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TAXONOMY, PHYLOGENY AND BIOGEOGRAPHY OF THE *TRIDENTIGERA* GROUP OF THE GENUS *CHREMISTICA* STÅL, 1870 (HOMOPTERA, CICADIDAE)

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ABSTRACT

The *tridentigera* group is one of four groups within the genus *Chremistica* Stål, 1870. Its monophyly is based upon genitalia characters. The group comprises 11 species, of which 4 are redescribed and 3 are described as new (*C. minor*, *C. siamensis*, *C. biloba*). The remaining 4 species are endemic to the Philippines and are not redescribed. A key to the males, distribution maps, a phylogenetic reconstruction and a historical biogeographic hypothesis are presented. The *tridentigera* group is distributed in Southern India, Sri Lanka, Thailand, Laos, Malaya, Sumatra, Kalimantan and the Philippines.

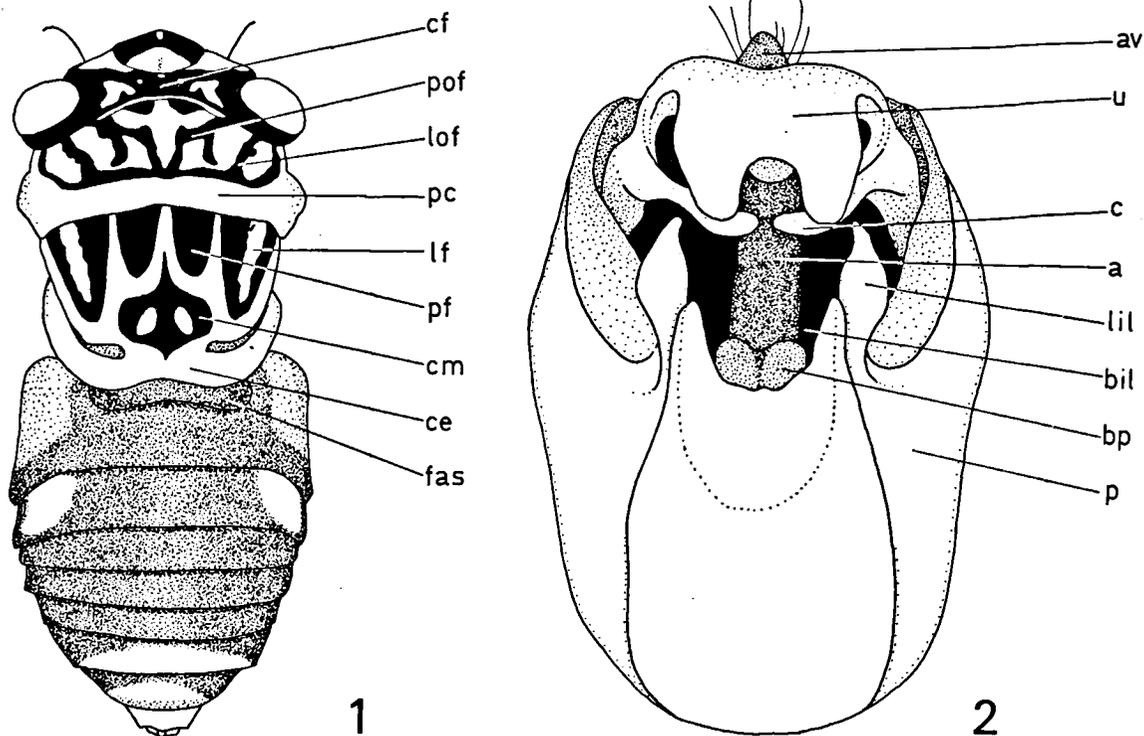
INTRODUCTION

Biogeographic studies of some groups of cicadas from the Papuan and Pacific regions have suggested the impact of palaeogeography in the evolutionary history of these insects (de Boer 1982, Duffels 1983). A similar study of the possible role of palaeogeography in the evolutionary history of a group of cicadas has been undertaken now in the western part of the Oriental region, west of Wallace's Line. The group studied is the *tridentigera* group of the genus *Chremistica*, which is found in continental South East Asia and the western Malaysian archipelago including the Philippines.

The genus *Chremistica* was first described by Stål in 1870 as a subgenus of *Cicada* Linnaeus. I follow Metcalf (1962, 1963) in regarding *Rihana* Distant, 1904, synonymous to *Chremistica*.

Most *Chremistica*'s are easy to recognise at first glance (fig. 1). The Malaysian species all possess about the same pronotum and mesonotum markings, which are sometimes invisible due to very dark colouration. The most important taxonomic characters of the genus are the shape of the head being more or less prominent and longer than half the breadth between the eyes, and the large 2nd abdominal segment in the males, its posterior margin being strongly bent to the posterior at the lateral sides of the abdomen. The male genitalia proved to be most useful in taxonomic and phylogenetic respects; the species can be identified by male genitalia only.

Mainly based upon the structure of the male genitalia I have distinguished 4 groups for which the following names are introduced: the *martini* group, the *coronata* group, the *tridentigera*



Figs. 1-2. 1, *Chremistica* body in dorsal view (*C. tridentigera* from Banguey): ce cruciform elevation; cf central fissure; cm central mark; fas first abdominal segment; fc frontoclypeal suture; lf lateral obconical field; lof lateral oblique fissure; pc pronotum collar; pf paramedian obconical field; pof paramedian oblique fissure. 2, Pygofer of *Chremistica biloba* from Sarawak in ventral view, showing genitalia structures: a aedeagus; av anal valves; bil basal inner lobes; bp basal plates; c clasper; lil lateral inner lobes; p pygofer; u uncus.

group and the *pontianaka* group. According to Metcalf (1962, 1963) *Chremistica* is widespread in South East Asia (18 species) and further recorded from S. India (1 species), Sri Lanka (1 species) and Madagascar (4 species). The genus has been recorded from most Malaysian islands west of Wallace's Line and from continental South East Asia. East of this line *Chremistica* is present in Lombok, Sumbawa, Sumba and Timor (3 species of the *coronata* group) and in Sulawesi by *C. tondana* (Walker).

DEPOSITORIES

The material studied was obtained from the following institutes (the same abbreviations are used in the lists of examined material):

- BMNH British Museum (Natural History), London.
- NRS Naturhistoriska Riksmuseet, Stockholm.
- RMNH Rijksmuseum van Natuurlijke Historie, Leiden.

ZMA Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam.

ZMH Zoologisches Institut und Zoologisches Museum, Hamburg.

PHYLOGENY

Infrageneric relationships in Chremistica

The genus *Chremistica* is tentatively subdivided into 4 species groups: the *martini*, *coronata*, *tridentigera* and *pontianaka* groups. The *martini* group (Madagascar, Seychelles) comprises 4 species [*C. martini* (Distant), *C. pulverulenta* (Distant), *C. hova* (Distant) and *C. nigrans* (Distant)]. This group is characterized by having spots all over the tegmina. The *coronata* group (Lesser Sunda Islands) contains 3 species [(*C. coronata* (Distant), *C. operculissima* (Distant) and *C. timorensis* (Distant)]. Members of this group exhibit long opercula in the males although this is not so

clear in *C. coronata*. In addition, representatives of the *martini* and the *coronata* groups show a long uncus and an even longer aedeagus. The majority of the *Chremistica* species belongs to the *tridentigera* group (SE Asian continent, western Sundaland, Southern India, Sri Lanka) and the *pontianaka* group (SE Asian continent, western Sundaland).

The *tridentigera* group comprises *C. atra* (Distant), *C. biloba* n. sp., *C. minor* n. sp., *C. mixta* (Kirby), *C. polyhymnia* (Walker), *C. seminiger* (Distant), *C. semperi* Stål, *C. siamensis* n. sp., *C. tagalica* Stål, *C. tridentigera* (Breddin) and *C. umbrosa* (Distant). Representatives of the *pontianaka* group are *C. atrovirens* (Guérin-Méneville), *C. germana* (Distant), *C. nesiotis* (Breddin), *C. numida* (Distant), *C. ochracea* (Walker), *C. pontianaka* (Distant), *C. viridis* (Fabricius). The presence of lateral inner lobes, which are restricted to the *tridentigera* and *pontianaka* groups, is beyond doubt an apomorphic character. This is one of the main reasons why the *pontianaka* group is believed to be the sistergroup of the *tridentigera* group. The *pontianaka* group is characterized by the shorter and broader lateral inner lobes and the very short and massive uncus which is completely fused with the well developed claspers. The characters of the uncus and the claspers are regarded apomorphic. Apomorphic character states of the *tridentigera* group (fig. 3) are discussed in the next chapter.

The position of *C. tondana* from Sulawesi remains uncertain since this species is known from one female specimen only. Also, *C. banksi* Liu, *C. euterpe* (Walker), *C. nana* Chen and *C. nigra* Chen have not been examined because the types of these species were not available.

Phylogeny of the tridentigera group

Fig. 3 shows the phylogenetic relationships of the species of the *tridentigera* group studied. Apomorphic states of 6 different characters have been used for phylogenetic analysis which are numbered 1-6 in the cladogram. These characters are the length and the shape of the lateral inner lobes (1), the position of the lateral inner lobes in relation to the basal inner lobes

(2), the presence of processes at the uncus margin (3), the presence of spines at the claspers (4), the presence and shape of the subapical aedeagal process (5) and the structure of the basal plates (6).

The shape of the basal inner lobes has not been used for phylogenetic analysis because similarly shaped lobes are found in many related Cicadidae genera, for instance *Diceroprocta*, *Tibicen*, *Cryptotympana*. The same applies for the operculum characters. In fact no characters other than those of the male genitalia have been used for phylogenetic analysis of the *tridentigera* group.

1. Length and shape of the lateral inner lobes

The possession of lateral inner lobes which are more than 3 times as long as they are wide, is a synapomorphic character of the *tridentigera* group (1.1). The lengths of these lobes vary from rather short in *C. siamensis* to very long in *C. seminiger* and the Philippine species; these lobes have developed into various forms in separated evolution lines, e.g. the very long and twisted lobes of the Philippine species (1.2).

2. Position of the lateral inner lobes in relation to the basal inner lobes

In most species of the *tridentigera* group the lateral inner lobes are situated close behind or in front of the basal inner lobes (2.1) but in *C. seminiger* the basal inner lobes are folded down inside the pygofer. In *C. minor* these lobes are fused (2.2), a complexity which is regarded apomorphic. In most species the lateral and basal inner lobes are adjacent.

3. Processes at the uncus margin

C. mixta and *C. umbrosa* possess a bundle of strong reddish spines at the lateral uncus margin (3.1). These spines look alike in both species. Such spines have not been found in any other species of *Chremistica* and are therefore regarded as a synapomorphy.

4. Spines at the claspers

C. siamensis, *C. mixta*, *C. umbrosa*, *C. biloba* and *C. tridentigera* share strong reddish to yellowish

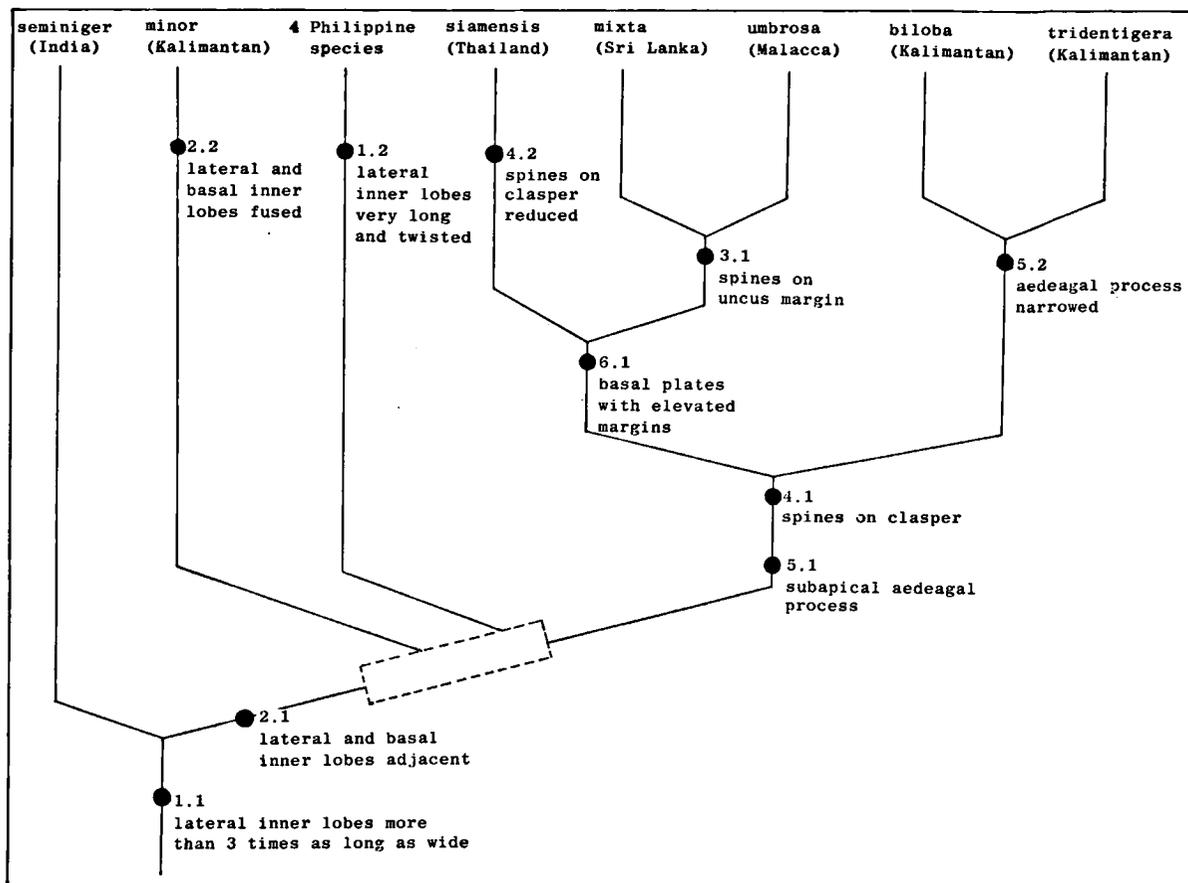


Fig. 3. Postulated phylogenetic scheme of the *tridentigera* group. For explanation see chapter "Phylogeny of the *tridentigera* group".

clasper spines (4.1), situated at both juxtaposed clasper ends. These spines are regarded apomorphic in comparison with the hairs normally found at the same place in other species of the genus. *C. siamensis* shows very thin clasper spines, possibly caused by spine reduction (4.2).

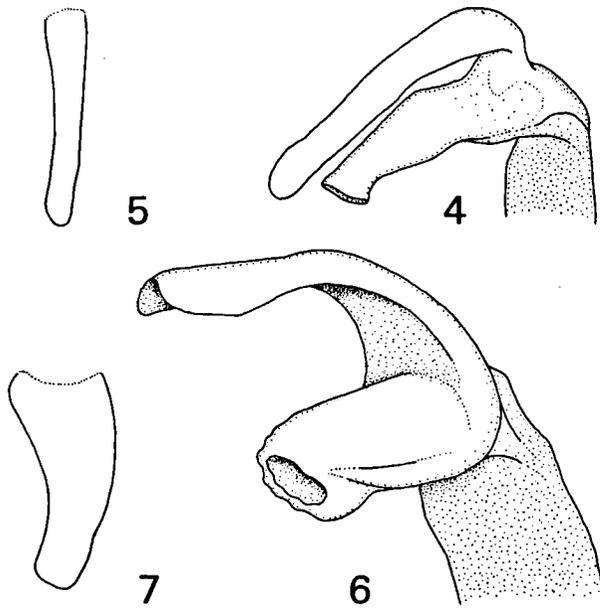
5. Aedeagal processes

This is a very important character since an aedeagal process is absent in *C. seminiger*, *C. minor* and the Philippine species *C. atra*, *C. polyhymnia*, *C. semperi* and *C. tagalica*. The same 5 species possessing clasper spines show a subapical flat aedeagal process situated just beneath the uncus (5.1, figs. 4-7). Two different forms of this process were observed: a relatively

short process with broadened base in *C. siamensis*, *C. mixta* and *C. umbrosa* and a narrow process without broadened base in *C. biloba* and *C. tridentigera* (5.2). It is difficult to select the apomorphous state of this character but on basis of the smaller distribution area of *C. biloba* and *C. tridentigera* the narrow aedeagal process has been considered apomorphic (De Jong, 1980).

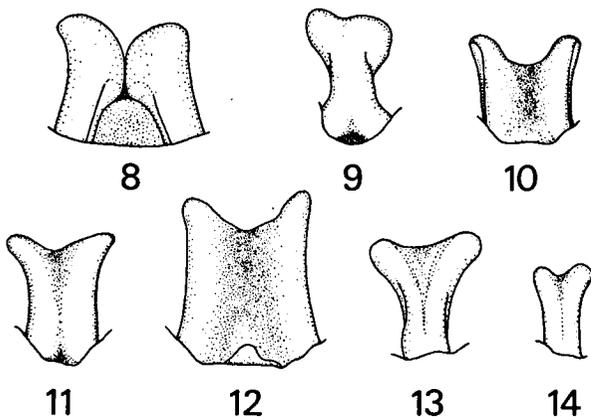
6. Structure of the basal plates

The basal plates are different in every species of the *tridentigera* group (figs. 8-14). These plates exhibit different stages of fusion. Very little fusion is met with in *C. seminiger* (fig. 8) and the Philippine species. More fusion is shown by the remaining species. In my opinion fused basal



Figs. 4-7. Two different forms of the subapical aedeagal process: 4, *Chremistica tridentigera* from Brunei, dorso-lateral view, narrow process; 5, dorsal view; 6, *Chremistica umbrosa* from Pulau Tujuh, dorso-lateral view, broad process; 7, dorsal view.

plates is the apomorphic character state. *C. siamensis*, *C. mixta* and *C. umbrosa* share (very broad) basal plates with elevated margins (6.1), a condition which is regarded apomorphic in



Figs. 8-14. Different shapes of the basal plates of the 7 species in ventro-caudal view; all drawings same magnification: 8, *Chremistica seminiger*, Southern India; 9, *Chremistica minor*, Sarawak; 10, *Chremistica siamensis*, Southern Thailand; 11, *Chremistica mixta*, Sri Lanka; 12, *Chremistica umbrosa*, Pulau Tujuh; 13, *Chremistica biloba*, Sarawak; 14, *Chremistica tridentigera*, Brunei.

comparison with the (narrow) plates without lateral elevations of *C. minor*, *C. biloba* and *C. tridentigera*. In fig. 3 the position of *C. minor* and the Philippine species is uncertain. Together with *C. seminiger* these species show very few synapomorphic characters.

BIOGEOGRAPHY

Biogeography of the genus Chremistica

The distribution of the 4 species groups of *Chremistica* is shown in fig. 15. The *martini* and *coronata* groups are distributed in relatively small and geographically isolated areas (Madagascar, the Seychelles, and the Lesser Sunda islands respectively). The *tridentigera* and *pontianaka* groups, on the contrary, occur almost sympatrically in large parts of South East Asia with a few differences: members of the *pontianaka* group are recorded from Japan (1 species) throughout the South East Asian continent to the Greater Sunda islands Java, Sumatra and Kalimantan, but not from the Philippines and India. The *tridentigera* group does not occur as far north as the *pontianaka* group and is, curiously, absent from Java.

Biogeography of the tridentigera group

Fig. 16 shows the present day distribution of the species of the *tridentigera* group. This is the only species group within the genus *Chremistica* with a disjunct spread. The majority of the species of the *tridentigera* group is found in S.E. Asia, Sumatra, Kalimantan and the Philippines. Two species are recorded from Southern India (*C. seminiger*) and Sri Lanka (*C. mixta*).

Many other taxa show a similar distribution pattern, for example cyprinoid fish (de Beaufort, 1951), agamids (Mani, 1974) and palms (Dransfield, 1981). But the most striking resemblance to the distribution of the *tridentigera* group is found in the scorpion genus *Heterometrus* (Couzijn, 1981). This author believes in a gondwanic origin of this genus on basis of the occurrence of the sister genus of *Heterometrus* in Africa. Since the phylogenetic

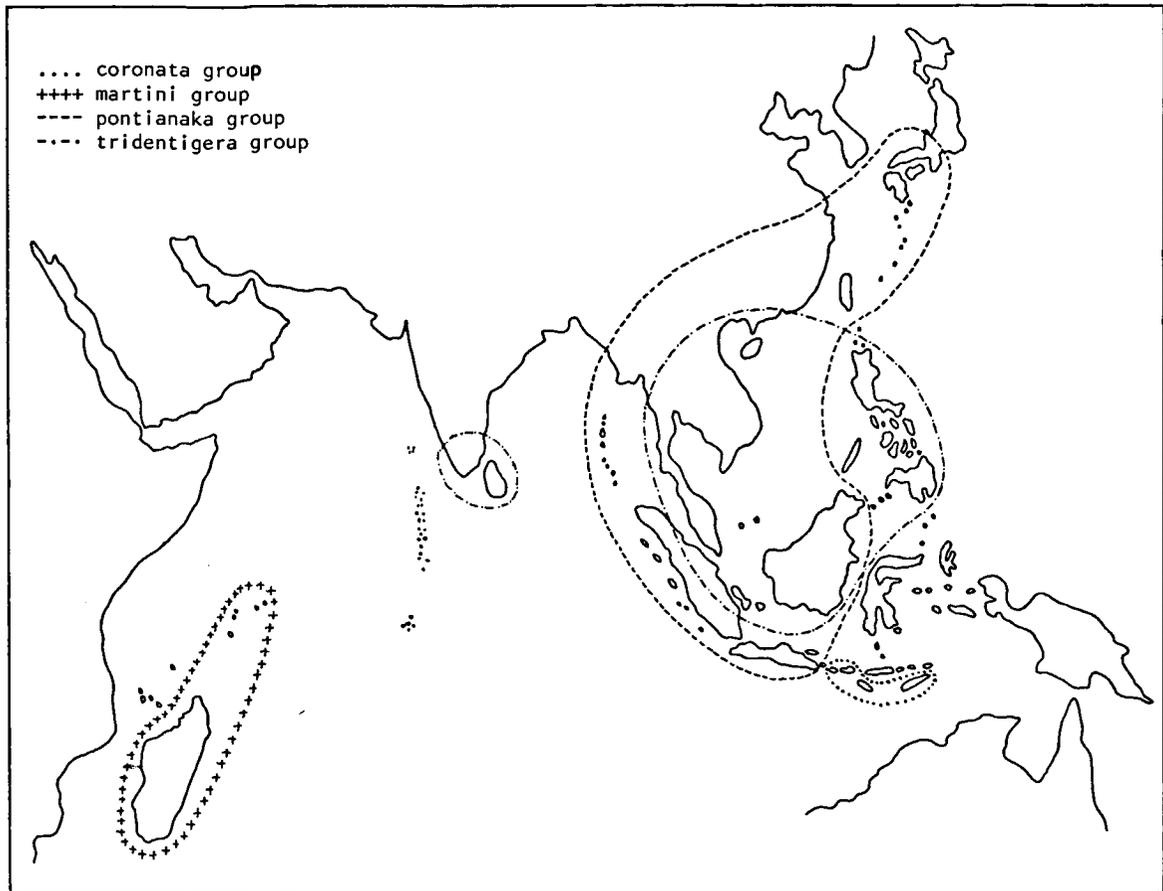


Fig. 15. Present day distribution of the 4 monophyletic groups within the genus *Chremistica*.

position of the *martini* group (distributed in Madagascar and the Seychelles) is not yet thoroughly studied and, secondly, since we do not know the sister genus of *Chremistica*, a similar explanation for the origin and present distribution of the *tridentigera* group is hard to make.

In any case the basic phylogenetic position of *C. seminiger* points in the direction of an origin not very far from India (if not in India itself). From there ancestral members of the species group dispersed to the Philippines and northern Kalimantan where the group is represented by the 4 Philippine species and by *C. minor* respectively. The route along which the ancestors of these species reached the Philippines and Kalimantan may have led via the island arc along Taiwan to Luzon, a route which may

have existed since the middle Cenozoic, or more south from Vietnam directly to Kalimantan. Couzijn (1981) holds the first mentioned route for his subgenus *Heterometrus*. Both routes are possible since no direct relatives were recorded from the large intervening area between India and the Philippines and Kalimantan. This colonization could have taken place during the late Mid-Miocene when sea level was about 1000 meters lower than it is today (Batchelor, 1979).

The colonization of Sundaland by the ancestor of *C. biloba* and *C. tridentigera* must be of a younger age. The occurrence of their sistergroup in Malaya (*C. umbrosa*), Thailand (*C. siamensis*) and Sri Lanka (*C. mixta*) suggests a more western southwards dispersal by the ancestor of the group composed of *C. siamensis*,

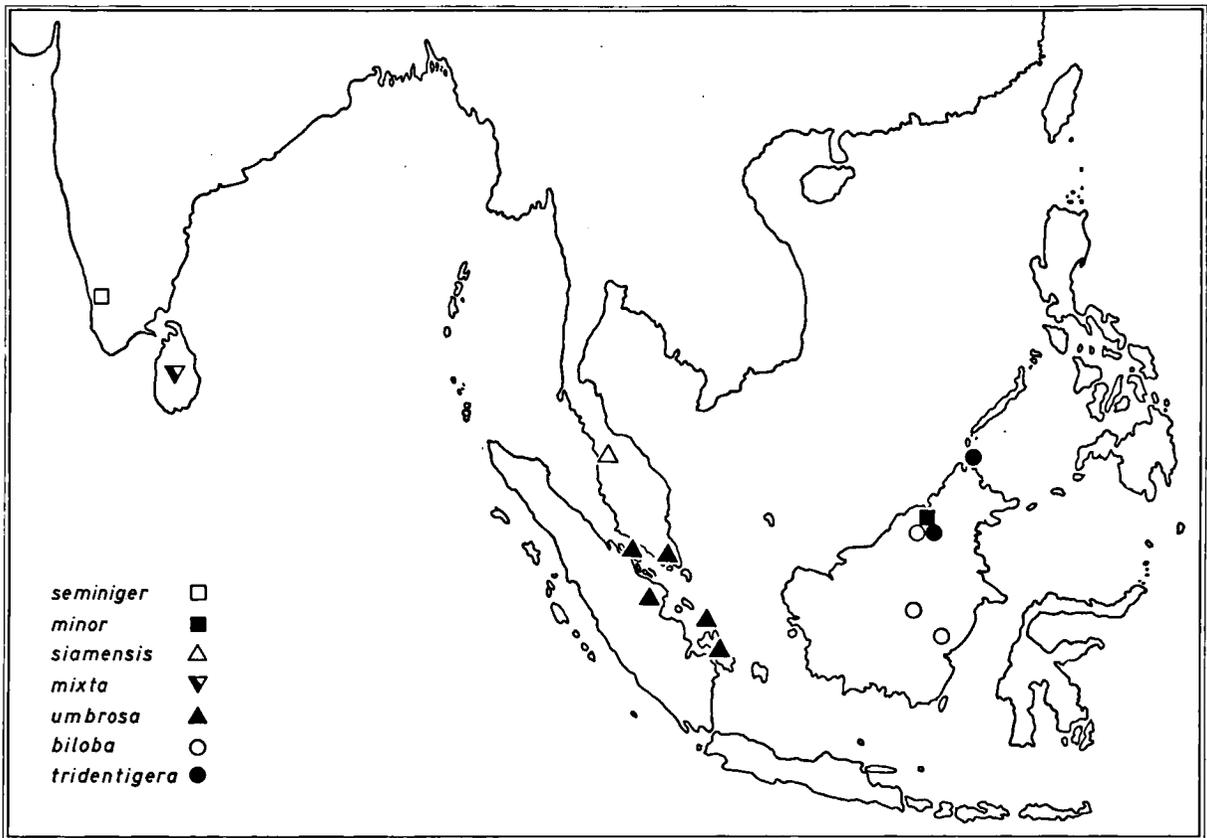


Fig. 16. Localities of the species of the *tridentigera* group.

C. mixta, *C. umbrosa*, *C. biloba* and *C. tridentigera*. Subsequent deviating routes of dispersal or vicariant events gave rise to the occupation of the 5 species in their present allopatric distribution patterns.

The ancestor of *C. mixta* may have migrated from S.E. Asia via the "Assam Gateway" to the South Indian region, which has been done by many other taxa (Mani, 1974). Its absence from India may be explained by the large-scale-destruction of the original woods in India, as a result of both climatic changes and human activities (Mani, 1974).

TAXONOMY

Description of the tridentigera group

In collections *Chremistica* specimens show a colour pattern of black and all kinds of yellow. The

living insects, however, are greenish instead of yellow. Apparently the original green colour changes rapidly into yellow after death (Dr. J.D. Holloway, London, pers. comm., X-1982). Rotten cicadas often turn black all over. However, the black colour of *C. seminiger* and the black forms of *C. umbrosa* are not artificial.

The *tridentigera* group is mainly characterized by the structure of the male genitalia: Lateral inner lobes oblong, more than 3 times as long as wide, apices convex or somewhat acute, arising from the lower half of the lateral pygofer margin. Basal inner lobes oblong, variable in length, apices convex. Uncus large, roof- or spoon-shaped, margin curled down, the central part sometimes developed into an oblong lobe bent down. Claspers only fused with lateral parts of uncus, together forming an arc-like

structure, its median juxtaposed ends closing round the aedeagus.

A key to the males is presented. The distinctive characters of the females are often too small in number to present a key.

- 1a. Opercula partly overlapping 2
- b. Opercula not overlapping 5
- 2a. No white spots on each lateral side of abdomen; body slender, length 21-23 mm *minor*
- b. One or more white spots on each lateral side of abdomen; body more robust, longer than 25 mm 3
- 3a. Pronotum without pronotum collar for the greater part yellow to orange; reddish spot in lateral obconical field of mesonotum *semperi*
- b. Pronotum without pronotum collar for the greater part black; lateral obconical field of mesonotum black 4
- 4a. Pronotum with a yellow to orange median stripe; claspers and lateral uncus margin with bundles of strong spines (figs. 29-30); basal inner lobes in front of lateral inner lobes (fig. 28) *mixta*
- b. Pronotum black or with a small dark brown median stripe; claspers and uncus margin without strong spines; basal inner lobes behind lateral inner lobes (fig. 17) *seminiger*
- 5a. Second and third apical area of tegminum not infuscated; lateral inner lobes very long and twisted; no subapical aedeagal process *atra, tagalica, polyhymnia*
- b. Second and third apical area of tegminum infuscated; lateral inner lobes moderately long, not reaching the uncus; aedeagus with a subapical process 6
- 6a. Median opercula margins already diverging from the base, their apices subacutely rounded (fig. 34) 7
- b. Median opercula margins diverging from about half the length, their apices broadly convex (fig. 39) 8
- 7a. Length of body 31-37 mm; claspers weakly developed (fig. 32); median juxtaposed ends of claspers and lateral margins of un-

- cus with bundles of strong spines (fig. 32) *umbrosa*
- b. Length of body 25-28 mm; claspers strongly developed (fig. 24); claspers and uncus without strong spines *siamensis*
- 8a. Uncus bilobate (figs. 35-36); claspers without process *biloba*
- b. Uncus tapering into long lobe (figs. 37-38); claspers with an acute process (fig. 37) *tridentigera*

Chremistica seminiger (Distant, 1909)
(Figs 8, 17-19)

Rihana seminiger Distant, 1909: 208; 1912: 28; 1916: 2
Chremistica seminiger Metcalf, 1963: 180.

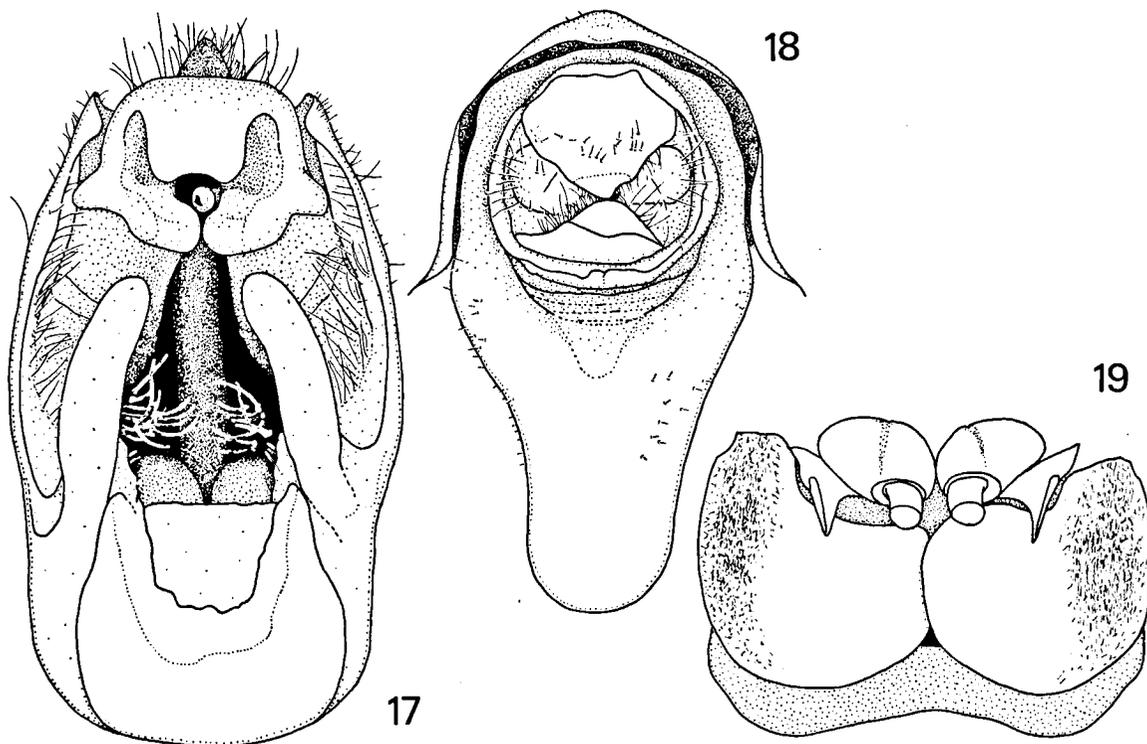
Material examined: INDIA: Nilgiri Hills: "Type" (red label, printed), "H. L. Andrewes 3500 ft" (printed and written), ♂, holotype, BMNH; Anamalai Hills: Cinchona, 3500 ft, IV. 1969, P. S. Nathan, 1 ♂, ZMA.

Description of the male

This species can be recognised by the almost totally black body and the white spots on segm. 3 and 8.

Head: Length little more than half the distance between eyes. Postclypeus moderately prominent, black with dark ochraceous median stripe. Ventral grooves of postclypeus with short white or yellowish pubescence. Lateral parts of anteclypeus black, yellowishly hirsute; median keel bright to dark ochraceous, glabrous, broadening at clypeal suture. Rostrum bright to dark ochraceous with longitudinal black fascia and black top, reaching beyond intermediate coxae. Mandibular plates black with long dense yellowish hairs. Supra-antennal lobes and vertex lobes black with irregular ochraceous to dark castaneous spots. Next to each lateral ocellus an irregularly shaped dark ochraceous spot. Remaining parts of the head black. Antennae about 4 mm long, black.

Thorax: Pronotum very dark brown to black with a narrow dark ochraceous median fascia on anterior half of pronotum. Pronotum collar



Figs. 17-19. *Chremistica seminiger* (Distant, 1909): 17, male genitalia in ventral view, Nilgiri Hills; 18, uncus in dorsal view, Nilgiri Hills; 19, male opercula in ventral view, Nilgiri Hills.

dark ochraceous to almost black. Mesonotum dark ochraceous to almost black; paramedian and lateral obconical fields and central mark black. Paramedian obconical field about half the length of mesonotum disk, lateral obconical field about 9/10 this length. Median point of central mark extending anteriorly far beyond mid-length of mesonotum disk. Thorax ventrally yellow to brown-yellow, median area black, with whitish pubescence.

Legs: Coxae ochraceous with brownish black spots, weakly hirsute with whitish hairs. Femora ochraceous to brownish black or spotted in these colours, weakly hirsute with whitish hairs; spines on anterior femora ochraceous with black top to totally black. Tarsi ochraceous or ochraceous-black spotted, weakly hirsute with whitish hairs; spines on posterior tibiae red-brown to dark castaneous. Tarsi ochraceous-black spotted to black, weakly whitely hirsute.

Tegmina and wings: Basal cell yellow to castaneous. Venation in basal part dark ochraceous, remaining venation dark brown. Tegmina hyaline without infuscations.

Male opercula (fig. 19): Dark brown to black; length 1 to 1.3 times basal breadth. Apices broadly convex; not reaching posterior margin of 2nd abdominal segment. Lateral margins curled up; lateral parts moderately to strongly whitely tomentose; median margins overlapping.

Abdomen: Dorsally black with a few short dark brown hairs, especially at segment boundaries. Tymbal coverings and posterior margins of abdominal segments dark castaneous to black. At each lateral side of segm. 3 and 8 an oval white spot, consisting of very closely inserted short white hairs; spots on segm. 3 larger than spots on segm. 8. Abdomen ventrally castaneous to black; posterior margins of sternites brown-yellow, medially weakly hir-

sute, laterally strongly hirsute with white to brown hairs. Posterior margin of segm. 2 follows curvature of opercula apices.

Male genitalia (figs. 17-18): Pygofer castaneous, its margins broadly dark yellow with an acute brown to black mediodorsal process and a very blunt short brown to black process at both laterodorsal pygofer margins. Lateral inner lobes very long, ochraceous; apices somewhat thickened and slightly bent to each other. Basal inner lobes very small, ochraceous; apices curved inwardly along inner sides of lateral inner lobes. Uncus large, long, slightly curved downwardly, without median furrow, castaneous, apex broadly rounded. Claspers strongly developed, more or less triangular and flat, ochraceous to brownish black with some brownish hairs pointing proximad; at both lateral clasper margins a blunt ochraceous process. Aedeagus red-brown without process.

Measurements: Length of body: 29-35 mm; width of head: 12-13 mm; length of tegminum: 43-47 mm.

Remark: No female specimens were available. However, in the collection of ZMA there is a female specimen from the Anamalai Hills. Due to deviating characters such as a dark yellow pronotum and mesonotum marking this specimen was left out of consideration. Nevertheless, since no other *Chremistica* species was described from Southern India, it might be a *C. seminiger* female.

Distribution: This species is only known from Southern India.

***Chremistica minor* n. sp.**
(Figs 9, 20-23, 40)

Type material: Kalimantan: Holotype ♂, "Sarawak: Gunong Mulu Nat. Park" (printed), "Site 14, February, Camp 2.5, Mulu, 1000 m. 413461, Lower 1. montane for., MV-canopy/understorey" (printed), "J.D. Holloway, RGS Mulu exped., B.M. 1978-206" (printed). BMNH; Paratype: same labels as holotype with exception of habitat label: "Site 8, February, Camp 1, Mulu, 150

m., 385470, Mixed dipt. for., MV-mainly canopy" (printed), 1♂, BMNH.

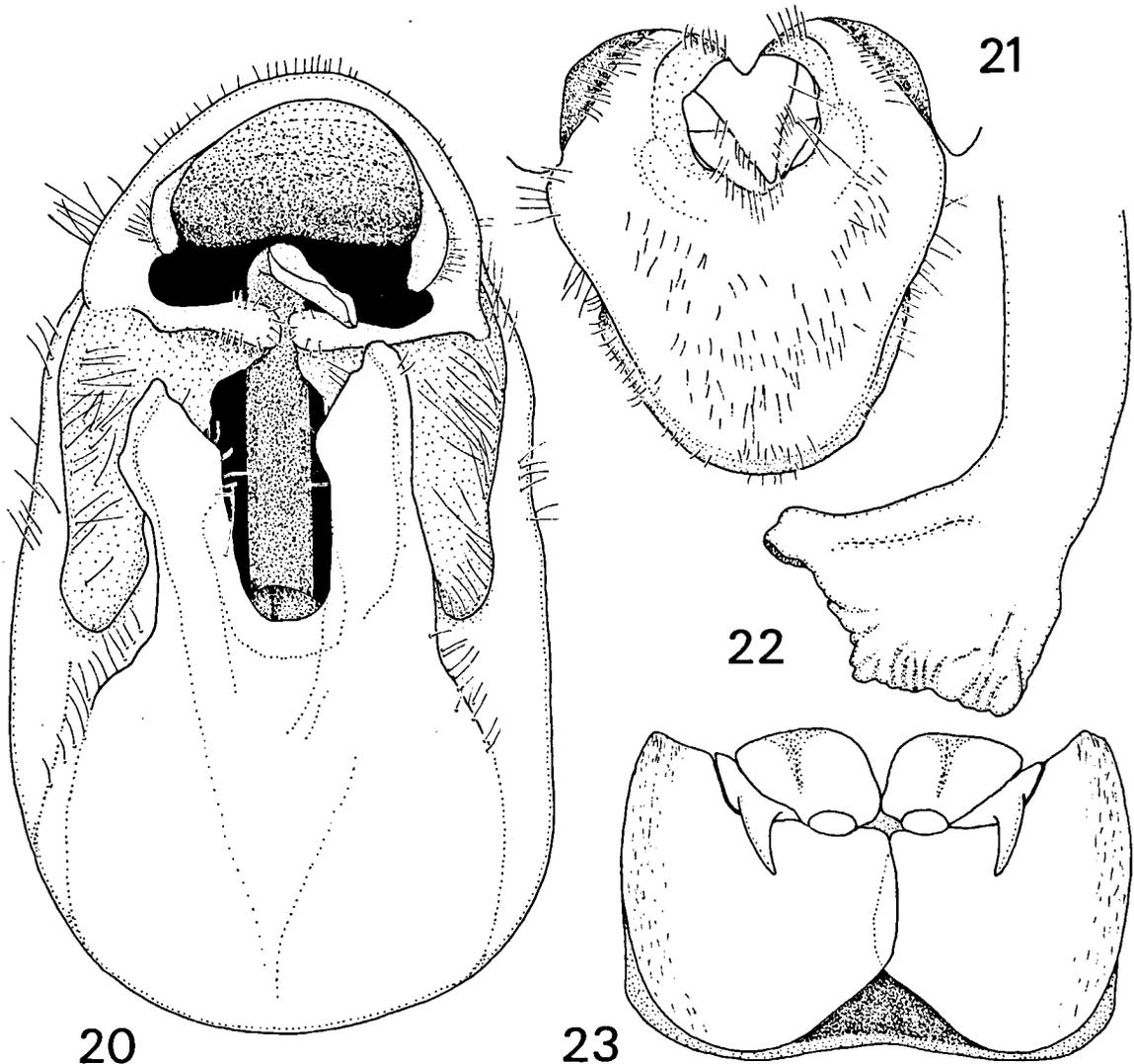
Description of the male

This species is one of the smallest of the genus, and it is remarkable for the slender appearance of the body. The ground colour is dark yellow.

Head: Somewhat longer than half the distance between eyes. Postclypeus moderately prominent with dark yellow transverse ridges; areas between ridges black, less to moderately hirsute with short silvery hairs. Lateral parts of anteclypeus black, silvery hirsute; median keel dark yellow, glabrous, broadening at clypeal suture. Rostrum pale yellow with longitudinal black fascia, reaching beyond intermediate coxae. Mandibular plates black, covered with fairly long yellowish hairs. Supra-antennal lobes dark yellow. Area between eyes black with 2 fairly large, more or less triangular, dark yellow spots next to lateral ocelli. Antennae dark ochraceous, base pale yellow.

Thorax: Pronotum dark yellow with only a few black markings: paramedian oblique fissure with a black colouration extending proximad to a thin black band all along anterior pronotum collar margin which is broader in median and paramedian region; 2 paramedian black spots just behind rim along anterior pronotum margin. Mesonotum dark yellow, paramedian and lateral obconical fields and central mark black. Paramedian obconical field shorter than half the length of mesonotum disk, lateral obconical field approximately 5/6 mesonotum disk length. Median point of central mark extending anteriorly beyond about 2/3 of mesonotum disk length. In each lateral obconical field an irregular lanceolate dark yellow spot. In central mark 2 oval dark yellow spots. Thorax ventrally ochraceous, fairly strongly whitishly hirsute.

Legs: Coxae yellow, weakly hirsute with short white hairs, anterior coxae with a few long white hairs. Femora yellow to ochraceous with some traces of green, weakly hirsute with short white hairs; anterior femora dark brown on the inside, spines yellow with brown apices. Tibiae yellow with some white and brown short hairs;



Figs. 20-23. *Chremistica minor* n. spec.: 20, male genitalia in ventral view, Sarawak; 21, uncus in dorsal view, Sarawak; 22, aedeagus apex in dorsal view, Sarawak; 23, male opercula in ventral view, Sarawak.

spines on posterior tibiae ochraceous to red-brown. Tarsi and claws ochraceous or brown-yellow spotted, weakly hirsute.

Tegmina and wings: Basal cell yellowish to olivaceous. Tegmina hyaline without infuscations. Venation from base to apex fading from yellow to brown.

Male opercula (fig. 23): Dark yellow, about as long as basal breadth. Apices broadly convex; not reaching posterior margin of 2nd abdominal segment. Lateral margins curled up;

lateral parts weakly hirsute with white hairs. Median margins slightly overlapping.

Abdomen: Dorsally dark yellow to ochraceous with a black band along anterior margin of every segment; black band on segm. 2 laterally obliterated; black bands about as broad as remaining yellow parts of the segments. Hairs on segments thin, short, with bronze reflection. Tymbal coverings ochraceous to brown with a small black spot in extreme laterodistal corner. Lateral posterior

margin of segm. 2 only slightly bent to the posterior. No white spot on segm. 3. Abdomen ventrally brown, weakly hirsute. Central area of sternite 2 between opercula black.

Male genitalia (figs 20-22): Pygofer large with respect to the body dimensions, ochraceous with irregular brown marks; mediodorsal process sharply pointed, ochraceous with black median fascia. Lateral inner lobes fairly long, irregular oblong, brown, situated behind basal inner lobes, fused with basal inner lobes along nearly their whole length. Basal inner lobes very large, ochraceous, about as long as lateral inner lobes, irregularly folded, apices pointed. Uncus large, very broad and flat, disk-shaped, margin curled down, dark brown with tiny white hairs; basal lateral uncus margin with a short blunt process. Claspers weakly developed with thickened club-shaped juxtaposed median ends, ochraceous to dark brown. Aedeagus ochraceous to dark brown, its apex fan-like broadened; no subapical process.

Measurements: Length of body: 21-23 mm; width of head: 8 mm; length of tegminum: 29-33 mm.

Remarks: Two female specimens from Mindanao, Philippines showed much resemblance to the male types of *C. minor*. It is not quite certain whether these females indeed belong to *C. minor*. PHILIPPINES: Mindanao, Surigao, coll. Dr. D. MacGillivray, 1 ♀, ZMA; Tibicen polyhymnia (Wk.) Det. J. G. Myers cf. Type, 1 ♀, BMNH.

Distribution: This species has been collected in the Gunong Mulu National Park, North Kalimantan. The females mentioned above have been collected in Mindanao Island, Philippines.

***Chremistica siamensis* n. sp.**
(Figs 10, 24-27, 41)

Type material: Holotype ♂, "Siam, Kedah., S.S. Flower, 99-246" (printed), BMNH; two paratypes: "Siam, W.R.S. Ladell" (printed), "Pres. By Com. Inst. Ent., BM 1948-536" (printed), "G. 49" (written), 1 ♂, BMNH;

"Biserat, Siam: Malay States, No. 24/10/01" (printed and written), 1 ♂, BMNH.

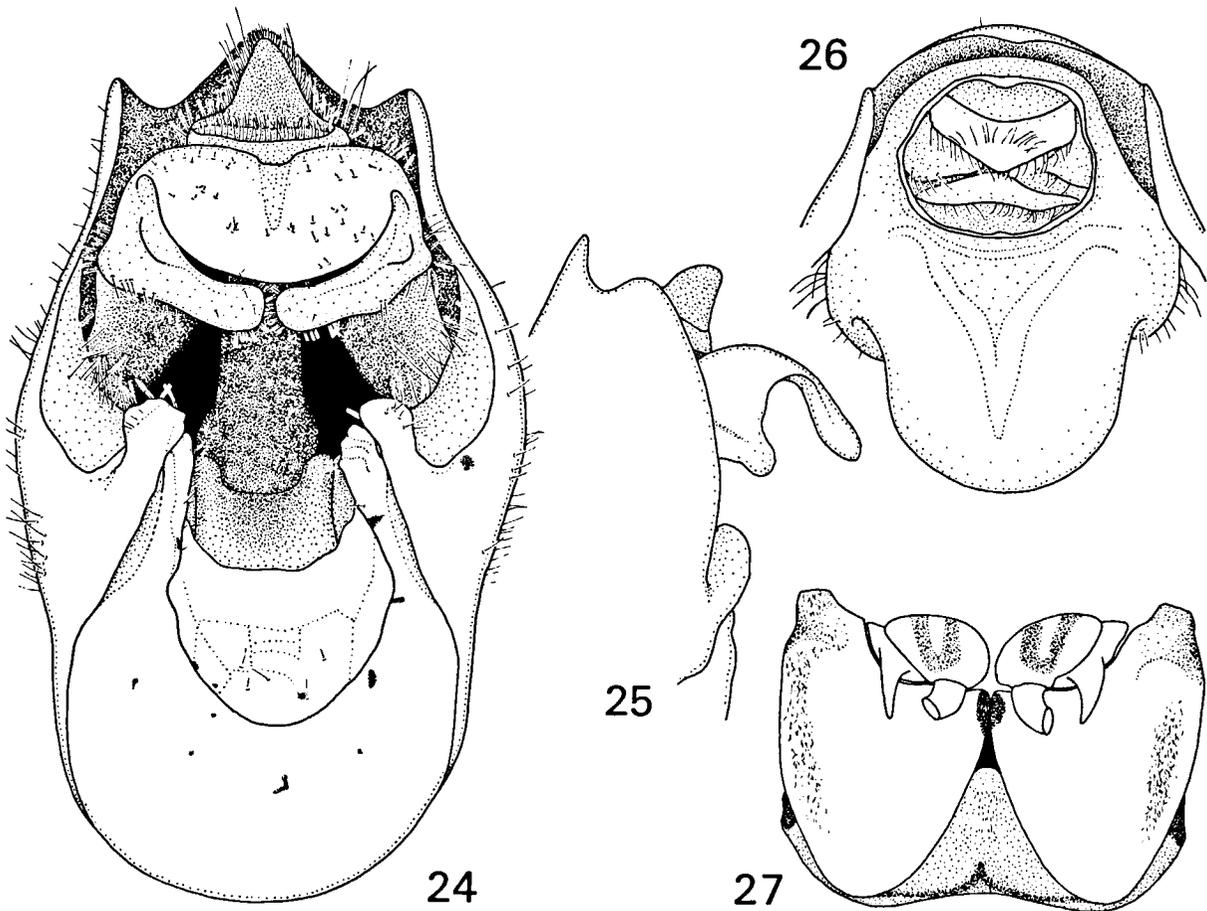
Description of the male

In dorsal view this species looks like *C. bimaculata*; however, *C. bimaculata* possesses a totally ochraceous and glabrous postclypeus, different pronotum markings and opercula characters.

The ground colour of the body is dark ochraceous.

Head: Length little more than half the distance between eyes. Postclypeus moderately prominent with dark ochraceous transverse ridges; areas between ridges black except median area; ventrally grooves moderately to fairly strongly hirsute with short white hairs. Lateral parts of anteclypeus black, whitely hirsute; median keel ochraceous, glabrous, broadening at clypeal suture. Rostrum pale yellow to ochraceous, apex dark brown, reaching posterior coxae. Mandibular plates black with yellow spot, densely whitely hirsute. Supra-antennal lobes dark ochraceous; vertex lobes black with ochraceous spot. Area between eyes black with 2 irregular broad dark ochraceous fasciae running obliquely from postclypeus base over supra-antennal and vertex lobes to posterior head margin behind lateral ocelli. Central fissure triangularly ochraceous. Antennae about 3 mm long, brownish black.

Thorax: Pronotum dark ochraceous. Paramedian oblique fissure narrowly black; lateral oblique fissure brown. Two paramedian black spots just behind rim along anterior pronotum margin. A narrow black band runs all along pronotum collar margin, broadening in median area. Pronotum collar olive to ochraceous. Mesonotum ochraceous; paramedian and lateral obconical fields and central mark black. In each lateral obconical field an irregular lanceolate ochraceous spot. In central mark 2 oval ochraceous spots. Paramedian obconical field a little longer than half the length of mesonotum disk, lateral obconical field about 5/6 mesonotum disk length. Median point of



Figs. 24-27. *Chremistica siamensis* n. spec.: 24, male genitalia in ventral view, Kedah; 25, pygofer of the male in lateral view, Kedah; 26, uncus in dorsal view, Kedah; 27, male opercula in ventral view, Kedah.

central mark continuing anteriorly a little beyond mid-length of mesonotum disk. Thorax ventrally yellowish, moderately to fairly strongly hirsute.

Legs: Coxae ochraceous, weakly hirsute with long white hairs; at base of central furrow of intermediate coxae a dark brown spot, central furrow of posterior coxae surrounded by a brown band. Femora ochraceous, weakly whitely hirsute; anterior femora with a longitudinal black band on the inside, spines dark brown. Tibiae ochraceous, weakly hirsute with short white hairs; spines on posterior tibiae red-brown. Tarsi and claws ochraceous with black spots, weakly hirsute.

Tegmina and wings: Basal cell yellow to ochraceous. Venation in basal part ochraceous,

remaining venation brown. Basal veins of 2nd and 3rd apical areas weakly infuscated.

Male opercula (fig. 27): Brown to ochraceous, somewhat longer than basal breadth. Apices subacutely rounded, not reaching or sometimes slightly extending beyond posterior margin of 2nd abdominal segment. Median margins not overlapping, diverging already from base. Lateral parts in most cases strongly whitely tomentose.

Abdomen: Dorsally black with a brown band on every posterior segment margin; black band wider than brown band except on segm. 2, 7 and 8. Tymbal coverings dark ochraceous with an irregular brown or black spot. At lateral side of segm. 3 an oval large white spot consisting of very closely inserted short white hairs; at segm.

8 a similar but smaller spot. Abdomen ventrally castaneous in median area, yellow to ochraceous in lateral area, with short white pubescence. Posterior margin of sternite 2 follows curvature of opercula apices. Anterior margin of sternite 2 almost completely folded back, fitting precisely on apical opercula margins.

Male genitalia (figs 10, 24-26): Pygofer yellowish, its basal part ochraceous to dark brown; mediadorsal process rather short with convex to subacutely rounded brownish-black apex. At both latero-dorsal pygofer margins a short blunt brownish black process. Lateral inner lobes rather short, about as long as basal inner lobes, ochraceous with blunt apices. Basal inner lobes appressed to inner side of lateral inner lobes, yellow to ochraceous with blunt apices. Uncus broad and short with median fissure, strongly curled downwards, dark castaneous. Claspers strongly developed all over, yellowish to dark ochraceous with a broad subapical process.

Measurements: Length of body: 25-28 mm; width of head: 11-12 mm; length of tegminum: 35-37 mm.

Remarks: The 3 male specimens studied were identified as "Rihana bimaculata" in the British Museum. Many specimens with 2 white abdominal spots have been named "bimaculata" but the only real *C. bimaculata* occurs in Java and belongs to the *pontianaka* group.

Distribution: The species has been collected in Southern Thailand.

Chremistica mixta (Kirby, 1891) (Figs 11, 28-31)

Dundubia mixta Kirby, 1891: 128

Cicada mixta Kirby, 1893: 179

Rihana mixta Distant, 1906a: 34; 1906b: 79, fig. 40; 1912: 28; Kato, 1932: 155; Pringle, 1954: 526, 527 fig. 1, 536, 537 fig. 11, 545 Table 2, 552-554 fig. 20; 1955: 231, Pl. 1; 1957: 152, 153, fig. 10; Leston & Pringle, 1963: 399 fig. 245; Fleming, 1975: 50, 59

Chremistica mixta Metcalf, 1963: 173

Material examined: SRI LANKA (CEYLON): "Type" (red label, printed), "Dundubia mixta

type Kb" (written), "Ceylon. Green Coll. 90-115" (printed), "65" (written), ♀ holotype, BMNH; Punduloya Ceylon, Atkinson Coll. 92-6, 64, 1♂, BMNH; LOCALITY UNKNOWN: Brit. Mus. 1962-168, 1♂, BMNH.

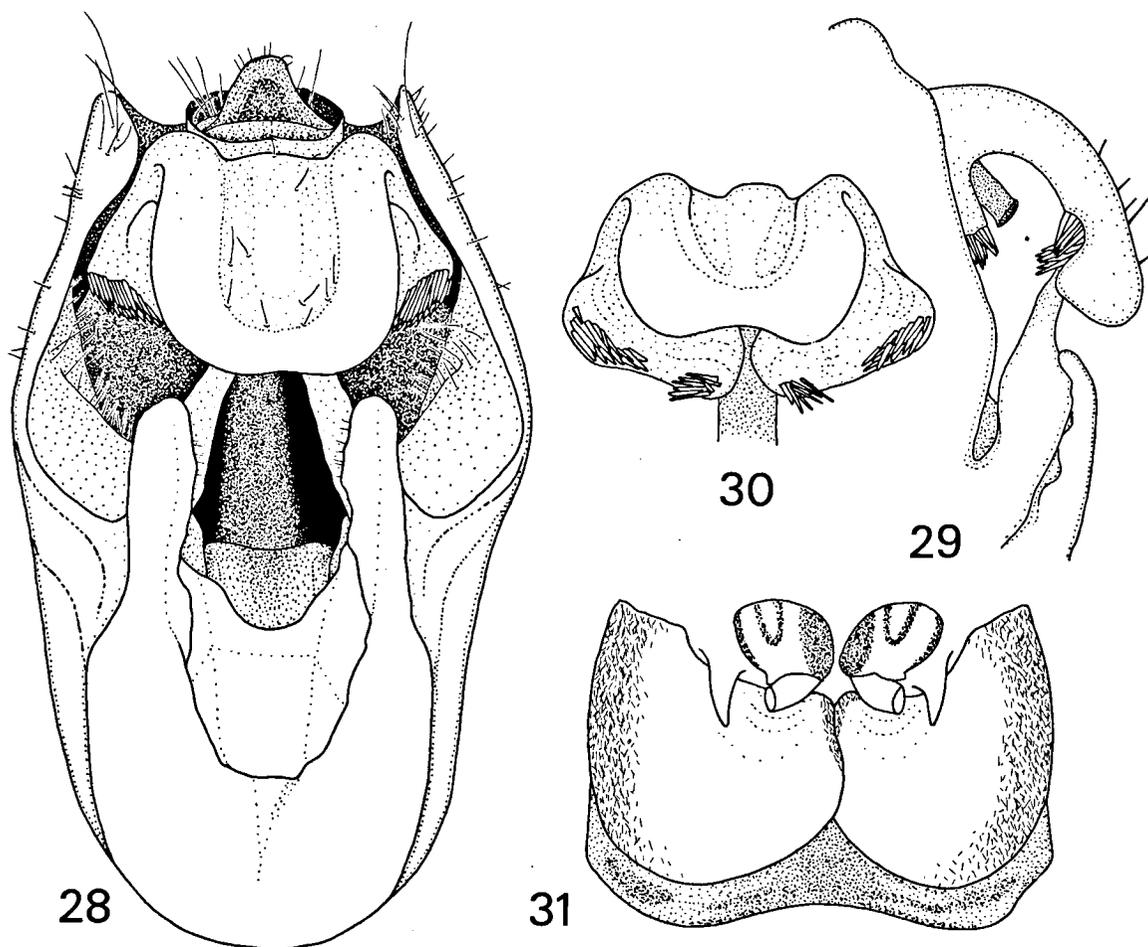
Description

This species can be identified by the ochraceous median stripe on the pronotum and by the black abdomen with 2 large white lateral spots on segm. 3.

The ground colour of the body is orange-yellow to dark ochraceous.

Head: Head longer than half the distance between eyes. Postclypeus prominent, black except a median proximal ochraceous stripe and a triangular ochraceous spot at frontoclypeal suture; ventral grooves moderately hirsute with short silvery hairs. Lateral parts of anteclypeus black, silvery hirsute; median keel dark ochraceous to almost black, glabrous, broadening at clypeal suture. Rostrum ochraceous with broad longitudinal dark brown fascia, reaching beyond intermediate coxae. Mandibular plates black with white to yellowish pubescence. Supra-antennal lobes black with a dark ochraceous fascia; vertex lobes black with a dark ochraceous spot. Area between eyes black with 2 oval ring-shaped dark ochraceous spots next to lateral ocelli. Central fissure sometimes narrowly ochraceous, mostly black. Antennae about 4 mm long, brownish black.

Thorax: Pronotum black with only an oblong dark ochraceous median stripe, not touching pronotum collar which is also ochraceous. Ambient fissure slightly bent forwards at both sides. Mesonotum ochraceous; paramedian and lateral obconical fields and central mark black; the ochraceous ground colour between black markings often blackened leaving only 2 triangular ochraceous paramedian spots and 2 narrow ochraceous lateral stripes; median point of central mark extending anteriorly to pronotum collar. Paramedian obconical field equal in length or little longer than half the length of mesonotum disk; lateral obconical field about



Figs. 28-31. *Chremistica mixta* (Kirby, 1891): 28, male genitalia in ventral view, Sri Lanka; 29, pygofer of the male in lateral view showing uncus spines, Sri Lanka; 30, uncus and claspers in ventro-caudal view showing clasper spines, Sri Lanka; 31, male opercula in ventral view, Sri Lanka.

8/10 mesonotum disk length. Thorax ventrally pale yellow with short white to yellowish pubescence.

Legs: Coxae pale yellow, black on the outside, weakly hirsute; central furrow castaneous. Femora ochraceous with irregular black spots, weakly hirsute along inside margin with fairly long whitish hairs; inside margin of anterior femora black, spines black with red-brown apices. Tibiae yellow with irregular black spots which are largest at anterior tibiae, weakly hirsute with whitish hairs; spines of posterior tibiae red-brown. Colouration and pubescence of tarsi and claws same as tibiae.

Tegmina and wings: Basal cell olive to ochraceous. Venation in basal part ochraceous, remaining venation brown. Tegmina hyaline without infuscations.

Male opercula (fig. 31): Ochraceous, a little longer than basal breadth. Apices broadly rounded, not reaching posterior margin of 2nd abdominal segment. Lateral margins slightly curled up; lateral parts weakly to fairly strongly whitely tomentose; median margins slightly overlapping.

Abdomen: Dorsally black with coppery short hairs, in particular along segment boundaries. Tymbal coverings dark brown. Lateral sides of

segm. 3 with an oval large white spot consisting of densely inserted short white hairs; sometimes a very large white spot extending from segm. 2 to 3 and separated smaller white spots on segm. 4 to 6. Lateral posterior margin of segm. 7 dark yellow to dark brown. On each lateral side of segm. 8 a small white spot which is sometimes absent. Abdomen ventrally shiny castaneous, very weakly hirsute with short yellowish hairs; lateral margins whitely tomentose. Anterior margin of sternite 2 curled up, following curvature of opercula apices. Central area between opercula apices brown to black.

Male genitalia (figs. 28-30): Pygofer ochraceous to castaneous with a very short, blunt, black, mediodorsal appendage. Lateral inner lobes long and slender, somewhat thickened at the level of the apices of basal inner lobes; apices subacutely rounded, pale yellow to ochraceous, reaching beyond uncus lobe. Basal inner lobes well developed, longer than half the length of lateral inner lobes, appressed to outer side of lateral inner lobes, yellow, their apices convex. Anal valves small, leaning over to uncus. Uncus broad, not narrowing towards apex, strongly curved down, apex broadly rounded, laterally elevated, castaneous to dark brown, medially ochraceous. In dorsal paramedian area of uncus some short reddish spines. At both lateral uncus edges a bundle of reddish spines pointing proximad. Claspers weakly developed, ochraceous. At junction of uncus base and clasper a bundle of reddish spines, obliquely directed; also some reddish spines at median juxtaposed clasper ends, pointing proximad. Aedeagus ochraceous to brown, apex tube-shaped with a dorsal subapical lanceolate dark brown process. Basal plates very broad with elevated lateral margins.

Measurements: Length of body: 32-38 mm; width of head: 12-15 mm; length of tegminum: 43-51 mm.

Distribution: *C. mixta* is probably endemic to Sri Lanka.

Chremistica umbrosa (Distant, 1904) (Figs 6-7, 12, 32-34)

Cicada umbrosa Distant, 1904: 330-331

Rihana umbrosa Distant, 1906a: 34; 1912: 28; Moulton, 1912: 128; 1923: 129

Chremistica umbrosa Metcalf, 1963: 181

Rihana pisang Moulton, 1923: 69, 129, 131, 168, pl. IV, figs. 20, 20a-b; Kato, 1932: 155

Chremistica pisang Metcalf, 1963: 178

The types of *Chremistica umbrosa* and *Chremistica pisang*.

The type specimen of *C. umbrosa* in BMNH is an immature male. It carries a red type label and a label "Bouro Doherty". Since the description was probably based on this type only, I regard it as the holotype of *C. umbrosa*. The type material of *C. pisang* in BMNH consists of 2 syntypes (1♂ and 1♀) from Pulau Pisang. I have designated the male as the lectotype of *Rihana pisang*; the female has been labelled paralectotype.

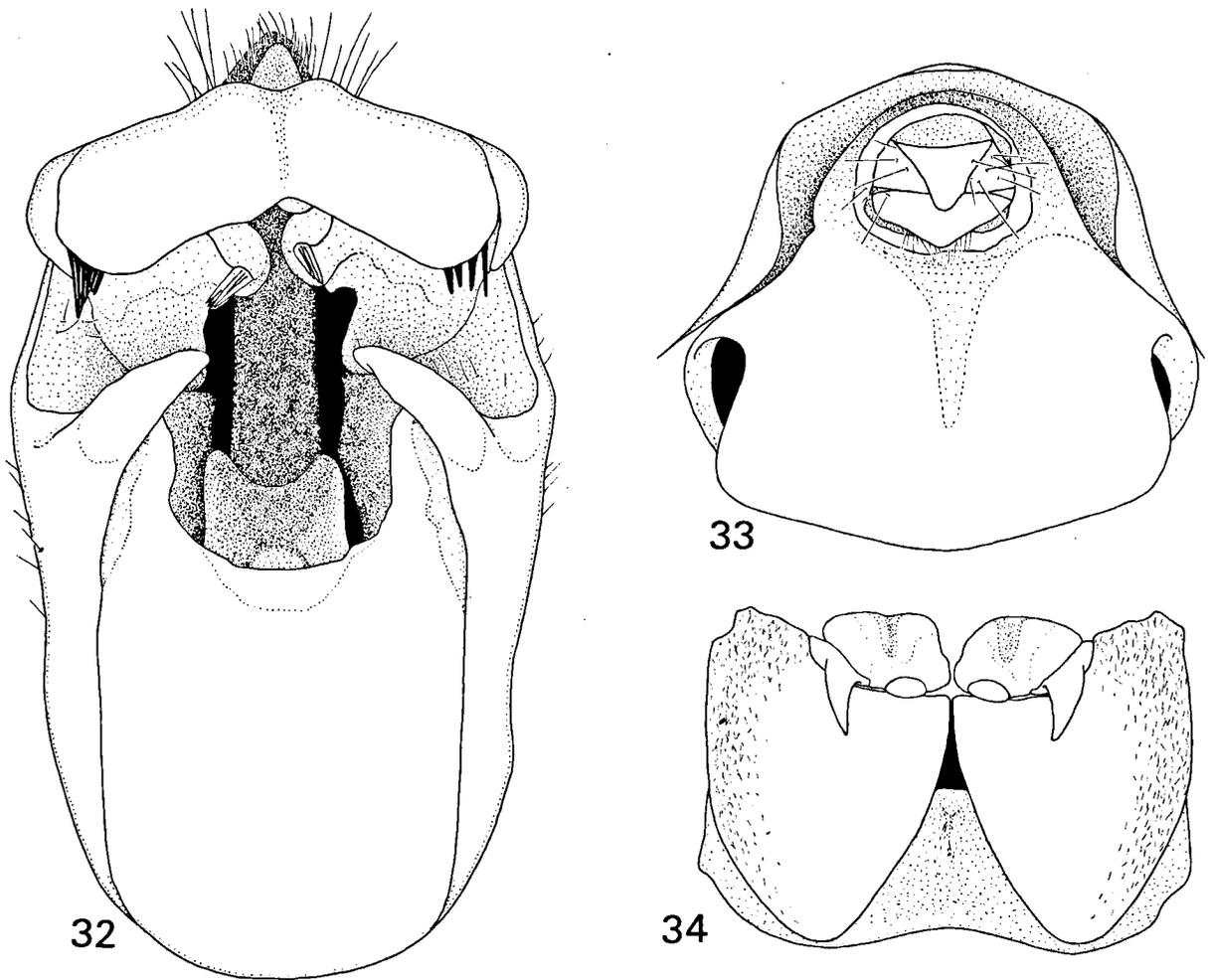
Synonymy: The original colour of the holotype of *C. umbrosa* must have been discoloured by preservation in alcohol. The body is almost totally ochraceous with red-brown mesonotum markings. However, genitalia and opercula of the holotype of *C. umbrosa* are in every way identical to those of the lectotype of *C. pisang*. Therefore, *C. umbrosa* and *C. pisang* are regarded conspecific.

Material examined: PULAU PISANG: ♂ lectotype and 1♀ paralectotype of *C. pisang*, BMNH; PULAU BURU: ♂ holotype of *C. umbrosa*, BMNH; PULAU TUJUH: E.H. Bon, 1974, 3♂ 2♀, ZMA; BANKA I.: E.H. Bon, 1976, 1♀, ZMA; MALAYA: Singapore: W. Schwinghammer, 1909, 1♂, ZMH; SUMATRA: Somgei Lalah, Indragira, W. Burchard, 1900, 1♂, ZMH.

Description

The specific pattern of the mesonotum spots makes this species easy to recognise. The abdomen of the females is often lighter coloured than that of the males.

The ground colour of the body is yellow to brown.



Figs. 32-34. *Chremistica umbrosa* (Distant, 1904): 32, male genitalia in ventral view, Pulau Tujuh; 33, uncus in dorsal view, Pulau Tujuh; 34, male opercula in ventral view, Pulau Tujuh.

Head: Head somewhat longer than half the distance between eyes. Postclypeus prominent with yellow to orange-brown transverse ridges; ventrally grooves black with less to moderate whitish pubescence; dorsally with a large semi-elliptic yellow to orange-brown spot at the frontoclypeal suture. Upper half of median keel of anteclypeus yellow, lower half brown to black. Rostrum reaching posterior coxae. Vertex with a black band along anterior margin enclosing ocelli, its median broadest part touching frontoclypeal suture and lateral ends narrowing towards vertex lobes; eyes with a black margin. Antennae about 4 mm long, brownish black.

Thorax: Pronotum yellow to brown, marking generally as in *C. tridentigera* but black colour of paramedian oblique fissure does not reach anterior pronotum collar margin and the proximal irregular black fascia of paramedian oblique fissure is also sometimes absent. Lateral oblique fissure sometimes yellow. Black band along anterior pronotum collar margin centrally widened. Pronotum collar olive-yellow to pale brown. Mesonotum yellow to pale brown; paramedian and lateral obconical fields and central mark black; all yellow areas enclosed larger than those of *C. tridentigera*; spot in lateral obconical field blends in ground colour between

lateral and paramedian obconical fields; median stripe between both paramedian obconical fields a little broadened behind pronotum collar; spots in central mark often blend in yellow area surrounding central mark. Paramedian obconical field about half as long as mesonotum disk, lateral obconical field about 4/5 mesonotum disk length. Median point of central mark extending anteriorly little or considerably beyond mid-length of mesonotum disk. Thorax ventrally pale yellow and black, mostly strongly hirsute.

Legs: Coxae pale yellow with triangular black spot around central furrow, weakly hirsute with short white hairs. Femora ochraceous with black spots at the base, weakly hirsute; anterior femora ochraceous with dark brown band at inner side, spines yellow with black top and white short hairs between them. Anterior tibiae brown with yellow base; intermediate tibiae ochraceous with black spots at both ends; posterior tibiae olive-yellow to ochraceous with black spots at the top; spines reddish-brown. All tibiae weakly hirsute with fairly short white hairs. Tarsi brownish-black, sometimes yellow spotted, with a few brown hairs; claws red-brown.

Tegmina and wings: Basal cell green to yellow. Venation in basal part olive to ochraceous, remaining venation almost black. Basal veins of 2nd and 3rd apical area weakly infuscated.

Male opercula (fig. 34): All opercula characters as *C. siamensis*.

Abdomen: Dorsally yellow to pale brown with a black band along the anterior margin of the segments. Black bands variable in width; in females narrower than in males. In the female the black band of segm. 3, which is the widest, is still narrower than the yellow band; this black band somewhat widened medially and laterally; segm. 8 with a trident black mark. In the male maximal width of black bands as wide as but mostly wider than yellow bands; lateral parts of abdominal segments often totally black; black bands of segm. 2 and 3 in paramedian area approximately as wide as yellow bands. Tymbal coverings with a variable colouration pattern.

Hind margin of segments with a short golden pubescence. White spots on segm. 3 less distinct than in *C. mixta*, often absent. Abdomen ventrally dark brown, lateral parts sometimes yellowish; weakly to fairly strongly hirsute laterally. In both sexes 2 ochraceous spots on sternite 8.

Male genitalia (figs. 6-7, 12, 32-33): Pygofer pale yellow to ochraceous, basal part dark brown. Mediodorsal process short, fairly sharply pointed, dark brown. Lateral inner lobes moderately long, tapering into subacute apices which are bent in median direction, pale yellow to ochraceous. Basal inner lobes somewhat shorter than lateral inner lobes, apices more rounded and hidden behind lateral inner lobes. Uncus very broad and fairly short with a median furrow, margin curled down, brown to ochraceous with a brown median fascia; both lateral uncus edges with bundles of reddish spines pointing proximad. Claspers weakly developed (hardly swollen), only their median juxtaposed ends thickened and provided with a bundle of reddish spines. Junction of clasper and uncus with a large, curved, sharply pointed, brownish black appendage. Aedeagus brown with a subapical, broad and relatively short, dorsal, dark brown process. Basal plates very broad with elevated lateral margins.

Measurements: Length of body: 31-37 mm; width of head: 13-15 mm; length of tegminum: 43-48 mm.

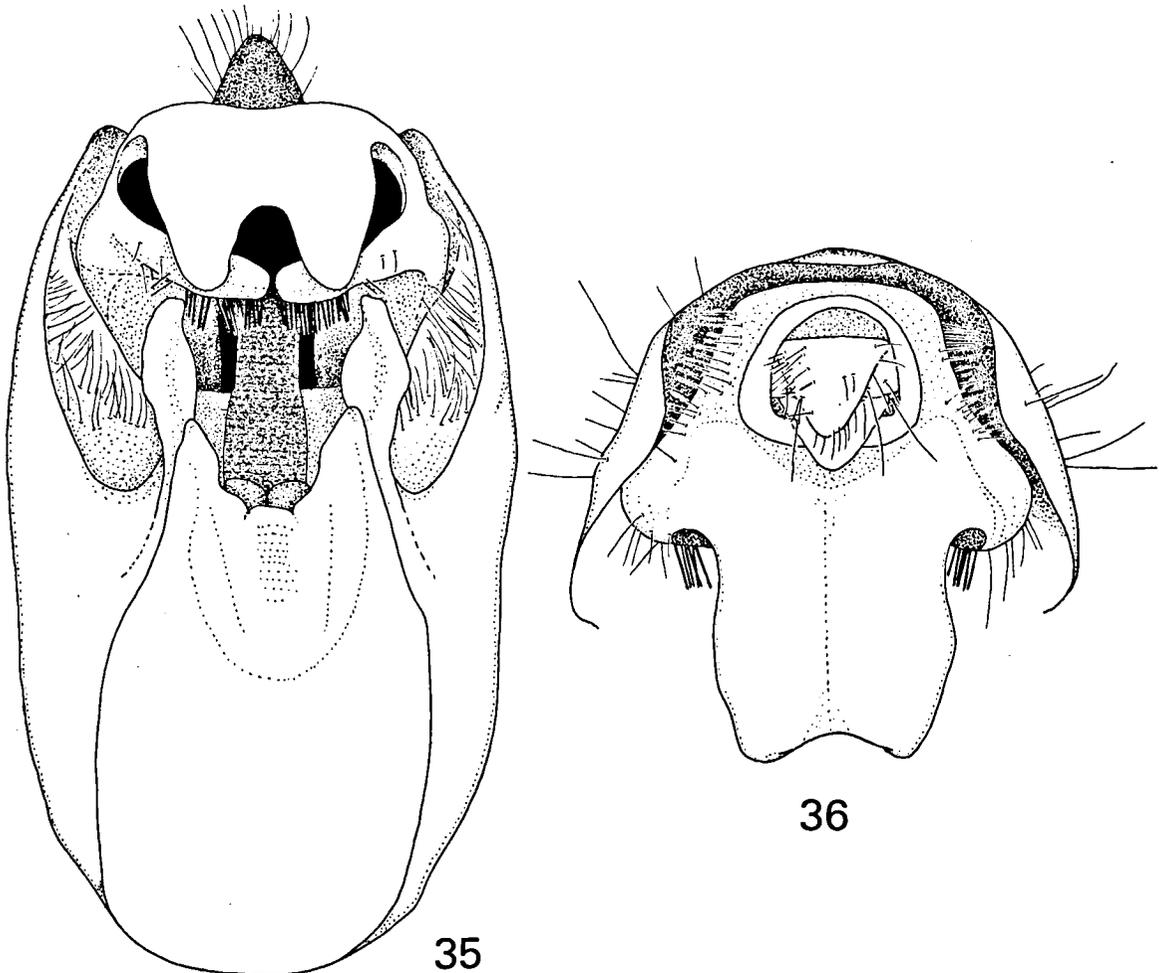
Remark: The collection of the BMNH contains 3 black specimens of *C. umbrosa*, which are described in the following lines: Head, pronotum, mesonotum, legs and dorsal side of abdomen black. Dorsal postclypeus ridges and area between lateral and paramedian obconical fields sometimes dark ochraceous. Male opercula dark castaneous. Abdomen ventrally medially shiny brownish black, laterally dark ochraceous to black. No ochraceous spots on segm. 8. Pygofer brownish black with a subapical transverse dark ochraceous band. Uncus dark castaneous. This black form was recorded from Pulau Pisang, a small island in the Strait of Malacca.

Distribution: The *C. umbrosa* holotype carries a label "Bouro Doherty". Some authors (Distant, 1904, Moulton, 1923) took the location "Bouro" for a corruption of "Borneo", but I believe that "Bouro" stands for "Pulau Buru", a small island in the Strait of Malacca, perfectly fitting in the range of the species. The species was recorded from the southern part of the Malayan peninsula, the eastern coastal area of Sumatra, Banka I. and various islands in the southern Strait of Malacca. Moulton (1923) mentioned one specimen recorded from Borneo and kept in the Sarawak Museum but this may be another species because of the deviating colour markings.

***Chremistica biloba* n. sp.**
(Figs. 2, 13, 35-36, 42)

Type material: KALIMANTAN: Holotype ♂, "Sarawak: Gunong Mulu Nat. Park" (printed), "Site 20. Mar.-Apr., W. Melinau Gorge, 150 m 422577, FEG 3 Kerangas. MV-understorey" (printed), "R.G.S. Exped. 1977-8, J. D. Holloway, BM 1978-206" (printed), BMNH. Two paratypes: same labels as holotype, 1♂, BMNH; "Borneo Exp. Dr. Nieuwenhuis, 1894" (printed), 3 unreadable words and "Mahakkan" (written), 1♂, ZMA.

This species only differs from *C. tridentigera* in the following genitalia characters (figs 35-36):



Figs. 35-36. *Chremistica biloba* n. spec.: 35, male genitalia in ventral view, Sarawak; 36, uncus in dorsal view, Sarawak.

Uncus tapered into 2 short lobes with convex apices, not narrowing towards the apex and shorter than uncus lobe of *C. tridentigera*. Claspers not provided with a process; some strong reddish or yellowish spines laterally on the clasper, pointing in different directions. Aedeagal process shorter.

Measurements: Length of body: 29-31 mm; width of head: 12-13 mm; length of tegminum: 41-43 mm.

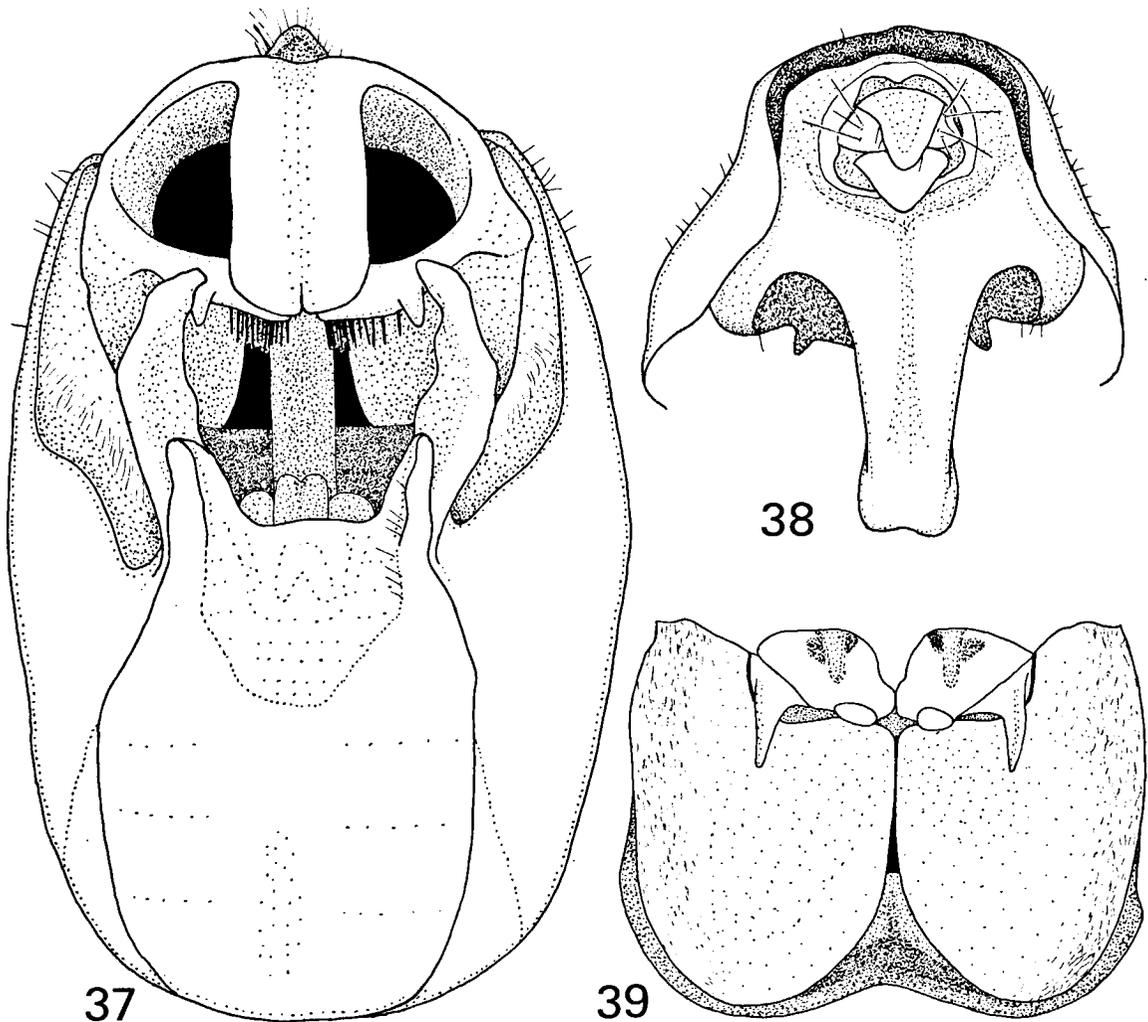
Distribution: The species is known from Sarawak (Northern Kalimantan) and Central Kalimantan.

***Chremistica tridentigera* (Breddin, 1905)**
(Figs 1, 4-5, 14, 37-39)

Cicada tridentigera Breddin, 1905: 220; Weidner & Wagner, 1968: 142

Chremistica tridentigera Metcalf, 1963: 181

Lectotype designation: The type material comprises one ♀ labelled "type" and 2 ♀ and 1 ♂ labelled "paratype". The specimen labelled "type" carries the following labels: "Banguay, Ins. nördl. Borneo, W. Kedenburg, ded. 20.VII.1894" (printed), "type" (red label, printed), "Cicada tridentigera, Type!, Bredd."



Figs. 37-39. *Chremistica tridentigera* (Breddin, 1905): 37, male genitalia in ventral view, Sarawak; 38, uncus in dorsal view Boentok; 39, male opercula in ventral view, Sarawak.

(Breddin's handwriting), and "G. Breddin determ." (printed). The paratypes carry a red label "Paratype" (printed) instead of the "Type" label, and further similar labels as the holotype but without the word "type" on the name label. Probably the red type and paratype labels have not been attached by Breddin but afterwards. However, the only animal that totally matches the original description (in particular in dimensions of body and tegmina) is a ♂ specimen without type label. This specimen carries 3 labels "C. tridentigera Bredd." (written by Breddin), "R. tridentigera Brdd." (written in other handwriting) and "G. Breddin determ." (printed). Therefore, it seems to me that mislabeling or a changement of labels has taken place. So I designate the specimen without type label as lectotype of *Cicada tridentigera*. The specimens with "type" and "paratype" labels have been labelled "paralectotype".

Material examined: BANGUEY: ♂ lectotype, 1♂ 3♀ paralectotypes, ZMH. KALIMANTAN: North Borneo, Brunei, Waterstradt, 2♂, BMNH; Central Borneo, Boentok, Barito River, 1910, G. C. Shortridge, 1♂, BMNH; Sarawak, Gunong Mulu National Park, 1977-8, site 16, Long Pala, Base, alt. 70 m, J. D. Holloway, RGS Mulu expedition, 2♂, BMNH; same labels but site 20, W. Melinau Gorge, alt. 150 m, 2♂, BMNH.

Description of the male

C. tridentigera is described in male sex only since females of this species and of *C. biloba* could not be separated.

Ground colour of head and thorax yellow to dark orange, ground colour of abdomen brown.

Head: Head half as long as distance between eyes or little longer. Postclypeus moderately prominent with transverse ridges; ventrally ridges yellow to orange, grooves black, less to moderately hirsute with short silvery hairs; dorsally proximal ridges black, frontoclypeal suture with a large semi-elliptic yellow to orange spot. Lateral parts of anteclypeus black, silvery hirsute; median keel yellow, glabrous, broadening at clypeal suture. Rostrum pale

yellow with longitudinal black fascia, reaching beyond intermediate coxae. Mandibular plates pale yellow with 2 black spots next to anteclypeus; colours sometimes invisible due to dense white to yellowish pubescence. Supra-antennal lobes and vertex lobes yellow. Area between eyes black with 2 oblique mushroom-shaped yellow spots next to lateral ocelli. Central fissure sometimes yellow. Antennae about 3 mm long, brownish black.

Thorax: Paramedian and lateral oblique fissures broadly black. Two paramedian black spots just behind rim along anterior margin. From about half-way each paramedian oblique fissure a black irregular fascia runs proximad, not reaching black colouration of lateral oblique fissure and curled sideways at the tops. A black band runs all along anterior pronotum collar margin, sometimes centrally interrupted. Mesonotum with paramedian and lateral obconical fields and central mark black. Paramedian obconical field a little longer than half the length of mesonotum disk; lateral obconical field about 5/6 mesonotum disk length. Median point of central mark extending anteriorly a little above midlength of mesonotum disk. In each lateral obconical field an irregular lanceolate yellow spot. In central mark 2 oblique oval yellow spots. Thorax ventrally pale yellow, with short white to yellowish pubescence.

Legs: Coxae pale yellow, weakly hirsute with long white hairs; on posterior coxae sometimes 2 brown spots next to central furrow. Femora ochraceous, weakly to fairly strongly hirsute on the inside with short white hairs; inner side of anterior femora with a longitudinal black stripe; spines dark brown. Tibiae ochraceous to dark brown, weakly hirsute with short white hairs; spines on posterior tibiae red-brown. Tarsi dark brown or dark brown with yellow spots, glabrous or weakly hirsute.

Tegmina and wings: Basal cell yellow to greenish. Venation in basal part yellow to ochraceous; remaining venation brown. Basal veins of 2nd and 3rd apical areas weakly infuscated.

Male opercula (fig. 39): Ochraceous to dark brown, length about $1\frac{1}{4}$ × basal breadth.

Apices broadly convex, not reaching posterior margin of 2nd abdominal segment. Lateral parts weakly to fairly strongly whitely tomentose; lateral margins curled up; median margins not overlapping, only touching each other at base.

Abdomen: Dorsally dark brown to black with coppery short hairs, especially on segment boundaries. Tymbal coverings brown. On lateral side of segm. 3 an oval large white spot, consisting of very closely inserted short white hairs. On segm. 7 and 8 a dark yellow band running along posterior margins, in the middle broader than remaining brown to black colouration, narrowing laterad. Abdomen ventrally ochraceous, pale brown to red-brown, weakly to fairly strongly hirsute, especially on lateral parts. Posterior margin of sternite 2 follows curvature of opercula apices. Anterior margin of sternite 2 almost completely folded back, fitting precisely on apical operculum margins. Central area between opercula darker coloured.

Male genitalia (figs 14, 37-38): Pygofer pale yellow to ochraceous with a very short, blunt, dark coloured, mediodorsal process. Lateral inner lobes flattened, their apices blunt and bent to each other, pale yellow to dark brown. Basal inner lobes about half the length of lateral inner lobes, appressed to inner side of lateral inner lobes, pale yellow to ochraceous. Anal valves small, leaning over to uncus. Uncus broad at its base, rapidly narrowing into a curved long lobe with central fissure, ochraceous to dark brown; lobe being lighter coloured than base. Claspers strongly developed, ochraceous to dark brown; median juxtaposed ends of both claspers thickened, with stiff reddish spines pointing proximad; lower margin of each clasper with a sharply pointed dark brown appendage, pointing to pygofer lobes. Aedeagus ochraceous to dark brown, with a dorsal subapical lanceolate process.

Measurements: Length of body: 26-32 mm; width of head: 11-13 mm; length of tegminum: 39-44 mm.

Remarks: The 2 specimens from Mulu at 150 m are ventrally more hirsute than the others.

Female material examined (C. tridentigera or C. biloba): KALIMANTAN: Sarawak, Gunong Mulu National Park, 1977-8, site 7, Long Pala (Base), 50 m, J. D. Holloway, RGS Mulu expedition, 3 ♀, BMNH; same labels but site 20, W. Melinau Gorge, 150 m, 1 ♀, BMNH; same labels but site 23, W. Melinau Gorge, 250 m, 1 ♀, BMNH; same labels but site 28, Long Pala, 50 m, 1 ♀, BMNH; Balikpapan, Z.O. Borneo, juli 1912, 1 ♀, RMNH.

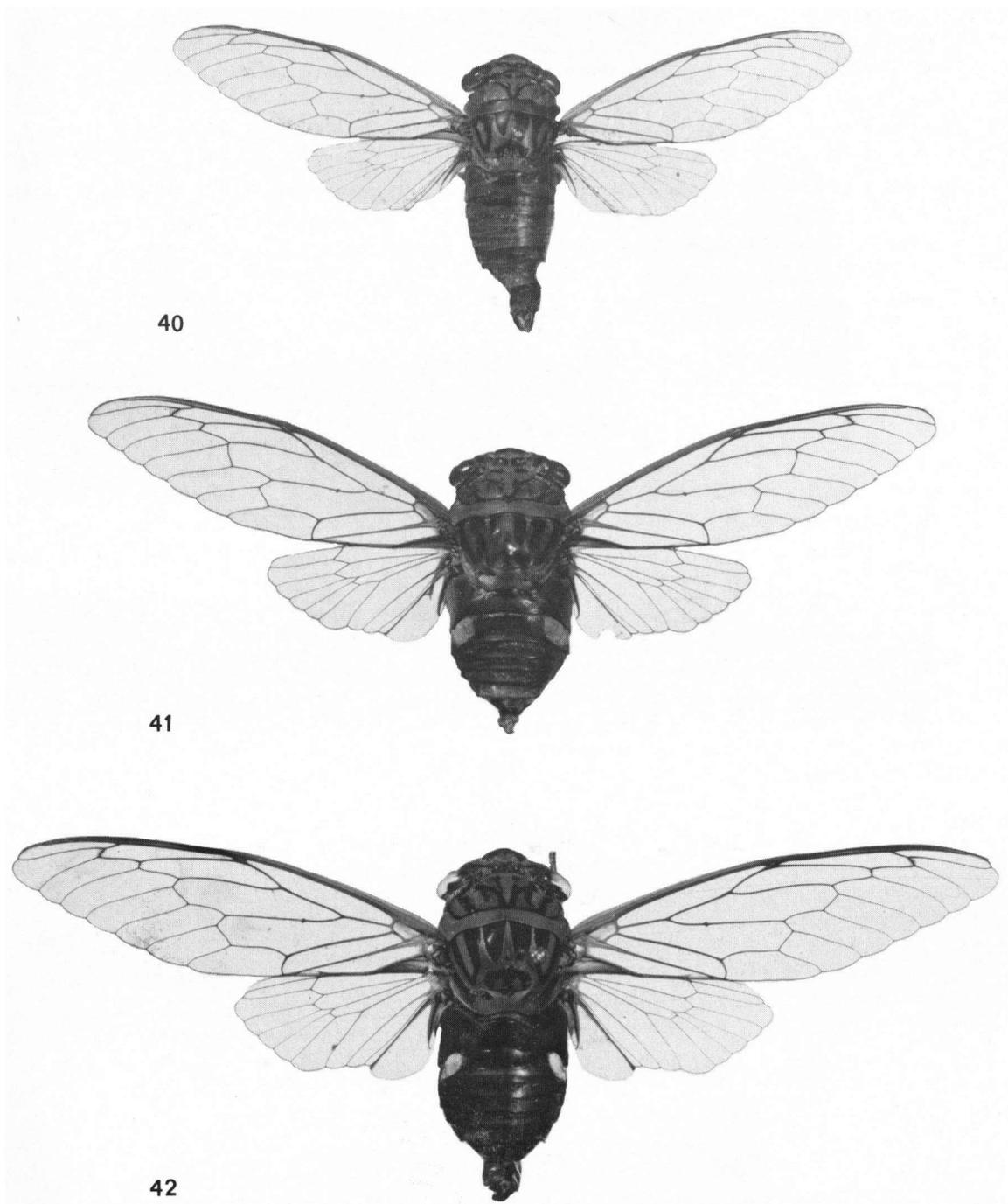
Distribution: The species has been recorded from Banguay island, just north of Kalimantan (Borneo) and from north and central Kalimantan.

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Figs. 40-42. 40, *Chremistica minor* n. spec.: male holotype; 41, *Chremistica siamensis* n. spec.: male holotype; 42, *Chremistica biloba* n. spec.: male holotype.

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