A PRELIMINARY REVISION OF THE GENUS *ATRACTOMORPHA* SAUSSURE, 1862

(Orthoptera: Acridoidea: Pyrgomorphidae)

by

SANTOSH K. BANERJEE and D. KEITH MCE. KEVAN
Entomology Department, McGill University,
Macdonald College, Que., Canada.

I. INTRODUCTION.

Atractomorpha is an easily recognizable pyrgomorphid genus which is widely distributed in the Old World tropics and subtropics, occurring from West Africa to the Indo-Malayan and Papuan regions. It is absent from Europe and North Africa, but its range extends into temperate zones, particularly in eastern Asia and in eastern Australia. At least one species has also been introduced into the Hawaiian Islands. Introduction into the New World so far seems improbable (See KEVAN, 1960).

No less than forty species have been described or subsequently placed in the genus by previous authors, but it has now become apparent that individual variation within species and the insufficient material available to earlier authors has led to a multiplicity of invalid species being erected. As a result of our examination only nine species and five additional subspecies may now be recognized.

In this preliminary revision only the primary synonymy is given; a fuller synonymy will be published later. It should however, be observed that many of the records of past authors are incorrect and little reliance can usually be placed in many of the names used. Further details of each species and subspecies will also be given at a later date. The great majority of existing types have been examined. These were kindly loaned by various institutions or were examined in the museums in which they are deposited. Some of these types had lain undetected since the time of their original description and have only now come to light.

Grateful acknowledgement is made of the help given by all those institutions and individuals who have granted facilities or lent material. Particular thanks are due to those who have enabled type specimens or

xtensive series to be examined, in particular: Dr. D. R. RAGGE, British useum (Natural History), London; Prof. G. C. VARLEY, Oxford; Dr. E. ORALES AGACINO, Madrid; Dr. CH. FERRIÈRE, Geneva; Dr. H. SCHIEMENZ, rmerly Berlin (now Dresden); Dr. H. C. BLÖTE, Leiden; Prof. L. CHOPARD, aris; Dr. B. KULLENBERG, Uppsala; Dr. R. MALAISE, Stockholm; Dr. J. O. ÜSING, Halle; Dr. F. CAPRA, Genoa; Dr. G. Ya. BEI-BIENKO, Leningrad; r. S. L. TUXEN, Copenhagen; Mr. A. COLLART, Brussels, Mr. J. A. G. REHN, hiladelphia, Dr. A. B. GURNEY, Washington, Dr. T. H. HUBBELL, Ann Arbor, lichigan, Dr. E. S. ROSS, San Francisco and Dr. R. L. WENZEL, Chicago. art of this work was assisted by a Quebec Auxiliary Grant received through lacdonald College of McGill University.

II. BRIEF GENERIC DIAGNOSIS.

Atracomorpha SAUSSURE, 1862

ruxalis FABRICIUS, 1793, Ent. Syst., 2: 26 (*partim*); PALISOT DE BEAUVOIS, 1806, Ins. Agr. Amér. Orth.: 16 (*partim*); THUNBERG, 1815, Mém. Acad. Sci. St.-Péterb., 5: 263 (*partim*); 1827 Nova Acta Soc. Sci. Uppsala, 9: 76 (*partim*); BURMEISTER, 1838, Handb. Ent. 2 (2): 606 (*partim*).

[cridium] (*Truxalis*), DE HAAN, 1842, Verh. nat. Gesch. Nederland. overz. Bezitt. 18 (Zool. 17): 138 (*partim*).

Truxalis (*Pyrgomorpha*), GUÉRIN-MÉNÉVILLE, 1844, Icon. Règne Anim. 7: 340 (*partim*).

Pyrgomorpha BLANCHARD, *in* DUMONT d'URVILLE, 1853, Voy. Pole Sud (Zool.) 4: 567 (*partim*); WALKER, 1870, Cat. Derm. Salt. Brit. Mus. 3: 497 (*partim*).

Atractomorpha SAUSSURE, 1862, Ann. Soc. Ent. France, (4) 1: 474.

Truxalis WALKER, 1870, Cat. Derm. Salt. Brit. Mus. 3: 494 (*partim*).

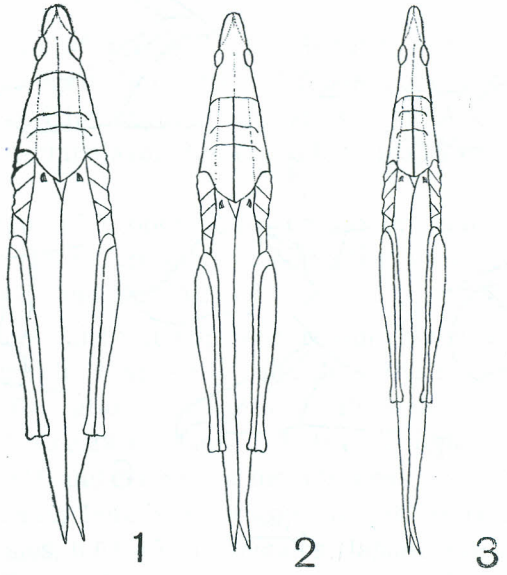
Perena WALKER, 1870, *Ibid.*: 506.

Minorissa THOMAS, 1874, Bull. U.S. Geol. geogr. Surv. Terr 1 (2), Ser. 1: 63 (*nec* WALKER) [*cf.* KEVAN, 1960].

Type species by subsequent designation (KIRBY, 1910, Syn. Cat. Orth. 3: 331): *Truxalis crenulatus* FABRICIUS, 1793 = *Atractomorpha crenulata* (FAB.).

Pyrgomorphidae with body fusiform or elongate. Head conical, frontal profile very strongly oblique, fastigium of vertex well developed, lanceolate to pyramidal in outline as seen from above. Antennae subtriquetrous at base, becoming subcylindrical apically. Eyes elongate-ovate or oblong, with a well defined dorsal spot. Outer surface of mandible with a pair of prominent ridges, the space between them concave. Pronotum tricarinate with anterior margin of dorsum subemarginate to truncate; posterior margin angular to subtruncate. Tegmina fully developed, usually extending beyond the apex of the abdomen, acute lanceolate at apex, narrower in male than in female. Hind wings present in both sexes, often rosy or red at base. Hind femur slender, elongate, with knee shortly bilobed; hind tibia smooth,

with pointed spines and an outer terminal spine. Prosternal tubercle obliquely truncated; anterior face of tubercle rather concave; mesosternal interspace trapezoidal, often rather narrow, particularly in the male, metasternal interspace ellipsoidal or oblong. Typanum well developed. Supra-anal plate elongate trigonal. Cerci short and conical. Epiphallus with middle portion anchor-shaped. Ovipositor with dorsal valves sinuate and crenulated. Male diploid chromosome number 19.



FIGS. 1-3. Body-forms of *Atractomorpha* spp. (diagrammatic). 1. Stout form as in *A. aberrans* group; 2. Intermediate form typical of the majority of species; 3. Very slender form as in *A. psittacina*.

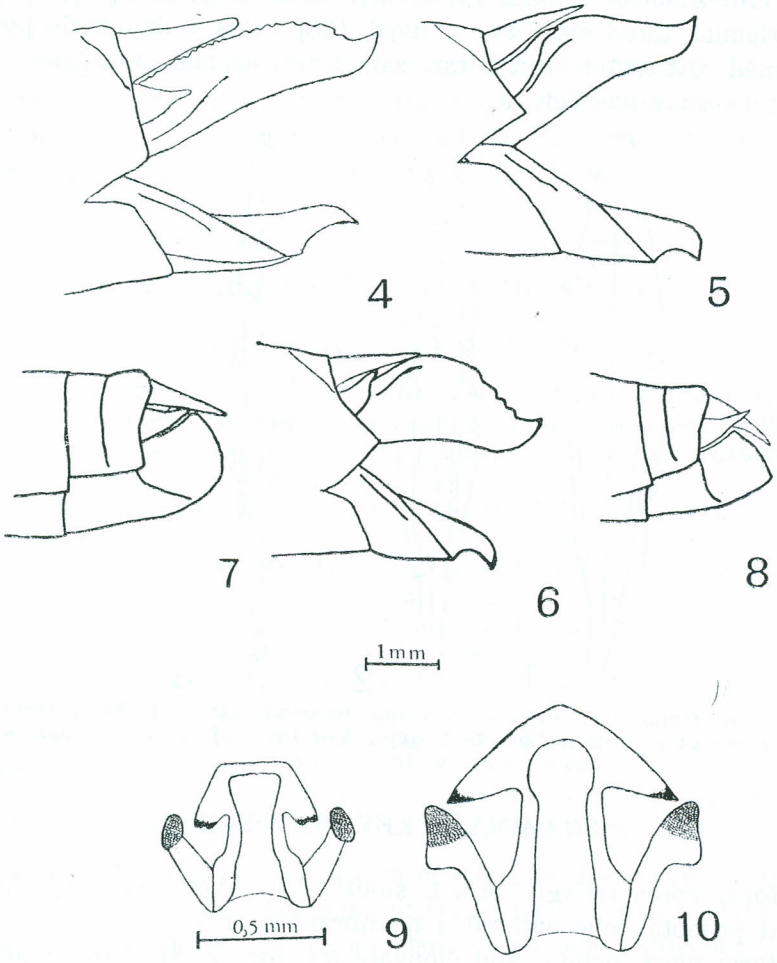
III. PRELIMINARY KEY TO SPECIES [1].

1. Body-form comparatively broad, stout and rather short (*cf.* fig. 1). Lateral pronotal lobe without a membranous area 2
   Body-form more slender and elongate (*cf.* figs. 2, 3). Lateral pronotal lobe often with a membranous area near posterior margin (figs. 35, 40, 41) [2] 4

[1] Like most other pyrgomorphid genera, *Atractomorpha* shows great intra-specific variation, so that individual specimens are often difficult to determine and series are desirable for diagnosis. As a rule, males are less easily distinguished than females.

[2] This membranous area has not previously been figured, although it was referred to by YAKOBSON (1902), in his generic diagnosis, and in passing by BOLIVAR (1905) in his description of *A. sinensis*, *A. blanchardi* and *A. ambigua* and in his redescriptions of *A. angusta* KARSCH; he does not refer to it in his key. HEBARD (1922: 339) and BEI-BIENKO (1949: 174) also refer, without special comment, to a small,

2. Oblique row of postocular tubercles callous, low and irregularly arranged (figs. 11, 21). Females almost always with small dark or reddish maculae or points on pronotum and tegmina. Hind wings deep reddish or brick-red, not clear hyaline nor rosy at base only. Dorsal ovipositor valves



FIGS. 4-10. Genitalia of *Atractomorpha spp.*, 4-6. Ovipositor (lateral); 7, 8. Apex of ♂ abdomen (lateral); 9, 10. Epiphallus. 4, 9. *A. aberrans;* 5. *A. sinensis;* 6. *A. crenulata;* 7. *A. crenaticeps;* 8. *A. psittacina;* 10. *A. brevicornis.*

smooth, colourless area on the lateral pronotal lobe near to the caudal margin. It is possible that this area may act as some form of resonator in stridulation, although sound production by *Atractomorpha* does not seem to have been recorded. Thoracic stridulation is reported for the pyrgomorphid genus *Aularches* (MAXWELL-LEFROY, 1923; HINGSTON, 1927). Another explanation might be that the cavity behind the membranous area acts as an air reservoir associated with the semi-aquatic habits of some *Atractomorpha* species. The absence of a thoracic spiracle behind the membrane gives no additional support to this suggestion, however.

slender (fig. 4). Postero-lateral margin of pronotum not strongly arcuate. Epiphallus as in fig. 9. West African region from Sierra Leone to N. Angola and E. to Katanga and Uganda . . . . *A. aberrans* KARSCH

Postocolar tubercles more strongly raised, distinct and rather regularly arranged (*cf.* figs. 12-17, 22-27). Neither sex with numerous dark pigment spots on pronotum and tegmina. Hind wings hyaline or rosy at base. Dorsal ovipositor valves stout (*cf.* figs. 5, 6). Asiatic or Australian 3

3. Posterior margin of pronotal disc distinctly angular (fig. 32). Hind wings well developed. Outer face of femur convex and strongly keeled. Nepal, N. India (Himalayas, N. West Bengal, Assam); Upper Burma, Siam; Mergui Archipelago; Malaya; Indo-China, S.W. China . . . . . *A. burri* BOLÍVAR

Posterior margin of pronotal disc obtuse or rounded (fig. 34). Hind wings smaller. Outer face of hind femur not strongly convex or prominently keeled. E. and S.E. Australia . . . . . *A. australis* REHN

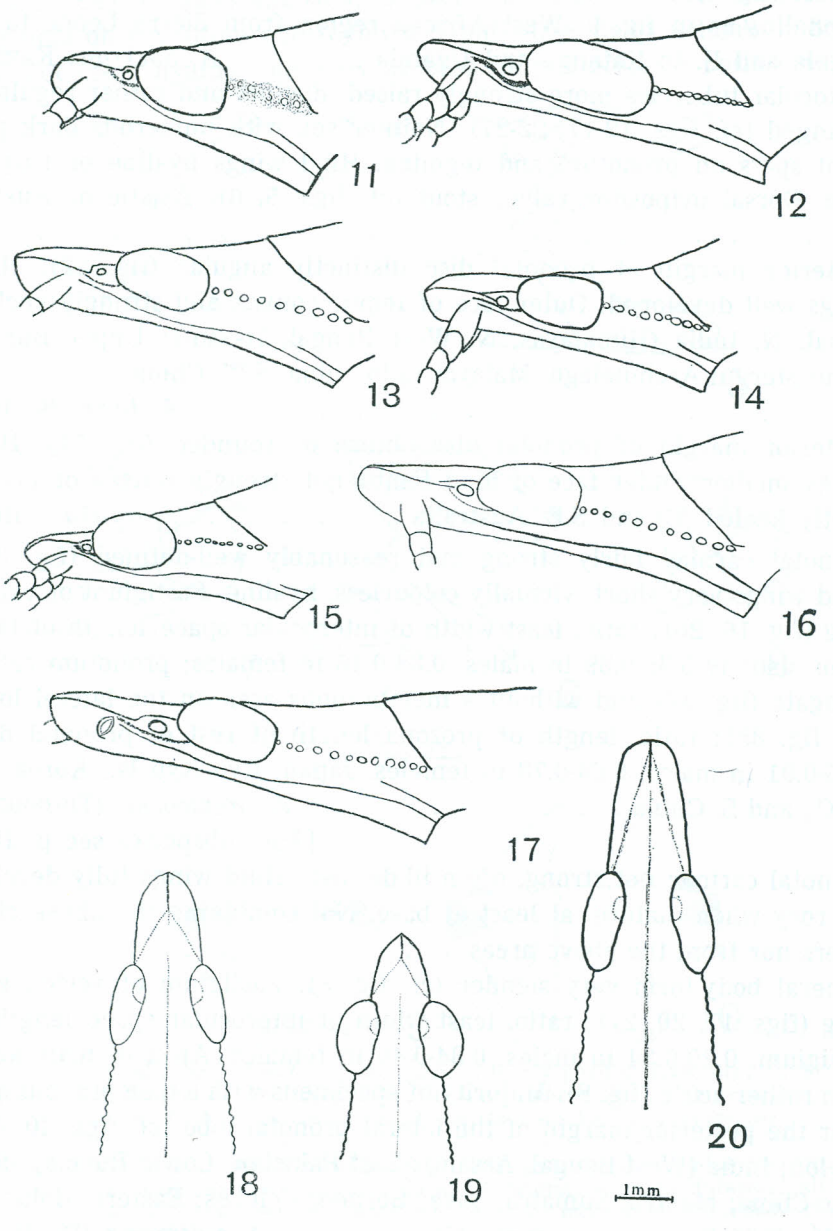
4. Pronotal carinae fairly strong and reasonably well-defined (fig. 37). Hind wings very short, virtually colourless, hyaline. Fastigium of vertex long (fig. 16, 26); ratio, least width of interocular space/length of fastigium, usually 0.35-0.39 in males, 0.38-0.45 in females; pronotum rather elongate (fig. 37) and without a membranous area on the lateral lobes (*cf.* fig. 38); ratio, length of prozona/length of rest of pronotal disc, 0.75-0.91 in males, 0.64-0.73 in females. Japan; Ryu Kyu Is.; Korea; N., E., C., and S. China . . . . . *A. brevicornis* (THUNBERG)

[For subspecies see p. 186]

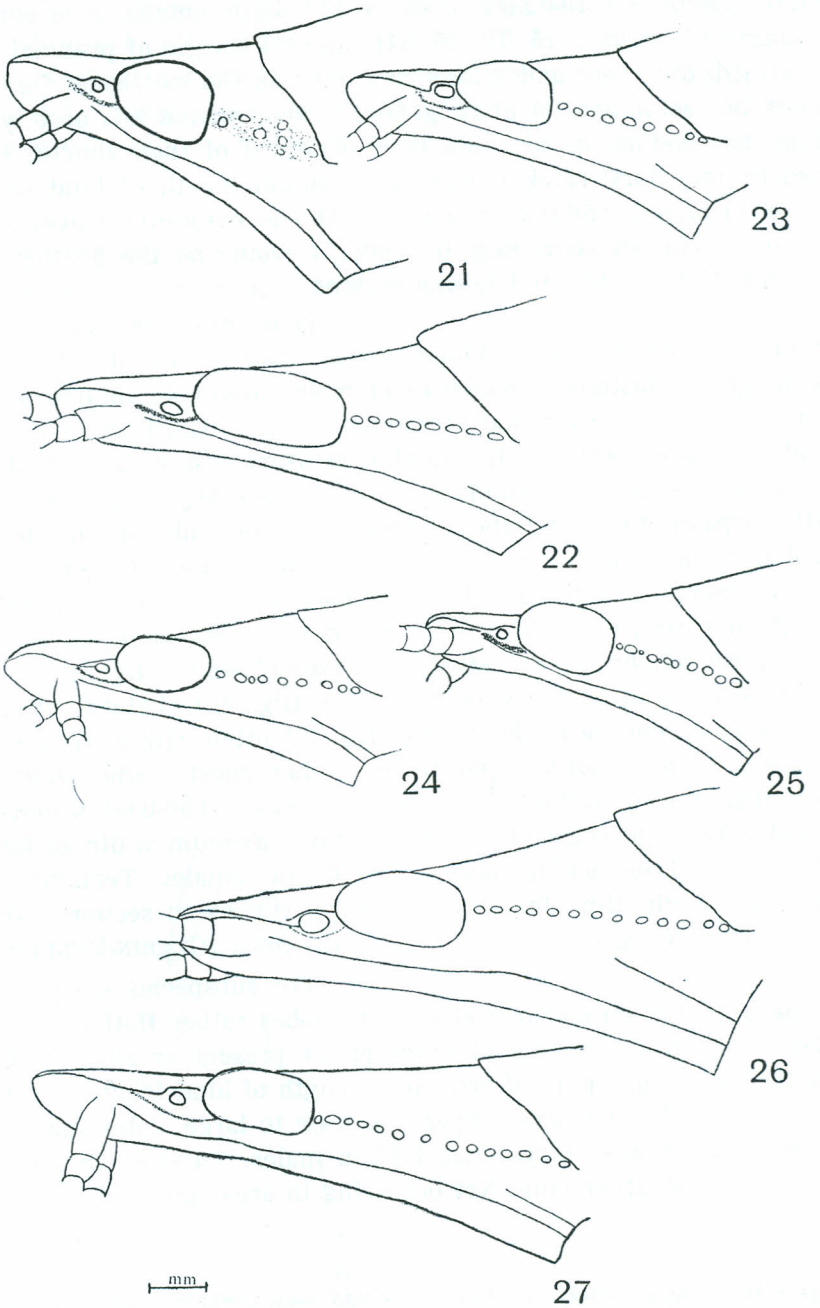
Pronotal carinae not strong, often ill-defined. Hind wings fully developed, rosy when mature, at least at base. Not combining the above characters nor from the above areas 5

5. General body-form very slender (*cf.* fig. 3). Fastigium of vertex very long (figs. 17, 20, 27); ratio, least width of interocular space/length of fastigium, 0.29-0.34 in males, 0.34-0.40 in females. Apex of male abdomen rather acute (fig. 8). Majority of specimens with a membranous area near the posterior margin of the lateral pronotal lobe (*cf.* figs. 40, 41). Ceylon; India (West Bengal, Assam); East Pakistan; Lower Burma; Siam; Indo-China; Malaya; Sumatra; Java; Borneo; Celebes; Eastern Moluccas; Philippines . . . . . *A. psittacina* (DE HAAN)

Body-form not exceptionally slender (*cf.* fig. 2). Fastigium of vertex comparatively rather shorter. Male abdomen with apex more obtuse (*cf.* fig. 7) 6



FIGS. 11-20. Heads of *Atractomorpha* spp. ♂ (11-17, lateral; 18-20, dorsal). 11. *A. aberrans*; 12. *A. crenaticeps crenaticeps*; 13, 18. *A. acutipennis sinensis*; 14. *A. acutipennis gerstaeckeri*; 15, 19. *A. crenulata crenulata*; 16. *A. brevicornis brevicornis*; 17, 20. *A. psittacina*.



FIGS. 21-27. Heads of *Atractomorpha* spp. ♀ (lateral). 21. *A. aberrans;* 22. *A. crenaticeps crenaticeps;* 23. *A. sinensis;* 24. *A. acutipennis gerstaeckeri;* 25. *A. crenulata crenulata;* 26. *A. brevicornis brevicornis;* 27. *A. psittacina.*

6. Fastigium of vertex rather short; ratio, least width of interocular space/length of fastigium, 0.40-0.50 in males, 0.48-0.59 in females. Eyes convex and prominent (*cf.* figs. 15, 19, 25, 31). Lateral margin of pronotal disc well defined, divergent and somewhat convex in the metazona(fig. 36). Tegmina not acuminate at apex, generally shorter and not usually exceeding the hind knees by more than one-third of their length. Hind femora rather short; ratio, length of pronotum/length of hind femur, 0.43-0.46 in males, 0.50-0.55 in females. Dorsal ovipositor valves short and strongly convex above (fig. 6). India, Ceylon and the greater part of the Indo-Malayan and Indonesian regions. . *A. crenulata* (FABRICIUS)
[For subspecies see p. 184].

   Fastigium of vertex usually longer; ratio, least width of interocular space/length of fastigium, 0.36-0.40 in males, 0.42-0.48 in females [1]). Eyes not markedly convex and prominent (*cf.* figs. 12-14, 22-24, 28-30). Lateral margin of pronotal disc in the metazona less well defined (*cf.* figs. 33, 35). Tegmina acuminate at apex, generally longer and frequently surpassing the hind knees by more than one-third of their length (except in some forms of *A. acutipennis*). Hind femora longer (except in *A. acutipennis*); ratio, length of pronotum/length of hind femur, 0.32-0.43 in males, 0.42-0.51 in the majority of females [2]). Dorsal ovipositor valves longer and less strongly convex above (*cf.* fig. 5) . . 7

7. Fovelae of fastigium usually more convex (fig. 30). Lateral pronotal lobe somewhat concave in the middle (fig. 39) often with a small membraneous area posteriorly. Hind femur rather short; ratio, length of pronotum/length of hind femur, 0.42-0.46 in males, 0.50-0.60 in females. Eyes not very large (figs. 14, 24, 30); ratio, maximum width of head/length of eye, 1.46-1.64 in males, 1.80-2.03 in females. Tegmina very variable in length. Hind femur not strongly convex in section. Africa, Medagascar, S.W. Asia . . . . *A. acutipennis* (GUERIN-MENEVILLE)
[For subspecies see p. 182].

   Foveolae of fastigium and lateral pronotal lobes rather flatter (*cf.* figs. 28, 38); [membraneous area of latter either present or absent]. Hind femur longer; ratio, length of pronotum/length of hind femur, 0.32-0.43 in males, 0.42-0.51 in females. Eyes moderate to large; ratio, maximum width of head/length of eye, 1.22-1.44 in males, 1.40-1.90 in females. Tegmina usually rather long. Not occurring in areas given for *A. acutipennis* 8

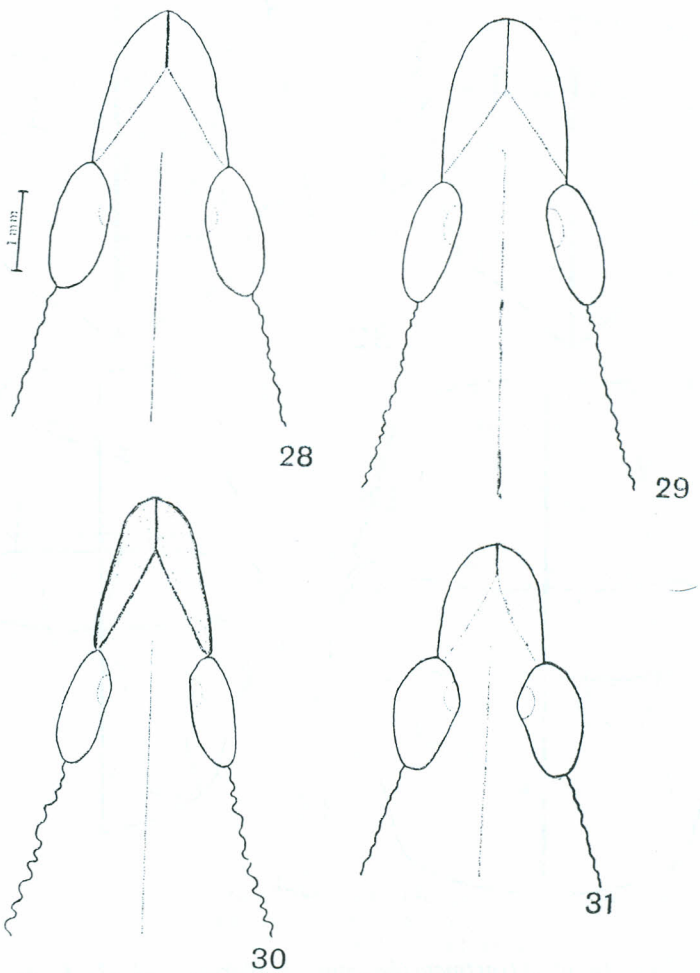
---

[1]) This ratio is very variable in *A. sinensis* and may sometimes fall well within the range of *A. crenulata*.

[2]) This ratio in *A. acutipennis* is similar to that of *A. crenulata*.

8. Eyes large, oblong (figs. 12, 22, 28); ratio, maximum width of head/length of eye, 1.22-1.46 in males, 1.40-1.91 in females. Lateral pronotal lobes without a membranous area near the posterior margin (fig. 38) except in Australian forms. Lesser Sunda Islands (east), Borneo; Moluccas, New Guinea; N. and E. Australia: [Hawaii (introduced) ?] [1] . . . . . *A. crenaticeps* (BLANCHARD) [For subspecies, see p. 179].

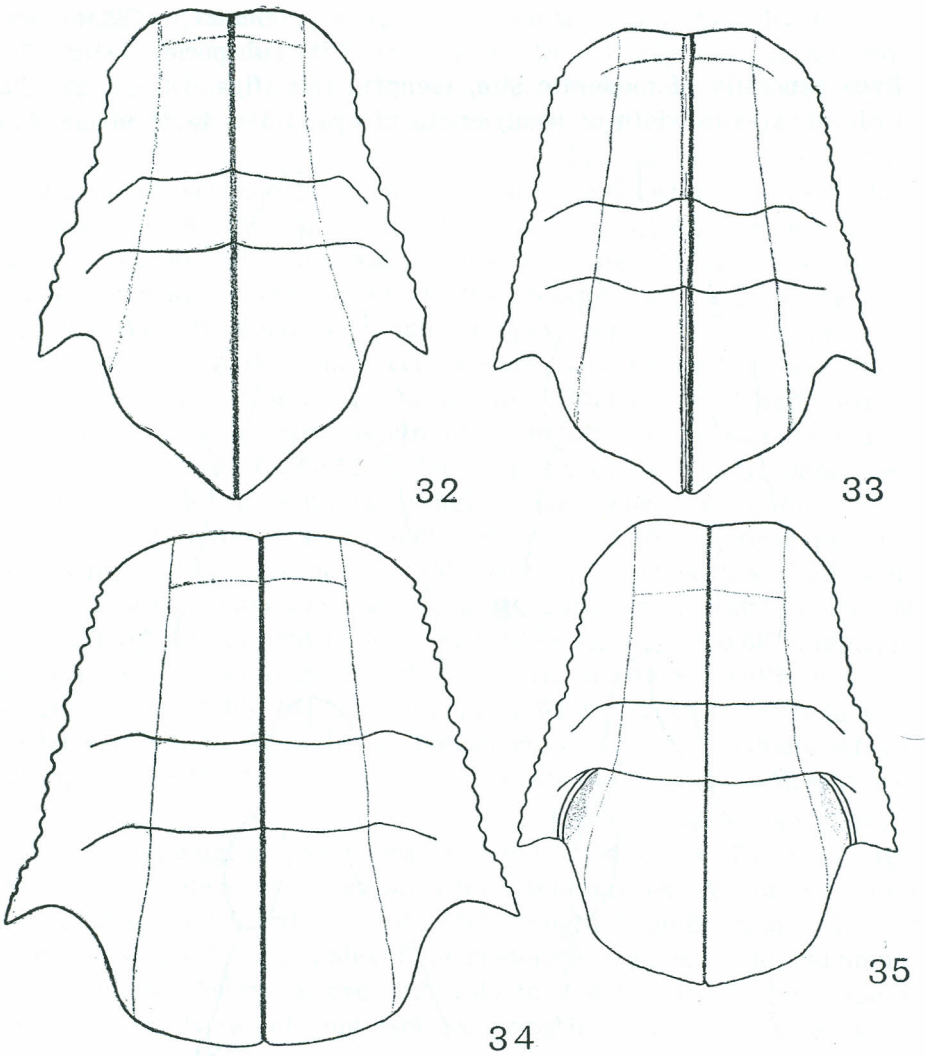
Eyes generally of moderate size, elongate-oval (figs. 13, 18, 23, 29); ratio, maximum width of head/length of eye, 1.31-1.44 in males; 1.80-



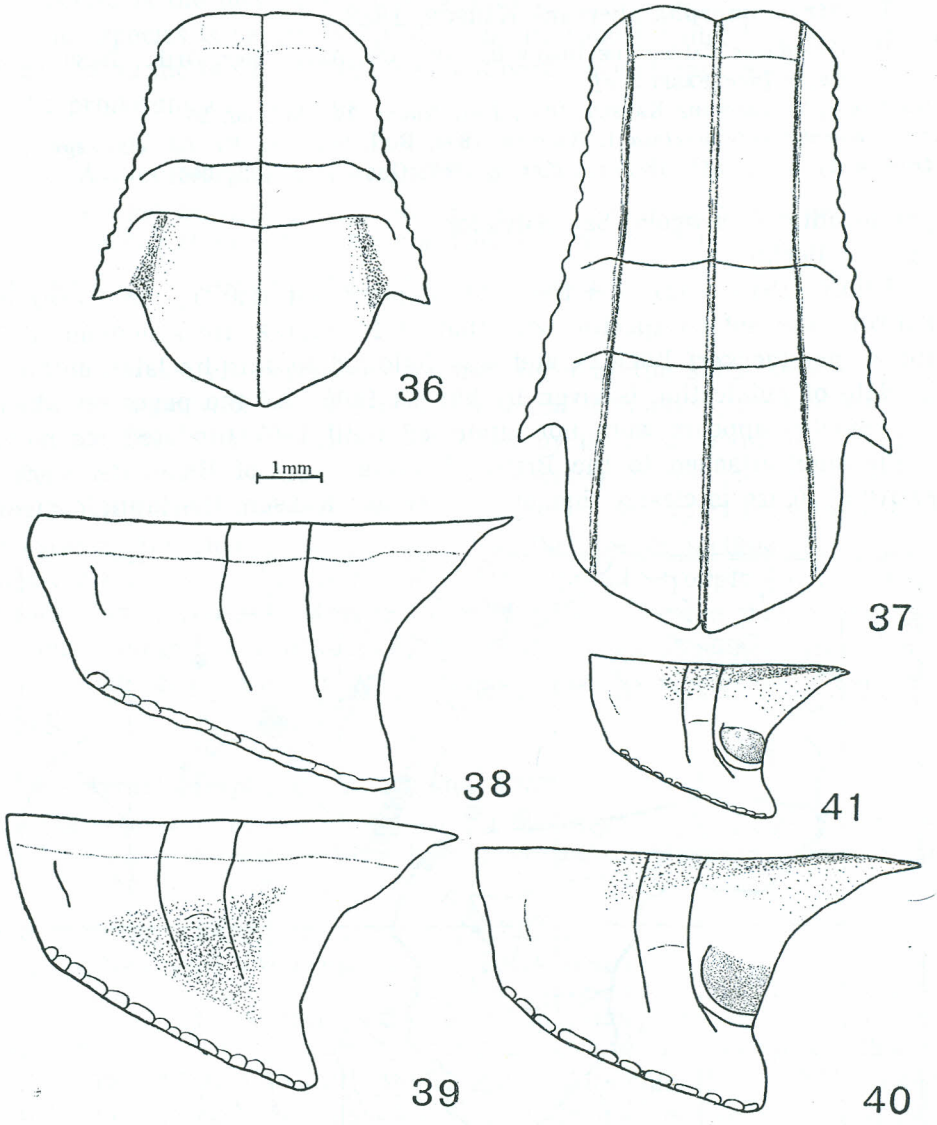
FIGS. 28-31. Heads of *Atractomorpha* spp. ♀ (dorsal). 28. *A. crenaticeps crenaticeps;* 29. *A. sinensis;* 30. *A. acutipennis gerstaeckeri;* 31. *A. crenulata crenulata.*

[1]) A single specimen only, see footnote, p. 179.

1.90 in females. Lateral pronotal lobe with a distinct membranous area near posterior margin (fig. 35). South and Central China; Taiwan; Hawaii and Midway I (introduced) . . . . . *A. sinensis* BOLÍVAR



FIGS. 32-35. Pronota of *Atractomorpha* spp., ♀ (dorsal). 32. *A. burri;* 33. *c. crenaticeps;* 34. *A. australis;* 35. *A. sinensis.*



FIGS. 36-41. Pronota of *Atractomorpha* spp. (dorsal and lateral). 36. *A. crenulata rhodoptera;* 37. *A. b. brevicornis;* 38. *A. c. crenaticeps* ♀; 39. *A. acutipennis gerstaeckeri* ♀; 40. *A. c. crenulata* ♀; 41. *Id.*, ♂.

IV. PRIMARY SYNONYMY AND NOTES ON SPECIES

1. **Atractomorpha aberrans** KARSCH, 1888

Truxalis crenulatus PALISOT DE BEAUVOIS, 1807, Ins. Agr. Amér. Orth.: 79-80, pl. 3, fig. 1a, b [*nec* FABRICIUS].
Atractomorpha aberrans KARSCH, 1888, Ent. Nachr. 14: 333, no. 25.
Atractomorpha rufopunctata I. BOLÍVAR, 1894, Bull. Soc. ent. Fr. 63: clxi - *syn. nov.*
Atractomorpha, sp. aff. *aberrans* KEVAN, 1957, Opusc. Ent. 22: 203.

Type locality: — Angola: San Salvador.
Type: — Berlin.

KIRBY (1910: 332) was the first to point out that *T. crenulatus* of BEAUVOIS was not conspecific with that of FABRICIUS. He synonymized it with *A. gerstaeckeri* BOLÍVAR and was followed in this by later authors. The date of publication is given by him as 1805, but the pages on which *T. crenulatus* appears were not published until 1807 (undated Ms notes by SHERBORN attached to the British Museum copy of BEAUVOIS' work). BEAUVOIS' figure is clearly that of *A. aberrans* KARSCH, the latitude given

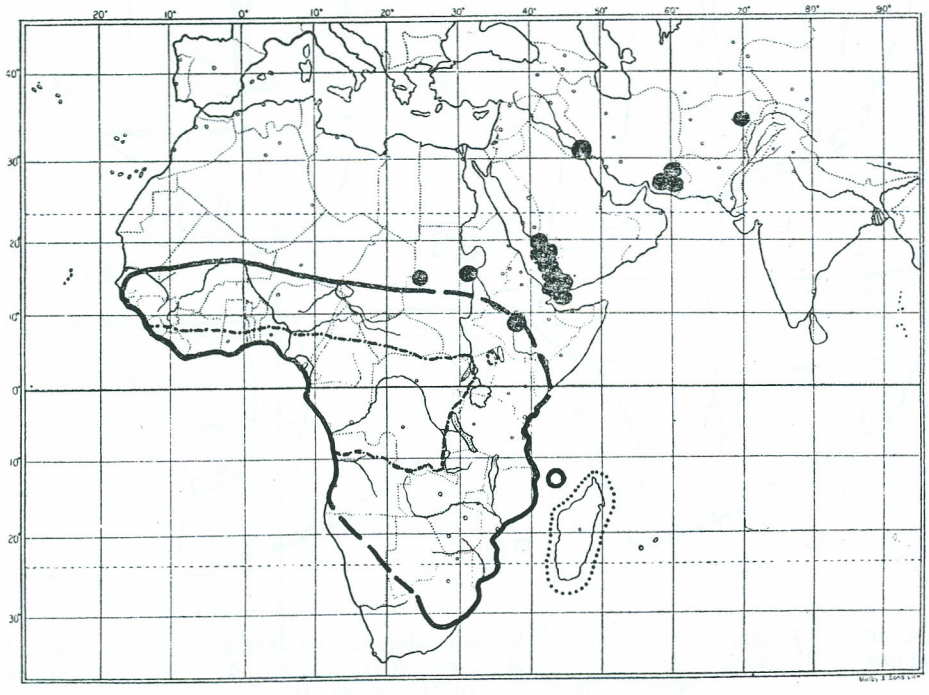


FIG. 42. Approximate distribution of *Atractomorpha aberrans* KARSCH and *A. acutipennis* (GUÉRIN). Broken line, limits of *A. aberrans;* dotted line, *A. acutipennis acutipennis;* solid line, *A. acutipennis gerstaeckeri* BOLÍVAR; black circles, *A. acutipennis brevis* UVAROV.

in the text suggests that this specimen was from the Cameroons coast where this species is the most likely one be found.

This species is easily recognizable by its robust build, bright red hind wings and, in the female, by the frequent occurence of dark reddish maculae on the pronotum and tegmina.

2. **Atractomorpha burri** I. BOLÍVAR, 1905

A[tractomorpha] Burri I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 197, 203.
A[tractomorpha] Himalayika I. BOLÍVAR, 1905, *Ibid.* 5: 198, 204 — *syn. nov.*

Type locality: — Assam; Khasia Hills, Cherapungi.
Type: — Madrid.

A. burri merely represents a small form of the same species as *A. himalayica,* somewhat resembling *A. crenulata rhodoptera;* types have been compared. The female specimen described by BOLÍVAR should be regarded as the lectotype of *A. burri* since this specimen bears his determination label, whereas the male (which is damaged) does not. Apart from the robust appearance, the characteristic features of the species include the angular posterior margin of the pronotum and the rather strongly carinate hind femora. Himalayan specimens tend to be above average in size, but we can detect no constant difference between them and specimens from other areas which would warrant the recognition of *himalayica* as a separate subspecies.

3. **Atractomorpha australis** REHN, 1907

Atractomorpha australis REHN, 1907, Bull. Amer. Mus. nat. Hist. 23: 449, fig. 5.
Atractomorpha crenaticeps australis REHN, 1953, Grassh. Locusts Australia, 2: 37, pl. 1, figs. 4-6, pl. 27, figs. 196-200.

Type locality: — Australia: New South Wales.
Type: — New York (American Museum Nat. Hist.).

A. australis has recently been reduced to a subspecies of *A. crenaticeps,* but after further consideration we have come to the conclusion that it must be raised again to full specific status. Although REHN (1953) found what he considered to be intermediate material between *australis* and *crenaticeps,* both forms (as in all species) are apparently subject to considerable convergent variation which gives the impression of intergradation. A considerable body of material, including much of that seen by REHN, has been examined.

Apart from its generally heavier build and shorter wings, *A. australis* may be distinguished by the eye being rather broad dorsoventrally, by

the subtruncated or very obtusely angulate posterior margin of pronotal disc, by the short hind wings, and, from *A. crenaticeps australiana* BOLÍVAR, by the complete absence of a membranous area on the lateral pronotal lobe in all the specimens we have examined. The view that *australis* and *australiana* belong to different species is also supported to some extent by the cytological evidence, put forward by WHITE (1957: 85), that in most populations of *australis*, supernumerary chromosomes are very frequent, while in *A. c. australiana* (*i.e.*, *A. crenaticeps crenaticeps* of REHN (1953)) these do not seem to occur. Further, the geographical overlap is very large (*A. australis* extends northwards as far at least as Brisbane) and it would appear that both forms may occur together — at least in the Sydney area, where it would be quite reasonable to consider two distinct species to exist (Dr. M. J. D. WHITE, *in lit.*, 1957). We have also seen specimens of undoubted *australiana* from as far south as Melbourne (if the hand-written data labels are to be believed). As Dr. WHITE suggests, only a detailed investigation in the field can finally elucidate this problem, but, until this is possible, we prefer to recognize *A. australis* as a distinct species.

A somewhat similar situation in the genus *Austroicetes* is discussed by WHITE and KEY (1957) who have shown that phenotypic intergradation can be misleading and can mask the existance of genotypically distinct species. In the present case certain morphological differences are apparent, although their reliability may be open to question.

4. **Atractomorpha crenaticeps** (BLANCHARD, 1853)

This species is distinguishable from its nearest relative, *A. sinensis* BOLÍVAR, by its more elongate eyes and by the lack, except in some Australian specimens of a distinct membranous area on the lateral pronotal lobe.

There are two subspecies, *A. c. crenaticeps* and *A. c. australiana*, which, however, do not correspond with those recognized by REHN (1953; see pp. 179 and 180). *A. c. crenaticeps* occurs in Indonesia, New Guinea, the Bismarck Archipelago and the Solomon Islands, but not in Australia, while *A. c. australiana* is found in Eastern Australia and S.E. New Guinea only.

The two subspecies may be distinguished from each other and from *A. australis* (which REHN regarded as a subspecies of *A. crenaticeps*) as follows:

1. General form heavier, broader, particularly in the females (*cf.* fig. 1); fastigium of vertex more regularly triangular, shorter and stouter, not usually longer than the eye. Eye smaller, ovoid, broader behind; ratio, maximum width of head/length of eye, 1.46-1.48 in males, 2.10-2.22 in

females. Hind margin of pronotal disc very obtusely angulate or even subtruncate; lateral pronotal lobe without a membranous area. Tegmina less acuminate; hind wings much shorter than fore wings. Male cerci with apical portion longer and usually straighter (*cf.* REHN, 1953). Southeastern Australia . . . . . *A. australis* REHN

General form more slender (*cf.* fig. 2); fastigium of vertex narrow and more elongate with more arcuate margins, longer than the eye. Eye larger, elongate-oblong (figs. 12, 22, 28); ratio, maximum width of head/length of eye, 1.22-1.46 in males, 1.40-1.91 in females. Hind margin of pronotal disc distinctly angulate; lateral pronotal lobe with or without a membranous area near the posterior margin. Tegmina elongate; hind wings fully expanded. Male cerci with apical portion shorter and slightly incurved (*cf.* REHN, 1953). Borneo; Moluccas; Lesser Sunda Islands (east); New Guinea; Bismarck Archipelago; Solomon Is.; northern and eastern Australia 2

2. Lateral pronotal lobe usually with a membranous area near the posterior margin (often absent in male and sometimes also in female), less deep; ratio, length/greatest depth, 1.37-1.56 in males, 1.63-1.80 in females. Southeast New Guinea; north and east Australia. . . . . *A. c. australiana* BOLÍVAR

Lateral pronotal lobe without a membranous area, deeper; ratio, length/greatest depth, 1.28-1.38 in males, 1.55-1.60 in females. Borneo [1]), Eastern part of Lesser Sunda Islands; Moluccas; New Guinea; Bismarck Archipelago; Solomon Is.; [Hawaii (introduced) ?] [2]) . . . . . *A. c. crenaticeps* (BLANCHARD)

4a. **Atractomorpha crenaticeps australiana** I. BOLÍVAR, 1905

A[tractomorpha] Australiana I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. Nat. 5: 198, 209.
Atractomorpha crenaticeps crenaticeps REHN, 1953 Grassh. Locusts Australia, 2: 33 (*partim*), pl. 1, figs. 1-3; pl. 2, fig. 7; pl. 27, fig. 191-195 [*nec* BLANCHARD].

Type locality: — Australia: Queensland, Rockhampton.
Type: — "Stockholm"? [cannot be traced] [3]).

[1]) WILLEMSE (1928) recorded *A. similis* (a synonym of this form) from the Mentawei Is., West of Sumatra. We have not seen his material, but doubt if the identification is correct; the species in question may be *A. crenulata crenulata.*

[2]) A single female in the U.S. National Museum bears the hand-written label "Aiea, Oahu, T. H., Tokuhara Plantation, Mar. 18, 1940, 40837". Since all over Hawaiian material examined belongs to *A. sinensis* and the date given is earlier than the beginning of large-scale wartime transportation between the South Pacific and Hawaii, we are not satisfied that some error in labelling has not occurred.

[3]) Although BOLÍVAR in his original description states that the single female type is in Stockholm, it is apparently nolonger there. Neither is it listed among Stockholm types by SJÖSTEDT (1932). A male and a female from the type series are in Vienna, but the latter is presumably not the type. The same holds for a female in Hamburg.

REHN (1953) regarded *australiana* and *crenaticeps* as being synonyms (although he does in fact suggest that the former may not be fully typical) and, in common with other authors, recognized BOLÍVAR's *A. similis* as a distinct species; he was not able to examine types. An examination of BLANCHARD's specimen (and a recent re-examination of them by Professor L. CHOPARD), however, has shown that *crenaticeps* and *similis* are synonyms and that *australiana* is distinct, at least subspecifically. The characteristic membranous area which is absent from the type material of both *crenaticeps* and *similis,* is present in typical *australiana* and can also be seen in REHN's plate of "*crenaticeps crenaticeps*". REHN also correctly records this form from Milne Bay, S.E. New Guinea. The specimens from this locality which we have examined (including those seen by REHN), have the membrane on the lateral pronotal lobe clearly developed in almost all the females and in some of the males, in contrast to other New Guinea material from more northerly and westerly parts of the island. The range of *A. c. australiana* extends north-eastwards to the Huon Gulf.

4b. **Atractomorpha crenaticeps crenaticeps** (BLANCHARD, 1853)

Pyrgomorpha crenaticeps BLANCHARD, 1853, Voy. Pole Sud (Zool.) 4: 568, and Atlas (Zool.), Orth.: pl. 3, figs. 5, 6 (*non* fig. 4).

Truxalis oceanicus MONTROUZIER, 1855, Ann. Soc. agric. Lyon (2) 7: 90 — *syn. nov.*

Atractomorpha similis I. BOLÍVAR, 1884, An. Soc. esp. Hist. nat. 13: 64, 68, 495 (*partim*) — *syn. nov.*

A[tractomorpha] dentifrons I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 199, 210 — *syn. nov.*

Atractomorpha crenaticeps crenaticeps REHN, 1953, Grassh. Locusts Australia, 2: 33 (*partim*).

Type locality: — N.W. Guinea: Triton Bay.
Type: — Paris.

The synonymy of *similis* with *crenaticeps* has already been discussed briefly (p. 180). The reasons for synonymizing *T. oceanicus* with *A. c. crenaticeps* are, firstly, that the type locality of *T. oceanicus* is within a part of the distributional range of *A. c. crenaticeps,* whence no other species of the genus is known; and secondly that, although MONTROUZIER's description is very inadequate, he mentions the oblong eye which is characteristic of *A. crenaticeps.* KIRBY (1910: 334) is responsible for suggesting that this species belongs to *Atractomorpha* — a view with which we concur. MONTROUZIER's other *Truxalis* species referred to *Atractomorpha* by KIRBY (*l.c.*), namely *T. sylvaticus,* would seem to be a species of *Desmopterella* and is here tentatively transferred to this genus since the meagre description

agrees more with *Demopterella* than it does with *Atractomorpha* [1]). MONTROUZIER's type appear to have been destroyed. His collections were deposited at the Institution Sainte Marie de Saint-Chamond, Loire, and were damaged during military occupations in the two World Wars; what could be salvaged was sent to the Paris Museum (Prof. J. WAUTIER of Lyons, *in lit.* 1958), but the above types do not appear to be among the material saved.

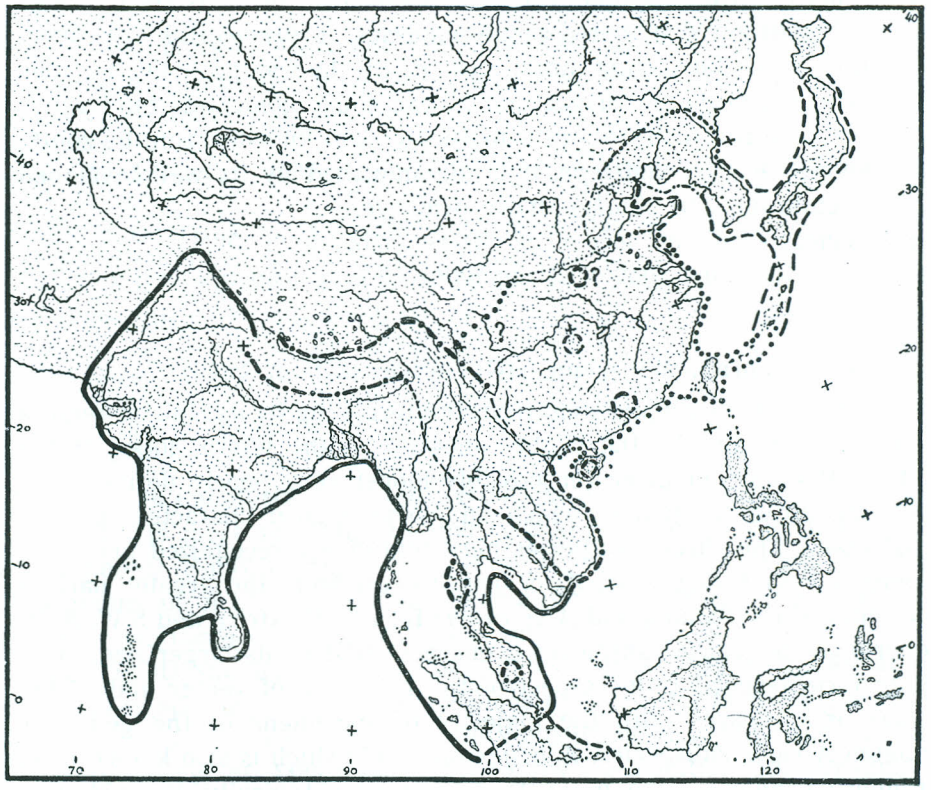


FIG. 43. Approximate distribution of *Atractomorpha crenulata crenulata* (FABRICIUS) ——————; *A. c. rhodoptera* KARSCH — — — —; *A. burri* BOLÍVAR — • — • —; *A. sinensis* BOLÍVAR • • • • • •; *A. brevicornis brevicornis* (THUNBERG) — — — —; and *A. b. heteroptera* BEI-BIENKO — • • — • • —.

5. Atractomorpha sinensis I. BOLÍVAR, 1905

Perena concolor WALKER, 1870, Cat. Derm. Salt. Brit. Mus. 3: 506 (*partim*).
Atractomorpha Aurivillii I. BOLÍVAR, 1884, An. Soc. esp. Hist. nat. 13: 64, 67, 495 (*partim*).

[1]) *Truxalis sylvaticus* MONTROUZIER, 1855, Ann. Soc. agric. Lyon (2) 7: 90 = *Desmopterella sylvatica* (MONTR.), *comb. nov.*

tractomorpha Aurivilliusi YAKOBSON, 1902, *In* YAKOBSON & BIANKI, Pyramokr. Lozhnoset. Ross. Imp.: 198, 289 (*partim*).
[*tractomorpha*] *sinensis* I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 198, 205.
[*tractomorpha*] *angusta* I. BOLÍVAR, 1905, *Ibid.*: 198, 207 (*nec* KARSCH, 1888).
[*tractomorpha*] *ambigua* I. BOLÍVAR, 1905, *Ibid.*: 198, 209 — *syn. nov.*
tractomorpha aurivillii SJÖSTEDT, 1933, Ark. Zool. 25A (3): 18, 31.

ype locality: — China.
ype: — Paris.

This species, which is now well established in Hawaii, is recognizable om the other widely distributed Chinese species, *A. brevicornis* THUNBERG, y the absence of the membranous area on the lateral pronotal lobe, by ıe more distinct pronotal carinae and by the short, colourless hind wings ı the latter. The full distribution of neither is well known. From its southrn neighbour, *A. c. crenaticeps*, it is distinguished by its well-developed ronotal membrane and shorter, more oval eye.

The lectotype of *Perena concolor* is referable to *A. brevicornis brevicrnis* (see p. 187) and that of *A. aurivillii* to *A. acutipennis gerstaeckeri* see p. 183).

6. **Atractomorpha acutipennis** (GUERIN-MENEVILLE, 1844)

This species is distinguishable from the foregoing by its shorter femora nd smaller eyes and by the slight concavity in the lateral lobes of the ronotum. It occurs in three (or possibly more) very poorly defined subpecies, the differentiation of which on morphological characters is very nsatisfactory. The three subspecies here tentatively recognized are *A. a. cutipennis* from Madagascar, *A. a. gerstaeckeri* from the greater part of ıfrica south of the Sahara, and *A. a. brevis* from N.E. Africa and S.W. Asia. n general the Malagasy subspecies is characterized by its larger size, more longate form (especially in respect of the fastigium of vertex and of the egmina) as compared with the majority of specimens of the generally istributed African subspecies, *A. a. gerstaeckeri* (which is also known from he Comoro Islands — see p. 183); *A. a. brevis*, typically, is small and ossesses a rather shorter fastigium and has rather short tegmina (these re, however, unreliable characters). The features mentioned are subject o wide variation and, at best, are of value only in the females; the males f all subspecies are very similar. A key to subspecies would be of little alue at present.

6a. **Atractomorpha acutipennis acutipennis** (GUERIN-MENEVILLE, 1844)

ruxalis (*Pyrgomorpha*) *acutipennis* GUÉRIN-MÉNÉVILLE, Icon. Règne Anim. 7: 340.
tractomorpha hova SAUSSURE, 1899, Abh. Senckenb. naturf. Ges. 21: 640 — *syn. nov.*

P[yrgomorpha] Madagascariensis BLANCHARD (*cf.* I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 209) — *nomen nudum.*

Type locality: — Madagascar.
Type: — Cannot be traced; probably lost; lectotype of *A. hova* (in Geneva) should be regarded as neotype.

There is little room for doubt that *A. hova* is synonymous with GUERIN's *T. (P.) acutipennis* in spite of the loss of the type of that species.

6b. **Atractomorpha acutipennis gerstaeckeri** I. BOLÍVAR, 1884

Truxalis crenulata BURMEISTER, 1838, Handb. Ent. 2 (2): 609 (*nec* FABRICIUS, 1793).
Atractomorpha Gerstaeckeri I. BOLÍVAR, 1884, An. Soc. esp. Hist. nat. 13: 64, 66, 495 (*partim*).
Atractomorpha Aurivillii I. BOLÍVAR, 1884, *Ibid.*: 64, 67, 495, p.l, fig. 8 (*partim*) — *syn. nov.* [1]).
Atractomorpha congensis SAUSSURE, 1893, Proc. U.S. nat. Mus. 16: 581 — *nomen nudum* [*cf.* KEVAN (1960)].
Atractomorpha Aurivilliusi YAKOBSON, 1902, *In* YAKOBSON & BIANKI, Pryamokr. Lozhnoset. Ross. Imp.: 198, 289 (*partim*).
Atractomorpha madacassis Bruner, 1910, *In* VOELZKOW, Reise Ostafr. 1903-1905, 2: 628 —*syn. nov.*

Type locality: — Gabon.
Type: — Madrid.

BURMEISTER's material (in Halle) from the Comoro Islands has been examined and is more referable to this subspecies than to the Malagasy *A. a. acutipennis*. BOLÍVAR's type series of *gerstaeckeri* and *aurivillii* include also specimens of *A. crenulata* and *A. sinensis* respectively. The female lectotype of *A. madacassis* agrees fully with typical *A. a. gerstaeckeri*, particularly in its smaller size and less elongate form, and is unlike any other Malagasy specimen examined. The locality (S.W. Madagascar), noted by BRUNER, is possibly erroneous and it is conceivable that the specimen is from the east coast of Africa since VOELZKOW's expedition also brought back material thence.

Three specimens from Northern Rhodesia (1 ♂, 1 ♀, Lake Bangweulu, near Moufuli, 7.X.1946, and 1♀, near Lake Bangweulu, N'Salushi Island, 13.XI.1946, *M. Steele*) in the British Museum (Natural History) differ from the rest of the African material by having a longer fastigium and strongly depressed eyes. The first two specimens are also very large, but in view of the wide variation in species of this genus, it is best for the present to refer them to this subspecies.

[1]) This synonymy has already been hinted at by KEVAN (1956: 975, 976; 1957: 203).

6c. **Atractomorpha acutipennis brevis** UVAROV, 1938

Atractomorpha brevis UVAROV, 1938, *In* UVAROV & TEWFIK, Bull. Soc. ent. Egypte, 21: 274, 280, fig. 3, A and B.

Atr[a]ctomorpha externa BEI-BIENKO, 1949, Dokl. Akad. Nauk. SSSR (n.s.) 67: 173, 174, fig. 1, 2. — *syn. nov.*

Type Locality: — Yemen: Wadi Sharis.

Type: — Cairo; paratype in the British Museum (Natural History).

Not a great deal of material of this subspecies is available, but it would seem that, in addition to S.W. Arabia, it occurs also in central Sudan, Ethiopia and the Somali 'horn' of Africa and eastwards through Iraq and S. and E. Persia to Afganistan. It may also occur in the western part of West Pakistan. Forms intermediate to subsp. *gerstaeckeri* occur in southern Sudan and western Ethiopia.

Amongst type material only the paratype of *A. brevis* has been examined, but photographs of the holotype of *A. externa* have been supplied by Professor BEI-BIENKO and there is, so far, no reason to doubt the correctness of the above synonymy.

7. **Atractomorpha crenulata** (FABRICIUS, 1793)

This species is usually fairly readily distinguishable by the characters given in the key to species (p. 172). There are two subspecies, western and eastern, as follows:

a. General body-form slightly more slender and tegmina generally longer. Lateral pronotal lobe always with a well-developed membranous area near the posterior margin (figs. 40, 41). Pakistan (E. and W.); India; Maldive and Laccadive Islands; Ceylon; Andaman Islands; Lower Burma; Siam, Malaya; N.W. Sumatra . . . . . *A. c. crenulata* (FABRICIUS)

b. General body-form slightly stouter and tegmina generally shorter. Lateral pronotal lobe without or with only a feebly developed membranous area. S.E. Sumatra; Java; Lesser Sunda Islands . . *A. c. rhodoptera* KARSCH

7a. **Atractomorpha crenulata crenulata** (FABRICIUS, 1793)

T[ruxalis] crenulatus FABRICIUS, 1793, Ent. Syst. 2: 28.

T[ruxalis] scaber THUNBERG, 1815, Mém. Acad. Sci. St.-Péterb. 5: 266.

T[ruxalis] crenatus THUNBERG, 1827, Nova Acta Soc. Sci. Upsala 9: 86.

Truxalis porrecta WALKER, 1859. Ann. Mag. nat. Hist. (3) 4: 222.

Atractomorpha consobrina SAUSSURE, 1862, Ann. Soc. ent. Fr., (4) 1: 475 — *syn. nov.*

Atractomorpha Gerstaeckeri I. BOLÍVAR, 1884, An. Soc. esp. Hist. nat. 13: 64, 66, 495 (*partim*).

Atractomorpha similis I. BOLÍVAR, 1884, *Ibid.*: 64, 68, 495 (*partim*).

Atractomorpha angusta KARSCH, 1888, Ent. Nachr. 14: 333, no. 24.
Atractomorpha infumata I. BOLÍVAR, 1898, Ann. Mus. Stor. Genova, 39: 86, no. 38 — *syn. nov.*
A[tractomorpha] crenulata var. *prasina* I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 197, 201 — *syn. nov.*
A[tractomorpha] Blanchardi I. BOLÍVAR, 1905, *Ibid.*: 198, 206 — *syn. nov.*
Atractomorpha blanchardi KIRBY, 1914, Faun. Brit. Ind., Acrid.: 181, 184 [Error for *A. blanchardii* I. BOLÍVAR]. — *syn. nov.*
Atractomorpha obscura I. BOLÍVAR, 1916, Rev. Acad. Cienc. Madr. 16: 392 — *syn. nov.*

Type locality: — South India: Tranquebar.
Type: — Copenhagen.

The greater part of this synonymy requires no comment at this stage except to say that it is based on an examination of all available types. The type of *T. porrecta,* however, cannot now be traced, but there is no reason to disagree with KIRBY (1910: 332), who synonymized WALKER's *T. porrecta* with THUNBERG's *T. scaber;* presumably KIRBY had seen WALKER's type. The inclusion of *A. gerstaeckeri* (part) and *A. similis* (part) in the synonymy is on account of BOLÍVAR's type material from Calcutta and the Andaman Islands.

A fairly long series of *A. crenulata* from the island of Minikoi is rather uniformly large and stout when compared with material of *A. c. crenulata* from India and elsewhere, but there is so much variation in the latter that it would be unwise to place much emphasis on these variants, although they may represent a localized race.

7b. **Atractomorpha crenulata rhodoptera** KARSCH, 1888

Atractomorpha rhodoptera KARSCH, 1888, Ent. Nachr. 14: 332, no. 23.
A[tractomorpha] crenulata var. *fumosa* I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 197, 201 — *syn. nov.*
A[tractomorpha] sinuata I. BOLÍVAR, 1905, *Ibid.*: 197, 201 — *syn. nov.*
A[tractomorpha] lanceolata I. BOLÍVAR, 1905, *Ibid.*: 197, 202 — *syn. nov.*

Type locality: — Java.
Type: — Berlin.

The above synonymy is based on an examination of types. The type of *rhodoptera* differs from almost all other material examined in having short hind wings, but this appears to be only an individual variation.

8. **Atractomorpha brevicornis** (THUNBERG, 1815)

This species is recognizable by its prominent pronotal carinae and colourless hind wings. It occurs in two ill-defined subspecies, the typical

form, *A. b. brevicornis,* and a northern race *A. b. heteroptera.* A sufficiently large series of the latter subspecies was not available for study, but the following key, based on that kindly provided by Professor G. Ya. BEI-BIENKO (*in lit.*, 1957), is given as a tentative means of distinguishing between them.

a. Fastigium of vertex longer (male 1.99-2.2 mm, female 2.6-3.1 mm). Interspace between lateral ocellus and the transverse ridge at the antennal base distinctly greater than double the length of the ocellus. Body somewhat larger, with longer tegmina (male 21.5-25.0 mm, female 32.0-41.0 mm; tegmina, male 18.5-24.0 mm, female 29.0-35.0 mm). South, Central, Eastern and Northern China (Hainan, Szechwan, Kwang Tung and Hopei Provinces) [1]), Japan; South Korea; Ryu-Kyu Is. . . . . *A. b. brevicornis* (THUNBERG)

b. Fastigium of vertex shorter (male 1.7-1.8 mm, female 2.2-2.7 mm). Interspace between lateral ocellus and the transverse ridge at the antennal base not greater than double the length of the ocellus [2]). Body smaller, especially in male, tegmina a little shorter (male 18.5-19.5 mm, female 28.0-35.0 mm; tegmina, male 15.8-19.0 mm, female 24.5-30.5 mm). North Korea; Manchuria . . . . *A. b. heteroptera* BEI-BIENKO — *stat. nov.*

8a. **Atractomorpha brevicornis brevicornis** (THUNBERG, 1815)

T[*ruxalis*] *brevicornis* THUNBERG, 1815, Mém. Acad. Sci. St. Péterb. 5: 264 [*nec* FABRICIUS, 1775 = *Gryllus brevicornis* Linné, 1764].

Truxalis lata MOTSCHOULSKY, 1866, Byull. Mosk. Obshch. Prir. 39: 181.

Perena concolor WALKER, 1870, Cat. Derm. Salt. Brit. Mus. 3: 506 (*partim*) — *syn. nov.*

Tryxalis diminuta WALKER, 1871, *Ibid.* 5: 50 — *syn. nov.*

Minorissa alata THOMAS, 1874, Bul. U.S. zool. geogr. Surv. Terr. 1 (2) Ser. 1: 63 [*cf.* KEVAN (1960)].

Atractomorpha Bedeli I. BOLÍVAR, 1884, An. Soc. Hist. nat. 13: 64, 69.

Acrida lata YAKOBSON, 1902, *In* YAKOBSON & BIANKI, Pryamokr. Lozhnset. Ross. Imp.: 214.

A[*tractomorpha*] *lata*, BEI-BIENKO, 1951, Opred. Faun. SSSR, 38: 277.

Type locality: — China [Not "Indiae orientali et occidentali" as indicated in THUNBERG's text; this habitat was presumably "borrowed" from FABRICIUS, with whose *T. brevicornis* THUNBERG's is not conspecific].

Type. — Uppsala.

---

[1]) The distribution of *Atractomorpha* in China is poorly known; that of *A. b. brevicornis* is presumably not so discontinuous as might be suggested from specimens examined. *A. sinensis* also occurs on Hainan, the south Chinese mainland and in central China. BEI-BIENKO (1951) cites *A. lata* (i.e. *A. m. brevicornis*) from Taiwan, but this is presumably an error.

[2]) The size of the ocellus is not a reliable character in either sex.

KIRBY (1910: 331) first indicated that THUNBERG's *T. brevicornis* belonged to *Atractomorpha* (although he synonymized it with *A. crenulata* (FABRICIUS, 1793)] and reference to THUNBERG's material shows him to have been generically correct. Since *T. brevicornis* THUNBERG is only an historial junior homonym of *T. brevicornis* FABRICIUS, 1775, neither species being described nor remaining in the same genus, the name *brevicornis* is available for this species, especially in the light of the decisions regarding junior homonyms made recently at the 15th International Congress of Zoology, London, 1958. The synonymy of the wellknown name *A. bedeli,* with the obscure *T. lata* was established by BEI-BIENKO (1951: 277), but, since it is not to be retroactive, the new 50-year "Statute of Limitations" introduced at the 15th International Congress of Zoology will not permit a return to the use of the well-known name *bedeli.* There is thus no reason not to use the first available name, *brevicornis,* in favour of the recently resurrected *lata.* The types of all nominal species, other than that of *T. lata,* have been examined.

There are three specimens (2 ♂ without data, and 1 ♀ from China) in THUNBERG's collection at Uppsala, all labelled *T. brevicornis.* Of these, the female is conspecific with *A. bedeli* and thus with *T. lata;* one male is referable to *A. psittacina* and the other to *A. sinensis.* Since only the female agrees with THUNBERG's original description, it is only this specimen which may safely be regarded as the type of his *T. brevicornis* — "hemelytra sesqui-longiora, alis hyalinis". The males were probably added to the collection at a later date and should be ignored for the purposes of type fixation.

The type of *T. lata* (from Japan) is presumed lost (Prof. G. Ya. BEI-BIENKO, personal communication, 1958). *P. concolor* types include material referable to *A. sinensis* (see p. 181). The type of *A. bedeli* is a female from Yokohama (Paris).

8b. **Atractomorpha brevicornis heteroptera** BEI-BIENKO, 1951

A[tractomorpha] heteroptera BEI-BIENKO, 1951, Opred. Faun. SSSR, 38: 275, 276, figs. 565, 566, 569.

Type locality: — Manchuria: Mukden.
Type: — Leningrad.

The reduction of *A. heteroptera* to subspecific status is due to Professor BEI-BIENKO himself *(in lit.,* 1957). Whether even this distinction is deserved remains to be determined.

9. **Atractomorpha psittacina** (DE HAAN, 1842)

Acridium (*Truxalis*) *psittacinum* DE HAAN, 1842, Verh. nat. Gesch. Nederl. overz. Bezitt. 18 (Zool. 7): 146; 1844, *Ibid.*; pl. 23, fig. 2 (*non* fig. 1) [1].

[1]) This error was pointed out by SAUSSURE (1899: 639) and KIRBY (1910: 333).

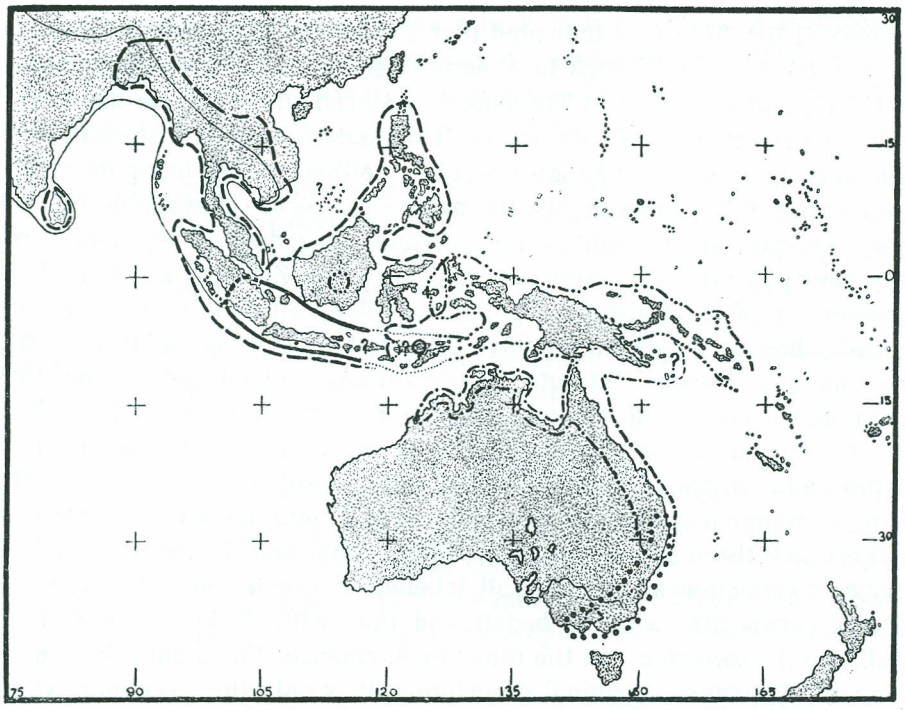


FIG. 44. Approximate distribution of *Atractomorpha crenulata crenulata* (FABRICIUS) ————; *A. c. rhodoptera* KARSCH ▬▬▬; *A. crenaticeps crenaticeps* (BLANCHARD) —··—··; *A. c. australiana* BOLÍVAR —·—·—; *A. australis* REHN ••••••; and *A. psittacina* (DE HAAN) ▬ ▬ ▬.

Pyrgomorpha parabolica WALKER, 1870, Cat. Derm. Salt. Brit. Mus. 3: 498.
Pyrgomorpha contracta WALKER, 1870, *Ibid.*: 499.
A[*tractomorpha*] *philippina* I. BOLÍVAR, 1905, Bol. Soc. esp. Hist. nat. 5: 199, 212 — *syn. nov.*
A[*tractomorpha*] *Dohrni* I. BOLÍVAR, 1905, *Ibid.*: 199, 212 — *syn. nov.*

Type locality: — Java.
Type: — Leiden.

This is a very easily distinguishable species on account of its very slender, elongate form. The above synonymy is based on an examination of all types and requires little comment at present, except to note that the type of *A. dohrni* is in Madrid and not Stettin.

V. APPENDIX.

The following was originally described as a species of *Atractomorpha*, but it belongs to the genus *Pyrgomorpha*. The type has been examined.

Atractomorpha mongolica SJÖSTEDT, 1933, Ark. Zool. 25A (30): 30, pl. 12, fig. 3. = *Pyrgomorpha conica mongolica* (SJÖSTEDT) [*cf.* BEI-BIENKO (1951, Opred. Faun. SSSR.: 39, p. 273)].

VI. REFERENCES

BEI-BIENKO, G. Ya. 1949. Novye dannye o saranchevykh (Orthoptera, Acridoidea) Afganistana. Dokl. Akad. Nauk SSSR., 67: 173-176.

BEI-BIENKO, G. Ya. 1951. Podsemeistvo pyrgomorphinae, *In* BEI-BIENKO, G. Ya., & MISCHCENKO, L. L. Saranchevye Fauny SSSR i sopredel'nykh Stran. Chast' I. Opred. Faun. SSSR, 38: 270-280.

HEBARD, M. 1922. The Dermaptera and Orthoptera of Hawaii. Occ. Pap. Bernice Bishop Mus. 7: 305-387, pl. 26, 27.

HINGSTON, R. W. G. 1927. The liquid-squirting habit of Oriental grasshoppers. Trans. ent. Soc. Lond. 75: 65-68, pl. 9.

KEVAN, D. K. McE. 1956. Results from the Danish Expedition to the French Cameroons 1949-50. XV. Orthoptera: Acrididae. Bull. Inst. Afr. Noire, (A) 18: 960-977.

KEVAN, D. K. McE. 1957. Orthoptera-Caelifera from northern Kenya and Jubaland. II. Pamphagidae, Pyrgomorphidae, Lentulidae and Romaleinae. Opusc. Ent. 22: 193-208.

KEVAN, D. K. McE. 1960. On the identity of *Minorissa alata* Thomas, 1874, and *Atractomorpha congensis* [Saussure, 1893] (Orthoptera: Pyrgomorphidae). Bull. Brooklyn ent. Soc. (*in press*).

KIRBY, W. F. 1910. Orthoptera Saltatoria Part II. (Locustidae vel Acridiidae). [With additions and corrections]. Syn. Cat. Orthopt., London, 3: ix + 674 pp.

MAXWELL-LEFROY, H. 1923. Manual of Entomology with special reference to economic entomology. London, xvi + 541 pp.

REHN, J. A. G. 1953. Family Acrididae (Sub-family Pyrgomorphinae). Grassh. Locusts Austral., Melbourne, 2: 270 pp. + 32 pl.

SAUSSURE, H. DE 1899. Wissenschaftliche Ergebnise der Reisen in Madagaskar und Ostafrika in den Jahren 1889-'95 von Dr. A. VOELZKOW. Abh. Seckenb. Naturf. Ges. 21: 567-664, pl. 37, 38.

SJÖSTEDT, Y. 1920. Results of Dr. E. MJÖBERG's Swedish Scientific expeditions to Australia, 1910-1913. 20. Acridiodea, Ark. Zool. 12 (20): 1-67, pl. 1, 2.

WHITE, M. J. D. 1957. Cytogenetics and systematic Entomology. Ann. Rev. Ent. 2: 71-90.

WHITE, M. J. D., & KEY, K. H. L. 1957. A cytotaxonomic study of the *pusilla* group of species in the genus *Austroicetes* Uv. (Orthoptera: Acrididae), Austral. J. Zool. 5: 56-87.

WILLEMSE, C. 1928. Spolia Metawiensia: Acridiidae (Orthoptera) [with an introduction by C. Boden KLOSS]. J. Malay. Br. R. Asiat. Soc. 6: 1-12, pl. 1-3.

YAKOBSON, G. G. 1902. Pryamokrylyya i Saranchevyya, *In* YAKOBSON, G. G. & BIANKI, B. L. 1902-1905, Ayamokrylyya i Lozhnosechatokrylyya Rossiiskoi imperii i sopredel'nykh stran. S. Peterburg: 162-320.