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## Occurrence of Mukariinae (Homoptera, Cicadellidae) in Japan, with Description of a New Species

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**Abstract** Two species of the cicadellid subfamily Mukariinae are newly recorded and described from the Ryukyu Islands, Japan; they are *Mukaria maculata* (MATSUMURA) and *M. zonata*, sp. nov. The lectotype of *Parabolotettix maculatus* MATSUMURA is here designated. Some biological notes are also given.

Key words: Homoptera; Cicadellidae; Mukariinae; new record; new species; Japan.

LINNAVUORI (1979) erected the cicadellid subfamily Mukariinae, in consequence of raising Mukariini, a tribe of Nirvaninae, to superior rank. This subfamily, characterized mainly in the cephalic structure and ♂ genitalia, comprises two Oriental and two Ethiopian genera. The Oriental Mukariinae are represented by *Mukaria* DISTANT and *Buloria* DISTANT (METCALF, 1963). The genus *Mukaria* contains 7 nominal species, *splendida* DISTANT, *penthimioides* DISTANT, *maculata* (MATSUMURA), *dorsivitta* MELICHAR, *confersa* (ISHIHARA), *variabilis* EVANS and *nigra* KUOH et KUOH, distributed in the Oriental region and Pacific.

As a result of my recent field research in the Ryukyu Islands, I was able to recognize the occurrence of *Mukaria maculata* and 1 *Mukaria* species new to science. In this paper, I am going to describe these cicadellids, and to designate a lectotype for *Parabolotettix maculatus* MATSUMURA.

The depositories of the material used are abbreviated as follows: HUS, Institute of Systematic Entomology, Hokkaido University, Sapporo; KUF, Entomological Laboratory, Kyushu University, Fukuoka; NIAES, National Institute of Agro-Environmental Sciences, Tsukuba; SUU, Department of Biology, Saitama University, Urawa.

I am much indebted to Prof. S. TAKAGI and Dr. M. SUWA (HUS), Prof. K. MORIMOTO and Mr. S. KAMITANI (KUF), and Mr. K. KONISHI (NIAES) for the loan of invaluable specimens. Ms. W. HONGSAPRUG (Department of Agriculture, Bangkok) kindly sent Thai material for comparison, for which I express my thanks. I also thank Prof. S. AZUMA and Mr. M. KINJÔ (University of the Ryukyus, Okinawa), Mr. T. OKA (Irabu High School, Miyako, Okinawa) and my colleagues (SUU), for their help to my study and/or offering material.

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*Mukaria maculata* (MATSUMURA, 1912)

(Figs. 1, 4-12)

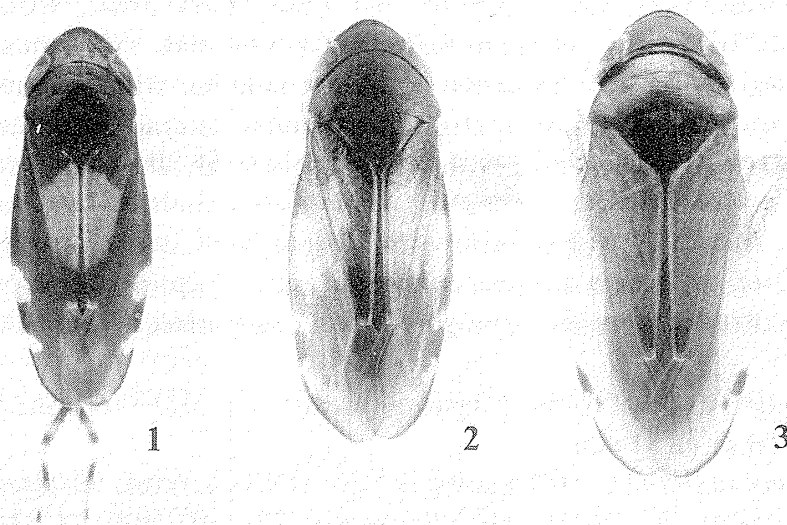
*Parabolotettix maculatus* MATSUMURA, 1912: 281. Lectotype ♂, Taiwan, here designated [examined].

*Mukaria maculata*: SCHUMACHER, 1915: 97.

*Mukaria dorsivitta* MELICHAR, 1914: 122. Types, Java (Moravian Museum, Brno) [not examined].  
Syn. by SCHUMACHER, 1915.

MATSUMURA (1912) described this species on the basis of 1♂ 3♀ specimens collected at Taikokan and Koshun in Taiwan. Among the Matsumura Collection deposited at the Systematic Entomology, Faculty of Agriculture, Hokkaido University, Sapporo (HUS), the lectotype and paralectotypes are selected and labelled by Dr. C. A. VIRAKTAMATH. But, he has not yet published the lectotype designation of *Parabolotettix maculatus* MATSUMURA, so that, I designate the lectotype here.

LECTOTYPE: ♂, "Taikokan", "16/VIII 1906", "Formosa, Matsumura", "Lectotype", "*Mukaria maculata* (Mats.), C. A. Viraktamath" (HUS). PARALLECTOTYPES: 2♀, same data as lectotype, "Paralectotype", "*Mukaria maculata* (Mats.), C. A. Viraktamath" (HUS); 1♀, "7/4, Koshun (handwriting; indicated by the first Chinese letter)", "Formosa, Matsumura" (HUS).



Figs. 1-3. 1: *Mukaria maculata* (MATSUMURA), ♂, from Miyako Is. — 2-3: *M. zonata*, sp. nov. (2, ♂; 3, ♀).

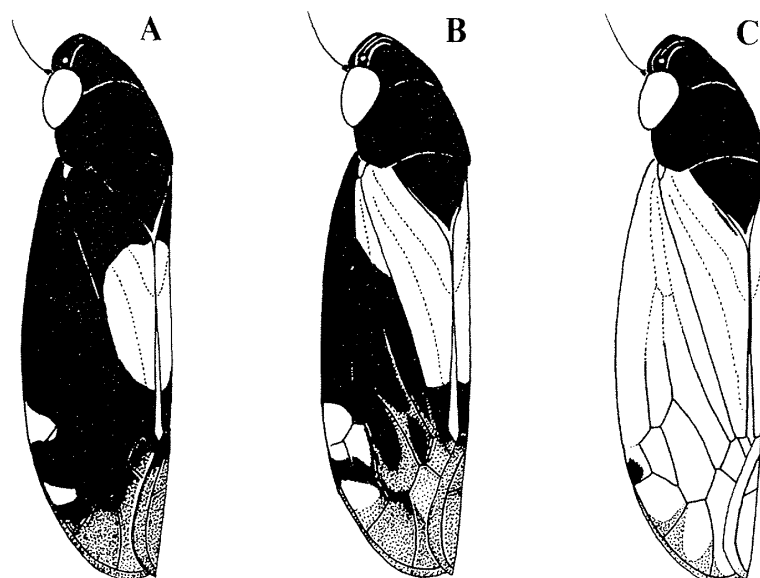


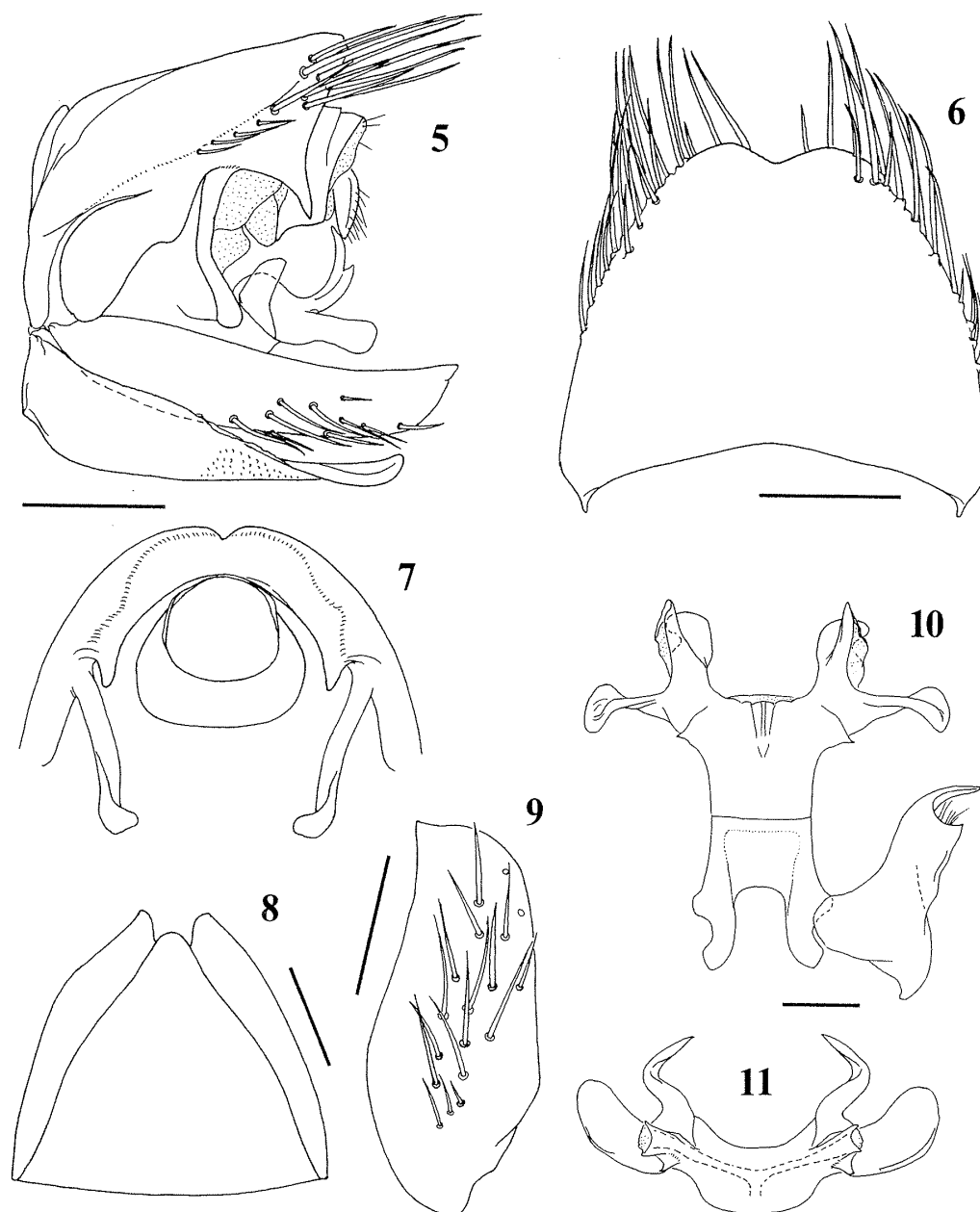
Fig. 4. Variations of marking pattern in *Mukaria maculata*. Type A in ♂, and all types (A–C) in ♀.

**Description.** A central large yellow spot on dorsum (forewing) generally developed in ♀, often spread throughout clavus or over almost entire part of forewing except for marginal area partly infuscated (Fig. 4).

**Male genitalia** (Figs. 5–11). Pygofer somewhat flattened, retuse apically in dorsal aspect, with a row of dense long setae along lateral margin and with a pair of short subapical spikes and long projections, curved inwards at apices; anal tube cylindrical but very short, widened basad. Valve triangular and enlarged, overhanging subgenital plates except for their outer lateral areas, with apex blunt and reaching a little before apices of plates; subgenital plate rather quadrate with blunt apex, bearing about 15 macrosetae. Style triangular with apophysis hooked and acutely pointed; ventral arm strongly expanded laterad. Connective short and wide, narrowly sclerotized, with stem considerably short and arms nearly parallel; connective fused to aedeagus. Aedeagus cylindrical and as thick as connective in basal 1/2, widely bifurcated distad; each shaft furnished with a subapical foliate expansion produced laterad and an apical spiny process recurved and protruded dorsally; gonopore apical, supported by horn-like sclerite inwards.

Body length to tip of folded forewing (mean): ♂, 3.13–3.60 mm (3.36 mm); ♀, 3.53–4.07 mm (3.81 mm).

**Specimens examined.** [Okinawa] 1♂ 3♀ (SUU), Yona, Kunigami, 5. IV. 1991, M. HAYASHI; 2♀ (SUU), Hiji, Kunigami, 22. XII. 1991, M. HAYASHI *et al.*; 1♀ (SUU), Abu, Nago, 22. XII. 1991, M. HAYASHI *et al.*; 1♂ (SUU), Ôura, Nago, 22. XII. 1991, M. HAYASHI *et al.*; 1♂ (SUU), Katsuyama, Nago, 21. XII.



Figs. 5–11. Male genitalia of *Mukaria maculata*. 5–6, Pygofer in lateral (5) and dorsal (6) views; 7, distal part of pygofer in ventral aspect (anal style removed); 8, valve and subgenital plates (setae on plates removed); 9, left subgenital plate; 10, right style, connective and aedeagus in ventral view; 11, aedeagus in apical view. Scales; 0.2 mm (5–9), 0.1 mm (10–11).

1991, M. HAYASHI *et al.*; 1 ♀ (SUU), Kyoda, Nago, 24. XII. 1991, M. HAYASHI *et al.*; 1 ♀ (SUU), Uebaru, Nakijin, 7. IV. 1991, M. HAYASHI *et al.*; 1 ♀ (SUU), same data except 21. XII. 1991; 1 ♀ (SUU), Gogayama, Nakijin, 19. VI. 1994, M. HAYASHI & M. SUEYOSHI; 2 ♀ (SUU), Afuso/ Kisembaru, Onna, 18. II.

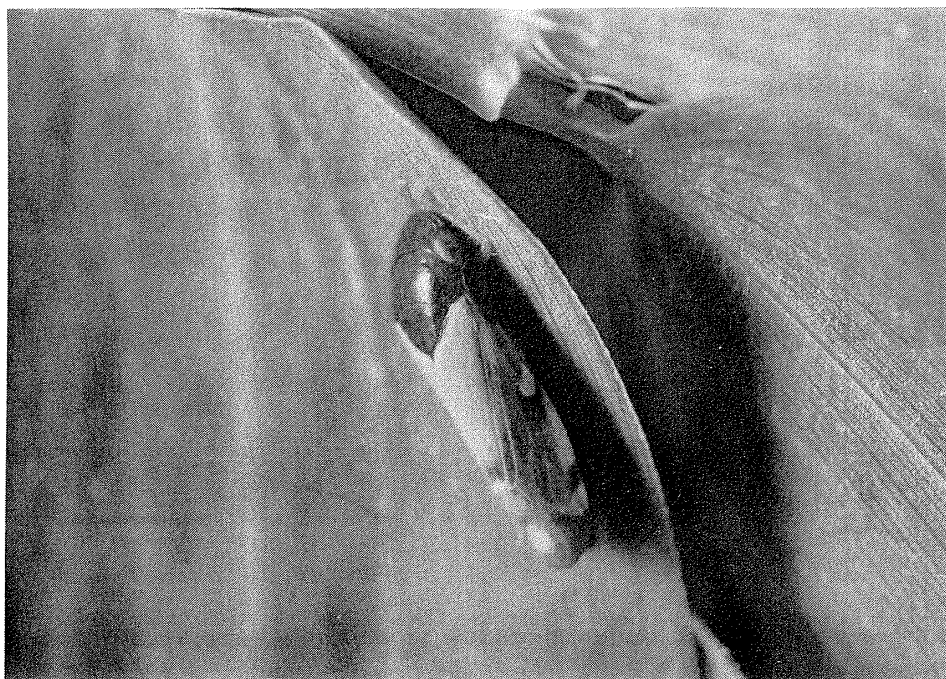


Fig. 12. *Mukaria maculata* (♀) resting on a leaf of *Bambusa multiplex* (Nakijin, Okinawa Is., 7. Apr. 1991; photograph by M. HAYASHI).

1993, M. HAYASHI; 1♂ 2♀ (SUU), same locality, 14. VI. 1994, M. HAYASHI & M. SUEYOSHI; 1♀ (SUU), Yamada, Onna, 24. XII. 1991, M. HAYASHI *et al.*; 6♂ 4♀ (SUU), Kisembaru, Kin, 17. X. 1988, M. HAYASHI *et al.*; 9♂ 4♀ (SUU), same data except 6. VI. 1990; 3♀ (SUU), same data except 20. XII. 1991; 1♂ (SUU), Gushiken, Chinen, 23. IX. 1991, M. HAYASHI. [Miyako] 2♂ 1♀ (KUF), Karimata, Miyakojima, 27. XI. 1960, K. YASUMATSU; 4♂ 3♀ (SUU), Higashi-nakasone-zoe, Hirara, 25. VI. 1992, T. OKA; 1♂ 1♀ (SUU), same locality, 21. XI. 1992, M. HAYASHI; 1♂ 1♀ (SUU), same data except 13. V. 1995. [Ishigaki] 15♂ 14♀ (NIAES), Okawa, 20. III. 1973, R. TERUYA; 15♂ 2♀ (SUU), Omoto, 12. V. 1995, M. HAYASHI; 2♂ 1♀ (SUU), Omoto/Takeda, 10. XI. 1985, M. HAYASHI. [Iriomote] 1♂ (SUU), Komi, 28. III. 1991, M. HAYASHI; 5♂ 1♀ (SUU), Funaura, 12. X. 1988, M. HAYASHI *et al.*; 1♂ 1♀ (SUU), same data except 25. VI. 1992; 1♂ 2♀ (SUU), Urauchi, 7. XI. 1985, M. HAYASHI; 3♂ 1♀ (SUU), same data except 12. X. 1990; 2♂ 1♀ (SUU), same data except 28. IX. 1993; 2♂ (SUU), Hoshidate, 12. X. 1990, M. HAYASHI *et al.*; 3♂ 7♀ (SUU), same data except 27. III. 1991; 1♀ (SUU), Sonai, 30. VI. 1963, Y. MIYATAKE. [Yonaguni] 1♀, Mt. Donan, 4. IV. 1991, S. KAMITANI (his private collection).

**Confirmed distribution.** Japan (Ryukyus: Okinawa Is., Miyako Is., Ishigaki Is., Iriomote Is. and Yonaguni Is.); Taiwan.

**Remarks.** In the ♂ genital structures, i.e., unusual expansion of valve,

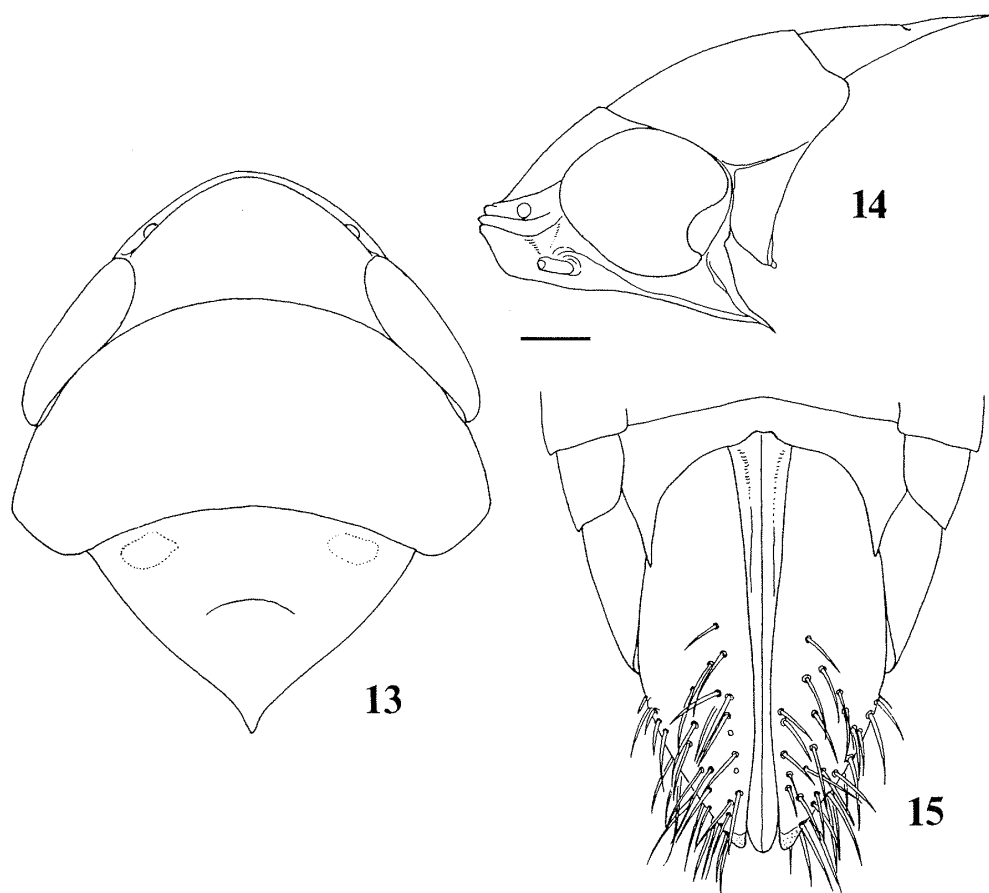
conformation of style and connective, etc., *M. maculata* shows some resemblance to *M. nigra* KUOH et KUOH from Fukien, South China, according to the illustration by KUOH and KUOH (1983).

*Bionomics.* Adults occur throughout the year, with March, May-June and October as the probable peak periods. This leafhopper feeds on some introduced bamboos such as *Bambusa multiplex* RAEUSCHEL, *B. vulgaris* SCHRAD., etc., in the Ryukyus. Adults of *M. maculata* sometimes rest on bamboo leaves (Fig. 12), but in the active time, they skilfully fly away when endangered.

*Mukaria zonata* M. HAYASHI, sp. nov.

(Figs. 2-3, 13-23)

Body plump, more *Penthimia*-like in general shape, widened across middle portion of forewings. Head and thoracic nota glossy black; pronotum transversely rugulose, and partly or mostly castaneous in some ♀ (Fig. 16); mesonotum (scutellum) somewhat shagreened, rarely stained brown centrally anteriorly



Figs. 13-15. *Mukaria zonata*, sp. nov. 13-14, Head and thoracic nota in dorsal (13) and lateral (14) aspects; 15, ♀ abdominal terminalia in ventral view. Scale; 0.2 mm.

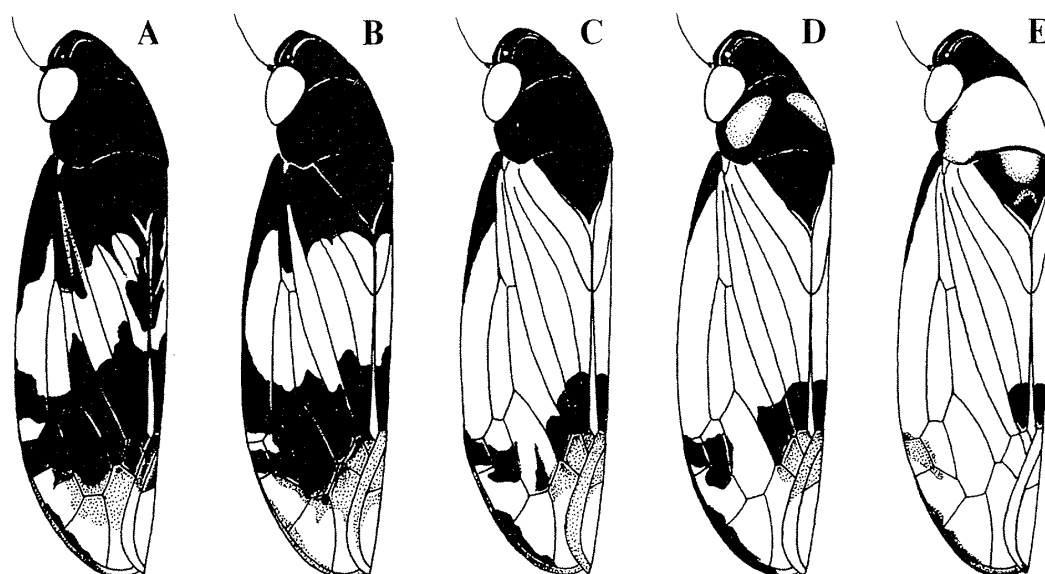
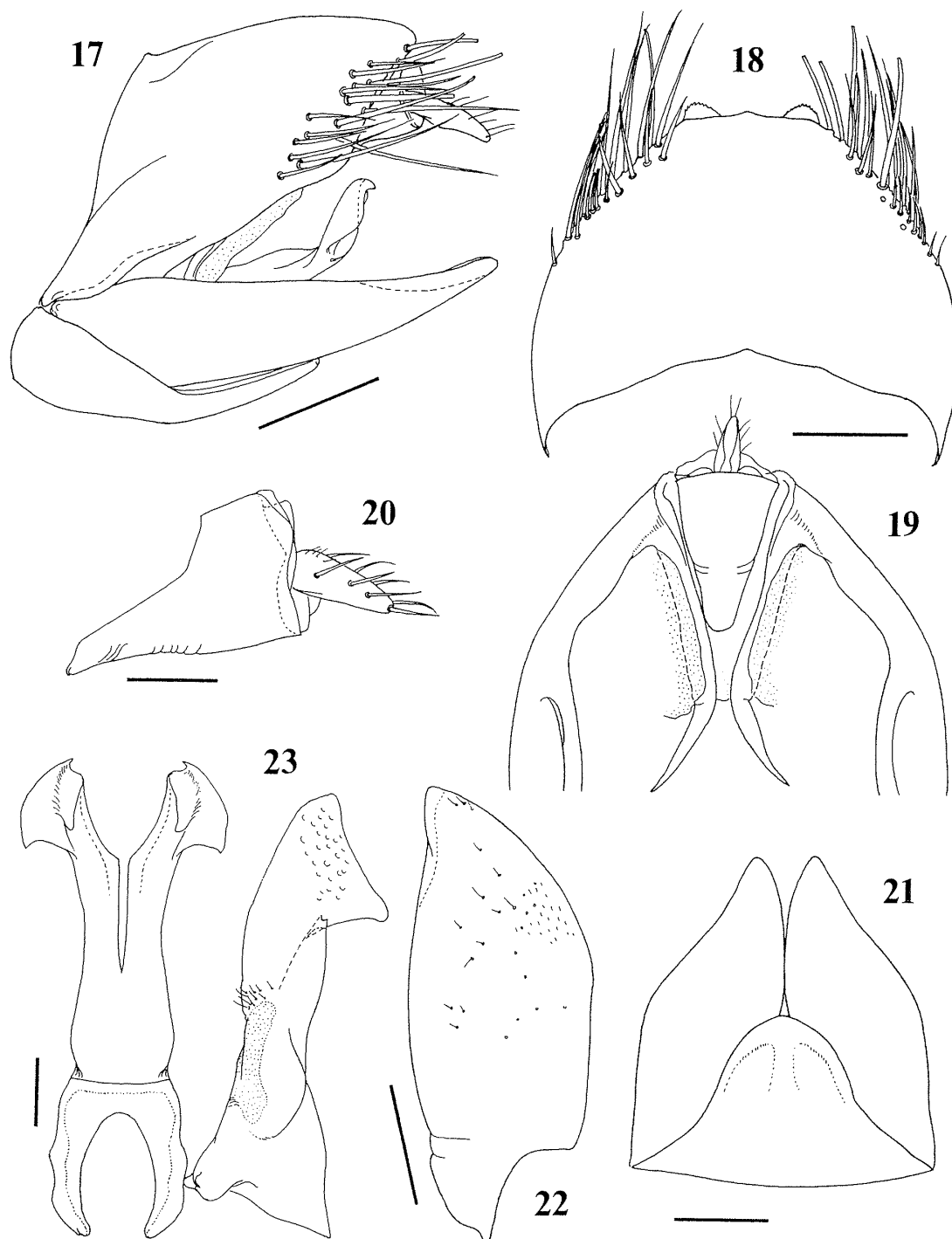


Fig. 16. Variations of marking pattern in *Mukaria zonata*, sp. nov. Types A–B appearing in ♂, and C–E in ♀.

in ♀. Male forewing smooth and glossy black with a wide transverse yellowish fascia before middle, sometimes reduced to form a zigzag marking, and with apical area hyaline, smoky basad and fuscous along wing margin; ♀ forewing yellowish ochraceous, becoming hyaline towards apex, with base of costal area, apical part of clavus and marginal area black or fuscous (Fig. 16). Legs pale ochraceous with tip of hind tibia black in ♀, but with coxa, femur and tibia widely black in ♂. Abdominal sterna entirely pitchy black in ♂, while partly or mostly pale ochraceous, nigrescent at least on central part of 7th sternum and basal part of pygofer, in ♀.

Head narrower than pronotum, with front margin tricarinate; ocellus situated laterally on space between upper and middle carinae; vertex smooth-surfaced, ca.  $2\times$  as wide as the median length; eye spherical in lateral view, excavated on posterior margin (Figs. 13–14); scutal suture well defined; caudal margin of ♀ 7th abdominal sternum strongly and sharply produced caudad at lateral parts and emarginate at middle (Fig. 15); ♀ pygofer coarsely setose in caudal 1/2; ovipositor (valvula 3) not exceeding pygofer apex.

*Male genitalia* (Figs. 17–23). Pygofer rotundate in dorsal view, furnished with a pair of long apical processes bent outwards and free from membrane in apical 1/3 and with very long setae densely arrayed on caudolateral margin; anal tube conical, becoming narrower towards base, and much shortened mid-dorsally. Valve triangular, ca. 1/2 the length of subgenital plate; subgenital plate elongate, acute at tip, with no macrosetae. Style very long, nearly equal to connective plus aedeagus in length, with apophysis much delated and spatulate. Connective short, fused to aedeagal base, with arms inwardly arched. Aedeagus



Figs. 17-23. Male genitalia of *Mukaria zonata*, sp. nov. 17-18, Pygofer in lateral (17) and dorsal (18) views; 19, distal part of pygofer in ventral view; 20, anal tube; 21, valve and subgenital plates; 22, left subgenital plate; 23, right style, connective and aedeagus in ventral view. Scales; 0.2 mm (17-19, 21-22), 0.1 mm (20, 23).



long and cylindrical, bifid in distal 2/3; each shaft contiguous to each other basally, with an apical spatulate expansion.

Body length (mean): ♂, 3.63–3.87 mm (3.73 mm); ♀, 4.20–4.33 mm (4.25 mm).

*Type material.* Holotype: ♂, Mt. Yonaha-dake, Kunigami, Okinawa Is., Ryukyus, Japan, 4. VII. 1993, M. HAYASHI & K. SEKINE (SUU). Paratypes: [Okinawa] 4♂ (SUU), Mt. Nishime-dake, Kunigami, 18. VI. 1994, M. HAYASHI & T. OKA; 6♂ (SUU), Mt. Terukubi-yama, Kunigami, 18. VI. 1994, M. HAYASHI & T. OKA; 4♂ 4♀ (SUU), same data as holotype; 1♀ (SUU), Okuma, Kunigami, 28. VI. 1992, M. HAYASHI *et al.*; 64♂ 22♀ (SUU), same data except 17. VI. 1994; 1♀ (SUU), Afuso/ Kisembaru, Onna, 14. VI. 1994, M. HAYASHI & M. SUEYOSHI. Type depository: SUU.

*Distribution.* Japan (Ryukyus: Okinawa Is.).

*Remarks.* This leafhopper resembles *M. maculata* (MATSUMURA) in general habitus, but differs particularly in the wing marking, ♂ genital structures, etc. Compared with other congeners, *M. zonata* is unique in the configuration of its aedeagus and style. In the shape of the aedeagus, this species shows a similarity to certain species of the Ethiopian genus *Pseudobalbillus* JACOBI.

*Bionomics.* This leafhopper is confined to the northernmost part of Okinawa Is., C. Ryukyus. Adults and nymphs feed exclusively on a native bamboo, *Pleioblastus linearis* NAKAI, fasciculate at the peripheries or floors of montane jungles. In the extent of my research, adult leafhoppers occur in June–July with a peak period of mid- and late June.

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