

## Description of new *Cephalops* species (Pipunculidae, Diptera) from the Oriental Region.

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### Abstract

Four new *Cephalops* Fallén species are described from the Oriental region: *C. burmensis* sp. n., *C. javensis* sp. n., *C. magnimembrus* sp. n. and *C. taiwanensis* sp. n.. Their phylogenetic position to other representatives of the genus is discussed.

### Résumé

Quatre nouvelles espèces orientales du genre *Cephalops* ont été reconnues: *C. burmensis* sp. n., *C. javensis* sp. n., *C. magnimembrus* sp. n. et *C. taiwanensis* sp. n.. Leur position phylogénétique est comparée avec d'autres représentants du genre *Cephalops*.

### Introduction

Pipunculidae (Diptera) are small, inconspicuous flies, closely related to hoverflies (Syrphidae). During their larval stage they are known to be parasitoids of Auchenorrhyncha (Homoptera) (WALOFF & JERVIS, 1987). Within the scope of a world revision of the genus *Cephalops* Fallén and adjacent taxa (DE MEYER, 1989a,b,c, 1990, DE MEYER & GROOTAERT, 1990) the representatives of the Oriental region were revised.

The genus *Cephalops* is well represented in the Oriental region. HARDY (1975) listed 30 species (under *Pipunculus* (*Cephalops*)) in his catalogue. KAPOOR et al. (1987) described a further 7 species from the Indian subcontinent. Our revision of the Oriental species, based on study of type material and additional material that could be obtained, revealed 4 hitherto undescribed species: *C. burmensis* sp. n. from Burma, *C. javensis* sp.n. from Java, *C. magnimembrus* sp.n. from Sri Lanka, and *C. taiwanensis* sp.n. from Taiwan. These new species are described here and their relationship with other *Cephalops* spp. is discussed in a worldwide perspective.

### Material and methods

Material from the Oriental region was kindly put at my disposal by the following institutions and curators:

- BPBM – Bernice P. Bishop Museum, Honolulu Hawaii (N. Evenhuis),
- NHM – Natural History Museum, London U.K. (A. Pont/ N. Wyatt),
- UHM – University of Hawaii at Manoa, Honolulu Hawaii (D.E. Hardy),
- ZML – Zoological Museum Lund, Sweden (R. DANIELSSON).

In addition, Dr. J.A. RAFAEL (Instituto Nacional de Pesquisas da Amazônia, Manaus, Brasil) kindly arranged the loan of some valuable Neotropical material for comparison (cfr discussions).

Terminology and preparation technique of male genitalia for study, is discussed in DE MEYER (1989a,b). Representatives of the genus *Cephalops* can be divided into a number of species groups and subgroups (see DE MEYER, 1989a,b,c; 1990; in prep; and DE MEYER & GROOTAERT, 1990 for characteristics of these (sub)groups). This division is based on a cladistic analysis performed by Felsenstein's MIX program of his PHYLIP package, version 2.9. (FELSENSTEIN, 1986). Where appropriate, the results of this analysis are discussed to indicate the relationship of the new species with other *Cephalops* spp.

### *Cephalops* FALLÉN

*Cephalops* Fallén, 1810: 10. Type species: *Cephalops aeneus* Fallén, 1810 by monotypy.

Synonymy and detailed description of generic characters have been given in DE MEYER (1989a).

### *Cephalops burmensis* sp. n. (Figs. 1, 6a)

*Body length* 4.3-5.1mm; *wing length* 5.0-5.3mm.

### *Male.*

Frons brownish pubescent, upper half greyish brown. Third antennal segment obtuse to short acute; yellow with brownish tinge. Face greyish pubescent; equal in width to lower portion of frons.

Thorax. Humeri dark, same colour as centre mesonotum. Propleural fan well developed with approx. 9 long darkish hairs. Mesonotum subshining black-brown; brownish dusted. Scutellum slightly paler dusting than centre mesonotum; with row of short to moderately long pale hairs along apical margin. Halteres yellow, knobs brown. Pleura greyish brown dusted.

Legs. Coxae brown; trochanters yellow. Femora yellow; all shining posteroventrally. Front femora ventrally with anterior row of six spines at apical half, posterior row at most with 1-2 spines at apical end. Mid femora ventrally with double row of approx. 13 spines nearly over entire length. Hind femora ventrally with double row of 5 pale bristly hairs at apical half, no distinct spines, continued as row of short pale hairs. Tibiae yellow; with dispersed rows of short pale hairs. Front and mid tibiae with apical spine; posteriorly with one short suberected bristle in median part. Hind tibiae thickened in the middle with anteriorly 2 distinctly erected spiny bristles. Tarsi yellow, last tarsal segment slightly darkened. Pulvilli as long as segment; claws longer than segment.

Wings. Third costal section about twice as long as fourth section. Cross-vein r-m placed at basal third of discal cell. Abdomen. Tergum 1 greyish dusted; lateral fan well developed with 6-8 long hairs. Terga 2-5 with anterior half densely black dusting, in terga 2-3 dusting extending over centre of tergum; posteriorly subshining black-

brown, brownish dusted, posterolaterally greyish dusted. Terga furthermore with short pale hairs. Sterna yellowish brown, dull. Sternum 6 swollen. Sternum 8 subshining black-brown, brownish dusted; in dorsal view less than half the length of tergum 5. Membraneous area not reaching epandrium; narrow slit like. Male terminalia (Fig. 1). Surstyli symmetrical, long, in lateral view strongly downcurved. Apical part of aedeagus simple, pointed. Ejaculatory duct unifid, with sclerotized and membraneous appendages. Ejaculatory apodema tubiform.

#### Female.

As male except for the following characters. Frons not broadened in the middle; silver-grey pubescent, shining black in front of ocellar triangle for length equal to triangle. Humeri yellow. Thorax and abdomen more greyish dusted. Claws and pulvilli longer. Female terminalia (Fig. 6a). Base long and broad; piercer very short, thin and straight.

*Type locality:* Burma, Kambaiti.

*Type material:* Holotype ♂, Burma, Kambaiti (7000ft), 28.IV.1934, Malaise (UHM); condition good. - Allotype ♀ BURMA, same locality as holotype, 15.V.1934, Malaise (UHM). - Paratypes: BURMA: Same locality

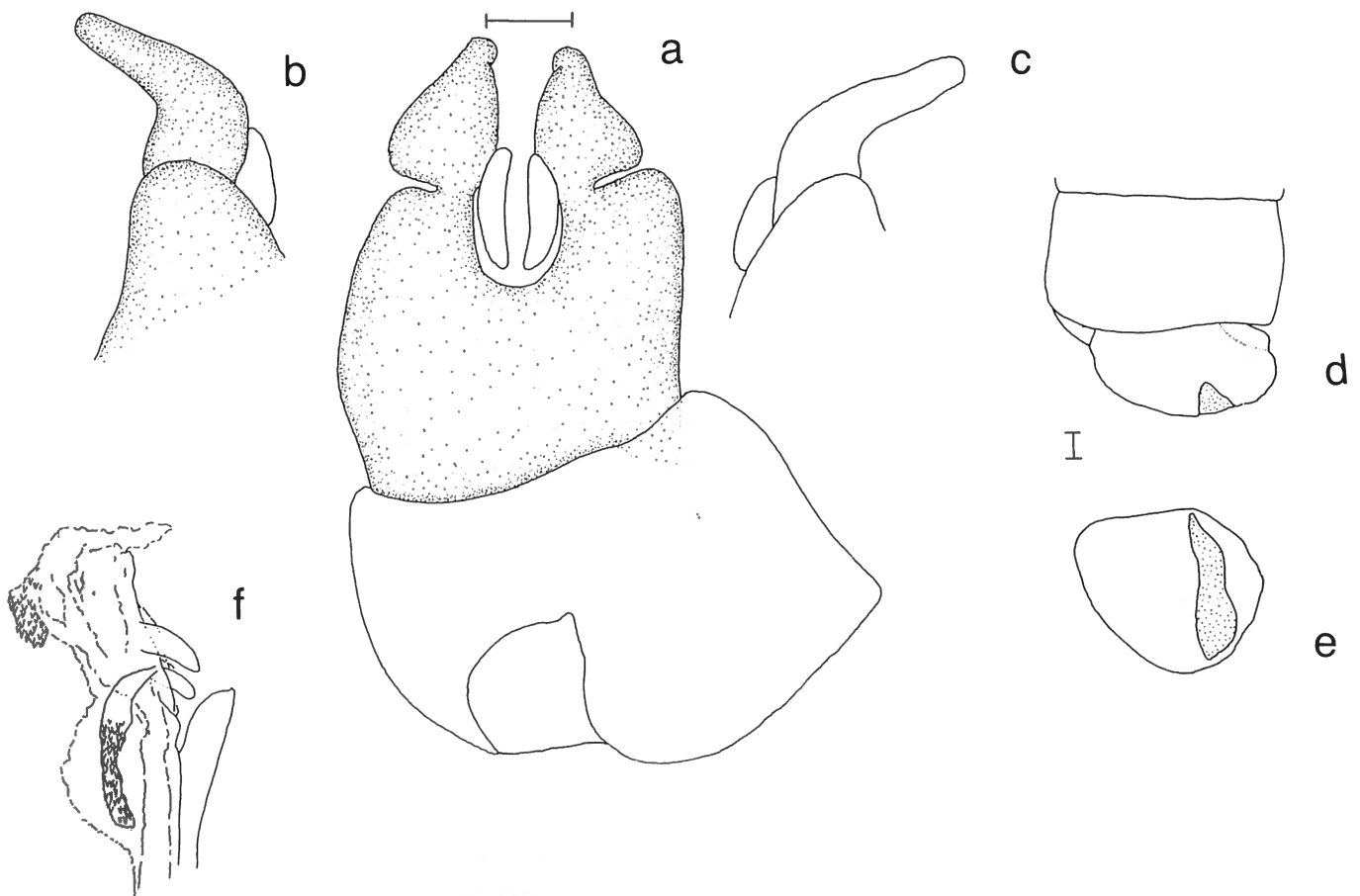


Fig. 1. — *C. burmensis* sp.n. Male terminalia. a, dorsal view; b, outer surstylus lateral; c, inner surstylus lateral; d, tergum 5 and sternum 8 dorsal; e, sternum 8 caudal; f, ejaculatory duct (scale line 0.1mm).

as holotype, 2 ♂♂, 5 ♀♀, 14.V-9.VI.1934, Malaise (UHM); 1 ♀, 15.IV.1934; 1 ♀, 14.V.1934 (BPBM). Holotype, allotype and two paratypes deposited in BPBM; 2 paratypes retained at KBIN; other paratypes returned to UHM.

*Derivatio nominis*: named after type locality, Burma.

*Discussion.*

These specimens were previously identified as *C. longipennis* by HARDY (1972). After comparison with type material of *C. longipennis*, they proved to belong to another, hitherto undescribed species. *C. burmensis* sp.n. belongs to the *aeneus* species group (see DE MEYER, 1989a,c). It does not show any relationship with other Oriental species. It shows however some resemblance with a number of Neotropical and Afrotropical species, which are referred to as the *kalimus* subgroup (DE MEYER, 1992). The monophyly of this subgroup and *C. burmensis* is mainly based on the synapomorphic character states of the ejaculatory duct which is single and membranous, the male sternum 6 being swollen, and (in most species) the presence of short suberected bristles in the posterior median portion of front and mid tibiae. *C. burmensis* presents a more plesiotypic species in this lineage because of the partly reduced and slit like membranous area on the male sternum 8. This seems to be a transition stage between other representatives of the *aeneus* group where the membranous area is large and variable in shape (roundish, oval or reniform) but never slit like, and the

*kalimus* subgroup where the membranous area is completely reduced and absent.

***Cephalops javensis* sp. n.**

(Figs. 2, 6b)

*Body length*: 3.9-4.1mm; *wing length*: 4.5-4.7mm.

*Male.*

Frons dark greyish pubescent. Third antennal segment acute, yellow-brownish. Face silver-grey pubescent; equal in width to lower portion of frons

Thorax. Humeri yellow. Propleural faw well developed with 6 long pale hairs. Mesonotum subshining black-brown; brownish dusted. Scutellum same colour and dusting as centre mesonotum; with row of short pale hairs along apical margin. Halteres yellow. Pleura greyish dusted.

Legs yellow. Coxae brown, apically yellow; trochanters yellow. Femora yellow; dull except for hind femora shining posteroventrally. Front femora ventrally with double row of 6 spines at apical two-fifths, posterior row less developed. Mid femora ventrally with double row of 15 spines nearly over entire length. Hind femora ventrally with double row of 4-6 spines at apical third, continued as row of short pale hairs. Tibiae yellow; with dispersed rows of short pale hairs. Hind tibiae thickened in the middle without any suberected spines anteriorly. Front and mid tibiae with apical spines. Tarsi yellow, last tarsal seg-

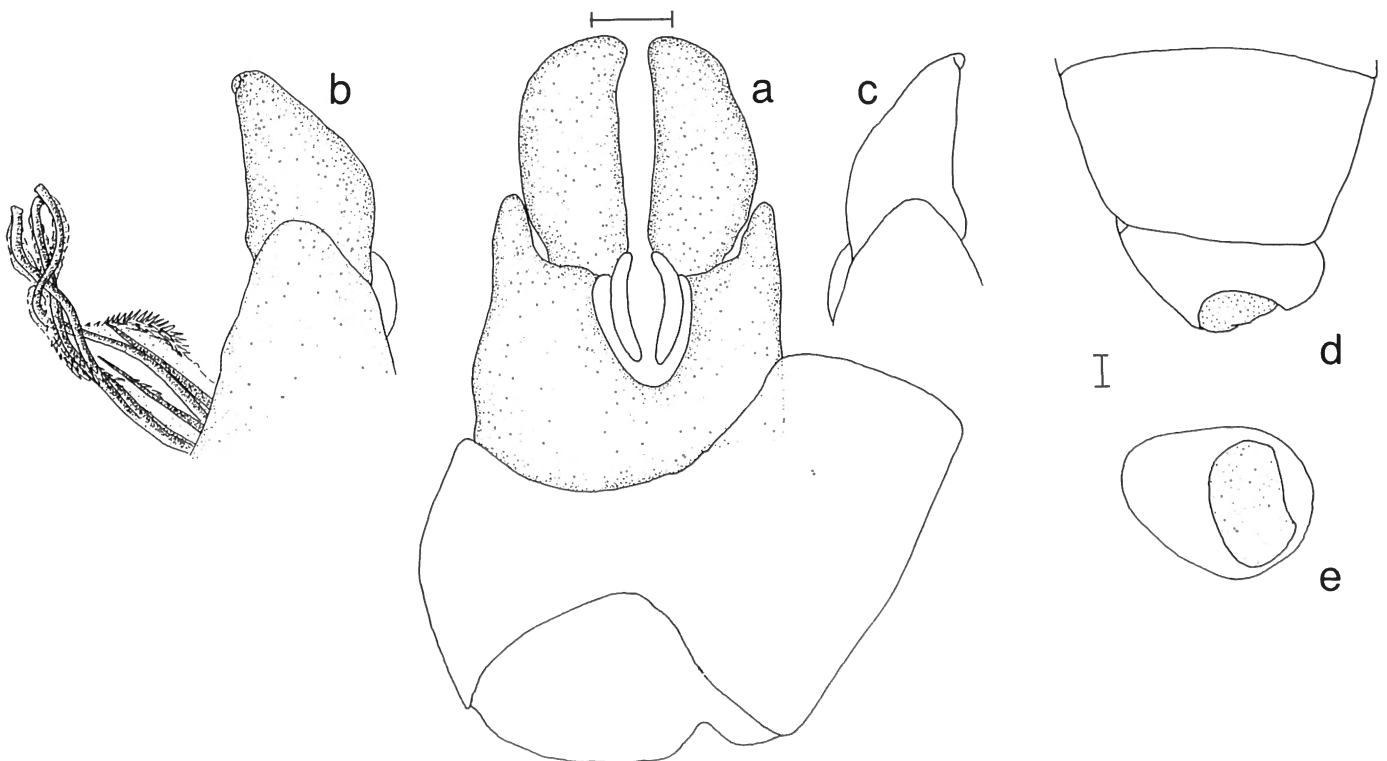


Fig. 2. — *C. javensis* sp.n. Male terminalia. a, dorsal view; b, outer surstylus with ejaculatory duct, lateral; c, inner surstylus lateral; d, tergum 5 and sternum 8 dorsal; e, sternum 8 caudal (scale line 0.1mm).

ment dark; with short pale hairs. Pulvilli shorter than last tarsal segment; claws about as long as segment.

Wings. Third costal section three to four times as long as fourth costal section. Cross-vein r-m placed at basal third of discal cell.

Abdomen. Tergum 1 greyish dusted; lateral fan poorly developed with 3 short pale hairs. Tergum 2 anteriorly dense black dusting; posterior third silver-grey dusted, subshining black-brown. Terga 3-5 anterior third dense black dusted; posteriorly silver-grey dusted, subshining black. Terga furthermore with short, pale hairs. Sterna yellowish brown. Sternum 8 brownish dusted, subshining black-brown; in dorsal view about half the length of tergum 5. Membraneous area not reaching epandrium; weakly reniform shaped; in distal view occupying half of sternum 8.

Male terminalia (Fig. 2). Surstyli symmetrical, slightly narrowed apically. Apical part aedeagus simple, pointed. Ejaculatory duct trifid, with several well developed teeth and sclerotized structures. Ejaculatory apodema tubiform.

#### *Female.*

As male except for the following characters. Frons broadened in the middle; silver-grey pubescent, shining black spot in upper part, about twice the length of ocellar triangle.

Female terminalia (Fig. 6b). Base broad, large; piercer straight and pointed.

*Type locality:* Java.

*Type material:* Holotype ♂, JAVA, V-VI.1907 (no correct locality site given) (BPBM). - Allotype: ♀ JAVA, V-VI.1907. Holotype and allotype returned to BPBM.

*Derivatio nominis:* named after type locality, Java.

#### *Discussion.*

Like the previous species, *C. javensis* sp.n. belongs to the *aeneus* group. The exact relationship to other species of this group is unclear. The sclerotized structures on the ejaculatory duct and the very long third costal section of the wing, are characters in common with *C. multidenticulatus* from Papua New Guinea, and 2 newly described species from Australia. The trifid ejaculatory duct however is a plesiomorphic character uncommon in other *Cephalops* of the *aeneus* group (where ejaculatory duct is bifid or single).

### ***Cephalops magnimembrus* sp. n.** (Figs. 3, 6c)

*Body length:* 3.0-3.3mm; *wing length:* 2.9-3.5mm.

#### *Male.*

Frons silver-grey pubescent; with large shining median patch occupying almost entire width. Third antennal seg-

ment short acute, yellow. Face silver-grey pubescent; equal in width to lower portion of frons.

Thorax. Humeri dark, same colour as centre mesonotum. Propleural fan well developed with 5 pale hairs. Mesonotum subshining black-brown; brownish dusted. Scutellum same colour and dusting as centre mesonotum; with row of short pale hairs along apical margin. Halteres yellowish. Pleura greyish dusted.

Legs yellow. Coxae brown; trochanters yellow. Femora yellow, sometimes slightly darkened in median part; dull except hind femora shining posteroventrally. Front femora ventrally with double row of 4-6 spines at apical half. Mid femora ventrally with double row of 12 spines nearly over entire length. Hind femora ventrally with double row of 5 spines at apical half, continued basally as row of short pale hairs. Tibiae yellow, with dispersed rows of short pale hairs. Hind tibiae thickened in the middle with anteriorly 2 suberected bristles. Tarsi yellow, last tarsal segment dark; with short pale hairs. Pulvilli shorter than last tarsal segment; claws as long as segment.

Wings. Third costal section as long as fourth costal section. Cross-vein r-m placed near middle of discal cell. Abdomen. Tergum 1 greyish dusted; lateral fan poorly developed with 3-4 short pale hairs. Tergum 2 mainly brownish dusted, posterolaterally narrowly shining black-brown. Tergum 3 brownish dusted on centre and along lateral margins, otherwise shining black-brown. Terga 4-5 mainly shining black-brown except along lateral margins. Terga furthermore with short pale hairs. Sterna brown, dull. Sternum 8 subshining black-brown, brownish dusted; in dorsal view less than half the length of tergum 5. Membraneous area barely reaching epandrium, roundish; in distal view occupying half of sternum 8.

Male terminalia (Fig. 3). Epandrium large. Surstyli symmetrical, bifurcated; in lateral view strongly downcurved. Apical part of aedeagus with hooklike structure. Ejaculatory duct single, with membraneous appendages. Ejaculatory apodeam funnel shaped.

#### *Female.*

As male except for the following characters. Frons broadened in the middle; silver-grey pubescent, shining black in upper half. Second antennal segment paler. Lateral margins of mesonotum greyish dusted. Abdominal terga completely brownish dusted; laterally more greyish dusted and with yellowish tinge.

Female terminalia (Fig. 6c). Base short and broad; piercer as long as base, thin and straight.

*Type locality:* Sri Lanka, Kandy.

*Type material:* Holotype ♂ Sri Lanka, 10km W of Kandy, 25.II.1972 (Sedlacek) (BPBM). - Allotype: Sri Lanka ♀: Centr. Prov., Rangala, Knuckle Mts, 11.III.1962 (ZML). - Paratypes: Sri Lanka, 1 ♂ 1 ♀, same locality and date as allotype (ZML); 1 ♂, Rangala, 25.II.1974 (Stubbs & Chandler); 1 ♂, Kandy distr., near Hantane, S of Kandy, 24.II.1974 (Stubbs & Chandler) (NHM). Holotype returned to BPBM; allotype and one

paratype returned to ZML; 2 paratypes returned to NHM; one paratype (ex ZML) deposited in KBIN.

*Derivatio nominis*: refers to the enlarged epandrium in male specimens.

#### Discussion.

This species belongs to the *semifumosus* group (see DE MEYER, 1989a,c). Together with *C. parmatus* from Papua New Guinea, the Afrotropical *C. visendus* and *C. inpaganus* from Brazil, they form the *visendus* subgroup within the *semifumosus* group (cfr. DE MEYER & GROOTAERT, 1990). A proposed phylogeny, as shown in the cladogram of fig. 4 is based on the following character states (1: apomorphic state, 0: plesiomorphic state; polarity based on outgroup comparison with other representatives of the *semifumosus* group):

1. (1) Epandrium strongly swollen; (0) epandrium variable in shape but not swollen (except in a few apomorphic species from Hawaii).
2. (1) Specific shape of surstyli: in lateral view broad basal part, curved downwards; (0) surstyli variable but not this specific shape.
3. (1) Surstyli dorsally with small, inwards directed protuberance (further apomorphic character state of transformation series with character 2).
4. (1) Ejaculatory duct large unifold, with membranous structures apically; (0) ejaculatory duct trifid.

5. (1) Epandrium with lateral protuberances; (0) without lateral protuberances.

6. (1) Membranous area not reaching epandrium; (0) reaching epandrium (polarity uncertain: within the *semifumosus* group the membranous area usually reaches the epandrium, but in other species groups of *Cephalops* it doesn't).

7. (1) In dorsal view inner surstylus shorter than outer surstylus; (0) both surstyli same size in dorsal view.

Characters 1 and 2 are synapomorphic for the *visendus* subgroup. According to this cladogram, *C. parmatus* seems to be the most plesiomorphic species with a keyhole shaped membranous area reaching the epandrium and a trifid ejaculatory duct (like in other representatives of the *semifumosus* group). The other species of the *visendus* subgroup show some transformation series for these characters with *C. magnimembrus* taking an intermediate position.

#### *Cephalops taiwanensis* sp.n.

(Fig. 5)

*Body length*: 3.6mm; *wing length*: 3.9mm.

#### Male.

Frons dark grey pubescent; with shining median spot occupying half of entire width. Third antennal segment

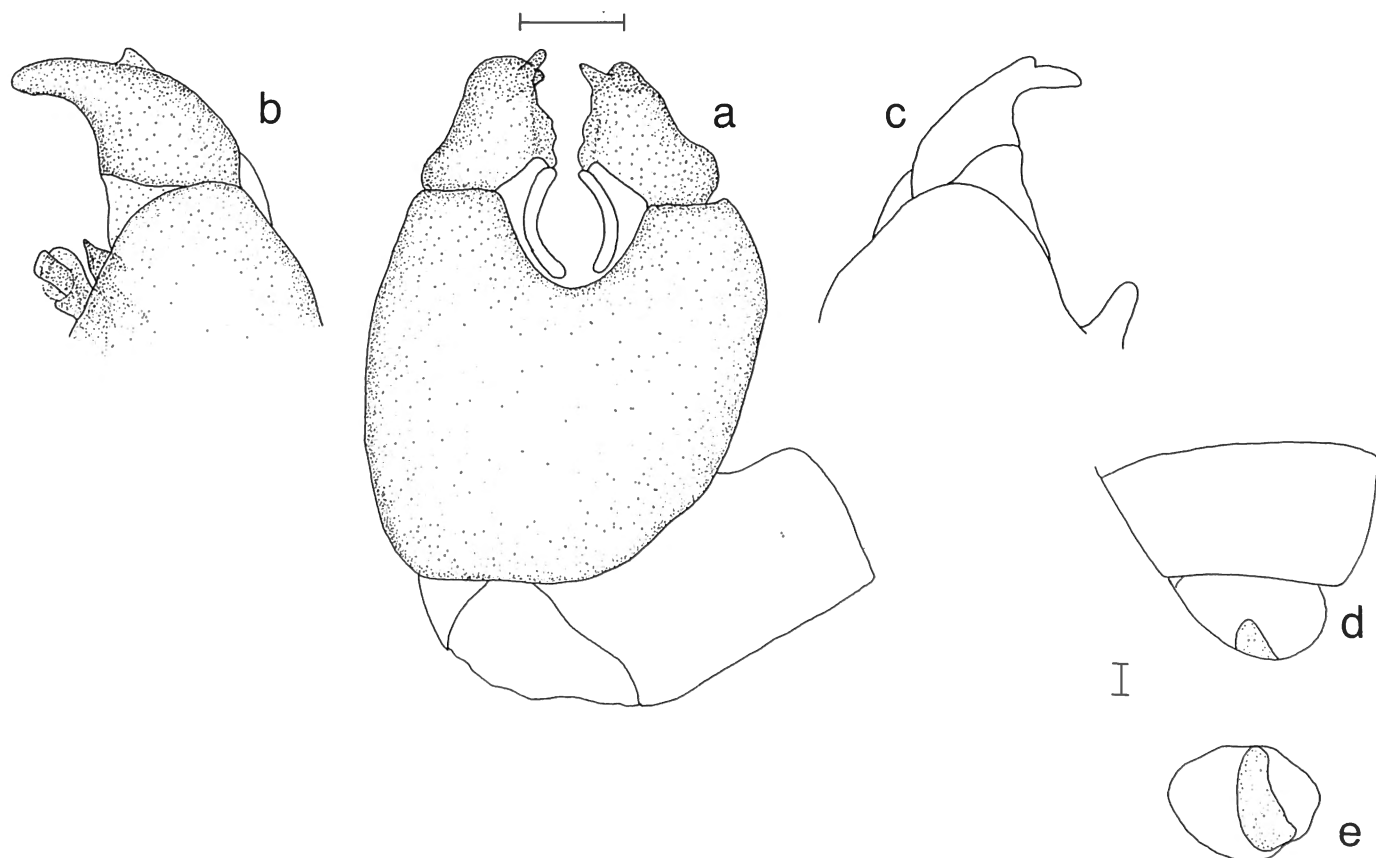


Fig. 3. — *C. magnimembrus* sp.n. Male terminalia. a, dorsal view; b, outer surstylus with aedeagus and ejaculatory duct, lateral; c, inner surstylus lateral; d, tergum 5 and sternum 8 dorsal; e, sternum 8 caudal (scale line 0.1mm).

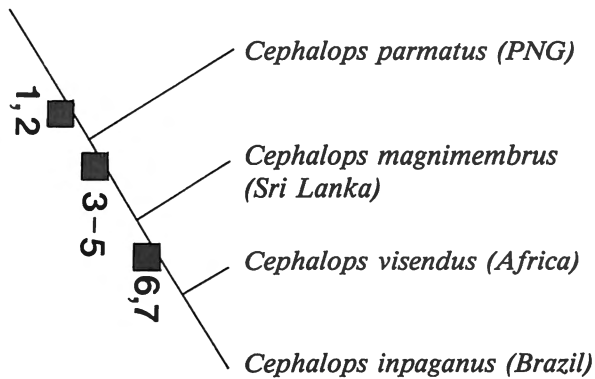


Fig. 4. — Cladogram for the *visendus* subgroup (see text for characters).

acuminate; brown. Face dark grey pubescent, equal in width to lower portion of frons.

Thorax. Humeri dark, same colour as centre mesonotum. Propleural fan moderately developed with 4 dark hairs. Mesonotum subshining black-brown, brownish dusted. Scutellum same colour and dusting as centre mesonotum; with short pale hairs along apical margin. Halteres brownish. Pleura greyish dusted.

Legs dark. Coxae dark brown; trochanters yellowish. Femora all shining posteroventrally, dark with apices yellow. Front femora ventrally with double row of 2-4 spines at apical fourth. Mid femora ventrally with double double row of approx. 10 spines almost over entire length. Hind femora ventrally without any distinct spines, only few pale hairs. Tibiae brown, basal part yellowish; with dispersed rows of short pale hairs. Hind tibiae

thickened in the middle, no suberected bristles. Tarsi brown with short darkish hairs. Pulvilli shorter than last tarsal segment; claws about as long as segment.

Wings. Third costal section as long as fourth section. Cross-vein r-m placed at basal part of discal cell.

Abdomen. Tergum 1 greyish dusted, anteriorly brownish; lateral fan with few short bristly hairs. Terga 2-4 brownish dusted, lateral margins more greyish dusted. Tergum 5 shining black-brown, anterior margin brownish dusted. Terga furthermore with dispersed dark hairs. Sterna brown, dull. Sternum 8 subshining black-brown; brownish dusted; in dorsal view half the length of tergum 5. Membraneous area irregular shape; in distal view occupying less than half the length of sternum 8; not reaching epandrium.

Male terminalia (Fig. 5). Surstyli symmetrical, in lateral view with subapical rounded protuberance. Apical part of aedeagus simple pointed, very broad. Ejaculatory duct trifid, tubiform. Ejaculatory apodema funnel shaped.

*Female* unknown.

*Type locality*: Taiwan, Chiayi Hsien.

*Type material*: Holotype ♂, Taiwan, Alishan, Chiayi Hsien (1800m), 11.II.1962, Yoshioto (BPBM). Holotype returned to BPBM.

*Derivatio nominis*: after type locality, Taiwan.

*Discussion*.

*C. taiwanensis* sp.n. seems to be closely related to *C. obtusinervis*, a Palaearctic species that is widespread

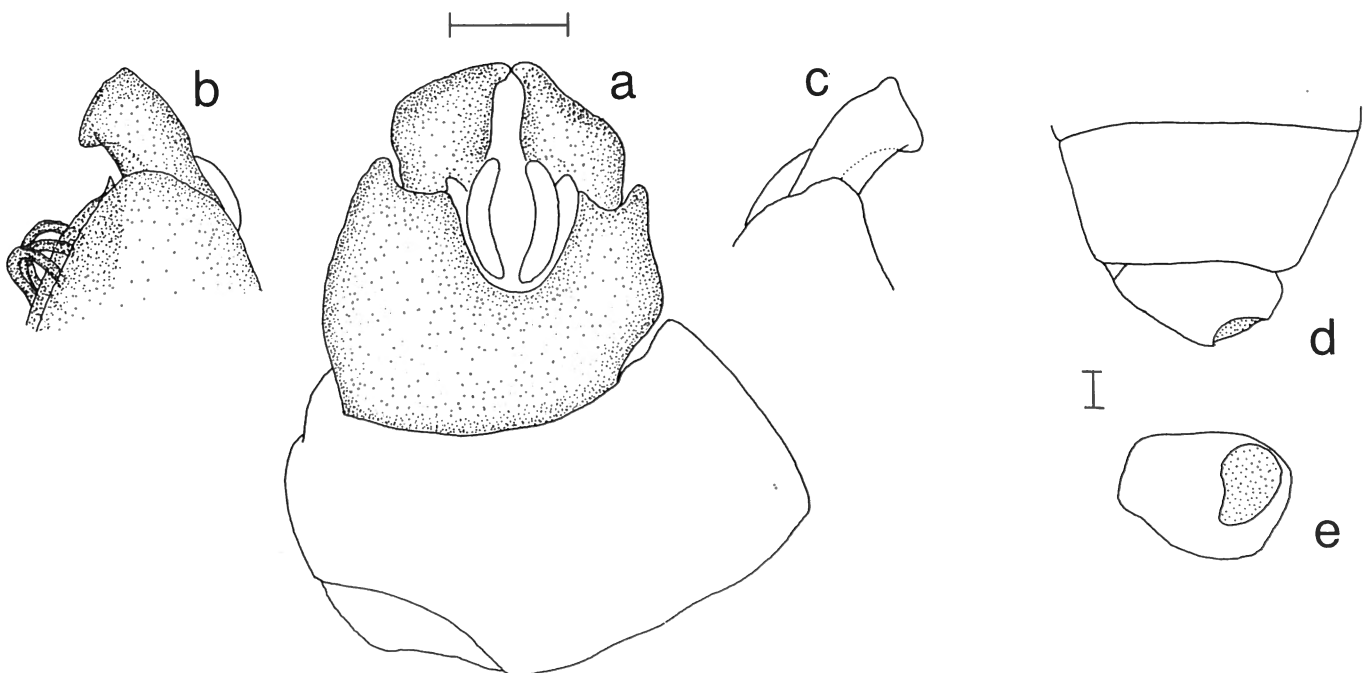


Fig. 5. — *C. taiwanensis* sp.n. Male terminalia. a, dorsal view; b, outer surstylus with aedeagus and ejaculatory duct, lateral; c, inner surstylus lateral; d, tergum 5 and sternum 8 dorsal; e, sternum caudal (scale line 0.1mm).

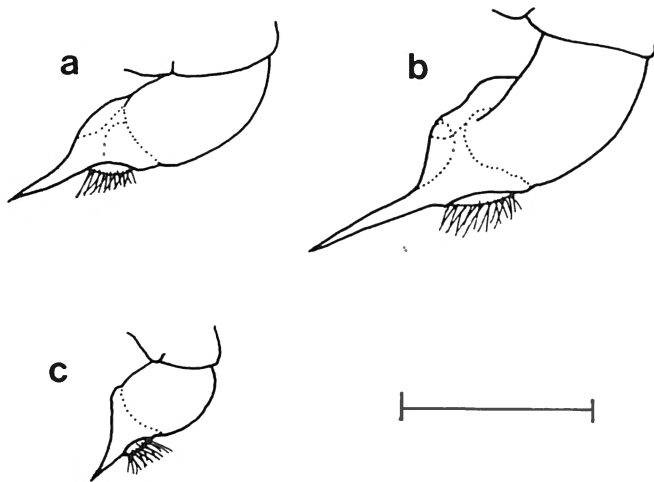


Fig. 6. — Female ovipositors, lateral view. a, *C. burmensis* sp.n.; b, *C. javensis* sp.n.; c, *C. magnimembrus* sp.n. (scale line 0.5mm).

in Europe (DE MEYER, 1989a) and also reported from Japan (MORAKOTE & HIRASHIMA, 1990). In both species the surstyli bear a ventral subapical lobe. In addition, the aedeagus is very broad and the lateral fan on the first abdominal tergum is reduced; apomorphic characters which they have in common with *Beckerias* spp. (DE MEYER, 1989a, 1990).

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