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ADDITIONS TO THE VERDULIINI (Orthoptera : Acridoidea : Pyrgomorphidae) FROM THE PHILIPPINES¹

By D. Keith McE. Kevan²

Abstract: On the basis of their phallic structures, ♀ genital armature and head structure, the Philippine genera *Meubelia* Willemse and *Spinacris* Willemse have been transferred from the Acrididae, *s. str.*, to the Pyrgomorphidae. They are related to *Verdulia* Bolívar and belong to the recently erected tribe Verduliini, which was previously monogeneric. A key to the genera is given. All species of the tribe, which is found from New Guinea to the Philippines, are listed and full bibliographies are given for the genera and species here added to the tribe. *Philippinacris gracilis* Willemse (= *Meubelia willemsei* Ramme) is synonymized with *Meubelia gracilis* Willemse. A new species of *Spinacris* is described.

Certain, mainly apterous, genera of Acridoidea from New Guinea and adjacent islands, previously regarded as belonging to the Acrididae, *s. str.* (Catantopinae—*Euthymiae*, or Hemiacridinae), have recently been found to belong instead to the Pyrgomorphidae (Dirsh 1964; Kevan & Akbar 1964; Kevan, ms). In view of this, and on the basis of the form of the fastigium of the vertex, suspicions regarding the systematic position of certain other SE Asiatic genera were aroused. Among these, it was discovered that the micropterous Philippine genus *Meubelia* Willemse, 1932, also belongs to the Pyrgomorphidae. Unlike the genera referred to above, however, it does not belong to the tribe Nereniini. An examination of its phallic structures (figs 7 and 8) and ♀ genital armature (fig 10) shows that it is related to *Verdulia* Bolívar, 1905, a genus of superficially very different appearance, placed in a tribe of its own, Verduliini, by Kevan & Akbar (1964). The geographical distribution of *Verdulia* extends from W. New Guinea, by way of the Moluccas to the Talaud Islands, i. e., almost to the Philippines.

In addition to *Meubelia*, another Philippine genus, *Spinacris* Willemse, 1933, is likewise a member of the Pyrgomorphidae. Although the ♂ of this genus is unknown and its hind femur is even less typical of the Pyrgomorphidae than that of *Meubelia* (being sometimes rather stout, with a strong pattern on the external face and a large superior basal lobe, fig 6), the form of the head is distinctly pyrgomorphid. The latter, with its very short

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fastigium verticis, short frontal ridge and reduced median ocellus, and the sternum (including the prosternal tubercle) are very similar to those of *Meubelia* (fig 5). The ♀ genital armatures in the two genera resemble each other closely (fig 10). *Spinacris* differs from *Meubelia* in several ways, however, notably in its tuberculate lateral pronotal lobes, and in its more fully alate condition. The tegmina and hind wings are both somewhat abbreviated but well developed in one species, the latter being cycloid, even more so than in typical *Verdulia cycloidea* (Haan 1842). A characteristic feature shared by *Verdulia* and *Spinacris* is the faint bluish tinge at the base of the hyaline hind wings (although in the latter genus the main veins are crimson for most of their length). *Spinacris* does not closely resemble *Verdulia*, as it is much stouter, has a much shorter fastigium verticis, characteristic lateral pronotal lobes and a simple, conical prosternal tubercle. It is clearly closer to *Meubelia*.

The most characteristic feature of the Verduliini would appear to lie in the form of the phallic structures, particularly in the very large and deep basal emargination of the cingulum, in the elongate aedeagal sclerites with outwardly directed apices, and in the very large, irregularly shaped, denticulate aedeagal valves. This is matched by the strongly and extensively sculptured post-vaginal sclerite in the ♀ (fig 10).

With the inclusion of *Spinacris* and *Meubelia* in the tribe, the diagnosis given by Kevan & Akbar (1964), in their key to the tribes of Pyrgomorphidae, is no longer fully appropriate. To distinguish Verduliini, as now understood, from other tribes, it is necessary to modify the key referred to.

A minor modification of the first part of couplet 5 of the key [leading to couplet 6, not 5 as misprinted] is required. This should indicate that some alate species, other than those already referred to, are included: these have a cylindrical body and a prosternal tubercle with lateral bosses. The metasternal pits, also, may be linked by a fine suture at their anterior ends, but in this case the corners of the metasternal lobes usually meet behind the pits to form a characteristic heart-shaped enclosure. The second part of couplet 8 must also be modified to include fully winged forms. The chief modification, however, is the substitution of the second part of couplet 9 by the following:

- "Not combining the features found in the Chapmanacridini; not West African9a
 9a. Often completely apterous or micropterous, but, if latter, fastigium of vertex triangular or elongate, alate forms (few) with fastigium short and rounded; [aedeagal valves not long and strongly denticulate;] from various parts of the world, but not yet known from the Philippines or Moluccas 10
 Not completely apterous, either alate or micropterous, but, if latter, fastigium of vertex broad, short and blunt, if former, fastigium pointed or broadly angular; [aedeagal valves long, irregular and strongly denticulate;] Philippines, Moluccas, New Guinea *Verduliini* (part)³"

The known distribution of the Verduliini is indicated in fig 12. The following is a key to the genera:

1. Macropterous; fastigium of vertex produced; prosternal tubercle with lateral bosses;

3. Some alate Verduliini still fall where they are at present indicated in the key because of variation in the metasternum in *Verdulia*. It may be noted that couplet 10 should also be modified in the light of other investigations (Kevan, ms), but no such change is needed here.

- epiphallus with lateral plates very closely approximated to form an anchor-like process; New Guinea, Moluccas, N to Talaud Is.**Verdulia**
 Wings somewhat or very reduced; fastigium of vertex very short; prosternal tubercle conical; epiphallus (where known) not as above; Philippine Is. 2
 2. Wings short, but fairly well developed or brachypterous, tegmina meeting dorsally; posterior parts of lateral pronotal lobes with distinct tubercles.....**Spinacris**
 Micropterous, tegmina not meeting dorsally; lateral pronotal lobes not distinctly tuberculate.....**Meubelia**

Genus **Verdulia** Bolívar, 1905

This genus, and its two included species, *V. cycloidea* (Haan 1842) and *V. subcycloidea* Willemse, 1932, have recently been discussed in detail, illustrated, and their full synonymies given (Kevan 1963)⁴. There is thus no need for repetition. However, since only the epiphallus of the phallic structures has hitherto been figured, further phallic details are illustrated here for comparison (fig 1). The ♀ genital armature and spermatheca are also figured for the first time (figs 10A, 11A).

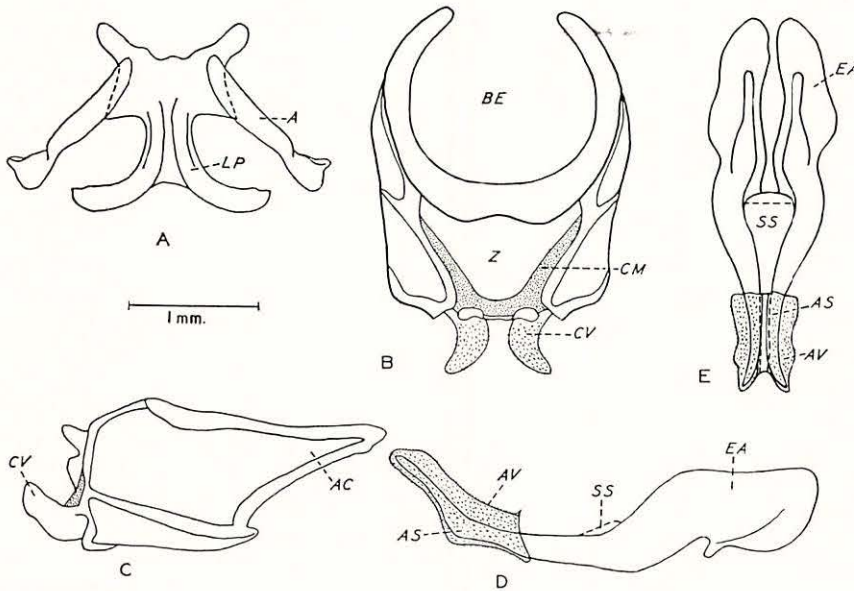


Fig. 1. *Verdulia subcycloidea* Willemse, phallic structures. A, epiphallus; B, cingulum, dorsal; C, cingulum, from right; D, aedeagus from right; E, aedeagus, dorsal: A, appendix of epiphallus; AC, apodemal plate of cingulum; AS, aedeagal sclerite; AV, aedeagal valve; BE, basal emargination of cingulum; CM, central membrane of cingulum; CV, valve of cingulum; EA, endophallic apodeme; LP, lateral plate of epiphallus; SS, spermatophore sac; Z, zygoma.

4. There is a misprint in Kevan (1963), citing Willemse, 1930, instead of 1932, in the synonymy of *V. cycloidea*. The reference is given correctly in the bibliography although that to Willemse 1930 is incorrect and should be: *Fauna Sumatrensis* No. 62 (not 32), *Tijdsch. Ent.* 73 (not 72): 1-210 (not 1-40).

Genus *Spinacris* Willemse, 1933

Spinacris Willemse, 1933 : 76.—Neave, 1940a : 256.—Willemse, 1956 : 8, 84 ; 1957 : Index, p. V.

Type species (by monotypy) : *Spinacris viridis* Willemse.

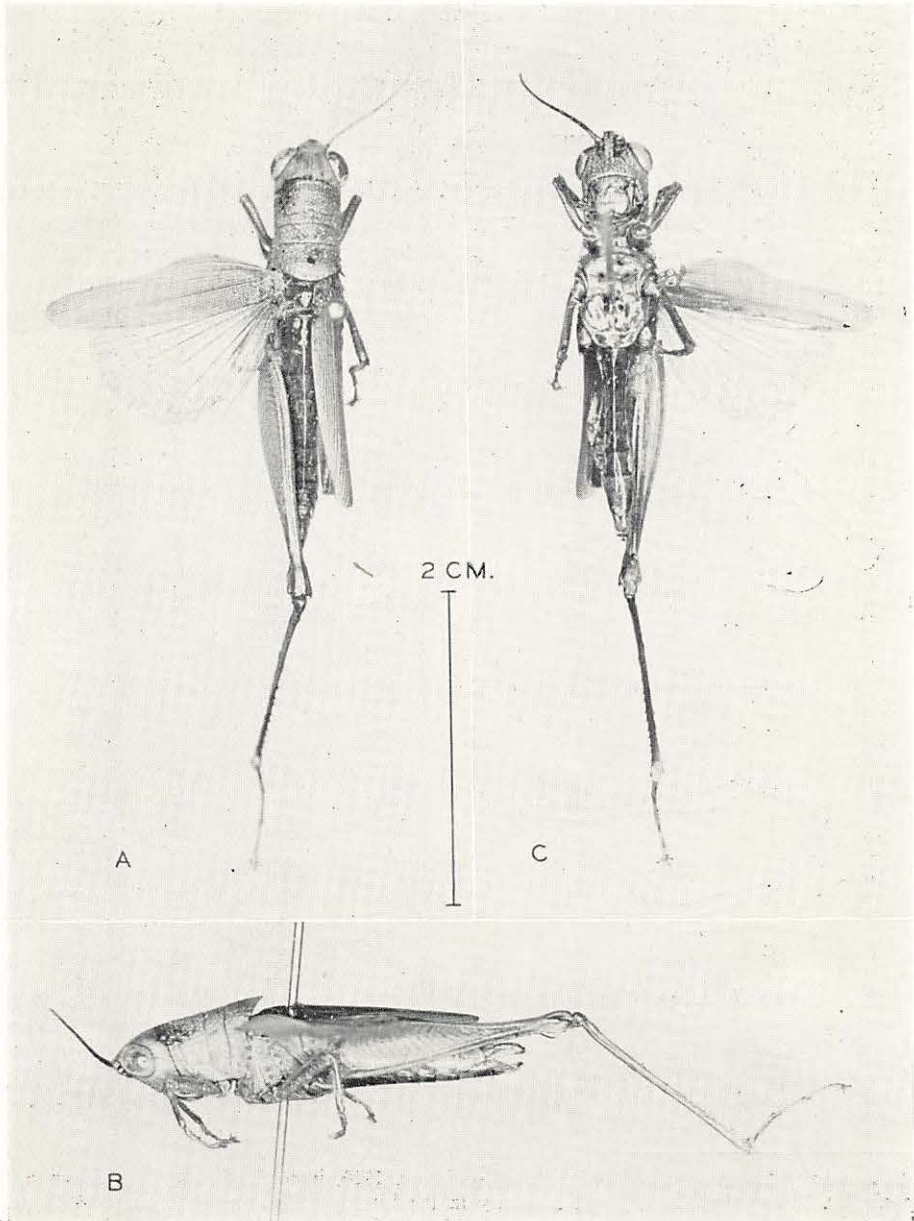


Fig. 2. *Spinacris viridis* Willemse, ♀ holotype. A, dorsal; B, lateral; C, ventral.

Only one species was previously known, but a second has now come to light.

Spinacris viridis Willemse, 1933 Figs. 2, 5A, 6A, 10B, 11B.

Spinacris viridis Willemse, 1933: 76, fig. 5 [♀ head and pronotum]; 1956: 7, fig 17 [♀ head and pronotum], 85; 1957: Index, p. V [as *viridis* (*Spinacris*)].

The only specimen known is the ♀ holotype in Stockholm. It bears the following labels: (1) Surigao, Mindanao [printed]; (2) 485/65; (2) *Spinacris* n. g. *viridis* n. sp. Det. C. Willemse; (4) Type [on dull red, black border].

Spinacris elegans, Kevan, n. sp. Figs. 3, 10C, 11C.

Holotype ♀ (BISHOP 6632), Philippines [Luzon], Camarines Sur., Mt Isarog, 750-850 m, 20.IV.1963, H. M. Torre Villas.

Similar to *S. viridis*, but more slender, more strongly brachypterous, and having a slightly constricted pronotum and longer, more slender and differently colored hind legs. Tegmina very short, but meeting dorsally, not extending beyond 4th abdominal tergum; hind femur extending well beyond end of abdomen; 3 hind tarsal segments all approximately equal, together more than 1/2 the length of hind tibia; subgenital armature and spermatheca as illustrated (figs 10C, 11C). The antennae are lacking.

Coloration: generally green to olive-green, olivaceous-testaceous below; eyes, costal areas of tegmina and anterior and middle legs brownish; hind femur orange-yellow on external face, bright red on internal face, greenish apically and above on both faces, knees green; hind tibia blue, yellowish gray above, especially toward base, spines of latter color, black-tipped; hind tarsus grayish-testaceous.

Measurements: length of body 24.8, pronotum 6.4, tegmen 8.0, hind femur 15.0 mm.

The type is unique.

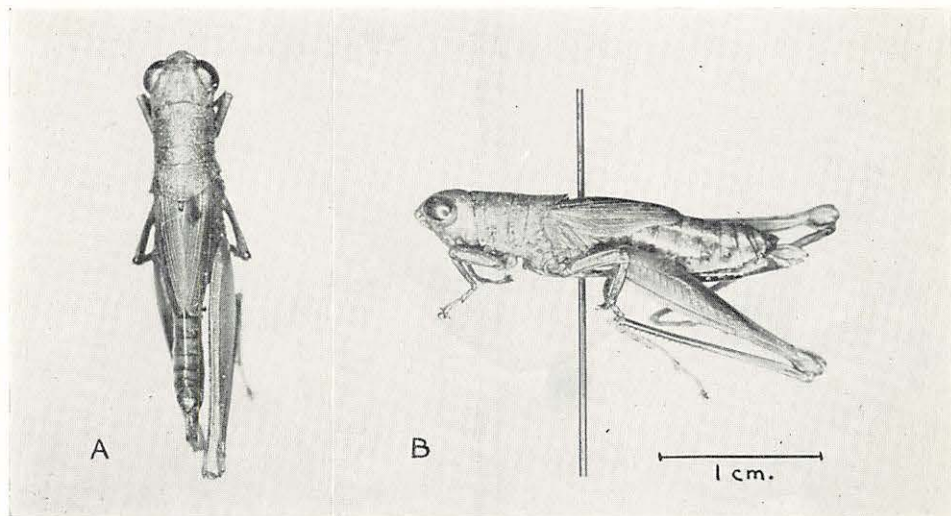


Fig. 3. *Spinacris elegans*, n. sp., ♀ holotype. A, dorsal; B, lateral.

Genus *Meubelia* Willemse, 1932

Meubelia Willemse, 1932 : 281, 283.—Neave, 1940 : 142.—Ramme, 1941 : 79.—Willemse, 1956 : 8, 82, 83 ; 1957 : Index, p. III.

Philippinacris Willemse, 1932 : 283.—Neave, 1940 : 709.—[Ramme, 1941 : 79 (only in synonymy with *Meubelia*).—Willemse, 1956 : 83 (only in citing type species ; generic synonymy listed p. 82) ; 1957 : Index, p. IV (only as a synonym)].

Type species (by monotypy) : *Meubelia gracilis* Willemse ; of *Philippinacris* (by orig. desig.) : *Philippinacris gracilis* Willemse = *Meubelia willemsei* Ramme = *Meubelia gracilis* Willemse. New Synonymy.

Ramme (1941) placed this genus nearest to *Paratarbaleus* Ramme, 1941, on the basis of the shape of the head. However, apart from the fact that both genera have proven to be Pyrgomorphidae, they are not closely related ; *Paratarbaleus* is a member of the Nereniini (see Kevan, ms).

Three species referable to *Meubelia* have been described, the type species from the ♀ only, and the others (*M. atriantennis* and *M. willemsei*) only from ♂♂. Of ♂♂, *M. atriantennis* (Willemse) may be recognized by its rather more slender build, its thicker antennae with shorter segments (not 3× as long as wide) and by its phallic structures (cf. figs 7 and 8). In dorsal view, the latter are very similar in the two species, although in *M. atriantennis* the cingulum and the aedeagal sclerites and valves are narrower, the latter tapering less strongly. In lateral view, the aedeagal sclerites and valves and the valves of the cingulum differ more strikingly, as illustrated, particularly in the less rectangular cingulum valves and less swollen appearance of the valves of the aedeagus of *M. atriantennis*. A notable feature of both species is the bifid apex of the aedeagal sclerites, a feature not seen in *Verdulia*, although in that genus there is a distinct irregularity some distance from

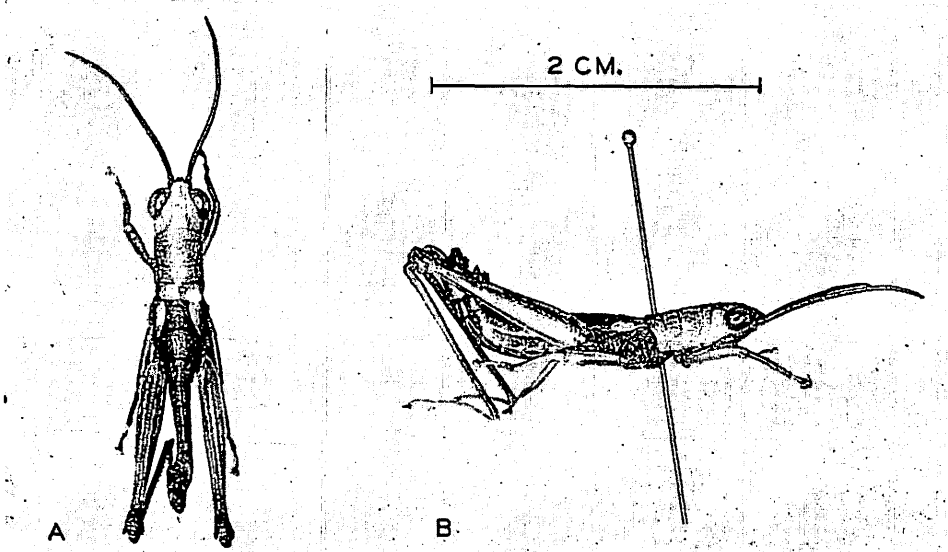
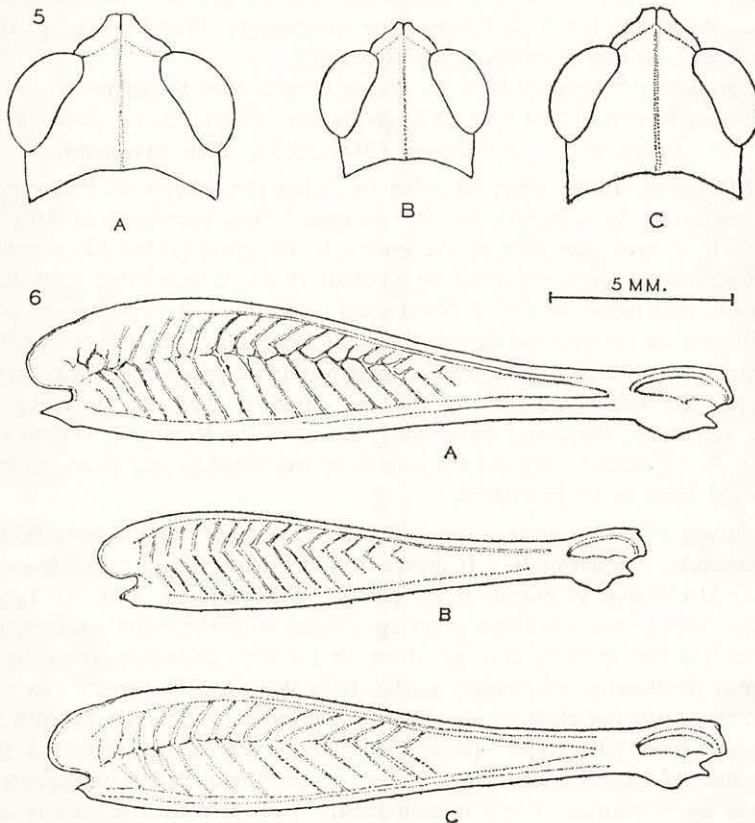


Fig. 4. *Meubelia atriantennis* (Willemse), ♂ holotype. A, dorsal; B, lateral.

the apex, which seems to indicate homology (fig 1D). Color characters are also said to distinguish the two "♂" species, but these are probably unreliable, except perhaps for the absence of black on the tegminal vestiges and the unicolorous black antennae of *M. atri-antennis*.

I believe *M. willemsei* Ramme to represent ♂ of *M. gracilis*, but no ♀ of *M. atri-antennis* is available for comparison with it. *M. willemsei* and *M. gracilis* were both described from the same series of specimens and from the same three localities (*M. gracilis* also from two additional ones), and, since one is known only from ♂ and the other only from ♀, there can be little doubt of their synonymy. The tegminal vestiges of ♀ (*M. gracilis*, s. str.), however, are relatively a little larger and have the whole of their anterior fields black, whereas in ♂ ("*M. willemsei*") the black is confined to the base, and the ♀ antennae are uniformly dark, not annulated as in ♂. Sexual dimorphism of this kind, however, seems to be of quite common occurrence in flightless Acridoidea. The antennal segments of ♀ *M. gracilis* are as long as they are in "*M. willemsei*", i. e., the middle segments are at least 3× as long as wide.



Figs. 5 & 6. Heads and hind femora of *Spinacris* and *Meubelia*. 5, head, dorsal; 6, hind femur left: A, *S. viridis* Willemse, ♀; B, *M. atri-antennis* (Willemse), ♂; C, *M. gracilis* Willemse, ♀.

Meubelia atriantennis (Willemse) Figs. 4, 5B, 6B, 7.

Philippinacris atriantennis Willemse, 1932: 285.

Meubelia atriantennis: Willemse, 1956: 83; 1957: Index, p. I (as *atriantennis* only).

This species is known only from the holotype in Stockholm. This specimen bears the following labels: (1) Ca[ra]marines Philippin. [printed]; (2) 459/65; (3) *Philippinacris atriantennis* nov. sp. Det. C. Willemse; (4) Type [on dull red, black border]; (5) *Meubelia* (= *Philippinacris*) Det. C. Willemse; (6) *Meubelia atriantennis* Will. Det. C. Willemse.

The type locality, Caramarines, or Caramoan Peninsula, being in Luzon, suggests that this is a northern species, whereas the next is southern.

Meubelia gracilis Willemse Figs. 5C, 6C, 8, 9, 10D, 11D.

Meubelia gracilis Willemse, 1932: 282.—Ramme, 1841: 79 (as *gracilis* only).—Willemse, 1956: 83, 84; 1957: Index, p. II [as *gracilis* (*Meubelia*)].

Philippinacris gracilis: Willemse, 1932: 284, pl. XII, fig 7 [♂].—Sjöstedt, 1932: 32.—Ramme, 1941: 80, 217 (generic synonymy and name change due to secondary homonymy indicated).—Willemse, 1956: 83 (citing type specimen); 1957: Index, p. II [as *gracilis* (*Philippinacris*), synonym only]. **New Synonymy.**

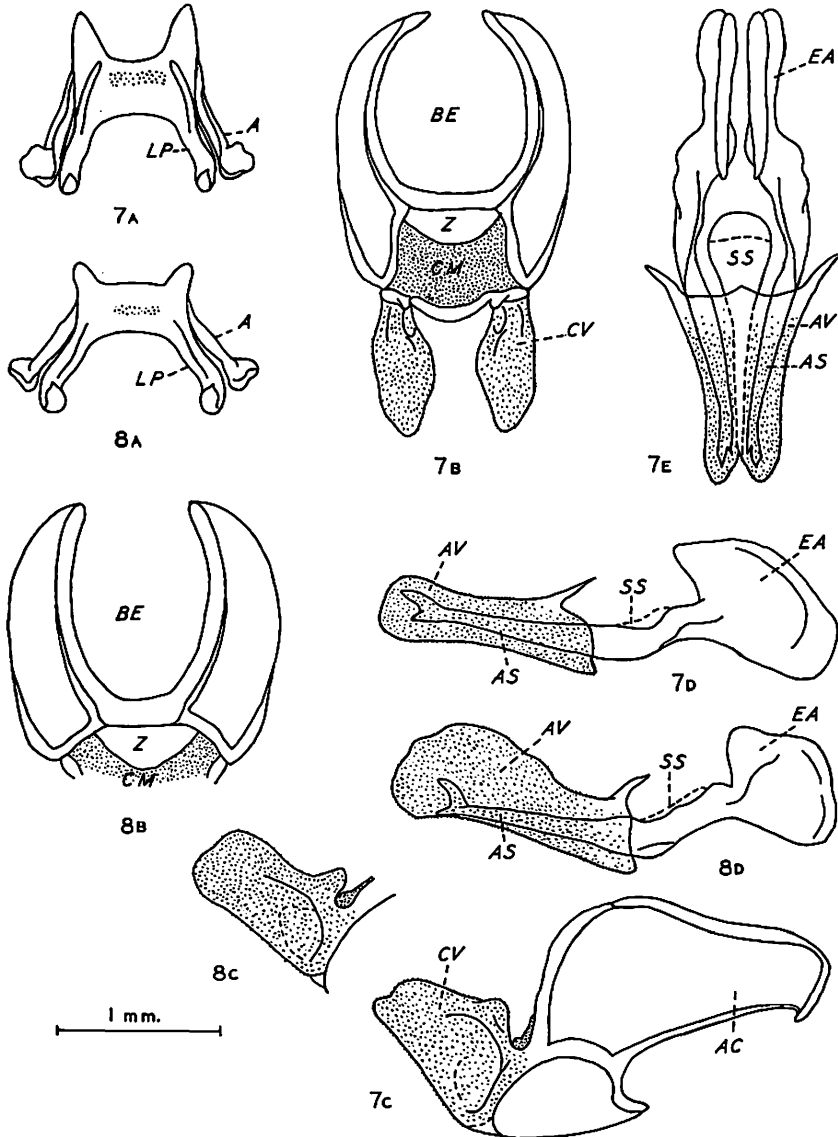
Philippinacris gracilior: Sjöstedt, 1932: 32. *nomen nudum*. **New Synonymy.**

Meubelia willemsei Ramme, 1941: 80, 217.—Willemse, 1956: 83, 84 [latter p. as *willemsei* only]; 1957: Index, p. V [as *willemsei* (*Meubelia*)]. **New Synonymy.**

Sjöstedt (1932) was, at the time, in error in listing the species as *Philippinacris gracilis*, since he was referring to a Stockholm ♀ "cotypus" (i. e. paratype) of *Meubelia gracilis*; there is no such ♀ type specimen of *Ph. gracilis*! Willemse (1956: 83) repeats this error. The name *Philippinacris gracilior*, cited by Sjöstedt (*l. c.*), is attributed to Willemse, "nondum descripta", and refers to the ♂ Stockholm "cotypus" (i. e. paratype) of *Ph. gracilis* listed by Willemse in his original description. It does not refer to the specimen of *atriantennis* in Stockholm (which was inadvertently omitted from Sjöstedt's list), since that is the holotype, not a "cotypus." As the two nominal "*gracilis*" species given above appear to be synonyms, there was presumably no need for Ramme (1941) to create a new name for the ♂ "species." Should the synonymy indicated by me prove to be erroneous, his name would have to be reinstated.

The ♀ holotype of *M. gracilis* is now in the Museum of the Limburg Natural History Society, Maastricht, Netherlands. It bears the following labels: (1) Bucas, Philippin. [printed]; (2) *Meubelia* n. g. *gracilis* n. sp. Det. C. Willemse; (3) and (4) Type and Holotype [on red]. There were also three other specimens with the same data before Willemse when he described the species, two of them in his own collection (now in Maastricht) and the other in Stockholm, but which of the three Willemse specimens was to be regarded as the holotype was not clearly indicated in the original text. That bearing the "Type" label (the others have "Paratype" labels) must, however, be regarded as the holotype, not only because of its label, but also because, of the three, its measurements are nearest to those given by Willemse. These measurements, however, are not strictly accurate (the body length is 28 not 27 mm) and I suspect that those given actually refer to a paratype labelled "Siargao, Philippin.", also in Willemse's collection. This collection also contained yet another paratype labelled "Dinagat, Philippin." Other paratypes are from Min-

danao, and Surigao (STOCKHOLM) and from Panaon and Siargao (Deutsches Entomologische Institut) [not seen by me]. Willemse (1932) also refers to "1♂ nymph" from Catbalogan. This is a nymph of the penultimate instar, but is a ♀ (the determination label was subsequently altered by Willemse himself).



Figs. 7 & 8. *Meubelia* spp., phallic structures. 7, *M. atri antennis* (Willemse): A, epiphallus; B, cingulum, dorsal; C, cingulum from right; D, aedeagus from right; E, aedeagus, dorsal. 8, *M. gracilis* Willemse (*M. willemsei* Ramme): A, epiphallus; B, base of cingulum, dorsal; C, right valve of cingulum from right; D, aedeagus, from right. Notation as in fig. 2.

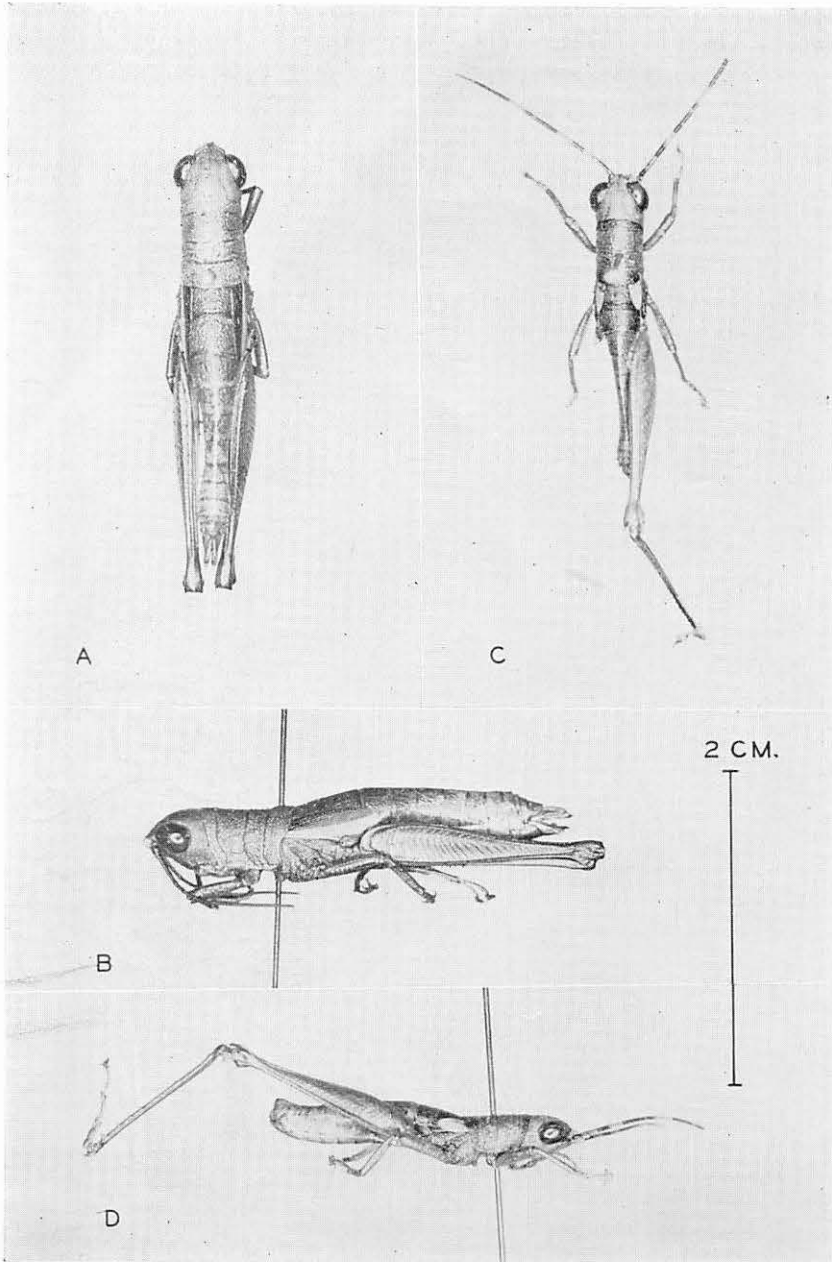
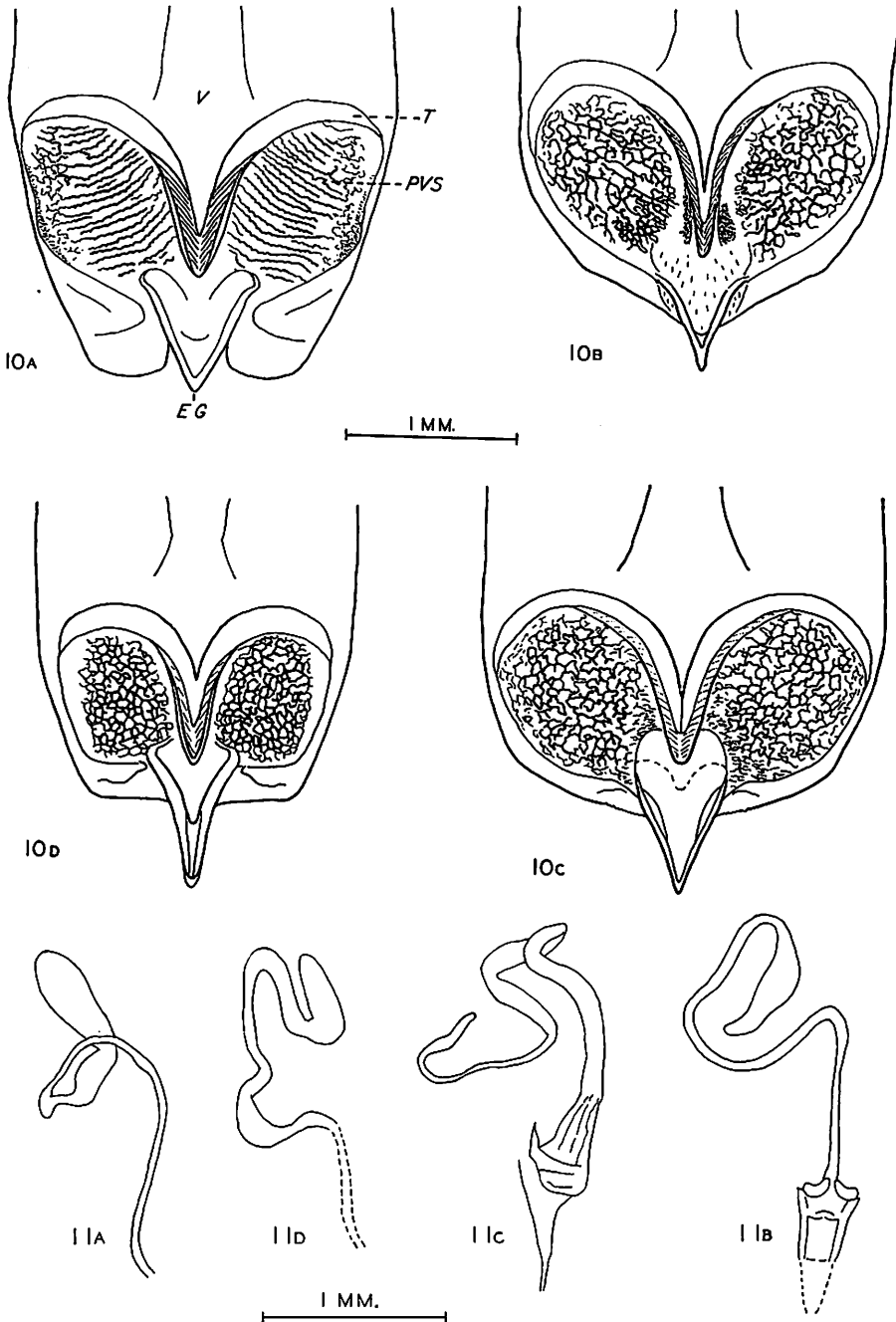


Fig. 9. A, *Meubelia gracilis* Willemse, ♀ holotype, dorsal; B, *id.*, lateral; C, *Philippinacris gracilis* Willemse (= *Meubelia willemsei* Ramme), ♂ holotype, dorsal; D, *id.*, lateral.



Figs. 10 & 11. 10, ♀ subgenital armature (dorsal) of: A, *Verdulia subcycloidea* Willemse; B, *Spinacris viridis* Willemse; C, *S. elegans*, n. sp.; D, *Meubelia gracilis* Willemse. EG, egg-guide; PVS, post-vaginal sclerotic area; T, tunica; V, vagina. 11, Spermathecae and ducts of: A, *Verdulia subcycloidea* Willemse; B, *Spinacris viridis* Willemse; C, *S. elegans* n. sp.; D, *Meubelia gracilis* Willemse,

The ♂ holotype of *Philippinacris gracilis* is also now in Maastricht. It bears the following labels: (1) Surigao, Mindanao [printed]; (2) *Philippinacris* nov. g. *gracilis* n. sp. Det. C. Willemse; (3) and (4) Type and Holotype [on red]; (5) *Meubelia willemse* Ramme Det. C. Willemse. There are also 4 paratypes from Siargao and one from Bucas in Willemse's collection. Another from Bucas is apparently in Stockholm, and yet another from Siargao is recorded as being in Berlin, but I have not seen these.

The only other specimens so far known to me are a last-instar ♀ nymph from the Island of Samar (Lyman Entomological Museum, Macdonald College) and 1 ♂ and 2 ♀♀ from W. Mindanao, Misamis Or[iental], Mt Empagatao, 1050-1200 m, 19-30. IV. 1961, H.

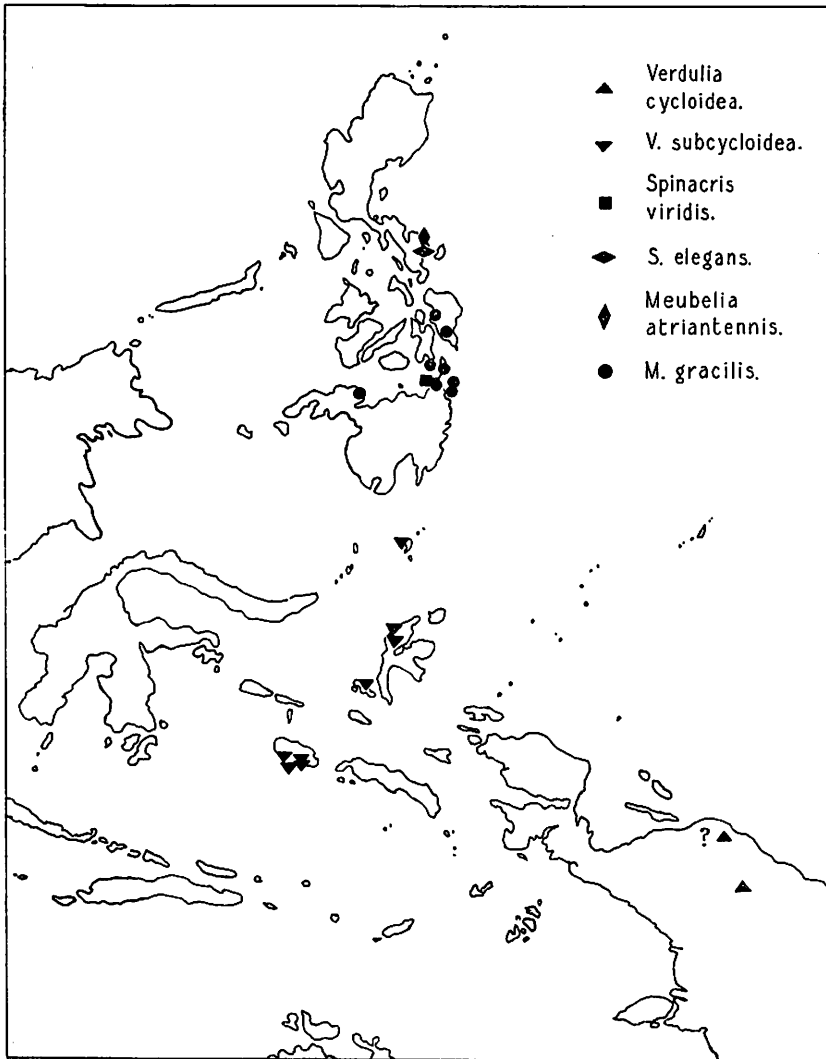


Fig. 12. Known geographical distribution of Verduljini,

M. Torrevillas coll. (Bishop Mus.). One of ♀♀ is also labelled "Rain Forest." The ♂ differs from the type in having almost, but not quite, black antennae, as in ♀♀ (not variegated), and there is practically no black at the bases of the tegmina. The differences are presumably due merely to individual variation. Nymphs are olivaceous green in color, with dark antennae, terminalia and inner faces of the hind femora; the vestigial tegminal buds are reddish.

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