Pacific Insects 8 (2): 389-396 July 15, 1966

A NEW GENUS OF TRIGONOPTERYGIDAE (Orthoptera: Acridoidea) FROM SABAH (NORTH BORNEO)[1]

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Abstract: The Indomalayan family Trigonopterygidae is discussed and its two subfamilies redefined. Keys to the genera and a list of all known species are included. A new brachypterous genus and species from NE Borneo, ***Pseudopyrgus curtipennis***, are described. The new genus possesses certain characters reminiscent of the Borneacridinae, but is a member of the Trigonopteryginae and is the most generalized member of the family so far known.

Trigonopterygidae are found only in the Indomalayan region from Malaya, Thailand, Sumatra and Java to Borneo, Celebes and the Philippines. The most recent definition of the family is that of Dirsh (1961), but this is slightly inaccurate as it stresses that the tegmina are widened towards the apex — a feature true only of previously known members of the subfamily Trigonopteryginae. There is, however, a second subfamily, Borneacridinae—originally erected as a tribe (Kevan 1952) and later raised in rank (Kevan 1957)— in which the tegmina of one of the two known genera, *Borneacris* Ramme, are only slightly expanded towards the apical region (Kevan 1952), and of the other, *Moultonia* Bolívar, tapered to a point (Kevan 1963). Furthermore, Dirsh's (1961) definition indicates that the [basal parts of the] radial and median veins of the tegmina are fused, whereas, in his earlier reference (Dirsh 1956), he states, more accurately, that they may also be weakly separated. In fact, complete fusion does not seem to occur as the two veins are distinguishable, even if they are so closely approximated as to appear to form a single vein.

Among some material recently studied, specimens closely resembling members of the family Pyrgomorphidae, came to light. On examination, these proved to belong to a new genus of Trigonopterygidae. Superficially all members of the latter family somewhat resemble Pyrgomorphidae (in which they were for long included) in possessing a conical head with dorsal impressions (foveolae) on the fastigium of the vertex, separated by a longitudinal sulcus. They may be distinguished by several characters, however. The branching of the main wing veins is clearly pectinate rather than appearing to be dichotomous, the superior basal lobe of the hind femur projects further forward than does the inferior lobe, instead of *vice versa* (there are a few Pyrgomorphidae that are exceptional, but these do not have conical heads), the male diploid chromosome number (where known) is 23, not 19 (or 17), in the female subgenital armature, the post-vaginal sclerotic area is bilobed, not triangular, apically and there is no "tunic" (*cf.* figs 3-6 and Randell 1963), and, most characteristic of all, the

1. Specimens examined are results of fieldwork supported by a grant to Bishop Museum from the NIH.

phallic structures are unique among Acridoidea in being reversed and inverted and incorporating a structure called the "pouch of the phallus" by Dirsh (1956)[2].

The new genus referred to possesses all the characters referred to above, except that the chromosome number has not been determined. By the original definition of the Borneacridinae given by Kevan (1952)—having no distinct sinuous truncation [or emargination] at the apex of the tegmen, and a reduced number of branches to the radial vein—it falls into that subfamily. In fact, however, it is closer to *Trigonopteryx* (Trigonopteryginae) than to any other known genus, thus calling for redefinitions of the two subfamilies, as follows:

BORNEACRIDINAE. Body-form long and slender or moderately elongate; fastigium of vertex long and broad, at least 2/3 as wide as greatest width of head, with narrow, marginal, dorsal impressions (foveolae), the space between which is distinctly longer than broad; pronotum not distinctly wider distad, its disc only moderately flattened; tegmina long and narrow, apex more or less evenly pointed, acute or subacute, not strongly expanded or obliquely truncated or emarginate, even in fully macropterous forms, with no more than one major posterior branch to the radial vein; ectophallus (where known) elongate, phallic pouch (where known) small; epiphallus (where known) narrowly transverse with 1 or 2 very large thorn-like tubercles near the posterior margin. [♀ subgenital armature and spermatheca unstudied].

TRIGONOPTERYGINAE. Body-form short, strongly compressd or not; fastigium of vertex scarcely 1/2 as wide as greatest width of head, space between foveolae not distinctly longer than wide; pronotum distinctly wider distad, its disc strongly flattened; tegmina not long and narrow, widely expanded and distinctly obliquely truncated and emarginate anteriorly at apex in macropterous forms, several major posterior branches to radial vein except in brachypterous forms in which the apices of the tegmina are rounded or obliquely truncated; epiphallus broadly transverse, tubercles numerous, not very large; ectophallus not elongate, phallic pouch large or of moderate size. ♀ subgenial armature and spermatheca of the forms illustrated in figs 3 C–D and 4–6.

The known genera of Borneacridinae may be distinguished as follows:

Body very elongate; fastigium verticis about as wide as rest of head; tegmina well developed, extending well beyond end of abdomen, radial vein with a large and distinct posterior branch, median vein with 2 branches, cross-veins of tegmina and hind wings regularly arranged, more or less perpendicular to the long veins; hind femur very slender; ♂ subgenital plate little compressed, with a long terminal process [Borneo only] .... **Borneacris** Ramme
[One species, **B. mirabilis** Ramme]

Body less elongate; fastigium of vertex not as wide as head behind the eyes; tegmina very narrow, lanceolate, not extending much, if at all, beyond end of abdomen, radial vein with only a small branch, median vein unbranched, cross-veins of tegmina especially, and of hind wings also, irregular, reticulate; hind femur rather stouter; ♂ subgenital plate compressed, pointed apically but without a long terminal process [Borneo; Sumatra] .....

2. In his series of definitions Dirsh (1956) states that the phallic pouch is found only in *Systella*, but he discusses and illustrates it also for *Trigonopteryx* (see also Dirsh 1961). Kevan (1952) indicates the same structure (in a 'reinverted' position) for both these genera and for *Borneacris*,

.....**Moultonia** Bolívar
[One species, **M. violacea** Bolívar]

The genera of Trigonopteryginae are as follows:

1. Tegmina and wings fully developed, the apices of tegmina very broadly expanded with anterior margin excised [occur throughout the range of the family] 2
   Brachypterous, tegmina not broadly expanded or excised [Borneo only]...**Pseudopyrgus*** [see below]
2. Posterior (dorsal) margin of tegmen straight, posterior angle abrupt, apical margin sinuous [Sumatra, Java, Borneo, Celebes] (*Trigonopteryx* Charpentier) 3
   Posterior margin of tegmen convex in apical 1/3, posterior angle broadly rounded, apical margin straight or convex [occur throughout the whole range of family except Celebes] ..... **Systella** Westwood [several species[3]]
3. ♂ cerci short, conical [Sumatra, Java, Borneo] ..... **Trigonopteryx**, *s str.* [*T.* (*T.*) *hopei* Westwood (Sumatra to Borneo); *T.* (*T.*) *punctata* Charpentier (Java); *T.* (*T.*) *sumatrana* Willemse (Sumatra)]
   ♂ cerci not as above [Celebes].....Subgen. ***Celebopteryx*** Ramme [*T.* (*C.*) *celebesia* Willemse; *T.* (*C.*) *willemsei* Ramme].

Genus **Pseudopyrgus** Kevan, n. gen.

Resembling a member of the Pyrgomorphidae, but having the general characters of the Trigonopteryginae as indicated above. Body rather short, not compressed; head conical with strongly oblique frontal profile; fastigium of vertex rather short and broad, not longer than an eye; pronotum strongly widening distad, pronotal disc parallel-sided, bordered by lateral carinae, posterior margin produced, median carina present; prosternal tubercle long, slender; tegmina short, not expanded or excised but rounded or obliquely truncated apically, subcostal and radial veins completely fused, without major branches, median vein with 1 major posterior branch, 1st cubital vein weak and unbranched[4]; hind femur long, stout at base, the outer face not flattened; ♂ subgenital plate pointed, only moderately

* described as new.

3. The genus is badly in need of revision. The preliminary work of Willemse (1930) leaves many questions unanswered. His use of antennal characters and minor differences in tegminal shape to distinguish species is probably unreliable as these vary. Several species known by one sex only are probably synonymous with species known only from the other. The following is a provisional list of species with their known or probable synonyms: *Systella rafflesi* Westwood [♀=*S. obliqua* (Walker) (♂)—**New Synonymy**—?=*S. annandalei* Bolívar (♀)] (Malaya, Sumatra, Thailand); *S. platyptera* (Haan) [♂=*S. dubia* Willemse (♀)—**New Synonymy**—?=*S. borneensis* Willemse] (Sumatra, Borneo); *S. dusmeti* Bolívar (Borneo); *S. gestroi* Bolívar [?=*S. bolivari* Willemse] (Mentawei Archipelago, Sumatra); *S. sarawakensis* Willemse (Borneo); *S. philippensis* (Walker) [=*S. westwoodi* Stål=*S. siccifolia* Bolívar=*S. philippinensis* Kirby] (Philippines). The last species is now known also from the Talaud Islands: Liroeng, Salibaboe, V. 1926, 1♀ (*Erie*) [Leiden Museum].
4. It is to be anticipated that, if macropterous individuals occur, these venational characters will not prove to be diagnostic.

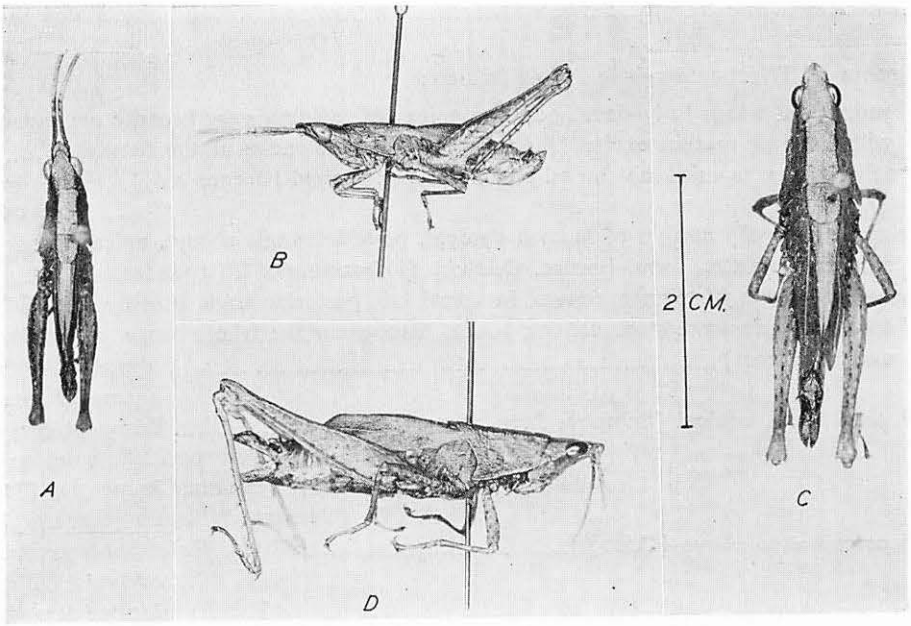


Fig. 1. *Pseudopyrgus curtipennis*, n. sp. A, B, ♂ holotype; C, D, ♀ allotype.

compressed, rather shallow; ♂ cerci simple, relatively long; ovipositor valves rather long and straight with strong apical hooks; phallic structures of the general form illustrated for the type species (fig 3 A, B), not greatly shortened, phallic pouch of moderate size, epiphallus forming a rather broad, simple plate bearing a few tubercles, apex of aedeagus strongly curved; ♀ subgenital armature and spermatheca of the general form indicated for the type species (fig 3 C, D), basically similarto, but considerably different in detail from those of other genera (figs 4–6).

Type species (here designated): *Pseudopyrgus curtipennis*, n. sp.

The similarity in venation to that of the Borneacridinae, and to that of *Moultonia* in particular (Kevan 1963), doubtless results from convergence due to the reduction of the tegmina and wings. It is conceivable that *Moultonia*, when it is better known, may prove to be more closely related to *Pseudopyrgus* than it at present appears to be, for the external male genitalia and the texture of the tegmina are rather similar in the two genera. Since both are less specialized than other members of the family (*Pseudopyrgus* being undoubtedly the most generalized and most conventionally acridoid of the Trigonopterygidae), the similarities are understandable, but the form of the body and fastigium of the vertex, and the shape of the tegmina and hind wings serve to separate *Pseudopyrgus* from *Moultonia* and to bring it closer to *Trigonopteryx*. The oblique truncation of the apex of the ♀ tegmina in *Pseudopyrgus* enhances this.

Pseudopyrgus curtipennis Kevan, n. sp. Figs. 1–3.

Holotype (fig 1 A, B): ♂ (Bishop 6740), "British N. Borneo" [=Sabah], Tenompok, 15.II.1959, T. C. Maa.

Antenna: cylindrical except for slight flattening at base, almost equal to head and pronotum together, with 13 segments in addition to scape and pedicel, segments mostly 1.5–2.0× as long as wide, alternating in length, terminal segment (2 segments fused) longer than others. *Head*: eyes oval, about 2× as long as deep, not very prominent; frons strongly reclinate, slightly sinuous in profile, rather flat, without carinae, but with about a dozen rather prominent tubercles, regularly arranged in rows; vertex rugose, slightly convex in profile, without a median carinula, fastigium verticis about as long as broad, not longer than an eye, parallel-sided at base, triangular apically; cheeks with a sharply raised callous line running from behind the eye to the inferior margin of pronotum. *Thorax*: pronotal disc somewhat rugose, particularly on metazona, biarcuate anteriorly, strongly and roundly produced posteriorly, nearly 5× as long as wide, median carina indistinct in prozona, lateral carinae strong and sharp throughout, typical transverse sulcus almost straight crossing disc at 2/3 of its length, anterior and median transverse sulci parallel to it, indistinct in the middle, crossing disc at 1/3 and 1/2 of its length respectively; lateral pronotal lobe much deeper behind than in front, anterior margin straight, oblique, inferior margin straight, descending, carinate, posterior margin deeply concave, infero-anterior angle obtuse, infero-posterior angle acute; prosternal tubercle erect, narrowly conical, blunt at apex, almost finger-like; mesosternal lobes wider than long, their posterior margins

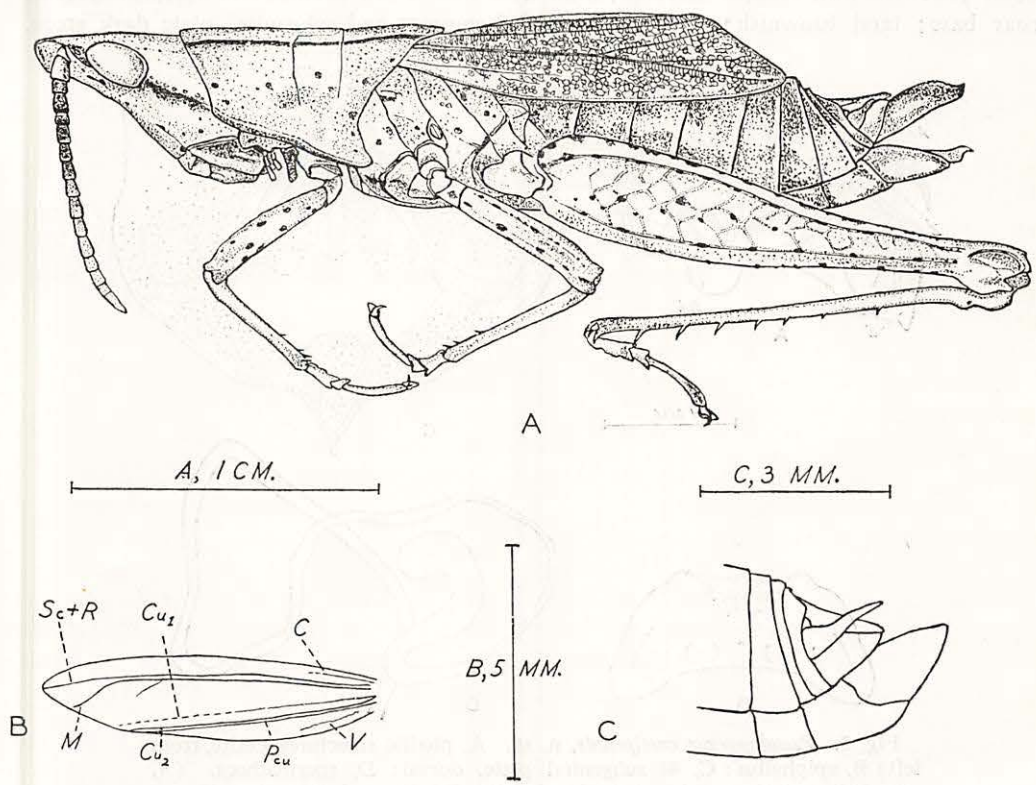


Fig. 2. *Pseudopyrgus curtipennis*, n. sp. A, ♀, lateral; B, ♂ tegmen; C, ♂ terminalia, lateral.

oblique and their interspace almost as long as broad, subquadrate. *Tegmina* (fig 2B): abbreviate, extending a little beyond 1/2 the abdominal length or to about 2/5 of the length of hind femur, posterior margin straight, anterior margin somewhat convex apically, apex narrowed and rounded. *Legs*: anterior and posterior femora with small, low tubercles, those of the former, scattered, those of the latter mostly arranged along carinae and middle of external face; hind femur long, stout, extending considerably beyond apex of abdomen; 3rd tarsal segments of all legs considerably longer than 1st and 2nd (very short) together; arolia large. *Abdominal terminalia* (fig 2G): 10th abdominal tergum broadly and trapezoidally excised; epiproct elongate triangular, about 2× as long as broad, longitudinally sulcate apically; cerci long, narrow, finger-like, acute and inwardly curved at apex, extending to apex of epiproct; subgenital plate moderately compressed, upwardly curved and strongly acute apically. *Phallic structures* (from a paratype): as illustrated in fig 3A, B.

Coloration: olive-green; eyes, dorsum of head and pronotum and anal field of tegmen light brown; tubercles of frons and of fore and hind femora, and various maculations on all femora, pleura, and subgenital plates, black; antenna black basally, gray in apical 1/2; a broad band behind eye, the lateral pronotal carinae, narrow zones immediately below them and extending along radial areas of tegmina, and narrow bands below the cheek carinae, also black; carinae of cheeks and inferior pronotal lobes brown; fore and middle tibiae yellowish with reddish maculae; hind tibia with a few reddish and blackish maculae near base; tarsi brownish; cerci and apices of epiproct and subgenital plate dark green.

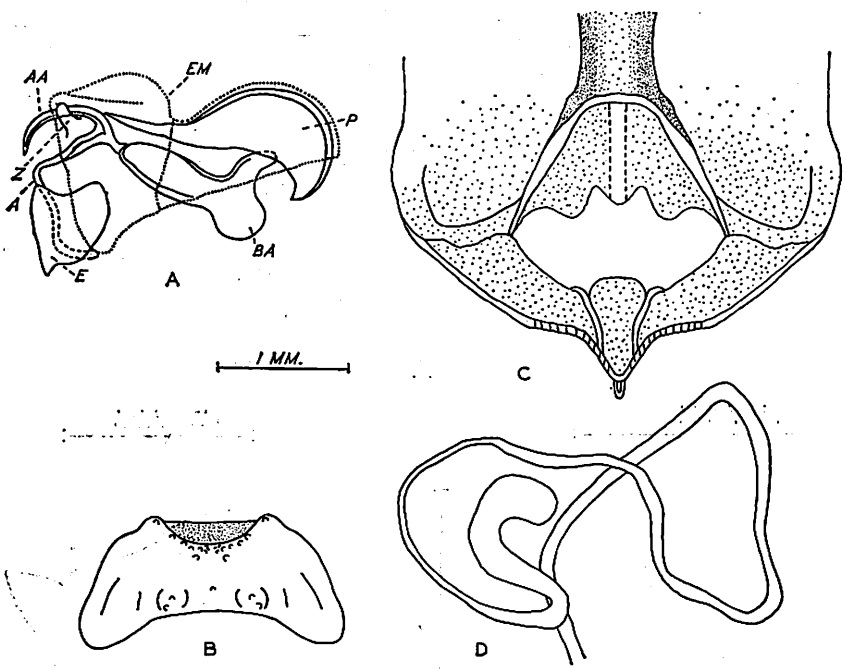
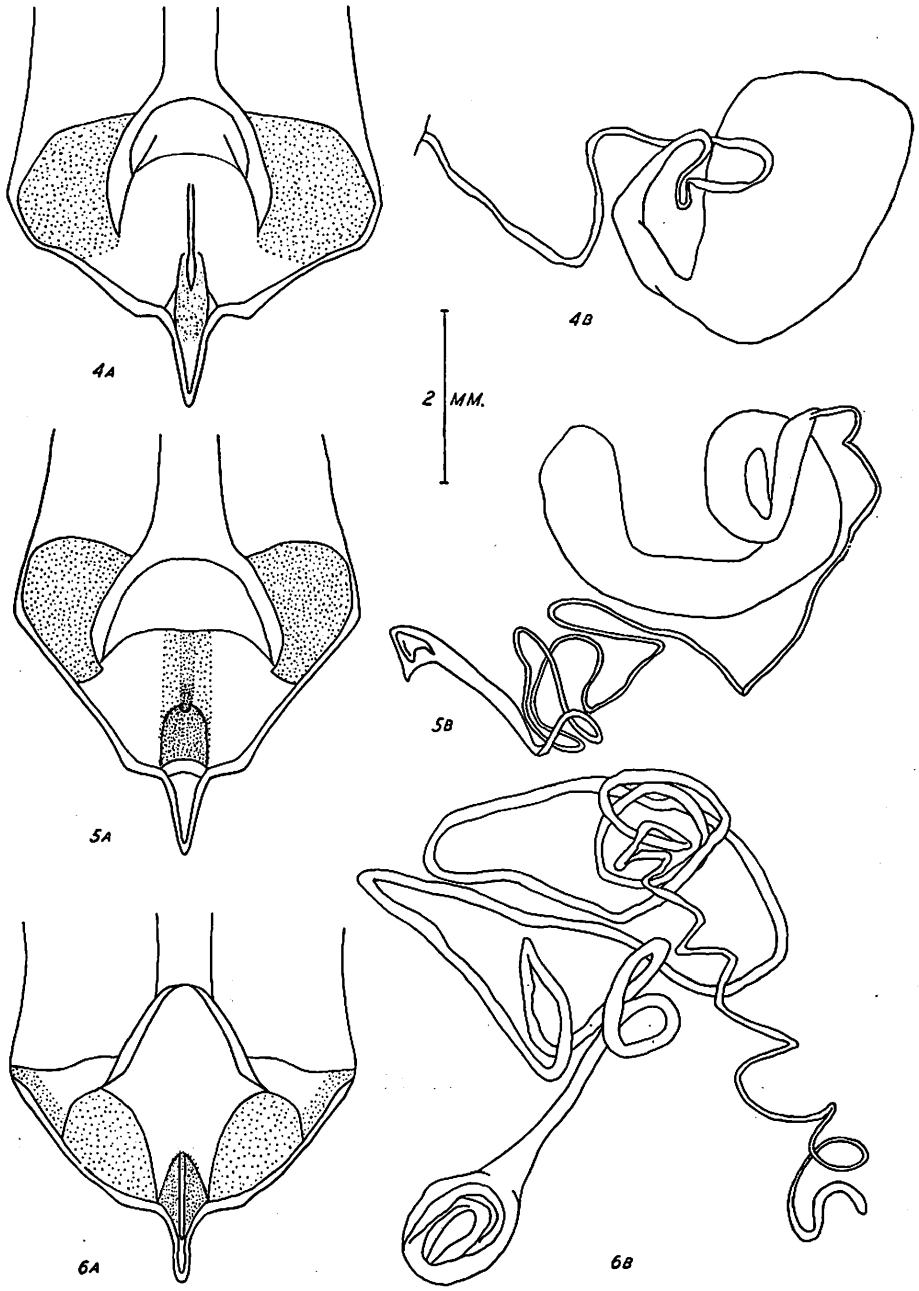


Fig. 3. *Pseudopyrgus curtipennis*, n. sp. A, phallic structures, entire, from left; B, epiphallus; C, ♀ subgenital plate, dorsal; D, spermatheca. (*A*, ectophallic apodeme; *AA* apex of aedeagus; *BA*, base of aedeagus; *E*, epiphallus; *EM*, ectophallic membrane; *P*, phallic pouch; *Z*, zygoma).



Figs. 4–6. Subgenital plate, dorsal (A) and spermatheca and duct (B) of: 4, *Trigonopteryx hopei* Westwood; 5, *T. punctata* Charpentier; 6, *Systella philippensis* (Walker).

Measurements: length of body 20.5, antenna 9.0, pronotum 5.9, tegmen 8.1, hind femur 12.5 mm.

Allotype (fig 1 C, D): ♀ (BISHOP), "British N. Borneo" [=Sabah], Tenompok, 1460 m, Jesselton, 48 km E, 17-18.X.1958, T. C. Maa.

Similar to holotype but larger; antenna considerably shorter than head and pronotum together, with 12 (shorter) flagellar segments, the basal ones distinctly triquetrous, median pronotal carina distinct throughout, median and anterior transverse sulci obsolescent on disc; tegmina (see fig 2A) longer, reaching beyond middle of abdomen and almost to middle of hind femur, anterior margin longer than posterior, straighter than in holotype, apex distinctly and obliquely truncated, resultant apical margin very slightly concave (venation a little stronger than in holotype); 10th abdominal tergum with a V-shaped excision; epiproct and cerci a little shorter; ovipositor as illustrated in fig 2A; subgenital armature and spermatheca as illustrated in fig 3 C, D.

Coloration: Similar to that of holotype but paler green, light brown confined to eyes and posterior margin of tegmina, black banding reduced, antenna yellowish in apical 1/3.

Measurements: length of body 30.5, antenna 9.0, pronotum 8.8, tegmen 12.0, hind femur 16.0 mm.

Paratypes: 1♂, same data as holotype; 1 ♀, same data as allotype, but 26-31.I.1959; 1♂, 1♀, as last, but 48 km E; 1♀, as last, but 10-19.II.1959; 1♂, as last, but 3.I.1958, L. W. Quate [This has improperly developed tegmina and wings; there is also a nymph with the same data].

These agree well, according to sex, with the above descriptions of holotype and allotype except that all but one male are rather darker in color. The males vary from 20 to 23 and the females from 26 to 31 mm in length.

Acknowledgements: I wish to thank Miss S. Nakata and Dr J. L. Gressitt of Bishop Museum, Honolulu, for the opportunity of studying this material, and Miss D. Johnstone for help with the illustrations. Financial assistance from the National Research Council of Canada is also gratefully acknowledged.

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