0"E, O. Missa, Coll. R.I.Sc.N.B."

Holotype, ♀, length of body 0.9 mm, of fore wing 0.9 mm.

Head.— Head hardly emarginate posteriorly, in lateral view distinctly convex; antenna with 15 segments, third segment 0.7 times as long as fourth segment, weakly separated, fifth segment about as long as fourth segment; length of third and fourth segments 3.0 and 2.7 times their width, respectively, fourth segment about 50% wider than third segment; scapus not protruding ventrally, with pair of minute teeth; antennal socket with large triangular tooth (fig. 140); length of maxillary palp 0.8 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons depressed antero-medially and with medium-sized median carina, with two branches anteriorly and close to anterior ocellus; vertex nearly flat medially; length of eye in dorsal view 1.1 times temple; OOL:diameter of ocellus:POL = 3:1:2; distance between anterior and posterior ocelli about 1.5 times diameter of ocellus; face flat medially with short median carina (fig. 140), largely smooth; clypeus nearly flat and smooth; length of malar space 0.1 times basal width of mandible; mandible comparatively narrow (fig. 143), outer side convex and with some striae and hardly curved, distinctly twisted apically, its second (= lower) tooth small, much shorter than upper tooth (fig. 143).

Mesosoma.— Length of mesosoma 1.4 times its height; side of pronotum largely smooth, with some rugae posteriorly and ventrally; lateral carina of mesoscutum subtransverse anteriorly, distinct; precoxal sulcus anteriorly narrow crenulate, remainder widely crenulate, with punctate area above base of middle coxa, and area between sulcus and episternal scrobe coarsely crenulate; mesopleuron dorsally rugose, remainder smooth; mesosternal sulcus very wide, shallow and reticulate; postpectal



Figs 20-25, *Cosmophorus brevipetiolatus* spec. nov., ♀, holotype. 20, head, antero-dorsal aspect; 21, head, postero-dorsal aspect; 22, first and second metasomal tergites, dorso-lateral aspect; 23, propodeum, dorsal aspect; 24, mesoscutum, dorsal aspect; 25, ovipositor, lateral aspect.

carina complete; metapleuron coarsely rugose; mesoscutum setose; scutellar sulcus medium-sized and crenulate; dorsal surface of propodeum distinctly and densely reticulate, with median carina absent, and its posterior face short and largely smooth, dorsally bordered by a rather strong curved carina, carina protruding ventrally.

Wings.— Fore wing: marginal cell short, robust (fig. 142); disco-submarginal cell distinctly widened anteriorly (fig. 142); r wide; r:3-SR+SR1: 2-SR = 1:25:15; cu-a indistinct; 1-CU1:2-CU1 = 1:3. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 2.8, 7.3 and 5.0 times their width, respectively; length of fore spur 0.8 times fore basitarsus; fore tarsus robust; length of hind tibial spurs 0.30 and 0.35 times hind basitarsus.

Metasoma.— Length of first tergite 1.4 times its apical width, subparallel-sided (fig. 141), its surface laterally with distinct rugae, medially superficially sculptured and partly smooth (fig. 141); second tergite only basally narrowly striate; second metasomal suture absent; upper valve of ovipositor without depressions, apical half slender and rather wavy apically; length of extended ovipositor 0.5 times fore wing and about as long as metasoma; length of ovipositor sheath 0.28 times fore wing, about as long as metasoma.

Colour.— Dark brown; face, clypeus, frons anteriorly, first-fourth antennal segment, propodeum, and first tergite, brownish-yellow; palpi, tegula and legs pale yellowish; pterostigma dark brown with its borders pale brown; wing membrane subhyaline but below pterostigma slightly infuscate.

Cosmophorus (*Cosmophorus*) *brevipetiolatus* Quicke & van Achterberg, spec. nov.
(figs 20-25, 135-139)

Material.— Holotype, ♀ (BMNH), "Congo Belge, Yangambi, 1952, Dr. Schedl", "K. Schedl, s.148-5".

Holotype, ♀, length of body 1.3 mm, of fore wing 1.1 mm.

Head.— Head emarginate posteriorly (fig. 21); antenna long setose (figs 21, 135), with 16 segments, third segment as long as fourth segment; length of third and fourth segments 3.5 and 2.3 times their width, respectively, fourth segment about 50% wider than third segment; scapus hardly protruding ventrally, with pair of minute teeth and antennal sockets with a large triangular tooth (fig. 135); length of maxillary palp unknown (covered by glue); occipital carina widely interrupted dorsally and remainder distinct; frons rather flat medially and with weak median carina, divided into two branches anteriorly and remaining far removed from anterior ocellus; vertex flat medially; length of eye in dorsal view 1.1 times temple; OOL:diameter of ocellus:POL = 7:4:5; face smooth, depressed medio-dorsally, without median carina; clypeus flat and smooth; length of malar space 0.2 times basal width of mandible; mandible medium-sized, outer side slightly convex, rather flat and gradually narrowed, strongly twisted apically, its second tooth large (fig. 139); malar space with oblique depression.

Mesosoma.— Length of mesosoma 1.4 times its height; propleuron distinctly convex and rugose, no carina; side of pronotum smooth, with some carinae and rugulae ventrally; lateral carina of mesoscutum rather angulate anteriorly, distinct; anterior third of precoxal sulcus finely crenulate, its medial third widely reticulate-rugose and connected to episternal scrobe, narrow, forming one oblique groove; remainder of mesopleuron smooth; mesosternal sulcus not visible because of glue; metapleuron reticulate-rugose; mesoscutum largely glabrous; scutellar sulcus medium-sized and distinctly crenulate; dorsal surface of propodeum densely reticulate-rugose, with median carina absent, and its posterior face short and largely smooth, dorsally bordered by a strong curved carina.

Wings.— Fore wing: r:3-SR+SR1 (unpigmented): 2-SR = 2:29:10; cu-a indistinct; 1-CU1:2-CU1 = 2:5; disco-submarginal cell rather slender, gradually widened (fig. 137). Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth (except one weak carina anteriorly); length of femur, tibia and basitarsus of hind leg 3.2, 8.3, and 6.0 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs about 0.5 times hind basitarsus.

Metasoma.— Length of first tergite 1.5 times its apical width, rather robust, widened apicad (fig. 138), its surface coarsely longitudinally rugose; basal fifth of second tergite obliquely rugose, remainder smooth; second metasomal suture absent; upper valve of ovipositor nearly straight; length of ovipositor sheath 0.67 times fore wing.

Colour.— Dark brown; scapus, pedicellus, third and fourth antennal segments, humeral plate, and legs pale yellowish; tegula rather dark brown; pterostigma (except narrowly basally and apically) rather dark brown; veins pale brown; remainder of antenna brown; wing membrane slightly infusate.

Cosmophorus (*Cosmophorus*) *choui* van Achterberg, spec. nov.
(figs 166-172)

Material.— Holotype, ♀ (TARI), “[China], C. Taiwan, Wanfeng Hill, Taichung Hsien, 30.xii.1982, K.C. Chou & S.P. Huang”.

Holotype, ♀, length of body 1.3 mm, of fore wing 1.1 mm.

Head.— Head hardly emarginate posteriorly, in lateral view distinctly convex; antenna incomplete, with 12 segments, third segment as long as fourth and fifth segments; length of third and fourth segments 3.0 and 2.5 times their width, respectively, fourth segment about 20% wider than third segment (fig. 166); scapus not protruding ventrally, with pair of minute lobe-shaped teeth; antennal socket with large acute tooth (fig. 168); maxillary palp incomplete, basal segments elongate; occipital carina widely interrupted dorsally and remainder distinct; frons rather concave medially and with unbranched median carina and remaining far removed from anterior ocellus; vertex rather convex medially; length of eye in dorsal view 0.9 times temple; OOL:diameter of ocellus:POL = 5:2:3; distance between anterior and posterior ocelli about 1.5 times diameter of ocellus; face largely flat, weakly depressed medio-dorsally, largely smooth; clypeus nearly flat and smooth; length of malar space 0.2 times basal width of mandible; mandible comparatively slender, its outer side rather convex and striate medially, distinctly twisted apically, and its second (= lower) tooth large, somewhat shorter than upper tooth (fig. 168).

Mesosoma.— Length of mesosoma 1.6 times its height; ventral half of side of pronotum with some rugae, remainder largely smooth; lateral carina of mesoscutum strong anteriorly, transverse; precoxal sulcus anteriorly rather narrow, with few rugae, medially widely rugose, with area above base of middle coxa and area near to episternal scrobe rugose; dorsally mesopleuron rugulose, remainder smooth; mesosternal sulcus shallow and wide, mesosternum extensively rugose; metapleuron densely rugulose and with some rugae; mesoscutum largely glabrous, but medially sparsely setose; scutellar sulcus narrow and distinctly crenulate; dorsal surface of propodeum densely and finely reticulate, median carina absent, and its posterior face largely smooth, dorsally with strongly arched carina.

Wings.— Fore wing: marginal cell robust (fig. 171); disco-submarginal cell widened anteriorly; r:3-SR+SR1: 2-SR = 1:32:23; cu-a indistinct; 1-CU1:2-CU1 = 1:3. Hind wing: 2-SC+R medium-sized (fig. 170).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.0, 10.5 and 4.5 times their width, respectively; length of fore spur 0.7 times fore basitarsus; fore tarsus rather slender (fig. 167); length of hind tibial spurs 0.30 and 0.40 times hind basitarsus.

Metasoma.— Length of first tergite 1.8 times its apical width, slightly widened apically, its surface densely and coarsely reticulate-rugose (fig. 172); second tergite basally narrowly and distinctly striate; second metasomal suture absent; upper valve of ovipositor covered by its sheath; length of ovipositor sheath 0.65 times fore wing, distinctly longer than metasoma.

Colour.— Yellowish-brown; fourth and following antennal segments, second and following tergites, ovipositor sheath and pterostigma (but basally narrowly whitish) dark brown; wing membrane subhyaline.

Note.— This species is dedicated to Dr Liang-yih Chou (TARI), who published several revisions on Taiwanese Braconidae, and kindly offered the material from Taiwan for study. Dr Chou suddenly died a few months ago; a great loss for the study of Braconidae.

Cosmophorus (Cosmophorus) curvatus van Achterberg, spec. nov.
(figs 159-165)

Material.— Holotype, ♀ (TARI), “[China], C. Taiwan, Kukuan, Taichung Hsien, 730 m, 14-17.x.1980. K.S. Lin & C.H. Wang”.

Holotype, ♀, length of body 2.0 mm, of fore wing 1.6 mm.

Head.— Head distinctly emarginate posteriorly, in lateral view distinctly convex; antenna incomplete, with 8 segments, third segment 1.1 times as long as fourth segment, fifth segment somewhat shorter than fourth segment; length of third and fourth segments 3.8 and 2.7 times their width, respectively, fourth segment about 30% wider than third segment (fig. 162); scapus not protruding ventrally, with pair of minute lobe-shaped teeth (fig. 162); antennal socket with large acute tooth; length of maxillary palp 0.7 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons shallowly concave antero-medially and with median carina weak posteriorly, not reaching anterior ocellus, not distinctly branched anteriorly; vertex nearly flat medially; length of eye in dorsal view 0.8 times temple; OOL:diameter of ocellus:POL = 9:4:5; distance between anterior and posterior ocelli about equal to diameter of posterior ocellus; face distinctly depressed dorso-medially, smooth; clypeus nearly flat and smooth; length of malar space 0.2 times basal width of mandible; mandible large, flattened, strongly and evenly curved, distinctly twisted apically, its second (= lower) tooth larger than upper tooth (fig. 164).

Mesosoma.— Length of mesosoma 1.7 times its height; side of pronotum smooth dorsally, distinctly rugose ventrally; lateral carina of mesoscutum subtransverse anteriorly, somewhat crenulate; anteriorly and near episternal scrobe precoxal sulcus narrow, rugose, remainder rather widely rugose, with reticulate rugosity extending to base of middle coxa; dorsally mesopleuron rugose, remainder smooth; mesosternal

sulcus very wide, shallow, mesosternum extensively rugose; metapleuron coarsely reticulate; mesoscutum sparsely setose; scutellar sulcus wide and distinctly crenulate; dorsal surface of propodeum coarsely and densely reticulate, median carina absent, and its posterior face largely smooth, dorsally bordered by a strong curved carina.

Wings.— Fore wing: marginal cell robust, SR1 distinctly curved subbasally (fig. 163); disco-submarginal cell rather widened anteriorly; r:3-SR+SR1: 2-SR = 1:53:33; cu-a short; 1-CU1:2-CU1 = 1:7. Hind wing: 2-SC+R short (fig. 161).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.0, 8.8 and 5.7 times their width, respectively; length of fore spur 0.7 times fore basitarsus; fore tarsus rather slender (fig. 165); length of hind tibial spurs 0.25 and 0.35 times hind basitarsus.

Metasoma.— Length of first tergite 1.9 times its apical width, subparallel-sided, its surface coarsely rugose-reticulate (fig. 160); second tergite coarsely rugose-striate basally (fig. 160); second metasomal suture absent; upper valve of ovipositor without depressions, rather slender and rather wavy apically; length of extended ovipositor about as long as fore wing and much longer than metasoma; ovipositor sheath incomplete.

Colour.— Yellowish-brown; stemmaticum, second and following metasomal tergites dark brown; three basal antennal segments, tegulae, legs and pronotum ventrally (brownish-)yellow; remainder of antenna dark brown; palpi rather dark brown; pterostigma dark brown, but basally narrowly pale yellowish; wing membrane somewhat infusate; ovipositor sheath brown.

Cosmophorus (Cosmophorus) dentifer Quicke & van Achterberg, spec. nov.
(figs 106-108)

Material.— Holotype, ♀ (RMNH), "Thailand: Suphanburi, Khao Yai Nat. P[ar]k, Elefant Cross Trail, 900 m, 2.vi.1993, J. Heraty".

Holotype, ♀, length of body 1.5 mm, of fore wing about 1.2 mm.

Head.— Head rather distinctly emarginate posteriorly; antenna with 15 segments, length of third segment 0.7 times fourth segment; length of third and fourth segments 2.2 and 2.8 times their width, respectively (fig. 108), fourth segment about 50% wider than third segment; scapus distinctly protruding ventrally, with pair of large teeth and antennal socket with one large and one medium-sized tooth (fig. 107); length of maxillary palp 0.7 times height of head; occipital carina widely interrupted dorsally, remainder distinct; frons shallowly concave medially and with lamelliform median carina, distinctly removed from anterior ocellus; vertex flat medially, with weak median groove between posterior ocelli; length of eye in dorsal view 0.8 times temple; OOL:diameter of ocellus:POL = 7:4:5; face largely smooth; clypeus with short median carina, flat and smooth; malar space absent; mandible large, flattened and submedially widened and angulate, strongly twisted and narrowed apically, its second tooth small (fig. 107).

Mesosoma.— Length of mesosoma 1.7 times its height; propleuron largely smooth, moderately convex, and with irregular transverse carina; side of pronotum smooth, with a few crenulae medially; lateral carina of mesoscutum gradually

upcurved anteriorly, distinct; anterior half of precoxal sulcus widely crenulate and connected to narrow episternal scrobe, forming one curve, smooth posteriorly; remainder of mesopleuron smooth, except some superficial rugulosity ventro-posteriorly; mesosternal sulcus very wide and sparsely rugulose; metapleuron largely smooth, but rugulose posteriorly; mesoscutum setose; scutellar sulcus rather narrow and finely crenulate; dorsal surface of propodeum largely smooth, with some sculpture laterally and near subposterior carina, with irregular median carina, and its posterior face short, dorsally with rather strong curved carina.

Wings.— Fore wing: marginal cell robust (fig. 106); disco-submarginal cell partly parallel-sided (obscured by glue); r:3-SR+SR1 (up to wing margin): 2-SR = 1:24:12; no distinct parastigma; cu-a indistinct and interstitial. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.2, 10.2, and 5.2 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs about 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 1.7 times its apical width, slender, slightly widened apically, its surface densely coarsely rugose-reticulate; second tergite smooth, except for some fine striae basally; second metasomal suture absent; upper valve of ovipositor straight; length of ovipositor sheath about 0.6 times fore wing.

Colour.— Brown; head (except dorsally), mesoscutum, prothorax, scapus, pedicellus, tegulae and legs pale yellowish; third antennal segment brown; remainder of antenna dark brown, but apical segment comparatively pale; pterostigma (but basally and apically narrowly whitish) and most veins dark brown; wing membrane slightly infusate.

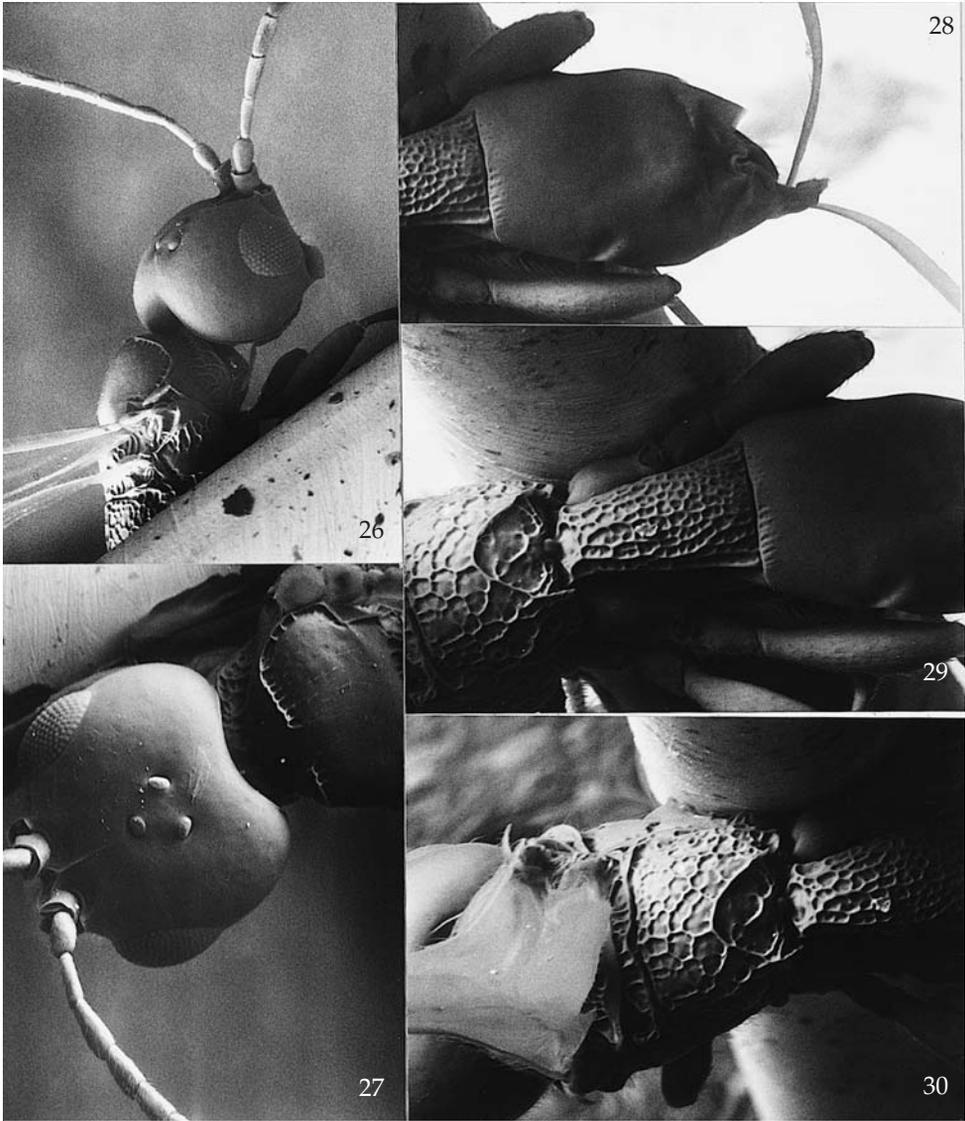
Cosmophorus (Cosmophorus) fusciceps Quicke & van Achterberg, spec. nov.
(figs 26-30, 154-158)

Material.— Holotype, ♀ (BMNH), "Thailand: Chiang Mai, ix-x.[19]84, D. Jackson". Paratype: 1 ♀ (RMNH), topotypic, but 14.viii-14.x.1984.

Holotype, ♀, length of body 1.5 mm, of fore wing 1.1 mm.

Head.— Head rather weakly emarginate posteriorly (fig. 27), rather convex in lateral view; antenna with 15 segments, third segment as long as fourth segment; length of third and fourth segments 3.0 and 2.1 times their width, respectively, fourth segment about 1.2 times wider than third segment; scapus hardly protruding ventrally, with pair of minute lobe-shaped teeth; antennal socket with medium-sized acute tooth (fig. 156); length of maxillary palp 0.8 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons concave medially and with strong median carina, and remaining distinctly removed from anterior ocellus; vertex weakly convex medially; length of eye in dorsal view 0.9 times temple; ocelli at same level; OOL:diameter of ocellus:POL = 7:2:3; face distinctly concave medially, smooth; clypeus narrow, flattened and smooth ventrally and rugulose dorsally; length of malar space 0.2 times basal width of mandible; mandible flattened large and gradually narrowed, distinctly twisted apically, its lower tooth medium-sized (fig. 155).

Mesosoma.— Length of mesosoma 1.7 times its height; propleuron rather convex, with irregular transverse carina and with some rugosity near it; side of pronotum



Figs 26-30, *Cosmophorus fusciceps* spec. nov., ♀, holotype. 26, head, latero-dorsal aspect; 27, head, dorsal aspect; 28, metasoma, dorsal aspect; 29, propodeum, first and second metasomal tergites, dorsal aspect; 30, propodeum, dorsal aspect.

smooth dorsally, remainder largely crenulate; lateral carina of mesoscutum upcurved anteriorly but anterior part straight, distinct; precoxal sulcus widely crenulate and connected to episternal scrobe, forming a curved and wide crenulate groove, by a rugose area connected to base of middle coxa; mesopleuron widely crenulate dorsally, remainder of mesopleuron smooth; mesosternal sulcus very wide and distinctly rugose; metapleuron reticulate, its flange comparatively slender and acute; mesoscu-

tum largely setose; scutellar sulcus medium-sized and distinctly crenulate; dorsal surface of propodeum rather coarsely reticulate, with median carina absent, and its posterior surface rather short and largely smooth, dorsally with strong curved carina.

Wings.— Fore wing: marginal cell comparatively slender; disco-submarginal cell rather slender, gradually widened (fig. 154); r:3-SR+SR1: 2-SR = 1:46:30; r wide but very short (nearly absent); cu-a indistinct; 1-CU1:2-CU1 = 2:5. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; fore telotarsus comparatively slender (fig. 157); length of femur, tibia and basitarsus of hind leg 2.9, 9.0, and 4.2 times their width, respectively; length of hind tibial spurs 0.2 and 0.4 times hind basitarsus; length of fore spur 0.7 times fore basitarsus.

Metasoma.— Length of first tergite 1.5 times its apical width, rather robust (fig. 29), slightly widened apically, its surface densely coarsely rugose-reticulate; second tergite mainly smooth, only basally narrowly rugose; second metasomal suture absent; upper valve of ovipositor nearly straight and slender, without depressions, slightly wavy apically (fig. 28); length of ovipositor sheath 0.69 times fore wing.

Colour.— Brownish-yellow; scapus, pedicellus, third and fourth antennal segments, palpi, tegulae and legs pale yellowish; head brown dorsally, distinctly darker than mesoscutum, with stemmaticum partly blackish; remainder of antenna and metasoma (except yellowish first tergite) dark brown; pterostigma dark brown; pigmented veins and ovipositor sheath brown; wing membrane subhyaline.

Variation.— Paratype is very similar to holotype; with 15-segmented antenna, length of ovipositor sheath 0.68 times fore wing, and length of fore wing 1.1 mm.

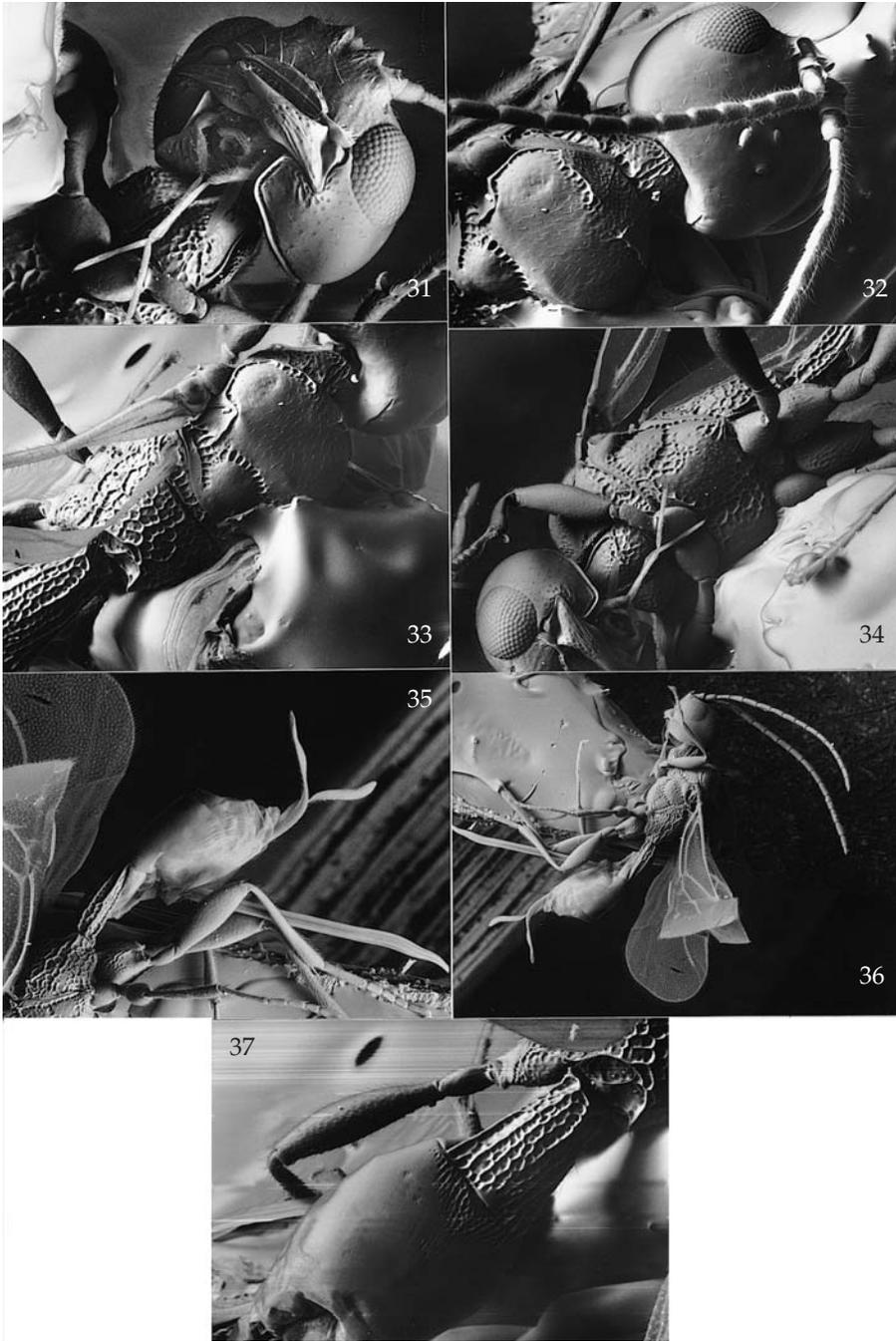
Cosmophorus (Cosmophorus) godfrayi Quicke & van Achterberg, spec. nov.
(figs 31-37, 114-118)

Material.— Holotype, ♀ (RMNH), "Uganda, Western Prov., Kibale Forest, n[ea]r Fort Portal, 20.vii.8.viii.1994, H.C. Godfray, RMNH'94".

Holotype, ♀, length of body 1.6 mm, of fore wing 1.4 mm.

Head.— Head weakly emarginate posteriorly (fig. 32); antenna with 16 segments, length of third segment 0.9 times fourth segment; length of third and fourth segments 3.0 and 4.5 times their width, respectively (fig. 117), fourth segment about 50% wider than third segment; scapus hardly protruding ventrally, its pair of teeth small; tooth of antennal socket sharp and medium-sized (fig. 117); length of maxillary palp equal to height of head; occipital carina widely interrupted dorsally and remainder distinct, and distinctly meeting hypostomal carina; frons weakly concave medially and with rather short medium-sized median carina, remaining far removed from anterior ocellus; vertex convex medially; length of eye in dorsal view 1.1 times temple; OOL:diameter of ocellus:POL = 5:2:3; face largely smooth, punctulate; clypeus narrow, convex and largely smooth; malar space absent; mandible narrow, without ventral lamella, outer side convex, upper tooth distinctly longer than lower tooth (figs 31, 116).

Mesosoma.— Length of mesosoma 1.8 times its height; propleuron strongly convex and posterior half coarsely reticulate; side of pronotum largely smooth, sparsely punctulate, remainder coarsely rugose; lateral carina of mesoscutum upcurved anteri-



Figs 31-37, *Cosmophorus godfrayi* spec. nov., ♀, holotype. 31, head, latero-ventral aspect; 32, head and mesoscutum, dorsal aspect; 33, mesosoma and first metasomal tergite, latero-dorsal aspect; 34, mesosoma, latero-ventral aspect; 35, metasoma, lateral aspect; 36, habitus, lateral aspect; 37, metasoma, latero-dorsal aspect.

only, distinct; anterior half of precoxal sulcus coarsely and widely crenulate and connected to episternal scrobe, forming one crenulate groove (fig. 34); mesopleuron dorsally and ventro-posteriorly coarsely punctate; mesosternal sulcus very wide and coarsely reticulate-rugose; metapleuron rugose, but partly smooth anteriorly; mesoscutum largely setose; scutellar sulcus narrow and finely crenulate (fig. 33); dorsal surface of propodeum coarsely reticulate, with median carina absent, and its posterior face short and largely smooth, dorsally bordered by a rather strong curved carina.

Wings.— Fore wing: marginal cell rather slender (fig. 114); disco-submarginal cell subparallel-sided; SR1 moderately curved; r:3-SR+SR1 (upto wing margin, apically only faintly pigmented): 2-SR = 1:31:14; parastigma small, vein-like; cu-a indistinct; 1-CU1:2-CU1 = 1:6. Hind wing: 2-SC+R rather short.

Legs.— Hind coxa coarsely rugose dorso-basally (figs 35, 37); length of femur, tibia and basitarsus of hind leg 2.8, 10.0, and 5.0 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs about 0.2 times hind basitarsus.

Metasoma.— Length of first tergite 1.3 times its apical width, gradually widened apicad, its surface coarsely longitudinally rugose, with interconnecting finer sculpture; basal triangle of second tergite finely sculptured, remainder of tergite largely smooth; second metasomal suture absent; upper valve of ovipositor nearly straight, slightly wavy (fig. 35); length of ovipositor sheath 0.41 times fore wing.

Colour.— Dark brown; palpi, scapus, and pedicellus, pale yellowish; tegula rather dark brown, and humeral plate largely yellowish; legs pale yellowish, but middle and hind coxae and femora partly infusate medially; pterostigma dark brown; veins brown; wing membrane slightly infusate.

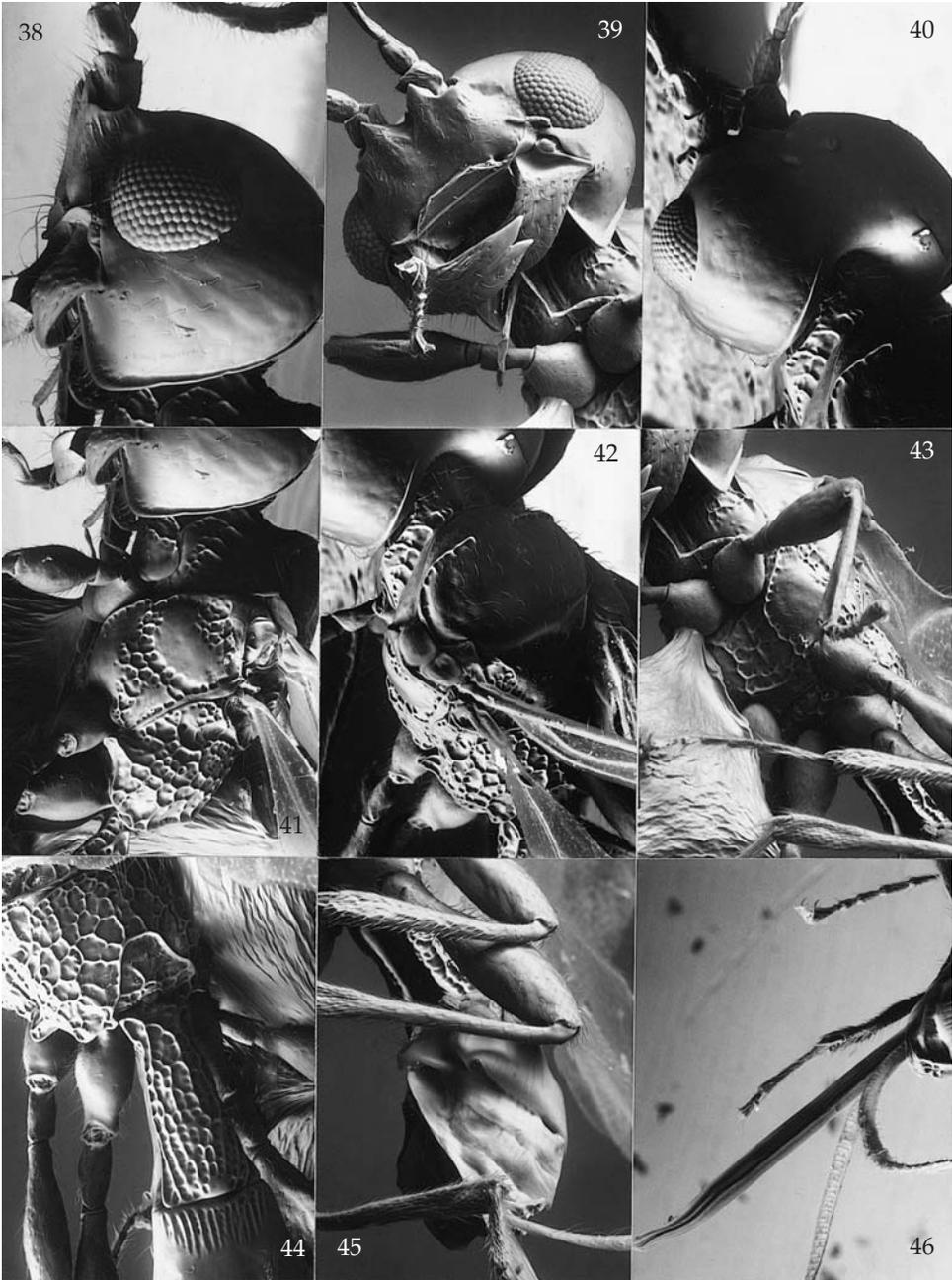
Etymology.— Named after Prof. Dr Charles Godfray (Ascot), who kindly presented the specimen for this revision.

Cosmophorus (Cosmophorus) harrysi van Achterberg, spec. nov.
(figs 177-182)

Material.— Holotype, ♀ (RMNH), "Indonesia: Sula Isl., Mangole, Buluhaya, Mal. trap 18, c. 90 m, 6-23.iii.1995, C. v. Achterberg & Y. Yasir, RMNH".

Holotype, ♀, length of body 1.5 mm, of fore wing 1.2 mm.

Head.— Head rather weakly emarginate posteriorly, convex in lateral view (fig. 178); antenna with rather long, bristly setae (fig. 177), incomplete, with at least 14 segments, third segment as long as fourth segment; length of third and fourth segments 5.0 and 4.0 times their width, respectively, fourth segment about 30% wider than third segment; scapus weakly protruding ventrally, its pair of teeth small (figs 177, 178); antennal socket with one large tooth (fig. 177); length of maxillary palp 0.9 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons concave medially and with distinct median carina, weaker posteriorly and remaining far removed from anterior ocellus; vertex flattened medially; length of eye in dorsal view 0.9 times temple; OOL:diameter of ocellus:POL = 7:2:3; face medially largely smooth, depressed, laterally obliquely rugose; clypeus flat and smooth, ventral border rather cariniform; malar space absent; mandible large and narrowed sub-



Figs 38-46, *Cosmophorus* spec. nov. near *C. harrysi* spec. nov., ♀, Brunei, Ulu Temburong. 38, head, lateral aspect; 39, head, antero-lateral aspect; 40, head, latero-dorsal aspect; 41, mesosoma, lateral aspect; 42, mesosoma, latero-dorsal aspect; 43, mesosoma, latero-ventral aspect; 44, propodeum, first and second metasomal tergites, dorsal aspect; 45, hind leg and metasoma, lateral aspect; 46, ovipositor, lateral aspect.

medially, rather twisted apically, its lower tooth large, about as long as upper tooth (fig. 178).

Mesosoma.— Length of mesosoma 1.6 times its height; propleuron rather convex and with some rugae; side of pronotum smooth, with some crenulae medially and rugulosity posteriorly and ventrally; lateral carina of mesoscutum slightly curved nearly straight anteriorly, distinct; anteriorly precoxal sulcus narrowly rugose, medially widely rugose, connected to episternal scrobe and by a rugose area to middle coxa, forming one crenulate groove; mesopleuron rugose dorsally and superficially rugose ventro-posteriorly, remainder of mesopleuron smooth; mesosternal sulcus very wide, shallow and distinctly reticulate-rugose; metapleuron distinctly reticulate, but partly smooth anteriorly; mesoscutum rather densely setose; scutellar sulcus medium-sized and with some crenulae; dorsal surface of propodeum moderately reticulate, with median carina absent, and its posterior face rather short and largely smooth, dorsally with rather strong curved carina.

Wings.— Fore wing: marginal cell rather robust (fig. 181); disco-submarginal cell rather widened anteriorly (fig. 181); r:3-SR+SR1: 2-SR = 1:24:11; cu-a indistinct; 1-CU1:2-CU1 = 1:5. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.2, 9.7, and 5.0 times their width, respectively; fore tarsus robust (fig. 180); length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs 0.2 and 0.45 times hind basitarsus.

Metasoma.— Length of first tergite 1.8 times its apical width, parallel-sided (except near its apex: fig. 179), its surface densely coarsely rugose-reticulate; basal triangular area of second tergite completely coarsely rugose-punctate, remainder smooth; second metasomal suture absent; upper valve of ovipositor without depressions, ovipositor apically rather wavy and robust (fig. 182); length of ovipositor sheath 0.85 times fore wing.

Colour.— Dark brown; scapus, pedicellus, base of third antennal segment, mandible largely, antennal socket dorsally, tegulae and legs (including hind femur, but telotarsi partly infusate) pale yellowish; mesosoma yellowish-brown; pterostigma (except base and apex narrowly dark brown; veins more or less brownish; wing membrane slightly infusate.

Note.— Named after Ir Harrys Hutapea (Falabisahaya, Mangole) for his help during the fieldwork on Mangole (Sula Islands, Indonesia).

Cosmophorus (Cosmophorus) infuscatus van Achterberg, spec. nov.
(figs 123-129)

Material.— Holotype, ♀ (TARI), “[China], C. Taiwan, Sungkang, Nantou Hsien, 2100m, x.1984, K.S. Lin & K.C. Chou, malaise trap”. Paratypes (TARI, RMNH): 6 ♀♀, topotypic, same date.

Holotype, ♀, length of body 1.4 mm, of fore wing 1.4 mm.

Head.— Head not emarginate posteriorly, in lateral view rather flattened; antenna with 14 segments, third segment 0.8 times as long as fourth segment and well differentiated, fifth segment somewhat shorter than fourth segment; length of third and fourth segments 3.0 and 2.5 times their width, respectively (fig. 126), compressed,

fourth segment about 50% wider than third segment; scapus not protruding ventrally, with pair of minute obtuse teeth; antennal socket with large acute tooth (fig. 126); length of maxillary palp 0.78 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons weakly depressed antero-medially and median carina remaining far removed from anterior ocellus; vertex nearly flat medially; length of eye in dorsal view 0.8 times temple; OOL:diameter of ocellus:POL = 4:1:3; distance between anterior and posterior ocelli about 1.5 times diameter of ocellus; face weakly depressed dorso-medially, no median carina, smooth; clypeus slightly convex and smooth; length of malar space 0.1 times basal width of mandible; mandible medium-sized, flattened and gradually curved, medially rather convex and finely striate, distinctly twisted apically, its second (= lower) tooth large, somewhat smaller than the first (= upper) tooth (fig. 124).

Mesosoma.— Length of mesosoma 1.6 times its height; side of pronotum largely smooth, narrowly crenulate antero-medially; lateral carina of mesoscutum subtransverse and medium-sized anteriorly; anteriorly precoxal sulcus absent, area above middle coxa smooth, medially and near episternal scrobe narrowly crenulate; dorsally mesopleuron smooth as remainder; mesosternum largely smooth, mesosternal sulcus narrow and finely crenulate (paratypes; invisible in holotype); metapleuron largely smooth medially, with some rugae ventrally and posteriorly; mesoscutum largely glabrous except along imaginary notaulic courses; scutellar sulcus curved, narrow, shallow and only laterally crenulate; dorsal surface of propodeum smooth anterodorsally, medially rugulose, with median carina absent, and its posterior face largely smooth, dorsally with strong circular carina.

Wings.— Fore wing: marginal cell moderately robust (fig. 123); disco-submarginal cell distinctly widened anteriorly; r:3-SR+SR1: 2-SR = 1:37:19; cu-a indistinct; 1-CU1:2-CU1 = 1:6. Hind wing: 2-SC+R medium-sized (fig. 125).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.8, 9.0 and 5.5 times their width, respectively; fore tarsus robust (fig. 127); length of fore tibial spur 0.7 times fore basitarsus (paratypes; not well visible in holotype); length of hind tibial spurs 0.35 and 0.45 times hind basitarsus.

Metasoma.— Length of first tergite 1.4 times its apical width, robust (fig. 129), somewhat widened apically, its surface rugose, but weakly rugose medially and smooth sublatero-posteriorly; second tergite smooth basally; second metasomal suture absent; upper valve of ovipositor without depressions, rather slender and slightly wavy apically; length of extended ovipositor 0.6 times fore wing and distinctly longer than metasoma; length of ovipositor sheath 0.42 times fore wing.

Colour.— Dark brown; palpi, scapus and pedicellus brownish-yellow; third antennal segment brown, remainder of antenna dark brown; femora largely infusate or dark brown; remainder of legs and tegulae yellowish-brown; pterostigma dark brown, but basally narrowly pale yellow; wing membrane subhyaline.

Variation.— Length of body 1.2-1.4 mm, of fore wing 1.3-1.4 mm; antenna of ♀ with 13 (3) or 14 (4) segments; third antennal segment 0.8-0.9 times as long as fourth segment; length of first metasomal tergite 1.2-1.4 times its apical width; length of ovipositor sheath 0.34-0.44 times fore wing; sculpture of propodeum may be limited and superficial; first tergite may be largely and rather coarsely punctate-rugose; mesoscutum sometimes sparsely setose laterally.

Cosmophorus (*Cosmophorus*) *mesocaudatus* van Achterberg, spec. nov.
(figs 144-148)

Material.— Holotype, ♀ (KBIN), "Canopy mission FOG. XL [= fogging of *Xanthophyllum papuana* (*Xanthophyllaceae*)], 4.v.1994"; "Papua New Guinea, Madang, Baiteta, 5°1'10"S 145°45'0"E, O. Missa, Coll. R.I.Sc.N.B.". Paratypes (KBIN, RMNH): 2 ♀♀, topotypic, but FOG T9 [ninth tree fogged of *Pometia pinnata* (*Sapindaceae*)], 8.vi.1993.

Holotype, ♀, length of body 1.3 mm, of fore wing 1.2 mm.

Head.— Head rather weakly emarginate posteriorly, in lateral view distinctly convex; antenna with 15 segments, third segment 0.9 times as long as fourth segment, fifth segment as long as fourth segment; length of third and fourth segments 3.0 and 2.6 times their width, respectively, fourth segment about 50% wider than third segment; scapus not protruding ventrally, with pair of minute teeth, hardly visible at 80 × magnification; antennal socket with medium-sized acute tooth (fig. 145); length of maxillary palp 0.8 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons shallowly concave medially and median carina nearly reaching anterior ocellus; vertex nearly flat medially; length of eye in dorsal view 1.3 times temple; OOL:diameter of ocellus:POL = 6:2:3; distance between anterior and posterior ocelli about equal to diameter of ocellus; face flat medially, with weak median carina, largely smooth; clypeus narrow, nearly flat and smooth; length of malar space 0.1 times basal width of mandible; mandible comparatively narrow (fig. 147), outer side convex and with some striae, somewhat twisted apically, its second (= lower) tooth subequal to upper tooth (fig. 147).

Mesosoma.— Length of mesosoma 1.4 times its height; side of pronotum crenulate antero-medially and posteriorly, remainder smooth; lateral carina of mesoscutum subtransverse anteriorly, distinct; anteriorly precoxal sulcus narrowly crenulate, remainder widely reticulate-rugose, with rugosity widely extending to base of middle coxa, and groove to episternal scrobe narrowly crenulate; dorsally mesopleuron reticulate-rugose, remainder smooth; mesosternal sulcus widely reticulate, shallow; metapleuron coarsely reticulate; mesoscutum evenly setose; scutellar sulcus rather narrow and crenulate; dorsal surface of propodeum densely reticulate, without distinct median carina, and its posterior face largely smooth, dorsally with medium-sized, strongly curved carina, tooth-like protruding ventrally.

Wings.— Fore wing: marginal cell robust (fig. 144); disco-submarginal cell distinctly widened anteriorly; r:3-SR+SR1: 2-SR = 3:62:44; cu-a indistinct; 1-CU1:2-CU1 = 3:11. Hind wing: 2-SC+R short (fig. 148).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 2.8, 9.2 and 4.5 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; fore tarsus robust; length of hind tibial spurs 0.30 and 0.40 times hind basitarsus.

Metasoma.— Length of first tergite 1.2 times its apical width, distinctly widened apically (fig. 146), its surface largely longitudinally reticulate-rugose; second tergite only basally narrowly rugose (fig. 146); second metasomal suture absent; upper valve of ovipositor without depressions, apical half slender and slightly wavy apically; length of ovipositor sheath 0.35 times fore wing; length of extended ovipositor 0.7 times fore wing and distinctly longer than metasoma.

Colour.— Rather dark brown; face, and clypeus yellowish-brown; remainder of head and metasoma after first tergite paler brown than remainder of body; palpi, tegulae, and four basal segments of antenna pale yellowish; pterostigma dark brown, but basally pale brown; wing membrane subhyaline, but below pterostigma weakly infuscate.

Variation.— Length of body 1.0-1.2 mm, of fore wing 1.0-1.2 mm; antennal segments of ♀ 15(3); length of first tergite 1.2-1.4 times its apical width; length of ovipositor sheath 0.35-0.60 times fore wing; length of extended ovipositor 0.7-0.9 times fore wing; body may be largely brown.

Cosmophorus (Cosmophorus) minutus van Achterberg, spec. nov.
(figs 119-122)

Material.— Holotype, ♀ (ZIL), "Swaziland: 2 km N Loyengo, 26°33'S, 31°11'E, 25.x.1994, loc. 34, R. Danielsson".

Holotype, ♀, length of body 1.0 mm, of fore wing 0.9 mm.

Head.— Head weakly emarginate posteriorly; antenna with 12 segments, length of third segment 0.9 times fourth segment; length of third and fourth segments 3.5 and 2.7 times their width, respectively, fourth segment about 50% wider than third segment; scapus hardly protruding ventrally, with pair of minute teeth; antennal socket with one medium-sized acute tooth (fig. 120); length of maxillary palp 0.8 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons flat medially and with short and rather weak median carina, splitted into two branches anteriorly and remaining far removed from anterior ocellus; vertex flat; length of eye in dorsal view 0.9 times temple; OOL:diameter of ocellus:POL = 5:2:3; face smooth; clypeus flat and smooth, its ventral rim narrow and straight; length of malar space 0.2 times basal width of mandible; mandible medium-sized, outer side nearly flat, without concave part and gradually narrowed, strongly twisted apically, its lower tooth rather large (fig. 121).

Mesosoma.— Length of mesosoma 1.5 times its height; propleuron rather convex, with weak transverse carina and with some rugulosity; side of pronotum largely smooth, but crenulate medially and with some rugulosity ventrally; lateral carina of mesoscutum upcurved anteriorly, distinct; anterior half of precoxal sulcus finely crenulate and posterior half widely crenulate connected to episternal scrobe, forming a curved crenulate groove; remainder of mesopleuron smooth, except some rugulosity ventro-posteriorly and widely rugose dorsally; mesosternal sulcus shallow, wide and distinctly rugose; metapleuron smooth anteriorly and rugulose posteriorly; mesoscutum sparsely setose; scutellar sulcus medium-sized and with few crenulae; dorsal surface of propodeum medially reticulate and laterally largely smooth, without median carina, and its posterior face medium-sized and reticulate, dorsally with rather weak arched carina.

Wings.— Fore wing: marginal cell robust (fig. 119); r short and widened; discosubmarginal cell distinctly widened anteriorly and robust (fig. 119); r:3-SR+SR1 (apically absent): 2-SR = 1:19:10; cu-a indistinct; 1-CU1:2-CU1 = 1:4. Hind wing: 2-SC+R rather long.

Legs.— Hind coxa largely smooth, with some short rugulae; length of femur, tibia

and basitarsus of hind leg 3.2, 7.7, and 5.0 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; length of hind tibial spurs about 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 1.6 times its apical width, gradually widened, rather slender, its surface densely coarsely rugose-reticulate (fig. 122); second tergite smooth, except some very short rugae anteriorly; second metasomal suture absent; upper valve of ovipositor without depressions, nearly straight, slightly wavy; length of ovipositor sheath 0.61 times fore wing.

Colour.— Dark brown; scapus, pedicellus, third and part of fourth antennal segments, palpi and legs pale yellowish; tegulae largely and remainder of antenna rather dark brown; pterostigma (except base and apex narrowly) brown; most veins hardly pigmented; wing membrane hyaline.

Cosmophorus (Cosmophorus) reticulatus van Achterberg, spec. nov.
(figs 149-153)

Material.— Holotype, ♂ (RMNH), "Indonesia, Mangole, Sula Isl., Mandafuhi Camp, c 50 m, 29.x.1993, C. v. Achterberg & Y.Yasir, RMNH'93".

Holotype, ♂, length of body 1.5 mm, of fore wing 1.3 mm.

Head.— Head rather weakly emarginate posteriorly, convex in lateral view (fig. 153); antenna with 13 segments, setae medium-sized, third segment as long as fourth segment, fifth segment slightly shorter than fourth segment; length of third and fourth segments 5.2 and 4.0 times their width, respectively, fourth segment about 30% wider than third segment; scapus hardly protruding ventrally, with pair of minute teeth; antennal socket with a large acute tooth (figs 152, 153); length of maxillary palp 0.6 times height of head; occipital carina widely interrupted dorsally and remainder distinct; frons shallowly concave medially and with medium-sized median carina, not reaching anterior ocellus; vertex weakly convex medially; eye in dorsal view as long as temple; OOL:diameter of ocellus:POL = 7:2:3; face slightly concave medially, largely smooth; clypeus flat and smooth, ventral rim cariniform; length of malar space 0.3 times basal width of mandible, with weak groove; mandible large and gradually narrowed, evenly curved, strongly twisted apically, its lower tooth large, somewhat shorter than upper tooth (fig. 153).

Mesosoma.— Length of mesosoma 1.7 times its height; propleuron convex, with transverse carina and some rugae posteriorly; side of pronotum smooth, with coarse crenulae medially and some rugae ventrally; lateral carina of mesoscutum upcurved anteriorly (nearly oblique in lateral view), distinct; anterior half of precoxal sulcus wide, coarsely reticulate and connected to episternal scrobe and rugosity of mesopleuron, forming a reticulate curve; mesopleuron coarsely reticulate dorsally and ventrally, remainder smooth (fig. 150); mesosternal sulcus very wide and distinctly rugose; metapleuron coarsely reticulate; mesoscutum largely setose; scutellar sulcus medium-sized and distinctly crenulate; dorsal surface of propodeum coarsely and remotely reticulate, with median carina absent, and its posterior face short and largely smooth, dorsally with medium-sized arched carina.

Wings.— Fore wing: marginal cell robust (fig. 149); disco-submarginal cell slender posteriorly, distinctly widened anteriorly (fig. 149); r:3-SR+SR1:2-SR = 1:18:9; cu-a

indistinct; 1-CU1:2-CU1 = 1:4. Hind wing: 2-SC+R short.

Legs.— Hind coxa smooth; hind femur swollen; length of femur, tibia and basitarsus of hind leg 3.2, 10.5, and 5.0 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs 0.20 and 0.35 times hind basitarsus.

Metasoma.— Length of first tergite 1.8 times its apical width, parallel-sided (but somewhat widened near its apex: fig. 151), its surface coarsely rugose-reticulate (except sublaterally); second tergite largely smooth, but semi-circular area on basal half of tergite coarsely longitudinally striate and finely punctate in between striae.

Colour.— Yellowish-brown; scapus, pedicellus, third, fourth and part of fifth antennal segments, tegulae and legs (but telotarsi infuscate) pale yellowish; face, clypeus, mandibles, and prothorax brownish-yellow; scutellum, propodeum and metasoma rather dark brown; pterostigma (except base and apex narrowly) dark brown; veins largely brown; wing membrane slightly infuscate (but paler below parastigma).

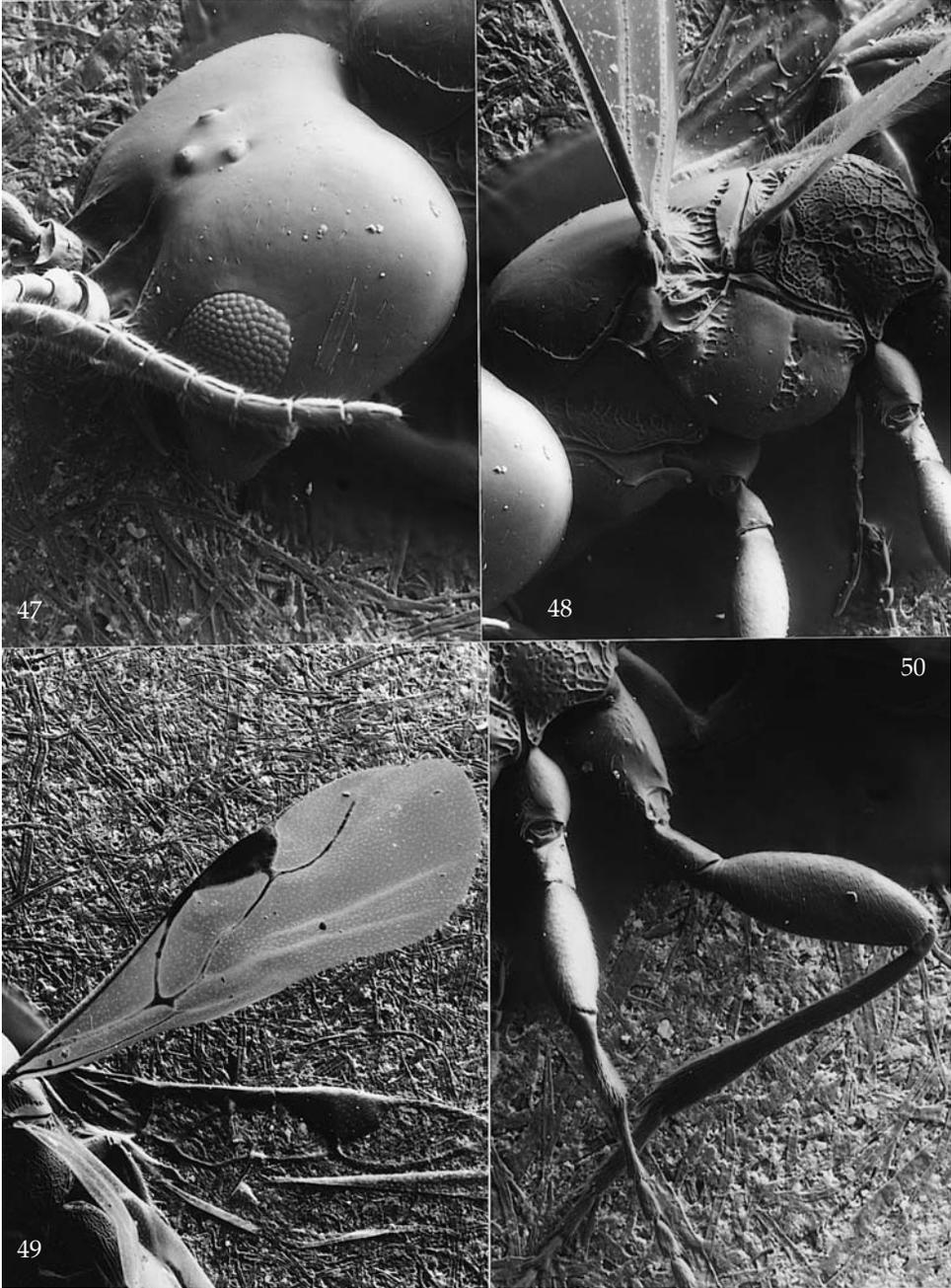
Cosmophorus (Cosmophorus) robustus van Achterberg, spec. nov.
(figs 109-113)

Material.— Holotype, ♂ (ZIL), "R. S[outh] A[frica]: Cape Prov., 9 km ESE George, Kaaimansrivier, 33°59'S, 22°33'E, 13.x.1994, loc. 17, R. Danielsson".

Holotype, ♂, length of body 3.1 mm, of fore wing 2.1 mm.

Head.— Head weakly emarginate posteriorly; antenna with 17 segments, pedicellus swollen, length of third segment 1.1 times fourth segment; length of third and fourth segments 3.7 and 3.3 times their width, respectively, fourth segment not wider than third segment (fig. 110); scapus not protruding ventro-apically, without teeth (fig. 110); antennal socket with one large tooth at inner side; length of maxillary palp 0.7 times height of head; occipital carina complete, arched, weak dorsally, laterally more distinct; frons deeply concave directly behind antennal sockets, but area in between antennal sockets strongly and obtusely protruding and at nearly same level as antennal sockets (fig. 109), and without median carina; vertex flat medially; length of eye in dorsal view 0.7 times temple; OOL:diameter of ocellus:POL = 8:2:4; face largely smooth; clypeus rather flat and smooth, medium-sized, with upcurved ventral rim; length of malar space 0.15 times basal width of mandible; mandible large and gradually narrowed, flattened, but outer side concave medially, strongly twisted apically, its lower tooth short and wide (figs 109, 113).

Mesosoma.— Length of mesosoma 1.6 times its height; propleuron distinctly convex and largely smooth; side of pronotum partly smooth, coarsely crenulate medially and with rugulosity postero-ventrally; lateral carina of mesoscutum evenly upcurved anteriorly, distinct; anterior 0.4 of precoxal sulcus rather narrowly crenulate, remainder widely crenulate and connected to episternal scrobe, forming one crenulate groove; remainder of mesopleuron largely smooth, except extensive rugosity dorsally and few rugulae near base of middle coxa; mesosternal sulcus very wide and distinctly rugose; metapleuron rather coarsely rugose; mesoscutum largely setose, rugulose medially; scutellar sulcus medium-sized and rather coarsely and densely crenulate; dorsal surface of propodeum moderately reticulate-rugose, with median carina



Figs 47-50, *Cosmophorus cembrae* Ruschka, ♀, France, Hautes Alpes, Brunissard. 47, head, dorso-lateral aspect; 48, mesosoma, dorso-lateral aspect; 49, fore wing; 50, middle and hind legs, dorso-lateral aspect.

absent, and its posterior face rather large and coarsely reticulate, dorsally without distinct regularly curved carina.

Wings.— Fore wing: marginal cell robust (fig. 112); r-m and 2m-cu partly indicated; marginal cell distinctly narrowed medially; disco-submarginal cell distinctly widened anteriorly; r:3-SR+SR1 (up to wing margin, close to apex only faintly pigmented): 2-SR = 3:51:19; cu-a distinct, short; 1-CU1:2-CU1 = 2:5; parastigma indistinct. Hind wing: 2-SC+R rather long.

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.6, 8.7, and 5.5 times their width, respectively; length of fore tibial spur 0.7 times fore basitarsus; length of hind tibial spurs 0.2 and 0.3 times hind basitarsus.

Metasoma.— Length of first tergite 1.5 times its apical width, robust, strongly widened apically (fig. 111), its surface densely coarsely rugose-reticulate; second tergite medio-basally finely punctate-rugose, remainder smooth; second metasomal suture absent.

Colour.— Brownish-yellow, but head posteriorly dark brown; scapus, pedicellus, third and fourth antennal segments, prothorax, tegulae and legs more or less pale yellowish; remainder of antenna dark brown; pterostigma (but narrowly whitish basally and apically) and most veins dark brown; wing membrane slightly infuscate, stronger below pterostigma.

Cosmophorus (Cosmophorus) rugitergitus Chen & van Achterberg, 1997

Cosmophorus rugitergitus Chen & van Achterberg, 1997: 40-41, figs 175-183.

Distribution.— Oriental China (Hainan).

Cosmophorus (Cosmophorus) taiwanensis van Achterberg, spec. nov.
(figs 130-134)

Material.— Holotype, ♀ (TARI), “[China], C. Taiwan, Meifeng, 2150m, Nantou Hsien, 7.xi.1981. S.C. Lin & W.S. Tang”.

Holotype, ♀, length of body 1.3 mm, of fore wing 1.4 mm.

Head.— Head rather emarginate posteriorly (more than in *C. infuscatus*), in lateral view distinctly convex; antenna incomplete, with 11 segments, third segment 1.1 times as long as fourth segment and well differentiated (fig. 134), fifth segment somewhat shorter than fourth segment; length of third and fourth segments 3.5 and 2.3 times their width, respectively, fourth segment about 50% wider than third segment; scapus not protruding ventrally, with two minute protuberances; antennal socket with large acute tooth (fig. 134); maxillary palp incomplete, basal segments elongate; occipital carina widely interrupted dorsally and remainder distinct; frons shallowly concave antero-medially and with unbranched median carina, and remaining far removed from anterior ocellus; vertex weakly convex medially; length of eye in dorsal view 0.7 times temple; OOL:diameter of ocellus:POL = 3:1:2; distance between anterior and posterior ocelli about 1.5 times diameter of ocellus; face distinctly depressed dorso-medially, largely smooth, somewhat protruding over base of mandible latero-ventrally; clypeus nearly flat and smooth; malar space absent;

mandible large, flattened and medially concave, smooth and distinctly curved medially, distinctly twisted apically, its second (= lower) tooth large, distinctly shorter than upper tooth (fig. 133).

Mesosoma.— Length of mesosoma 1.7 times its height; side of pronotum rugose ventrally, remainder smooth; anterior part of lateral carina of mesoscutum subtransverse and rather coarsely crenulate; precoxal sulcus anteriorly and groove to episternal scrobe narrowly rugose, remainder widely rugose, area above base of middle coxa partly weakly rugose; dorsally mesopleuron distinctly rugose, remainder largely smooth; mesosternum largely smooth, mesosternal sulcus very wide, shallow and medially rugulose; metapleuron largely smooth medially, except for some rugae and punctures, ventrally distinctly rugose; mesoscutum largely glabrous; scutellar sulcus shallow, curved and completely densely crenulate; dorsal surface of propodeum rugulose anteriorly, rugose medially and remainder of dorsal part largely smooth, median carina absent, and its posterior face largely smooth, dorsally with strong semi-circular carina.

Wings.— Fore wing: marginal cell robust (fig. 130); disco-submarginal cell distinctly widened anteriorly; $r:3\text{-SR}+\text{SR}1:2\text{-SR} = 1:50:32$; $cu\text{-}a$ indistinct; $1\text{-CU}1:2\text{-CU}1 = 1:2$. Hind wing: $2\text{-SC}+\text{R}$ medium-sized (fig. 131).

Legs.— Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.7, 9.0 and 5.5 times their width, respectively; length of fore tibial spur 0.8 times fore basitarsus; fore tarsus robust; length of hind tibial spurs 0.20 and 0.30 times hind basitarsus.

Metasoma.— Length of first tergite 1.9 times its apical width, slightly widened apically, its surface rather coarsely reticulate-rugose (fig. 132); second tergite smooth basally; second metasomal suture absent; upper valve of ovipositor covered by its sheath; length of ovipositor sheath 0.52 times fore wing, somewhat shorter than metasoma.

Colour.— Dark brown; three basal antennal segments, palpi, tegulae, and legs brownish-yellow; remainder of antenna and pterostigma dark brown (but base and apex of pterostigma narrowly pale brownish); wing membrane subhyaline.

Acknowledgements and abbreviations

We wish to thank Mr Terry Nuhn and Dr Dave Smith (Washington) for information about the types of *Cosmophorus* species housed in the Smithsonian Institution, the late Dr Liang-yih Chou (TARI) and Dr Y. Braet (KBIN) for the loan of specimens, Dr M. Capek (Brno) for information about *Cosmophorus regius*, Prof. Charles Godfray (Ascot) for the gift of the holotype of *C. godfrayi*, Ms Rachel Kruft (Ascot) for making the SEM photographs. BMNH stands for Natural History Museum, London, KBIN for Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels, RMNH for Nationaal Natuurhistorisch Museum, Leiden, TARI for Taiwan Agricultural Research Institute, Wufeng, and ZIL for Zoological Institute, Lund.

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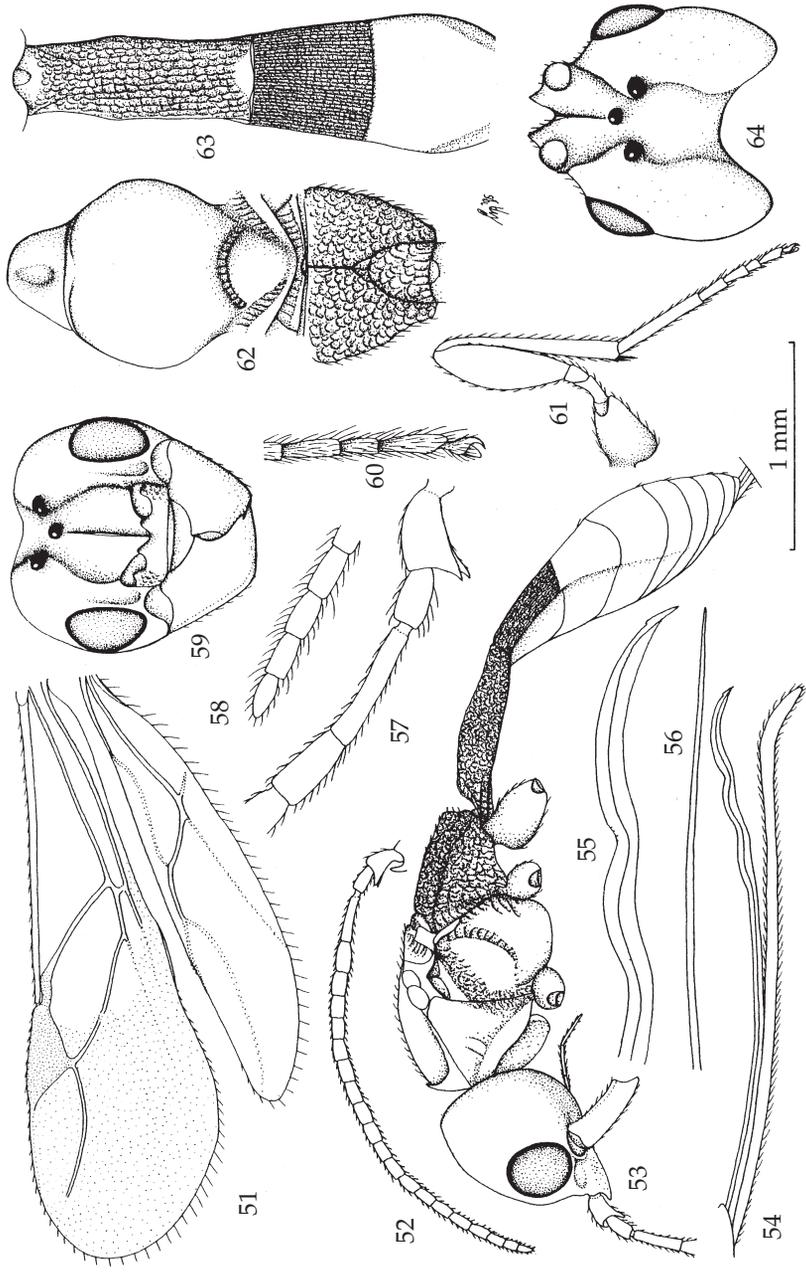
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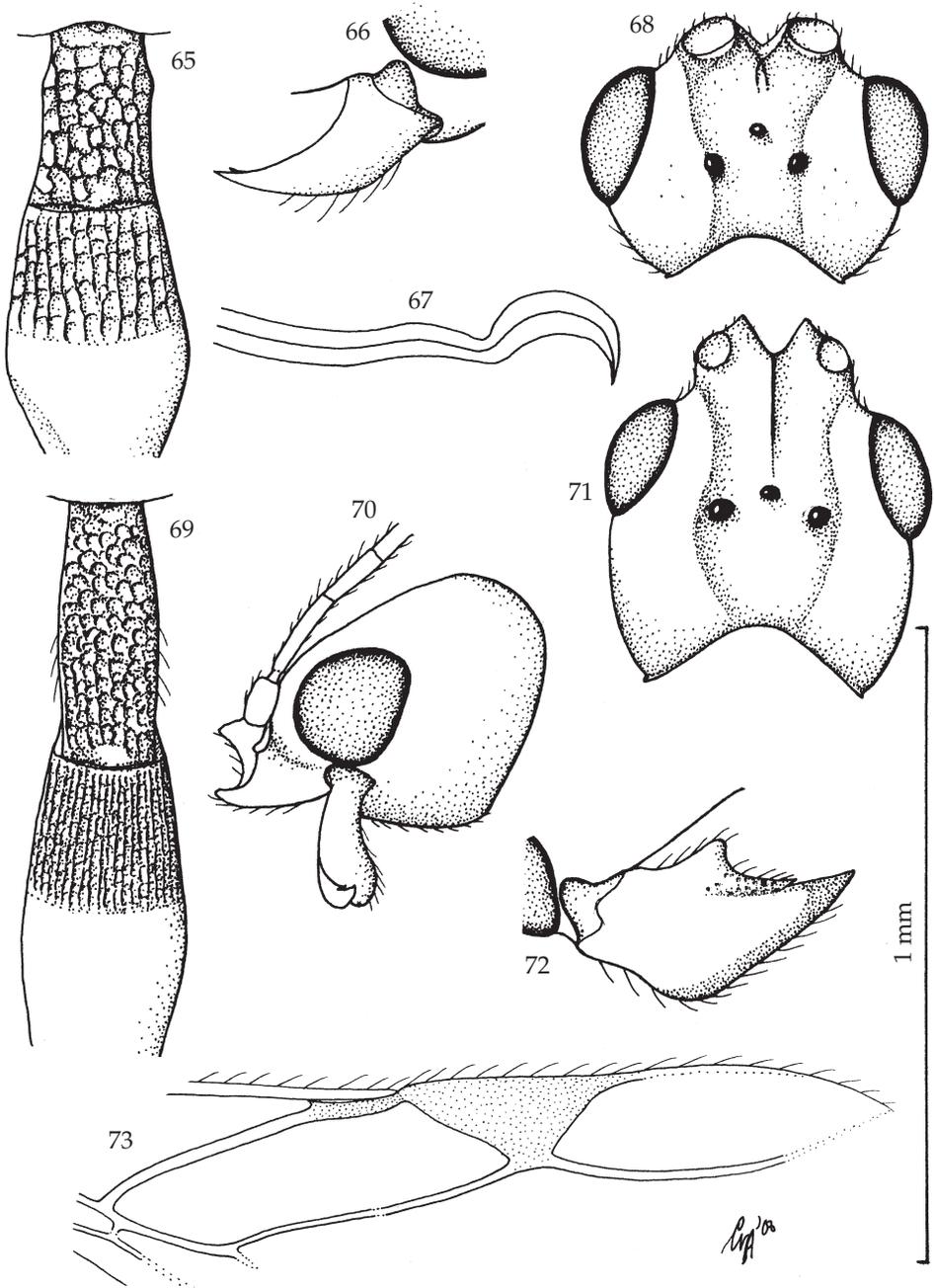
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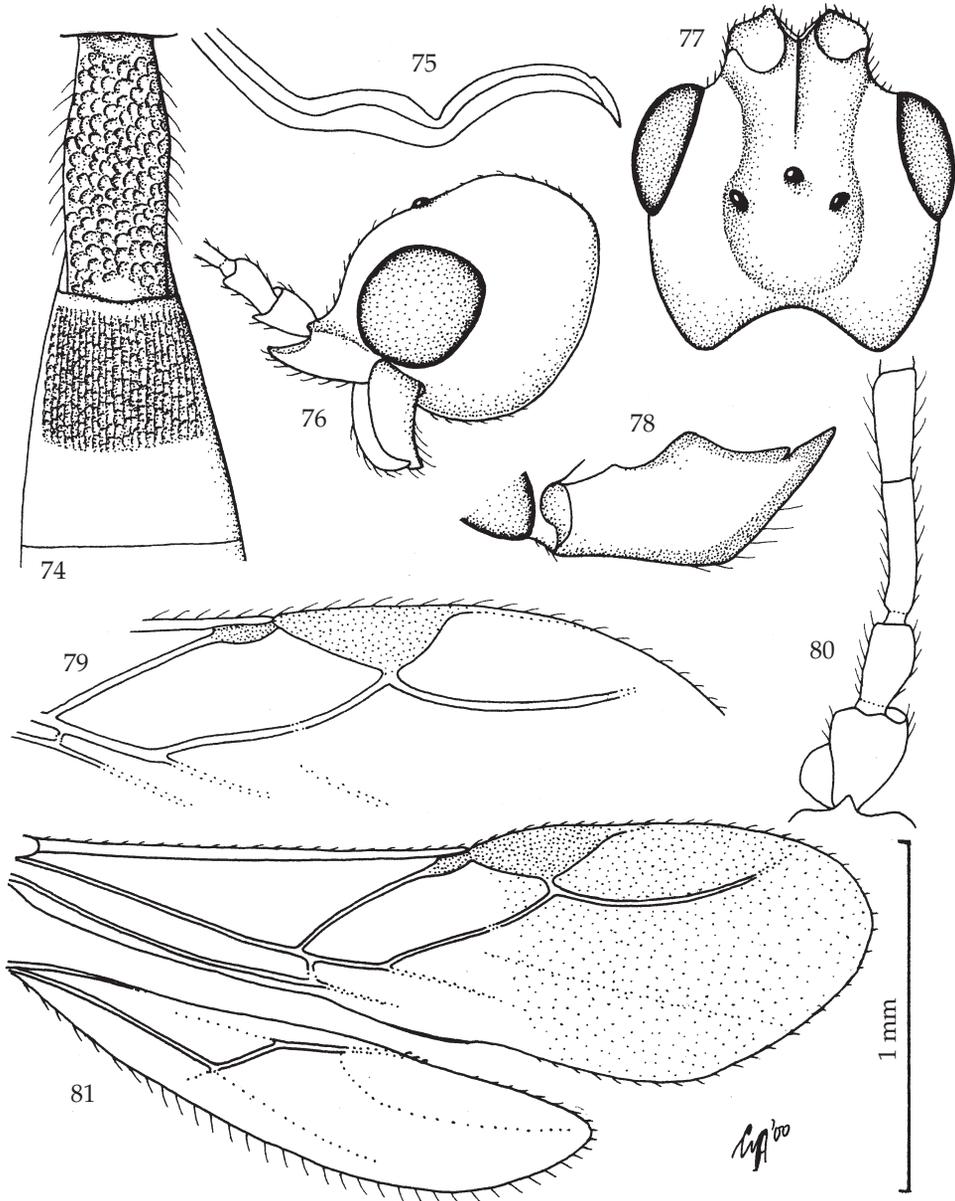
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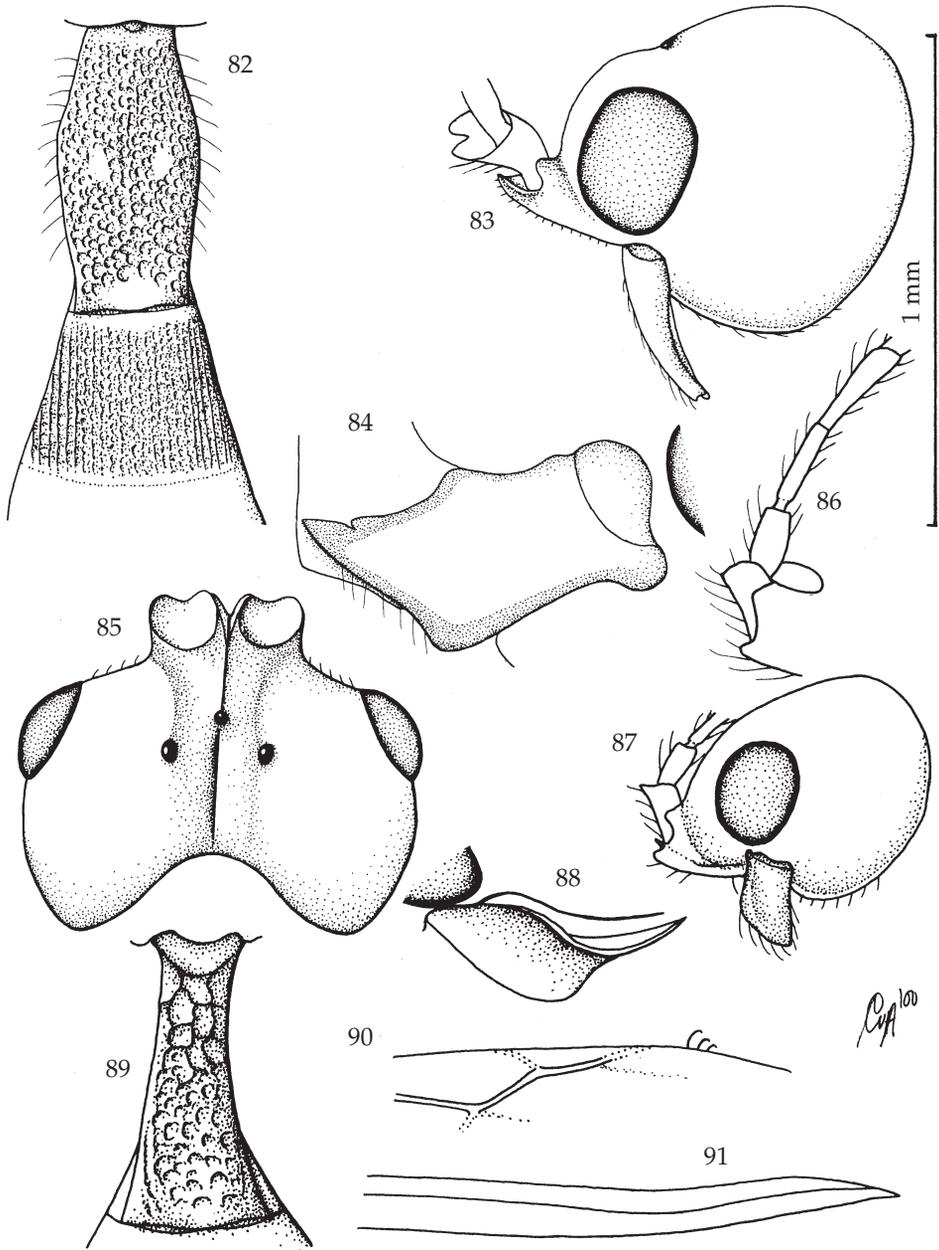
Figs 51-64, *Sinuatophorus maximus* gen. nov. & spec. nov., ♀, holotype. 51, wings; 52, antenna, lateral aspect; 53, habitus, lateral aspect; 54, ovipositor and its sheath; 55, apical third of ovipositor, lateral aspect; 56, id., but dorsal aspect; 57, basal segments of antenna; 58, apex of antenna; 59, head, frontal aspect; 60, outer hind claw; 61, hind leg; 62, mesosoma, dorsal aspect; 63, first-second metasomal tergites, dorsal aspect; 64, head, dorsal aspect. 51-54, 61: 1.0 × scale-line; 55-58, 60: 2.5 ×; 59, 62-64: 2.3 ×.



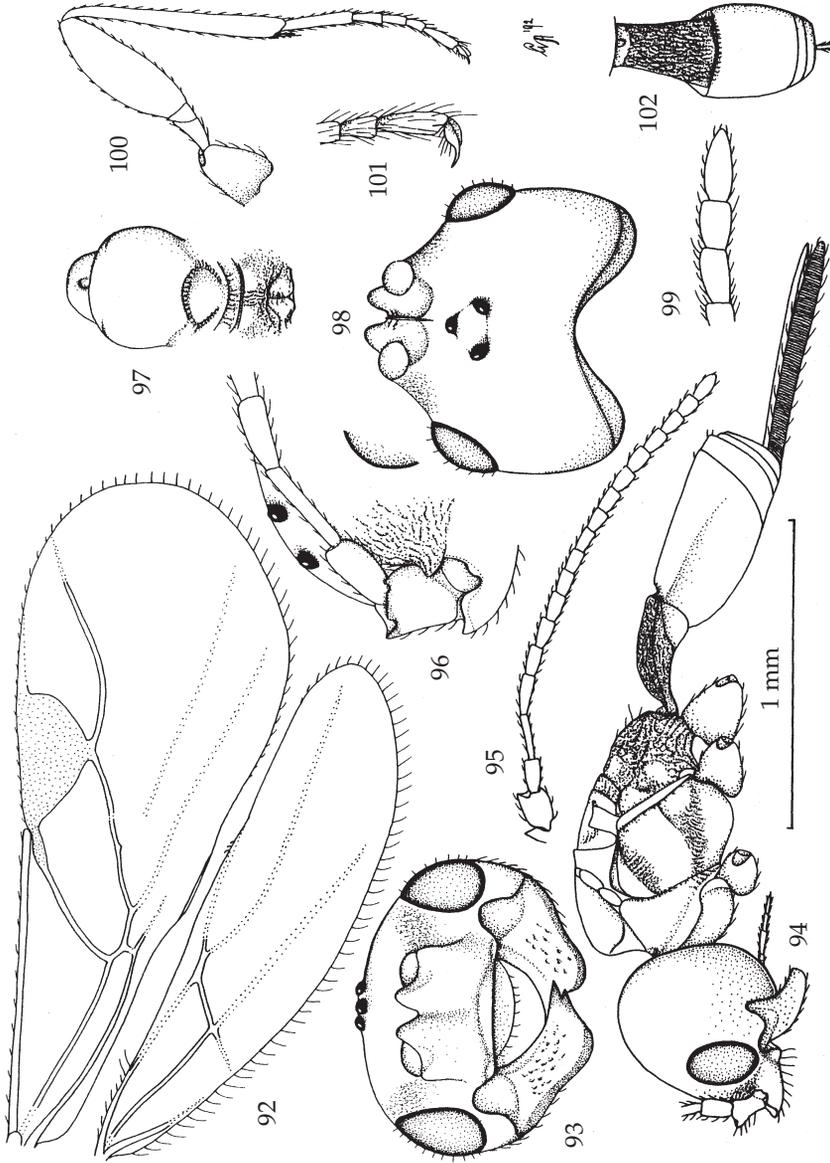
Figs 65-68, *Simatophorus breviceps* spec. nov., ♀, holotype; figs 69-73, *S. longiceps* spec. nov., ♀, holotype. 65, 69, first-third metasomal tergites, dorsal aspect; 66, mandible, dorso-lateral aspect; 67, apex of ovipositor, lateral aspect; 68, 71, head, dorsal aspect; 70, head, lateral aspect; 72, mandible, dorsal aspect; 73, disco-submarginal and marginal cells. 65, 68-71: 1.0 × scale-line; 66, 67, 72: 1.5 ×; 73: 1.2 ×.



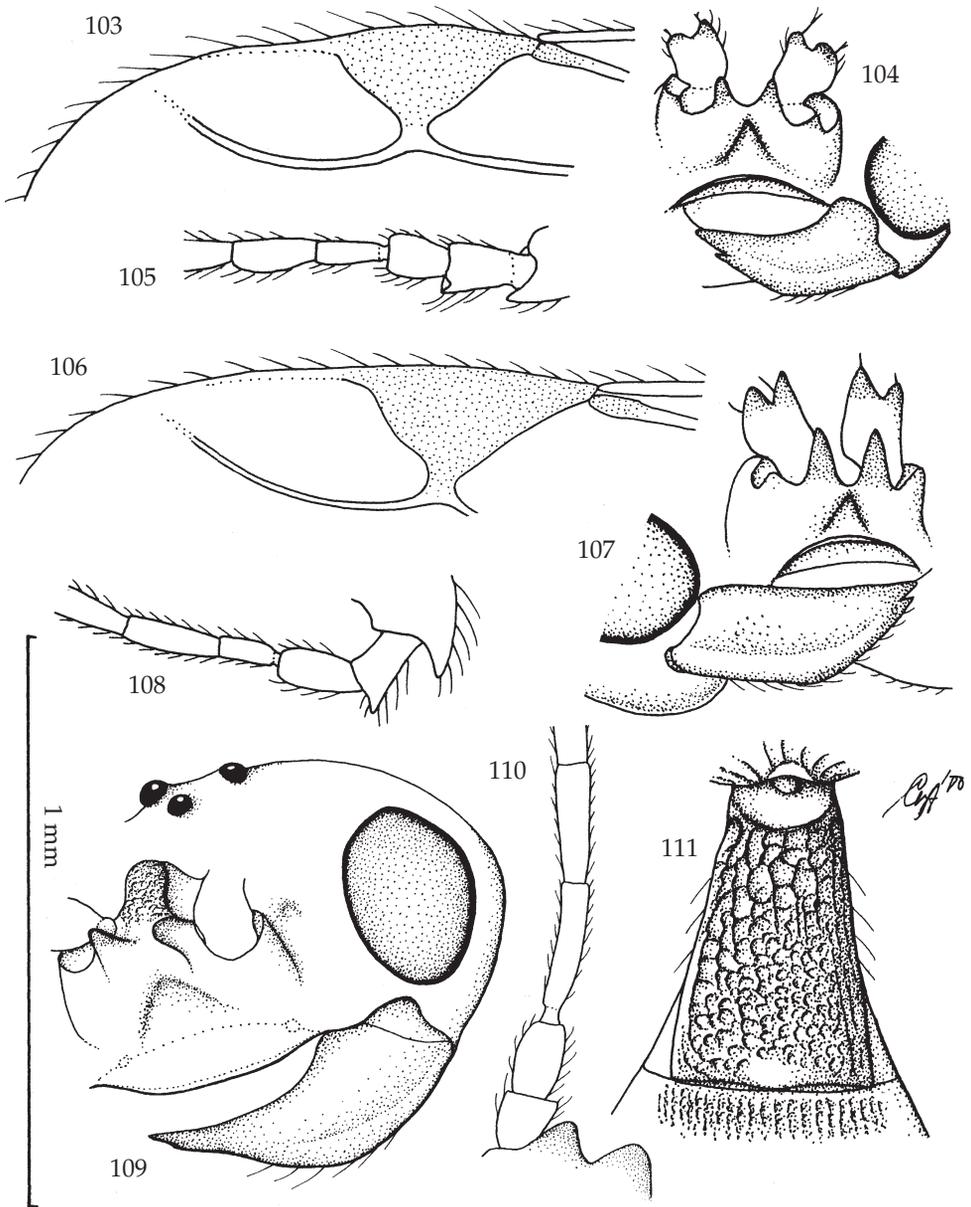
Figs 74-80, *Simuatophorus acutidentatus* spec. nov., ♀, holotype; fig. 81, *S. constrictus* spec. nov., ♀, holotype. 74, first-third metasomal tergites, dorsal aspect; 75, apex of ovipositor, lateral aspect; 76, head, lateral aspect; 77, head, dorsal aspect; 78, mandible, dorsal aspect; 79, disco-submarginal and marginal cells; 80, four basal segments of antenna, anterior aspect; 81, wings. 74, 76, 77, 79: 1.6 x; 75, 78: 2.4 x; 80: 2.7 x; 81: 1.0 x scale-line.



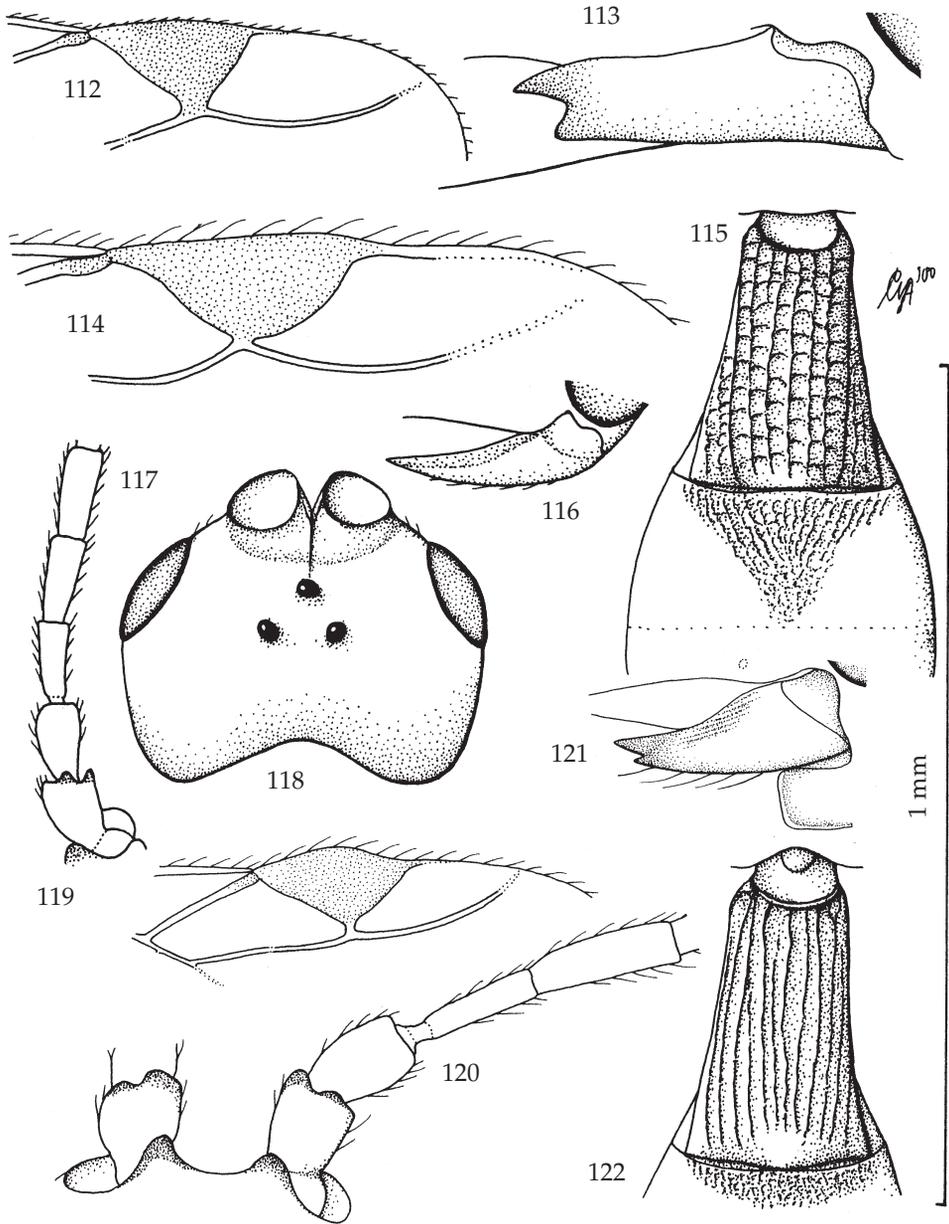
Figs 82-84, *Sinuatophorus constrictus* spec. nov., ♀, holotype; figs 85-91, *Cosmophorus depressus* spec. nov., ♀, holotype. 82, first and second metasomal tergites, dorsal aspect; 83, 87, head, lateral aspect; 84, mandible, dorsal aspect; 85, head, dorsal aspect; 86, base of antenna, lateral aspect; 88, mandible, dorso-lateral aspect; 89, first tergite, dorsal aspect; 90, detail of vein 2-SC+R of hind wing; 91, apex of ovipositor, lateral aspect. 82, 83: 1.0 × scale-line; 84, 87, 90: 1.3 ×; 85: 1.5 ×; 86, 88, 89, 91: 1.9 ×.



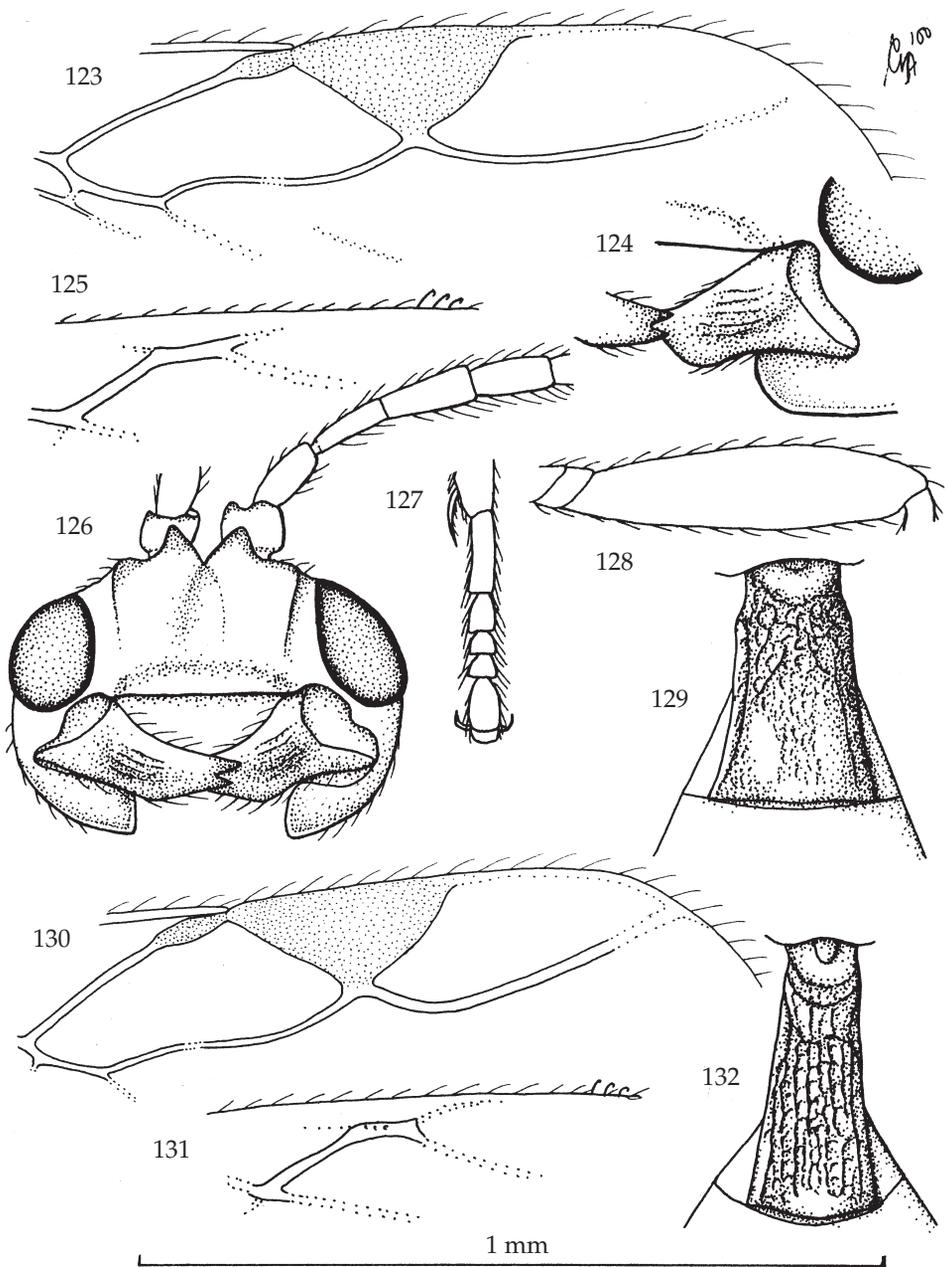
Figs 92-102, *Cosmophorus klugii* Ratzelburg, ♀, Poland, Czarna Białostoka. 92, wings; 93, head, frontal aspect; 94, habitus, lateral aspect; 95, antenna, lateral aspect; 96, mesosoma, dorsal aspect; 97, head, dorsal aspect; 98, head, dorsal aspect; 99, apex of antenna; 100, hind leg; 101, outer middle claw; 102, metasoma, dorsal aspect. 92, 94, 95, 100: 1.0 × scale-line; 93, 98: 1.5 ×; 96, 99, 101: 2.0 ×; 97, 102: 0.9 ×.



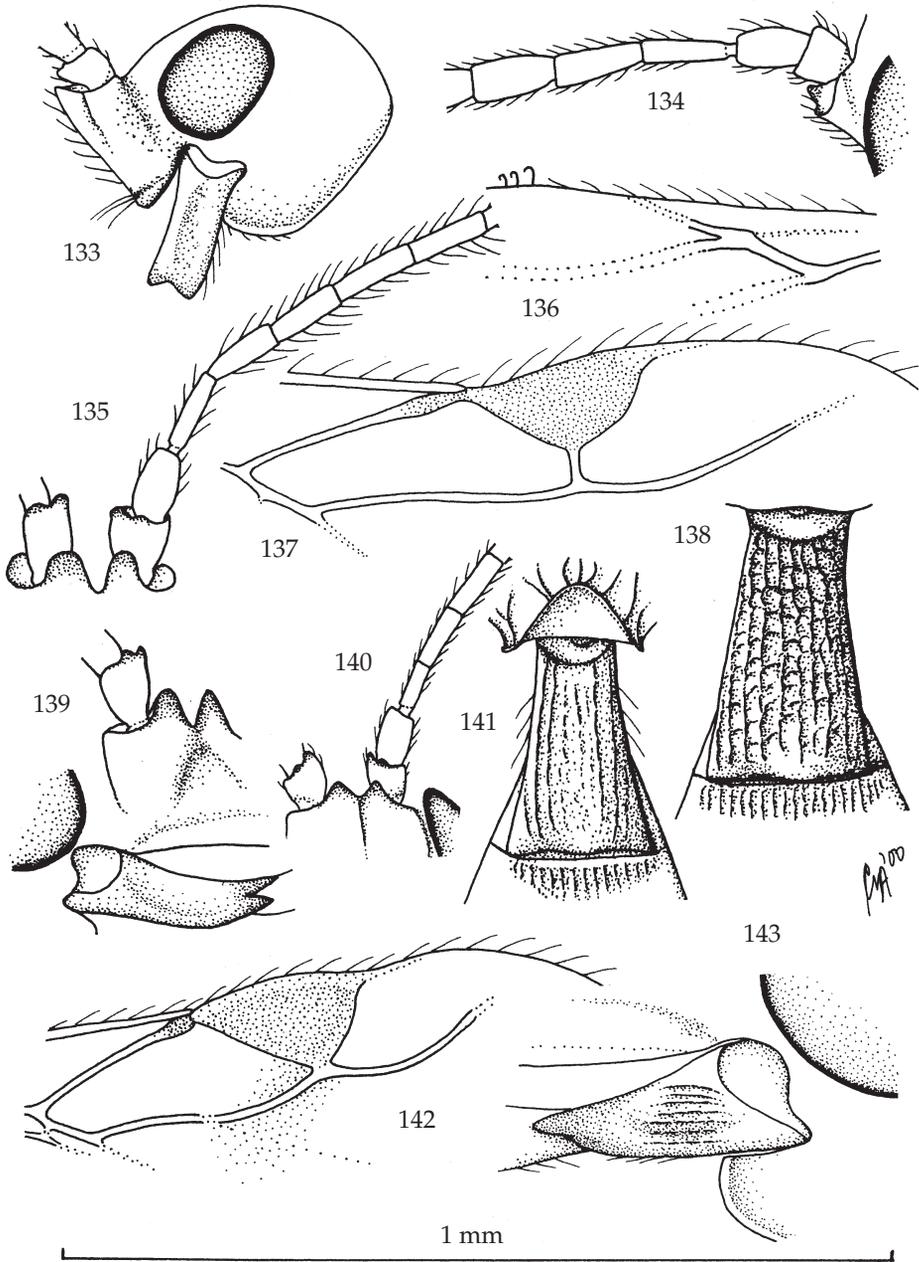
Figs 103-105, *Cosmophorus alboterminalis* spec. nov., ♀, holotype; figs 106-108, *C. dentifer* spec. nov., ♀, holotype; figs 109-111, *C. robustus* spec. nov., ♂, holotype. 103, 106, marginal cell of fore wing; 104, 107, face and mandible, ventro-frontal aspect; 105, 108, base of antenna, lateral aspect; 109, head, antero-lateral aspect; 110, base of antenna, anterior aspect; 111, first metasomal tergite, dorsal aspect. 103-105, 107, 108: 1.7 ×; 106: 1.5 ×; 109, 110: 1.3 ×; 111: 1.0 × scale-line.



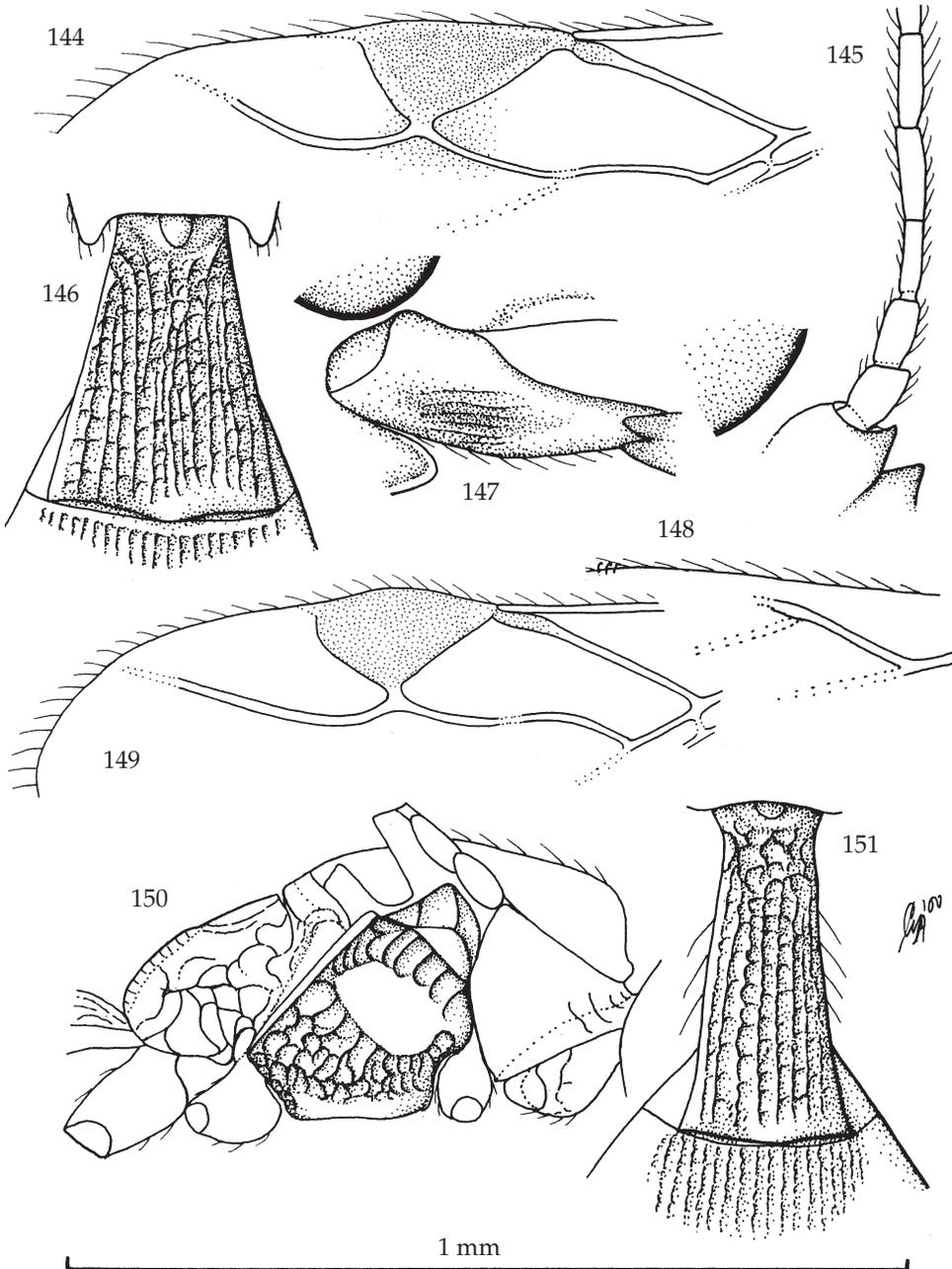
Figs 112-113, *Cosmophorus robustus* spec. nov., ♂, holotype; figs 114-118, *C. godfrayi* spec. nov., ♀, holotype; figs 119-122, *C. minutus* spec. nov., ♀, holotype. 112, 114, marginal cell of fore wing; 113, mandible, ventral aspect; 115, first and second metasomal tergites, dorsal aspect; 116, mandible, dorso-lateral aspect; 117, 120, base of antenna, anterior aspect; 118, head, dorsal aspect; 119, disco-submarginal and marginal cells of fore wing; 121, mandible, ventro-lateral aspect; 122, first tergite, dorsal aspect. 113-115, 118: 1.0 × scale-line; 112: 0.4 ×; 116, 117: 1.1 ×; 119: 0.8 ×; 120: 1.5 ×; 121: 1.6 ×; 122: 1.7 ×.



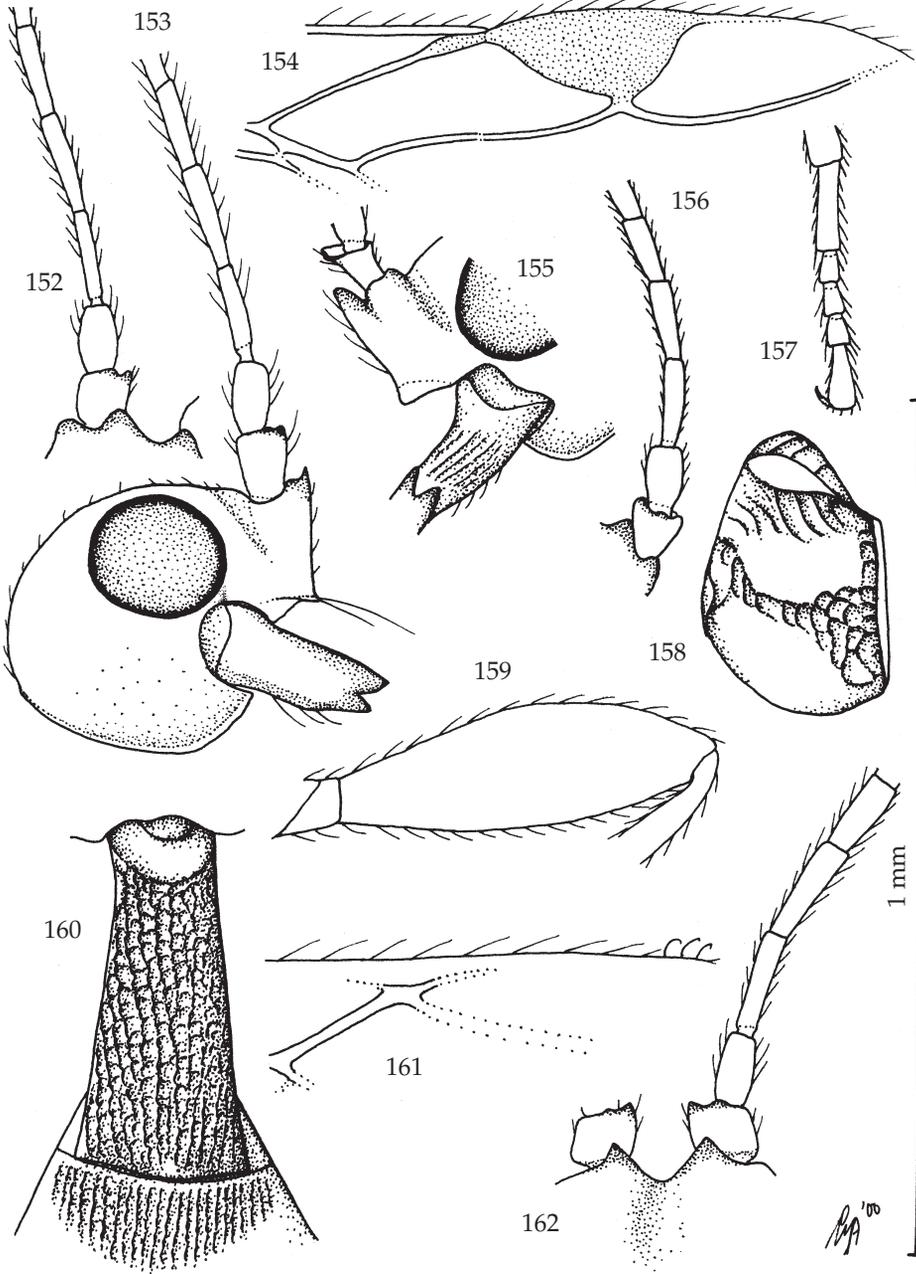
Figs 123-129, *Cosmophorus infuscatus* spec. nov., ♀, holotype; figs 130-132, *C. taiwanensis* spec. nov., ♀, holotype. 123, 130, disco-submarginal and marginal cells of fore wing; 124, mandible, latero-ventral aspect; 125, 131, detail of vein 2-SC+R of hind wing; 126, head, ventro-frontal aspect; 127, fore tarsus, dorsal aspect; 128, hind femur, lateral aspect; 129, 132, first metasomal tergite, dorsal aspect. 123, 130: 1.0 × scale-line; 124, 125, 127, 128: 1.4 ×; 126, 129, 131, 132: 1.3 ×.



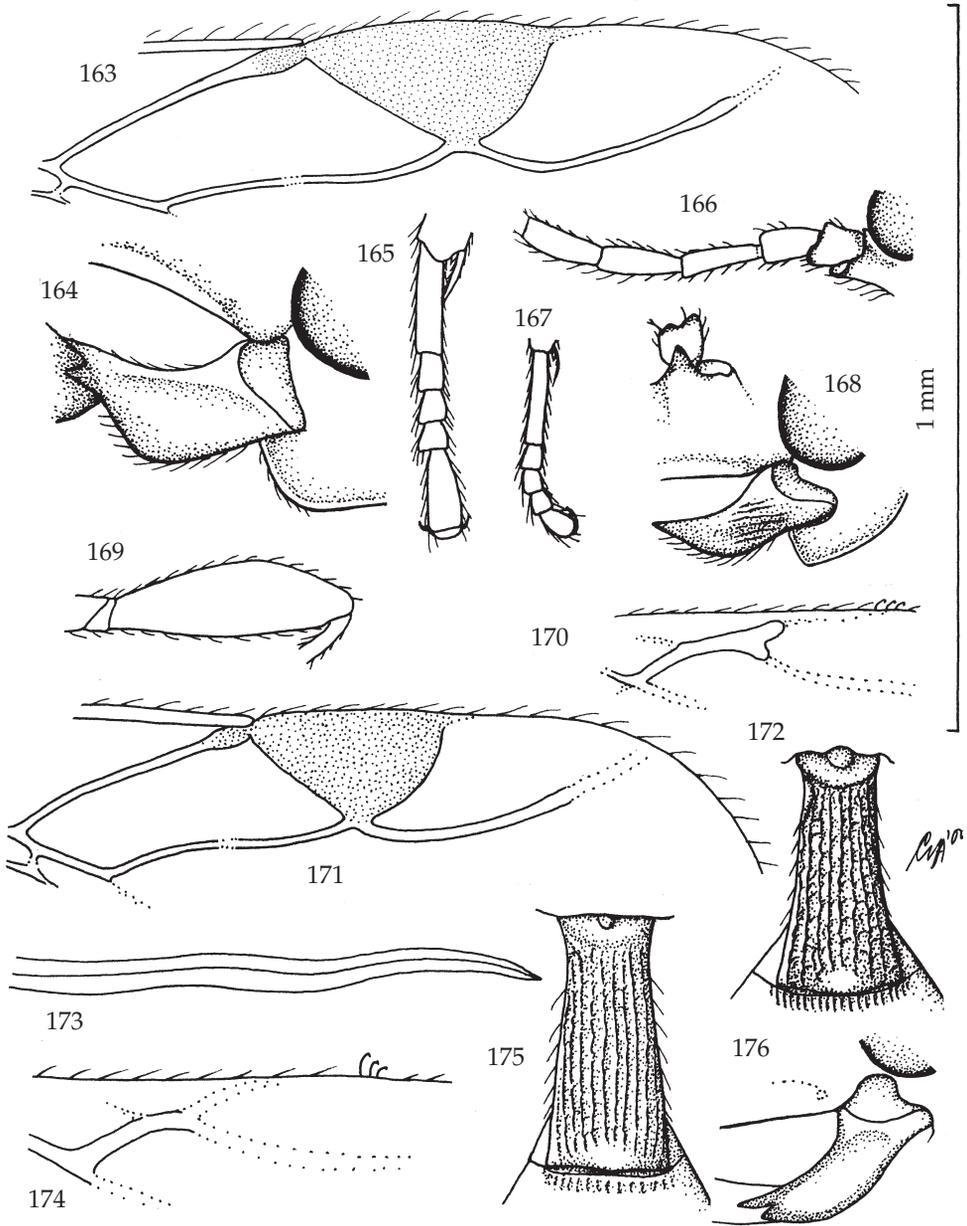
Figs 133-134, *Cosmophorus taiwanensis* spec. nov., ♀, holotype; figs 135-139, *C. brevipetiolatus* spec. nov., ♀, holotype; figs 140-143, *C. brevicaudatus* spec. nov., ♀, holotype. 133, head, lateral aspect; 134, base of antenna, lateral aspect; 135, 140, id., but anterior aspect; 136, detail of vein 2-SC+R of hind wing; 137, 142, disco-submarginal and marginal cells of fore wing; 138, 141, first metasomal tergite, dorsal aspect; 139, face and mandible, ventro-lateral aspect; 143, mandible, ventro-lateral aspect. 133, 137: 1.0 × scale-line; 134, 135, 136, 138-142: 1.1 ×; 143: 1.7 ×.



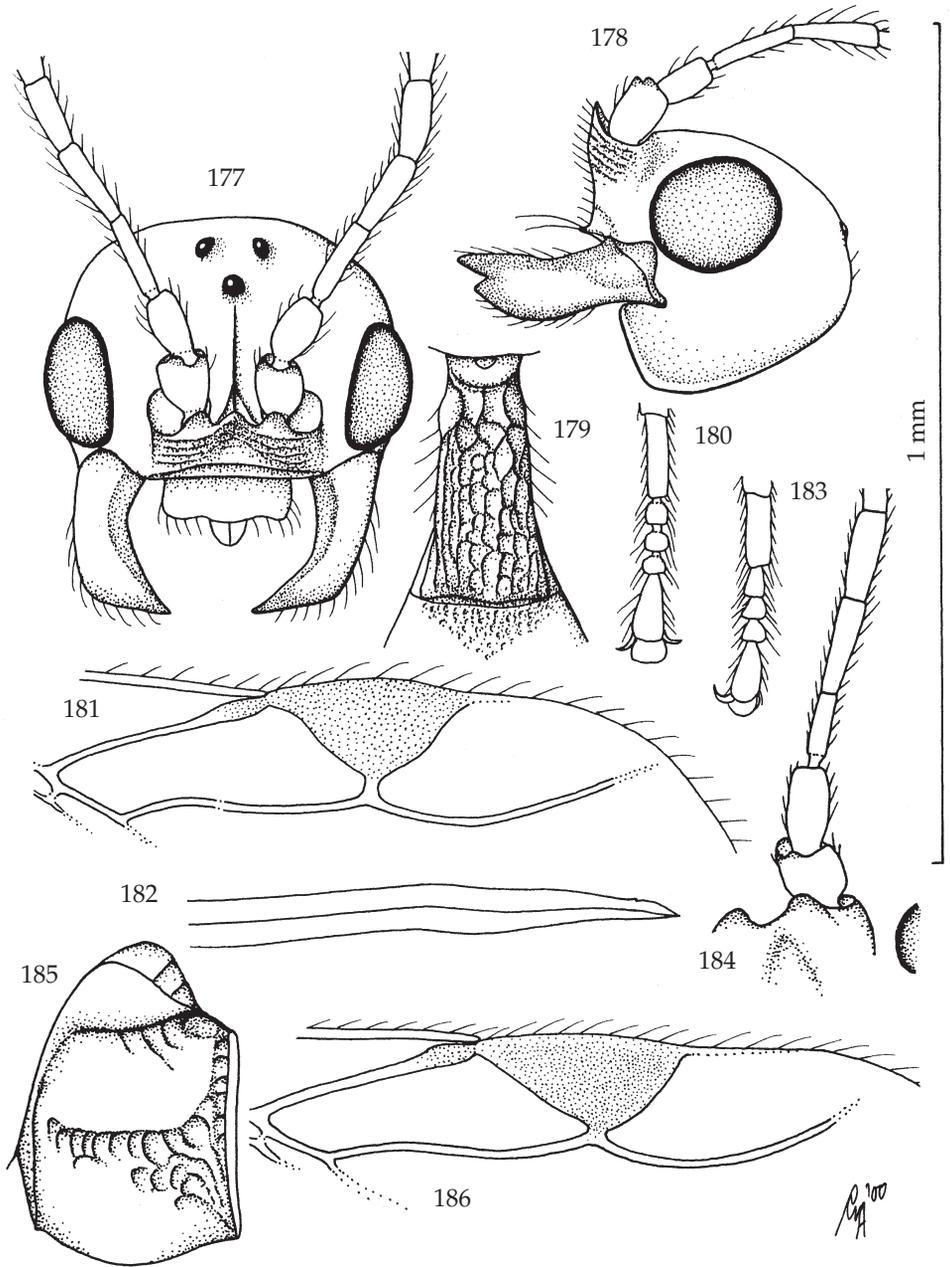
Figs 144-148, *Cosmophorus mesocaudatus* spec. nov., ♀, holotype; figs 149-151, *C. reticulatus* spec. nov., ♂, holotype. 144, 149, disco-submarginal and marginal cells of fore wing; 145, base of antenna, anterior aspect; 146, 151, first tergite, dorsal aspect; 147, mandible, latero-ventral aspect; 148, detail of vein 2-SC+R of hind wing; 150, mesosoma, lateral aspect. 144, 146, 147, 150: 1.0 × scale-line; 145, 148, 151: 1.1 ×; 149: 0.9 ×.



Figs 152, 153, *Cosmophorus reticulatus* spec. nov., ♂, holotype; figs 154-158, *C. fusciceps* spec. nov., ♀, holotype; figs 159-162, *C. curvatus* spec. nov., ♀, holotype. 152, 156, 162, base of antenna, anterior aspect; 153, head and base of antenna, lateral aspect; 154, disco-submarginal and marginal cells of fore wing; 155, face and mandible, lateral aspect; 157, fore tarsus, dorsal aspect; 158, mesopleuron, lateral aspect; 159, hind femur, lateral aspect; 160, first metasomal tergite, dorsal aspect; 161, detail of vein 2-SC+R of hind wing. 152, 153, 156, 158, 159, 161: 1.1 x; 154, 155, 162: 1.0 x scale-line; 157: 1.2 x; 160: 0.9 x.



Figs 163-165, *Cosmophorus curvatus* spec. nov., ♀, holotype; figs 166-172, *C. choui* spec. nov., ♀, holotype; figs 173-176, *C. adebratti* spec. nov., ♀, holotype. 163, 171, disco-submarginal and marginal cells of fore wing; 164, 176, mandible, fronto-ventral aspect; 165, 167, fore tarsus, dorsal aspect; 166, base of antenna, lateral aspect; 168, mandible, antero-lateral aspect; 169, hind femur, lateral aspect; 170, 174, detail of vein 2-SC+R of hind wing; 172, 175, first metasomal tergite, dorsal aspect; 173, apex of ovipositor, lateral aspect. 163: 1.0 × scale-line; 164-166, 168-176: 1.3 ×; 167: 1.6 ×.



Figs 177-182, *Cosmophorus harrysi* spec. nov., ♀, holotype; figs 183-186, *C. adebratti* spec. nov., ♀, holotype. 177, head, anterior aspect; 178, head, lateral aspect; 179, first metasomal tergite, dorsal aspect; 180, 183, fore tarsus, dorsal aspect; 181, 186, disco-submarginal and marginal cells of fore wing; 182, apex of ovipositor, lateral aspect; 184, base of antenna, anterior aspect; 185, mesopleuron, lateral aspect. 177-179, 181, 182, 186: 1.0 × scale-line; 180, 184, 185: 1.1 ×; 183: 1.2 ×.