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DO  
MUSEU PARAENSE  
EMILIO GOELDI



TOMO XI – FASCÍCULO I



BELÉM – PARÁ  
BRASIL  
1955

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INSTITUTO NACIONAL DE PESQUISAS DA UNIV. DE BRASÍLIA

BOLETIM

DO

MUSEU PARANAENSE

EMILIO GOELDI



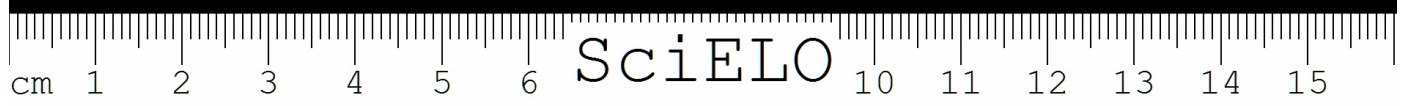
TOMO XI - FASCÍCULO I



BELEM - PARA

BRASIL

1974



Por um convênio realizado em 7 de dezembro de 1954, entre o Estado do Pará e o Instituto Nacional de Pesquisas da Amazônia, foi a direção científica e a administração do Museu Paraense Emílio Goeldi entregue a esse órgão a partir de 1.º de Janeiro de 1955, pelo espaço de 20 anos.

O Museu Paraense Emílio Goeldi continuará a pertencer ao Estado do Pará, recebendo o Instituto Nacional de Pesquisas da Amazônia todo o seu acervo, que administrará com ampla e total autonomia, sem, entretanto, poder alienar qualquer parcela de seu patrimônio. Construções e benfeitorias que forem feitas nos terrenos e prédios do Museu, nesse período, passarão a constituir seu patrimônio.

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Deverá o Instituto Nacional de Pesquisas da Amazônia promover o reequipamento do Museu Paraense Emílio Goeldi, restaurar suas instalações, atualizar sua biblioteca e dotar o mesmo com um quadro de especialistas nacionais ou estrangeiros à altura da elevada missão de continuar a obra com tanto brilho realizada por seus antecessores.

Dois anos antes de findo o prazo do convênio, poderá este ser denunciado por qualquer das partes, em caso contrário sendo considerado automaticamente prorrogado por períodos sucessivos de cinco anos, sempre que não seja denunciado com dois anos de antecedência.

*Denunciado o convênio e findo o prazo de sua vigência, passarão para o Governo do Estado do Pará a responsabilidade da administração do Museu Paraense Emílio Goeldi, bem como os respectivos encargos relativos a pessoal e material, inclusive os resultantes de contratos, acôrdos ou convênios assinados pela administração do Instituto Nacional de Pesquisas da Amazônia.*

*O Museu Paraense Emílio Goeldi continuará, através de seus técnicos e cientistas de outras instituições a contribuir para o estudo das ciências naturais na região Amazônica, mantendo, assim, a sua tradição e área de ação.*

*O Boletim será mantido sob o formato anterior e publicará trabalhos também em línguas estrangeiras quando o âmbito ou natureza puramente técnica do trabalho assim o exigir.*

REVISÃO DO COMPLEXO CYRTORHINUS FIEBER —  
MECOMMA FIEBER (HEMIPTERA-HETEROPTERA,  
MIRIDAE)

Por

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### INTRODUÇÃO

*Os percevejos de plantas ou mirídios incluídos no complexo acima apresentam grande interesse econômico e taxonômico. Algumas espécies são utilizadas no controle biológico de cigarrinhas (homópteros) nas Ilhas do Pacífico e encontram-se, no momento, em estado de confusão taxonômica.*

*Atualmente estão incluídas no complexo espécies pertencentes a duas subfamílias diferentes, Orthotylinae e Phylinae, facilmente separáveis pela presença ou ausência de verdadeiros arólios entre as unhas.*

*Nossos estudos mostram que Fieber estava certo quando estabeleceu, em 1864, o gênero Tytthus para abranger duas espécies sem arólios, os quais se acham substituídos por pêlos entre as unhas. Assim sendo, todas as espécies do complexo com este e outros caracteres dos Phylinae deverão passar ao gênero Tytthus, embora autores recentes, não reconhecendo a importância das unhas, hajam colocado as mesmas em Cyrtorhinus (Orthotylinae). Algumas espécies deste último gênero deverão ser transferidas para Mecomma, que continua sendo mantido como gênero independente. Um gênero novo, Fieberocapsus, e proposto para a espécie flaveolus Reuter.*

*Essa confusão existente entre entomólogos experimentados resulta do fato de serem as espécies desse complexo, embora pertencentes a subfamílias diferentes, muito semelhantes entre si e com os mesmos hábitos e habitats, constituindo, assim, um caso de acentuada e curiosa convergência.*

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Los presentes trabajos se refieren a las investigaciones realizadas en el Laboratorio de Biología Celular y Tisular, durante el año 1932, en el estudio de la fisiología de las células de la corteza cerebral de la especie *Macaca mulatta*.

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El presente trabajo se refiere a las investigaciones realizadas en el Laboratorio de Biología Celular y Tisular, durante el año 1932, en el estudio de la fisiología de las células de la corteza cerebral de la especie *Macaca mulatta*.

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## INTRODUCTION

The Mirid bugs in this complex are of both economic and taxonomic interest; for not only are they important in biological control of leaf hoppers, especially in the Pacific Islands, but taxonomically they are in a confused state.

At present the complex includes species belonging to two distinct subfamilies, the Orthotylinæ and Phylinae, which, have respectively, flap-like and bristle-like arolia.

Our studies have shown that Fieber was correct when in 1864 he erected the genus *Tytthus* for two species with bristle like arolia. Hence all species with this and other phylina characters (see pp. 13-14) should now be included in *Tytthus*; although later authors, not recognising the importance of the claws, have placed all species included in *Tytthus* under *Cyrtorhinus*, which is in the Orthotylinæ. Those species hitherto in *Cyrtorhinus* which have Orthotyline characters mostly remain in this genus, but a few should be transferred to the closely related *Mecomma*, which is retained as a genus. A new genus, *Fieberocapsus*, is raised for *flaveolus* Reuter. This confusion has arisen amongst experienced entomologists because these species, belonging to two different sub-families are so much alike in appearance and have similar habits and habitat; thus being a striking case of convergence.

## TAXONOMIC HISTORY OF THE CYRTORHINUS COMPLEX

The genus *Cyrtorhinus* was described by Fieber (Wien. Ent. Monat. 2:313, 1858) to include a single species, *Capsus elegantulus* Meyer-Dür, 1843. Fieber (Eur. Hem.: 69, 1860) separated it, in a key, from other European genera and redescribed the type (Eur. Hem.: 285, 1860).

The genus *Tytthus*, generally regarded by authors as a synonym of *Cyrtorhinus*, was described by Fieber (Wien. Ent. Monat. 8: 82, 1864) to include *Capsus geminus* Flor and *Capsus pygmaeus* Zetterstedt. The type of the genus was later fixed by Kirkaldy ((Trans. Amer. Ent. Soc. 32:128, 1906). The first author to include *Tytthus* in the synonymy of *Cyrtorhinus* was Reuter (Bih. K. Sv. Vet. Akad. For. 3 (1): 31, 1875).

Thomson (Opusc. Ent. 4: 437, 1871) detected the synonymy of *Capsus caricis* Fallen, 1807 and *Capsus elegantulus* Meyer-Dür, 1843.

Reuter (Rev. Crit. Caps. 1: 91, 2: 12, 1875, and Bih. K. Sv. Vet. Akad. Handl. 3 (1): 31, 1875) considered *Cyrtorhinus* as a subgenus of *Chlamydatus* Curtis listing four species with synonymy. Description of the genus and species was given later (Hem. Gymn. Eur. 3: 379, 545, 1883).

Uhler (Proc. Zool. Soc. London: 711, 1893) described *Cylloceps pellicia*, new genus and species from St. Vicent Il., which was later found by China to be a synonym of *Cyrtorhinus parviceps* Reuter (Ann. Mag. Nat. Hist. (9) 14: 444, 1924).

Breddin (Deut. Ent. Zeit.: 106, 1896) described *Periscopopus mundulus*, new genus and species from Java, the generic name being preoccupied by *Periscopopus* Fitzinger, 1843 (Reptilia). Kirkaldy (Wien. Ent. Zeit. 22: 13, 1903) established *Breddiniessa* a n. nov. for *Periscopopus* Breddin.

Distant (Faun. Brit. Ind. Rhync. 2: 476, 1903) redescribed the genus *Cyrtorhinus* Fieber, listing its synonymy and giving a figure of *C. lividipennis* Reuter then found in Ceylon, Burma and Great Nicobar.

Knight (Conn. Nat. Hist. Surv. Bul. 34: 509, 511, 1923) keyed the genus and described *Cyrtorhinus caricis* var. *vagus*, he mentions the typical *caricis* from Colorado and says that he had compared it with a Finnish specimen named by Reuter. A female of this species from Colorado and a series from Wrangel, Alaska are to be found in the U.S. National Museum. Most american records are however *Tytthus vagus* (Knight, 1923), a species of Phylini.

Hueber (Syn. Blindw. 2: 106, 1908) gives a key and descriptions of the German species.

Poppius (Acta Soc. Sci. Fenn. 44 (3): 60, 70, 1914) redescribes the genus from Africa, listing with descriptions, *C. parviceps* and *C. megalops* (error pro *melanops* Reuter).

Usinger (Proc. Haw. Ent. Soc. 10 (2): 271, 1939) gives host, distribution, notes and a key for the Pacific species, and is the first recent author to draw attention to the fact that some species had only bristle like arolia while others had true convergent arolia. Later (Soc. Sci. Fenn. Comment. Biol. 12 (8): 1, 1951) the same author in a revision of the Pacific species proposed the subgenus *Reuteriessa* for the species with Orthotylini claws and arolia, keeping the *Cyrtorhinus* s. str. for the Phylini species. His work was based on specimens misnamed by E. P. Van Duzee in the California Academy of Sciences, who named a Phylini species (which was

actually the same as Knight's *Cyrtorhinus caricis* var. *vagus*) as the true European *Capsus caricis* Fallen. In the same paper a new species, *C. vitiensis* was described from Fiji.

Blatchley (Hem. Het. E.N. Amer.: 845, 853, 1926) mentions *caricis vagus* Knight and *pygmaeus* from the United States. Here again the author was misled, since *pygmaeus* Flor does not occur in America. Specimens which were named as such by Van Duzee are conspecific with *Cylloceps pellicia* Uhler, actually *Tytthus parviceps* (Reuter).

Zimmerman (Ins. Hawaii, 3 Het.: 205, 1948) gives the history of *Cyrtorhinus* in Hawaii, biological control and notes for *mundulus* and *fulvus* Knight, with good illustrations. Notes on species from Guam are to be found in Usinger (Ins. Guam, II: 79, 1946).

Knight (Ins. Samoa II, Hem. 5, 1935) described *C. fulvus* from Samoa. The same author (Ill. Nat. Hist. Surv. Bul. 22 (1): 82, 95, 1941) mention the presence of *caricis* in Minnesota.

Carvalho (An. Acad. Brasil. Ci. 24 (1): 76, 1952) includes in the synonymy of *Cyrtorhinus* the genus *Aristobulus* Distant (Ann. Mag. Nat. Hist. (8) 5: 16, 1910) and *Nycticapsus* Poppius (Acta Soc. Sci. Fenn. 44 (3): 74, 1914). The authors include them as synonyms of *Mecomma* Fieber in the present paper.

Wagner (Tierw. Deut. 41, Blindw.: 110, 127, 1952) deals with the genus *Cyrtorhinus* in Germany in which he includes *caricis*, *flaveolus*, *pygmaeus* and *geminus* with illustrations.

Kiritchenko (Hem. Eur. URSS: 175, 1951) gives keys for the four species mentioned above (in Russian).

Catalogue references on the genus are to be found in Atkinson (1890), Oshanin (1906, 1912), Van Duzee (1917), Stichel (1933), China (1943), Carvalho (1952) and Carvalho & Leston (1952).

## MAJOR CHARACTERES SEPARATING ORTHOTY-LINAE AND PHYLINAE

The Orthotylinae and Phylinae are most easily separated on three characters:

1. *Pretarsal structure*: the claws of the Orthotylinae have small pads, the pseudarolia, on their undersides, whilst between the claws are a pair of convergent membraneous arolia (Fig. 1 F); pseudoarolia are also present in the Phylinae, but the arolia are thin and hairlike (Fig. 1 G).

2. *Female genitalia*: Slater (1950) found that in typical Orthotylinae the sclerotised rings on the dorsal wall of the bursa copulatrix have their lateral margin strongly folded dorso-mesad:

whilst on the posterior wall, two sclerotised flaps (K structure) arise from the lateral lobes (J structures). The structure of this region in *Orthotylus* has been described in detail by Southwood (1953) and in this subfamily gives good specific characteres. In the Phylinae the sclerotised rings are simple and ovoid or subelliptical in shape and the posterior wall has a pair of bilaterally symmetrical sclerites (A structures), the interspecific variation in these is slight and their taxonomic value is mostly at the generic level.

3. *Male Genitalia*: Singh-Pruthi (1925), Kullenberg (1947) and others have shown the major differences between the typical structure of the aedeagus in Orthotylinae and Phylinae. In the Orthotylinae (Gig. 1 A, B) the genital capsule or pygophore, has an ingrowth, the subgenital plate (Kullenberg 1947). This is secondarily attached to the floor of the genital capsule anteriorly; it is boat-shaped and from its dorsal margin a membrane arises that envelops the lower region of the aedaegal complex. The posterior apices of the subgenital plate are usually dark in colour and have two discrete walls, the outer one continuous with pygophore and the inner and dorsal one running back as the subgenital plate (Fig. 1 B).

The aedeagus itself is attached to the upper margin of subgenital plate by a "tendon", this arises from the apex of the lateral arms of the basal plate, which clearly corresponds to the stapes of Lygaeidae (Bonhag & Wick, 1953). Hence it is possible to homologise the "arm of the phallic pivot" of the latter, with the subgenital plate of Mirids and Nabids (Kullenberg), whilst a similar structure (i.e. an ingrowth from the ninth segment) has been described in the Pentatomoidea and called the inferior process (Sharp, 1890) or the aedeagal support (Leston, 1953).

Attached to the base of each lateral arm of the basal plate or stipes is a "tendon" which runs dorsally and is attached to a plate, the capitata processes or mushroom bodies (Kullenberg) or more correctly, the promotor apodeme of the phallobase ((Bonhag & Wick). The promotor muscle is attached to this plate and to the dorsal surface of the genital capsule; on the contraction of this muscle the whole aedeagus, pivoted on the stipes-subgenital plate connection, is moved posteriorly and upwards and is in a more suitable position for copulation.

Arising from the basal plate is the tubular basal region of the aedeagus, known as the theca. In the resting condition the rest of the aedeagus is invaginated within the theca. The apical region is the vesica and from its base there arise one or more sclerotised processes, the vesical appendages or spiculae. The gonopore is situated at the apex of the vesica.

Two claspers or parameres are situated on either side of the apices of the subgenital plate. They are asymmetrical and in general in the Orthotylinae differ markedly from one species to another.

In the Phylinae, the most striking superficial feature is the posterolaterally directed sclerotised sheath (Fig. 1 E). According to Kullenberg this consists of a fusion of the subgenital plate and theca. But it seems that owing to the mechanics of the aedeagus during copulation such a fusion is impossible and this sheath cannot be homologised with the theca of the Orthotylinae. It corresponds only with the subgenital plate or aedeagal support and this is confirmed by the attachment of the stapes (Fig. 1 D) to its margin. This structure sharply distinguishes the typical Phylinae from the Orthotyline genitalia and is referred to as the aedeagal sheath. The Phylinae differ further in the lack of sclerotised vesical appendages and in the modification of the aedeagus into a strap like structure.

The claspers of related species of Prylinae are often very similar in form, more so than in the Orthotylinae.

INDEX TO SPECIES WHICH MAY BE REFERRED TO THE  
CYRTORHINUS-MECOMMA COMPLEX

CYRTORHINUS	Original generic assignment	Present generic assignment
<i>alboornatus</i> Knight, 1931	Cyrtorhinus	Tytthus
* <i>annulicollis</i> Poppius, 1915 = <i>chinensis</i> (Stal, 1859)	Cyrtorhinus	Tytthus
<i>balli</i> Knight, 1931	Cyrtorhinus	Tytthus
<i>caricis</i> Fallen, 1807	Capsus	Cyrtorhinus
<i>collaris</i> Matsumura, 1911	Chlamydatius	?
<i>chinensis</i> Stal, 1859	Capsus	Tytthus
* <i>chloropterus</i> Herrich-Scheffer, 1853 = <i>caricis</i> (Fallen, 1807)	Capsus	Cyrtorhinus
<i>cumberi</i> Woodward, 1950	Cyrtorhinus	Cyrtorhinus
* <i>elegantulus</i> Meyer, 1843 = <i>caricis</i> (Fallen, 1807)	Capsus	Cyrtorhinus
* <i>elongatus</i> Poppius, 1915 = <i>chinensis</i> (Stal, 1859)	Cyrtorhinus	Tytthus
* <i>filius</i> Distant, 1910 = <i>amicus</i> (Distant, 1909)	Aristobolus	Mecomma
<i>flaveolus</i> Reuter, 1870	Tytthus	Fieberocapsus
<i>fulvus</i> Knight, 1935	Cyrtorhinus	Cyrtorhinus
<i>geminus</i> Flor, 1860	Capsus	Tytthus

\* = a synonym

<i>CYRTORHINUS</i>	Original generic assignment	Present generic assignment
* <i>insignis</i> Douglas & Scott, 1866 = <i>pygmaeus</i> (Zetterstedt, 1840)	Tytthus	Tytthus
<i>insperatus</i> Knight, 1925	Cyrtorhinus	Tytthus
<i>lividipennis</i> Reuter, 1884	Cyrtorhinus	Cyrtorhinus
<i>marginatus</i> Uhler, 1895	Cyrtorhinus	Orthotylus
<i>melanocephalus</i> Poppius, 1914	Nycticapsus	Mecomma
<i>melanops</i> Reuter, 1905	Cyrtorhinus	Cyrtorhinus
<i>mundulus</i> Breddin, 1896	Periscopus	Tytthus
<i>neotropicalis</i> Carvalho, 1954	<i>Cyrtorhinus costae</i> Carvalho nec Stal	Tytthus
<i>parviceps</i> Reuter, 1890	Cyrtorhinus	Tytthus
* <i>pellicia</i> Uhler, 1893 = <i>parviceps</i> (Reuter, 1890)	Cylloceps	Tytthus
* <i>pellucens</i> Boheman, 1852 = <i>pygmaeus</i> (Zetterstedt, 1840)	Capsus	Tytthus
* <i>pubescens</i> Knight, 1931 = <i>geminus</i> (Flor, 1860)	Cyrtorhinus	Tytthus
<i>pygmaus</i> Zetterstedt, 1840	Capsus	Tytthus
* <i>riveti</i> Cheesman, 1927 = <i>chinensis</i> (Stal, 1859)	Cyrtorhinus	Tytthus
<i>vagus</i> Knight, 1923	Cyrtorhinus	Tytthus
* <i>vitiensis</i> Usinger, 1951 = <i>lividipennis</i> Reuter, 1884	Cyrtorhinus	Cyrtorhinus
<i>swaluwenburgi</i> Usinger, 1944	Cyrtorhinus	Tytthus
<b>MECOMMA</b>		
<i>ambulans</i> Fallen, 1807	Capsus	Mecomma
<i>amicus</i> Distant, 1909	Antiphilus	Mecomma
<i>antennata</i> Van Duzee, 1917	Mecomma	Mecomma
* <i>dubius</i> Zetterstedt, 1840 = <i>ambulans</i> (Fallen, 1807)	Capsus	Mecomma
<i>chinensis</i> Reuter, 1906	Mecomma	Mecomma
<i>gilvipes</i> Stal, 1858	Leptomerochoris	Mecomma
* <i>luctuosus</i> Provancher, 1887 = <i>gilvipes</i> (Stal, 1858)	Chlamydatius	Mecomma
<i>madagascariensis</i> Reuter, 1892	Mecomma	Mecomma
* <i>nigritulus</i> Zetterstedt, 1840 = <i>ambulans</i> (Fallen, 1807)	Capsus	Mecomma
* <i>ochripes</i> Curtis, 1838 = <i>ambulans</i> (Fallen, 1807)	Chlamydatius	Mecomma

\* = a synonym

KEY TO GENERA

1. Pretarsus with a pair of bristle-like arolia (Fig. 1 G), male pygophore with a strongly sclerotised tubular sheath for the aedeagus (Fig. 1 D) (Phylinae) ..... *Tytthus* Fieber  
 Pretarsus with a pair of flap-like arolia (Fig. 1 F), male pygophore not developed to form such a projecting sheath (Orthotylinae) ..... 2
2. Pronotum straight sided (Fig. 10 G), its lower margin slightly concave, cuneus wider than long (Fig. 16 C), (pubescence short: 0.08-0.12 mm. without any black coloration) .....  
 ..... *Fieberocapsus* n. gen.  
 Pronotum bell-shaped or campanuliform (Fig. 15 A), its lower margin straight (frequently partly or entirely black) ..... 3
3. Cuneus only slightly longer than wide (Fig. 16 A); slightly rounded in outline; pubescence short; 0.15 mm. or less, rostrum not reaching posterior coxa (never completely brachypterous) ..... *Cyrtorhinus* Fieber  
 Cuneus considerably longer than wide (often twice as much) (Fig. 16 B); males almost parallel sided; pubescence long; mostly over 0.15 mm.; rostrum reaching beyond base of posterior coxa (females often completely brachypterous (Fig. 22 A, B) ..... *Mecomma* Fieder

GENUS *TYTTHUS* FIEBER

*Tytthus* Fieber, Wien. Ent. Monat. 8:82, 1864.

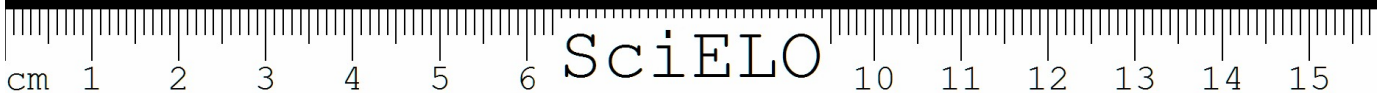
\* *Cylloceps* Uhler, Proc. Zool. Soc. London : 711, 1893 (nov. syn.).

\* *Periscopus* Breddin, Deut. Ent. Zeit. : 106, 1896 (necm. preoc. by *Periscopus* Fitzinger, 1843, Reptilia).

\* *Breddiniessa* Kirkaldy, Wien. Ent. Zeit. 22:13, 1903 (nom. nov. for *Periscopus* Breddin, 1896) (n. syn.).

Type species: *Capsus geminus* Flor, 1860, fixed by Kirkaldy, Trans. Amer. Ent. Soc. 32:128, 1906.

Small bugs (2.2-3.6 mm.); head rounded anteriorly, face semi vertical; pronotum campanuliform, calli slightly marked; opening of odiferous gland raised and well marked, pretarsus with bristle like arolia; male pygophore with a projecting aedeagal sheath; female bursa copulatrix with symmetrical A structures. Covered by simple erect pubescence (0.10-0.19 mm. in length); rostrum reaching the hind coxae; colour pattern generally black and pale green.



KEY TO THE SPECIES OF THE GENUS *TYTTHUS*

1. Colour pale yellowish testaceous .....  
     ..... *zwaluwenburgi* (Usinger)  
     Colour if pale then pronotum, head and scutellum black or  
     with dark brown to black areas ..... 2
2. First antennal segment pale, darkened only at extreme apex  
     or extreme base ..... 3  
     First antennal segment black, pale only at extreme base and  
     apex ..... 6
3. Hemelytra white at least on basal third ..... 4  
     Hemelytra darkened basally or unicolorous but not as above  
     ..... 5
4. Hemelytra with a wide dark brown to black fascia, the basal  
     third and cuneus whitish ..... *alboornatus* (Knight)  
     Hemelytra with only basal third whitish ... *montanus* n. sp.
5. Hemelytra noticeably infuscate longitudinally along clavus  
     and endocorium, pronotum totally black .....  
     ..... *mundulus* (Breddin)  
     Hemelytra pale green, if infuscate, the pronotum pale at basal  
     angles ..... *geminus* (Flor)
6. First antennal segment entirely black, tibiae black to dark  
     brown; pronotum slightly constricted at middle ..... 7  
     First antennal segment pale at least on extreme apex or base,  
     tibiae pale to fuscous, not black; pronotum not constricted  
     at middle ..... 8
7. Pronotum brownish black with a transverse milky white fascia  
     in front of calli, cuneus pale ..... *insperatus* (Knight)  
     Pronotum orange yellow on anterior margin of disc, cuneus  
     with a darkened apex ..... *balli* (Knight)
8. First antennal segment with a black ring at middle leaving  
     apical and basal third white ..... *neotropicalis* (Carvalho)  
     First antennal segment mostly black, with only extreme apex  
     or base pale ..... 9
9. Pronotum usually pale anteriorly (in front, between or over  
     calli) ..... 10  
     Pronotum usually totally black or dark brown ..... 11
10. Tibiae entirely yellow; pronotum varying from pale with only  
     posterior angles black to black with a pale central area  
     anteriorly ..... *pygmaeus* (Zetterstedt)  
     Tibiae with extreme base dark; pronotum black, only pale  
     anteriorly ..... *parviceps* (Reuter)



- 11. Tibiae entirely pale, hemelytra largely infusate, paler along anterior margin (large species, about 2.8 mm long) .....  
 ..... *vagus* (Knight)  
 Tibiae with extreme base or basal portion brownish to black; hemelytra mostly pale green ..... 12
- 12. Pale spots on vertex obsolete; underside rufescent .....  
 ..... *panamensis* n. sp.  
 Pale spots on vertex distinct; underside dark brown to black ..... 13
- 13. Larger species, the spots on vertex larger .....  
 ..... *parviceps* var. *thoracicus* (Horvath)  
 Smaller species, the spots on vertex minute .. *chinensis* (Stal)

*TYTTHUS ZWALUWENBURGI* (USINGER) nov. comb.

*Cyrtorhinus zwaluwenburgi* Usinger, Proc. Hawaii. Ent. Soc. 12 (1): 148, fig. 1, 1944.

(Fig. in Usinger, 1944)

Characterized by its entirely pale yellowish testaceous colour and dimensions.

*Male*: length 2.3 mm., width 0.8 mm.

Colour pale yellowish testaceous except for dark brown eyes and a vague brown area at middle of head.

Rostrum reaching nearly to apices of middle coxae.

*Distribution*: Canton Is.

*Specimens studied*: 1 ♂, Type, Canton Is., Hawaii Sugar Planter's Exp. Station.

This species according to Usinger (1944) is very close to *riveti* Cheesman (= *chinensis* Stal) in size and structure but is strikingly different from *riveti* and all other described species in colour pattern. It will run to *riveti* in Usinger's key (Hawaii. Ent. Soc. Proc. 10: 271, 1939), but *riveti* has shorter second antennal segment (less than three times as long as first, 12: 5), a longer rostrum which surpasses apex of middle coxa and different colour.

It was taken on *Boerhaavia* associated with the cicadellid, *Nesaloha cantonis* Oman, and is possibly a predator of this species.

*TYTTHUS CHINENSIS* (STAL) nov. comb.

*Capsus chinensis* Stal., Freg. Eug. Resa, Hem.: 258, 1859.

*Cyrtorhinus chinensis* Reuter, Ofv. F. Vet. Soc. Forh. 45 (16): 22, 1903.

- \* *Cyrtorhinus elongatus* Poppius, Arch. Naturges. 80 A (8): 65, 1914 (*n. syn.*)
- \* *Cyrtorhinus annulicollis* Poppius, Arch. Naturges. 80 A (8): 66, 1914 (*n. syn.*)
- \* *Cyrtorhinus riveti* Cheesman, Ann. Mag. Nat. Hist. 19: 94, 1927 (*n. syn.*); Usinger; Soc. Sci. Fenn. Comment. Biol. 12 (8): 4, 1951.

(Figs. 2 A-E)

Characterized by its colour and male genitalia.

*Male*: length 2.1-2.5 mm., width 0.8 mm.; head, width 0.6 mm., vertex 0.31 mm.; antennae, segment I length 0.23 mm.; II 0.7 mm.; III 0.45 mm.; IV 0.28 mm.; pronotum, length 0.3 mm., width 0.75 mm.; rostrum length 0.70 mm.

Head black apart from two areas adjacent to the eyes, which are pale; antennae brown-black with extreme apex of first segment pale; pronotum and scutellum black; hemelytra pale green, membrane and nervures pale; legs yellow green to pale fulvous except for extreme base of tibia which is black; rostrum pale, tip dark; underside of thorax dark, abdomen dark except for extreme venter of segments 2-8 which is green-yellow.

Pubescence of fine pale adpressed hairs, some of those on the back of the head and anterior of the pronotum are slightly longer and more erect. Macropterous.

*Genitalia*: aedeagus (fig. 2 B) of phyline type; left clasper (fig. 2 G) with basal process slightly shorter than in *parviceps*; right clasper (fig. 2 D) simple.

*Female*: similar to male in colour and dimensions, slightly more robust.

*Distribution*: China, Formosa, Bonin IIs. (Chichi Jima), Marianas IIs. (Guam, Saipan, Rota, Tinian), Caroline IIs. (Palau IIs., Ngulu, Faraulep, Yap, Koror, Pulo Anna), New Hebrides, Samoa, Tahiti, Fiji.

*Specimens studied*: 1 ♂ (Holotype of *elongatus*), Anping, Formosa, Sauter 1911 (Deutsches Entomologisches Institut); 1 ♂ (Holotype of *annulicollis*), Tainan, Formosa, H. Sauter (Deutsches Entomologisches Institut); 1 ♀ (Type of *riveti*), Papeete, Tahiti, March-April 1925, L. E. Cheesman (British Museum); 1 ♂, 2 ♀, Amalui, Tutuila, Samoa, 9.6.23, Swezey and Wilder; 1 ♂, 1 ♀, Chekiang Prov., China, July 1927, Dora Wright; 2 ♂, Upolu, Samoa, 9.12.23 (Bermuda grass), Swezey and Wilder; 1 ♂, 1 ♀, Erromanga, New Hebrides, July 1930. L. E. Cheesman; 26 ♂, 29 ♀, MARIA-

NAS ISL., Guam: Pt. Oca, 5.12.45, J. L. Gressit (collected at light); Talofoto, Aug. 1949, N. L. H. Krauss; Agana airport, 15.8.45, H. S. Dybas; *Saipan*: 1-2 m. of Tanapag, 10.1.45, H. S. Dybas; *Tinian*: July 1946, H. K. Townes; *Rota*: June 1936, T. Esaki; *CAROLINE ILS.*, *Pulo Ana*: 13.9.52, N. L. H. Krauss; *Koror Is*: 30.11.47, H. S. Dybas; *Ngulu Atoll*: Ngulu IIs, 3.10.52, N. L. H. Krauss; *Faraulep Atoll*: Faralep Is. 21.9.52, N. L. H. Krauss; *Yap group*: E. Mafrid, Kanif Yaf, Colonia Yafrid, July 1950, R. J. Goss; *BONIN ILS.*: *Chichi Jima Retto*: Aug. 1934, H. Ikeda.

Usinger (1939) found this species sucking eggs of *Sogata ochrias* Kirkaldy on *Sporolobus virginicus* and of *Nilaparvata lugens* (Stal) on rice.

This is the smallest species of *Tytthus* and is distinguished by its black pronotum and scutellum, the dark bases of the tibia and the small size.

D. R. Malaise of the Riksmuseum, Stockholm, has kindly informed us that the type of *Capsus chinensis* must be considered lost. We consider that this species is referred to in Stal's description (*Freg. Eug. Resa*: 258, 1859): —

"Nigricans, maculis duabus basalibus capitis albidis; hemelytris fuscescente albidis; pedibus abdominisque disco pallide testaceo-flavis.

Female. Long. 3, lat.  $1\frac{1}{3}$  millim. Patria: China (Hongkong).

*C. elegantulo* affinis et similis, capite angustiore, thorace posterius latiore, antennis, praesertim articulo basali, brevioribus differt."

The Director of the Deutsches Entomologisches Institut has kindly sent Poppius' types for study. That of *elongatus* represents a teneral male specimen of *T. chinensis*; the measurements agree except for the third and fourth antennal segments which are somewhat shrivelled, whilst the head (apart from the spots on the vertex), the pronotum and scutellum are light brown instead of black. The type of *annulicollis* is a typical male of *T. chinensis*.

#### *TYTTHUS PARVICEPS* (REUTER) nov. comb.

*Cyrtorhinus parviceps* Reuter, Rev. d'Ent. 9: 258, 1890; Poppius, Acta Soc. Sci. Fenn. 44 (3): 70, 1914.

\* *Cylloceps pellicia* Uhler, Proc. Zool. Soc. London: 712, 1893 (syn. by China, Ann. Mag. Nat. Hist. (9) 14: 444, 1924).

(Figs. 3 I-M)

Characterized by its colour and genitalia.

*Male*: length 2.4-2.7 mm.; width 0.85-0.95 mm.; head width 0.58 mm.; vertex 0.3 mm.; antennae, segment I length 0.3 mm.,

II 0.84 mm., III 0.5 mm., IV 0.4 mm.; pronotum, length 0.29 mm., width 0.75 mm.; rostrum length 0.75mm.

Head black with two pale areas adjacent to the eyes; antennae black except apex of basal joint which is pale; pronotum black with two paler (usually yellowgreen) areas at anterior angles; scutellum black; hemelytra pale yellow-green, membrane and nervures pale; legs pale yellow-green with extreme base of tibia dark; rostrum pale, its tip dark; underside of thorax and pygophone black, remainder of abdomen green.

Pubescence of fine pale adpressed hairs, longer than in *pygmaeus*, especially on the back of the head. Macropterous.

*Genitalia*: aedeagus of phyline type (fig. 3 C), left clasper (fig. 3 I, J, K) with terminal process blunt and slightly curved inwards at apex, right clasper (fig. 3 M) simple.

*Female*: length 2.5-3.0 mm.; width 0.95-1.1 mm.; head width 0.63 mm., vertex 0.35 mm.; antennae, segment I length 0.28 mm., II 0.78 mm., III 0.5 mm., IV 0.4 mm.; pronotum, length 0.36 mm., width 0.92 mm.; rostrum length 0.75 mm.

Similar to male in colour. Abdomen with underside pale green-yellow, lateral margins dark, dorsum pale. Dorsal wall of bursa copulatrix very simple, as in *balli* and *vagus*.

*Distribution*: Egypt, St. Vicent, Seychelles, Rodriguez I., Paraguay, Florida, East and West Africa, Morocco, Gigepio Is. Italy, S. Africa (Cape Province), St Helena.

*Specimens studied*: ♀ (Type) Cairo, May 1886, E. Antian (B.M.); 1 ♀ (Type of *C. pellicia*), St. Vicent, May, H. H. Smith (B. M.); 1 ♂ 3 ♀ Rodrigues II., Aug.-Sept. 1918, H. J. Snell & H. P. Thomasset; 3 ♂ 1 ♀ Lakeland, Florida (at light), Oct. 1948, May 1952, R. F. Hussey; 1 ♀ Mossel Bay, Cape Province, May 1932, R. E. Turner; 1 ♂ beaten from native Composite Tree, Picquet Post, St. Helena 27/2/36, H. F. D. Bartlett; 1 ♀ Waldia, Abyssinia, 1-26/2/36, J. W. C. MacFie; 1 ♀ Libreville, Gabon, J. Primot; 1 ♀ Serpent Lake, c. 9,000 ft., Wouramboulchi, Abyssinia 5/10/26, J. Omer Cooper; 1 ♀ Hora Keloli, Abyssinia, Dec. 1926, J. Omer Cooper; Cuba, Uhler col.; Pto. Obaldia, Coclé Prov., Panamá, Blanton col.; Managua, Nicaragua, Baker col.

This species is close to *T. pygmaeus* (Zetterstedt) but differs in the narrower head, in the black ring at extreme bases of tibiae and in the structure of the male genitalia; the pronotum is generally darker. The form *thoracicus* was described from the Canary IIs. by Horvath (Ann Mus. Nat. Hung. 8: 289, 1909) and is characterised by having the pronotum entirely black. This form has subsequently

been refound in the same area by Lindberg (1936, 1953), but it does not appear to have been found elsewhere. However the amount of black colouration on the pronotum is very variable within one population of *T. pygmaeus* and this probably applies to other species.

Since the comments above were written the senior author has seen specimens of this species in the U.S. National Museum in which the variation mentioned above is to be seen. The following localities should be added: Charlotte Amalie, St. Thomas, Virgin Is. VI, 917, H. Morrison col.; Macoris River, San Domingo, VII, 917, H. Morrison col.; Cuba (labelled by Uhler as *Cylloceps pellicia*); Guanajibo, Puerto Rico, VIII, 935, H. L. Dozier col.; Lake Placid, Florida, Beamer col.; Fellsmore, Florida (named by Barber as *pellicia*), in action of ovipositing in egg of *Saccharosydre sacharyvora* (Westwood); Guapara, Carabobo, Venezuela, IX, 938, C. H. Ballou (on cotton).

#### *TYTTHUS PYGMAEUS* (ZETTERSTEDT)

*Capsus pygmaeus* Zetterstedt, Ins. Lapp.: 279, 1840.

*Tytthus pygmaeus* Fieber, Wien Ent. Monat. 8: 82, 1864.

\* *Capsus pellucens* Boheman, Ofv. Sv. Vet. Akad. Forh.: 76, 1852 (syn. by Reuter, Not. Sallsk. F. Fl. Fenn. Forh. 14: 16, 1873).

*Cyrtorhinus pygmaeus* Reuter, Hem. Gymn. Eur. 3: 381, 554, pl. 2, fig. 4, 1883; Saunders, Hem. Het. Brit. Is.: 283, pl. 26, fig. 6, 1892; Wagner, Tierw. Deut. 41, Blindw.: 128, 1952.

\* *Tytthus insignis* Douglas & Scott, Ent. mon. Mag. 2: 247, 1866 (syn. by Saunders, Ent. mon. Mag. 13:113, 1876).

(Figs. 3A-G)

Characterised by its colouration and genitalia.

*Male*: length 2.85 mm.; width 1.0 mm.; head, width 0.7 mm., vertex 0.32., antennae, segment I length 0.32 mm., II 1.03 mm., III 0.76 mm., IV 0.76 mm.; pronotum, length 0.34 mm., width 0.80 mm.; rostrum length 1.15 mm.

Head black with two pale areas adjacent to the eyes; antennae dark except for apex of basal and base of second segments pale; pronotum varying from pale with only the extreme posterior angles dark to black with a pale central area anteriorly; scutellum black; hemelytra pale grey-green, nervures and membrane pale grey; legs yellow; rostrum pale, its tip dark; underside of thorax and pygophore black, rest of abdomen pale green suffused with fuscous towards pygophore.

Pubescence of fine pale adpressed hairs. Macropterous.

*Genitalia:* aedeagus (fig. 3 C) of phyline type, left clasper (fig. 3 E, H) with comparatively short process, right clasper (fig. 3 F) simple.

*Female:* length 3.2 mm., width 1.22 mm.; head, width 0.78 mm., vertex 0.38 mm.; antennae, I 0.32 mm., II 0.87 mm., III 0.76 mm.; IV 0.77 mm.; pronotum length 0.37 mm., width 0.87 mm., rostrum length 1.2 mm.

Colour and pubescence as in male. Macropterous.

*Distribution:* England, Wales, Netherlands, N. France, Sweden, Lappland, Finland, N. Russia, N. Germany.

*Specimens studied:* 6 ♂ 6 ♀ Houndslow Heath, Middlesex, U. K., 20/7/53, G. E. Woodroffe; 1 ♀ Harpenden, Herts, U. K., 11/8/54, T. R. E. Southwood; 1 ♀ Flatford, Suffolk, U. K., 26/8/54, T. R. E. Southwood; 1 ♀ Pergas, Finland, Dr. Eger; 1 ♀ which has been designated the lectotype, labelled "Esher" and "Tyththus Fieb, insignis Scott J. nova spec." from the Scott collection, now in Power collection (B. M.).

The degree of pigmentation of the pronotum of this species varies greatly, even within one population; but in general it is largely pale at the anterior and this together with the entirely yellow legs and the mostly dark basal antennal segment distinguishes it. Wagner (1952) records this species from marshy places around the bases of rushes and grasses: it is however occasionally taken by sweeping and occurs as an adult in July and August (earlier than *geminus* whose range is similar). The winter is passed in the egg stage.

*TYTTHUS VAGUS* (KNIGHT) nov. comb.

*Cyrtorhinus caricis vagus* Knight, Conn. Nat. Hist. Surv. Bul. 34: 511, 1923.

(Fig. 4 A-E)

Characterised by its colour and male genitalia.

*Male:* length 2.8 mm., width 1.2 mm.; head, length 0.2 mm., width 0.6 mm., vertex 0.32 mm., antennae, segment I, length 0.2 mm., II 0.8 mm., III ... mm., IV ... mm., pronotum, length 0.3 mm., width at base 0.8 mm., rostrum, length 0.7 mm.

Head black, shining, pale spots on vertex scarcely apparent. Antennae with first segment black, apex pale, remaining segments black; pronotum and scutellum black; hemelytra uniformly fuscous,

the latter slightly paler along embolium; cuneus and membrane pale fuscous; legs pale, coxae, hind femora except base and more narrowly at apex, fuscous.

Morphological characters as given for genus.

*Genitalia:* aedeagus of the Phylinae type. Left clasper (fig. 4 E) with both branches strongly pointed. Right clasper (fig. 4 D) short and compact.

*Female:* similar to male in colour and dimensions. Sclerotized ring and dorsal wall of bursa copulatrix as in figures 4 B, C.

*Distribution:* New York, Massachusetts, New Jersey, Virginia, N. Carolina, Colorado, U.S.A.

*Specimens studied:* 1 ♂ and 1 ♀ paratypes, New Jersey, Lakehurst (Knight's collection); 12 specimens, Piney Point, Md., VIII 946. A. I. Sailer col.; 1 spp. Boston, Mass. (named by Knight as *C. caricis vagus* Knight.).

This species shows some convergence with *Cyrtorhinus caricis* (Orthotylini) but is a typical Phylini in the structure of claws and genitalia. It is closest to *parviceps*, *neotropicalis*, *pygmaeus* and *chinensis*, but distinguished in the colour of antennae and pronotum, as well as in the structure of claspers. So far most American specimens seen by the senior author and named as *caricis* auct. are to be referred to this species.

*TYTTHUS NEOTROPICALIS* (CARVALHO) nov. comb.

*Cyrtorhinus costae* Carvalho nec Stal, Rev. Brasil. Biol. 5 (1): 316, figs. 1, 2, 3, 1945.

*Cyrtorhinus neotropicalis* Carvalho, An. Acad. Brasil. Ci. 26 (3-4): 425, 1954.

(Figs. in Carvalho, 1945)

Characterised by its colour, dimensions and male genitalia.

*Male:* length 2.9 mm., width 0.8 mm.; head, length 0.2 mm., width 0.5 mm., vertex 0.28 mm., antennae, segment I, length 0.2 mm., II 0.8 mm., III 0.6 mm.; IV 0.3 mm., pronotum, length 0.4 mm., width at base 0.7 mm., rostrum, length 1.4 mm.

Colour fuscous to black on head, pronotum and scutellum, the hemelytra and legs pale; antennae black (except apex and base of first segment); hemelytra infuscate on the clavus; pale spots of vertex obsolete. Rostrum reaching the middle coxae.

*Genitalia*: left clasper bifurcate with several dorsal setae. Right clasper falciform.

*Female*: similar to male in colour and dimensions.

*Distribution*: Km. 47 Estrada Rio S. Paulo, Rio de Janeiro, Viçosa, Minas Gerais, Goiás, Brazil.

*Specimens studied*: 3 ♂ 5 ♀ D. Federal, Rio de Janeiro, Brazil.

This species was described and figured by the senior author in 1945 as *Cyrtorhinus costae* (Stal, 1860). After studying types in Stockholm it was found that *costae* (Stal) is a species of *Falconia* Distant and not a *Cyrtorhinus* as stated by Berguoth (1922). The name *neotropicalis* was proposed for the species An. Acad. Brasil. Ci. 26 (3-4): 425, 1954. It can be distinguished from other species by the black ring of the first antennal segment, being closest to *vagus* Knight which has the first antennal segment largely black and pale spots on vertex well marked.

*TYTTHUS MUNDULUS* (BREDDIN) nov. comb.

*Periscopus mundulus* Breddin, Deut Ent. Zeit., 106, 1896.

*Cyrtorhinus mundulus* Reuter, Ofv. F. Vet. Soc. Forh. 44: 178, 1902, Zimmerman, Ins. Hawaii, 3, Het.: 206, fig. 88, 1948; Usinger, Soc. Sci. Fenn. Comment. Biol. 12 (8): 4, fig. 1951.

(Fig. in Zimmerman, 1948)

Characterised by its size, colour and genitalia.

*Male*: length 3.5 mm., width 1.0 mm.; head, width 0.7 mm., vertex 0.36 mm.; antennae, segment I, length 0.35 mm., II 1.10 mm., III 0.62 mm., IV 0.5 mm.; pronotum, length 0.38 mm., width 0.85 mm., rostrum length 1.1 mm.

Head black-brown except for two pale areas adjacent to the eyes, occasionally entirely dark; basal segment of antennae pale fulvous with the apex sometimes darker, other segments usually fuscous; pronotum and scutellum black-brown; hemelytra pale green suffused with brown towards the suture, cell nervures brown; legs yellow-green to pale fulvous; rostrum pale green tip dark; underside brown-black.

Pubescence of pale fine hairs especially long at the posterior of head and anterior of thorax; macropterous.



*Genitalia*: aedeagus of phyline type (fig. 5 E), left clasper (fig. 5 C) with terminal process stouter than in *germinus*, right clasper (fig. 5 G) simple.

*Female*: length 3.25 mm.; width 1.2 mm.; head, width 0.75 mm., vertex 0.38 mm.; antennae, I 0.35 mm., II 1.0 mm., III 0.50 mm., IV 0.35 mm.; pronotum, length 0.45 mm., width 0.90 mm.; rostrum length 1.0 mm.

Colour and pubescence as in male; macropterous.

*Distribution*: Java, Fiji, Philippine IIs. Queensland (Australia), (Introduced into Hawaii).

*Specimens studied*: 5 ♂ 4 ♀ Natoua, Fiji, April 1919, R. Veitch; 2 ♀ Lahaina Maui, Hawaii, Swezey col. Dec. 1928; 2 ♀ Halifax, Queensland, Australia, April 1920, F. Muir; 1 ♂ 1 ♀ Los Banos, Philippine IIs., Williams col.

The largest species of *Tytthus*, distinguished by its pale basal antennal segment and general dark colouration.

According to Zimmerman (1948) "this species was introduced in Hawaii in 1920, from Queensland and Fiji, to aid in the control of the sugarcane leafhopper, *Perkinsiella sacharicida* Kirkaldy. It became established and constitutes one of the outstanding records in the history of biological control. It has saved the Hawaiian sugar industry the Territory millions of dollars—its true worth can hardly be estimated".

The predatory habits of the species were discovered by Dr. Muir in Queensland (1920) (Swezey, 1936).

It may also feed on the eggs of *Peregrinus maidis* (Ashmead) on corn and *Megamelas proserpina* Kirkaldy, on taro.

#### *TYTTHUS ALBOORNATUS* (KNIGHT) nov. comb.

*Cyrtorhinus alboornatus* Knight, Bul. Brook. Ent. Soc. 26 (4): 172, 1931.

(Figs. 6 A-G, 7 A)

Characterized by the dark colour with basal two fifths of hemelytra pale whitish, cuneus likewise pale and male genitalia.

*Male, macropterous*: length 2.3 mm., width 0.8 mm., head, length 0.1 mm., width 0.5 mm., vertex 0.30 mm., antennae, segment I, length 0.3 mm., II 1.0 mm., III 0.7 mm., IV 0.7 mm., pronotum, length 0.3 mm., width at base 0.7 mm., rostrum, length 0.9 mm.

Colour dark brown to black, basal two fifths of hemelytra and entire cuneus pale whitish; distal half of coxae and bases of femora pale to whitish; tibiae and tarsi pale fuscous, spines black; membrane and veins rather uniformly pale fuscous.

*brachypterous*: length 1.7 mm., width 0.7 mm., head, length 0.2 mm., width 0.6 mm., vertex 0.30 mm., antennae, segment I, length 0.2 mm., II 0.7 mm., III 0.2 mm., IV 0.2 mm., pronotum, length 0.3 mm., width at base 0.6 mm., rostrum, length 0.7 mm.

Colour black; basal two thirds and apical one sixth of hemelytra, white; first antennal segment (except extreme base), coxae, extreme bases and apices of femora, the tibiae towards the apex and rostrum, sordid yellow.

Hemelytra without indication of cuneus or membrane; rostrum reaching the posterior coxae; posterior femora much longer and stouter than others; pubescence short and semiadpressed.

*Genitalia*: no macropterous forms were available for dissection. In the brachypterous form the aedeagus is of the Phylinae type (fig. 6 F). Left clasper (fig. 6 G, H) as seen in illustration, with the arm somewhat laminate and much less sclerotized, the left arm ending by a spinelike point. Right clasper very small. Pygophore (fig. 6 B, D) as shown in illustrations; the sheath is noticeably pointed (fig. 6 E).

*Female*: similar to male in colour, slightly more robust.

*Distribution*: Florida, New York, U.S.A.

*Specimens studied*: 1 ♂ holotype, Jacksonville, Florida (Knight's collection); 2 ♂ brachypterous, Titusville, Florida, 4.2.52, H. C. Chapman.

This species can be easily recognized by the whitish base of hemelytra and cuneus, which seem to be constant also in the brachypterous form.

#### *TYTTHUS GEMINUS* (FLOR)

*Capsus geminus* Flor, Rhync. Livl. 1: 606, 1860.

*Tytthus geminus* Fieber, Wien. Ent. Monat. 8 (3): 83, 1864.

*Cyrtorhinus geminus* Reuter, Hem. Gymn. Eur. 3: 382, 554, pl. 2, fig. 5, 1883; Wagner, Tierw. Deut. 41, Blindw.: 129, 1952.

*Chlamydatus* (*Cyrtorhinus*) *geminus* Reuter, Rev. Crit. Caps. 2: 126, 1875.

\* *Cyrtorhinus pubescens* Knight, Bul. Brook. Ent. Soc. 26 (4): 172, 1931 (n. syn.).

(Figs. 8 A-G)

Characterised by its colour, the long black hairs and male genitalia.

*Male*: length 2.6 mm., width 1.0 mm.; head, width 0.65 mm., vertex 0.33 mm.; antennae, segment I, length 0.38 mm., II 1.0 mm., III 0.79 mm., IV 0.65 mm.; pronotum, length 0.33 mm., width 0.76 mm.; rostrum length 1.15 mm.

Head black with two pale areas adjacent to the eyes; antennae dark except for basal joint which is only dark at extreme base; pronotum anteriorly dark fading to pale brown at posterior, scutellum black or brown, darker in the median area; hemelytra pale green-brown, membrane pale; legs entirely pale yellow-green, rostrum yellow-green, dark at apex; pleurites and sternites of thorax, dorsum and lateral margin of abdomen and pygophore dark brown, extreme ventral area of abdomen pale green-yellow.

Pubescence, long (0.19 mm.) dark erect hairs on posterior of head and anterior of pronotum (fig. 8 B), short dark and mostly adpressed hairs on the legs, otherwise pubescence of short adpressed mixed pale and dark fine hairs; macropterous.

*Genitalia*: aedeagus (fig. 8 E) simple.

*Female*: length 2.5-3.25 mm., width 1.05-1.25 mm.; head, width 0.75 mm., vertex 0.35 mm.; antennae, I 0.40 mm., II 0.90 mm., III 0.75 mm., IV 0.7 mm.; pronotum, length 0.42 mm., width 0.85 mm.; rostrum length 1.18 mm.

Colour as in the male, but pronotum sometimes entirely dark an with the dorsum and lateral areas of the abdomen dark, the entire venter pale yellow-green.

Pubescence as in the male. Semi-brachypterous, hemelytra reaching to the base of the 7th abdominal segment, membrane reduced.

*Distribution*: England, N. Russia, Finland, Siberia, Livonia, N. Germany, Denmark, Sweden.

*Specimens studied*: 1 ♀ Wicken Fen, Cambs., 19/9/34, H. St. J. Donisthorpe; 1 ♂ 2 ♀ Madeley, Staffs., 22/9/31 H., W. Daltry; 2 ♀ Finland, R. Linnavuori; 1 ♂ Porgos, Finland, J. Sahlberg.; 1 ♂ 3 ♀ Anchorage, Alaska, VIII, 948, R. I. Sailer col., 1 ♀ Colorado, Uhler col., holotype (*pubescens*), Wray, Colorado, Knight's collection.

This species is easily distinguished by the long black hairs, the entirely yellow legs, the pronotum usually paler posteriorly and the basal segment of the antennae almost entirely pale. Semi-brachypterous males and macropterous females are known (Wagner 1952),

but none were available for study. It is associated with various species of *Carex* and is found as an adult in September and October (Butler, 1923).

The amount of dark colour on head and pronotum varies within the species.

*TYTTHUS BALLI* (KNIGHT) nov. comb.

*Cyrtorhinus balli* Knight, Bul. Brook. Ent. Soc. 26 (4): 171, 1931.

(Fig. 5 A, D F)

Characterized by its colour, short antennal segments and bi-coloured aspect of the hemelytra.

*Male*: length 2.7 mm., width 0.7 mm., head, length 0.1 mm., width 0.6 mm., vertex 0.32 mm.; antennae, segment I, length 0.2 mm., II 0.6 mm., III 0.7 mm., IV 0.5 mm.; pronotum, length 0.2 mm., width at base 0.6 mm.; rostrum, length 1.0 mm.

Head black, shining, a pale spot each side of vertex bordering eye; antennae black, a trace of pale at tip of second segment; pronotum pale fuscous to blackish, anterior margin of disk orange yellow; mesoscutum and scutellum dark fuscous, with orange tint in hypodermis; hemelytra pale and fuscous, inner half of clavus bordering scutellum, apical half of corium, apical half of embolium except tip, and apical half of cuneus fuscous to blackish; membrane rather uniformly pale fuscous, a shade darker on areoles and veins. Underside of body brownish to black, abdomen pale beneath, genital segment black; legs pale to orange coloured, tibiae and tarsi blackish.

*Genitalia*: aedeagus of the Phylene type. Left clasper (fig. 5 D) with apices of branches short and pointed. Right clasper (fig. 5 F) elongate with a pointed outgrowth near apex.

*Female*: similar to male in colour and dimensions.

*Distribution*: Florida, Texas, U.S.A.

*Specimens studied*: 1 ♂ 1 ♀ paratypes, Jacksonville, Florida (Knight's collection); 1 ♂, México (an roses), intercepted Brownsville, Texas.

This species is well distinguished amongst the others in the genus by the anteriorly narrowed pronotum and colour pattern of the body. It is nearest to *C. insperatus* Knight, especially in antennal length and shape of pronotum, but differs in colour and size.

*TYTTHUS INSPERATUS* (KNIGHT) nov. cob.

*Cyrtorhinus insperatus* Knight, Bul. Brook. Ent. Soc. 30: 43, 1925.

(Fig. 9)

Characterized by its colour and male genitalia.

*Male*: length 3.0 mm., width 0.8 mm.; head, length 0.2 mm., width 0.6 mm., vertex 0.28 mm.; antennae, segment I, length 0.3 mm., II 1.5 mm., III 1.0 mm., IV 0.5 mm.; pronotum length 0.3 mm., width at base 0.7 mm.; rostrum, length 1.0 mm.

Head black with a small pale ocellate spot each side of vertex above eye; rostrum reddish yellow, basal segment greenish, apical segment black; antennae black, finely pale to dusky pubescent; pronotum brownish black, becoming fulvous basally, anterior margin pale, scutellum and mesoscutum fulvous, the mesoscutum broadly exposed and tinged with fuscous; hemelytra semitranslucent, fumate, basal area of corium and narrow margin of clavus pale translucent, clavus fuscous, except along claval suture, the scutellar margin and slenderly along commissure fulvous; membrane and veins uniformly fumate, anal area darker; sternum fulvous, sides, pleura and ostiolar peritreme becoming fuscous; legs pale fulvous, tibiae and tarsi black, femora with fuscous line along dorsal margins, also a reddish to fuscous longitudinal line on anterior face, this line being more subventral on front femora; abdomen greenish with a metallic luster, genital segment black.

*Genitalia*: no male specimens were available for dissection.

*Female*: more robust than male but similar in colouration.

*Distribution*: Arizona, U.S.A.

*Specimens studied*: 1 ♂ and 1 ♀ paratypes, Tucson, Arizona, A. A. Nichol (Knight's collection); 1 ♂, 1 ♀, Calexico, Calif. Ball col., 1 ♂, Buckeye, Arizona, Johnson col.

This species is easily recognized by its very long second antennal segment and the white transverse area on anterior portion of pronotum. It shows also a protruding clypeus and a short neck, characters which set it apart from the remaining species and probably from the genus. Once specimens are available for dissection, it will be possible to place it with certainty.

*TYTTHUS MONTANUS* n. sp.

Characterized by its colour, shape of pronotum and male genitalia.

*Male*: length 2.7 mm. width 0.8 mm. *Head*: length 0.2 mm., width 0.6 mm., vertex 0.33 mm. *Antennae*: segment I, length 0.2 mm.; II, 0.9 mm.; III, IV, broken. *Pronotum*: length 0.4 mm., width at base 0.7 mm.

Castaneous to dark brown; head, pronotum and scutellum (except pale areas on vertex) dark brown; antennae pale yellow, second and two last joints fuscous towards apex; hemelytra greyish brown with basal third whitish to pale yellow, membrane paler towards apex; underside of body castaneous, legs pale yellow except bases of coxae which are reddish and apical portion of femora (especially hind pair) which are castaneous to dark brown, tibiae slightly darker towards base.

Rostrum reaching the base of hind coxae. Head rounded in front, clypeus not seen from above, eyes placed near middle of head, distant from pronotum by a space equal to thickness of first antennal segment, pronotum noticeable constricted behind middle, disc convex, smooth, calli larger but not marked, lateral margins broadly rounded and converging anteriorly, posterior margin sinuate internally, humeral angles rounded; pubescence scanty and short, mesoscutum broadly exposed.

*Genitalia*: aedeagus of the common *Phyline* type. Left clasper (fig. 7 C, F) as seen in figures, the longer arm with many hairs on external margin. Right clasper (fig. 7 B, D) somewhat laminate, as shown in figures.

*Female*: unknown.

*Holotype*: male, Drummond, Montana, Oman col., VII. 935, in the collection of the U.S. National Museum.

This species shows a peculiar pronotum but still can be maintained in the genus *Tytthus* Fieber, since the position of the eyes and shape of pronotum varies within the genus. It differs from the others known so far in the colour and the above mentioned characters.

*TYTTHUS PANAMENSIS* n. sp.

Characterized by its size, colour and male genitalia.

*Male*: length 2.4 mm., width 0.6 mm. *Head*: length 0.2 mm., width 0.4 mm., vertex 0.23 mm. *Antennae*: segment I, 0.2 mm.; II, 0.9 mm.; III and IV, broken. *Pronotum*: length 0.2 mm., width at base 0.5 mm.

Head, pronotum and first antennal segment (except extreme apex) black to dark brown; remaining antennal segments, apices of femora and bases of tibiae castaneous to fulvous; hemelytra pale to greenish yellow, membrane translucent; rostrum, coxae (except for reddish tinge on first pair), bases of femora and apices of tibiae, pale yellow; underside of body (except median portion of abdomen) dark brown to castaneous; the light spots on head obsolete.

Rostrum reaching base of hind coxae, body elongate, hemelytra parallel sided.

*Genitalia*: aedeagus of the common *Phyline* type. Left clasper (fig. 7 G) as seen in figure. Right clasper (fig. 7 E) with a long setae on truncate apex.

*Female*: unknown.

*Holotype*: male, Corozal, C. Z. Panama, A. Bucsk col. (at light).

*Paratypes*: 3 males, same data as the type, in the collection of the U.S. National Museum and of the author.

This species is near *parviceps* in colour but with more elongate body, the spots on vertex obsolete and a typical left clasper. From *balli* and *alboornatus* it differs in colour and structure of claspers.

#### GENUS FIEBEROCAPSUS nov. gen.

Head rounded anteriorly, face short, distance from base of eye to apex of tylus half height of eye; antennae with the first and second segments at least half as broad again as the third and fourth; pronotum trapeziform, straight sided and only slightly wider posteriorly than anteriorly (Fig. 10), its lower margin usually slightly concave, calli only slightly raised; hemelytra with the cuneus broader than long; covered with pale semi-erect hairs, longer (average 0.12 mm.) on head and anterior of pronotum and shorter on hemelytra and legs (average 0.08 mm.), occasional spinose hairs on hind tibia, rostrum reaching to apex hind coxa. *Genitalia* comparatively large, the left clasper simple and curved, the right rounded with a median row of the teeth; the vesica of the aedeagus has a pair of appendages arising from near its apex, as well as the more basal vesical appendage; in the female the K structure is large and its posterior median concave. Brachypterism occurs in both sexes.

Type species: *Tytthus flaveolus* Reuter 1870.

Although superficially similar to *Cyrtorhinus* and *Mecomma*, this genus is sharply distinguished from them on *genitalia*, in the structure of these it shows affinities with *Cyllecoris* Hahn and *Dryophilocoris* Reuter.

*FIEBEROCAPSUS FLAVEOLUS* (REUTER) nov. comb.

*Tytthus flaveolus* Reuter, Not. Sallsk. F. Fl. Fenn. 11: 323, pl. 1, fig. 6, 1870.

\* *Tytthus insignis* Reuter nec Douglas & Scott, Rev. Crit. Caps. 2: 126, 1875 (syn. by Reuter, Ent. mon. Mag. 14: 131, 1877).

*Cyrtorhinus flaveolus* Reuter, Hem. Gymn. Eur. 3: 380, 554, 1883; Saunders, Hem. Het. Brit. Is.: 284, 1892; Wagner, Tierw. Deut. 41, Blindw.: 128, 1952.

(Fig. 10 A-H)

Characterized by its shape, colour and genitalia.

*Male: Brachypterous:* length 2.8 mm., width 1.50 mm.; head, width 0.94 mm., vertex 0.40 mm.; antennae, segment I, length 0.44 mm., II 1.2 mm., III 0.75 mm., IV 0.5 mm.; pronotum, length 0.52 mm., width 0.97 mm.; rostrum 1.3 mm.

Entirely pale yellow except for antennae, the first and second segments of which are brown with pale backs, whilst the third and fourth segments are pale grey-brown; the tylus is dark brown as are two areas on the frons (to which the feeding pump muscles are attached); lateral region of pronotum and meso- and meta-thoracic pleurites suffused with brown, tip of rostrum dark brown.

Pubescence of pale fine adpressed hairs. Brachypterous, hemelytra reaching just beyond posterior of eighth segment, membrane and cuneal suture absent.

*Genitalia:* aedeagus (fig. 10 B) of orthotyline type with straplike tooth vesical appendages; left clasper (fig. 10 D, E) narrow, its apex produced and grooved; right claspers (fig. 10 A) broad with a central toothed shelf-like projection.

*Macropterous:* length 3.5 mm., width 1.47 mm.; pronotum, length 0.52 mm., width 1.15 mm.; otherwise as in brachypterous male.

*Female: brachypterous:* length 2.97 mm., width 1.75 mm.; head, width 0.94 mm., vertex 0.45 mm.; antennae, I 0.43 mm., II 1.15 mm., III 0.72 mm., IV 0.5 mm.; pronotum, length 0.5 mm., width 1.12 mm.; rostrum length 1.28 mm.

Colour and pubescence as in male.

*Genitalia:* K structures shaped in a curved L, quite distinct from any other species (fig. 10 F).

*Macropterous:* length 3.75 mm., width 1.75 mm.; pronotum, length 0.62 mm., width 1.35 mm.; otherwise as in brachypterous female.



*Distribution:* England, Sweden, Finland, Denmark, N. Russia, Germany.

*Specimens studied:* 6 ♂ 6 ♀ Houdslow Heath, Middlesex, U.K, 20/7/53, G. E. Woodroffe, 1 ♂, Finland, Aug. 1947, R. Linnavuori; 1 ♀ Finland.

This species is easily recognised by its entirely pale coloration. The adult, which is found from July to September (Butler, 1923), is said to be phytophagous (Wagner, 1952) (see however p. 64). It is found at the bases of reeds and rushes; the brachypterous form is the commonest.

### GENUS *CYRTORHINUS* FIEBER

*Cyrtorhinus* Fieber, Wien. Ent. Monat. 2: 313, 1858; Reuter, Hem. Gymn. Eur. 3: 379, 1883; Distant, Faun. Brit. Ind. Rhync. 2: 476, 1904; Hueber, Syn. Blindw. 2: 106, 1908; Poppius, Acta Soc. Sci. Fenn. 44 (3): 70, 1914; Wgner, Tierw. Deut 41, Blindw.: 127, 1952.

\* *Cyrtorrhinus* Reuter, Acta Soc. Sci. Fenn. 13: 379, 1884 (emendation).

\* *Reuteriessa* Usinger, Soc. Sci. Fenn. Comment. Biol. 12 (8): 3, 1951 (*nov. syn.*).

Type species: *Capsus elegantulus* Meyer, 1843, a synonym of *Cyrtorhinus caricis* (Fallen, 1807) — monobasic.

Small to medium sized bugs (2.5-4.5 mm), haed rounded anteriorly, face semi-vertical; antennae arising adjacent to anterior margin of eyes; pronotum campanuliform with calli slightly raised, its lower margin straight; posterior of pronotum slightly wider than head; opening of odiferous gland raised; pretarsus with flaplike arolia; rostrum reaching base of mid-coxa; male pygophore with subgenital plate or adeagal support only slightly projecting; bursa copulatrix of female with rounded or semi-quadrate K structures. Covered with simple semi-erect pubescence (0.08-0.15 mm. in length;) colour pattern generally black and pale green. Female sometimes partially brachypterous.

### KEY TO THE SPECIES OF *CYRTORHINUS*

1. Second antennal segment about twice as long as pronotal width at base (1.5 : 0.8) ..... 2
- Second antennal segment noticeably less than twice as long as pronotal width at base (1.5 : 1.0 to 0.8 : 0.7). ..... 3

2. Colour chiefly fulvous, apex of first antennal segment pale ..  
 ..... *fulvus* Knight  
 Colour pale yellow green, apex of first antennal segment dark  
 ..... *cumberi* Woodward
3. Second antennal segment half as long again as width of  
 pronotum at base (1.5 : 1.0 mm.), right clasper of male not  
 bifid, basal segment of antennae entirely black; pronotum and  
 scutellum entirely black, head black with only two small pale  
 areas adjacent to the eyes ..... *caricis* (Fallen)  
 Second antennal segment only slightly longer than the pronotum  
 is wide at its base (0.8 : 0.7 mm. or 1.18 : 0.93 mm.), right  
 clasper of male bifid, basal segment of antennae pale at apex;  
 (pronotum and scutellum often partially pale; head generally  
 with wide pale areas adjacent and posterior to the eyes) .... 4
4. Small species (under 3.0 mm.), tibiae entirely yellow .....  
 ..... *lividipennis* Reuter  
 Larger species (over 3.5 mm.), tibiae generally infuscate  
 especially at base ..... *melanops* Reuter

#### CYRTORHINUS CUMBERI WOODWARD

*Cyrtorhinus cumberi* Woodward, Rec. Auck. Inst. Mus. 4 (1):  
 9-23, 1950.

(Figs. 11 A-G)

Characterized by its long second antennal segment, pale coloured  
 pronotum of the male and genitalia.

*Male*: length 3.85 mm., width 1.0 mm.; head, width 0.75 mm.,  
 vertex 0.4 mm.; antennae, segment I, length 0.5 mm., II  
 1.5 mm., III 1.34 mm., IV 0.55 mm.; pronotum, length  
 0.48 mm., width 0.84 mm.; rostrum length 1.0 mm.

Pale yellow green, except antennae (apart from extreme base  
 of first segment), anterior and lateral regions of head, lateral area  
 of thorax and apices of tarsi and rostrum which are black.

Pubescence pale and fine; macropterous.

*Genitalia*: aedeagus fig. 11 E) of orthotyline type, the theca  
 with a dorsal projection and the vesical appendage truncate at its  
 apex; right clasper (fig. 11 C) with a curved process which is toothed  
 at its apex, left clasper (fig. 11 D) with a long simple curved  
 process.

*Female, Brachypterous*: length 3.84 mm., width 1.25 mm.; head, width 0.78 mm., vertex 0.40 mm. Antennae, I 0.5 mm., II 1.33 mm., III 1.07 mm., IV 0.55 mm.; pronotum, length 0.5 mm., width 0.85 mm.; rostrum length 1.1 mm.

Head red with anterior and lateral regions black and two areas on the vertex, median to the eyes, yellow; antennae with basal joint red, second red-brown becoming darker at apex; pronotum yellow-green suffused with red and anterior and lateral regions black; legs and scutellum yellow green; hemelytra pale green; underside yellow-green; tip of rostrum dark.

Pubescence as in male; brachypterous, hemelytra reaching to end of seventh abdominal segment, membrane much reduced.

*Genitalia*: K structures (fig. 11 G) semi quadrate.

*Macropterous* not seen, based on Woodward (1950): length 3.6 mm., width 1.3 mm. As brachypterous female but hemelytra reaching, but not entirely covering the ninth tergite.

*Distribution*: New Zealand (N. Island).

*Specimens studied*: 1 ♂, Paiaka, Manawatu, New Zealand, 2/2/51, T. E. Woodward (B. M.); 4 ♀, ditto, New Zealand, 4/1/50, T. E. Woodward (B. M.).

This species is very similar to *fulvus* Knight in proportions, but is distinguished by its coloration and genitalia. It was found below and in tufts of rushes and grasses, where Delphacids occurred abundantly (Woodward, 1950).

#### CYRTORHINUS FULVUS KNIGHT

*Cyrtorhinus fulvus* Knight, Ins. Samoa, II, Hem. 5: 205, 1935.

*Cyrtorhinus fulvus* Zimmerman, Ins. Hawaii, 3, Heteropt.: 205, fig. 8, 1948.

(Fig. 12 A-E, G-H)

Characterized by its colour, size, length of second antennal segment and genitalia.

*Male*: length 3.4 mm., width 1.0 mm.; head, length 0.2 mm., width 0.7 mm., vertex 0.34 mm.; antennae, segment I, length 0.4 mm., II 1.5 mm., III 1.3 mm., IV 0.6 mm.; pronotum, length 0.4 mm., width at base 0.8 mm.; rostrum, length 1.1 mm.

General colour fulvous, antennae except apex of segment I, head except on vertex and genae and lora, pronotum except median ray on basal half of disc, mesonotum more or less, and median line of scutellum, black; legs fulvous, fuscous on knees; membrane pale to dusky, cubitus fuscous.

Rostrum reaching the middle coxae. Genitalia with aedeagus showing a typical spiculum (fig. 12 B). Left clasper (fig. 12 D) branched at middle, the lower arm curved, the upper lobe with dorsal setae. Right clasper (fig. 12 C, H) also branched, one lobe with setae, the other ended by a serrate margin. Pygophore (fig. 12 G) as seen in figure.

*Female*: length 3.8 mm., width 1.3 mm., slightly more robust than male but very similar in structure and colouration. K structure as seen in figure 12 E.

*Distribution*: Micronesia, Caroline Is. (Palau, Babelthuap, Yap, Koror), Samoa, Java, Philippines, Fiji, New Guinea (Introduced into Hawaii).

*Specimens studied*: 1 ♂ (Holotype) Savaii, Samoa, Lower forest (1000-2000 ft.), E. H. Bryan (Brit. Mus.); 3 ♂ (Paratypes) Savaii, Samoa, E. H. Bryan (Brit. Mus.); 2 ♀ (Paratypes) Malololedei, Upolu, Samoa 1/5/24, P. A. Buxton and G. H. Hopkins (Brit. Mus.); 2 ♀ Suva, Fiji, 7/5/43, R. A. Lever; 3 ♂ New Guinea, Pemberton col.; 1 ♂ Java, F. Muir col.; 1 ♀ Los Banos, Philippine IIs. F. Muir col.; 1 ♂ Honolulu, Hawaii; 9 ♂ 41 ♀, CAROLINE ILS., Palau: Babelthuap Is., 7/12/52, J. L. Gressit; *Yap Group*: Yapid, Colonia, Konif, S. Yapid, Tomil Dist., July 1950, R. J. Goss, Koror: 30/11/47, H. S. Dybas; 15/3/48 K. L. Maekler; 26/1/53, L. W. Beardsley; *Babelthuaup*: Kaishan, Aug. 1939, T. Esaki.

#### CYRTORHINUS LIVIDIPENNIS REUTER

*Cyrtorhinus lividipennis* Reuter, Ent. Tidskr. 5: 199, 1884; Distant, Faun. Brit. Ind. Rhync. 2: 476, fig. 308, 1904.

\* *Cyrtorhinus vitiensis* Usinger, Soc. Sci. Fenn. Comm. Biol. 12 (8): 3, figs. 1, 2, 1951 (nov. syn.).

(Figs. 12 F, 13 A-G)

Characterized by its size, length of second antennal segment and genitalia.

*Male*: length 2.50-2.78 mm., width 0.95 mm.; head, width 0.6 mm., vertex 0.27 mm.; antennae, segment I, length 0.3 mm., II 0.86 mm., III 0.78 mm., IV 0.52 mm.; pronotum, length 0.33 mm., width 0.78 mm.; rostrum length 0.75 mm.

Head, pronotum and scutellum pale yellow with a variable amount of black or dark brown markings, ranging from almost entirely dark to entirely light; antennae dark except for apex of basal and base of segment; hemelytra pale green, membrane pale grey with nervures grey-green; legs pale yellow; rostrum pale green, tip dark; underside of thorax, and all abdomen pale yellow-green.

Pubescence of short pale adpressed hairs. Macropterous.

*Genitalia*: aedeagus (fig. 12 F, 13 C) of orthotyline type, the single vesical appendage sharply widened on one side and then narrowing again before the tip; left clasper (fig. 13 F) with an elongated curved arm with three teeth on the ventral aspect, as in *fulvus*; the right clasper (fig. 13 H, G) with a short curved process.

*Female*: length 2.75-3.0 mm., width 1.1 mm.; head, width 0.63 mm., vertex 0.34 mm.; antennae, I 0.26 mm., II 0.78 mm., III 0.74 mm., IV 0.58 mm.; pronotum, length 0.33 mm., width 0.85 mm.; rostrum length 0.76 mm.

Colour and pubescence as in male. Macropterous.

*Genitalia*: K structures (fig. 13 D) curved.

*Distribution*: S. India, Ceylon, Burma, Gt. Nicobar, China, Formosa, Japan, Philippine IIs., Java, Sumatra, New Guinea, Marianas IIs. (Guam, Rota), Caroline IIs. (Yap, Babelthuap, Koror, Yapid), Samoa, New Hebrides (Malekula), Borneo.

*Specimens studied*: 1 ♂ (Holotype of *vitiensis* Usinger) Dobuilevu, Fiji (sweeping young rice), 15/6/48, B. A. O'Conner (Brit. Museum); 2 ♂ Dobuilevu, Fiji (sweeping young rice), 15/6/48, B. A. O'Conner; 10 ♂, 9 ♀ Naduroloulou, Fiji, (sweeping young rice), 16/10/50, B. A. O'Conner; 1 ♂ 2 ♀ Mokassau, Chekiang, China, Dora E. Wright; several ♂, ♀ San Joe, Mindoro, Philippine IIs., March 1945, E. S. Ross; Los Banos, Philippine IIs., October 1945, G. B. Viado; 1 ♂ New Guinea, Pemberton col.; 1 ♂ Malekula, Malua Bay, New Hebrides May 1929, L. E. Cheesman; 25 ♂ 43 ♀ MARIANAS ILS., *Guam*: Pt. Oca, Agana May June and July 1945, G. E. Bohart and J. L. Gressitt; *Rota*: 22/6/52 Y. Kondo; CAROLINE ILS., *Yap Group*: Yap Is., Oct. 1952, N. L. H. Krauss; Hill behind Yaptown, 29/11/52, J. L. Gressitt, *Babelthuap*: Ulimang. 25/12/47 H. S. Dybas, 23/5/53 Oller; *Yafid*: Colonia, July 1950 R. J. Goss; *Koror*: July 1953, J. W. Beardsley, Sandakan, Borneo, Pemberton col.: Fly River, New Guinea, Pemberton col.

This species is near to *fulvus* Knight but differs in the shorter second antennal segment, less tumid calli, coloration, smaller size and in the structure of the male genitalia, whilst the two latter characters distinguish it from *melanops* Reuter.

Usinger (1939) found this species associated with *Peregrinus maidis* (Ashmead) on corn, the eggs of the fulgorid apparently being its preferred food. It was also common on rice where it preyed upon the eggs of *Nilaparvata lugens* (Stal). According to Usinger (1946) *lividipennis* Reuter was introduced into the Hawaiian Islands recently in an effort to control the corn leafhopper but did not become established. Zimmerman (1948) says that the species was introduced from Guam into Hawaii by the Board of Agriculture and Forestry, in 1939, and confirms the fact that it did not become established.

### CYRTORHINUS MELANOPS REUTER

*Cyrtorhinus melanops* Reuter, Ofv. F. Vet. Soc. Forh. 47 (2): 6, 1905.

\* *Cyrtorhinus megalops* Poppius, Acta Soc. Sci. Fenn. 44 (3): 71, 1914 (error pro *melanops* Reuter).

(Figs. 14 A-J)

Characterized by the wide pale area adjacent to the eyes in the male and the genitalia.

*Male*: length 3.8 mm., width 1.2 mm.; head, width 0.73 mm., vertex 0.37 mm.; antennae, I 0.3 mm., II 1.18 mm., III 1.0 mm., IV, broken; pronotum, length 0.45 mm., width 0.93 mm.; rostrum length 1.15 mm.

*Type*: Yellow-green apart from anterior of head, basal segment of antennae (except extreme base and apex) black-brown, second antennal segment light brown, paler in the centre, hind tibia with pale brown mark a third length from the apex, apical segment of tarsus and claws light brown.

*Other specimens*: Head black with two wide pale areas adjacent to the eyes, stretching from just posterior to the base of the antennae to the posterior margin of the vertex; antennae black-brown with the extreme base and apex of the basal segment pale; pronotum and scutellum entirely black-brown; hemelytra yellow-green, claval suture slightly infuscate, membrane pale, nervures, pale green; legs pale green, with extreme base of the tibia brown, the hind tibia sometimes entirely pale brown, with the base darker, apex of tarsus and claws brown; underside and abdomen brown-black rostrum pale green, tip dark.

Pubescence pale and fine, macropterous.

*Genitalia*: aedeagus with a single vesical appendage (fig. 14 J), left clasper bifid, lower arm curved (figs. 14 F, G), right clasper also bifid, its lower arm with inwardly curved teeth apically (figs. 14 H, I).

*Female*: length 3.88 mm., width 1.21 mm.; head, width 0.77 mm., vertex 0.38 mm.; antennae, segment I, length 0.32 mm., II 1.19 mm., III IV broken; pronotum, length 0.5 mm., width 0.98 mm., rostrum length 1.17 mm.

Generally similar in coloration to male, but pale areas adjacent to eyes sometimes very small and clavus infuscate; abdomen pale green with dorsum brown or entirely fuscous.

*Distribution*: "Caffrorca" [Natal], Abyssinia.

*Specimens studied*: Type, 1 ♂, "Caffrorca" (Riksmuseum, Stockholm), 3 ♂ 1 ♀ Hawash River, W. of Mount Zaquala (c. 6,000 ft.), Abyssinia, 28/11/26, J. Omer Cooper (B.M.); 1 ♂ Serpent Lake, Wouramboulchi, (c. 9,000 ft.) Abyssinia, 5/10/26, J. Omer Cooper (B. M.); 1 ♀ nr. Addis Allem (c. 8,000 ft.), Abyssinia, 19/9/26, J. Omer Cooper (B. M.); 1 ♀ Natal, Brown col.

Although the other specimens are much darker in colouration than the type, examination of the genitalia left no doubt that they were the same species. On genitalia and other characters it is closest to *lividipennis* Reuter, but is distinguished from this species on size, and from *caricis* (Fallen) by the pale areas on its head, the pale apex of the basal antennal segment and genitalia.

#### CYRTORHINUS CARICIS (FALLEN)

*Capsus caricis* Fallen, Mon. Cimic. Suec.: 102, 1807.

*Lygus caricis* Vollenhoven, Hem. Het. Neerl.: 228, pl. 16, fig. 4, 1878.

*Cyllecoris caricis* Hahn, Wanz, Ins. 2: 100, fig. 184, 1834.

*Cyrtorhinus caricis* Reuter, Hem. Gymn. Eur. 3: 383, 555, pl. 1, fig. 10, pl. 2, fig. 3, 1883; Saunders, Hem. Het. Brit. Is.: 283, pl. 26, fig. 5, 1892; Stichel, Illus. Best. Deut. Wanz. 8: 227, figs. 590, 591, 1933; Wagner, Tierw. Deut. 41, Blindw.: 127, 1952.

\* *Capsus elegantulus* Meyer-Dür, Verz. Schw. Rhync.: 86, pl. 5, fig. 2, 1843 (syn. by Thomson, Opusc. Ent. 4: 437, 1871).

*Sphyracephalus elegantulus* Douglas & Scott, Brit. Mem.: 351, 1865.

\* *Capsus chloropterus* Herrich-Schaeffer, Wanz. Ins. Verz.: 34, 1853 (syn. by Reuter, Hem. Gymn. Eur. 3: 383, 1883).

(Figs. 15 A-H)

Characterized by the entirely black antennae and the genitalia.

*Male:* length 4.1 mm., width 1.25 mm.; head, width 0.85 mm., vertex 0.35 mm.; antennae, segment I, length 0.45 mm., II 1.50 mm., III 1.20 mm., IV 0.53 mm.; pronotum, length 0.5 mm., width 1.0 mm.; rostrum length 1.2 mm.

Head black, except for two triangular areas on the vertex adjacent to the eyes, pale green; antennae entirely black; pronotum and scutellum black; hemelytra pale green with clavus and median area of corium suffused with dark brown, nervures brown; legs pale green with apex of tarsi dark; rostrum pale tip dark; underside of head and thorax black; abdomen pale green.

Pubescence pale and fine; all specimens seen macropterous.

*Genitalia:* aedeagus (Fig. 15 H) of orthotyline type, with the single vesical appendage curved at its apex; left clasper (Fig. 15 D, E) with process simply curved; right clasper (Fig. F) simple truncate slightly curved, teeth of dorsal area not raised on a process.

*Female:* length 4.0 mm., width 1.45 mm.; head, width 0.85 mm., vertex 0.38 mm.; antennae, I 0.45 mm., II 1.22 mm., III 1.0 mm., IV 0.53 mm.; pronotum, length 0.5 mm., width 1.0 mm.; rostrum length 1.1 mm.

Coloration and pubescence as in male. Macropterous.

*Genitalia:* The K structures are small semiquadrate with the inner posterior corner elongated (Fig. 15 G).

*Distribution:* Ireland, Scotland, Wales, England, Netherlands, France, Switzerland, Hungary, Denmark, Norway, Sweden, Finland, European Russia (incl. Caucasus), Siberia, Turkestan.

*Specimens studied:* 1 ♂ Saunders coll.; 2 ♂ 1 ♀ Houndslow Heath, Middlesex, U. K. 20/7/53, G. E. Woodroffe, 2 ♀ Wimbledon Common, Surrey, England, 8/10/51, T. R. E. Southwood; 2 ♀ Aviemore, Scotland, August 1938, A. M. Masee; 1 ♂ Piesting, Lower Austria; 1 ♀ Colorado, Uhler col.; Several ♂ and ♀, Wrangel, Alaska, B. Malkin, VII. 951.

This large species is similar in appearance to *melanops* Reuter, but its entirely black antennae, small pale areas on the head and genitalia distinguish it. It is found at the bases of rushes (*Juncus*) and sedges (*Carex*, *Scirpus*), as an adult between June and October. The winter is passed in the egg state and the young nymphs hatch the following spring (Butler 1923, Kullenberg 1946). The eggs, which are sausage-shaped with their micropylar end strongly curved, are laid in the leaves or stems of various *Scirpus* spp. (Kullenberg 1943, 1946) (Fig. 22).



Most of the American records for this species are to be referred to *Tytthus vagus* Knight (*Cyrtorhinus caricis vagus* Knight, 1923), a species of Phylini. Several specimens labelled as *caricis* in American collections and seen by the senior author do not possess the convergent arolia of the Orthotylini. *C. caricis* (Fallen) is apparently rare in the United States where it seems to be restricted to the Rocky Mountain range.

#### GENUS *MECOMMA* FIEBER

*Mecomma* Fieber, Wien. Ent. Monat. 2: 313, 1858; Reuter, Herm. Gymn. Eur. 3: 383, 545, 1883; Hueber, Syn. Blidw. 2: 166, 143, 1908; Poppius, Acta Soc. Sci. Fenn. 44 (3): 60, 72, 1914; Wagner, Tierw. Deut. 4, Blindw.: 110, 129, 1952.

- \* *Sphyracephalus* Douglas & Scott, Brit. Hem.: 348, 1865.
- \* *Sphyrops* Douglas & Scott, Ent. Mon. Mag. 3: 16, 1866 (nom. nov. for *Sphyracephalus* Douglas & Scott, 1865).
- \* *Antiphilus* Distant, Ann. Mag. Nat. Hist. (8) 4: 521, 1909 (syn. by Carvalho, An. Acad. Brasil. Ci., 24 (1): 78, 1952).
- \* *Aristobulus* Distant, Ann. Mag. Nat. Hist. (8) 5: 16, 1910 (n. syn.).
- \* *Nycticapsus* Poppius, Acta Soc. Sci. Fenn. 44 (3): 74, 1914 (n. syn.).
- \* *Aristobolus* Carvalho, An. Acad. Brasil. Ci. 24 (1): 79 (error pro *Aristobolus* Distant).

Type species: *Capsus ambulans* Fallen, 1807 — monobasic.

Males always fully winged medium sized bugs (4-5 mm.), females usually brachypterous (2.0-3.5 mm.), occasionally fully winged. Head rounded anteriorly; face vertical, depth from base of eyes to apex of tylus about half the vertical diameter of the eyes, antennae arising adjacent to lower median corner of the eyes, basal and second antennal segments markedly thicker than third and fourth; pronotum campanuliform with narrow anterior collar and in the male strongly raised posteriorly; in the males head width including eyes nearly twice as wide as pronotal collar and subequal to the width of the base of the pronotum; opening of odoriferous sac raised; pretarsus with flap-like arolia; rostrum reaching beyond base of hind coxa; male pygophore with subgenital plate or aedeagal support only slightly projecting; left clasper strongly curved, right clasper with a ridge of teeth, aedeagus with single vesical appendage and vesica curved dorsally just before gonopore; bursa copulatrix of female with rounded to conical K structures; covered with simple semi-erect

pubescence (0.10-0.18 mm.), usually longer in the male; general colour of males light brown and black and in females brown and black or almost entirely brown.

*Mecomma* is closest to *Cyrtorhinus* in general fascies and in the structure of the genitalia of both sexes. It differs however in the following characters: the female is usually brachypterous, the outline of the male is almost parallel sided, the rostrum reaches beyond the base of the hind coxa, the pubescence is long (usually over 0.15 mm.), the cuneus is long (in the male twice as long as wide), the left clasper is strongly curved and unbranched, the right clasper has an apical row of spines and a spineless ventral process, the vesica is curved upwards just before the gonopore and the K structure of the bursa copulatrix has its posterior margin produced almost to a point.

Species of *Mecomma* occur amongst grasses (generally damp) in or around temperate forests. Hence in tropical regions (e.g. India) *Mecomma* sp. are present only in mountainous districts, where these conditions are found; this results in geographical isolation, followed by subspeciation. Subspeciation has also occurred in the Nearctic region. It seems that the isolating effect of the geographical barriers are strengthened by the brachypterism common in the female. One species is polymorphic.

The striking convergence between the allied Orthotyline genus *Cyrtorhinus* and the Phyline genus *Tytthus* has already been noted; a similar convergence in both sexes occurs between *Mecomma* and the phyline genus *Orthonotus* which in habits similar situations.

A further study of *Mecomma* with more material and ecological data would be of great interest, intrinsically and from the more general aspect of speciation.

#### KEY TO THE SPECIES OF *MECOMMA* FIEBER

*Females:* (at present known)

1. Second antennal segment distinctly clavate, elytra reaching only to second abdominal segment ..... *mimetica* n. sp.  
Second antennal segment if incrassate towards apex, not clavate, elytra reaching posterior margin of third abdominal segment or beyond ..... 2
2. Elytra entirely black ..... 3  
Elytra pale or if infuscate, yellowish at base or margins .. 7
3. Pronotum noticeably broader posteriorly than anteriorly (Figs. 22 B, A), segment two of antennae entirely black ..... 4  
Pronotum only slightly broader posteriorly than anteriorly

- (Figs. 17 A, B; 20 A) segment two of antennae at least partially pale ..... 6
4. Antennae entirely black ..... *amicus* (Distant)  
 Antennae partially pale ..... 5
5. Basal segment of antenna pale ..... *chinensis* Reuter  
 Basal segment of antennae black, the third partially pale ..  
 ..... *ambulans* (Fallen)
6. Second antennal segment dark at apex, upper surface of pronotum and hemelytra shining .....  
 ..... *orientalis orientalis* n. sp. form a  
 Second antennal segment entirely yellow, upper surface of pronotum and hemelytra rugose .....  
 ..... *orientalis orientalis* n. sp. form b
7. Antennae entirely black, larger species ..... *grandis* n. sp.  
 Antennae partially pale or brown ..... 8
8. First antennal segment black or fulvous ..... 9  
 First antennal segment pale ..... 10
10. Antennae usually castaneous to fulvous; K structure as in fig. 20 J ..... *antennata* Van Duzee  
 Antennae black; K structure as in fig. 20 F .... *gilvipes* (Stal)
11. Pronotum and scutellum unicolorous .. *luctuosa* (Provancher)  
 Pronotum with a longitudinal fascia and apex of scutellum pale ..... *melanocephalus* (Poppius)

*Males:* (known at present)

1. Pronotum and first antennal segment castaneous to fulvous ..... *antennata* Van Duzee  
 Pronotum black, first antennal segment black or pale .... 2
2. Third antennal segment partially pale ..... 3  
 Third antennal segment black ..... 4
3. Basal antennal segment pale, cuneus long (0.70-0.81 mm), head narrow (0.68-0.71 mm) ..... *orientalis* n. sp. *orientalis* for a  
 Basal antennal segment dark or pale, cuneus short (0.60-0.62 mm), head wide (0.73-0.78 mm) .....  
 ..... *orientalis himalayensis* n. subsp.
4. Antennae black ..... 5  
 Antennae with first segment pale ..... 8
5. Apices of corium and cuneus pale to ochraceous ..... 6  
 Apices of corium and cuneus suffused with black ..... 7
6. Endocorium black ..... *madagascariensis* Reuter  
 Endocorium translucent, pale .. *luctuosa luctuosa* (Provancher)

7. Larger, head width 0.83-0.87, right clasper as in fig. 21 E  
spiculum as in fig. 21 F ..... *ambulans* (Fallen)  
Smaller, head width 0.79-0.83 mm, right clasper as in fig. 19 B,  
C spiculum as in fig. 19 D ..... *amicus* (Distant)
8. Genitalia as in figs. 17 G, F ..... *orientalis orientalis* form b  
Genitalia as in figs. 21 A, I .... *luctuosa pacifica* n. subsp.

*MECOMMA ORIENTALIS* n. sp.

(Figs. 17 A-H)

Characterized by the pronotum of the female only slightly wider posteriorly than anteriorly, the partially pale coloured antennae, the general proportions and genitalia.

[Note: forms a and b of the female may not correspond with the respective forms in the male and hence an allotype has not been designated].

Subspecies *orientalis* nov. sp. Form a (type form)

*Male, Holotype:* length 4.25 mm., width 1.25 mm.; head width 0.68 mm., vertex 0.32 mm., antennal segment I, length 0.38 mm., II 1.48 mm., III 1.12 mm., IV 0.40 mm.; pronotum length 0.47 mm., width 0.92 mm.; rostrum length 1.39 mm.; cuneus length 0.80 mm.

Head black, antennae with the first segment yellow brown, the second black, the third pale yellow with its apical half black-brown, the fourth black-brown; pronotum and scutellum black; hemelytra light brown with clavus, inner margin and angle of corium darker, outer angle of corium and apex of cuneus dark brown; legs yellow-red, with base of coxa black, and apex of tarsi darker; abdomen and underside entirely black.

Pubescence of fine semi-erect hairs. Macropterous.

*Genitalia:* aedeagus of orthotyline type with a single vesical appendage (Fig. 17 F), this is not bifid at the apex; right clasper with ventral process curved posteriorly (Figs. 17 C, E); left clasper strongly curved (Fig. 17 D, I) slightly more so than in *amicus* and with dorsal corner of basal region slightly produced.

*Other specimens:* length 4.0-4.4 mm.; width 1.20-1.29 mm. (for other measurements see Table I).

Coloration only differing in that of third antennal segment which may be pale with only extreme base and apex dark or variations between this and the condition in the Holotype, but always at least half pale.

*Specimens studied:* 1 ♂ (Holotype) South India, T. V. Campbell (British Museum); 17 ♂ (Paratypes) South India, T. V. Campbell (British Museum); 3 ♂ Kodai-Kanal, S. India, T. V. Campbell; 1 ♂ Chikballapur, Mysore, Jan. 1915, T. V. Campbell.

*Form b*

*Male:* length 4.05 mm., width 1.15 mm.; head width 0.72 mm., vertex 0.31 mm.; antennae, segment I, length 0.37 mm., II 1.23 mm., III 0.96 mm., IV 0.48 mm.; pronotum, length 0.50 mm., width 0.85 mm., rostrum length 1.33 mm.; cuneus length 0.64 mm.

Similar to form a in general coloration, but differing in having the third antennal segment entirely black and the apices of the corium and cuneus often paler, also in the shorter cuneus and antennae and the narrower base of the pronotum. The genitalia are virtually identical with those of form a.

*Specimens studied:* 3 ♂ South India, T. V. Campbell; 1 ♂ Kodai-Kanal, S. India (7 000 ft.) 24/3/36; 7 ♂ Nilgiri Hills., S. India, T. V. Campbell.

*Form a, Female:* length 2.40 mm., width 1.4 mm.; head width 0.70 mm., vertex 0.33 mm.; antennae, segment I, length 0.34 mm., II 1.20 mm., III 0.83 mm., IV 0.33 mm.; pronotum, length 0.42 mm., width 0.71 mm.; rostrum length 1.42 mm.; hemelytra width 0.72 mm.

Head black with two areas adjacent to the eyes slightly paler; antennae, basal segment dark or pale, second segment with basal two thirds yellow, apex black, third segment basal third pale, apex and fourth segment dark brown; pronotum and scutellum black; hemelytra black with extreme humeral angle slightly paler; legs yellow-fulvous with apical segment of tarsus dark and coxa, at least their base black; abdomen black with extreme margin of connexivum pale; rostrum fulvous, its basal and apical segments dark brown or black.

Upper surface smooth and shining, especially on hemelytra where the only markings are those of the alveoli, from which arise pale semi-erect hairs of medium length. Brachypterous.

*Genitalia:* K structure of bursa copulatrix as in Fig. 17 H.

*Specimens studied:* 2 ♀ Lovedale, S. India, T. V. Campbell; 2 ♀ Nilgiri Hills, S. India, T. V. Campbell.

*Form b, Female:* length 2.48 mm.; width 1.38 mm.; head, width 0.75 mm., vertex 0.32 mm., antennae, segment I, length 0.29

mm., II 0.98 mm., III 0.75 mm.; pronotum, length 0.45 mm., width 0.75 mm., rostrum length 1.43 mm., hemelytra width 0.74 mm.

Coloration as in form a except for antennae which are yellow with the apical two thirds of the third segment and the whole fourth segment fuscous.

Whole of upper surface strongly rugose; covered with semi-erect hairs of medium length. Brachypterous.

*Genitalia*: K structure slightly less curved than in form a (Fig. 17 G).

*Specimens studied*: 3 ♀ Lovedale, Nilgiri Hills, S. India (7,200 ft., "very common in grass"), T. V. Campbell; 2 ♀ Nilgiri Hills, South India, T. V. Campbell.

*Distribution of M. orientalis orientalis*: the only definite localities are the Nilgiri Hills and the Cardamon Hills in S. W. India.

*Sub-species himalayensis* nov. subsp.

*Male, Holotype*: length 4.38 mm., width 1.10 mm.; head width 0.73 mm., vertex 0.33 mm.; antennae segment I, length 0.39 mm., II 1.29 mm., III 0.98 mm., IV 0.40 mm.; pronotum length 0.48 mm., width 0.88 mm.; rostrum length 1.25 mm.; cuneus length 0.62 mm.

Head black, two slightly paler areas on the vertex adjacent to the eyes; antennae with basal segment yellow, second segment black, third with basal third pale, rest of third and fourth fuscous; pronotum and scutellum black; hemelytra light brown with clavus, inner and outer angles of corium and apex of cuneus darker; membrane pale dusky, nervures darker; legs yellow with bases of coxae black and apices of tarsi fuscous, rostrum yellow with basal segment and apex of last segment fuscous; abdomen and underside black.

Covered with fine erect or semi-erect pubescence. Macropterous.

*Genitalia*: aedeagus (Fig. 18 D) of orthotyline type with the apex of the vesica raised, as in all *Mecomma* species; vesical appendage with thin dorsal process and apex with a slight twist; right clasper (Figs. 18 B, C) with extremely broad ventral process which distinguishes it from *M. o. orientalis*; left clasper curved and similar to the type subspecies.

*Other specimens*: unfortunately all the antennal segments except the basal were missing from the other specimens, in one of these the basal segment was yellow and in the other brown. Otherwise similar to type; for measurements see Table I.

*Female:* unknown.

*Specimens studied:* 1 ♂ (Holotype), Kurseong, E. Himalayas (5,000 ft.), 7/7/08 (Brit. Mus.); 2 ♂ Gangtok, Sikkim, (6,000 ft.), 29/4/28, F. M. Bailey.

*Distribution of M. orientalis himalayensis:* Eastern Himalayas (Sikkim and N. Bengal).

*Notes on M. orientalis:* this species is sharply distinguished from *M. amicus* by the form of the vesical appendage of the male genitalia, in *M. orientalis* the apex of this structure is single, resembling *Cyrtorhinus* in this respect. *M. orientalis* differs from *M. amicus* in coloration and proportions, and can, with experience, be distinguished with the naked eye by the slightly narrower and less convex form of the anterior pronotum, the anterior collar being well marked. The two subspecies *orientalis* and *himalayensis* are clearly distinguished by the form of the right genital clasper and by the slightly different proportions, especially the wider head and short cuneus of *himalayensis*. The two subspecies whose habitats are montaine grassland associated with damp, but temperate woodlands, are separated from one another by the Deccan plateau and the Ganges valley.

Forms a and b of *M. o. orientalis* are distinguished in the male by the partially pale third antennal segment, the longer cuneus and antennae and wider pronotum of form a and in the same form of female by the partially dark second antennal segment and the shining hemelytra. There are no differences of any magnitude in the male genitalia and those in the female are only slight. It will be seen from Figs. 23-25 that there is some overlap between the range of variation of these species even with the most diagnostic measurements. The majority of the material available was collected by Mr. T. V. Campbell; who, it is understood, mounted his captures, generally on the same day as capture. As forms a and b (of both sexes), were often mounted on the same card, suggesting that they were collected together, it seems unlikely that they could be different seasonal forms of the same species or different ecotypes, although the latter possibility cannot be eliminated. Until further material and ecological information is available *M. o. orientalis* should be regarded as polymorphic.

#### MECOMMA AMICUS (DISTANT)

*Antiphilus amicus* Distant, Ann. Mag. Nat. Hist. (8) 4: 521, 1909;  
Distant, Fauna. Brit. Ind. Rhync. 5: 272, fig. 147, 1910.

*Mecomma amicus* Carvalho, An. Acad. Brasil. Ci. 24 (1): 78, 1952.

\* *Aristobulus filius* Distant, Ann. Mag. Nat. Hist. (8) 5: 17, 1910  
n. syn.) Distant, Faun. Brit. Ind. Rhync. 5: 286, fig. 157,  
1910.

\* *Cyrtorhinus filius* Carvalho, An. Acad. Brasil. Ci. 24 (1): 79,  
1952.

(Figs. 19 A-G)

Characterized by its entirely black antennae, size and genitalia.

*Male*: length 4.0-4.5 mm., width 1.20-1.28 mm.; head, width 0.80 mm., vertex 0.38 mm.; antennae, segment I, length 0.45 mm., II 1.35 mm., III 1.15 mm., IV 0.43 mm.; pronotum, length 0.50 mm., width 0.95 mm.; rostrum length 1.33 mm.; cuneus length 0.72mm.

Head black, sometimes two slightly paler areas adjacent to the eyes; antennae black; pronotum and scutellum black; hemelytra light brown with clavus, inner and outer angles of corium and apex of cuneus dark brown; membrane light grey, nervures brown; legs yellow-red, apices of tarsi slightly darker; underside and whole of abdomen black.

Pubescence of fine semi-erect hairs. Macropterous.

*Genitalia*: aedeagus of orthotyline type, the vesical appendage with dorsal projection and apically bifid (Fig. 19 D), left clasper strongly curved (Fig. 19 E). The right clasper with the ventral process curved anteriorly (Figs. 19 B, C).

*Female, brachypterous*: length 2.1-2.4 mm., width 1.4 mm.; head, width 0.83 mm., vertex 0.38 mm.; antennae, I 0.36., II 0.87 mm., III 0.74 mm., IV 0.37 mm.; pronotum, length 0.41 mm., width 0.86 mm.; rostrum length 1.1 mm.

Entirely black apart from two small areas median and adjacent to the eyes which are pale yellow-green and the legs which are testaceous, with only the base of the coxa black.

Pubescence of fine pale adpressed hairs, some longer ones on the anterior of the thorax, those on the legs dark. Brachypterous, hemelytra reaching to posterior of segment six, membrane absent and cuneal suture absent.

*Genitalia*: K structure (Fig. 19 F) with an elongated curve process.

*Macropterous*: length 3.75 mm., width 1.35 mm.; head, width 0.90 mm., vertex 0.36 mm.; pronotum, length 0.53 mm., width



1.10 mm.; otherwise as in brachypterous form. Hemelytra dark brown to black, membrane dusky with nervures darker, otherwise as in brachypterous form.

*Distribution:* Sikkim, N. Bengal, and Manipur (Assam).

*Specimens studied:* 1 ♂ (Holotype of *amicus*) "Darjiling" (6,000 ft.), 25/9/08, Brunetti (Brit. Mus.); 1 ♀ (Holotype of *filius*), "Darjiling" (6,000 ft.), 23/9/08, Brunetti (Brit. Mus.); 2 ♂ "Darjiling" (6,000 ft. — sweeping grass and low herbage), 25/9/08, Brunetti; 2 ♂ Ukhral, Manipur (6,400 ft.), Aug. 1908, Pettigrew; 1 ♂ Kurseong, E. Himalayas (5,000 ft.), 7/7/08; 23 ♀ Darjeeling (7,000 ft.) 11-20/3/24, R. W. G. Hingston; 9 ♂ 5 ♀ (2 macropt.), Gangtok, Sikkim (6,000 ft.), 24 April—2 May 1928, F. M. Bailey.

An examination of the types of *Antiphililus amicus* Distant and *Aristobulus filius* Distant for their coloration and size, in relation to other Indian specimens, shows that these are the male and female of the same species. This conclusion is supported by the similarity in the locality data. *M. amicus* is distinguished by the entirely black antennae in both sexes and the genitalia; the bifid apex of the vesical appendage and the longer basal antennal segment clearly separates it from *M. orientalis*. It is closest to *M. ambulans*, unfortunately however most work on this latter species had to be done on material from England; it is highly desirable that larger samples from other parts of its range should be compared with *M. amicus*, for even within the English material one specimen (out of several) of *M. ambulans* from Harpenden had measurements just within the range of variation of *M. amicus* (Figs. 23, 24). Measurements of several specimens of each species are given in Table I and II and the diagnostic characters plotted on Figs. 23, 25; it will be seen that *M. amicus* differs from *M. ambulans* in being smaller in both sexes. It also differs in having the antennae entirely black in the female, whilst they are partially pale in this sex of *M. ambulans* and the male genitalia of the two species, although close are distinct.

Hitherto *M. amicus* only has been recorded from Sikkim, N. Bengal and Manipur, Assam, but it probably occurs throughout the Eastern Himalayan and Assam regions between 5,000 and 7,000 ft. where the cold temperate forest occurs.

#### *MECOMMA CHINENSIS* (REUTER)

*Mecomma chinensis* Reuter, Annu. Mus. Zool. Acad. St. Petersb. 10: 63, 1905.

Characterized by its black coloration, the long antennae with the basal segment pale.

*Male:* unknown.

*Female:* Reuter's description: —

Femina late ovata, nigra, capite abdomineque nitidissimus hoc subaeneo-micante, pronoto, scutello hemielytrisquae opaculis cum dorso abdominis longe cinereo-pubescentibus; vertice utrimque guttula minuta obsoleta testacea; rostro, articulo primo nigricante excepto, antennis articulo primo toto secundoque basi, nec non pedibus flaventibus; antennis articulo secundo margine basali pronoti (formae brachypterae) saltem dimidio longiore versus apicem in clavam elongatum incrassato, tertio secundo fere  $\frac{1}{3}$  brevior, dimidio basali albo. Long ♀ 3 mm.

Ad flumen Schubagu d. 8 auguste 1893, unicum specimen.

*M. ambulanti* (Fall.) simillima, antennis longioribus, aliter constructis, articulo primo flavo-testaceo divergens. Caput (♀ brachypt.) basi pronoti aequae latum, valae nitens, ab antico visum latitudine verticis oculique unici aequae longum, vertice oculo circiter duplo lutiore. Rostrum coxas posticas subattingens, apice nigro. Antennae (♀) corporis longitudine, articulo secundo sat longe adpressim piloso, primo fere  $3\frac{1}{2}$  longiore, a medio fortius incrassato, ultimus semierecte pilosis. Pronotum (♀ brachypt.) basi longitudini fere duplo latius apice quam basi vix magis quam  $\frac{1}{2}$  angustius disco horizontali, angulantius rotundatis, lateribus mox ante angulos posticos leviter sinuatis, margine basali late sinuato. Hemielytra tota nigra, medium abdominis paullo superantia, clavo et cuneo haud discretis, margine apicali latissime rotundato, membrana angustissima. Tibiae tenuiter concoloriter spinulosae. Tarsi articulo ultimo apice fusco.

*Distribution:* Schubagu, China (only known from the type locality).

Specimens of this species were not available for study, but it would appear to be closest to *ambulans* Fall. on size, differing in the antennae which are longer with the basal segment pale.

#### MECOMMA AMBULANS (FALLEN)

*Capsus ambulans* Fallen, Mon. Cimic. Suec.: 104, 1807; Herrich-Schaeffer, Wanz. Ins. 3: 109, figs. 335-337, 1836; Reuter, Hem. Gymn. Eur. 3: 384, 555, pl. 2, figs. 1-2, 1883; Saunders, Hem. Het. Brit. Is.: 280, pl. 26, fig. 3-4, 1892; Stichel, Illus. Best. Deut. Wanz. 8: 226, figs. 588-89, 1933; Wagner, Tierw. Deut. 41, Blindw.: 129, fig. 1952.

- \* *Capsus dubius* Zetterstedt, Ins. Lapp.: 279, 1840 (syn. by Thomson, Opusc. Ent. 4: 437, 1871).
- \* *Capsus ochripes* Curtis, Brit. Ent. 15, pl. 693, 1838 (syn. by Douglas & Scott, Brit. Hem.: 349, 1865).
- \* *Capsus nigritulus* Zetterstedt, Ins. Lapp.: 279, 1840 (syn. by Thomson, Opusc. Ent. 4: 437, 1871).

(Fig. 22 B)

Characterized by its size, proportions, genitalia and the female with entirely black hemelytra, but partially pale antennae.

*Male*: length 4.4-4.6 mm., width 1.38-1.42 mm.; head, width 0.86 mm., vertex 0.36 mm.; antennae, segment I, length 0.46 mm., II 1.50 mm., III .38 mm., IV 0.52 mm.; pronotum length 0.50 mm., width 1.07 mm.; rostrum length 1.30 mm.; cuneus length 0.90 mm.

Head black with two pale areas adjacent to the eyes; antennae entirely dark; pronotum and scutellum black; hemelytra light ochrous brown with the clavus, apices of corium and cuneus, and inner angle of corium suffused with black, and the remaining margins of the cuneus and outer margin of the corium a deeper yellow-brown; membrane pale, nervures margined with black; legs yellow-brown, the apex of the tarsi darker and base of coxa black; rostrum yellow-brown, its tip darker; sides and venter of thorax black; abdomen entirely black.

Pubescence of fine semi-erect hairs of medium length (0.15 mm.) their alveoli being well marked on the hemelytra. Macropterous.

*Genitalia*: aedeagus (Fig. 21 F) of orthotyline type with bifid tooth vesical appendage, left clasper strongly curved (Figs. 20 C, D), right clasper (Fig. 21 E) with an apical toothed ridge and a thin median projection. Singht-Pruthis (1925) figure of the aedeagus of this species is quite incorrect.

*Female: Brachypterous*: length 2.4-3.0 mm., width 1.58-1.70 mm.; antennae, I 0.48 mm., II 1.25 mm., III 1.12 mm., IV 0.53 mm.; pronotum, length 0.5 mm., width 0.98 mm.; rostrum length 1.30 mm.

Head black, two slightly paler areas adjacent to the eyes, antennae, first and second segments black, the third pale for basal third of its length, the remainder of the third and the fourth segment brown; pronotum, scutellum and hemelytra black; legs light yellow-brown with bases and apices of tarsi darker; rostrum yellow-brown, its apex dark; entire underside black, extreme margins of connexivum brown.

Pubescence of semi-erect hairs of medium length (0.13 mm.), they are particularly dense on the second antennal segment and paler and sparser on the third and fourth. Brachypterous, hemelytra reaching posterior of third abdominal segment; membrane and cuneal sutures lost.

*Genitalia*: the K structure (Fig. 20 I) is tapered and curved.

*Macropterous*: length 4.25 mm.; width 1.50 mm.; pronotum, length 5.60 mm., width 1.20 mm.

Otherwise measurements, colouration and pubescence as in brachypterous female, with membrane dusky, the nervures black-grey outlined with black.

*Distribution*: Europe, Caucasus, Algeria, N. Asia, Alaska and Canada.

*Specimens studied*: 1 ♀ New Forest, Hants., U. K. 24/8/47 T. R. E. Southwood; 1 ♀ E. Peckham, Kent, U. K., 16/8/48, T. R. E. Southwood; 5 ♂ 2 ♀ Harpenden, Herts., U. K. 14-25/8/53, T. R. E. Southwood; 5 ♂ 6 ♀ (1 macrop.) S. Lake District, U. K., J. E. Satchell & T. R. E. Southwood 17-30/7/54; 1 ♀ Moffat, Scotland, U. K. Fryer col.; 3 ♂, 3 ♀ Cambridgeshire, U. K. Fryer col.; 1 ♂, 1 ♀ Bradore Bay, Quebec.

The almost entirely black female, the black antennae, its size and genitalia distinguish this species from *amicus* Distant the closest Old World species and from *gilvipes* Stal and *luctuosus* Provancher in the New World. Knight says that all records of *ambulans* for America are incorrect and that males of this species and *gilvipes* can be separated only by the structure of the genitalia.

This assertion was corrected later in a paper by Walley (Can. Ent. 64: 152, 1932) in which a series of 37 males and 21 females from Bradore Bay were found by Knight to be *ambulans* (Fallen) after comparison with European specimens. A male and female of this species were studied by the senior author at the California Academy of Sciences.

The egg of this species, described by Kullenberg (1943) is laid in the stems of various *Juncus* spp. and grasses (Kullenberg, 1946) (Fig. 22) during late summer (July and August) and hatch the following spring, mostly in May. The nymphs, which are greenish-red, mature from late June onwards (Butler, 1923, Southwood unpublished).

#### MECOMMA MADAGASCARIENSIS REUTER 1892

*Mecomma madagascariensis* Reuter, Ent. mon. Mag. 28: 185, 1892; Poppius, Acta Soc. Sci. Fenn. 44 (3): 75, 1914.

*Male*: Reuter's description: —

Elongatus, niger, nitidus, longius pallido-pubescentis; gutta utrinque verticis rostro pedibusque flavo-ochraceis; hemielytris divi-dis, clavo commissura apiceque late, corio intravenam cubitalem, angulo anteriore, cunei membranaeque cum venis brachiali et cubitali nigricantibus, corio extra venam cubitalem, cuneo, angulo interno excepto, areola membranae minore cum vena connectante limboque laterali externo pallidis, angulis apicalibus corii exteriori et cunei concoloribus. Long.  $4 \frac{2}{5}$  mm.

Specimens of this species were not available for study.

*MECOMMA GRANDIS* nov. sp.

Characterized by its size, entirely black antennae and partially pale hemelytra.

(Fig. 20 A)

*Male*: unknown.

*Female*: length 3.25 mm., width 1.68 mm.; head, width 1.00 mm., vertex 0.48 mm.; antennae, segment I, length 0.45 mm.; II 1.19 mm., III 1.04 mm., IV 0.48 mm.; pronotum length 0.55 mm., width 1.05 mm.; rostrum length 1.50 mm.; hemelytra width 0.87 mm.

Head black, with two slightly paler areas on the vertex adjacent to the eyes antennae entirely black; pronotum and scutellum black; hemelytra black with a lateral and apical band of about  $\frac{1}{3}$  their width yellow-testaceous; legs testaceous with extreme bases of coxae and apices of tarsi darker; abdomen black with margins of connexivum redish; underside black; rostrum yellow-testaceous with basal and apical segments fuscous.

Covered with pale short adpressed hairs and longer fine erect hairs; hemelytra and pronotum strongly rugose; brachypterous, but trace of membrane remaining.

*Distribution*: Djem-Djem Forest, 45 miles west of Abdis Ababa, Ethiopia.

*Specimens studied*: 1 ♀ (Holotype), Edge of Djem-Djem Forest (c. 9,000 ft.), Abyssinia, 4/10/26, H. Scott (Brit. Mus.).

This species is distinguished from *M. ambulans* and *M. amicus* by its partially yellow coloured hemelytra, resembling in this respect *M. luctuosus* and *M. gilvipes*, and from these species and *M. melanocephalus* by its large size.

The only known specimen of this bug was collected by Dr. Hugh Scott at the edge of the Djem-Djem (or Jem-Jem) Forest in October. D. Scott has kindly given us the following information about the area: the forest itself is coniferous with giant Junipers, 60 ft. or more in height and giant *Podocarpus*. The forest is reeking wet during the Great Rains which end in September or later, and probably remains damp for most of the year; the general climate is cool temperate. From his Journal Dr. Scott finds that on October 4th, 1926, he collected much material from the grassland and isolated clumps of trees at the edge of the forest. An account of this area is given by Scott (1950).

Thus the habitat of *M. grandis* agrees closely with that of other members of the genus, viz. damp grasslands in or around the margins of cold temperate forests.

#### MECOMMA ANTENNATA (VAN DUZEE)

*Mecomma antennata* Van Duzee, Proc. Cal. Acad. Sci. 7: 275, 1917.

Characterized by its colour and genitalia.

*Male*: length 4.5 mm., width 1.3 mm.; head, length 0.2 mm., width 0.8 mm., vertex 0.35 mm.; antennae, segment I, length 0.3 mm., II 1.5 mm., III 1.4 mm., IV 0.3 mm.; pronotum, length 0.5 mm., width at base 1.0 mm.; rostrum, length 1.4 mm.

Colour dark brown to castaneous (antennae, head, pronotum and scutellum); two last antennal segments darker (base of third segment slightly paler); two faint spots on vertex near eyes, hemelytra (except infuscate area of clavus and corium along commissure), legs and rostrum pale yellow translucent to ochraceous; apex of cuneus and membrane infumate, the first and veins darker; underside of body castaneous.

Cuneus twice as long as wide at base, vertex with a row of bristles.

*Genitalia*: aedeagus with a spiculum (Fig. 21 H) less curved apically as in *gilvipes*. Left clasper very similar to that of *gilvipes*. Right clasper (Fig. 21 B) characteristic, as seen in figure.

*Female*: length 2.7 mm., second antennal segment 1.1 mm., third segment 0.9 mm.; pronotum, length 0.5 mm., width at base 0.9 mm.

Similar in colour to male but brachypterous, without cuneus, membrane and claval suture, the second antennal segment moderately incrassate calli of pronotum not noticeably prominent.

*Genitalia:* K structure (Fig. 21 H) slightly curved, tapering to apex.

*Distribution:* California, U.S.A.

*Specimens studied:* 5 ♂ 3 ♀ Muir Woods, Marin, California, 15/7/17, F. Muir and W. M. Giffard, 4 ♂ 5 ♀ San Francisco, California, 24/7/17, W. M. Giffard.

Differs from *M. gilvipes* in the colour of body which is noticeably brown tending to castaneous, with a dark brown first antennal segment and in the structure of the right clasper and spiculum of aedeagus.

*MECOMMA MIMETICA* n. sp.

(Fig. 18 A)

Characterized by its colour, strongly convex calli, very short elytra and noticeably clavate second antennal segment.

*Female:* length 3.2 mm., width 1.5 mm.; head, length 0.5 mm., width 0.8 mm., vertex 0.37 mm.; antennae, segment I, length 0.3 mm., II 1.4 mm., III 0.8 mm., IV 0.3 mm.; pronotum, length 0.5 mm., width at base 0.6 mm.; rostrum, length 1.1 mm.

Colour black with reddish or castaneous tinge, strongly shining; antennae (except clavate apex of second segment), two spots on vertex near eyes, rostrum and legs pale fulvous, the bases of femora, trochanters and apices of coxae pale white, hind tibiae towards base and base of coxae fuscous; elytra pale translucent with a transversal dark brown fascia; connexivum with reddish to pale areas on inner margin.

Head strongly rounded, with a short neck, pronotum slightly wider at base than long, calli very strongly raised with a wide furrow between them, second antennal segment strongly clavate on apical half, elytra very short reaching only to third abdominal segment.

*Male:* unknown.

*Holotype:* female, Aspen Grove, Nicola, British Columbia, 21/8/32, G. I. Spencer, Prof. R. L. Usinger's collection; *paratype:* female, same data as type.

This species differs from others in the genus (females) in the very short elytra, clavate second antennal segment, colour of the

elytra and legs, the shape of head and very prominente pronotal calli. It was taken together with the ichneumonidae (*Gelis* sp., *Hemitelini*, Cryptinae) which it strongly mimics.

*MECOMMA MELANOCEPHALUS* (POPPIUS)

*Nycticapsus melanocephalus* Poppius, Acta. Soc. Sci. Fenn. 44 (3): 74, 1914.

*Females* Poppius description (translated):

Head, pronotum, scutellum, pro- and mesosternum black; collar anteriorly, calli, a longitudinal fascia at middle of disk, apex of scutellum widely, hemelytra, mesosternum posteriorly, metasternum, underside of body, rostrum, first antennal segment and legs yellow; apex of clavus, corium internally and middle of metasternum laterally, dark; membrane yellowish brown, strongly iridescent, extreme apex of rostrum, second antennal segment and apex of clypeus black; two last antennal segments dark-brown.

Length 2.8 mm., width 0.8 mm. Nyassa Lake.

Poppius probably studied a macropterous female of this species and until further specimens are found and studied (none were available to the authors) we prefer to include it in the genus *Mecomma* Fieber and not in *Cyrtorhinus* as previously considered by Carvalho (1952).

*MECOMMA GILVIPES* (STAL)

*Leptomerocoris giloipes* Stal. Stett. Ent. Zeit. 19: 187, 1858.

*Mecomma gilvipes* Reuter, Hem. Gymn. Eur. 3: 386, 555, pl. 2, fig. 6; 1883.

*Chlamydatus gilvipes* Reuter, Ofv. F. Vet. Soc. Forh. 21: 57, 1879.

Characterized by its colour and genitalia.

*Male*: length 4.7 mm., width 1.3 mm.; Head, length 0.3 mm., width 0.7 mm., vertex 0.35 mm. Antennae, segment I, length 0.4 mm., II 1.4 mm., III 1.2 mm., IV 0.5 mm.; Pronotum, length 0.4 mm., width at base 1.0 mm.; Cuneus, length 0.928 mm.

Antenna, head (except two obsolete spots near the eyes), pronotum, scutellum, black to dark brown; clavus infuscate, black along commissure, corium translucent (except on commissure); underside of body black, legs pale.



*Genitalia*: aedeagus with typical spiculum (Fig. 21 G) branched apically, the larger branch provided with a fairly large prong. Left clasper (Fig. 20 B) as seen in figure, the apical portion tapering and not swollen as in other species. Right clasper (Fig. 21 C) as seen in figure.

*Female*: length 2.7 mm., width 1.6 mm.; head, length 0.4 mm., width 0.8 mm., vertex 0.39 mm.; antennae, segment I, length 0.3 mm., II 1.0 mm., III 0.9 mm., IV 0.3 mm.; pronotum, length 0.3 mm., width at base 1.0 mm.

Black except the base of third antennal segment, two spots near the eyes, hemelytra, rostrum and legs which are translucent, base of coxae dark.

*Genitalia*: K structure (Fig. 20 F) with a hump on the external margin, the apex somewhat acute.

*Distribution*: Described originally from Sitka, Alaska.

*Specimens studied*: several males and females, Anchorage, 27/7/948; Palmer, VIII, 948; Valdez, VII, 948, Alaska, R. I. Sailer col.; 3 females, Ketchikan, Falls Creek, Alaska, IX, 951, B. Malkin col.; male and female, Willow, Alaska, VII, 948, F. S. Blanton col., several males and females, Popoff Is., VII, 1899, Harriman Expedition; 1 male, Wrangel, Alaska, VIII, 1951, B. Malkin col.

This species differs from *M. luctuosa* (Provancher) in the completely black first antennal segment of females and in the typical male genitalia; from *M. ambulans* (Fallen) it differs in the translucent hemelytra of females and in the male genitalia.

With exception of Alaskan records for this species, all references to *gilvipes* (Stal) concern either to *luctuosa luctuosa* (Provancher) or *luctuosa pacifica* n. subsp.

#### *MECOMMA LUCTUOSA LUCTUOSA* (PROVANCHER)

*Chlamydatius luctuosus* Provancher, Pet. Faun. Ent. Can. 3: 137, 1887.

*Mecomma gilvipes* Knight, Conn. Nat. Hist. Surv. Bul. 34: 510, 1923; Blatchley, Het. E. N. Amer.: 852, fig. 176, 1926; Slater, Iowa St. Coll. Jour. Sci. 25 (1): 52, pl. 6, fig. 19, 1950.

(Fig. in Blatchley, 1926)

*Male*: length 4.5 mm., width 1.2 mm.; head, length 0.3 mm., width 0.7 mm., vertex 0.21 mm.; antennae, segment I, length

0.4 mm., II 1.5 mm., III 1.3 mm., IV 0.4 mm.; pronotum, length 0.4 mm., width at base 1.0 mm.; cuneus, length 0.88 mm.

Colour black to dark brown, except spots near the eyes, rostrum, hemelytra and legs which are pale to translucent, clavus and apex of cuneus infuscate; underside of body black.

*Genitalia*: spiculum of aedeagus (Fig. 21 J) curved apically in almost a straight angle. Left clasper (Fig. 20 E) as seen in figure. Right clasper (Fig. 21 D) as seen in figure.

*Female*: length 2.7 mm., width 1.3 mm.; head, length 0.3 mm., width 0.9 mm., vertex 0.36 mm.; antennae, segment I, length 0.3 mm., II 1.1 mm., III 1.0 mm., IV 0.3 mm.; pronotum, length 0.5 mm., width at base 0.9 mm.

Black except for basal half or more of second antennal segment, first antennal segment, two spots near the eyes, hemelytra, legs and rostrum.

*Genitalia*: K structure (Fig. 20 H) somewhat similar to that of *M. luctuosa pacifica* n. subsp.

*Specimens studied*: 7 males and 5 females, Machias, Me. Janson col.; 2 males and 2 females, Glen House, N. H., Parshley col.; 3 males and 1 female, Mt. Washington, Parshley col.; 2 males and 1 female, East Port Me., Parshley col.; 1 male and 1 female, Fulton Co., N. Y., Parshley col.; 1 male, Lake Placid, N. Y., Parshley col.; several males and females, Montmor Canada, Uhler col.; Indian Lake, N. Y., H. G. Barber col.; 2 males, Illinois (Brooklin Museum); several males and females, Smith River, California, Aldrich col.; females, Liberty Co., Florida, V, 924, T. H. Hubbel col.

The species was originally described from Cap Rouge, Canada.

The series from Smith River, California here referred to this species could not be separated from the typical *luctuosa* (Provancher). It may actually have a continuous distribution across the northern United States of America. All records for *gilvipes* (Stal) known up to date from the eastern United States and Canada should be referred to typical *luctuosa*.

This subspecies differs from *luctuosa pacifica* n. subsp. in the black first antennal segment of the males, in the much longer cuneus and in the shape of the spiculum of the aedeagus. The species can

be readily separated from the others in the genus by the pale first antennal segment of females and in the structure of the male genitalia.

*MECOMMA LUCTUOSA PACIFICA* n. subsp.

Characterized by its colour and length of cuneus on males.

*Male*: length 4.0 mm., width 1.3 mm.; head, length 0.2 mm., width 0.7 mm., vertex 0.34 mm.; antennae, segment I, length 0.4 mm., II 1.5 mm., III 1.3 mm., IV 0.3 mm.; pronotum, length 0.4 mm., width at base 0.9 mm.; rostrum, length 1.3 mm.; cuneus, length 0.697 mm.

Colour dark brown to black; first antennal segment, base of third segment, two spots near the eyes, hemelytra, rostrum and legs, pale to dull yellowish translucent, tinged with fuscous along claval and corial commissure; veins of membrane and third segment of tarsi brown to castaneous; underside of body dark brown.

*Genitalia*: aedeagus (Fig. 21 I) with a spiculum broadly curved apically. Left clasper (Fig. 20 E) strongly curved and provided with a swollen apical area covered by minute teeth. Right clasper (Fig. 21 A) as seen in figure.

*Female*: similar to male in colour, brachypterous, the elytra as in *antennata*. Length 2.7 mm., width 1.3 mm.; head, length 0.3 mm., width 0.9 mm., vertex 0.36 mm.; antennae, segment I, length 0.3 mm., II 1.1 mm., III 1.0 mm., IV 0.3 mm.; pronotum, length 0.4 mm., width at base 0.8 mm.; rostrum, length 1.3 mm.

*Genitalia*: K structure (Fig. 20 G) broad basally, tapering to apex, only slightly curved.

*Holotype*: male, Buckley, Washington, VII, 935, Oman col. in the collection of the USNM; *allotype*: female, same data as type; *paratypes*: 22 males and females, Wrangel, Beauclerc, Ducan Canal, Alaska, VIII, 1951, B. Malkin col.; 6 males and 5 females, Forks, Clallan Co., Washington, VII, 1920, E. P. Van Duzee col.; 1 female, Sasnich Dist. B. C., VIII, 1918, W. Downes col.

This species differs from *luctuosa luctuosa* (Provancher) in the pale first antennal segment of males, the much shorter cuneus and in the structure of male genitalia, especially in the shape of the spiculum.

TABLE I

Measurements of males of *Mecomma ambulans*, *M. amicus*, *M. orientalis* and *M. o. himalayensis* (all measurements in mm.)

SPECIES—LOCALITY	HEAD		PRONOTUM		ANTENNAE LENGTH				Cuneus length
	Width	Vertex width	Width	Length	I	II	III	IV	
<i>Ambulans</i>									
Kendal, Westm. ....	0.87	0.36	1.15	0.50	0.49	1.59	1.40	0.56	1.01
Cambridgeshire.....	0.86	0.36	1.03	0.52	0.47	1.52	1.53	0.51	0.97
Harpenden, Herts.....	0.86	0.36	1.10	0.50	0.47	1.43	1.38	0.52	0.84
" " .....	0.83	0.35	1.01	0.50	0.45	1.33	1.23	0.48	0.78
" " .....	0.86	0.37	1.07	0.50	0.45	1.51	1.39	0.53	0.87
" " .....	0.87	0.37	0.98	0.46	0.47	1.43	1.38	0.52	0.86
<i>Amicus</i>									
Kurseong, Himalayas.....	0.80	0.37	1.09	0.52	0.45	1.46	1.20	0.48	0.74
Sikkim.....	0.79	0.37	0.99	0.50	0.46	1.28	1.10	0.39	0.70
" .....	0.82	0.37	0.94	0.53	0.44	—	—	—	0.69
" .....	0.80	0.37	0.90	0.49	0.41	1.25	1.08	0.37	0.69
" .....	0.83	0.38	0.94	0.51	0.45	1.32	1.15	0.40	0.72
Ukhrul, Himalayas.....	0.81	0.37	0.95	0.48	0.40	1.29	1.12	—	0.75
Darjeeling.....	0.82	0.39	0.92	0.52	0.46	1.50	1.25	0.45	0.73
" .....	0.80	0.36	1.08	0.51	0.43	1.39	1.20	—	0.73
<i>Orientalis orientalis</i>									
<i>Form a</i>									
S. India.....	0.68	0.32	0.92	0.47	0.38	1.48	1.12	0.40	0.80
" .....	0.70	0.35	0.95	0.50	0.38	1.46	1.10	0.40	0.79
" .....	0.70	0.31	0.91	0.47	0.38	1.43	1.14	0.40	0.79
" .....	0.69	0.33	0.92	0.48	0.39	1.42	1.10	0.41	0.78
" .....	0.71	0.34	0.97	0.49	0.38	1.47	1.12	0.44	0.78
Mysore.....	0.72	0.35	0.97	0.48	0.39	1.52	1.13	0.60	0.72
S. India.....	0.71	0.34	0.95	0.47	0.39	1.31	1.03	—	0.70
KodaiKanal, S. India.....	0.75	0.37	0.95	0.50	0.37	1.45	1.12	—	0.75
<i>Form b</i>									
S. India.....	0.72	0.32	0.85	0.49	0.38	1.37	1.00	0.44	0.65
" .....	0.71	0.31	0.82	0.50	0.34	1.27	0.98	0.45	0.61
" .....	0.70	0.31	0.76	0.50	0.36	1.15	0.93	0.49	0.63
KodaiKanal, S. India.....	0.70	0.30	0.87	0.51	0.37	1.28	0.92	—	0.72
Nilgiri Hills.....	0.70	0.31	0.80	0.49	0.37	1.29	0.99	0.52	0.64
<i>Orientalis himalayensis</i>									
Sikkim.....	0.74	0.32	0.88	0.50	0.37				0.60
" .....	0.78	0.35	0.87	0.50	0.37				0.62
Kurseong.....	0.73	0.33	0.88	0.48	0.39	1.29	0.98	0.40	0.62

TABLE II

Measurements of females of *Mecomma ambulans*, *M. amicus*, *M. amicus* and *M. orientalis* (all measurements in mm.)

SPECIES—LOCALITY	HEAD		PRONOTUM		ANTENNAE LENGTH				Hemelytra breadth
	Width	Vertex width	Width	Length	I	II	III	IV	
<i>Ambulans</i>									
Harpden.....	0.88	0.42	0.96	0.48	0.40	0.10	1.10	0.50	0.73
East Peckham.....	0.90	0.42	0.90	0.50	0.38	1.11	1.10	0.51	0.70
Grange, Lancs.....	0.88	0.40	0.89	0.47	0.37	1.15	1.12	0.51	0.75
Newby Bridge.....	0.90	0.41	0.92	0.48	0.39	1.20	1.12	0.54	0.75
Kendal, Westm.....	0.92	0.40	0.92	0.51	0.40	1.24	1.11	0.52	0.75
<i>Amicus</i>									
Darjeeling.....	0.84	0.37	0.85	0.40	0.36	0.90	—	—	0.70
".....	0.85	0.39	0.87	0.42	0.36	—	—	—	0.67
".....	0.84	0.39	0.85	0.40	0.33	0.80	0.75	0.40	0.68
".....	0.83	0.38	0.84	0.40	0.34	0.85	0.70	0.32	0.64
".....	0.83	0.37	0.86	0.41	0.36	0.87	0.76	0.35	0.66
".....	0.84	0.38	0.85	0.41	0.35	0.91	0.75	0.32	0.64
Sikkim.....	0.85	0.39	0.89	0.40	0.36	—	—	—	0.65
".....	0.86	0.38	0.86	0.41	0.35	—	—	—	0.67
<i>Orientalis orientalis</i>									
<i>Form a</i>									
Nilgiri Hills.....	0.70	0.31	0.72	0.43	0.30	0.87	0.74	—	0.68
".....	0.69	0.30	0.73	0.44	0.31	1.17	0.87	0.30	0.70
S. India.....	0.70	0.32	0.70	0.44	0.30	1.18	0.79	0.36	0.73
".....	0.73	0.32	0.73	0.44	0.32	1.26	0.90	—	0.73
<i>Form b</i>									
S. India.....	0.75	0.32	0.75	0.45	0.31	0.92	0.74	0.36	0.75
".....	0.74	0.32	0.74	0.44	0.32	0.96	0.75	0.40	0.73
".....	0.75	0.33	0.75	0.45	0.30	0.87	0.76	0.34	0.75
".....	0.75	0.32	0.75	0.45	0.30	0.96	0.75	—	0.73
".....	0.74	0.32	0.75	0.49	0.32	1.00	0.76	—	0.74

BIOLOGY

*Pterygo-polymorphism*

In many Heteroptera varying degrees of wing reduction are known. This phenomenon, first reviewed by Peneau (1905), has subsequently been studied by many authors; the most recent general studies are by Larsen (1950) and Poisson (1951).

All stages of wing reduction, from the fully developed to the apterous condition are rarely found in one species (e.g. *Gerris lacustris* L. — Poisson, 1951). Within the *Cyrtorhinus-Mecomma* complex (old sense) three grades can be fixed:

- (a) fully developed hemelytra *macropterous* (Fig. 4 A)
- (b) reduced hemelytra, membrane present *semi-brachypterous* (Fig. 8 A)

- (c) reduced hemelytra, membrane absent *brachypterous* (Fig. 7 A)

A variety of intermediate conditions exist between these grades (Stehlik, 1952), but these are generally much rarer.

It is not known to what extent this reduction is environmental of genetical but in *Mecomma* it is related to sex, for the males are always fully developed and the females are generally brachypterous. Occasionally macropterous females are found and even more rarely semi-brachypterous individuals and other intermediates. The production of macropterous forms in female *M. ambulans* seems to be associated with either northern latitude or mountainous regions (Stehlik, 1952, in Czechoslovakia, Southwood, unpublished, in Gt. Britain). Such a phenomenon could be a direct environmental effect or due to a selection factor more favorable to the macropterous form in these localities. Stehlik says that in general mountain-macropterism is found in species that overwinter in the egg condition, whilst the reverse (a tendency towards brachypterism) is found in species that overwinter as adults.

The sex in wing reduction occurs and its degree are characteristic for each genus now recognised in the *Cyrtorhinus-Mecomma* complex: —

<i>Cyrtorhinus</i>	} in female only	{	semi-brachypterous, in <i>cumberi</i> only
<i>Mecomma</i>			brachypterous condition common in all species, other conditions very rare ( <i>M. mimetica</i> female micropterous)

*Fieberocapsus* — in both sexes, brachypterous and more rarely macropterous condition.

*Tytthus* — complete brachypterism is found in the male of *alboornatus*, a semi-brachypterism in the females of *pubescens* and both sexes of *geminus*.

#### *Feeding habits*

Muir (1920) found that *T. mundulus* in Queensland lived exclusively on the eggs of the sugar-cane leafhopper, *Perkinsiella sccharicida* Kirkaldy; when this mirid was introduced into Hawaii it brought about the control of the leafhopper (Swezey, 1936). Subsequent workers, notably Usinger (1939), have recorded similar habits for *T. chinensis*, *C. fulvus* and *C. lividipennis* (the details are given under each species. European authors (e.g. Kullenberg 1946, Wagner 1952) however have generally considered their species to be phytophagous. Kullenberg observed *C. caricis* feeding on various *Carex* and *Scirpus* species, but Usinger points out that even

when the bug appeared to be feeding on an unbroken plant surface there was always a Delphacid egg present, often laid from the other side of the leaf or stem. Southwood (unpublished) has noted that *C. caricis* and *T. pygmaeus* are always found together with large numbers of Delphacids, especially *Conomelus limbatus* Fab. and Masee (1954) records *T. pygmaeus* feeding on the early instar larva of a leafhopper. Kullenberg considered *Mecomma ambulans* to be phytophagous, but little is known of the biology of this genus.

#### *Immature stages*

The eggs of *T. mundulus* are laid in the leaves of the sugar cane, frequently in an old leafhopper egg slit (Williams, 1931); they are of typical mirid form and the operculum and micropylar region just projects above the leaf surface. Those of *C. caricis* and *M. ambulans* which have been described by Kullenberg (1943) are laid in the stem of various species of *Scirpus* and grasses respectively (Kullenberg, 1946) and the ovarian egg of *M. orientalis* is figured below (Fig. 22 I). The eggs of these Orthotyline species appear to be much more strongly curved than those of *T. mundulus*.

The young nymphs of *T. mundulus* are bright red in colour and also feed on leaf hopper eggs (Williams, 1931); Butler (1923) describes the first instar of *C. caricis* as orange, though later instars of this species and of *T. pygmaeus* and *F. flaveolus* resemble the adults in general coloration (Butler, Southwood unpub.).

#### *Habitat*

In temperate regions the species of *Cyrtorhinus Fieberocapsus* and *Tytthus* are found around the bases of tufts of various rushes (*Juncus*), sedges (*Carex*) and grasses growing in very damp or water logged situations. This is closely correlated with the distribution of Delphacid eggs, which as indicated above are probably their major food. In tropical regions the habitats are analagous: for example bamboo grass, young rice, sugar cane; it seems that here they are more readily taken by sweeping than in temperate areas.

*Mecomma ambulans* is normally found amongst damp grass, especially in or around temperate woodlands. From what is known of the distribution of *M. amicus* and *M. orientalis* together with the collector's note that latter was aken "sweeping grass", it would seem that they are confined to similar situation, which in the Indian sub-continent are only found over 5,000 ft. It is noteworthy that the solitary African specimen was taken at 9,000 ft. at the edge of the cold temperate Djem-Djem Forest, Abyssinia. The Nearctic common nearctic species according Blatchley occurs upon rank herbage in moist shaded locations.

Thus it would seem that the genus *Mecomma* is always associated with damp grassy areas in temperate, mostly broadleaved, woodlands.

The males of *M. ambulans* are very active and fly readily; when alive they have a marked superficial resemblance to parasitic Hymenoptera; this probably applies to the whole genus. *M. mimetica* mimics the Ichneumonid, *Gelis* sp. and was found with it.

## ZOOGEOGRAPHY

*Tytthus* is the most widely distributed of the four genera revised in this paper, it occurs in all the major zoogeographical regions. *T. parviceps* is particularly noteworthy with its wide distribution from Florida Central America, Venezuela and Paraguay in the west, to the Rodriguez Il. and the Seychelles in the east, whilst northwards it has been recorded from Giglio I., Italy, by Mancini (1952). As *T. parviceps* occurs on so many islands, especially isolated ones like St. Helena, it can be assumed that it has obtained this wide distribution in comparatively recent times. In the Oceania two species occur, *chinensis* and *mundulus*; on present knowledge the ranges of the species appear to be distinct, *mundulus* occurring in Melanesia and *chinensis* in Micronesia. *T. geminus* and *T. pygmaeus* have overlapping ranges in the Palearctic, whilst *T. pubescens* and *T. vagus* are probably an analogous pair of non-allied species in the Nearctic.

*Cyrtorhinus* is absent from the Americas but is present in both tropical and temperate regions. *C. cumberi*, in many ways the most primitive species, occurs in New Zealand; whilst *C. fulvus*, which is similar to it in many respects, is found from Java to Samoa. Overlapping with *C. fulvus*, but extending much further west into China, Burma and India is *C. lividipennis*, a species having affinities with both *C. fulvus* and the Ethiopian *C. melanops*. Set somewhat apart from the other species structurally is the Holarctic *C. caricis*. The distribution of the species of *Cyrtorhinus* and its correlation with their structural relationships shows that it is an old genus; this is further supported by the way the species are clearly separated.

In contrast to *Cyrtorhinus*, *Mecomma* is a genus of closely related species, often very similar in structure and confined to the broadleaved or mixed forest of temperate region. When present in equatorial regions, they occur only on the mountains (e.g. Nilgiri Hills, S. India) where this type of forest occurs. Of the 3 nearctic species known before, existing records show that two are restricted to the Pacific coast, *antennata* being known only from the San Francisco Bay area of California and *gilvipes* from the coastal



region and southeastern Alaska west to the treeless Aleutian Islands. The third species, *M. luctuosa* occurs from coast to coast across southern Canada and northern United States. Most of its range is occupied by the typical subspecies which is known from such widely distributed localities as northern California, Michigan and Florida. The other subspecies appears to be restricted to the coastal region from southeastern Alaska south to Washington. In India, *M. orientalis*, a distinct subspecies occurs in the *E. Himalayas*, separated from the typical subspecies by the Deccan plateau and Ganges Valley.

*Fieberocapsus* is represented by one species, *F. flaveolus* whose range is confined to northern Europe. Structural evidences shows that whilts *Mecomma* is very close related to *Cyrtorhinus*, *Fieberocapsus* belongs to another branch of the Orthotylinae.

### CHECK LIST

#### (Sub-family Phylinae)

*Tytthus* Fieber 1864

*Cyloiceps* Uhler 1893 (nov. syn.)

*Periscopus* Breddin 1896

*Breddiniessa* Kirkaldy 1903 (nov. syn.)

*zwaluwenburgi* Usinger 1944 (nov. comb.)

*chinensis* Stal 1859 (nov. comb.)

*elongatus* Poppius 1914 (nov. cyn.)

*annulicollis* Poppius 1914 (nov. syn.)

*riveti* Cheesman 1927 (nov. syn.)

*parviceps* (Reuter) (nov. comb.)

*pelicia* Uhler

*pygmaeus* Zetterstedt 1840

*pellucens* Boheman 1852

*insignis* Douglas & Scott 1866

*vagus* Knight 1923 (nov. comb.)

*neotropicalis* Carvalho 1954

*costae* Carvalho 1945 nec Stal

*mundulus* Breddin 1896 (nov. comb.)

*panamensis* n. sp.

*alboornatus* Knight 1931 (nov. comb.)

*montanus* n. sp.

*geminus* Flor 1860

*pubescens* (Knight) (nov. syn.)

*balli* Knight 1931 (nov. comb.)

*insperatus* Knight 1925 (nov. comb.)

*(Sub-family Orthotylinae)*

Fieberocapsus nov. gen.

flaveolus Reuter 1870 (nov. comb.)

Cyrtorhinus Fieber 1858

Cyrtorrhinus Reuter 1884 (emendation)

Reuteriessa Usinger 1951 (nov. syn.)

cumberi Woodward 1950

fulvus Knight 1935

lividipennis Reuter 1884

vitiensis Usinger 1951 (nov. syn.)

melanops Reuter 1905

megalops Poppius 1914 error pro melanops

caricis Fallen 1807

elegantulus Meyer-Dür 1843

chloropterus Herrick-Schaeffer 1853

Mecomma Fieber 1858

Sphyracephalus Douglas &amp; Scott 1865

Sphyrops Douglas &amp; Scott 1866

Antiphilus Distant 1909

Aristobulus Distant 1910 (nov. syn.)

Nycticapsus Poppius 1914 (nov. syn.)

Aristobolus Carvalho 1952 error pro Aristobulus (nov. syn.)

Orientalis nov. sp.

sub. sp. orientalis nov. sub. sp.

sub. sp. himalayensis nov. sub. sp.

amicus Distant 1909

filius Distant 1910 (nov. syn.)

chinensis Reuter 1905

ambulans Fallen 1807

dubius Zetterstedt 1840

ochripes Curtis 1838

nigritulus Zetterstedt 1840

madagascariensis Reuter 1892

melanocephalus Poppius 1914

grandis nov. sp.

luctuosa luctuosa Provancher 1887

gilvipes auctt. nec Stal 1858

luctuosa pacifica n. subsp.

gilvipes Stal 1858

antennata Van Duzee 1917

mimetica nov. sp.

*Species incertae sedis*

Chlamydatus collaris Matsumura 1911

## SUMÁRIO

O presente trabalho é uma revisão do complexo *Cyrtorhinus* — *Mecomma* (Hemiptera, Miridae). Esses pequenos percevejos possuem grande importância econômica e larga distribuição geográfica. Algumas espécies são usadas no combate biológico das cigarrinhas. Segundo Zimmerman (1948), a espécie *Tytthus mundulus* foi introduzida em Hawaii em 1920, proveniente de Queensland e Fiji, para auxiliar o combate à cigarrinha de cana de açúcar. A espécie estabeleceu-se e constitui um dos marcos na história do controle por meios biológicos. Ela contribuiu para a economia da indústria açucareira de Hawaii com milhões de dólares — o seu valor real podendo dificilmente ser estimado.

As espécies aqui tratadas se achavam em estado confuso taxonômico, existindo também dúvidas quanto à sua área geográfica.

Iniciamos o trabalho com uma introdução e um histórico dos estudos prévios sobre espécies do grupo. A seguir, damos os caracteres usados na separação das subfamílias Orthotylinae e Phylinae. Foi incluído um índice das espécies que já foram descritas no complexo com sua posição genérica atual, bem como uma chave para separação dos gêneros nele envolvidos. Cada gênero é tratado separadamente, as espécies descritas e ilustradas com chaves apropriadas para sua separação. As espécies novas estão descritas. Comentários sobre a biologia e distribuição geográfica das espécies foram feitos e uma lista da bibliografia mais manuseada acha-se incluída no fim do trabalho.

## SUMMARY

A revision of the species hitherto included in *Cyrtorhinus* Fieber and *Mecomma* Fieber has shown that the species with bristle-like arolia and other Phylinae characters should be placed in the genus *Tytthus* Fieber within the sub-family Phylinae. The Orthotyline species are allotted to *Cyrtorhinus* and to the closely allied *Mecomma*, whilst *flaveolus* Reuter is placed in a new genus *Fieberocapsus*.

Keys are given to genera and species, which are redescribed and figured or in a few cases where material was not available for study the original descriptions are given. Three new species of *Mecomma* are described, one of them with two subspecies, one of them which is polymorphic in both sexes. A new subspecies of *M. luctuosus* Prov. is described.

Notes are given on: the comparative morphology of the genitalia of the Phylinae and the Orthotylinae; on the biology of the species, including pterygo-polymorphism and their use in the biological control of leafhoppers; and on their zoogeography.

## ACKNOWLEDGEMENTS

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EXPLANATION OF FIGURES:

Fig. 1

- A — Lateral view of aedeagus of *C. caricis*, with support and part of floor of pygophore.
- B — Longitudinal half of male pygophore of *C. caricis* (diagramatic) to show structure of aedeagal support or subgenital plate.
- C — Postero-ventral view of pygophore of *C. caricis*, claspers removed.
- D — Aedeagus with aedeagus sheath of *T. pygmaeus*, lateral view.
- E — Anterior view of pygophore of *T. pygmaeus*, with claspers and aedeagus removed, showing tubular structure of aedeagal sheath.
- F — Lateral view of pretarsus of *C. caricis* (Orthotylinae).
- G — Lateral view of pretarsus of *T. pygmaeus* (Phylinae).

l — lateral arm of basal plate; p — promotor apodeme of the phallobase; ph — paramere (or clasper) holes; s — aedeagal sheath (= aedeagal support or subgenital plate); t — theca; v — vesica; va — vesical appendage or spiculum; bp — basal plate.



Fig. J

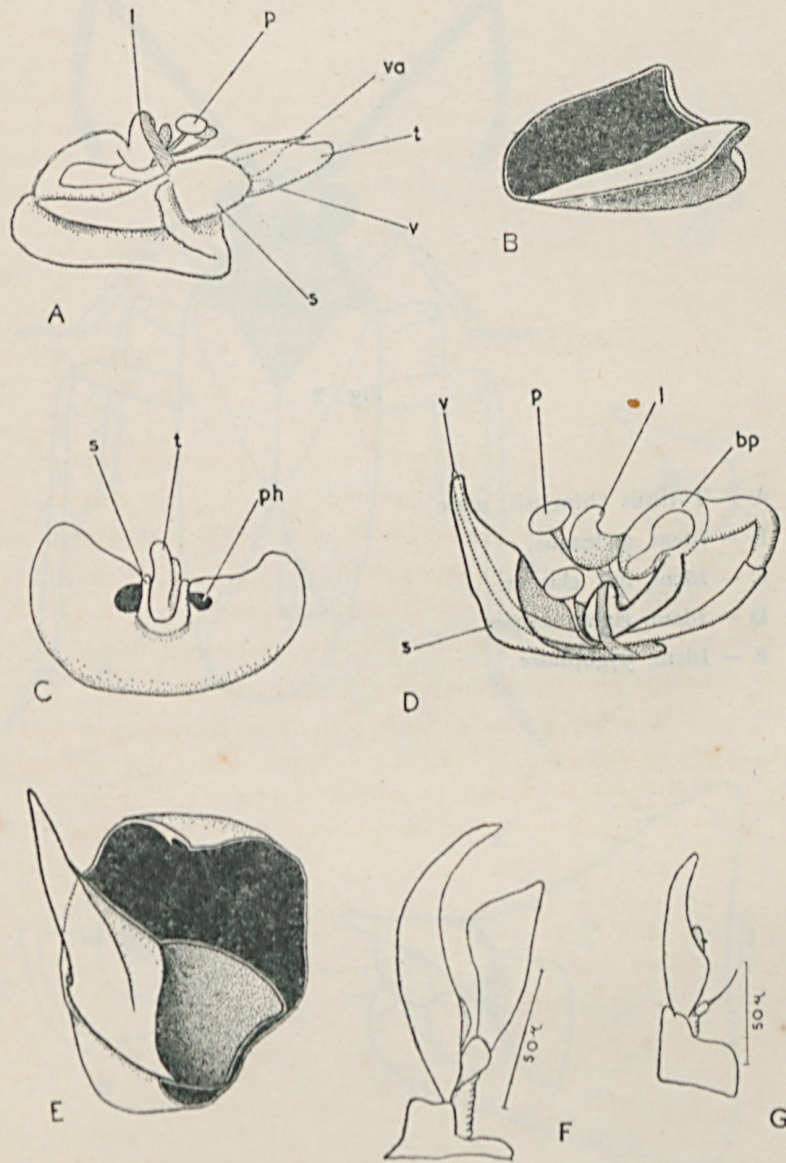


Fig. 2

- A - *Tytthus chinensis*, male.
- B - Idem, aedeagus.
- C - Idem, left clasper.
- D - Idem, right clasper.
- E - Idem, pygophore.

Fig. 2

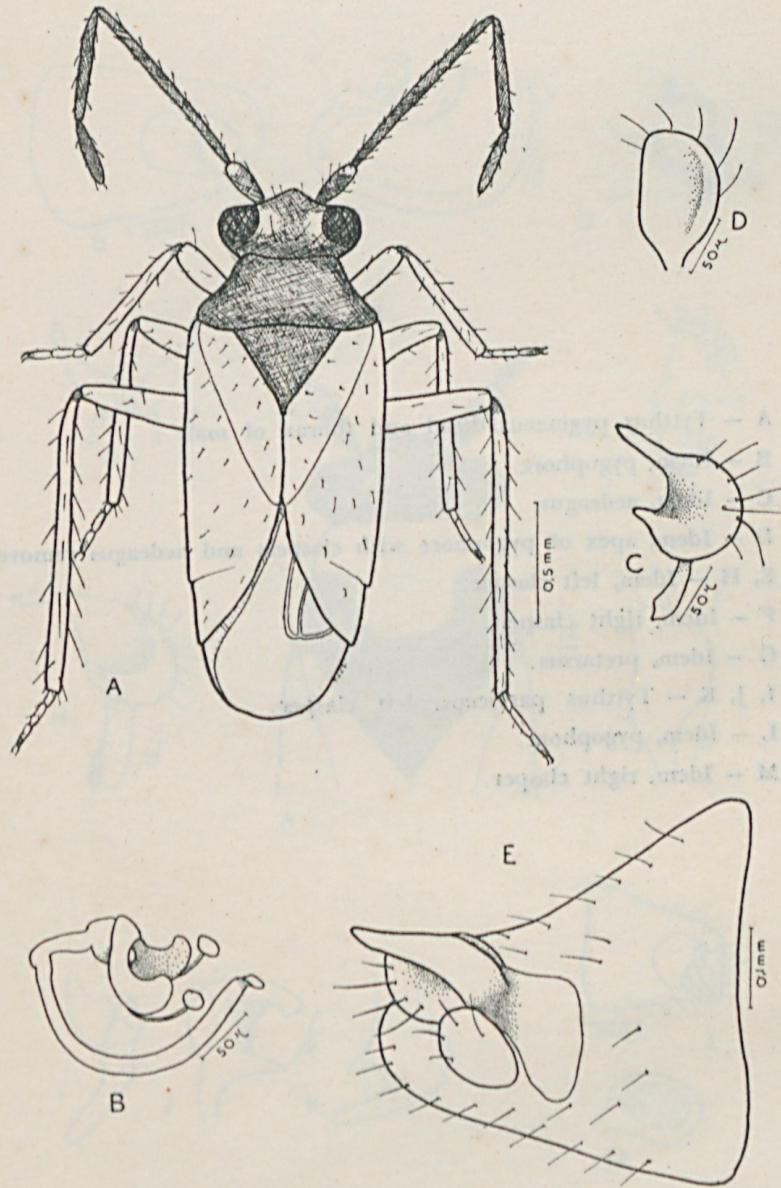


Fig. 3

- A — *Tytthus pygmaeus*, head and thorax of male.  
B — Idem, pygophore.  
C — Idem, aedeagus.  
D — Idem, apex of pygophore with claspers and aedeagus removed.  
E, H — Idem, left clasper.  
F — Idem, right clasper.  
G — Idem, pretarsus.  
I, J, K — *Tytthus parviceps*, left clasper.  
L — Idem, pygophore.  
M — Idem, right clasper.

Fig. 3

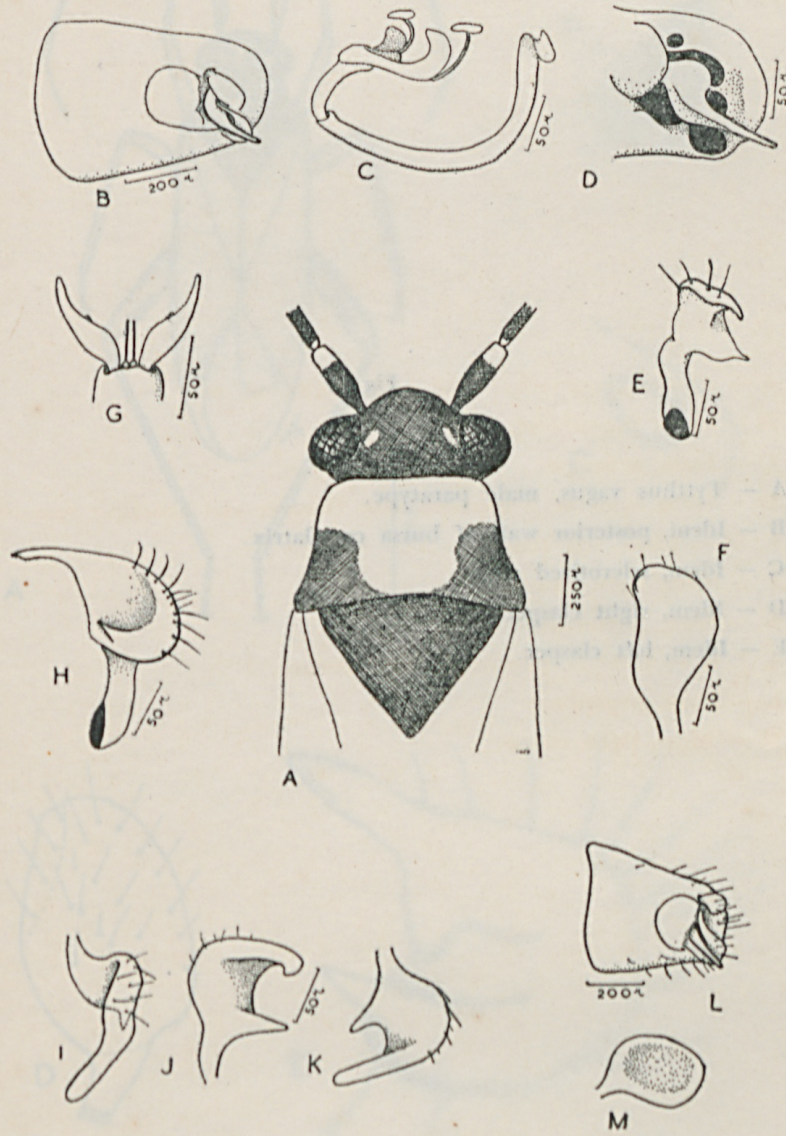




Fig. 4

- A - *Tytthus vagus*, male paratype.
- B - Idem, posterior wall of bursa copulatrix.
- C - Idem, sclerotized ring.
- D - Idem, right clasper.
- E - Idem, left clasper.

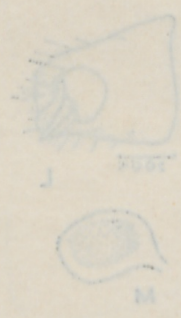
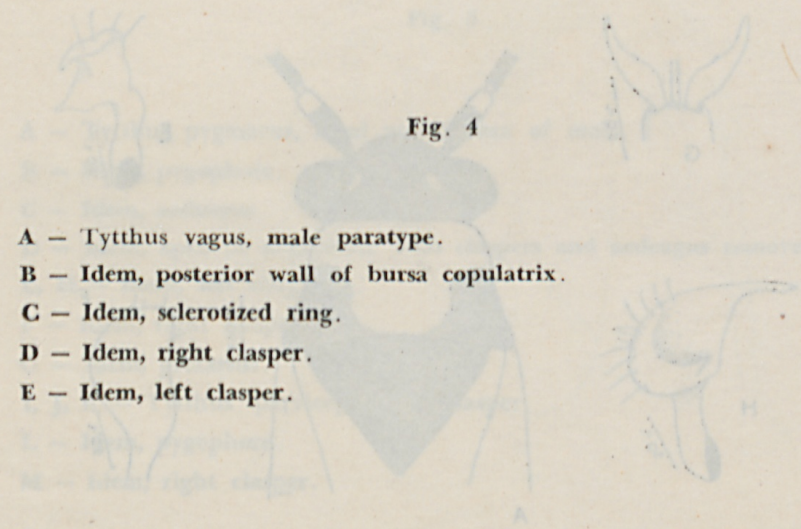


Fig. 4

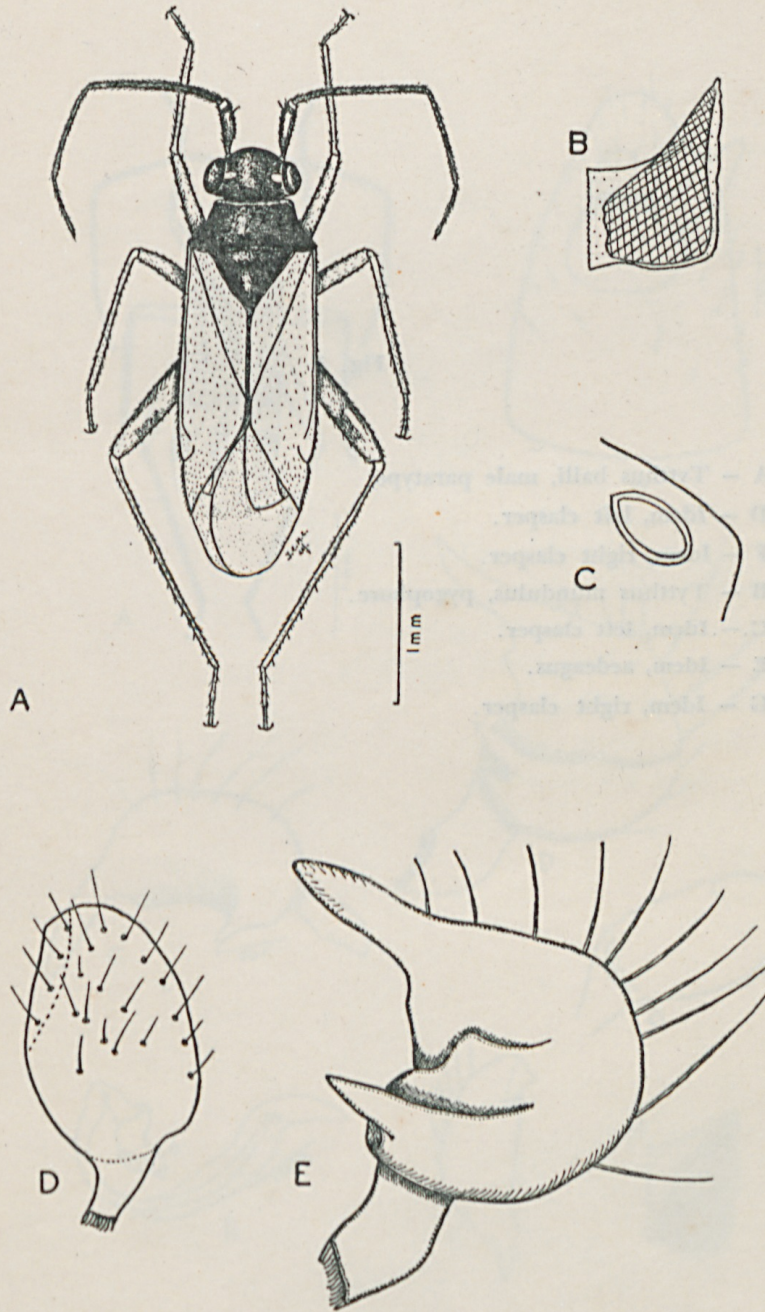


Fig. 5

- A — *Tytthus balli*, male paratype.
- D — Idem, left clasper.
- F — Idem, right clasper.
- B — *Tytthus mundulus*, pygophore.
- C. — Idem, left clasper.
- E — Idem, aedeagus.
- G — Idem, right clasper.



Fig. 5

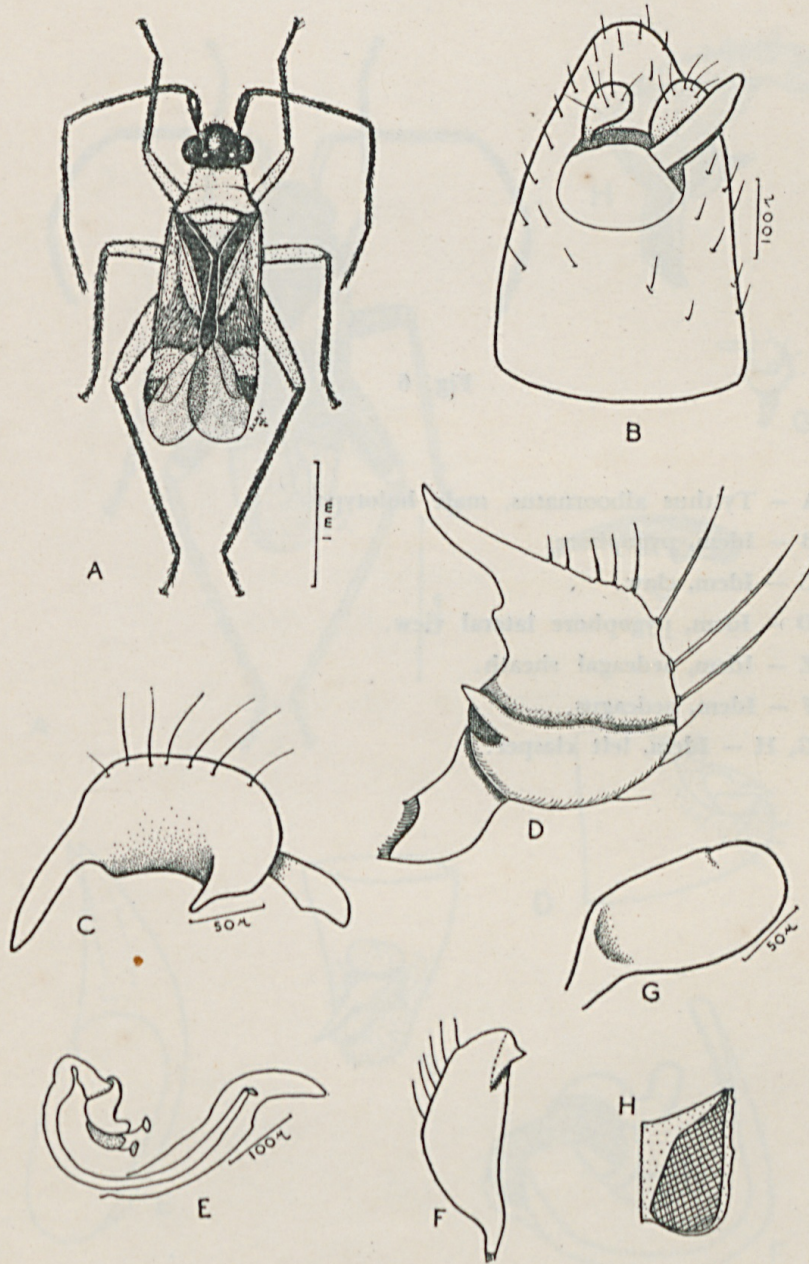


Fig. 6

- A - *Tytthus alboornatus*, male holotype.
- B - Idem, pygophore.
- C - Idem, claw.
- D - Idem, pygophore lateral view.
- E - Idem, aedeagal sheath.
- F - Idem, aedeagus.
- G, H - Idem, left clasper.

Fig. 6

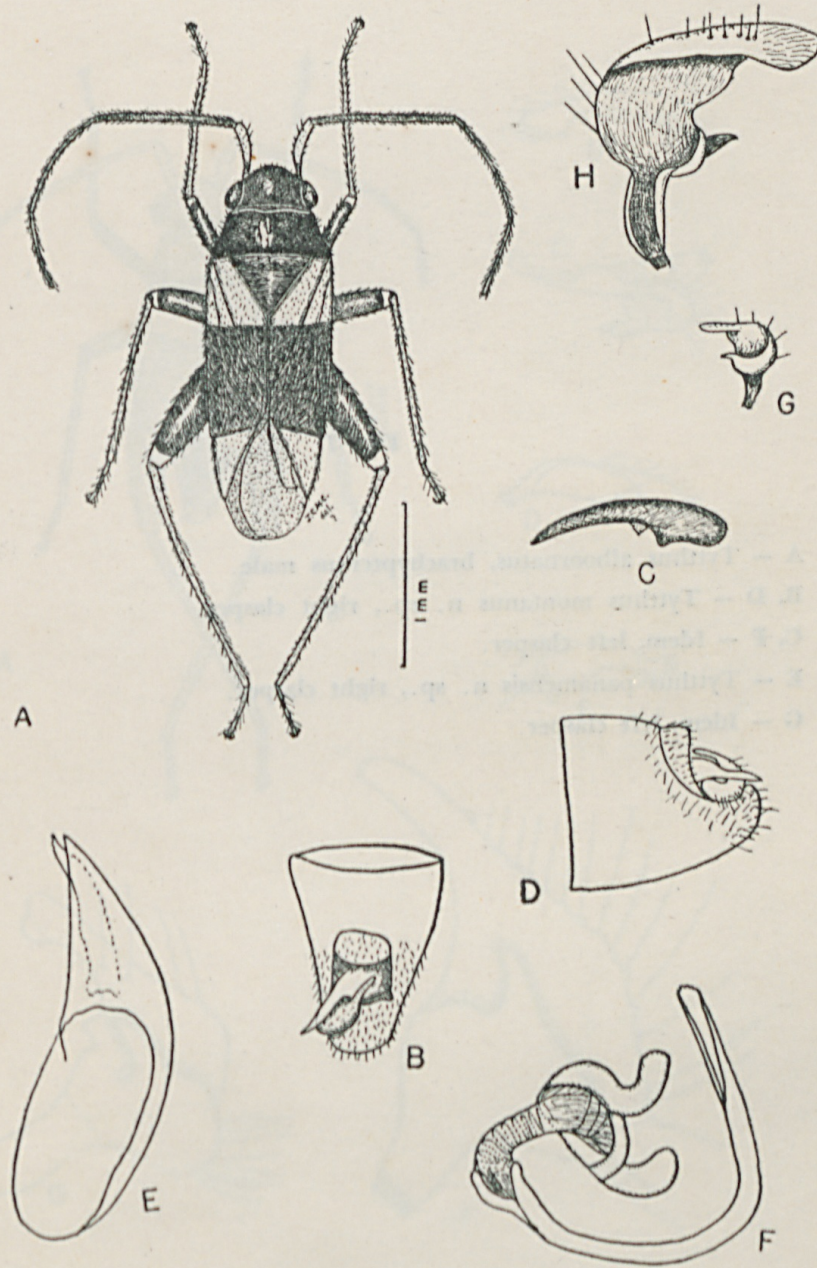




Fig. 7

- A - *Tytthus alboornatus*, brachypterous male.  
B, D - *Tytthus montanus* n. sp., right clasper.  
C, F - *Idem*, left clasper.  
E - *Tytthus panamensis* n. sp., right clasper.  
G - *Idem*, left clasper.

Fig. 7

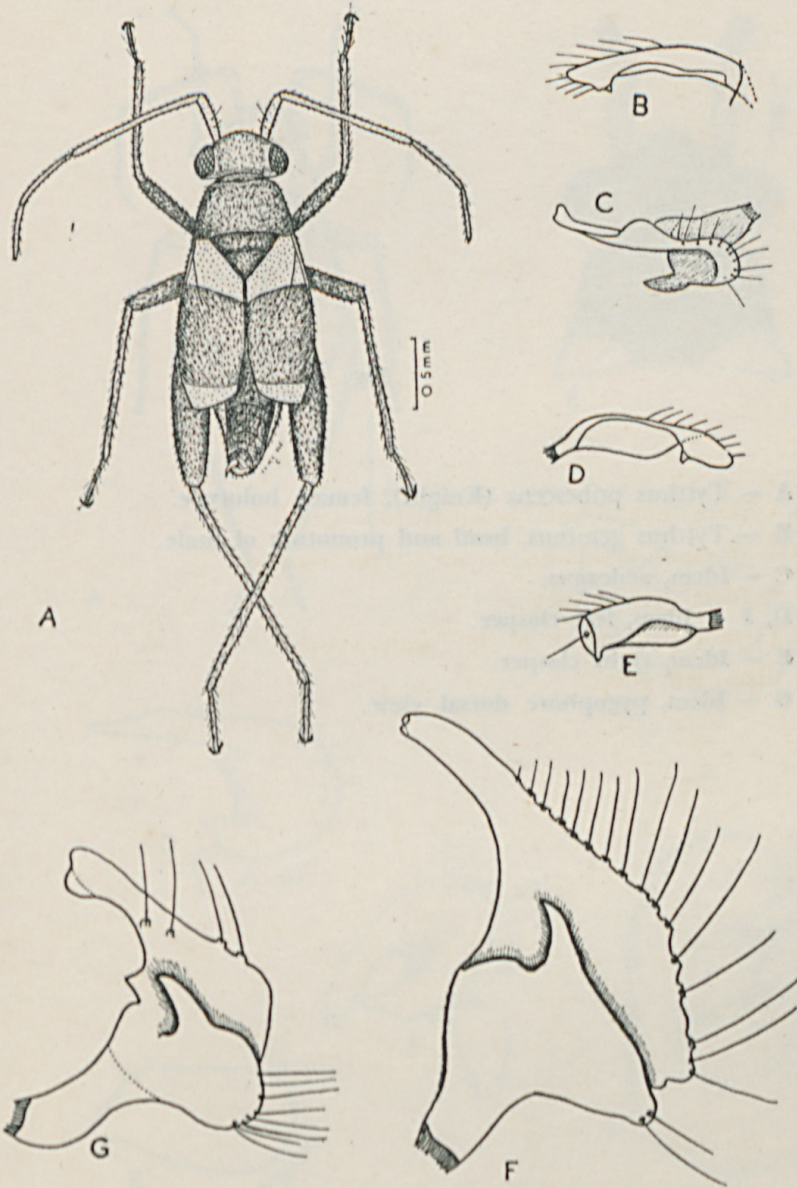
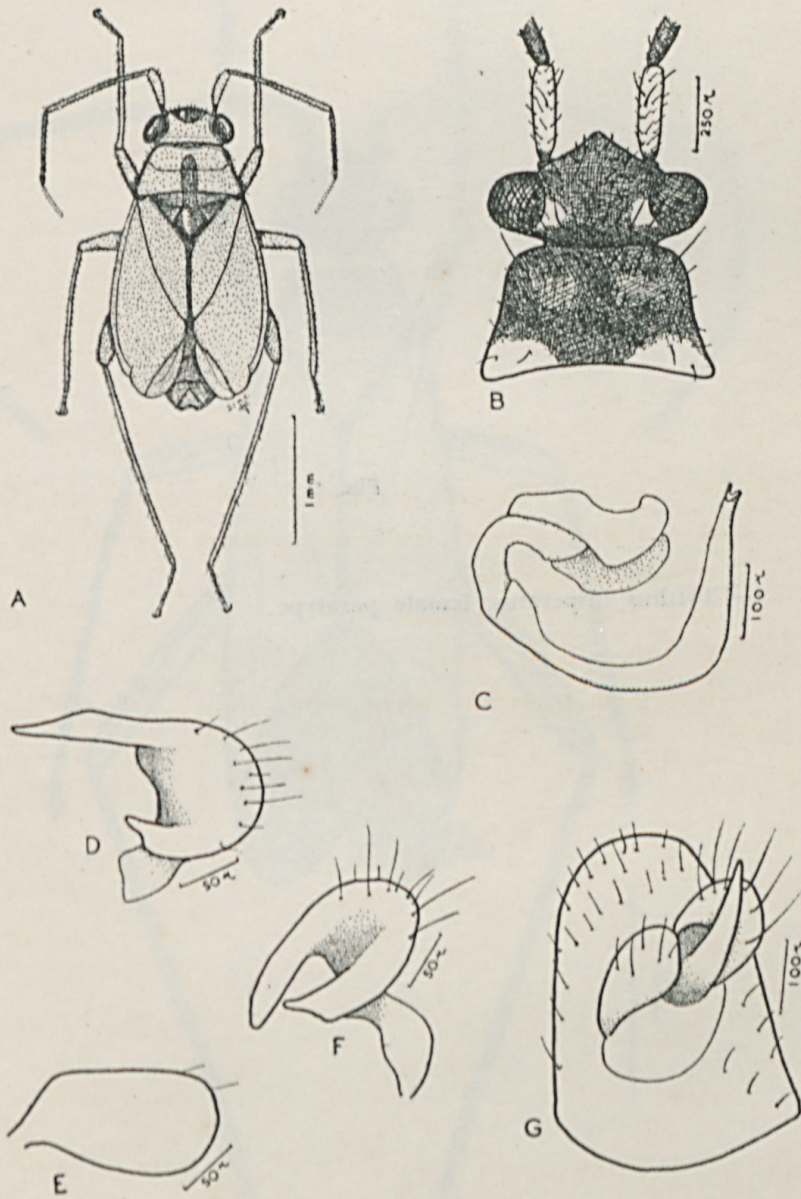




Fig. 8

- A — *Tytthus pubescens* (Knight), female holotype.
- B — *Tytthus geminus*, head and pronotum of male.
- C — Idem, aedeagus.
- D, F — Idem, left clasper.
- E — Idem, right clasper.
- G — Idem, pygophore dorsal view.

Fig. 8



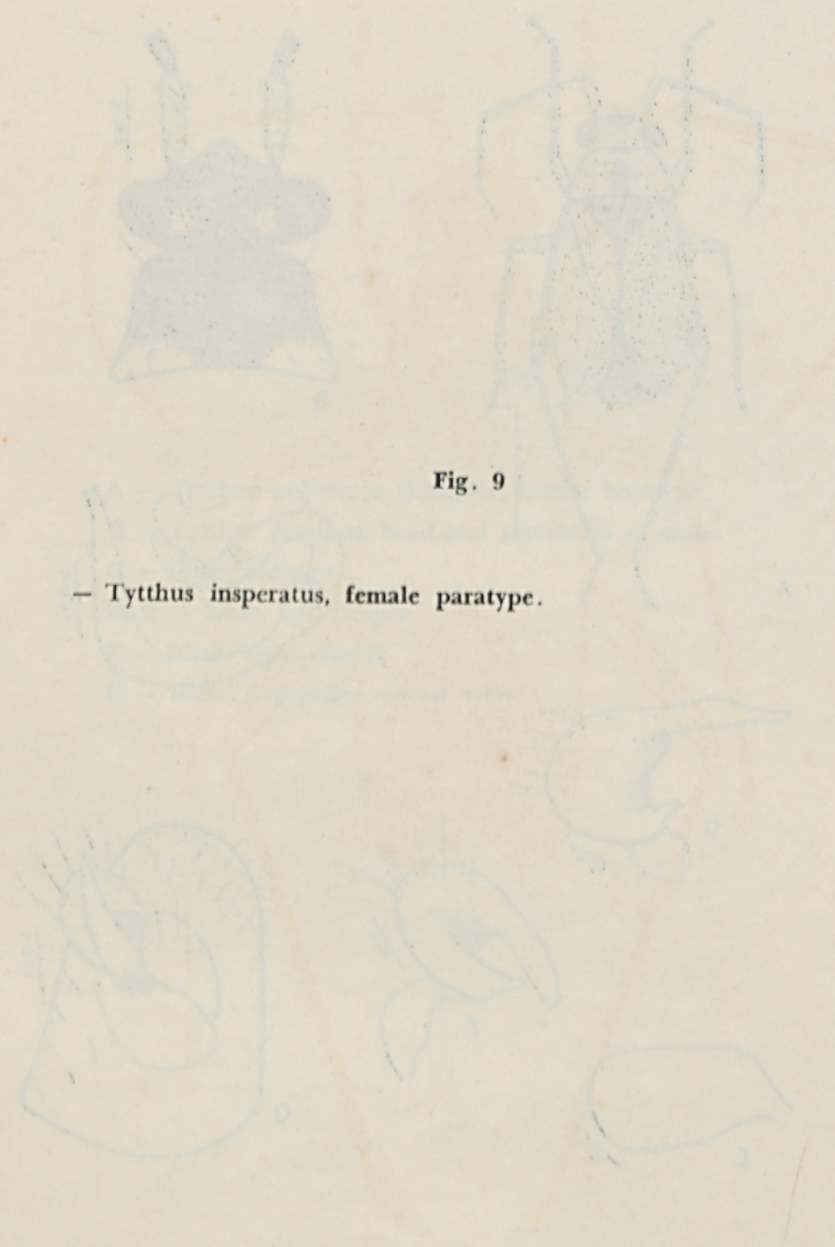
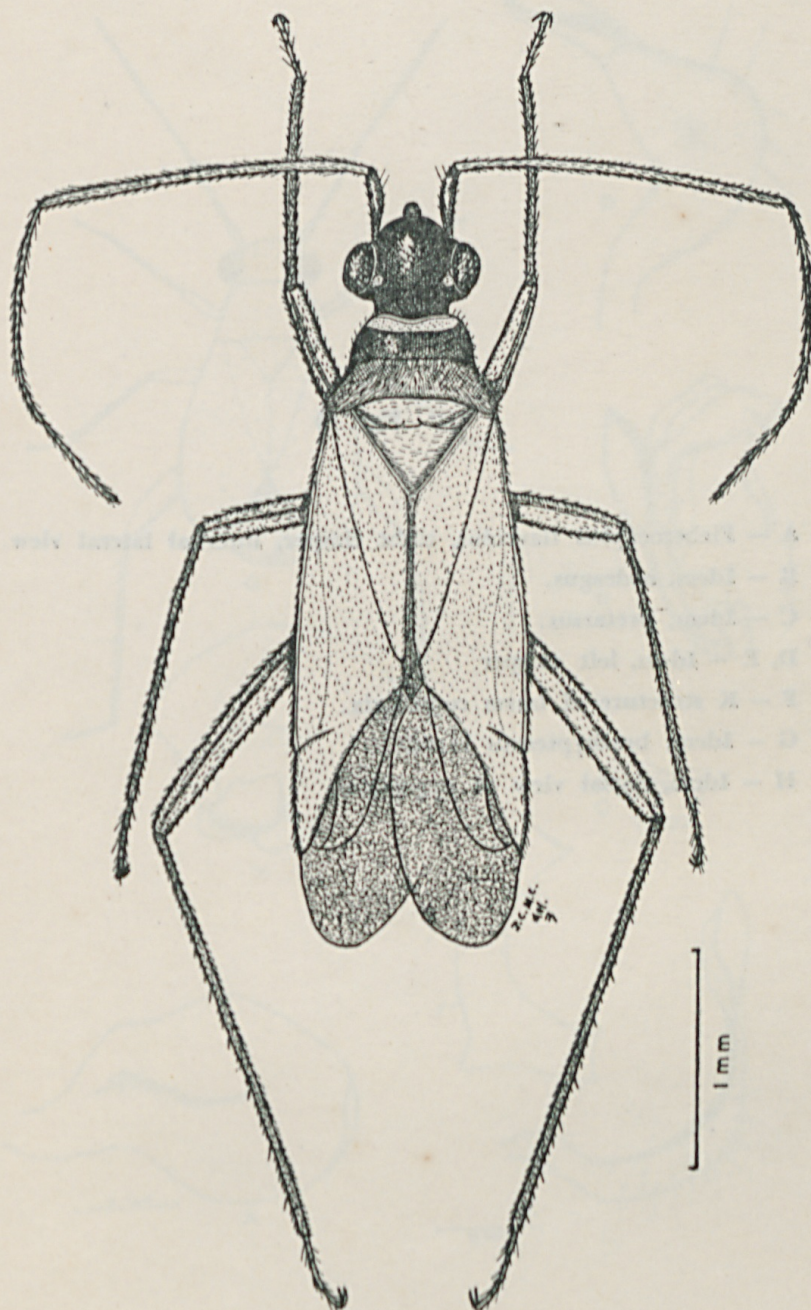


Fig. 9

— *Tytthus insperatus*, female paratype.



Fig. 9



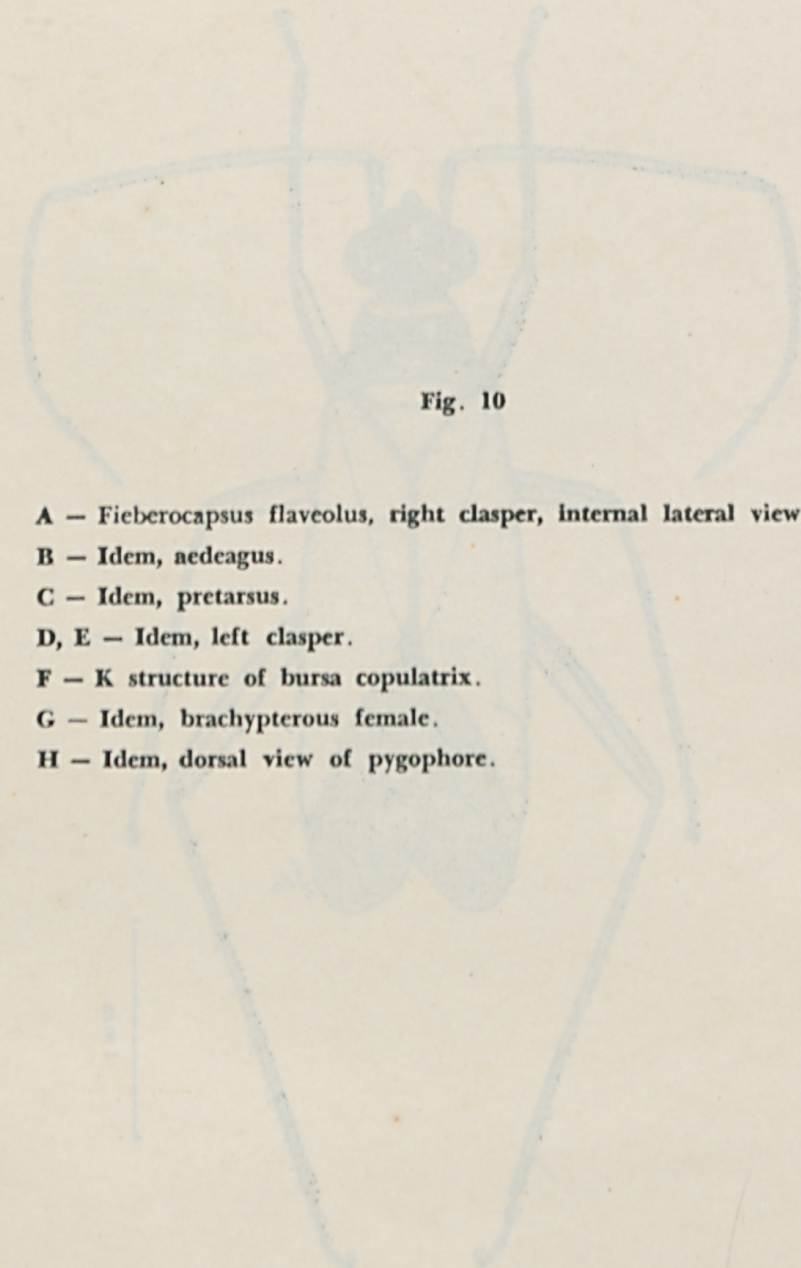


Fig. 10

- A — *Fieberocapsus flaveolus*, right clasper, internal lateral view.
- B — Idem, aedeagus.
- C — Idem, pretarsus.
- D, E — Idem, left clasper.
- F — K structure of bursa copulatrix.
- G — Idem, brachypterous female.
- H — Idem, dorsal view of pygophore.

Fig. 10

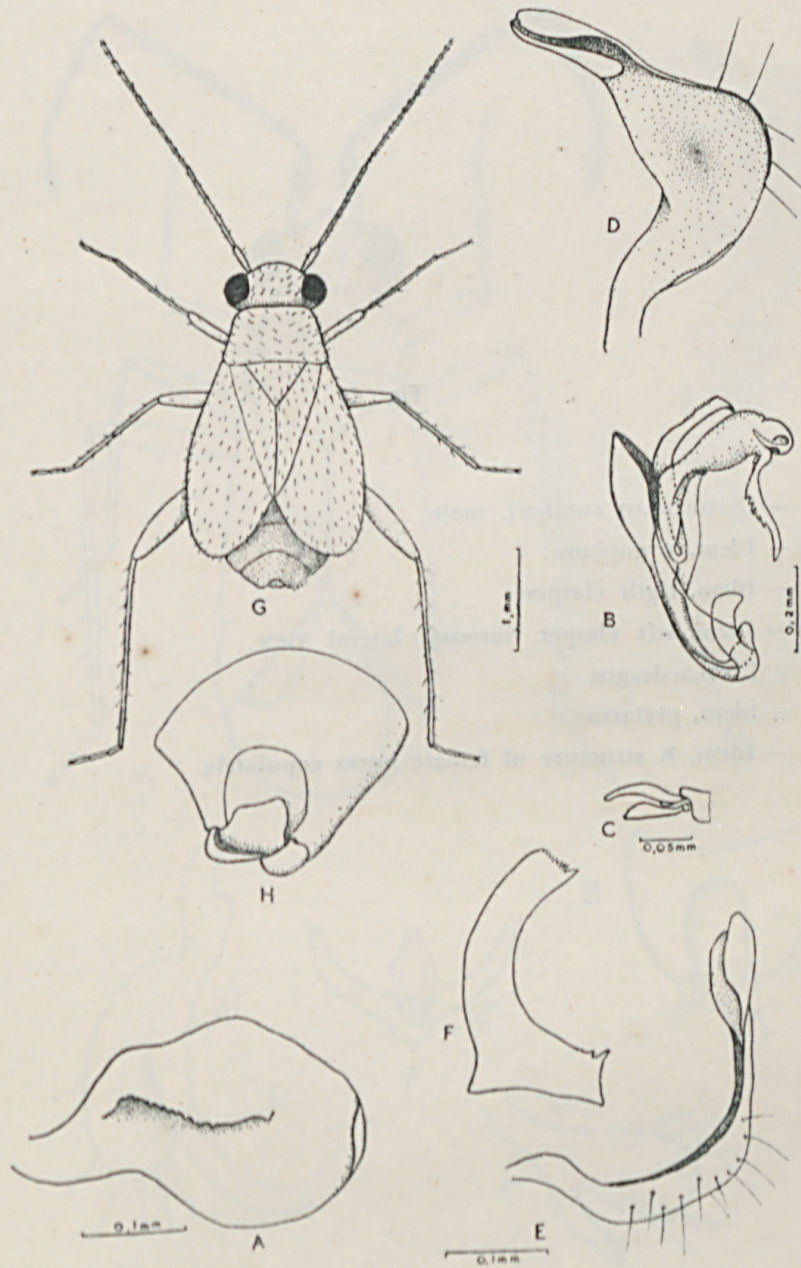


Fig. 11

- A — *Cyrtorhinus cumberi*, male.
- B — Idem, pygophore.
- C — Idem, righth clasper.
- D — Idem, left clasper, internal lateral view.
- E — Idem, aedeagus.
- F — Idem, pretarsus.
- G — Idem, K structure of female bursa copulatrix.

Fig. 11

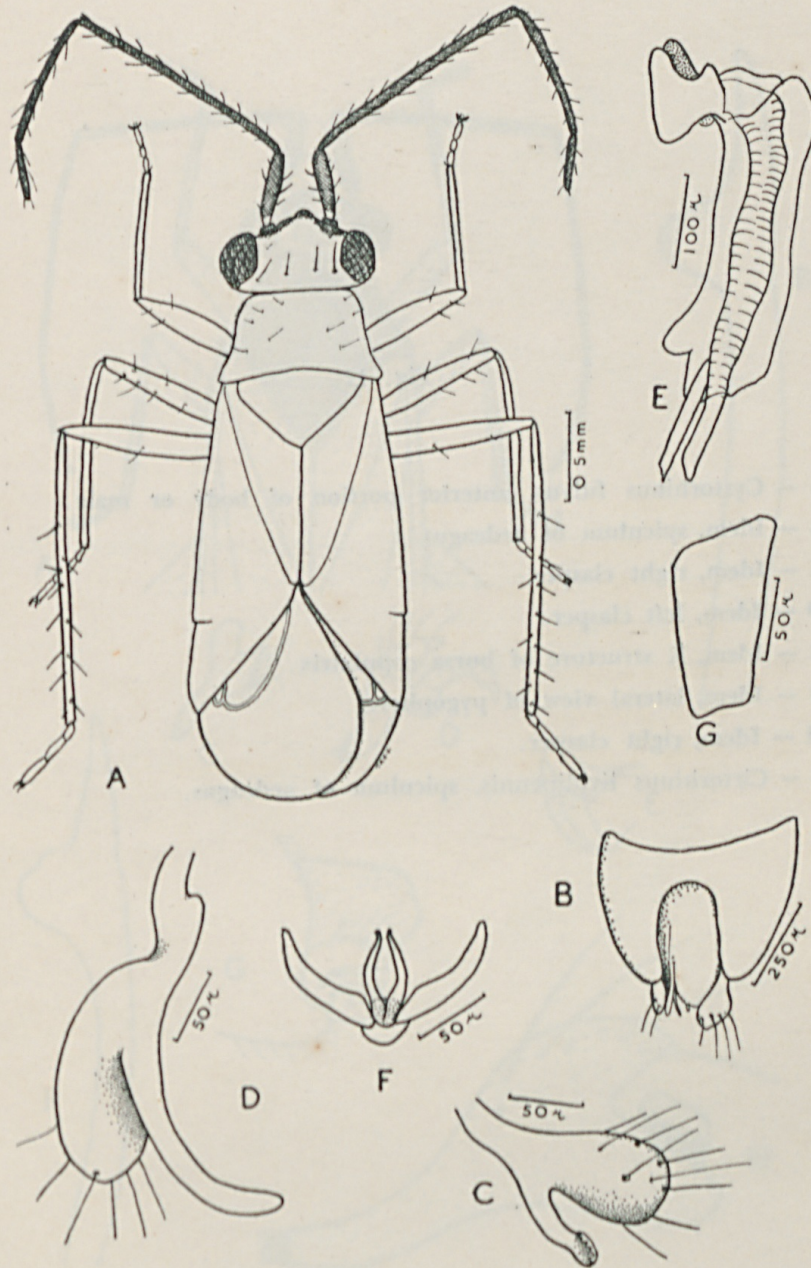


Fig. 12

- A — *Cyrtorhinus fulvus*, anterior portion of body of male.
- B — Idem, spiculum of aedeagus.
- C — Idem, right clasper.
- D — Idem, left clasper.
- E — Idem, K structure of bursa copulatrix.
- G — Idem, lateral view of pygophore.
- H — Idem, right clasper.
- F — *Cyrtorhinus lividipennis*, spiculum of aedeagus.

Fig. 12

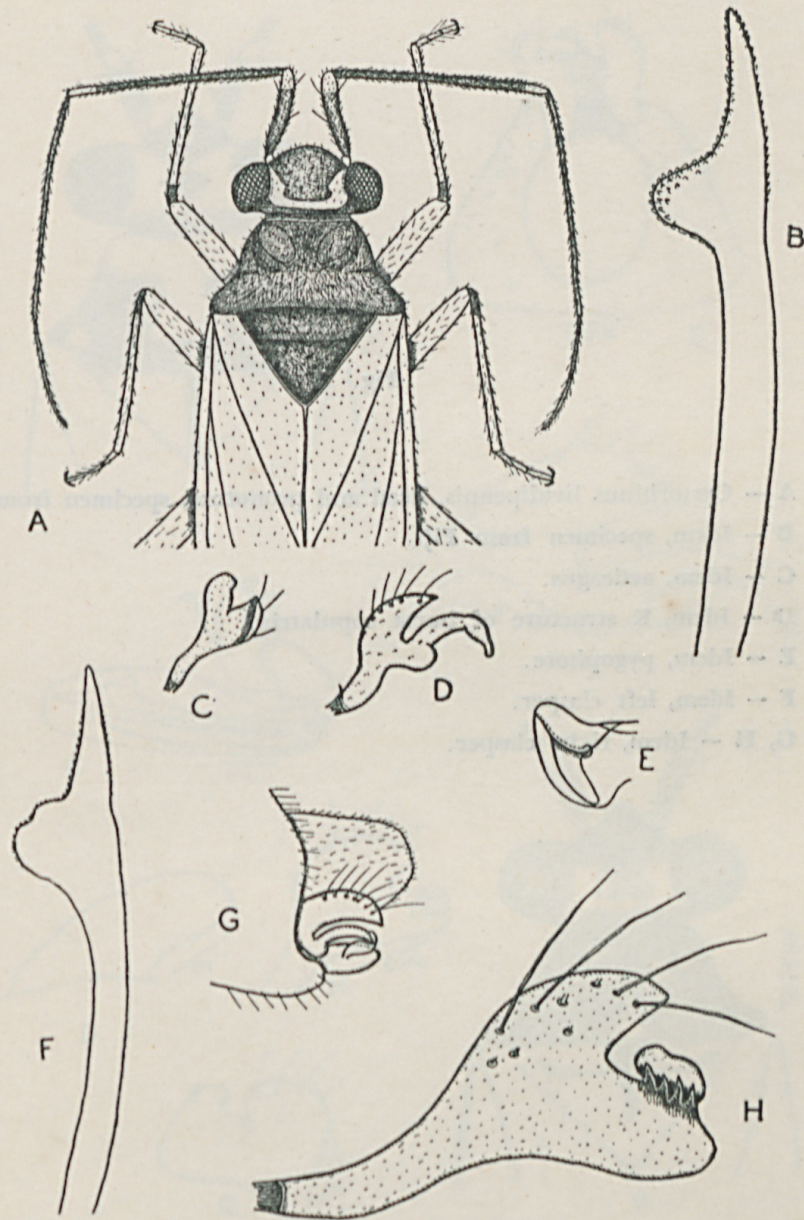
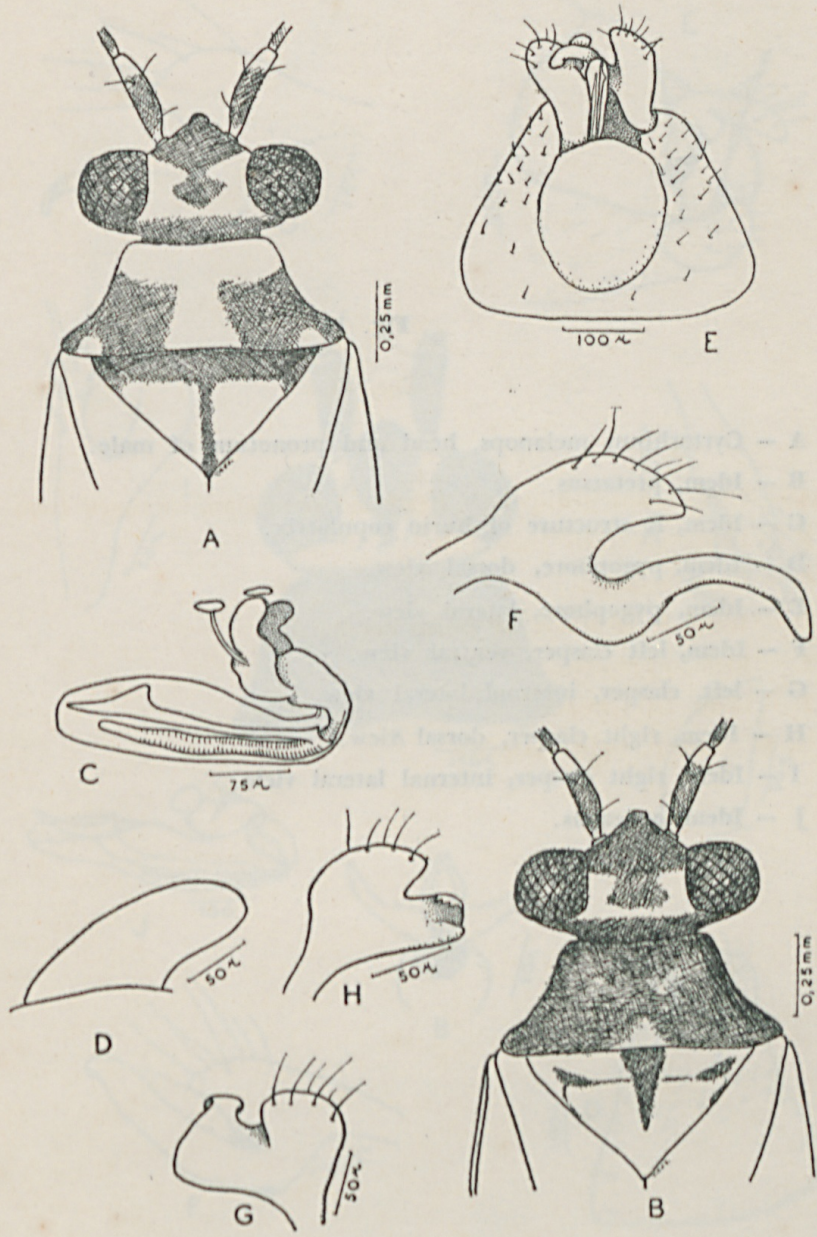


Fig. 13

- A — *Cyrtorhinus lividipennis*, head and pronotum, specimen from India.
- B — Idem, specimen from Fiji.
- C — Idem, aedeagus.
- D — Idem, K structure of bursa copulatrix.
- E — Idem, pygophore.
- F — Idem, left clasper.
- G, H — Idem, right clasper.



Fig. 13



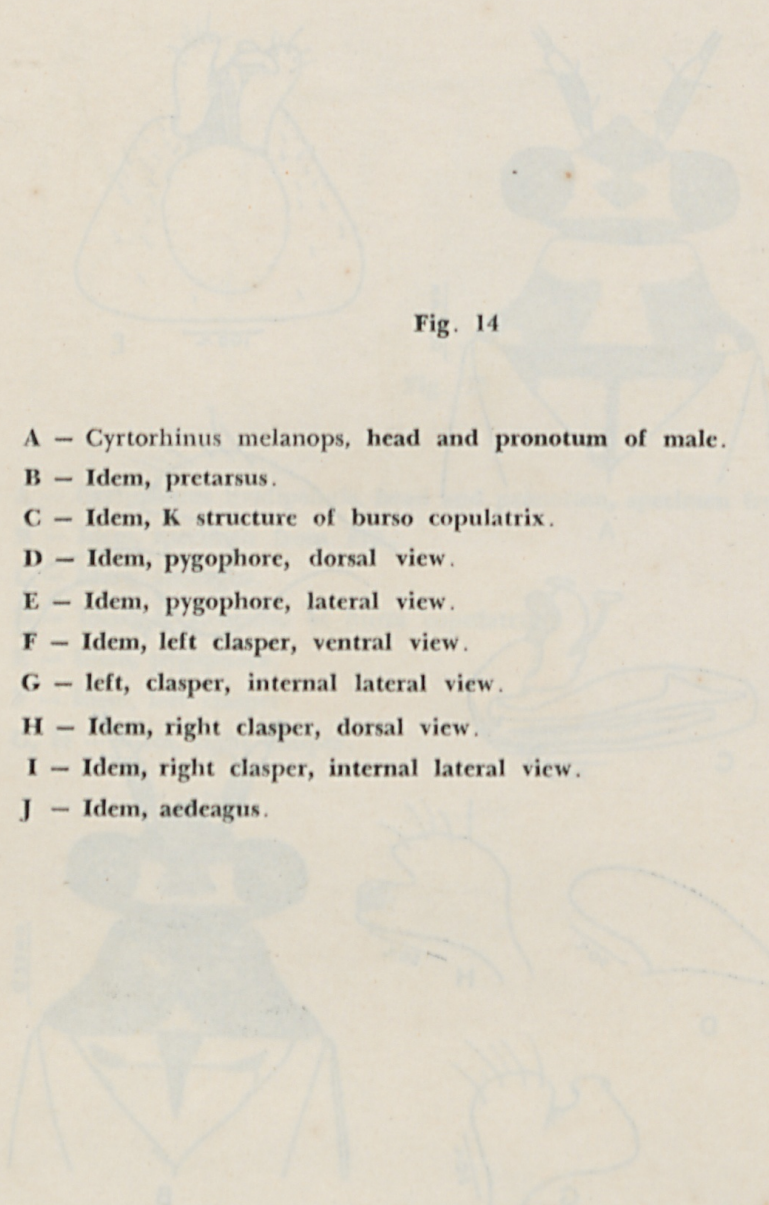


Fig. 14

- A - *Cyrtorhinus melanops*, head and pronotum of male.
- B - Idem, pretarsus.
- C - Idem, K structure of burso copulatrix.
- D - Idem, pygophore, dorsal view.
- E - Idem, pygophore, lateral view.
- F - Idem, left clasper, ventral view.
- G - left, clasper, internal lateral view.
- H - Idem, right clasper, dorsal view.
- I - Idem, right clasper, internal lateral view.
- J - Idem, aedeagus.

Fig. 14

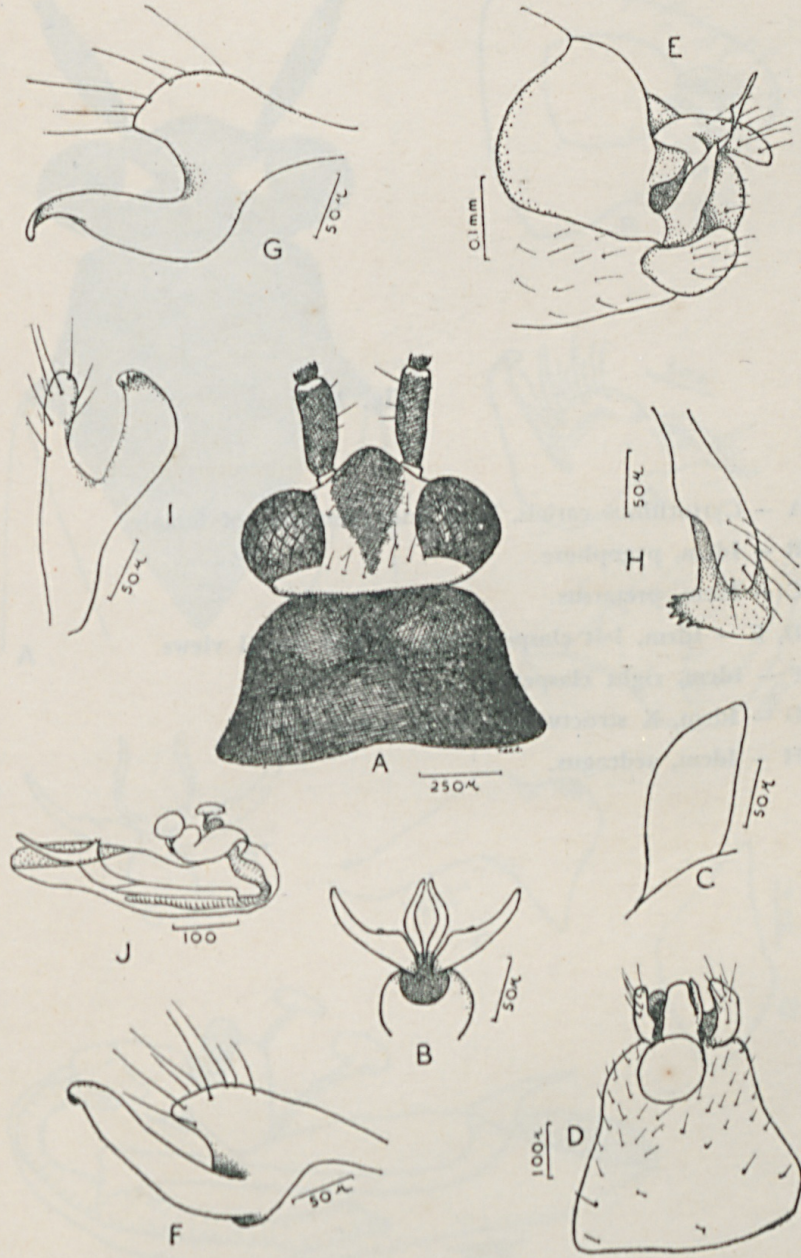


Fig. 15

- A - *Cyrtorhinus caricis*, head and pronotum of female.
- B - Idem, pygophore.
- C - Idem, pretarsus.
- D, E - Idem, left clasper, internal and dorsal views.
- F - Idem, right clasper.
- G - Idem, K structure of bursa copulatrix.
- H - Idem, aedeagus.

Fig. 15

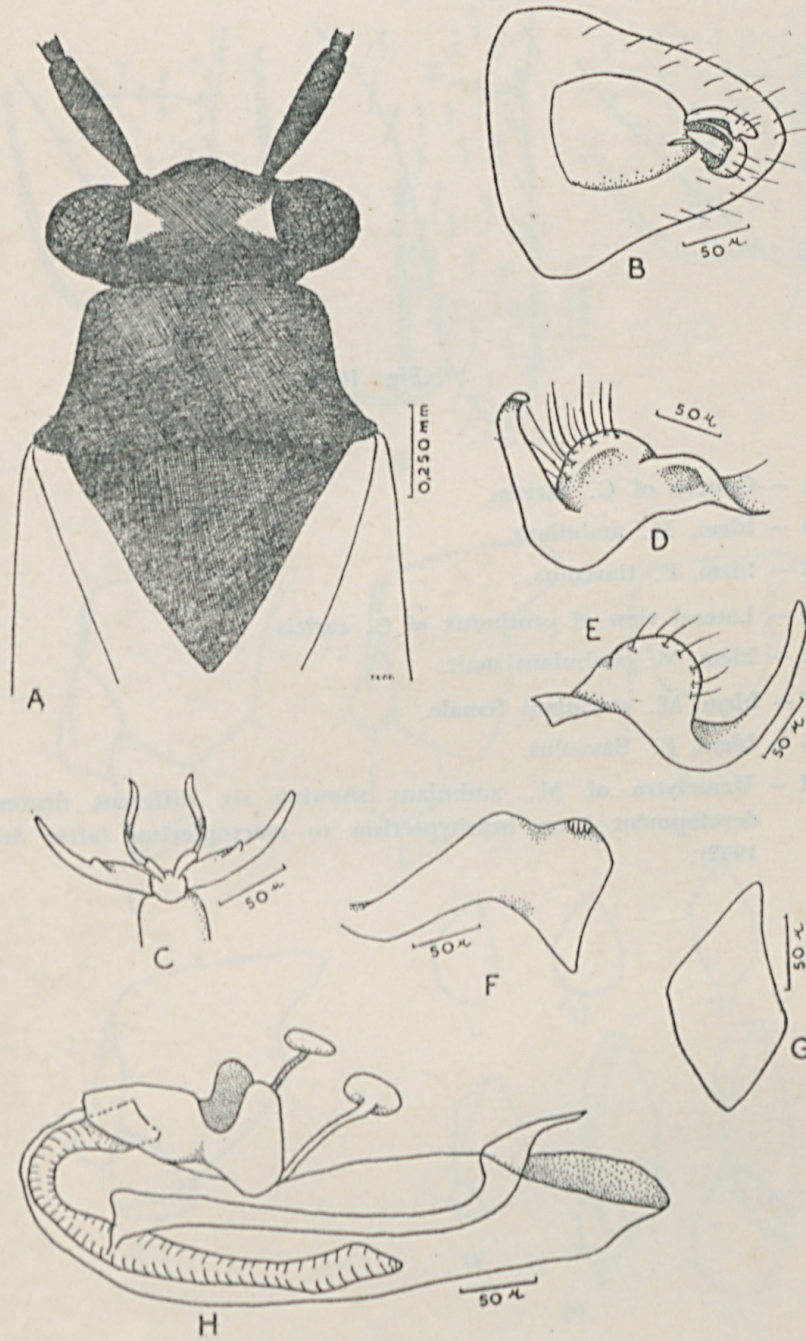
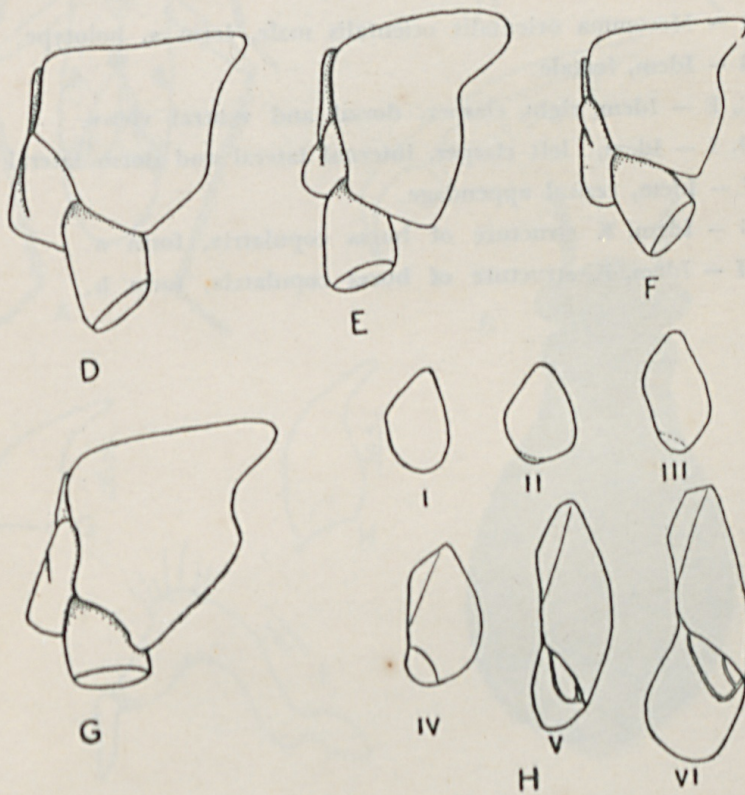
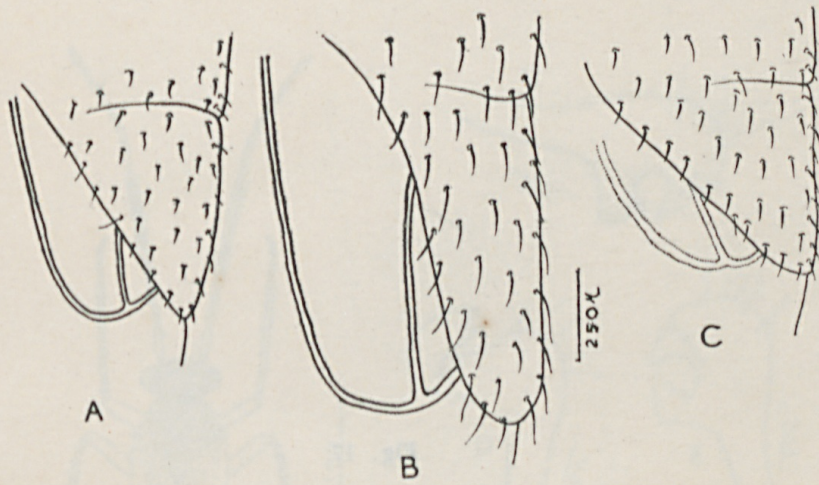


Fig. 16

- A — Cuneus of *C. caricis*.
- B — Idem, *M. ambulans*.
- C — Idem, *F. flaveolus*.
- D — Lateral view of prothorax of *C. caricis*.
- E — Idem, *M. ambulans* male.
- F — Idem, *M. ambulans* female.
- G — Idem, *F. flaveolus*.
- H — Hemelytra of *M. ambulans* showing six different degrees of development from brachypterism to macropterism (after Stichel, 1952).

Fig. 16



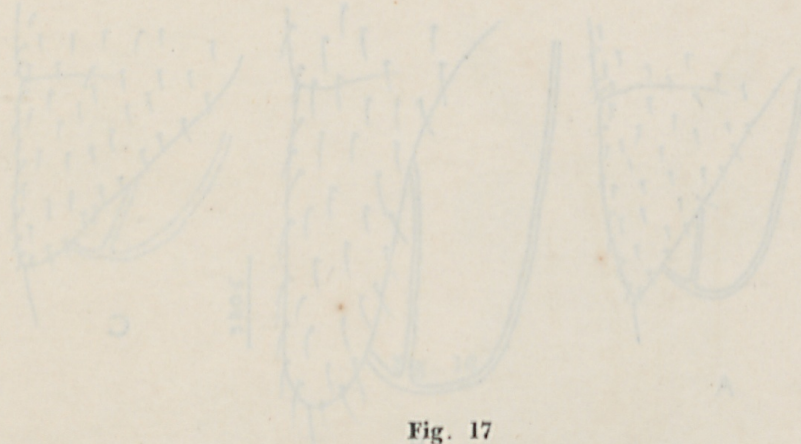


Fig. 17

- A - *Mecomma orientalis orientalis* male, form a, holotype.
- B - Idem, female.
- C, E - Idem, right clasper, dorsal and ventral views.
- D, I - Idem, left clasper, internal lateral and dorso lateral views.
- F - Idem, vesical appendage.
- G - Idem, K structure of bursa copulatrix, form a.
- H - Idem, K structure of bursa copulatrix, form b.





Fig. 17

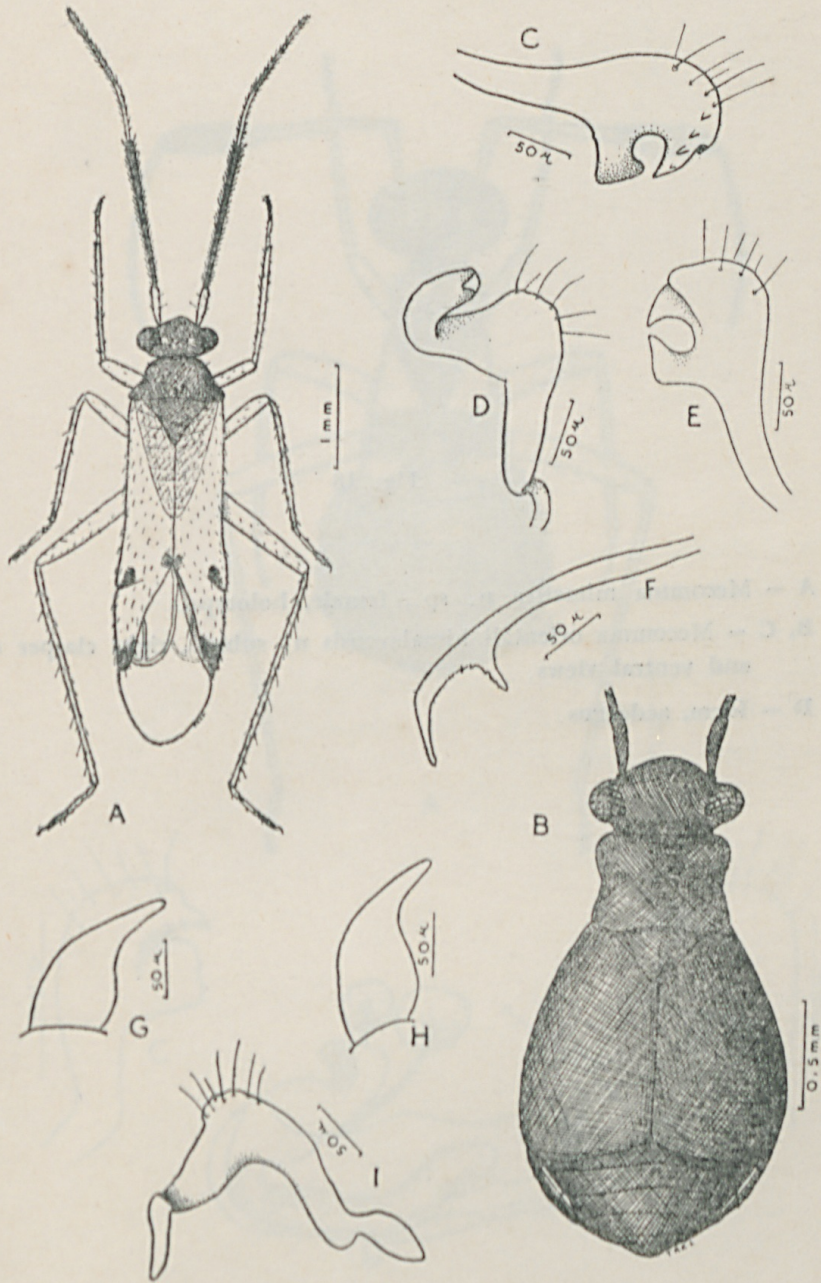


Fig. 18

- A — *Mecomma mimetica* n. sp., female, holotype.  
B, C — *Mecomma orientali himalayensis* n. subsp., right clasper dorsal  
and ventral views.  
D — Idem, aedeagus.

Fig. 18

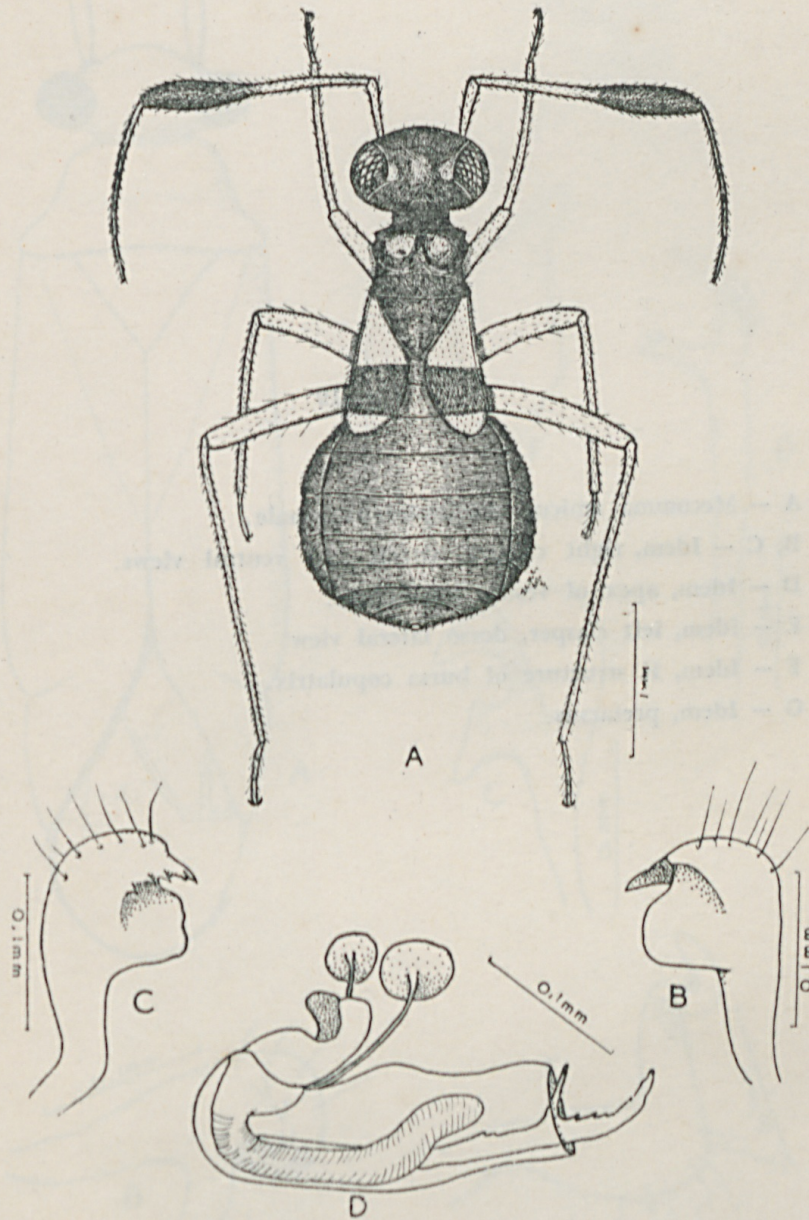
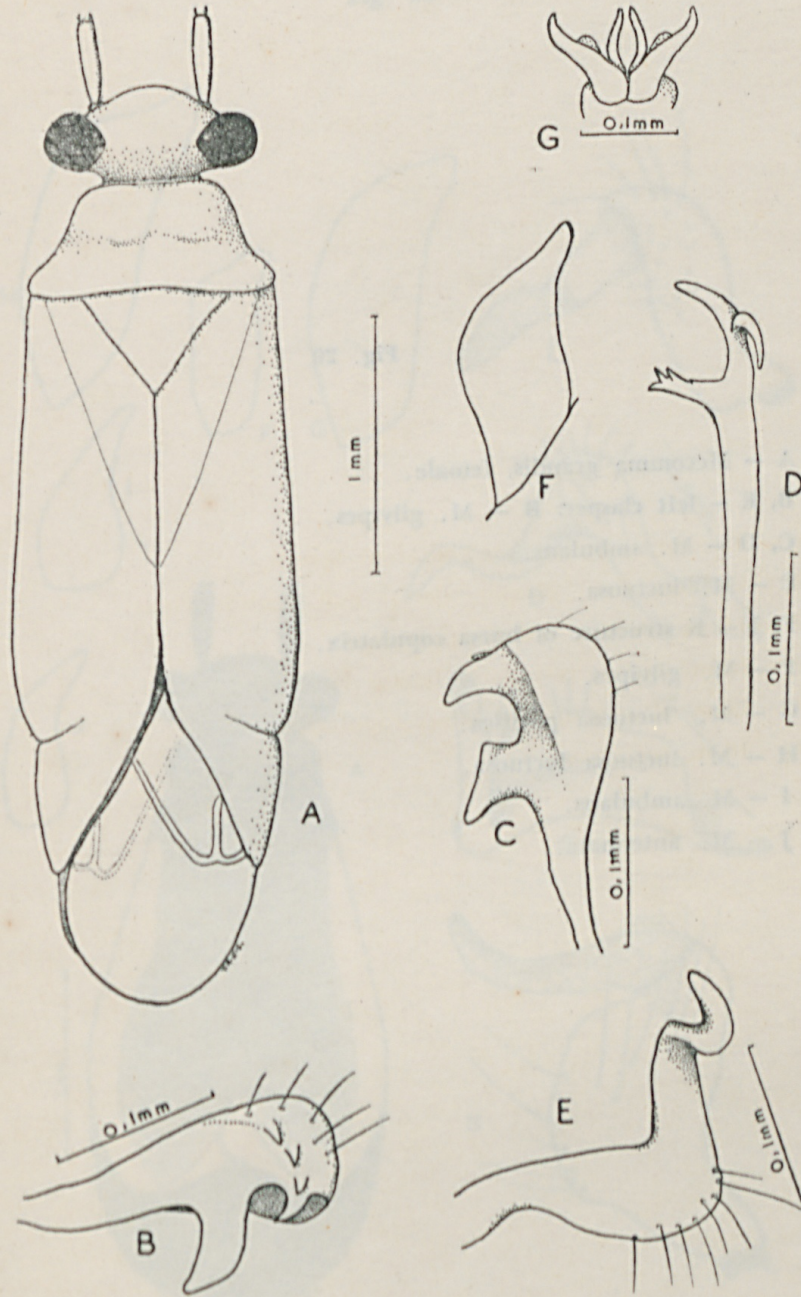


Fig. 19

- A — *Mecomma amicus*, macropterous female.
- B, C — Idem, right clasper, dorsal and ventral views.
- D — Idem, apex of vesical appendage.
- E — Idem, left clasper, dorso lateral view.
- F — Idem, K structure of bursa copulatrix.
- G — Idem, pretarsus.

Fig. 19



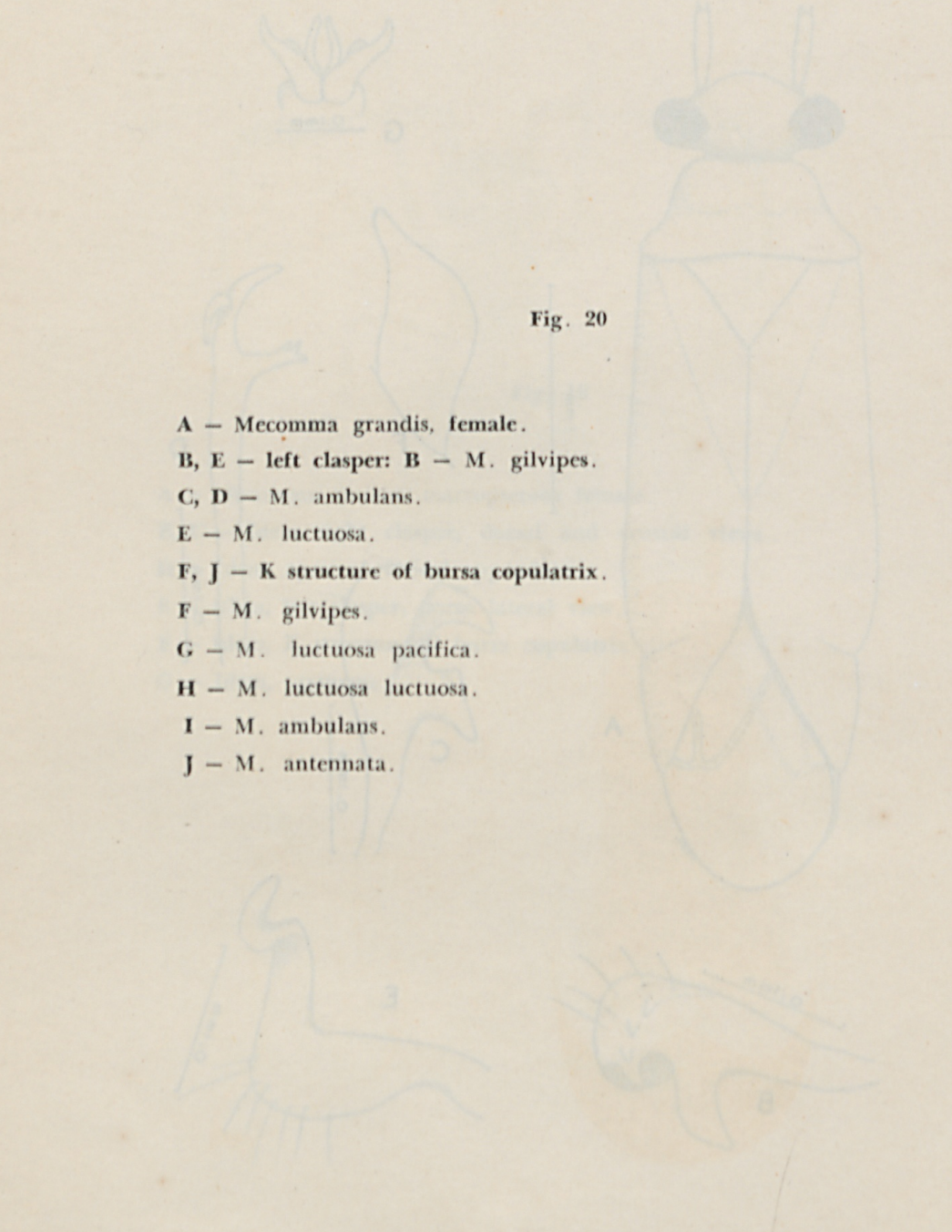


Fig. 20

- A - *Mecomma grandis*, female.
- B, E - left clasper: B - *M. gilvipes*.
- C, D - *M. ambulans*.
- E - *M. luctuosa*.
- F, J - K structure of bursa copulatrix.
- F - *M. gilvipes*.
- G - *M. luctuosa pacifica*.
- H - *M. luctuosa luctuosa*.
- I - *M. ambulans*.
- J - *M. antennata*.

Fig. 20

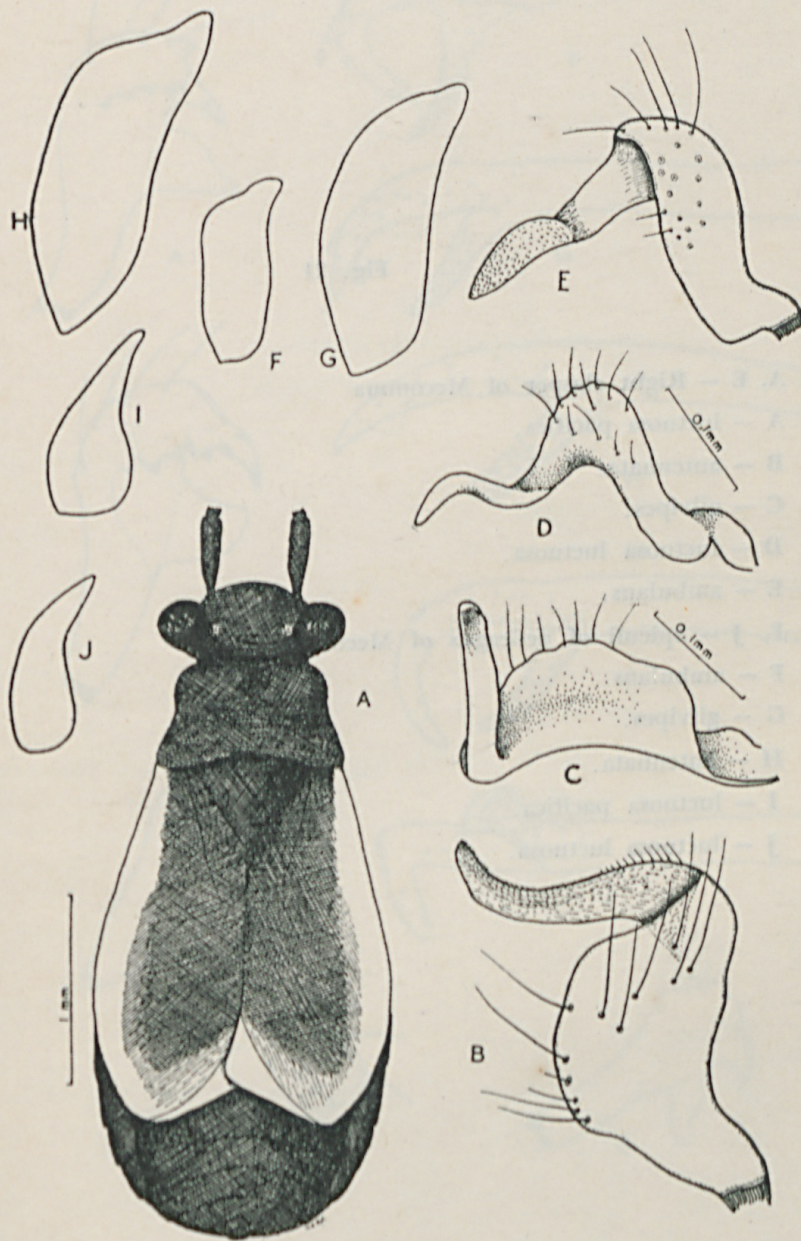


Fig. 21

Fig. 21 A, E — Right clasper of *Mecomma*

A — *luctuosa pacifica*.

B — *antennata*.

C — *gilvipes*.

D — *luctuosa luctuosa*.

E — *ambulans*.

F, J — Spiculi of aedeagus of *Mecomma*.

F — *ambulans*.

G — *gilvipes*.

H — *antennata*.

I — *luctuosa pacifica*.

J — *luctuosa luctuosa*.



Fig. 21

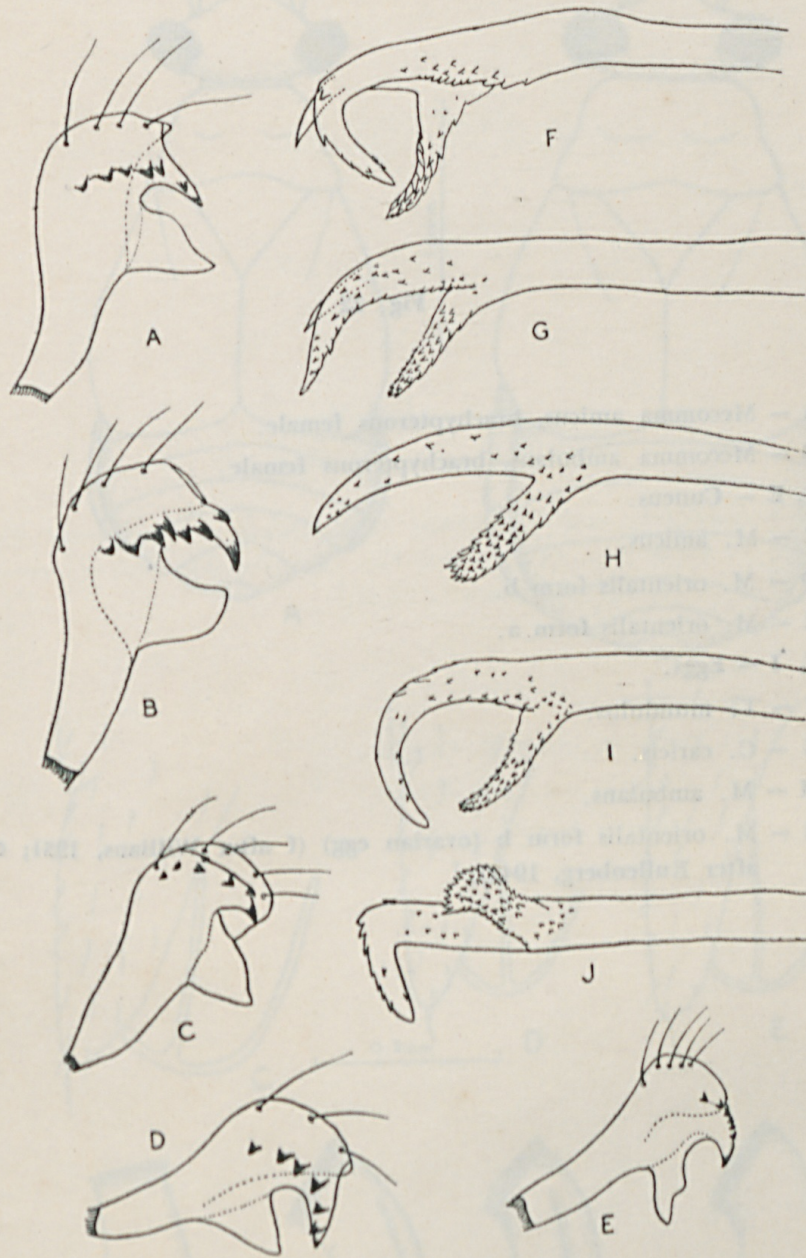
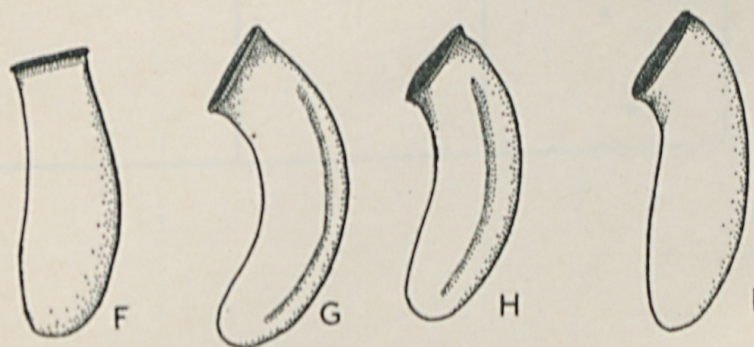
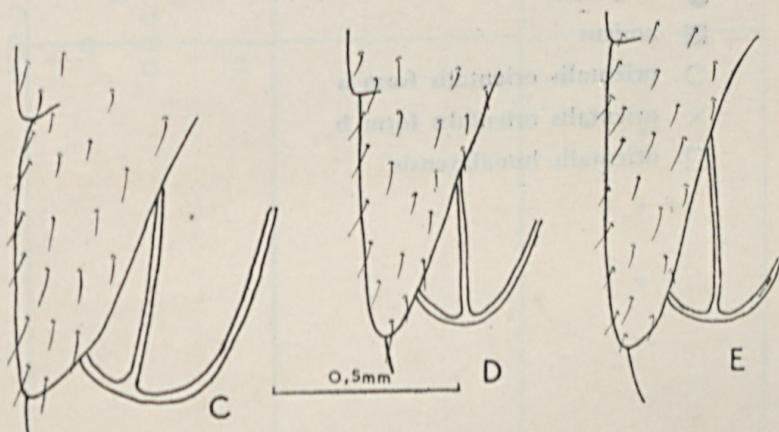
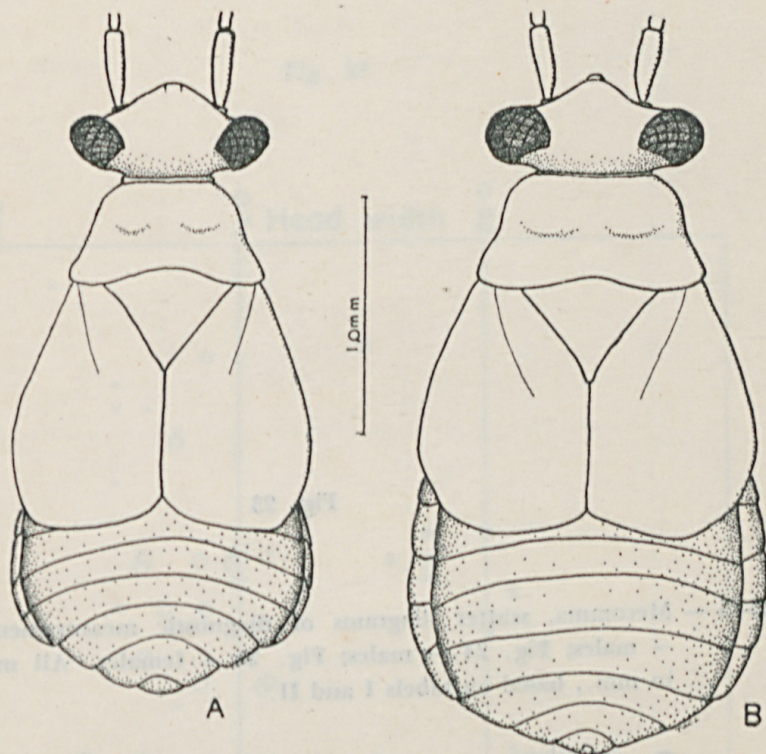


Fig. 22

- Fig. 22 A — *Mecomma amicus*, brachypterous female.  
B — *Mecomma ambulans*, brachypterous female.  
C, E — *Cuneus*.  
C — *M. amicus*.  
D — *M. orientalis* form b.  
E — *M. orientalis* form a.  
F, I — Eggs.  
F — *T. mundulus*.  
G — *C. caricis*.  
H — *M. ambulans*.  
I — *M. orientalis* form b (ovarian egg) (f after Willians, 1931; G, H after Kullenberg, 1942).

Fig. 22



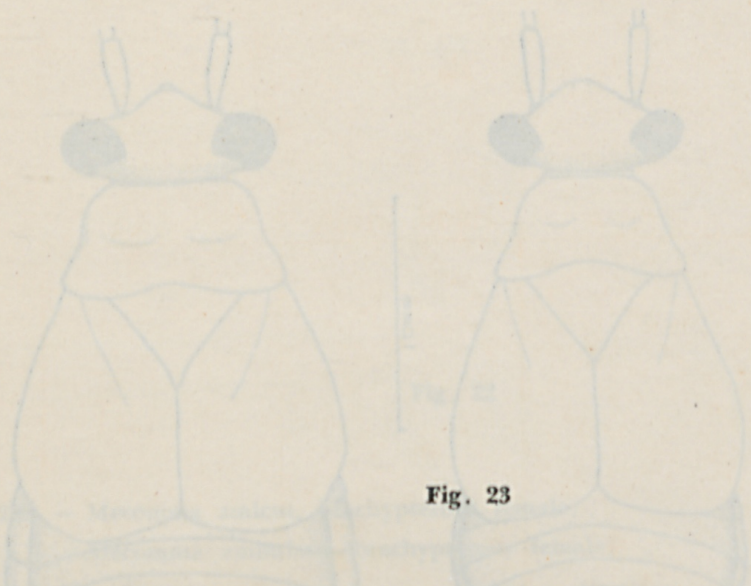


Fig. 23

Fig. 23-25 — Mecomma, scatter diagrams of diagnostic measurements: Fig. 23 — males; Fig. 24 — males; Fig. 25 — females. All measurements in mm., based on tabels I and II.

- ambulans
- amicus
- orientalis orientalis form a
- × orientalis orientalis form b
- orientalis himalayensis

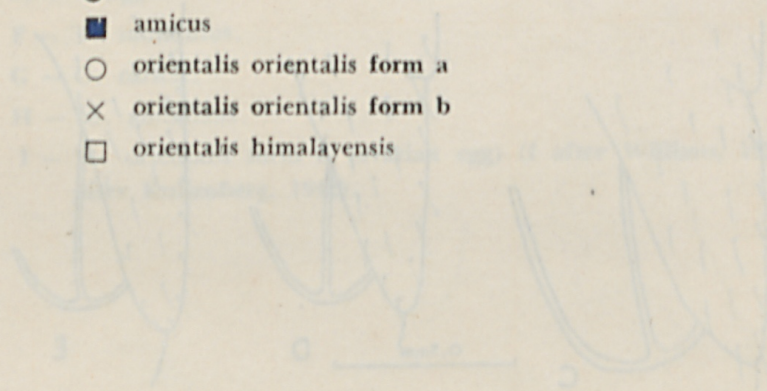


Fig. 23

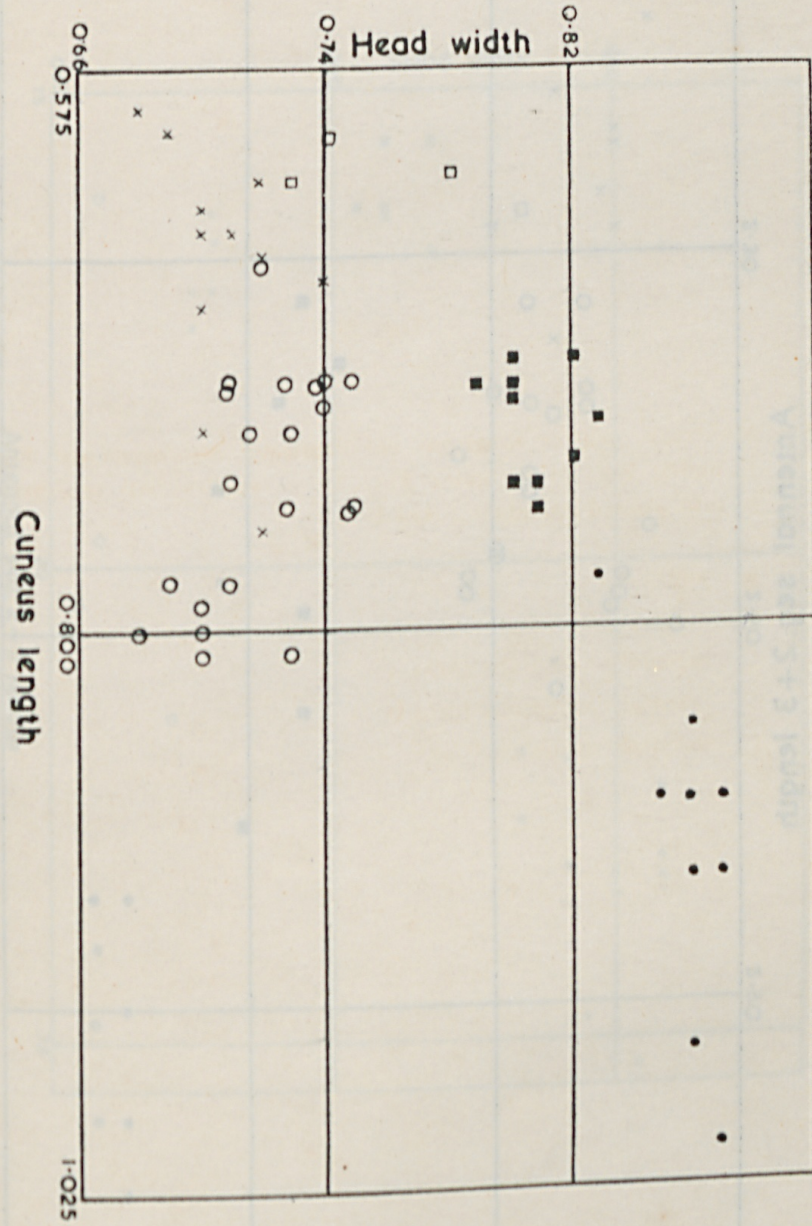


Fig. 24

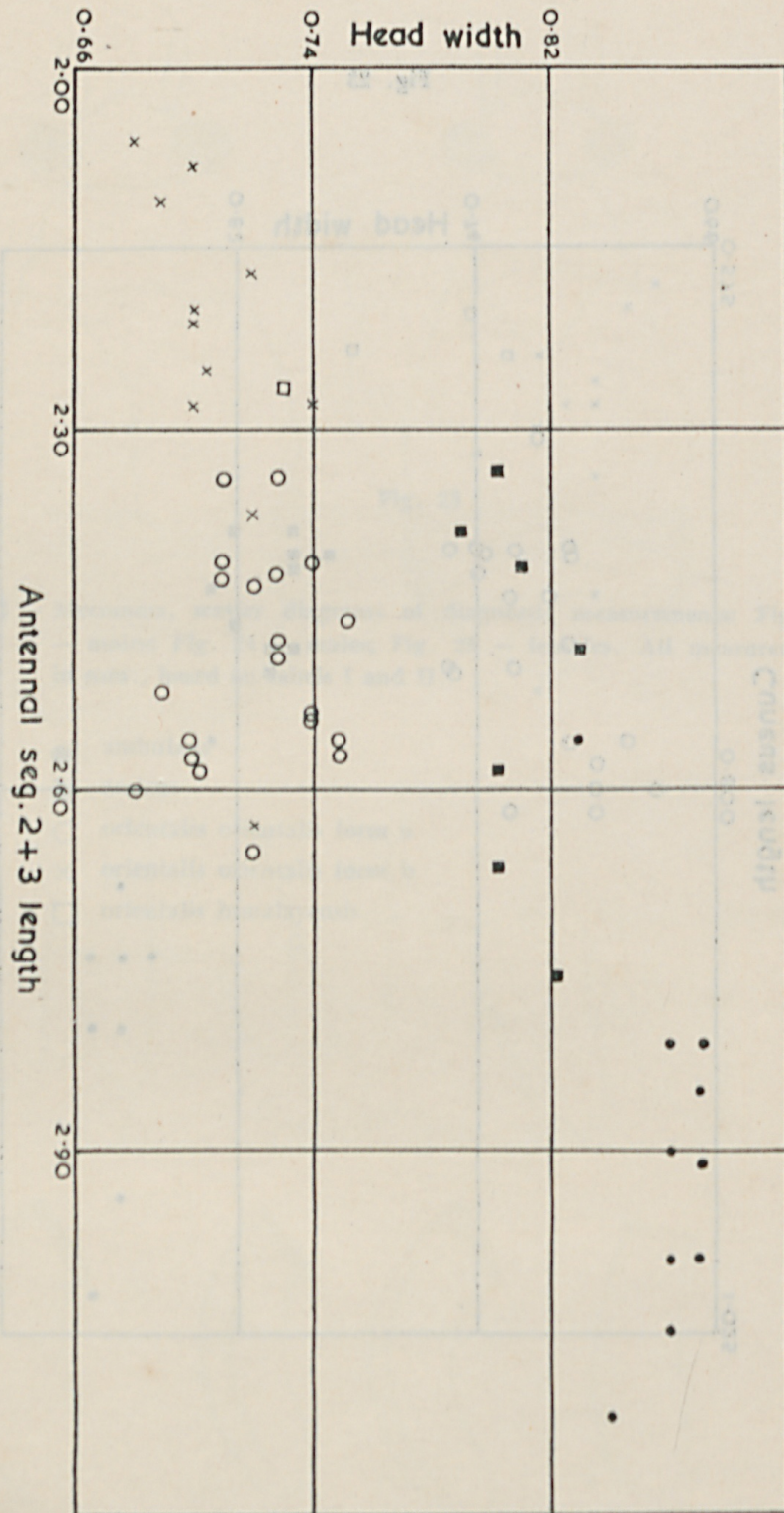


Fig. 25

