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ABSTRACT

The subfamily Blissinae is defined and the following aspects treated: a historical review, a summary of the biology and feeding habits, a checklist of world species, and an analysis of characters of taxonomic and phylogenetic importance. A proposed phylogeny is presented with cladograms. The distribution of the taxa is discussed and an interpretation is given. Keys are included for adults of all genera and species of the world, and for fifth instar nymphs of all species for which they are known. A diagnosis is given for each genus as well as its original reference, synonymy, type species, and general distribution. A figure is included for at least one species of each genus as well as 170 figures of anatomical details and 19 diagrams showing phylogenetic relationships. Slaterellinae Drake and Davis is placed as a junior synonym of Blissinae. *Blissus navis* Slater is transferred to *Capodemus, Macropes tinctus* Distant to *Cavelerius*, and *Dimorphopterus aleocharoides* Jakovlev to *Ischnodemus*. *Neoblissus* Bergroth is placed as a junior synonym of *Blissus* Burmeister. *Pseudoblissus* is erected as a new genus to contain *Blissus trispinosus* Slater.

INTRODUCTION

The Blissinae constitute a monophyletic group of lygaeid bugs. The subfamily is characterized not only by several morphological features such as the unique spiracle arrangement (two-six dorsal, seven ventral) but also by its unique trophic position within the Lygaeidae. This is the only subfamily of the Lygaeidae that feeds entirely on the sap of plant tissues rather than on the seeds, and the only one where most of the species live between leaf sheaths (laminaphiles of Slater, 1977).

I have devoted a considerable portion of my research efforts of the past 15 years to understand the systematic relationships and biological and ecological characteristics of members of the subfamily. Most of the descriptive work that can be accomplished from existing material has been completed. It thus seems important and desirable to attempt to bring together in one paper not only keys to all genera and species but also to attempt a preliminary interpretation of the phylogenetic and zoogeographic relationships within the subfamily.

In the present paper I include a cladistic analysis of the blissine genera, a discussion of the zoogeographic patterns, a checklist of world species, keys to all genera and species and, in some cases, a phylogenetic analysis of the species within the genus.

The biological section is brief as I (Slater, 1976) have previously discussed the host plant relationships in considerable detail. On the other hand, a key to species is included even where a recent key has been published. A dorsal view illustration is given for one species of each genus and where possible an illustration of the sperm reservoir of at least one species of each genus. Other illustrations are included where necessary to clarify the text.

ACKNOWLEDGMENTS

I express my appreciation to the following for their help: the late Mrs. Darleen Wilcox (University of Connecticut) who collaborated with me on many aspects of blissine studies and who prepared preliminary drafts of several of the more complex keys presented in this paper; to Dr. Peter D. Ashlock (University of Kansas) for collaborative work on the phylogeny of the Blissinae; to Ms Jane O'Donnell (University of Connecticut) for extensive assistance with the manuscript, dissections, interpretation and illustration of genitalia; to Dr. Abdul Hamid (University of Sokoto, Nigeria) for aid in dissection and illustration; to Dr. Randall T. Schuh (American Museum of Natural History), Dr. Merrill Sweet (Texas A & M University), Mr. Jack Munting (Pretoria, South Africa), Mr. Samuel Slater, Dr. R. M. Baranowski (University of Florida) and Dr. B. J.

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HISTORICAL REVIEW

The subfamily Blissinae was established by Stål (1862) as "Blissida" in a key and has remained a rather noncontroversial concept ever since. There were, of course, species and genera described prior to that time.

The first blissine species to be described was, surprisingly, the Neotropical species *Cimex fulvipes* by DeGeer in 1773. In 1794 Fabricius described *Acanthia gibbus* from the Orient and in 1803 he described *Lygaeus oblongus* from the Neotropics. The first European species to be described was *Lygaeus sabuleti* by Fallen in 1826. In 1831 Thomas Say described the two abundant and widespread Nearctic species *Lygaeus leucopterus* and *Lygaeus falicus*. These early species were, of course, all described in expansive early omnibus genera such as *Cimex*, *Lygaeus*, and *Acanthia*. In 1835 Burmeister described the nominate genus *Blissus* with an African species *hirtulus* as monotype. Prior to 1861 only six generic names were used in the subfamily and two of these have proved to be junior synonyms. It thus further attests to the genius of Carl Stål who conceived and erected a subfamily based upon four genera and only 30 species that has been capable of adequately encompassing the present complement of over 50 genera and 400 species.

Subsequent to these early descriptions the history of systematic work on the Blissinae for many years followed the path of numerous other Hemiptera groups. Descriptions of new species and genera were added by such serious students of Hemiptera as Spinola, Signoret, Stål, Reuter, Bergroth, Horvath, Berg, Walker, Distant, Van Duzee, Barber, and many others. By 1960 when Slater (1964) catalogued the literature, 50 authors were listed as describers of new species of the Blissinae (excluding species synonymized by 1960). The bulk of the descriptive work was accomplished by northern European, British, and North American workers with W. L. Distant at the British Museum having described by far the most species (45). Most of the blissine descriptions in the long period from 1850 to 1960 were either done as parts of extensive faunal works, or as parts of reports of expeditions and collecting trips. No careful revisional study had been accomplished on any large genus and no phylogenetic or zoogeographic analysis had been undertaken.

Just prior to 1960 the present author began a series of revisional and faunal studies of the world blissine fauna. The work of my colleagues (Ashlock, Harrington, Miyamoto, Ahmad, and especially the late Darleen Wilcox) and myself has resulted in a series of revisional studies in the course of which 46 percent of the present genera and 60 percent of the species have been described.

It is appropriate to say a word here concerning the importance of having some historical perspective of the maturity of knowledge about

a group before one undertakes cladistic and/or zoogeographic analysis. The descriptive phase of taxonomy in ornithology and mammalogy especially is so nearly "complete" that students can often undertake phylogenetic analyses without engaging in detailed descriptive work. This is a very dangerous procedure in most entomological groups and certainly in the Lygaeidae. If such an analysis had been attempted in the Blissinae prior to 1960 it would have included little more than one-half of the fauna then existing in collections and interpretations of generic relationships would certainly have been faulty. This is not to say that the present analysis is more than preliminary, but it should be many times closer to the truth than could previously have been possible. There is sometimes an unfortunate tendency to deprecate the value of descriptive systematics, but it has become clear to me during the course of this work that not only is such work necessary but without it most classifications will be as soundly based and as permanent as sand castles on a beach.

The history of biological and ecological knowledge of the Blissinae is more difficult to understand. It is safe to say that for most of the species there is no knowledge. We have at best only a general idea of the distribution of most species, we do not know anything of their host plants, life histories, ecological requirements, parasites, predators, mimetic associations, etc. Nevertheless, a considerable amount of information has accumulated for several species, some of it of a quite sophisticated nature.

The North American Chinch Bug *Blissus leucopterus* (Say) has been a serious pest of corn *(Zea mays)* in the central United States for more than a century and as a result its biology and ecology have been studied in detail. As early as 1856 Fitch published a detailed study of the species and subsequent detailed analyses have been written by Walsh and Riley (1869), Riley (1875), Thomas (1877), Howard (1887), Webster (1899, 1907), Forbes (1905), Headlee and McCulloch (1913), and many others. The eastern subspecies *Blissus leucopterus hirtus* Montandon, which is a lawn pest rather than a crop pest, also has developed an extensive literature as has the southern Chinch Bug *Blissus insularis* Barber.

The European *Ischnodemus sabuleti* (Fallen) has been studied carefully especially by Tischler (1960), Putshkov (1969), and the earlier literature is nicely summarized by Southwood and Leston (1959).

For the other species, what biological information exists consists chiefly of host plant associations, some habitat information, descriptions and duration of immature stages and occasionally comments on abundance and dispersal. Slater (1976) has summarized and analyzed the host plant relationships in detail and has discussed their significance both for the plant taxa involved and for adaptations of the insects to their hosts. This discussion will not be repeated here other than to point out the following: All true known breeding hosts of the Blissinae are monocots.

The majority of host plants are members of the Gramineae but host plants are also known in the families Cyperaceae, Restionaceae, Zingiberaceae, Juncaceae, Sparganiaceae, Typhaceae, and Haemodoraceae. Slater's (1976) paper gave host plant information for 21 genera and 111 species of Blissinae.

ANALYSIS OF CHARACTERS

MALE GENITALIA

SPERM RESERVOIR: The plesiomorphic condition in the Blissinae appears to be that of a large ovoid bulb with narrow straplike wings extending basad (fig. 1P, W). This condition is widespread in other subfamilies of Lygaeidae and is found in blissines that have, what I believe, are numerous other plesiomorphic character states, and this type of sperm reservoir is found in species and genera of Blissinae that are otherwise quite dissimilar. I interpret this to be the retention of a plesiomorphic condition rather than the development of apomorphic ones. For sperm reservoirs of this type to be considered apomorphic would require the condition to have evolved several times within

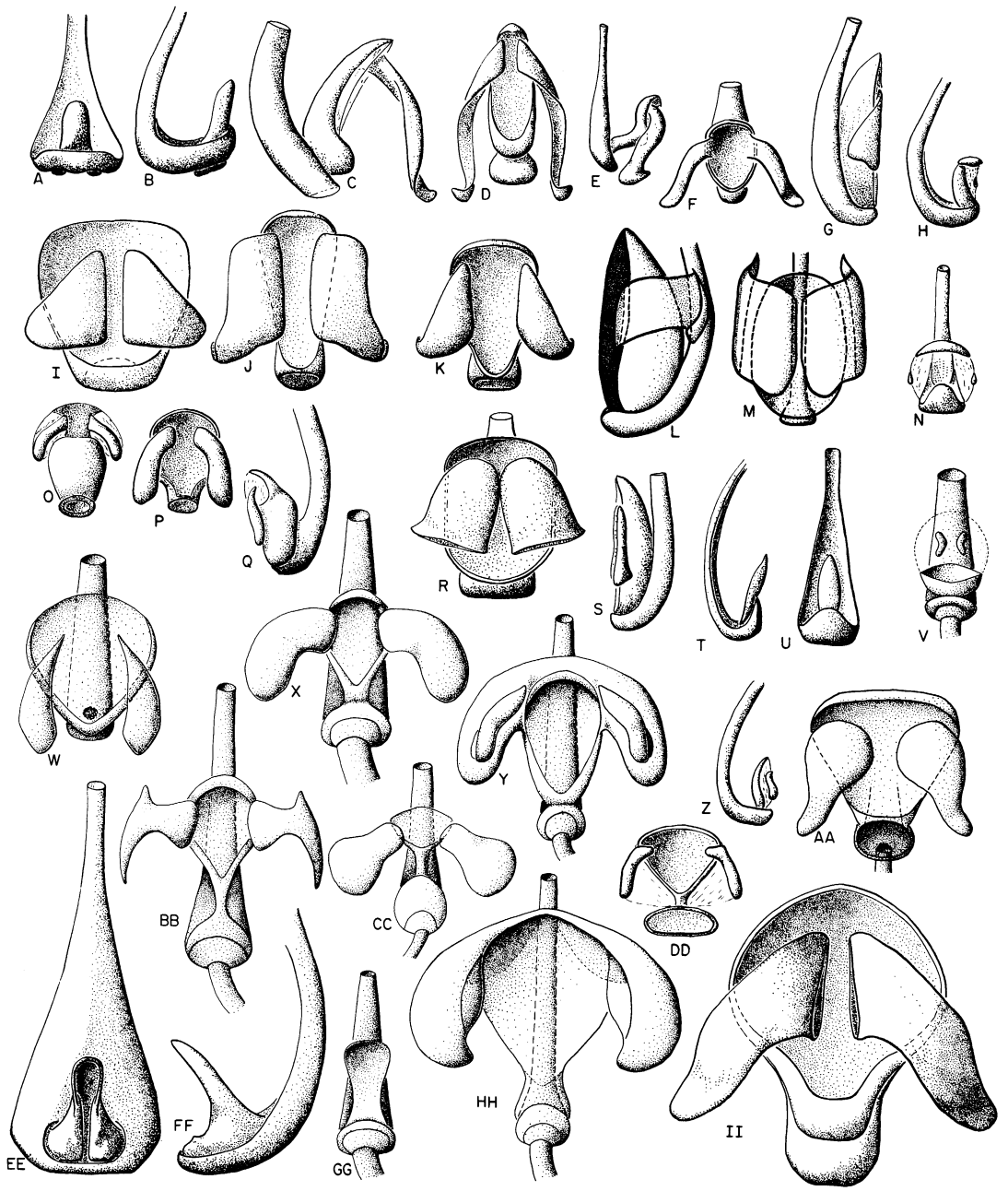


FIG. 1. Sperm reservoir, dorsal and lateral views. A,B. *Slaterellus hackeri*. A. Dorsal view. B. Lateral view. C,D. *Patritius laevus*. C. Lateral view. D. Dorsal View. E,F. *Extarademus macer*. E. Lateral view. F. Dorsal view. G. *Ischnodemus* sp., lateral view. H. *Ischnodemus genei*, lateral view. I. *Ischnodemus* sp. (Manchuria), dorsal view. J. *Ischnodemus caspius*, dorsal view. K. *Ischnodemus sabuleti*, dorsal view. L. *Ischnodemus basalis*, lateral view. M. *Ischnodemus ochripes*, dorsal view. N. *Ischnodemus genei*, dorsal view. O. *Ischnodemus sordidus*, dorsal view. P. *Talpoblissus latus*, dorsal view. Q. *Ischnodemus sordidus*, lateral view. R,S. *Ischnodemus* nr. *suturalis* (Syria). R. Dorsal view. S. Lateral view. T,U. *Heinsius explicatus*. T.

the Blissinae. This must not be taken to mean that this type of sperm reservoir is necessarily the plesiomorphic condition for the Lygaeidae. No serious attempt has yet been made to study this structure throughout the family. If the interpretation of the plesiomorphic condition of the sperm reservoir is correct then two distinct trends are evident within the subfamily.

One trend is toward enlargement of the wings into relatively huge platelike sheets (fig. 1I, J, K, M, R) that often are "curled over" at the outer margins (fig. 1L, M). This apomorphic condition is found in all "advanced" species of *Ischnodemus*. In the most apomorphic taxa these wings shift toward the outer end of the bulb, become strongly curled under laterally and are somewhat reduced in total area (fig. 1L). Since these wings function to depress the membrane of the bulb and force fluid from the bulb out the ejaculatory tube, the functional value of large robust wings is evident (see Slater and Harrington, 1970).

A second trend is that of reduction. In contrast to the development of platelike wings, reduction has not been a single evolutionary event but has developed a number of times and in a number of different ways. Frequently the basal area of the bulb becomes solid and forms a basal "stalk" (fig. 1E, O, Q) which reduces the functional bulb area and often the size of the wings. A sequence of reduction events can be distinguished. First the bulb and wings become smaller and smaller, then the wings eventually disappear entirely, and finally only a minute hook remains at the base of the ejaculatory tube (fig. 1A, B, T, U) to indicate where the sperm reservoir was attached. It is remarkable to dissect some of the largest and most robust blissines, such as *Bochrus* and find only such a minute remnant present. At some point in this reduction sequence the sperm reservoir must become nonfunctional. It is very difficult to distinguish between what are independent reductions and what are reduction sequences within single phyletic lines. Reference to the accompanying "cladograms" and illustrations indicate an interpretation of what has occurred in the Blissinae.

One conclusion that study of the blissine sperm reservoir has brought forcibly home to me is the impracticality of attempting to establish higher group relationships by sampling only a few taxa. Such a procedure would certainly have led to erroneous or superficial conclusions with this character.

CLASPERS (Parameres): The blissine clasper is for the most part a simple conventional structure consisting of a large, curving, rather sickle-shaped "blade," a short thick "shaft," a rounded, thumblike "outer projection" that marks the juncture of blade and shaft, and a rounded or sharp "subbasal inner angle" often near the base on the inner side (fig. 2A). This type of clasper is widespread in the Blissinae and occurs in many other subfamilies of the Lygaeidae as well.

In *Macropes* and related genera the "shaft" is greatly elongated, the blade reduced and the outer projection often absent so that a relatively slender, undifferentiated clasper results (fig. 2B). In *Spalacocoris* and related taxa the simplification of the clasper has proceeded to the point where only a short blocklike structure remains (see Slater and Ahmad 1968).

FEMALE GENITALIA

SPERMATHECA: A distinct spermatheca is present in all species of the Blissinae that have been examined. It is generally simple in structure with a bulb, pump, and tube (fig. 2C-R) (Dupuis, 1955). The conformation of the bulb and length of the pump show considerable variability, the structure, however, despite its value in other groups, appears to be of limited phylogenetic value in the Blissinae. Not only is the spermatheca frequently quite similar in otherwise dissimilar taxa but sometimes closely re-

Lateral view. U. Dorsal view. V. *Riggiella vianai*, dorsal view. W. *Ischnocoridea elegans*, dorsal view. X. *Scintillademus gemmatus*, dorsal view. Y. *Xenoblissus lutzi*, dorsal view. Z. *Blissiella* sp. (Madagascar), lateral view. AA. *Heteroblissus anomilis*, dorsal view. BB. *Iphicrates nigritus*, dorsal view. CC. *Dentisblissus venosus*, dorsal view. DD. *Blissiella* sp. (Madagascar), dorsal view. EE,FF. *Australodemus elongatus*. EE. Dorsal view. FF. Lateral view. GG. *Micaredemus pusillus*, dorsal view. HH. *Ramadademus sakalava*, dorsal view. II. *Cavelerius illustris*, dorsal view.

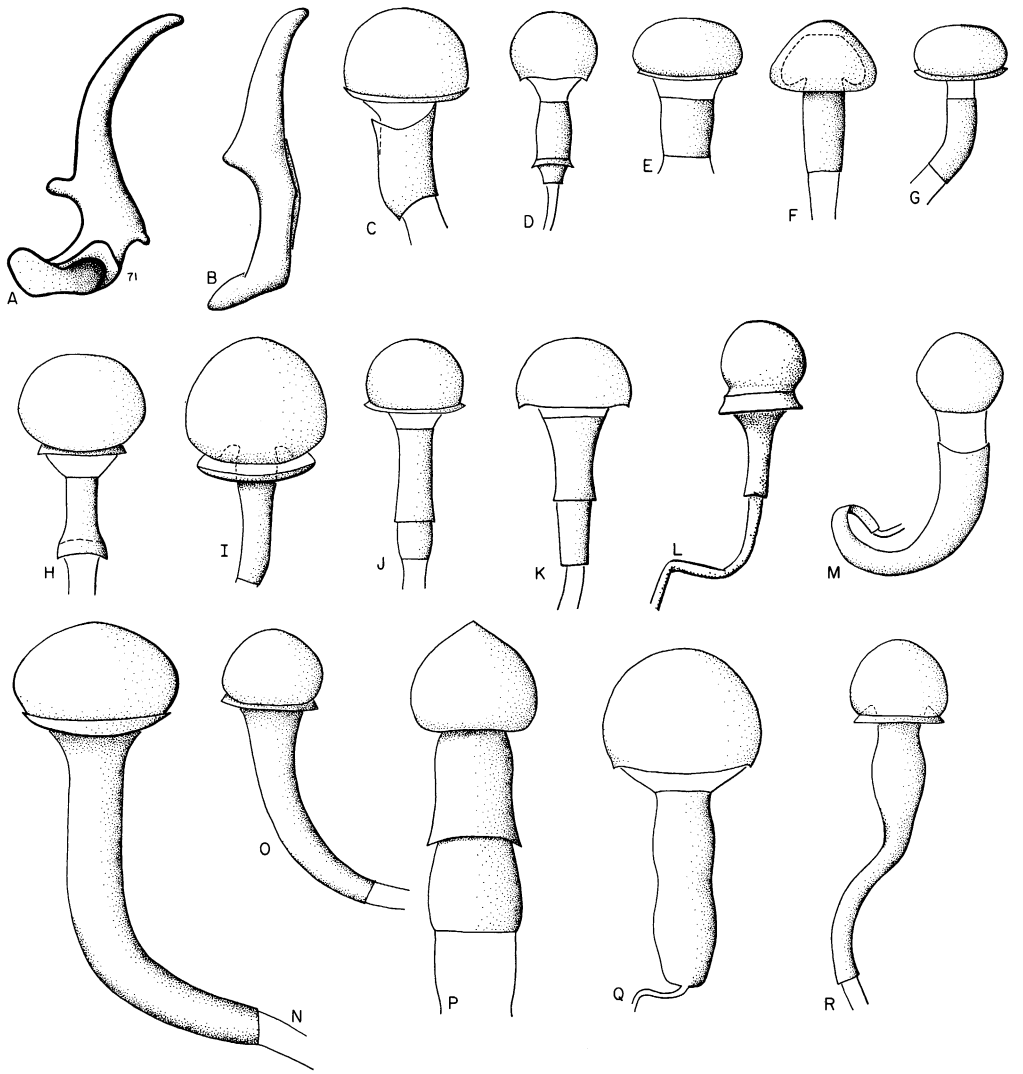


FIG. 2. A,B. Clasper of male. A. *Ischnodemus ochripes*. B. *Macropes varipennis*. C-R. Spermatheca of female. C. *Aradademus mirificus*. D. *Macropes femoralis*. E. *Blissiella castanea*. F. *Heinsius explicatus*. G. *Barademus attenuatus*. H. *Caveloblissus americanus*. I. *Heteroblissus anomilis*. J. *Macropes raja*. K. *Iphicrates nigritus*. L. *Macchiademus capensis*. M. *Micaredemus obscurellus*. N. *Dimorphopterus pallipes*. O. *Dimorphopterus annulatus*. P. *Dentisblissus divisus*. Q. *Ischnocoridea elegans*. R. *Atrademus capeneri*.

lated congeneric species will have striking spermathecal differences. For example, in the Neotropical genus *Reticulatodemus* (see Slater and Wilcox, 1966) the species *umbrosus*, *orbiculatus*, and *nitidus* have differences in the spermatheca that are greater than that found between species of many different blissine genera.

In some Oriental and Australian genera the pump has a transverse expansion midway along its length so that it appears to consist of two discrete parts (fig. 2D, J, K, P). This condition occurs in at least some species of *Iphicrates*, *Macropes*, and *Dentisblissus* and is clearly an apomorphic condition.

It is possible that other features of the sper-

matheca such as the elongation of the pump in species of *Dimorphopterus* will prove to be of phylogenetic value when more species are studied.

FORE COXAL CAVITIES: Slater and Ashlock (1976) have discussed the significance of this character, pointing out that closed coxal cavities are, among the Lygaeidae, found only in certain taxa of the Blissinae. They noted that open coxal cavities (fig. 3A, B, C) are not the result of wing reduction and resultant decrease in the size of the posterior pronotal lobe, nor is there direct correlation between closed coxal cavities (fig. 3D, E, F) and body elongation. It is true that, in general, elongate blissines have closed coxal cavities and short-bodied ones have the coxal cavities open. However, the general correlation of open coxal cavities and short bodies is due to the fact that most plesiomorphic Blissinae are short bodied.

I am indebted to Dr. Merrill Sweet (personal commun.) for suggesting a functional explanation for modifications of the fore coxal area in the Blissinae. Sweet suggests that the median prosternal spine that extends posteriorly between the fore coxae braces the prothorax against the mesosternum and strengthens the segmental connection between pro- and mesothorax. Thus the segmental connection is able to withstand the stress of ventral (downward) flexion without loss of dorsal mobility.

This explanation is reasonable for, in addition to open coxal cavities being plesiomorphic and thus not useful in forming a group, it is an oversimplification to separate the Blissinae into two groups on the basis of "open" or "closed" fore coxal cavities. Once the coxal cavities have "closed" there has been a series of specializations that serve to increase the efficiency of the area. The prosternal spine becomes increasingly spatulate and the adjacent pleural area extends inward until the pleural "bridges" and the spatulate prosternal spine make contact and a strongly "closed" coxal cavity is formed. Subsequently increasing thickness of the pleural bridge would continue to increase the strength of the connection. Sweet notes that an elongate insect moving about the linear stems and leaves would be dangerously exposed to downward flexion and that the method of feeding requires dorsal flexion to raise the stylets.

Thus it is easy to understand why as the Blissinae become more and more closely associated with the linear stems and leaves of grasses and sedges there would be selection for body elongation and closing of the fore coxal cavities.

SURFACE PRUINOSITY: The pruinose "bloom-like" area that are conspicuous features of the pronotum, head, and scutellum of many Blissinae have been shown by Slater and Harrington (1970) to be composed of minute hairs. The importance of pruinosity for the classification of *Ischnodemus* has been discussed by Slater and Wilcox (1969) and its significance in cladistics by Slater and Ashlock (1976). The

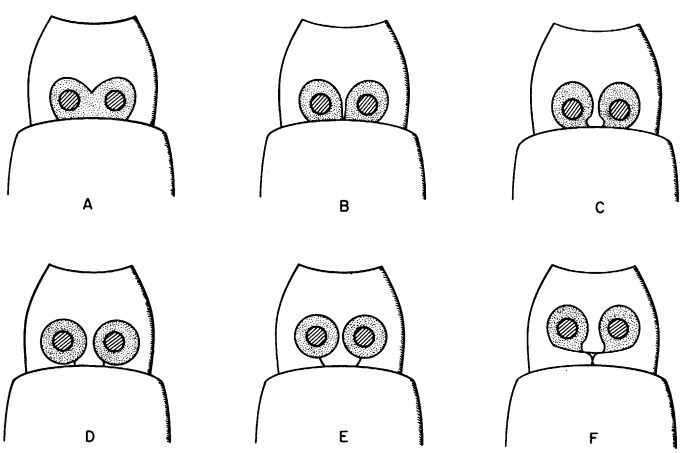


FIG. 3. A-E. Schematic representations of fore coxal cavity modifications.

latter paper points out that pruinosity loss, particularly that of the prothorax, does not occur randomly. The most common sequence appears to be as follows:

Prothorax: Shining areas posteriorly on the pronotum consisting of three individual units, a transversely elongate central shining stripe separated laterally by pruinosity from an ovoid shining area on each humeral elevation (fig. 4B).

Coalescence of the three shining areas into a single shining strip across the posterior portion of the pronotum (fig. 4C-E). There may or may not be a very narrow pruinose area retained along the extreme posterior margin of the pronotum.

Development of a series of tiny shining dots that collectively define a triangular area on each callus of the anterior pronotal lobe (fig. 4B).

Coalescence of the calli "dots" to form a pair of shining triangular patches on the anterior pronotal lobe (fig. 4D, E).

Expansion of the intrahumeral shining strip to include all or almost all of the posterior pronotal lobe (fig. 4F).

Expansion of the dorsal shining areas until pruinosity is reduced to a narrow band behind the pronotal "collar" and as a pair of mesally narrowing wedges (fig. 4K, L) across the transverse impression that may or may not meet at the midline.

A completely shining dorsal pronotal surface (fig. 4O) but with propleuron completely pruinose even above a well-differentiated longitudinal impressed stripe (fig. 5Q).

Restriction of pleural pruinosity to below the lateral impressed stripe (fig. 5N, O).

Reduction of pleural pruinosity to the ventral half to cover an area roughly bounded dorsally by the upper edge of the acetabulum.

Restriction of pruinosity to in front of and behind acetabula, the latter shining (fig. 5T).

Restriction of pruinosity to a narrow ventral area before and between coxae.

Complete loss of all pruinosity.

The great majority of the Blissinae may be placed in one of the above categories insofar as their prothoracic pruinosity pattern is concerned. There are a number of submodifications and variations as might be expected. However, divergence from the above is by no means random. For example, one never finds a blissine with dorsal pruinosity and shining nonpruinose pleural and sternal areas; one never finds blissines with shining areas across the depressed transverse impression and behind the "collar" and pruinose areas on the calli and between the humeri. In other words there is an observable sequence of pruinosity loss and in general this proceeds as outlined above. Examples of major deviations include the following:

An entirely shining anterior one-half to the pronotum and a completely pruinose posterior one-half. *(Praeblissus, Cavelerius, Caveloblissus)* (figs. 27, 28, 29, 67).

Development of the series of calli spots to form a triangular outline, or even large shining calli patches without the development of shining intrahumeral bands (fig. 4A) (this may well be a precursor condition to the preceding).

Loss of pruinosity on the posterior one-half of the propleuron but not the anterior one-half (fig. 5N).

Development of a broad shining stripe across the humeri and a similar one across the area of the calli (figs. 31, 61).

The best generalization that can be made is that pruinosity is first lost dorsally and on those dorsal surfaces that are the most elevated, and lost last in those areas most depressed; that pleural and sternal pruinosity loss never occurs until dorsal pruinosity loss is essentially complete and that it progresses from the dorsal margin of the propleuron ventrally.

Scutellum: Pruinosity disappears first distally along the raised median ridge or elevation (fig. 5K) and subsequently proximally on the meson (fig. 5J), then laterally on the anterior one-half (fig. 5I) and is lost last in the depressed areas laterally (fig. 5M).

Head: Pruinosity loss on the head does not appear to follow such a well-defined sequence as it does on the prothorax. This may well be because the eyes are frequently raised above the remainder of the head surface and the functional advantage of a smooth "sliding" surface is not present. In general, the tylus is not pruinose; frequently there is a somewhat "comma-shaped" shining strip adjacent to the inner margin of each ocellus that in many cases becomes bifid anteriorly. Further shining areas do follow some progression, the vertex mesally becoming

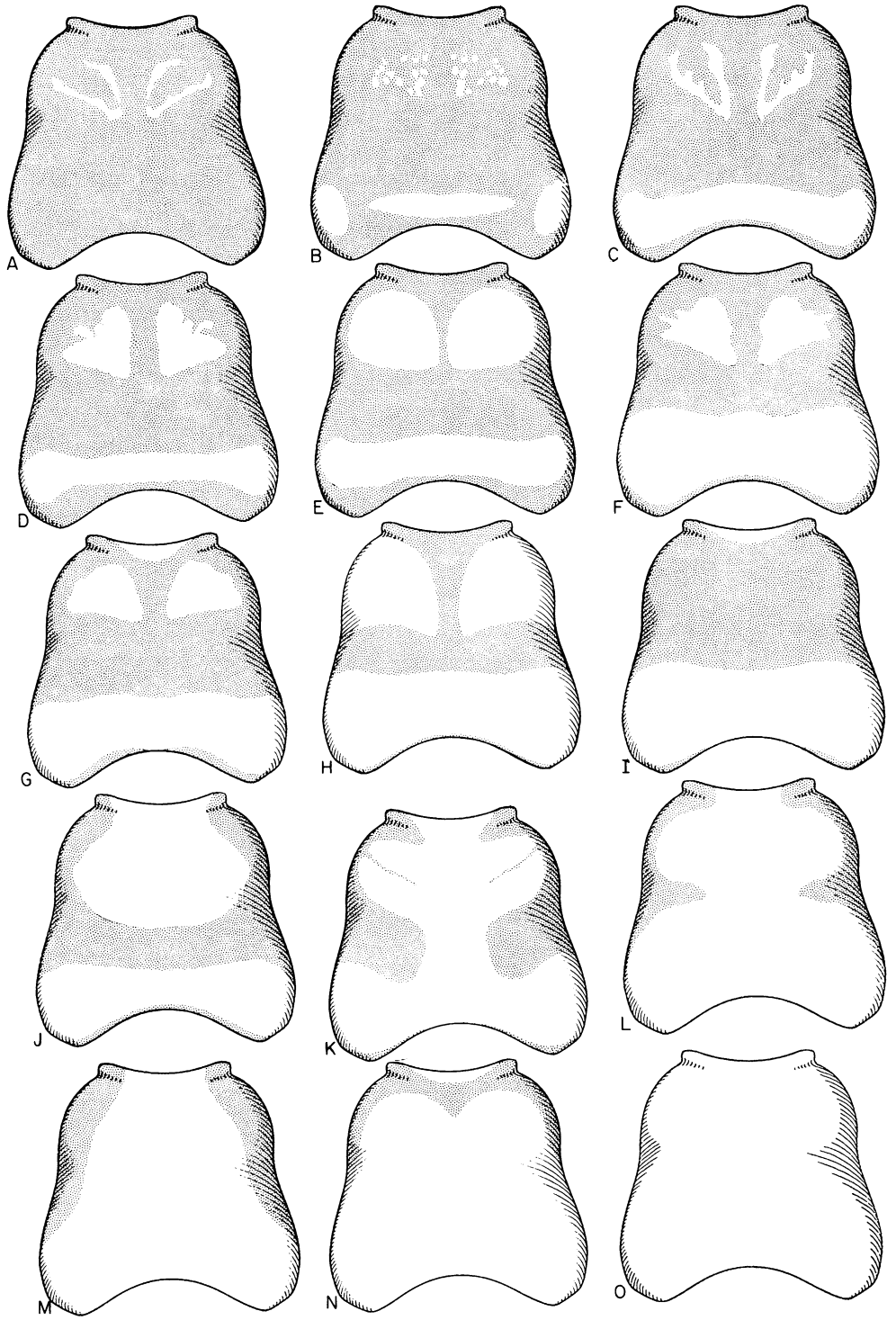


FIG. 4. Pronotum, dorsal view. Stippling indicates pruinosity. A. *Ischnodemus oculatus*. B. *Ischnodemus fulvipes*. C. *Ischnodemus wittei*. D. *Ischnodemus ochripes*. E. *Ischnodemus bosqi*. F. *Ischnodemus linearis*. G. *Ischnodemus ocellaris*. H. *Ischnodemus schoutedeni*. I. *Ischnodemus lactipennis*. J. *Ischnodemus genei*. K. *Capodemus elegiae*. L. *Ischnodemus umbrosus*. M. *Capodemus herbosus*. N. *Ischnodemus torquatus*. O. *Ischnodemus brevicornis*.

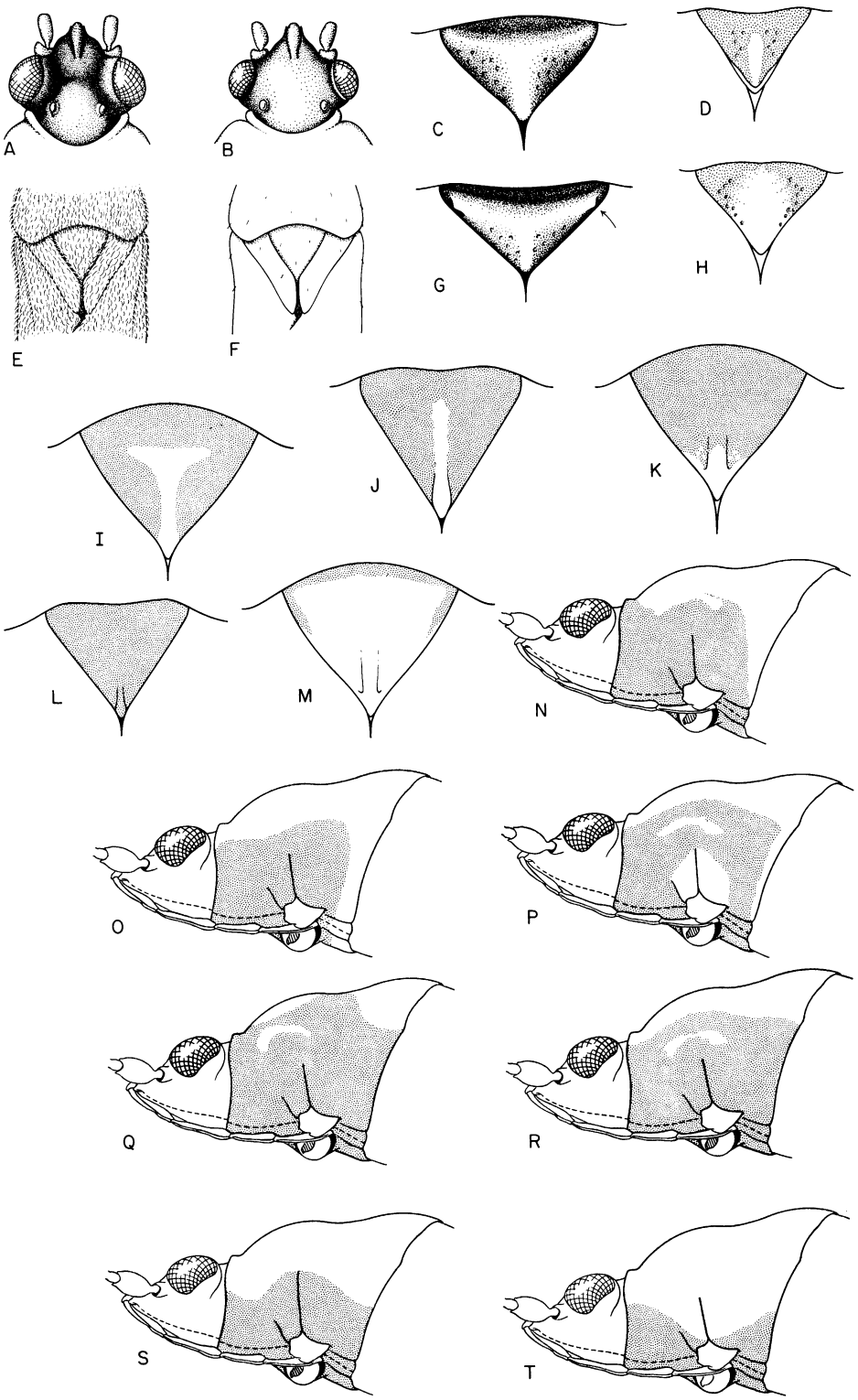


FIG. 5. A,B. Head, dorsal view. A. *Micaredemus eleganoides*. B. *Micaredemus wilcoxae*. C,D. Scutellum, dorsal view. C. *Geoblissus mekongensis*. D. *Capodemus wilcoxae*. E,F. Middle one-third of body, dorsal

shining before it does laterally and the head losing pruinosity dorsally before it does so laterally and ventrally.

Hemelytra: The most common pruinosity loss is along the raised radial vein. In some species the lateral third or half of the corium is shining and contrasts strongly with the pruinose inner portion (never the reverse). I do not know of any case where the basal half of the corium is of one composition and the distal half the reverse.

The membrane of the forewing is usually either completely shining or dull but in some large forms, particularly certain species of *Macropes*, there may be alternating transverse bands of shining and dull surfaces. This probably is not actually pruinosity or lack of it but gives a similar effect when viewed with the light microscope.

Although the functional significance of pruinosity loss has not actually been demonstrated, it is evident that the dorsal surfaces of the body that most frequently come into contact with leaf sheaths are the first areas to show loss of pruinosity. For a blissine that moves between two closely appressed surfaces, as most of them do, the dorsal surface is the one most directly in contact with the plant, for the ventral surface is slightly removed because of the presence of the legs.

These varying pruinosity patterns are very useful in blissine taxonomy as they are surprisingly constant for a given species. It is a character, however, that must be used with much caution in phylogenetic interpretation as it is evident that similar progression series have occurred in several quite distinct phyletic lines (see Slater and Ashlock, 1976).

SEXUAL DIMORPHISM: Marked sexual dimorphism is not widespread in the subfamily. Morphological specializations are generally present in males when the sexes are dimorphic. One of the striking features is the relatively high frequency of sexually dimorphic taxa in the Oriental Region as compared to other zoogeographic regions.

In the majority of blissine taxa the sexes are very similar in most external features. The only modifications usually evident is that females tend to average somewhat larger and to have a comparatively broader abdomen.

The following cases are examples of secondary sexual dimorphism known to occur in the subfamily.

ELONGATION OF THE MALE BUCCULAE: In the genus *Iphicrates* males of all species have bucculae that extend considerably anterior to the apex of the tylus and in many species they are broadened distally (fig. 6F). The females of many *Iphicrates* have the bucculae somewhat more produced anteriorly than in other Blissinae, but in almost all species those of the males are much larger. *Aradacrates*, a monotypic Madagascar genus, also has produced bucculae (fig. 18), but apparently these have evolved independently. (Females of this genus are unknown.)

ELONGATION OF THE JUGA: This condition is confined to certain species of *Iphicrates* where the male juga become very long and tapered in contrast to the conventionally subtriangular blissine condition found in females of the same species.

ELONGATION OF THE GENAE: Males of the genus *Dentisblissus* have greatly elongated and anteriorly produced genae that appear as heavy "tusklike" extensions and are usually bifid apically (fig. 31). In the females of *Dentisblissus* and males and females of species of *Scintillademus* and *Patritius* a very short protrusion is present in the genal area.

EYE SHAPE: Marked sexual dimorphism of the eyes occurs in many species of *Pirkimerus*. The eyes of females are very large and protrude markedly from the lateral margin of the head. The eyes of males, by contrast, are relatively narrow, protrude only slightly, and with the rest of the lateral margin of the head, form an almost even, gently convex arc.

ENLARGEMENT OF THE HIND FEMORA AND TIBIAE: In males of the genus *Bochrus* and some species of *Patritius* and *Extarademus* the

view. E. *Blissiella castanea*. F. *Blissiella micans*. G-M. Scutellum, dorsal view. G. *Geoblissus siccus*. H. *Capodemus variabilis*. I. *Macropes pseudofemoralis*. J. *Ischnodemus mendax*. K. *Macropes nigrolineatus*. L. *Ischnodemus inornatus*. M. *Macropes australis*. N-T. Thoracic pruinosity, ventrolateral view. N. *Capodemus pentameri*. O. *Capodemus tenuatus*. P. *Capodemus wilcoxae*. Q. *Capodemus variabilis*. R. *Capodemus stuckenbergi*. S. *Ischnodemus brunnipennis*. T. *Ischnodemus slossoni*.

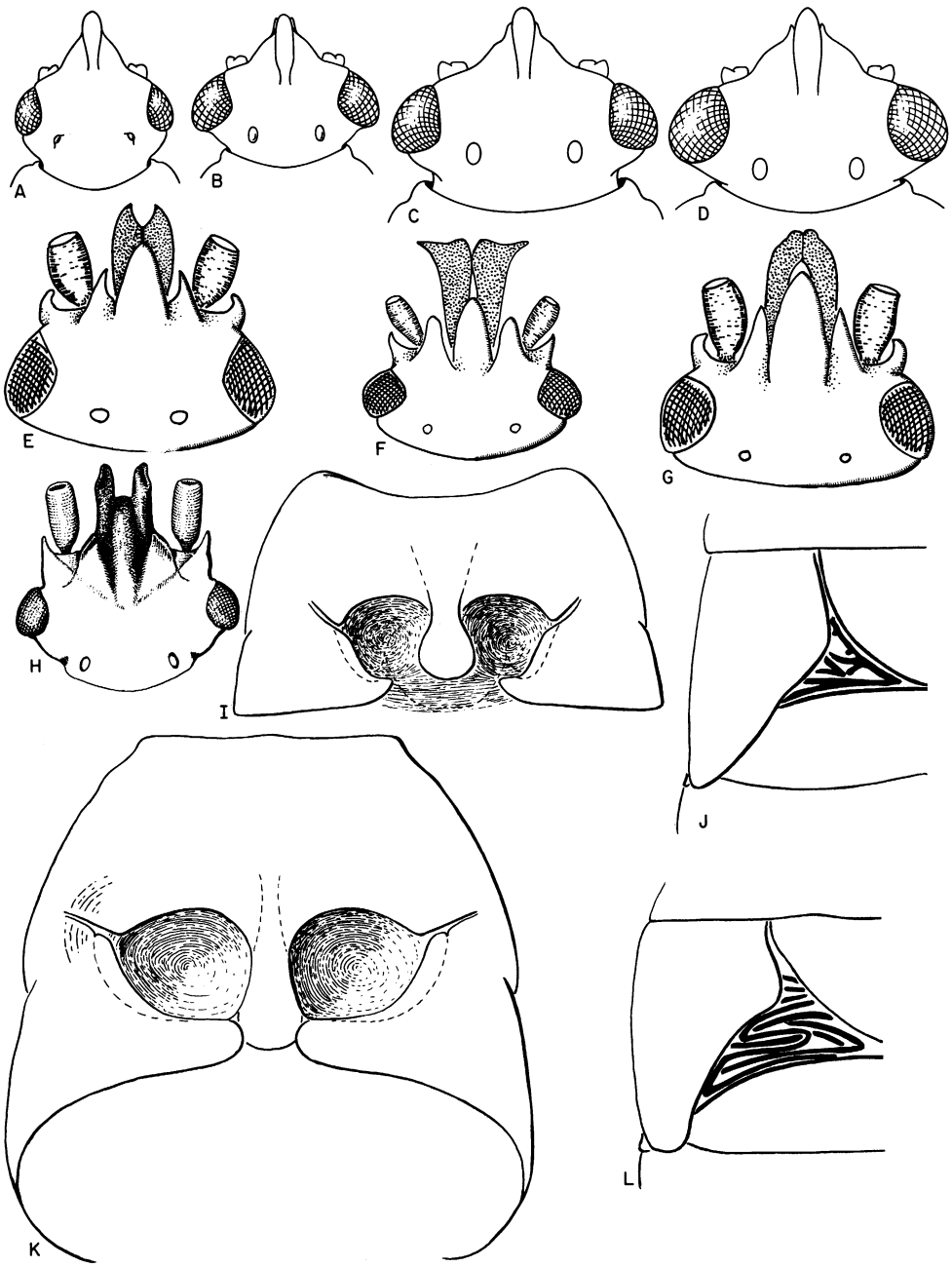


FIG. 6. A-G. Head, dorsal view. A. *Macchiademus acuminatus*. B. *Macchiademus capensis*. C. *Ischnodemus diplachne*. D. *Ischnodemus oculatus*. E. *Iphicrates pseudolineatus*. F. *Iphicrates lativentris*. G. *Iphicrates montaguei*. H. *Iphicrates rex*. I. Open fore coxal cavities, *Capodemus sabulosus*. J. Mesonotal striations, *Capodemus rusticoides*. K. Closed fore coxal cavities, *Atrademus capeneri*. L. Mesonotal striations, *Capodemus rusticus*.

hind femora are much thicker and more incrassate than are those of the females. In at least one species of *Bochrus* there is also a large spine developed on the male tibiae. Some *Pirkimerus* species also have more strongly enlarged and spinose tibiae in the males than in the females.

ENLARGEMENT OF THE FORE FEMORA: Many of the Blissinae have strongly incrassate and spinose fore femora. In *Macropes spinimanus* this is much more pronounced in the males than in the females, and in a number of other *Macropes* the male fore femora are somewhat more swollen.

ABDOMINAL SPINES: Males of *Extarademus* have a series of spines on the posterior abdominal sterna (fig. 8A) and sometimes elongation of the connexiva (the very elongate connexiva of *Toonglasa* (fig. 79) may be sexually dimorphic but only a single specimen is known).

FEMORAL SPINES: Many species of the Blissinae have all femora mutic. However, the occurrence of a single spine ventrally on the distal third of the fore femora occurs in many taxa, two spines in this area are not uncommon, and there is a whole group of genera that have multispinose fore femora. Spines on the middle and hind femora are much less common and are rarely present as other than a series of spines and then almost always only in species that also have multispinose fore femora. Variation in the number of fore femoral spines intraspecifically has been discussed by Slater and Wilcox (1973) for the South African fauna and is not repeated here other than to say that generally species with only a single spine present only rarely have more, but in species with more than one spine, variation in the number is greater. Species that are generally mutic appear never to develop spines, and the reverse is so rare as to almost be an aberration.

If used with care, the presence, absence, or number of femoral spines is very helpful in blissine taxonomy, however, its use in phylogeny is very difficult. This is so in part because, like pruinosity patterns, both different and similar femoral spine conditions are found in different phyletic lines even within the same genus. Of more importance is the difficulty of determining whether the plesiomorphic condition for the Blissinae is mutic or spinose. Study of related outgroups is not especially valuable, for while many of the Lygaeidae have multispinose fore femora, many others do not. Further, spined and mutic fore femora both occur within tribes and subfamilies almost throughout the family, and of course we do not yet have a cladistic analysis of the higher taxa of the Lygaeidae. I suggest that mutic fore femora may be ancestral, but if so, a single fore femoral spine developed early. I suggest this because of the possibility that the Orsillinae is the sister group of the Blissinae (Ashlock, 1967) (if not, the sister group of the Blissinae probably is the Ischnorhynchinae or Lygaeinae) and all have many taxa with mutic femora. Also blissines with multispinose fore femora usually have a number of apomorphic characters and in closely allied rather generalized blissine taxa such as *Blissus-Dimorphopterus* and *Capodemus-Macchiademus*, those species with other apomorphic characters are those most likely to have fore femoral spines present. There appears to be a functional advantage in having more femoral spines for insects that move through closely appressed leaf sheaths, in that spines can serve as a "brace" to hold the folded tibiae against the ventral surface of the femur. Thus, one can hypothesize selection for the acquisition and elaboration of the spines. However, species without spines do not seem to be concentrated in those taxa whose species live less closely associated with closely appressed surfaces. This is not to say that secondary loss of spines has not taken place. It appears to have occurred in *Ischnodemus* and *Pirkimerus* and may well have done so in other taxa.

Admittedly the evidence for the plesiomorphic condition is not strong and greatly limits the cladistic value of the character.

The mutic condition is certainly plesiomorphic for the middle and hind femora. Spines appear on these femora only in taxa with many other derived features.

APICAL CORIAL MARGIN: The value, variability, and cladistic limitations of this character are discussed in detail by Slater and

Ashlock (1976). Outgroup comparison seems to show conclusively that a straight corial margin is plesiomorphic. Concavity of the apical corial margin is a general statement that subsumes a variety of modifications of the margin, some of which at least have certainly occurred independently, and thus a concave apical corial margin in itself does not necessarily constitute a synapomorphy.

ANTENNAL SHAPE: Terete antennae appear to be the plesiomorphic condition. The evidence is similar to that for the apical corial margin, i.e., it is the predominate condition in other Lygaeidae and other families of Hemiptera. Strongly clavate antennae usually occur in taxa that have many other derived characters. (I understand the danger of circular reasoning here.) Like the concave apical corial margin, "clavate antennae" is by no means a "yes or no" condition. Many species that have what are called terete antennae show a tendency toward a slight enlargement of the second and third segments distally. In relatively plesiomorphic taxa clavate antennae seem generally to be associated with shortening of the body.

ABDOMINAL SCLERITES OF NYMPHS: Although the nymphs of the Blissinae appear to have a number of features important to an understanding of the phylogeny of the subfamily, it is difficult at present to use these characters in phylogenetic work, as nymphs of many species (including all species of a number of genera) remain unknown. Nymphs of most the Blissinae have a series of plates on the dorsal and ventral surfaces of the abdomen. Usually these are larger and more heavily sclerotized on the posterior segments. Slater and Wilcox (1973) present a coding system for recognition of the various sclerites (fig. 7). These plates (Slater, 1976) are most extensively developed in species that live between closely appressed leaf surfaces. They appear to be useful as "skid plates" to facilitate the movement of the body through tightly appressed surfaces. Many of the elongate Blissinae live in such habitats and are capable of moving backward almost as readily as they move forward. Thus, the value of strong plates at the posterior end of the abdomen is evident. The plates along the midline are usually the largest on the posterior segments and appear to develop progressively from the posterior end of the body anteriorly, so that the plesiomorphic condition is one in which median dorsal plates (TM) are present on terga six and caudad, and the most apomorphic condition is where there is a TM plate on all terga from segment two posteriorly. The lateral plates form a similar although less complete series. The most apomorphic condition of these plates of any blissine whose nymphs are yet known is found in the Ethiopian and Madagascar genus *Barademus* (fig. 7P). The most plesiomorphic conditions are found in such genera as *Dimorphopterus* and *Blissus*.

ABDOMINAL TRICHOBOTHRIA: I have not personally studied this set of characters. Schaefer (1975) has investigated either nymphs and/or adults of 21 species of Blissinae, representing 13 genera (chiefly South African and North American). He believes that two "trends" may be present in heteropteran trichobothrial evolution. In the "main trend" the condition in which an increased number of trichobothria become present in earlier and earlier instars is apomorphic. In the "counter trend" the apomorphic condition is where fewer trichobothria are present in the later instars and the adult number is reduced.

Schaefer (1975) believed the "counter trend" best explains the situation in the blissines he studied, i.e., reduction of the full adult complement is apomorphic. This seems reasonable and is supported by the fact that although Schaefer did not indicate the adult trichobothrial complement of species of *Capodemus*, Slater and Sweet (1972) have previously shown that in members of this genus only two trichobothria each were present on sterna three and four. Clearly, there has been a reduction or "counter trend" in this genus at least.

The trichobothrial pattern in the Blissinae may be of some value within genera or closely allied groups of genera. However, frequently we are involved with a reduction phenomenon and in such cases synapomorphy can be established only with the greatest caution. Schaefer also notes that there is considerable individual variation (sometimes within the same individual

on a given segment) and that in this subfamily it is often very difficult, if not impossible, to differentiate trichobothria from other setae. It is my belief that a really extensive survey is necessary with long series studied to allow for understanding of individual variation (Davidova and Stys, 1976) before trichobothrial patterns can be used in the phylogeny of the Blissinae.

FORE TIBIAE: In most of the Blissinae the fore tibiae are cylindrical for much of their length, although they are frequently somewhat enlarged near the distal ends and bear a series of spines. The most strikingly apomorphic conditions occur in the *Blissus-Dimorphopterus* phyletic line. The most apomorphic states occur in such genera as *Geoblissus* and *Talpoblissus* (fig. 7G, H) where the fore tibiae are modified into enlarged and flattened "scoops" to enable the insect to burrow readily into sandy soil. In species of these two genera the "digging" modification appears to have evolved independently. In *Geoblissus* the entire tibia is flattened and bears a closely set series of teeth along both margins (fig. 37). These teeth are sometimes worn down to blunt stubs in some "old" specimens (Slater, Ashlock, and Wilcox, 1969). In *Talpoblissus* the terminal portion of the tibiae is strongly splayed out, somewhat "scalloped" with a heavy "tooth" present at the point of each "scallop" (fig. 7G, H). Many species of *Dimorphopterus* and *Blissus* have somewhat enlarged, flattened, and toothed fore tibiae.

In such genera as *Spalacocoris* (fig. 77) and *Chelochirus* (fig. 30) the fore tibiae are very short and thick, usually curved with a few large teeth or hooks on the distal ends. Although the habits of these bizarre blissines are unknown, it is possible that the fore tibial modifications are also fossorial adaptations.

LABIAL LENGTH: This is a very useful character for specific discrimination, especially in large and complex genera such as *Ischnodemus*, but it is of limited value at higher group levels. The plesiomorphic condition appears to be one in which the labium extends posteriorly onto the extreme anterior portion of the mesosternum. A labium of this length is found in many species of a large number of genera of the Blissinae. Apomorphic conditions are represented by both shortened and elongated labia and there is obviously a considerable amount of parallelism. The labial length probably functions in some manner in resource partitioning as often sister species within a genus have rather different labial lengths. How the mouthparts function in insects moving about between appressed leaf surfaces is somewhat of a puzzle. In some other lygaeids the utility of a very elongate "beak" is quite apparent. For example, *Oxycarenus maculatus* and *Dinomachus marshalli* have greatly elongated labia which in the adults reach to or beyond the middle of the abdomen, and in early instar nymphs actually "trail" posteriorly beyond the end of the abdomen. *Oxycarenus maculatus* feeds on the seeds of African proteas, which lie deep within the flower heads. *Dinomachus marshalli* feeds on the seeds of *Ficus sycomorus* (and probably other *Ficus* spp.) and presumably feeds by inserting the stylets through the syconium to reach the seeds within. In the Blissinae, however, it is not evident how an elongate (or a shortened) "beak" is adaptive. This offers an interesting area for investigation, for how most of the Blissinae actually feed is completely unknown.

MESOSTERNAL FURROW: In most of the Blissinae there is a fine groove running longitudinally along the midline of the mesosternum. In some species, a definite deep troughed furrow is present. I previously considered this to be of phylogenetic importance. However, it now appears that there has been substantial parallel development and that it is at least in part correlated with elongation of the labium. The labium lies in this furrow and it can readily be seen that such a development should be advantageous to an insect moving through closely appressed leaf surfaces.

MEMBRANE TEXTURE: The plesiomorphic condition is one in which the membrane is noticeably thinner than the clavus and corium but semiopaque, thicker than the hind wing and of uniform texture. Two opposing apomorphic "trends" are evident; in one the membrane becomes increasingly leathery and opaque and can scarcely be differentiated in texture from

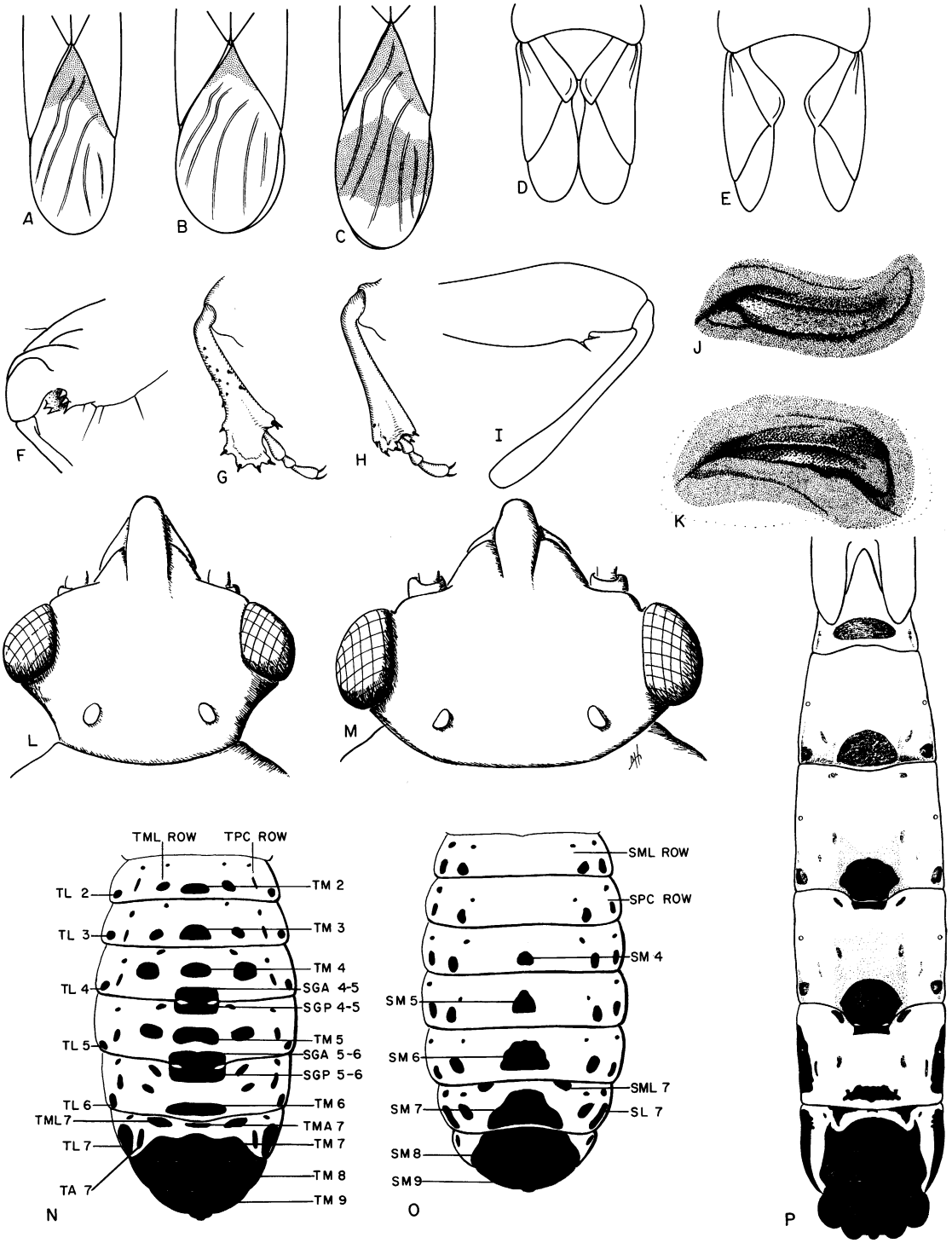


FIG. 7. A-C. Membrane of forewing. Stippling indicates pruinosity. A. *Macrops lobatus*. B. *Macropes privus*. C. *Macropes albosignatus*. D,E. Mesothoracic wings. D. *Ischnodemus slossoni*. E. *Ischnodemus*

the rest of the hemelytron. Such a condition is well exemplified by some of the large flattened species of *Riggiella, Scansidemus, Chelochirus* and members of the *Macropes raja*-complex. The converse apomorphic condition is one in which the membrane becomes very thin and hyaline and is either partially or completely transparent. In some species of *Dimorphopterus* the proximal part of the membrane may be opaque and the distal portion transparent-hyaline. It is apparent that intermediate conditions exist and that the hyaline membrane has developed more than once. It is also apparent that there is, in some cases, a strong correlation of wing texture with other synapomorphic characters and that used with caution this feature is of some value in establishing cladistic relationships.

The membrane of some of the Blissinae such as *Reticulatodemus, Xenoblissus,* and *Gelastoblissus* is composed of a network of tiny cells (figs. 72, 80, 36). I have interpreted this for the most part as synapomorphy as is discussed under the individual taxa.

In some complexes of *Macropes* and related taxa the surface of the membrane has alternate bands of dull (pruinose) and bands of shining surface. This is an important feature but difficult to use in practice, as any accumulation of grease or dirt will obscure or obliterate the pattern, and even with material in good condition it requires some practice and care in orientation of the light source to make accurate comparative observations.

OVIPOSITOR LENGTH: This is a very useful character for specific discrimination and does have value at higher group levels. The major problem is in understanding what the plesiomorphic condition is because of the great variability of ovipositor length in other lygaeids and lack of knowledge of what is the sister group of the Blissinae. Certainly when the ovipositor has become platelike as it has in *Spalacocoris* and *Pirkimerus* the condition is highly apomorphic, in fact approaching at least superficially the condition found in the Pentatomoidea. Extreme elongation of the ovipositor is also certainly relatively apomorphic. Beyond this it is really not possible to be certain. However, in studying a genus such as *Ischnodemus* one becomes impressed by the appearance of a progression from an ovipositor that does not completely divide the sixth sternum (fig. 8D) through types that do divide sternum six (fig. 8C, E, G), those that partly divide sternum five (fig. 8G), those that completely divide sternum five (fig. 8C), to those that partially divide sternum four. The shorter ovipositor also usually occurs in species that have a number of other plesiomorphic characters. Therefore, I believe the most reasonable hypothesis is to consider that the plesiomorphic condition of the ovipositor in the Blissinae is one in which the ovipositor is distinctly geniculate and laciniate but short, and when "at rest" does not completely divide sternum six. Thus, increasing modification of the anterior sterna by ovipositor elongation is relatively apomorphic.

In the Australian genera *Heinsius* and *Australodemus* the ovipositor is prolonged posteriorly beyond the remainder of the abdomen (fig. 8H, I), a strongly synapomorphic feature (see Slater and Sweet, 1963).

OCELLI: Most of the Blissinae have a pair of conventional small ocelli on the vertex. Occasionally in morphs with a high degree of wing reduction the ocelli will be reduced or lost. This is true in number of lygaeid groups and, although an apomorphic condition, is certainly a convergence or parallelism phenomenon.

In the *Spalacocoris-Pirkimerus-Chelochirus* clade the ocelli are much enlarged and I believe they represent an important synapomorphic character uniting these taxa.

ANTENNIFEROUS TUBERCLE: The plesiomor-

hesperius. F. Fore femur, *Micaredemus quadratus*. G,H. Fore tibia. G. *Talpoblissus cydnoides*. H. *Talpoblissus latus*. I. Fore femur, *Ischnodemus sinuatus*. J,K. Metathoracic scent gland auricle. J. *Patritius fusconervosus*. K. *Patritius colombianus*. L,M. Head, Dorsal view. L. *Capodemus distinctus*. M. *Capodemus herbosus*. N,O. Abdomen of nymph showing sclerite code. N. Dorsal view. O. Ventral view. P. Abdomen of nymph, dorsal view, *Barademus attenuatus*.

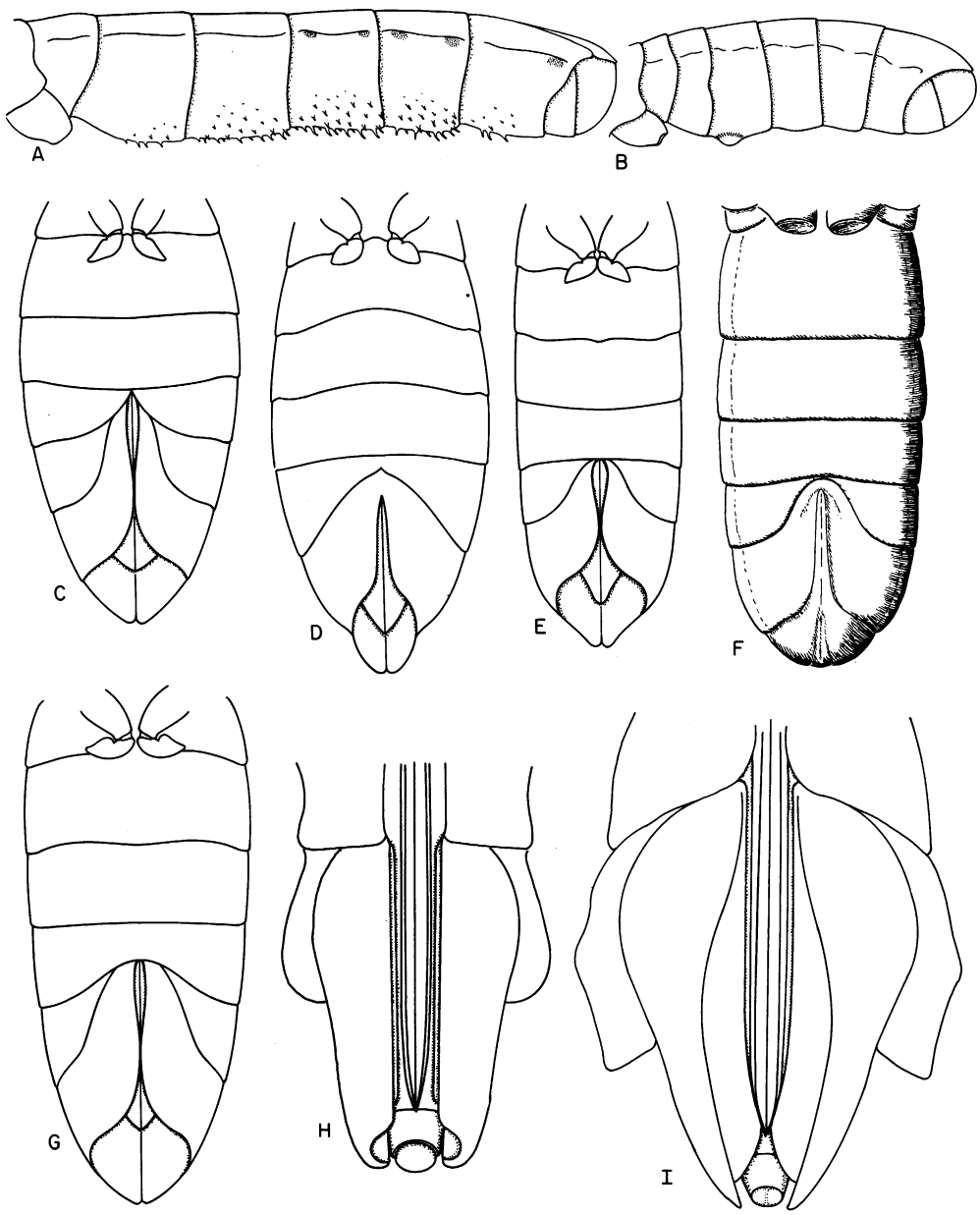


FIG. 8. A,B. Abdomen, lateral view. A. *Extarademus macer*. B. *Macropes obnubilis*. C-I. Abdomen of female, ventral view. C. *Ischnodemus montanus*. D. *Ischnodemus fulvipes*. E. *Ischnodemus stali*. F. *Ischnodemus basalis*. G. *Ischnodemus* sp. (Tanzania). H. *Heinsius explicatus*. I. *Australodemus elongatus*.

phic condition in the Blissinae (and indeed in the Lygaeidae) is that of a short truncate protrusion from the body wall, anterior to and slightly below the eye (fig. 6A, B). Species of *Iphicrates, Reticulatodemus*, and *Extarademus* have the outer margin of the tubercle produced forward and curved, so as to appear hooked or like a cow's horn on to the tubercle (fig. 6E-

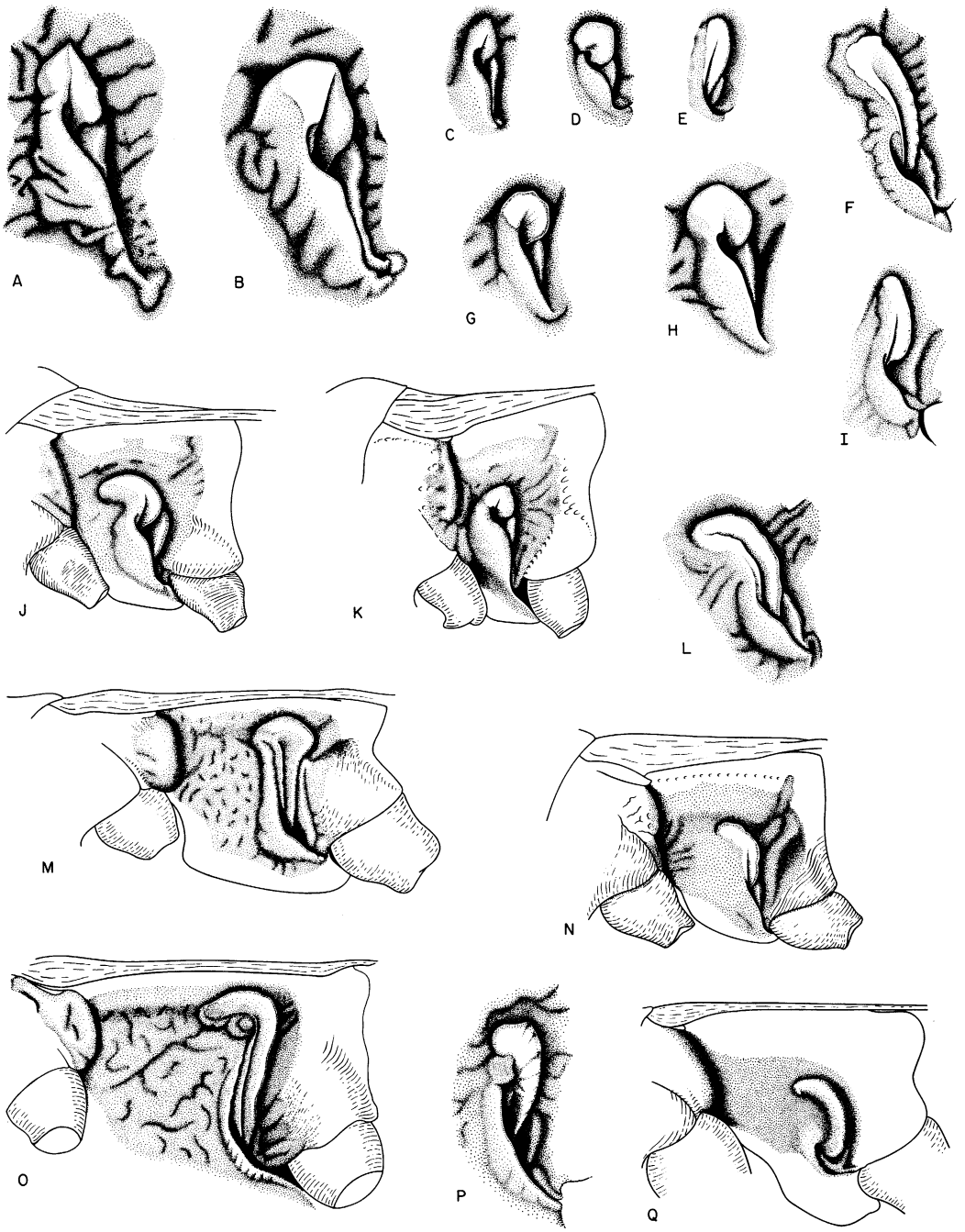


FIG. 9. Metathoracic scent gland auricle. A. *Ischnodemus basilewskyi*. B. *Ischnodemus grossinigrus*. C. *Capodemus sabulosus*. D. *Macropes lobatus*. E. *Macropes uniformis*. F. *Macropes raja*. G. *Heteroblissus anomilis*. H. *Ischnocoridea elegans*. I. *Macropes spinimanus*. J. *Ischnodemus brincki*. K. *Blissus leucopterus*. L. *Extarademus humerus*. M. *Aradademus mirificus*. N. *Extarademus macer*. O. *Aradademus oculatus*. P. *Macropes albosignatus*. Q. *Barademus attenuatus*.

G). Outgroup comparison suggests that this probably is a synapomorphic condition and is important because of the Neotropical-Oriental relationship thus established.

COLORATION: Color generally is affected so strongly by the immediate environment as to be of little value in cladistic analysis. It is relatively constant in some species, and leg and antennal color, as well as hemelytral patterns, have proved to be of considerable ancillary value in species segregation. The dark spot in the middle of the membrane that occurs in so many blissine lines probably has some disruptive pattern value and is sometimes useful in recognizing clades within large genera. However, at the generic level, color does not seem to be useful in systematic work on this subfamily.

Savanna species, as might be anticipated, tend to be pale yellow, whereas there is a tendency for species living in more mesic habitats to be variegated, but we really know too little of the habits of most species to generalize further.

METATHORACIC SCENT GLAND AURICLE: This structure is of considerable phylogenetic importance in the subfamily. Not only is there a great variety of forms within the Blissinae but frequently a given genus will have a given type of auricle, and it is often possible to observe what appear to be synapomorphies in the shape of the structures that aid in the recognition of clades. In some genera the auricle is an important indicator of which of the species is the most plesiomorphic.

The plesiomorphic metathoracic scent gland auricle is a short ovoid button-like structure, probably somewhat narrowed at the distal end (fig. 9D, G, H). Evidence for this is the widespread occurrence of this type of auricle in other groups of the Lygaeidae and its presence in a number of blissine taxa. Also this type of auricle occurs in species of some genera, other members of which have different auricle shapes. Finally, this is the type of auricle that is most often present in taxa that have a number of other plesiomorphic characters. The above is not true of any other auricle type.

The simplest modification of this lobed or button-like auricle is for the auricle to elongate (fig. 10A). This has occurred in several phyletic lines, and in advanced states the auricle sometimes expands irregularly at the distal end as in *Dentisblissus venosus* (fig. 11I), *Aradademus mirificus* (fig. 9M), and *Iphicrates rex* (fig. 11F). Another apomorphic condition is for the auricle to elongate and curve forward in a somewhat scimitar-shaped arc (fig. 9Q). In *Barademus, Micaredemus,* and *Extarademus* this appears to show cladistic relationship, but a somewhat similar condition apparently has been attained independently in *Macropes*.

The scent gland auricle is then one of the really important external features available for use in the classification and phylogenetic reconstruction of the taxa of the Blissinae.

WING POLYMORPHISM: Reduction of wings is widespread in the Blissinae. I have previously discussed the general phenomenon and proposed a classification of wing types (Slater, 1975, 1977). In the latter paper the Blissinae were placed in a special category which I called the "laminaphiles" (living between leaf sheaths) to distinguish them from the ground-living species (geophiles) and those that live on trees, shrubs, and forbs above the ground (arboreals). This special category is necessary as the development of flightlessness in the Blissinae much more closely parallels the condition found in the geophiles than it does that of the arboreals.

Whether deterioration of wing muscles occurs after a dispersal or mating flight period has not been investigated in this subfamily. When wing reduction occurs it takes the form of progressive shortening of the wing and never results in the formation of a coleopteroid or staphylinoid "shell" of the type that is so common in the Rhyparochrominae (see Slater, 1975 for definition of terms). Submacroptery (fig. 18), where the membrane is slightly shortened, and brachyptery, where the membrane, corium, and clavus are all shortened, are both common. Microptery (fig. 68) occurs but appears to be limited to taxa living under relatively stable ecological conditions. In some cases such as *Praetorblissus* and *Capodemus* the microptery is extreme, the forewing being reduced to a

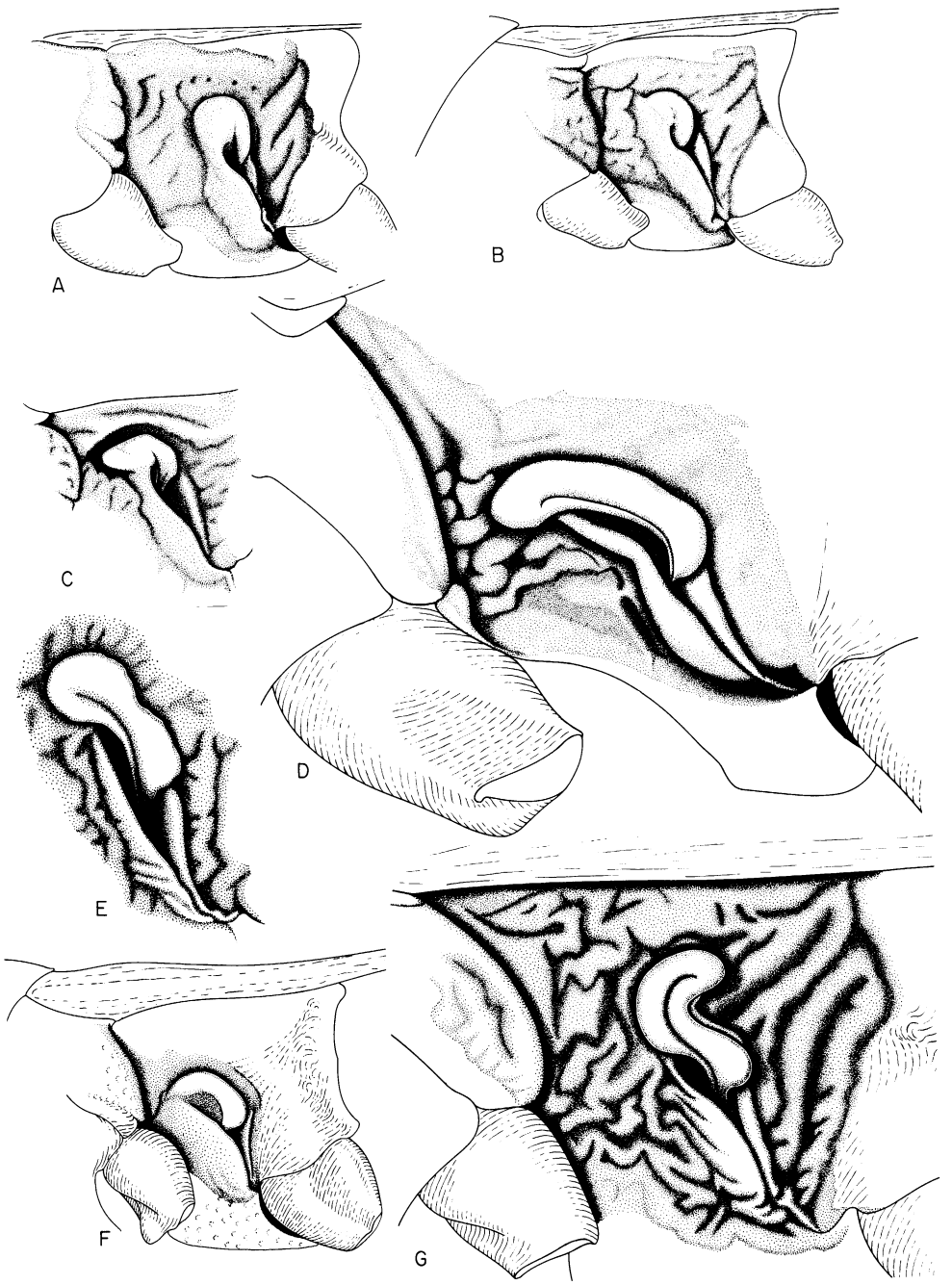


FIG. 10. Metathoracic scent gland auricle. A. *Ischnodemus badius*. B. *Ischnodemus falicus*. C. *Ischnodemus asciaformis*. D. *Spalacocoris nigritus*. E. *Chelochirus confertus*. F. *Micaredemus pilosulus*. G. *Chelochirus talpus*.

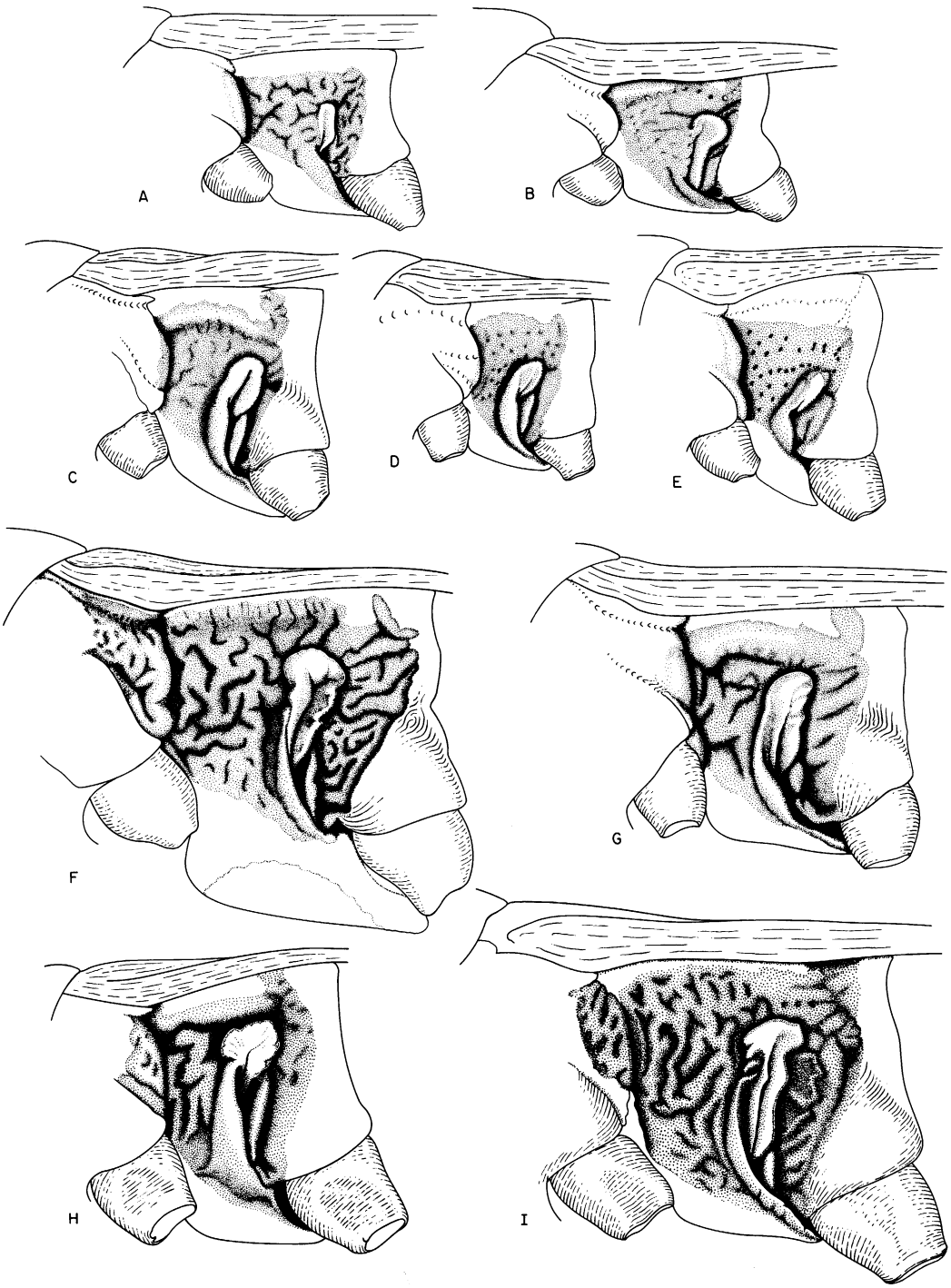


FIG. 11. Metathoracic scent gland auricle. A. *Reticulatodemus nitidus*. B. *Iphicrates malayensis*. C. *Iphicrates angulatus*. D. *Iphicrates lativentris*. E. *Xenoblissus lutzi*. F. *Iphicrates rex*. G. *Iphicrates nigritus*. H. *Scintillademus gemmatus*. I. *Dentisblissus venosus*.

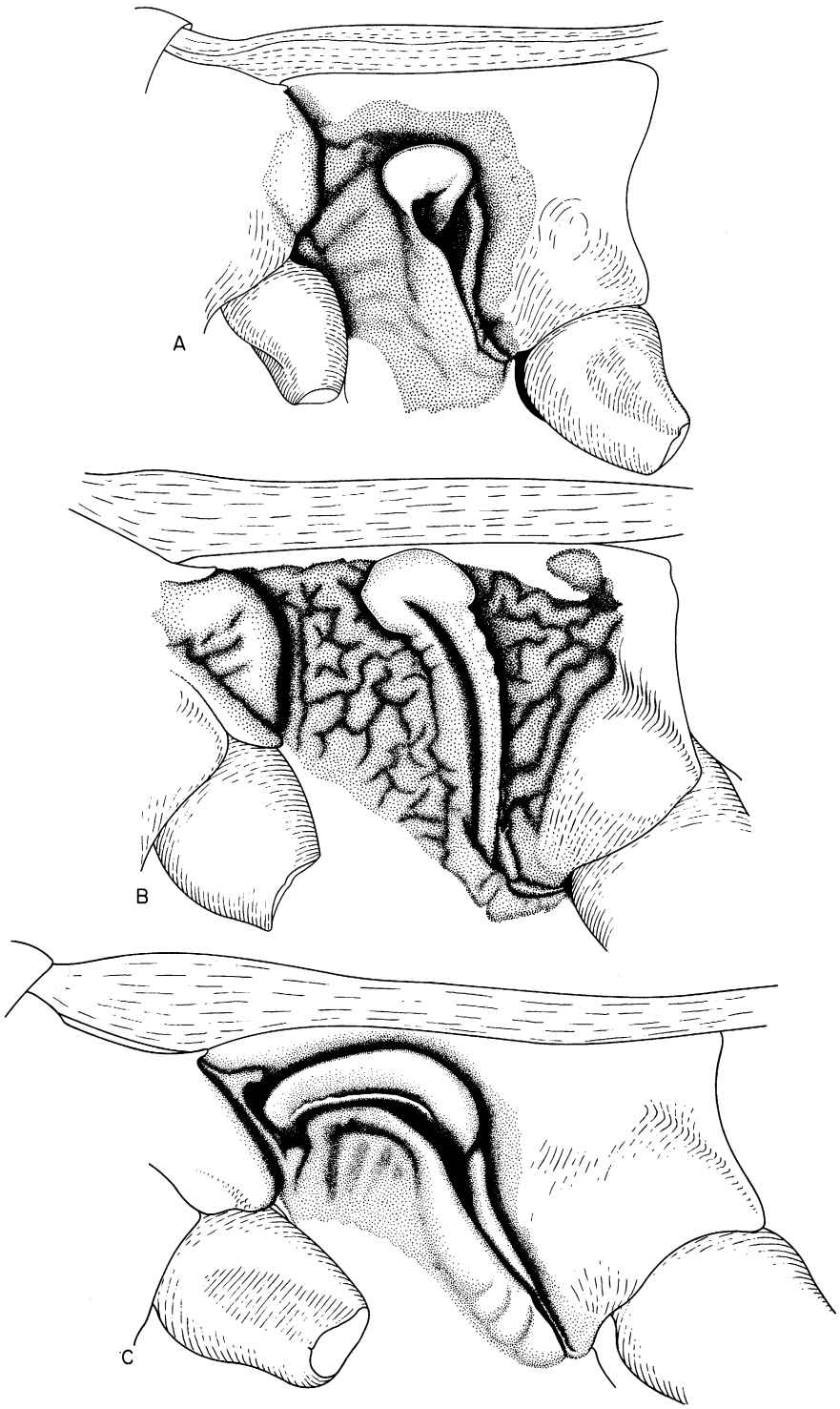


FIG. 12. Metathoracic scent gland auricle. A. *Procellademus venenatus*. B. *Riggiella vianai*. C. *Ramadademus sakalava*.

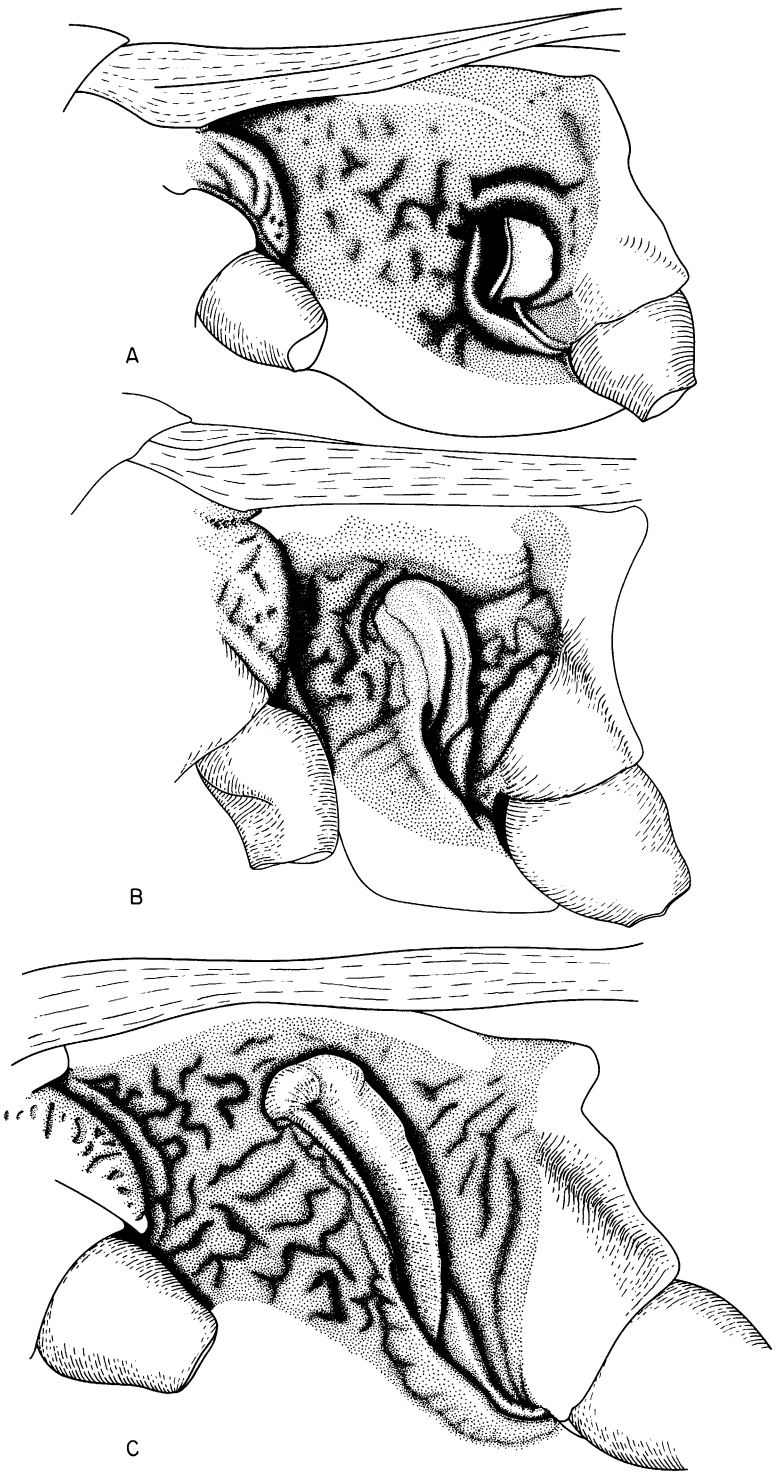


FIG. 13. Metathoracic scent gland auricle. A. *Pirkimerus japonicus*. B. *Macropes major*. C. *Bochrus poecilopterus*.

minute scalelike pad that does not extend posteriorly to cover even the metanotum.

Wing polymorphism is very important ecologically, but of almost no phylogenetic value, as it occurs sporadically in various species of diverse genera and is certainly more an expression of habitat stability than of cladistic relationship.

TARSAL SEGMENTS: Most blissine bugs have conventional tarsi composed of three segments, the first segment being the longest. Only in some of the most apomorphic taxa is there any significant modification. In some species of *Pirkimerus*, for example, the first segment is greatly elongated; in such genera as *Macropes*, *Chelochirus*, and their relatives the second segment is much reduced and the first segment swollen. Only two tarsal segments are rarely present. Since all nymphs have only two tarsal segments, adults with two segments may be neotenic.

PROPLEURON: In *Macropes* species and in some of the other large Oriental blissines the anterior portion of the propleuron is deeply excavated. Such species have the fore femora strongly incrassate and the propleural modification appears to be an adaptation to allow the femur to "fit" into the body form when the insect is moving through narrow spaces. Nevertheless, not all blissines with enlarged fore femora show this modification, and I believe it to be of value cladistically. It is a difficult character to use in practice as actually the condition is an not either-or one but a series of increasingly deep impressions in the side of the prothorax.

HOST PLANTS: Host plants and morphological adaptations of blissine bugs to their hosts have been extensively discussed previously (Slater, 1976) and are not repeated here. I note only the restriction of these insects to monocots and the concentration of species on the Gramineae. There is marked host specificity but hosts are unknown for so many taxa that this information can be used phylogenetically only in a very limited fashion. This does not mean, however, that eventually the insect-host relationship will not be extremely valuable (it almost certainly will be), but only that information is still insufficient for detailed comparative studies.

PHYLOGENETIC RELATIONSHIPS[1]

The cladogram (fig. 15) is constructed on the basis of shared apomorphies rather than plesiomorphies. Trichotomies and polytomies occur in the generic cladogram and in some of the specific cladograms. Paraphyletic groups are recognized (*sensu* Hennig, 1966 and Ashlock, 1971). The question of the desirability of recognizing paraphyletic groups is discussed by Mayr (1974), Ashlock (1974), Nelson (1978), Michener (1978) and Brothers (1978), among others.

In attempting to reconstruct the phylogeny, reliance has been placed upon uniquely derived characters such as the extensive posterior sclerotization of the abdomen of the nymphs, the presence of a genital tubercle, and the development of broad platelike wings on the sperm reservoir. Such characters as clavate or terete antennae, degrees of thoracic, head and scutellar pruinosity, presence or absence of fore femoral spines, etc., while useful, are of secondary value since they appear to have developed a number of times in the evolution of the group. The broad flattened body, multispinose fore femora, deeply concave apical corial margin, and structural characteristics of this kind are somewhat intermediate between the unique characters and those that reappear upon a number of occasions. Thus, there is a galaxy of characters that must be used with considerable care if evidence for a reasonable approximation of the phylogenetic history of the group is to be marshalled in support of the hypothesis presented here.

[1]This section was done in collaboration with Dr. P. D. Ashlock (U. of Kansas) and is considered to be coauthored, although J. A. Slater is responsible for the final wording.

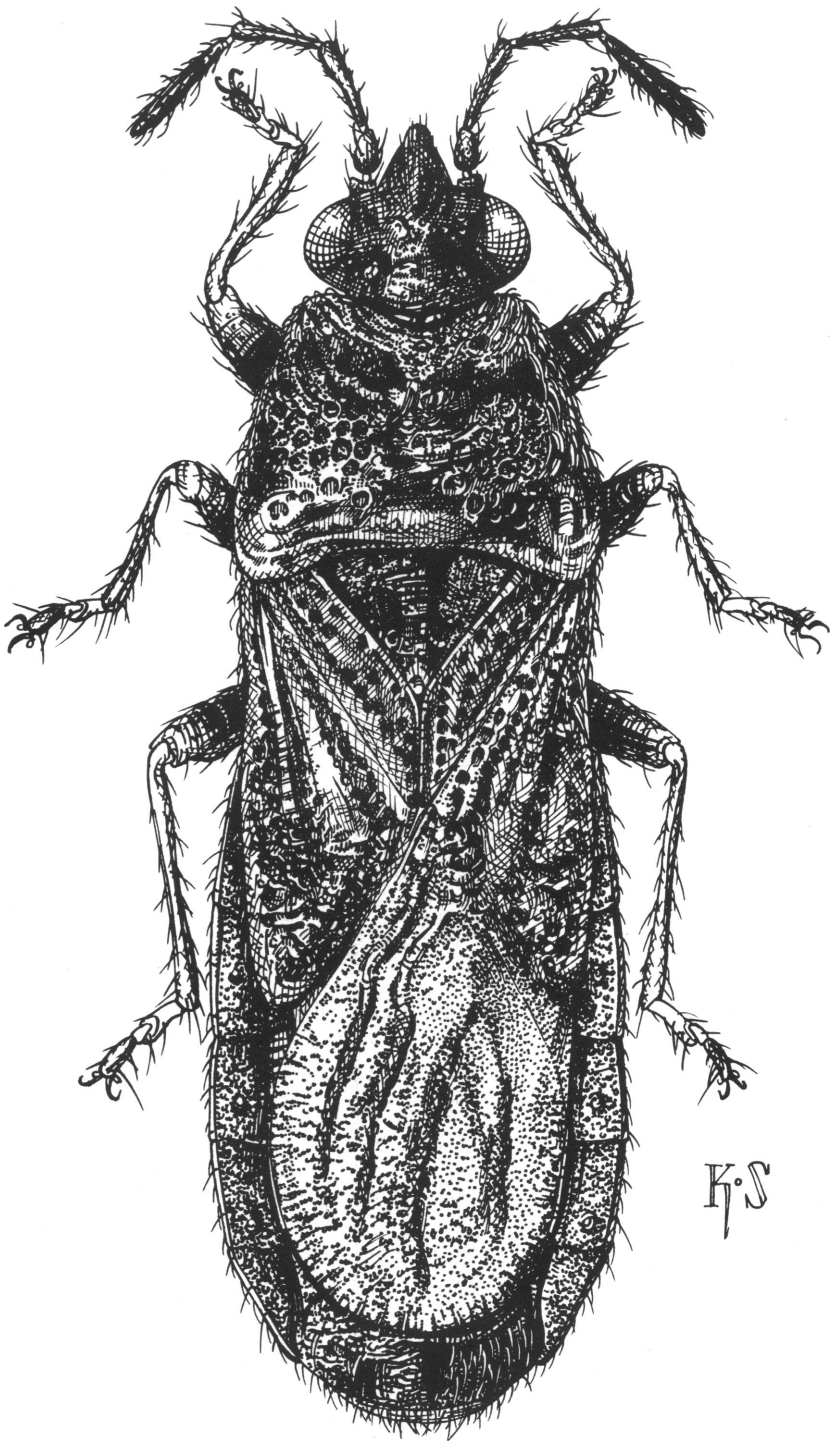


FIG. 14. *Capodemus navis* (Slater). Example of a generalized blissine adult.

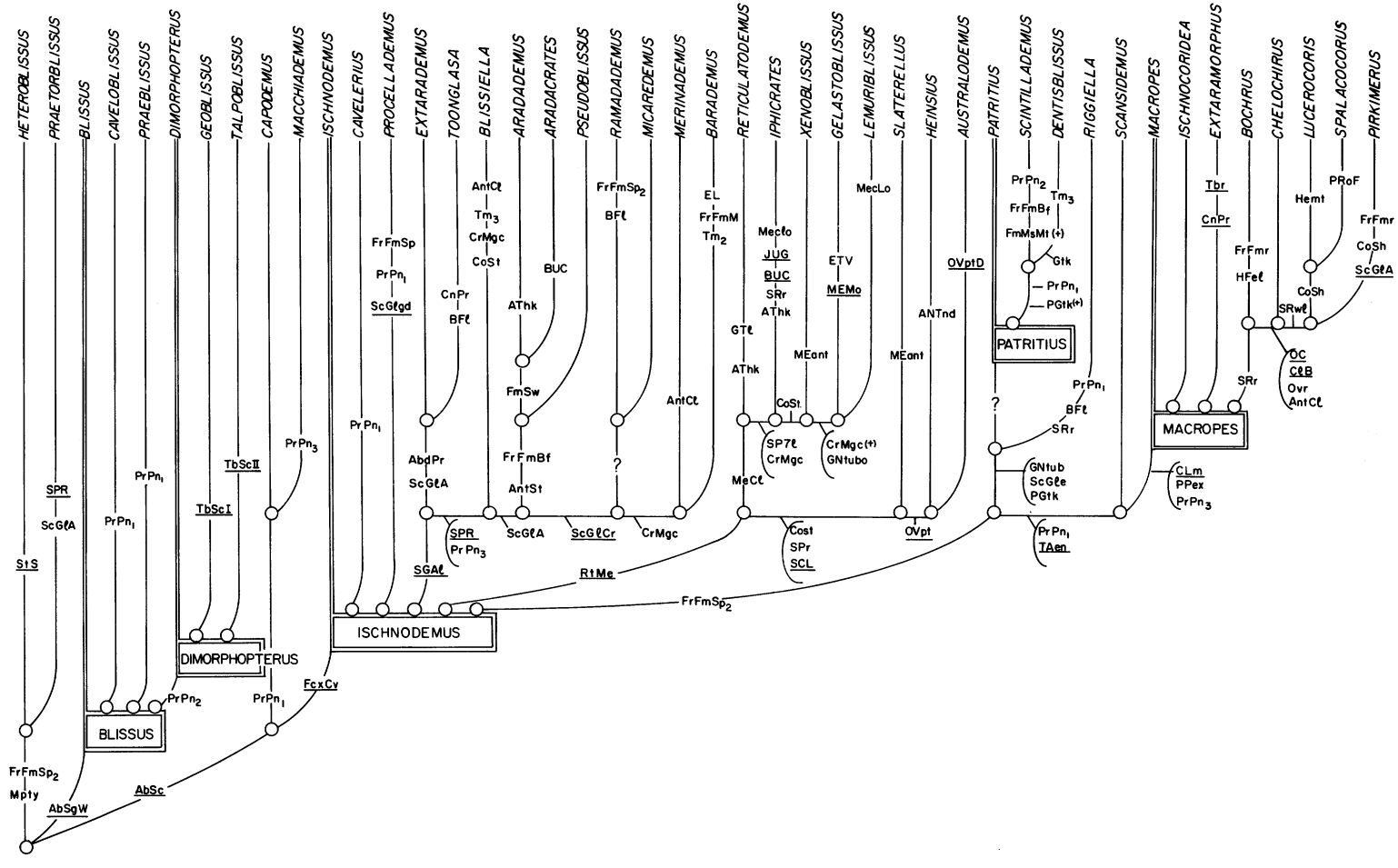


FIG. 15. Generic cladogram of the Blissinae. Genera in boxes are considered to represent paraphyletic genera and such generic names are carried to the top of the cladogram by a double line. Synapomorphic characters that are underlined are considered to be particularly "strong" characters in the construction of the cladogram. The distribution of the genera may be readily obtained from the accompanyiing check list of species.

In the cladogram (fig. 15) there is no appreciable deviation from the partial cladogram presented by Slater and Ashlock (1976) and that portrayed on the left side of the present cladogram.

In the cladistic analysis of species of *Ischnodemus* primary reliance has been placed on the condition of the phallus and especially the nature of the sperm reservoir. This is a complex structure and thus the various apomorphic conditions present are less likely to develop twice, or more than twice, than are most external features such as pruinosity patterns, fore femoral spines, "stalked" eyes, hyaline membranes, color patterns, grooved sterna, labial and ovipositor lengths, and so forth. It seems probable that certain characters found in the nymphs as well as the host plant relationships will ultimately prove to be of great phylogenetic importance, and they have been introduced into the *Ischnodemus* analysis as well as the generic analysis in several places. Unfortunately, this type of information is lacking for many species and genera.

At the base of the generic cladogram there is a trichotomy. As mentioned by Slater and Ashlock (1976) this is probably due to the unavailability of nymphs of the genera *Heteroblissus* and *Praetorblissus*. It seems likely that *Heteroblissus*, although having several highly apomorphic characters, will prove to belong in a clade with *Blissus* and *Dimorphopterus*, whereas *Praetorblissus* may be one of the most plesiomorphic elements of a "line" now characterized by *AbSc* leading to the rest of the Blissinae. In any event, the sclerotization of the posterior segments of the abdomen of the nymphs (AbSc) is a very strong character which unites all the other genera of the Blissinae except those associated with the *Blissus* and *Dimorphopterus* clades which have been discussed by Slater and Ashlock (1976). This synapomorphy applies at a high level of generality within the group as it indicates the relationship of two genera *(Capodemus* and *Macchiademus)* that are essentially endemic in the southwest Cape Region of Africa with the *Ischnodemus* complex from ancestral components of which most of the genera of Blissinae appear to have been derived. *Capodemus* and *Macchiademus*, while agreeing with *Ischnodemus* and its descendant groups in having these uniquely derived sclerotized plates at the posterior end of the nymphal abdomen, retain the plesiomorphic condition of narrowly open fore coxal cavities. In such otherwise highly derived genera as *Lucerocoris* and *Heinsius* this posterior nymphal sclerotization is also absent. However, these genera are so closely related to others in which it is well developed that there seems little doubt that this is a case of secondary loss.

One of the most important features on the cladogram is the acceptance of the closed fore coxal cavities (FcxCv) as being a uniquely derived condition. If this is true, it follows that ancestors similar to modern species of *Ischnodemus* represent the sister groups of most of the more apomorphous genera. It is possible that a few species that are placed in *Ischnodemus* because of the closed coxal cavities (particularly such species as *Ischnodemus parathoracicus,* and *thoracicus*) may have a sister group relationship with some species of *Dimorphopterus*. The sperm reservoirs of *parathoracicus* and such a species of *Dimorphopterus* as *zuluensis* are very similar. This appears to indicate symplesiomorphy and to not necessarily be indicative of cladistic relationship. The similarity, however, is very striking. To accept the closing of the fore coxal cavities independently two or more times would necessitate the acceptance of the independent development of the posterior abdominal sclerotization two or more times.

The species included in *Ischnodemus* appear to constitute a paraphyletic group. There seem to have been two major "trends" in operation within the complex. One trend is the development of large, flattened platelike wings on the sperm reservoir and a concomitant increase in the size of the bulb of the reservoir itself. A second trend (which probably involves several different evolutionary lines) is one in which reduction takes place. This reduction frequently results in the retention of only a minute bulb, with or without tiny wings present, but in other cases results in the development of a thickened, sclerotized thumblike projection above the ejaculatory tube without wings developed at all.

From various *Ischnodemus* ancestors the cladogram shows five separate lines diverging (a possible sixth line leading to *Patritiodemus* is not shown). Two of these lines "lead," however, only to a single genus each *(Cavelerius* and *Procellademus)*. The cladogram of *Ischnodemus* (fig. 42) indicates probable areas within the genus where the sister groups of these five various lines lie. There is a great deal of difference in the strength of the synapomorphies holding these together.

The genus *Cavelerius* could be synonymized with *Ischnodemus*. The species differ from species of *Ischnodemus* primarily in the unusual nature of the pruinosity of the pronotum where the anterior half is completely shining and the posterior half completely pruinose (PrPn1). This has occurred independently in two other cases in the Blissinae both derived from *Blissus*-like ancestors *(Caveloblissus* and *Praeblissus)*. In view of the fact that within *Ischnodemus* we have retained species that are completely pruinose and completely shining one certainly can question the desirability of retaining this as a separate genus. The most apomorphic species have the posterior angles of the pronotum extremely strongly produced backward in a great arc, whereas the more plesiomorphic species do not, and it is this high degree of apomorphy which makes it questionable to synonymize *Cavelerius*. Almost exactly the same phenomenon is found in the South American genus *Patritiodemus*. This latter genus has a completely pruinose head and pronotum (plesiomorphic) and rather stalked eyes (apomorphic). Its most apomorphic members also have very enlarged fore femora with great bifid spines present ventrally. The most generalized members are very similar to some species of *Ischnodemus*. Thus, both *Cavelerius* and *Patritiodemus* could conceivably be included in *Ischnodemus*.

As transformation series occur within "groups" of *Ischnodemus* the above cases are really of a different order of magnitude. Since anagenesis is a consideration in the classification used in this paper *Cavelerius* and *Patritiodemus* are treated as distinct genera.

A very different situation exists for the three other phyletic lines that we believe have developed from "*Ischnodemus*-like" ancestors. The first of these includes a group of genera held together by a synapomorphic character in the nymphal abdomen. This is the possession of a very large elliptical, ovoid sclerotized plate (SGAl) which extends forward from the anterior margin of each dorsal abdominal scent gland. Other species of the Blissinae have small sclerotized plates around the scent glands (as do almost all the Lygaeidae) but in this case the sclerite is very large and is similar in all taxa that possess it. This is a very strong synapomorphy and is most interesting in that it includes two South American genera and a series of genera from Madagascar, three of which also occur on the African continent. As discussed in the zoogeographic section the South American-Madagascar-African relationship probably indicates relatively early divergence of this stock (West Gondwanaland). Within this clade the Western Hemisphere taxa are the most plesiomorphic. They have a less reduced sperm reservoir and retain thoracic pruinosity which is lost (PrPn3) in Madagascar-African genera. Nevertheless, it is important to point out that this Western Hemisphere clade, which consists of *Extarademus* and *Toonglasa*, is in several ways a very specialized one. *Extarademus* itself shows uniquely derived conditions of spines and secondary sexual projections upon the abdomen which are unusual in the Blissinae. *Toonglasa*, which is known only from the holotype, is essentially a large flattened *Extarademus* with long projections of the abdominal connexivum. The flattened body of *Toonglasa* gives it a superficial resemblance to such genera as *Bochrus, Chelochirus, Scansidemus*, etc., but the cladistically significant relationships are with *Extarademus*. *Ramadademus* is a large flattened blissine. Fortunately, the nymph is known and the abdominal sclerotization is of the type which characterizes the *Extarademus* clade. *Ramadademus* is very similar in habitus to such genera as *Scansidemus* (Oriental) and the two genera have similar (and highly derived) scent gland auricles. Until nymphs of *Scansidemus* become available there is no way to determine whether *Scansidemus* belongs in a clade with *Ramadademus* or with *Bochrus* and its relatives.

The remaining members of the above clade, which is "held together" by the anteriorly enlarged nymphal scent glands, includes chiefly a Madagascan complex of eight genera, one of which is undescribed. All of these genera have an extremely reduced sperm reservoir, with only a small median, usually curved, hooklike central sclerite present. It is doubtful that the sperm reservoir is functional. Of these seven Madagascan genera (in addition to *Ramadademus*) three are known to occur in Africa and the other four are restricted to Madagascar. The most plesiomorphic of these appears to be *Blissiella*, which is also the most widespread on the African continent. This is the only genus of the clade which has a plesiomorphic rounded earlike metathoracic scent gland auricle, all the others having it modified either by elongation or by forming a crescent shape (fig. 9Q). *Blissiella* also has a short, thickened corium with a concave apical margin. In many ways species of *Blissiella* are reminiscent of species of *Dimorphopterus* and they certainly appear to remain a number of plesiomorphic conditions.

Of the remaining genera *Aradademus*, *Aradacrates*, and *Pseudoblissus* have a synapomorphous stalked fourth antennal segment. This feature is quite distinctive for these three autochthonous Madagascan taxa. Each of the three is a very highly specialized genus whose species have a number of autapomorphous features. *Aradacrates* is particularly striking because of the extremely enlarged bucculae which project forward as plates anterior to the end of the tylus (figs. 6E-H, 40), similar to the condition found in some species of *Iphicrates*. However, these two genera, despite the presence of these large bucculae, are not closely related and in *Aradacrates* enlargement of the bucculae is certainly an independent evolutionary event. The remaining genera of the clade *Micaredemus*, *Merinademus*, and *Barademus* form a very closely related group which is held together by an uniquely shaped metathoracic scent gland auricle which in all the species curves forward in a lunate or crescent-shaped arc (fig. 9Q, 10F).

The other two large complexes of genera that are shown as arising from an *Ischnodemus* ancestry are held together by synapomorphies that are less compelling than those discussed above. The first of these constitutes a clade of genera placed together on the basis of having a reticulate membrane (RtMe). There are difficulties with this interpretation in that two of the genera included actually do not have a reticulate membrane and in those genera that do, the type of membrane surface is not uniform. For example, *Reticulatodemus*, *Xenoblissus*, and *Gelastoblissus* have a series of minute hexagonal cells present over the entire surface of the membrane. In Australian genera such as *Heinsius* and *Slaterellus* there is a "dimpling" or corrugating of the surface which may or may not be homologous to the true reticulations. The similarity of many species of *Iphicrates* to species of *Reticulatodemus* on the one hand and to *Xenoblissus* on the other seems to justify the inclusion of a genus such as *Iphicrates* (which does not have a reticulate membrane) in this group and to support the belief that the reticulate membrane is secondarily lost. *Iphicrates* is an Australian and Oriental genus and *Reticulatodemus* and *Xenoblissus* are both Neotropical. It seems highly unlikely that such characters as the hooked antenniferous tubercles and the unusual scent gland auricle shape (which are apomorphic conditions and common to the three genera) can all be the result of convergence.

The final clade derived from *Ischnodemus* is a group of very large, usually flattened genera with multispinose femora which is held together primarily by the presence of these numerous spines (FrFmSp2). Since multispinose fore femora appear to have arisen independently in the case of *Ramadademus* there is, of course, no reason why it could not have occurred independently again. Most of the included genera are, however, related to most other genera on the basis of other characters (see fig. 15) even though I have not been able to discover a strong apomorphic character common to all genera. Within this supposed clade the South American genus *Patritius* is certainly the most plesiomorphic. Not only do these species show a more *Ischnodemus*-like, elongate, relatively slender body form but the pruinosity on the dorsal surface is much more generalized than in the other genera included here. *Patritius*

is a particularly important genus and one shown on the cladogram as possibly being paraphyletic.

The rationale for treating *Patritius* as possibly paraphyletic is due to lack of information. Several species of *Patritius* with relatively derived pronotal pruinosity patterns are known only from females. These species have short genal projections rather similar to those found in females of such New Guinea genera as *Dentisblissus* and *Scintillademus* where the male gena, particularly in *Dentisblissus*, project forward as hugh "tusks." The pruinosity patterns and scent gland auricles are also similar in these species of *Patritius* to those of the New Guinea genera.

The relationships of the various species of *Macropes* have been treated by Slater and Wilcox (1973) and that paper should be consulted for details. In the cladogram *Macropes* is treated as a paraphyletic group. *Ischnocoridea* and *Extaramorphus* appear to have sister group relationships with different sections of *Macropes*. *Ischnocoridea* is very closely related morphologically to some species of *Macropes* and it is questionable whether it should have generic status. *Extaramorphus*, while obviously derived from a *Macropes*-like ancestor, has a number of striking autapomorphies and certainly on phenetic grounds deserves generic status. The remaining genera that are derived from an ancestral group of *Macropes*-like species consist of five genera of large generally flattened or cylindrical Oriental insects: *Bochrus, Chelochirus, Lucerocoris, Spalacocoris,* and *Pirkimerus*. All of these genera have a greatly reduced sperm reservoir (SRr) and all but *Bochrus*, which is somewhat isolated, form a very distinctive clade by themselves with synapomorphies evident in the hugh ocelli (OC), strongly clavate antennae (AntCl), a greatly modified, reduced and blocklike clasper (ClB), and a greatly reduced ovipositor (Ovr).

The position of the Oriental genus *Scansidemus* and the Neotropical genus *Riggiella*, which are held together within the clade by the multispinose fore femora, is more difficult to understand. It is possible that *Scansidemus* is the sister group of *Ramadademus*, but if so this can only be verified by a study of the nymphs. These two genera do have very similar metathoracic scent gland auricles. The phylogenetic position of *Riggiella* is perhaps the greatest enigma in the Blissinae. There is nothing in the Neotropics that even remotely resembles this genus with its extremely flattened body and huge multispinose legs. The habitus is reminiscent of some of the large Oriental genera. However, the scent gland of *Riggiella* is quite distinctive and it does not have the enlarged first tarsal segment which is characteristic of the Oriental clade. Again, study of nymphs would be extremely desirable here. It is possible that *Riggiella* represents an extremely early divergence of a West Gondwanaland stock which is now absent from Africa. It may be the sister group of the Oriental clade.

One of the most interesting features that emerges from the generic cladogram—and which was arrived at completely independently of the zoogeographic analysis—is that in each of the three major phyletic lines leading from *Ischnodemus* the most plesiomorphic genera in each clade are Neotropical. Note that *Praetorblissus* and *Heteroblissus* (fig. 15) that are treated as possibly the most plesiomorphic of all the Blissinae are also Neotropical.

CODE TO CLADOGRAM ABBREVIATIONS

A

AbdPr .....males with spines and projections on abdominal sternum
AbSc .....abdominal sclerites on nymphs
AbSgW .....basal abdominal segments white
AntCl .....clavate antenna
ANTnd .....antennae "nodular"
AntSt .....“stalked" fourth antennal segment
AThk .....antenniferous tubercle hooked

B

BF1 ..... .broad flattened body
BUC ..... .male bucculae greatly produced

C

C1B ..... .clasper reduced and blocklike
CLm ..... .clasper modified, at least outer knob moved distally and inner knob reduced
CnPr ..... .seventh connexivun with projections
CoSh ..... .lateral portion of corium shining
CoSt, Cost ..... .corium shortened and thickened
CrMgc ..... .apical corial margin secondarily concave (add + for deeply concave)
CrMgs ..... .apical corial margin straight

E

EL ..... .extreme body elongation
ETV ..... .transverse eyes

F

FcxCv ..... .closed fore coxal cavities
FmSw ..... .all femora short, stout and swollen
FrFmBf ..... .fore femoral spine bifid
FrFmM ..... .fore femora mutic
FrFmr ..... .fore femora slender and reduced
FrFmSp1 ..... .fore femora with one (or rarely two) spines
FrFmSp2 ..... .fore femora multispinose
FmMsMt (-) ..... .middle and hind femora mutic

G

GNtub ..... .genital tubercle prominent
GNtubo ..... .secondary loss of genital tubercle
GT ..... .genital tubercle
Gtk ..... .males with genal tusks enlarged
GTl ..... .genital tubercle secondary loss

H

Hemt ..... .two-textured hemelytral membrane
HFel ..... .hind femora of males greatly enlarged

J

JUG ..... .male juga strongly projecting

M

MEant ..... .membrane veins anastomosing
MeCl ..... .true "cellular" membrane
Meclo, MecLo ..... .secondary loss of true cells
MEMo ..... .membranes only partially overlapping
Mpty ..... .extreme microptery

O

OC ..... .ocelli enlarged
OVpt ..... .ovipositor paratergites elongated

OVptD .....ovipositor paratergites secondarily divided
OVr .....ovipositor reduced and platelike

P

pGtk .....proclivity for genal tusks
PPex .....propleuron excavated
PRoF .....median longitudinal pronotal furrow
PrPn1 .....reduced pronotal pruinosity (dorsally)
PrPn2 .....no pronotal pruinosity (dorsally)
PrPn3 .....no pleural pruinosity

R

RtMe .....reticulated membrane on fore wing

S

SCL .....body with flattened scalelike hairs
ScGlA .....metathoracic scent gland auricle modified
ScGlb .....metathoracic scent gland auricle curved backward
ScGlCr .....crescent shaped metathoracic scent gland auricle
ScGle .....metathoracic scent gland auricle elongated
ScGlgd .....metathoracic scent gland auricle widened and enlarged
SGAl .....enlarged SGA sclerite in nymphs
SPR, SPr .....modified sperm reservoir
SP7l .....seventh abdominal spiracle lateral
SRr .....sperm reservoir reduced
SRwl .....sperm reservoir wings absent
StS .....stridulatory structure present

T

TAen .....first tarsal segment enlarged
Tbr .....tibiae much shortened
TbScI .....tibial "scoop" type I
TbScII .....tibial "scoop" type II
Tm2 .....Tm2 present
Tm3 .....Tm3 present (see *Blissiella*)

ZOOGEOGRAPHY

There is no meaningful fossil history of the Blissinae and therefore zoogeographic analysis beyond the descriptive must be based upon inference and interpretation of modern distributions.

I have been considerably influenced by the operational logic of the vicariance "model" insofar as it considers that the burden of proof in disjunct distribution situations is on those who believe that such distributions are the results of dispersal. (Platnick and Nelson, 1978). On the other hand, I believe that insects including the Blissinae do disperse. Nevertheless, the complete lack of the Blissinae on oceanic islands[1] of the Pacific and Indian oceans and the paucity of the West Indian fauna cannot help but persuade one that the major features of the distribution are not the result of recent dispersal.

The major features of the distribution of the Blissinae are:

[1]*Dimorphopterus pilosus* (Barber) was described from Yap Island but this probably is a parthenogenetic species and thus stands somewhat apart from the "normal" dispersal potential of the subfamily. *Macropes obnubilus* (Distant) occurs on the Bonins and on Guam but is almost certainly introduced by man.

(1) Extremely close relationship between the *Ischnodemus* faunas of Africa and South America and paucity of this taxon in the Oriental and Australian regions.

(2) Presence of a considerable number of highly apomorphic genera (not closely related between regions) endemic to either the Oriental or Neotropical region.

(3) Closer relationship of the (scanty) Palearctic and Nearctic faunas to the Old and New World Tropics respectively rather than to one another, i.e., no Holarctic element.

(4) Apparent tropical relationships (not *Ischnodemus*) between the Oriental and Neotropical faunas.

(5) Impoverishment of the Australian fauna, with a few isolated endemic genera, but with the greater part of the fauna congeneric with Oriental genera and restricted to the north and east.

(6) Occurrence of several "sister" groups between South America and Africa.

(7) Radiation of several "stocks" on Madagascar, almost all of which appear to be most closely related to forms from Africa.

(8) Absence of the subfamily from New Zealand.

Before attempting a general interpretation of the present distribution of the Blissinae, I outline the situation in each major faunal region so that general conclusions can be placed in some perspective relative to more specific ones.

PALEARCTIC FAUNA

The blissine fauna is depauperate, with 18 species present in *Ischnodemus, Dimorphopterus,* and *Geoblissus*. All three of these genera occur in both the Ethiopian and Oriental regions and are more extensively developed there. In the genus *Ischnodemus* the majority of species belong to the *sabuleti*-group, which is essentially a Palearctic complex and is somewhat isolated from the extensive Ethiopian fauna. There is no evidence of a direct faunal relationship between the Palearctic and Nearctic regions. Certainly blissine stocks did not disperse through Beringia in the late Tertiary.

NEARCTIC FAUNA

Like that of the Palearctic, the blissine fauna is depauperate (three genera, 29 species). There has been a rather extensive radiation of chinch bugs *(Blissus)*, especially in western North America and a more limited radiation of the *Ischnodemus falicus*-group in the southeastern states.

There seems little doubt but that the Nearctic fauna is derived from the Neotropical. *Blissus* has a number of Neotropical species and there are closely related derivative genera *(Praeblissus, Caveloblissus)* in the Neotropics.

Two "groups" of *Ischnodemus* are present in North America; one, consisting of *robustus, praecultus, rufipes,*[1] and *fulvipes*, appears to represent two or three independent introductions (dispersals) of Neotropical lines into the southeastern states in relatively recent time. *Ischnodemus praecultus* and *fulvipes* are widespread Neotropical species and the others are very closely related to Neotropical taxa.

The second, the *I. falicus* group, is more difficult to understand. It includes all the other species of *Ischnodemus* in North America. The species are most numerous in the southeast (especially Florida) but there has been speciation in the Great Plains and in the midwestern prairies. The *falicus* group species are strongly apomorphic, not at all similar to any Palearctic species (and absent from the far western states), but are not obviously closely related to any existing Neotropical species. Most of these *falicus* group species have a micropterous morph in contrast to the first group noted above. I (Slater, 1977) have suggested that when the living habits of two groups of species are similar, wing reduction in species of one group can be interpreted as indicating that, in the area under consideration, such a group is the older.

Thus, it seems probable that the *falicus* group has been in North America for a relatively long time, and I suggest that both *Blissus* and *I. falicus*-group ancestral stocks entered the United States no later than the Miocene, and probably coincident with the rise and spread of the Madro-Tertiary flora. The only other blissine known to occur north of the Mexican border is *Extarademus macer* (Van Duzee).

[1]This species was synonymized with *praecultus* by Slater and Wilcox, 1969. Subsequent collecting in Florida has raised the question whether or not they may be distinct species and until this is resolved I treat them as distinct.

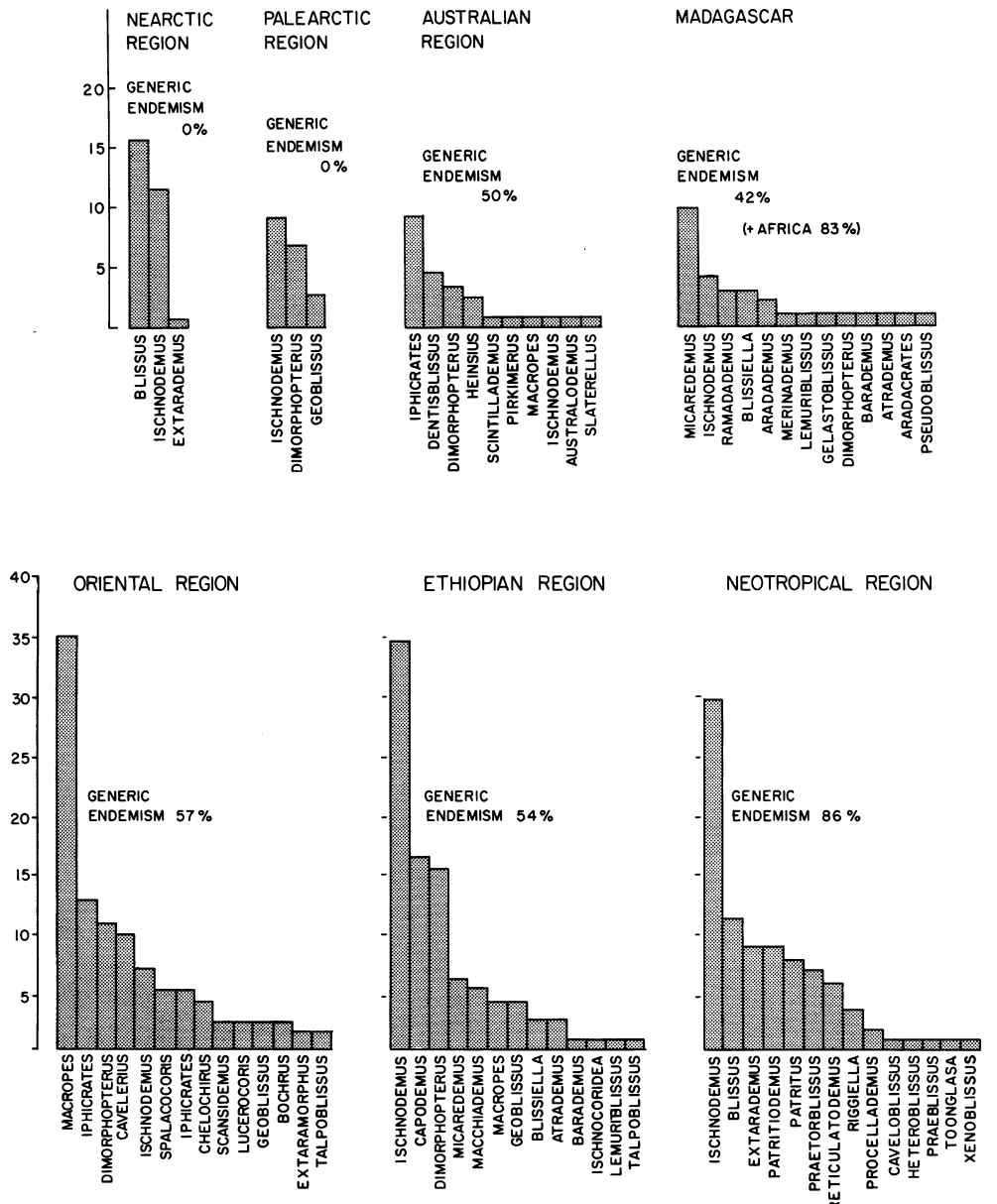


FIG. 16. Number of genera per zoogeographic region.

This is a widespread Neotropical species and a member of an otherwise Neotropical genus. *E. macer* is known to occur north to extreme western Iowa. There it is associated with xeric habitats that contain remnant disjunct colonies of dry adapted western plants. The Madro-Tertiary hypothesis is consistent with a secondary speciation center in Florida. The extension of a "dry adapted" fauna and flora into Florida is well documented and evidenced today by many organisms such as burrowing owls and gopher tortoises.

AUSTRALIAN FAUNA

The Australian blissine fauna is also relatively depauperate (only 24 species) but contains 10 genera half of which are endemic. Despite the similarity in number of species present, the situation in Australia is quite unlike that in the Northern Hemisphere where there is no generic endemicity. This is to be expected in an isolated continent like Australia, but it is puzzling why there are so few species present. It may in part be due to lack of collecting, but is probably primarily due to loss of fauna under conditions of increasing Tertiary aridity.

Zoogeographic analysis is further complicated by the difficulty of determining for the Blissinae just what the limits of the Australian Region should be. If one restricts it to Australia proper one obscures the close relationship between the fauna of northern and eastern Queensland with that of New Guinea. On the other hand, the inclusion of New Guinea and its associated islands (as is done conventionally for mammals) does introduce what is undoubtedly an Oriental element. On the whole, I believe the more inclusive concept to be preferable.

Three genera are restricted to Australia proper *(Australodemus, Heinsius,* and *Slaterellus).*[1] All three of these are morphologically isolated, and show a number of autapomorphic features but together probably do form a clade with synapomorphic features such as scalelike hairs, short thick antennae, and structure of the sperm reservoir. I believe that these taxa are remnants of a very old element in the Australian blissine fauna, one that has probably been decimated by increased aridity during the Tertiary. That aridity may have decimated a once more extensive fauna is indicated by the presence of *Ischnodemus sordidus* Slater in extreme southwestern Australia. Although *Ischnodemus* is a relatively plesiomorphic genus and is represented in all major zoogeographic regions, this is the only Australian representative. *Ischnodemus sordidus* is also quite plesiomorphic within *Ischnodemus* and is the sister species of *I. noctulus* Distant which occurs in India, Ceylon, and southern Africa. I do not believe such a disjunct distribution can realistically be attributed to dispersal but rather that it is a vicariance pattern representing an old African-Oriental-Australian "track" in Croization terminology. If this is true, *I. sordidus* has been able to survive in the winter rainfall area of the southwest coast of Australia, but has been eliminated by aridity over most of a formerly more extensive range. This certainly seems to parallel the situation for many plants and insects that are now restricted to the southwest corner of Australia.

The remainder of the Australian blissine fauna has had a completely different history. All of these genera either occur in the Oriental Region as well or are closely related to Oriental taxa. They all occur on New Guinea and, where they also occur in Australia, they are restricted for the most part to the tropical and subtropical north and east. *Macropes* has radiated in the Oriental Region and one widespread species reaches eastern Queensland. At least half of the species of *Iphicrates* occur on New Guinea and associated islands. In Australia one species extends down the east coast and reaches Tasmania. There is also a species on New Caledonia. The absence of blissines from New Zealand suggests that the presence of a species on New Caledonia may be a dispersal rather than a vicariant event. *Pirkimerus* is an Oriental genus with one bizarre species found on New Guinea. *Dimorphopterus* is widespread in the Orient. *Dentisblissus* and *Scintillademus* are closely related, strongly apomorphic taxa restricted to New Guinea and northern Queensland.

ETHIOPIAN FAUNA

The fauna is large and diverse (13 genera, 92 species). There is a striking endemic ele-

[1] *Slaterellus* Drake and Davis was described as representing a distinct subfamily, the Slaterellinae, and has never formally been placed in the Blissinae although several authors have commented on the close relationships. It is unquestionably a blissine and related by several features to *Heinsius* New Synonymy.

ment (*Capodemus, Macchiademus*, and several species in other genera) in the Southwest Cape. The South African fauna has been dealt with extensively by Slater and Wilcox (1973) and the host plant relationships by Slater (1976) and are not elaborated here other than to point out that these Southwest Cape endemics are very ancient plesiomorphic taxa.

Much of the African fauna is a savanna element made up largely of species of *Ischnodemus* and *Dimorphopterus*. As with many other African savanna insects the range of any given species tends to be extensive, often extending from the dry inland areas of the West African savanna in a great arc through east Africa into the low veld of the Transvaal or coastal Natal. There is evidence of speciation in the isolated East African mountains but it is less striking than in many other animal groups (including many of the Lygaeidae).

The distribution of such genera as *Lemuriblissus, Barademus, Micaredemus*, and *Atrademus* may reflect a more mesic period in Africa and these taxa may well be at a competitive disadvantage relative to species of *Ischnodemus* and *Dimorphopterus*. All four of the above genera also occur on Madagascar where *Micaredemus* has speciated considerably. Unfortunately, little is known about the biology of these insects.

There is, as in many other taxa, an Oriental relationship in African blissines which is sometimes at the specific level conspecific *(Ischnodemus noctulus, I. thoracicus, Geoblissus hirtulus)*, and sometimes consists of sister taxa *(Talpoblissus, Macropes, Dimorphopterus)*. This would suggest Late Tertiary faunal interchange, but is more likely an older vicariant event. It should be noted that the dominant *Ischnodemus* groups of Africa are totally absent from the Oriental Region and the numerous highly apomorphic Oriental blissine taxa are absent from Africa. Indeed, one of the striking features of the Ethiopian Blissinae lies in the close resemblance of the Ethiopian and Neotropical *Ischnodemus* faunas and the absence of Oriental components.

Despite the large number of species and genera in the Ethiopian Region, the species tend to be without the bizarre sizes, shapes, and ornamentations that occur so frequently in Oriental taxa.

MADAGASCAN FAUNA

The fauna of this great island probably remains poorly known. Most of the 12 genera and 29 species I have described in the past few years. No Hemipterist, much less a blissine or lygaeid specialist, has collected intensively on the island. Nevertheless, a general pattern is evident. I (Slater 1967) previously thought that the greater part of the Madagascan fauna could have resulted from the introduction of only one or two African stocks. However, subsequent African collecting has shown that *Barademus* and *Lemuriblissus*, previously thought to be Madagascan endemics, are present in Africa.

One is tempted to see a vicariance pattern for the Madagascan-African relationships, but unless limited dispersal is admitted this would apparently require the Blissinae to be present in the Triassic and thus such an idea may be untenable.

Most, if not all, of the Madagascan blissine fauna is related to that of Africa, not the Orient. There are Madagascar species that are very closely related to a group of African species but with only a single species on Madagascar. There are other taxa that are congeneric with African species but in which considerable speciation has occurred on Madagascar, and finally there are genera with such strongly autapomorphic characteristics that their affinities are at present difficult or impossible to clearly understand.

Ramadademus, which is an endemic Madagascar genus of large, strongly flattened bugs with multispinose femora, is similar in shape to several Oriental genera and to the Neotropical *Riggiella*. However, nymphs of this genus have elliptically enlarged sclerites anterior to the scent glands which I consider a synapomorphic character that relates *Ramadademus* to other Madagascar genera. Thus, as noted above, the similarity of body configuration is convergent.

The Madagascan blissine fauna shows no

more Neotropical relationships than does the African.

ORIENTAL FAUNA

The Blissinae of this huge and varied region are remarkable for two reasons: (1) The presence of a series of genera of large size, many species of which have striking and bizarre structural modifications, including various expressions of sexual dimorphism (otherwise minimal in the subfamily), modification of head spines, buccular enlargements, reduction of genitalia, incrassate and spinose hind legs, flattened bodies. (2) The scarcity of species of *Ischnodemus* and the complete absence of the dominant *Ischnodemus* groups of Africa and South America.

The genus *Macropes* has about the same number of described species in the Oriental Region as *Ischnodemus* does in each of the Ethiopian and Neotropical regions, but too little is known of the biology of species of *Macropes* to indicate to what extent ecological replacement may exist.

It is evident that while relatively dry-adapted plesiomorphic taxa are present *(Dimorphopterus)*, the chief feature of the Blissinae of the Oriental Region is the large number of varied and highly apomorphic taxa. There probably are more, as collecting in recent decades has been sporadic, and for a number of genera that have been known for a long time, only a handful of specimens exist in the museums of the world. This suggest unusually specialized habitats and probably is indicative of species adapted to relatively mesic conditions on at least the "fringes" of the varies montane and rain forest flora.

What little is known of the blissine fauna of the Indonesian islands on the Sunda shelf indicates a close relationship to the Asiatic mainland. The Philippines do have an endemic genus *(Lucerocoris)* and many endemic species but the known fauna is for the most part harmonic.

NEOTROPICAL FAUNA

As is true of many other animal groups the Neotropical blissine fauna is characterized by richness and by a very high degree of generic endemism (86% of the Neotropical genera are endemic as compared with 57% for the Oriental Region and 23% for the Ethiopian—54% if Madagascar is included).

Of the Neotropical subregions, the South American fauna is by far the richest. Indeed, Central America and the West Indies appear to have blissine species that are largely of South American relationship. This is strikingly true of the West Indies from which only seven species have been reported. Of these, four are species of *Blissus* all so closely related that their status needs careful investigation (all are in disturbed habitats). Of 32 Neotropical species of *Ischnodemus* only one is known from the West Indies. This is *I. fulvipes*, which is widespread in South and Central America and also occurs in Florida. There is an endemic species of *Extarademus (discalis)* and one of *Patritius (cubensis)* on Cuba. The sister groups are South and Central American. These last two are, in my opinion, the only true endemic blissine elements in the West Indies. It is probably significant that these two species occur on Cuba, as this was probably the only island that remained above sea level during the Miocene. The presence of these two species may represent vicariant events; the other species I believe to be the result of recent dispersal.

The Central American fauna is somewhat more extensive than the West Indian (seven genera, 13 species). However, with the possible exception of *Extarademus* species, the stocks are derived from South America. For example, all three of the Central American *Ischnodemus* species also occur in South America. Central America has only a single species of *Reticulatodemus* and of *Praetorblissus*, the other species all being South American. *Extarademus* has a number of Central American and Mexican species (but is also South American) and its sister group is African.

Although there is evidence of dispersal in *Blissus* and *Ischnodemus*, in general the West Indian and Central American faunas appear to present more of a vicariance pattern.

In South America the most striking aspect of the fauna is the very close relationship of the *Ischnodemus* species to those of Africa. Both regions contain a series of species that are so similar that it is difficult to believe that they

come from two continents physically so far removed from one another. Presumably some of this resemblance is due to convergence toward elongate bodies and tan coloration in the East and South African savannas on the one hand and the Argentine and adjacent pampas on the other. It is tempting to consider this a direct effect of continental drift. I suggest, however, that while drift is involved, that the relationship is more remote and subtle than that of a series of sister groups.

When one examines the South American blissine fauna as a whole one is struck by the presence of several New World-Old World "sister" groups at the generic level, with the Neotropical component retaining in each pair the more plesiomorphic features. Examples are *Blissus-Dimorphopterus*, *Extarademus-Micaredemus*, *Riggiella-Scansidemus*, and possibly *Patritius-Dentisblissus* and *Reticulatodemus-Iphicrates*. However, this is not the situation in *Ischnodemus*. In *Ischnodemus* the species with important plesiomorphic characters are African. The Neotropical fauna is relatively apomorphic and to judge by the appearance of the sperm reservoir probably is a monophyletic unit in itself. Despite the presence of many African species with important plesiomorphic characters the most widespread and abundant savanna species of African *Ischnodemus* are in contrast even more apomorphic than the Neotropical. I conclude that *Ischnodemus*-like stocks of a relatively apomorphic nature were present when Africa and South America were still close enough together for considerable faunal exchange to occur, and that the diverse species in South America may be members of a single phyletic line the evolution of which has taken place independent of the subsequent evolution of the genus in Africa.

There is also an apparent Oriental-Neotropical relationship which is more difficult to understand but which also is found in a number of plant groups.

We know too little about the distribution of the Blissinae within South America itself to say more than that there appear to be a number of old and endemic taxa in Peru, and that the Chilean fauna does not appear to be as distinctive and isolated as one might have anticipated.

In general then the hypothesis that seems to best fit the distributional and cladistic relationships of the Blissinae is the following:

1) That the Blissinae originated as a tropical group.

2) That the taxon originated in Gondwanaland.

3) That considerable diversification took place before the fragmentation of Gondwanaland, certainly before the breakup of West Gondwanaland.

4) That the present fauna of the Northern Hemisphere developed from nearby tropical regions.

Evidence to support this hypothesis has been suggested in a few places above but must be stated more fully here. That the Blissinae originated as a tropical group seems evident. Not only are they much more diverse in the tropics but all of the major phyletic lines are represented. Although host plant information remains scattered, there is a concentration upon tropical groups shown especially in the grasses where bambusoid, panicoid, and eragrastoid grasses are most frequently utilized. The north temperate fauna in both hemispheres is very depauperate, the Nearctic and Palearctic faunas not closely related and each quite easily derivable from adjacent tropical areas. In the Southern Hemisphere the Blissinae are absent from New Zealand, and almost absent from temperate Australia. In the rich veld and pampas regions of southern and eastern Africa and in South America the fauna is reasonably diverse and in the former contains some old elements, but it should be remembered that southern Africa is certainly warm temperate and extends to less than 35°S. Recognition of the Blissinae as a tropical group must be considered when one attempts to establish age of the group. The several sister group relationships noted above between Africa and South America strongly suggest that the Blissinae were in existence by or soon after 96 m.y. (B.P.) the date generally accepted for the last (and tropical) connection between South America and Africa. There is no present evidence for an ancient (or Recent) northern dispersal between hemispheres for this subfamily.

The first problem to be faced in attempting to interpret the distributional patterns discussed above is to try to understand how old the

Blissinae are. In the absence of any meaningful fossil record, this question must necessarily be approached through the use of indirect evidence and by comparing the distributions with those of other groups.

As I have previously discussed (Slater, 1976), modern Blissinae are known to breed only on monocotyledonous plants. Since many families of monocots serve as host plants there must be an absolute physiological dependence on the part of the insects upon some feature of monocot plants. Therefore, it is highly unlikely that the subfamily would have existed as a recognizable entity before the existence (and before some degree of differentiation) of the monocots. Further, the other subfamilies of lygaeid bugs for the most part feed on the seeds of angiosperms. The origin of the angiosperms is still a matter of much debate. Raven and Axelrod (1972) noted that pollen that can definitely be referred to any living genera is first known from the middle of the Upper Cretaceous (about 75 m.y. B.P.). There is no a priori reason why blissine genera should be older or younger than plant genera, but it is my impression that generally a plant "genus" is a more inclusive category than are most animal genera. Thus, for a working hypothesis it seems reasonable to think that a living animal genus might not be older than all of the plant genera with which the group is associated. This would lead to the conclusion that the Blissinae did not originate earlier than some time in the Upper Cretaceous, and probably arose coincident with the radiation of the monocot angiosperms. Further evidence that the Blissinae may not be appreciably older is their complete absence from New Zealand. This suggests that the group was not present in temperate West Antarctica 80 m.y.B.P. when New Zealand broke away. This, of course, does not mean that blissines did not exist at that time. They appear to have originated as a tropical group, whereas the Late Cretaceous climates of New Zealand and West Antarctica were temperate and possibly cool temperate during most of this period (Cracraft, 1973). The presence of at least three and probably several more sister groups between Africa and South America would argue for some diversification of the Blissinae before Africa and South America separated in the Upper Cretaceous (some 80-90 m.y.B.P. depending upon which authority one follows). As Raven and Axelrod (1972) pointed out, however, for organisms with some ability to cross water gaps, time of actual marine transgression between two continental masses is certainly not coincident with the last period of extensive faunal exchange. To the contrary, exchange will take place for a very long time subsequently, although at an ever diminishing rate as the two land areas move farther and farther away from each other. Thus, the Blissinae need not have been especially diversified at the time of the final separation of Africa and South America, but they must have been diversified within a reasonable time thereafter.

The result of this is that all the (admittedly scanty) evidence points to the occurrence of the Blissinae with some degree of differentiation in the Upper Cretaceous. This will be used as a working hypothesis in attempting to understand present distributions.

POSSIBLE GONDWANALAND RELATIONSHIPS

AUSTRALIA: The limited "autochthonous" Australian fauna appears to have its closest cladistic relationships with Madagascar (the evidence is not compelling). There is also a relationship to southern Africa and to India. *Ischnodemus sordidus* is known to occur only in the winter rainfall area of extreme southwestern Australia. It is a relatively plesiomorphous member of the genus and shares several synapomorphic features with *Ischnodemus noctulus* Distant. The latter has a disjunct distribution in India, Ceylon, Southeast Asia, Indonesia and southern Africa. The two species are moderately closely related morphologically and quite isolated from other species of *Ischnodemus*. It is interesting that neither species occurs on Gramineae but on monocot taxa generally considered to be older (Cyperaceae, Zingiberaceae). It seems unlikely that the disjunct distribution of *noctulus* between Asia and Africa is a drift phenomenon

but rather is due to Tertiary climatic deterioration between the two areas, as is discussed later. The relationship between *noctulus* and *sordidus* may, however, be related to drift through a common ancestor. Cracraft (1973) discussed conflicting viewpoints as to whether or not India was in contact with Australia. Despite the ambiguity of the geological evidence the presence of a thaumastocorid bug in India (Drake and Slater, 1957), a family otherwise known in the Eastern Hemisphere only from Australia, persuades me that former close faunal interchange did take place. Veevers, Jones, and Talent's (1971) reconstruction of Gondwanaland shows southeastern India in close contact with southwestern Australia. My suggestion is that *noctulus* and *sordidus* do illustrate a drift relationship although not necessarily indicating or implying actual continental contact.

Heinsius, *Australodemus*, and *Slaterellus*, the other autochthonous Australian genera, are highly derived taxa and have no close relatives in Africa, India, or South America. Cladistically, they appear to be most closely related to Madagascan taxa (see Cladogram) but the evidence is scarcely compelling. MacKerras (1964, 1970) referred to an "old northern" or "Lemurian" element in the Australian fauna that consists of groups that "have centers of origins in Africa or Madagascar, extended around or across the Indian Ocean." If this fauna is real in the Blissinae, it suggests either astonishing dispersal across the Indian Ocean or extinction (or non-collecting) in the Oriental Region. The Australian taxa are dry-adapted and possibly the remnants of a more extensive fauna. It seems certain that they are not derived directly from the existing Oriental fauna or vice versa. These genera may represent disjunct Gondwanaland elements from a period when Australia, Antarctica, and Madagascar were closer together. However, if MacKerras's "Lemurian" distributions are real, in the absence of Indian representatives, I cannot explain them other than by extinction in India as it drifted through many degrees of latitude. Cracraft (1973) believed "it is not yet possible to extrapolate the continental position (for the Indian Ocean) of 75 m.y. back to any particular reconstruction of Gondwanaland."

The "tropical" Australian genera do have Oriental affinities. *Iphicrates*, for example, though richest in species in New Guinea and its associated islands, is also represented in Southeast Asia, India, and Ceylon. The intriguing aspect of this fauna is its apparent relationships to tropical and subtropical genera in South and Central America. It seems most unlikely that such relationships are the result of dispersals through the Antarctic. Nor, despite Raven and Axelrod's (1972) discussion of the massive extinction of plants in Africa, does it seem likely to me that these Australasian-Neotropical relationships are old Gondwanaland elements which have been eliminated in much of the Old World Tropics. I am intrigued by the idea of Nelson and Platnick (personal commun.) who suggest the "hybrid" nature of continental faunas. For South America this would be the result of an early separation in the Pacific that carried part of the "Oriental" fauna eastward until the plate collided with a westward moving plate carrying faunal elements of African relationship. This would explain the composition of the South American blissine fauna very well and make understandable the Neotropical rather than Old World tropical affinities of several of the tropical Australian-New Guinea blissine genera.

SOUTH AMERICA: The cladistic affinities of such South American genera as *Xenoblissus*, *Reticulatodemus*, and *Patritius* to Australian or Asian genera such as *Iphicrates*, *Dentisblissus*, and *Scintillademus* are those discussed above.

There is a closer relationship between several Neotropical and African taxa where definite sister group relationships are present. These are *Dimorphopterus-Blissus*, *Micaredemus-Extarademus*, and the "advanced" sections of *Ischnodemus*. Interestingly, in each of these cases the Neotropical representative is the most plesiomorphic. This seems to be an illustration of the isolation of South America as a great island for most of the Tertiary, thus allowing the survival there of relatively primitive stocks. While the *Dimorphopterus-Blissus* and *Micaredemus-Extarademus* relationships appear to be

drift phenomena and therefore one may postulate that their ancestor existed in West Gondwanaland *ca.* 75-90 m.y.B.P., the situation with *Ischnodemus* is less clearly identifiable as a drift associated event, although it may be. Some of the Neotropical and Ethiopian species of *Ischnodemus* are extremely similar, so much so that it is hard to imagine that they would not have diverged more than they have over such an immense period of time. The sperm reservoirs of all Neotropical *Ischnodemus* species are all of a highly apomorphic type and very similar to one another. In Africa, by contrast, many types of sperm reservoirs are present. It is possible that the ancestral Neotropical *Ischnodemus* could have arrived by over-water transport long after an extensive water gap had developed between Africa and South America. If so there has been time for much speciation and a great deal of morphological diversification to have taken place.

AFRICA: Distributions in Africa that appear to be best understood as related to the breakup of Gondwanaland are those already discussed relative to Australia and to South America. The plesiomorphic nature of such taxa as *Capodemus* and *Macchiademus*, now restricted entirely or largely to the southwest Cape Floral Kingdom, suggests that such taxa are the remnants of the "old" blissine fauna.

In summary then, it may be said that present blissine distributions and relationships strongly suggest that the Blissinae arose in tropical areas of Gondwanaland and that the Australian, Neotropical, and Ethiopian faunas show relationships that seem to be best explained by the breakup of Gondwanaland.

POST-DRIFT DISTRIBUTIONS

ORIENTAL REGION: One of the most striking features of blissine distribution is the paucity of *Ischnodemus* species in the Oriental Region. Only a few rather plesiomorphic species of *Ischnodemus* are present and the dominant groups within *Ischnodemus*, such as the *grossus* and *stali* groups with enlarged sperm reservoirs, are entirely absent. This is especially striking when one realizes the close relationship of these very groups of *Ischnodemus* in Africa and South America. There are close relationships between Africa and Asia in other taxa of the Blissinae. *Dimorphopterus gibbus*, a widespread Oriental species, also occurs in West Africa. There are sister species of *Talpoblissus* in the two regions; two "groups" of *Macropes* are present in both areas and there are related species of *Geoblissus* and a number of closely related species of *Dimorphopterus*. All of this would seem to argue for a former close faunal connection between the two regions and to make it even more difficult to understand why the apomorphic *Ischnodemus* groups are absent from Asia. I believe this apparently anomalous situation is most reasonably understandable by interpreting the *Talpoblissus*, *Geoblissus*, and *Dimorphopterus* relationships between the two continents as relatively recent, probably Pleistocene events. These groups presumably originated in Africa and dispersed into Asia and the Palearctic during the Pleistocene periods when the xeric climates were less rigorous than at present. The appearance of the *Ischnodemus* situation may be exaggerated by taxonomy. There is an apparently plesiomorphic (undescribed, one micropter) blissine related to *Ischnodemus* in the mountains of Burma and the species of the genus *Cavelerius* could, of course, be considered to be only a group of *Ischnodemus*. This taken together with the presence in Asia of at least two (probably three) generalized *Ischnodemus* "groups" *(noctulus, nigrocephalus* and relatives, *thoracicus)* clearly shows that *Ischnodemus* species were present in Asia early. The lack of "advanced lines" seems to me to probably be due to the presence of a diverse *Macropes* fauna that ecologically replaces *Ischnodemus* to a large extent.

Ischnodemus-like ancestral "stocks" appear to have been present in Africa and South America for a long time. Nevertheless in both continents some of the more apomorphic *Ischnodemus* clades have been undergoing active speciation in relatively recent geological time. I believe that at least a considerable proportion of this speciation is best accounted for by Pleistocene events. Pluvial periods would have reduced the savanna to widely separated areas

where isolation would lead to speciation. Subsequently, dry periods would favor the spread of the savanna at the expense of the forest and allow the formerly limited savanna species to spread widely in both continents [see Moreau (1966) for Africa; Brown and Benson (1977) for South America].

MADAGASCAR: The present blissine fauna of this great island is somewhat of an enigma. On the one hand, there is considerable endemism at the generic level with radiation of some groups. On the other hand, the relationships of the fauna are almost entirely with Africa. Some of these African-Madagascan relationships are at a conspecific level and others of closely related sister species. Thus, at least some of the Madagascan species must have been acquired by dispersal across the Mozambique Channel. There are a number of lygaeid species in other subfamilies that occur in both Africa and Madagascar. Many of these tend to be "fugitive" species associated with disturbed or early succession habitats. This suggests to me that there is considerable lygaeid faunal exchange at the present time between Africa and Madagascar. On the other hand, the degree of morphological differentiation of some of the endemic genera would at least suggest that a portion of the Madagascan fauna has been evolving on the island for a long time. However, if it is true that there has not been a direct land connection between Africa and Madagascar since the Triassic this would seem much too early for a group of insects that feed on monocot plants. Thus, the ancestors of these "older" faunal elements would appear to have reached Madagascar when the Mozambique Channel was much narrower or by stepping stones such as through the Comoro Islands. Unfortunately, as previously stated, we probably know too little about the blissine fauna of Madagascar to speculate further.

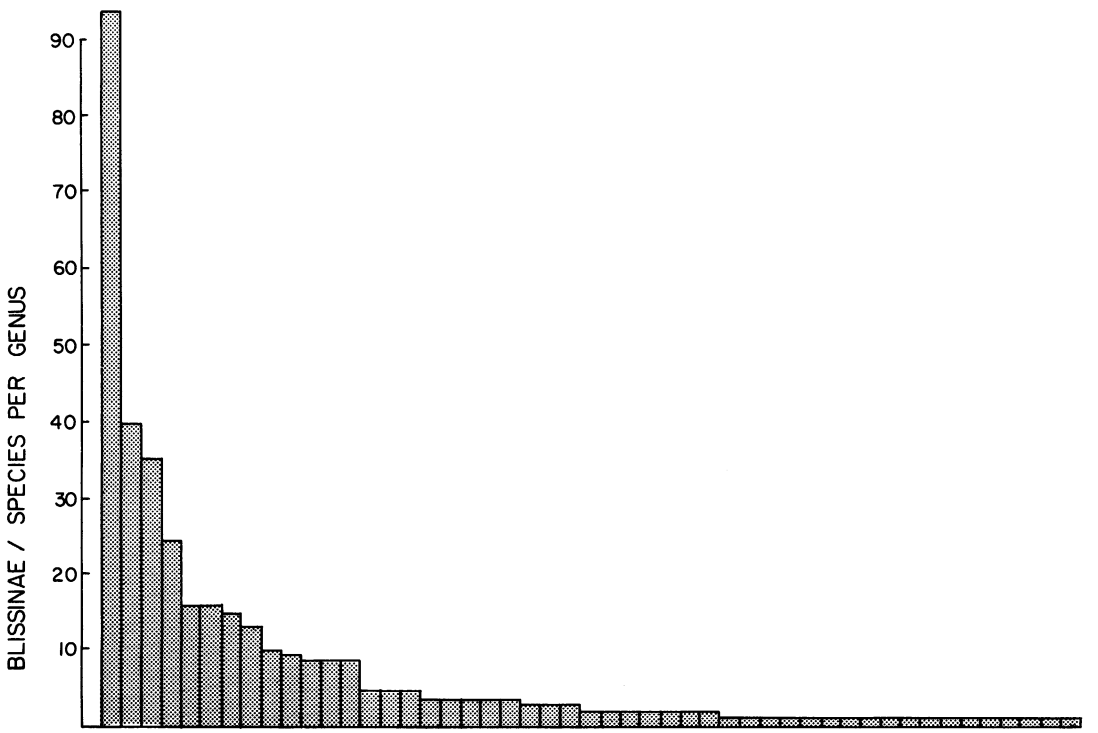


FIG. 17. Number of species per genus.

CHECK LIST OF THE BLISSINAE OF THE WORLD[1]

ARADACRATES	
1. *cochlear* S. & W., 1969	Madagascar
ARADADEMUS	
1 *mirificus* Slater, 1967	Madagascar
2. *oculatus* Slater, 1967	Madagascar
ATRADEMUS	
1. *allaudi* Slater, 1967	Madagascar
2. *capeneri* (Slater), 1964 *(Ischnodemus)*	South Africa
3. *fusconervosus* (Stål), 1855 *(Micropus)*	South Africa
synonym *strigatus* Walker, 1872	
4. *maritimus* S. & W., 1973	South Africa
AUSTRALODEMUS	
1. *elongatus* S. & S., 1963	Australia
BARADEMUS	
1. *attenuatus* Slater, 1967	Madagascar, South Africa
BLISSIELLA	
1. *castanea* (Slater), 1964 *(Ischnodemus)*	Madagascar, Africa
2. *castanoides* Slater, 1967	Madagascar
3. *micans* (Slater), 1964 *(Ischnodemus)*	Zaire, West Africa
4. *nidus* (Slater), 1964 *(Ischnodemus)*	Sudan
5. *pauliani* Slater, 1967	Madagascar
BLISSUS	
1. *antillus* Leonard, 1968	Puerto Rico
2. *arenarius* Barber, 1918	Eastern United States and Canada,
subspecies *maritimus* Leonard, 1966	Southeastern United States
3. *barberi* Leonard, 1968	Texas
4. *bosqi* Drake, 1940	Argentina, Brazil
5. *brasiliensis* Drake, 1951	Brazil
6. *breviusculus* Barber, 1937	Connecticut, Massachusetts, Maine
7. *canadensis* Leonard, 1970	Alberta, Saskatchewan, Montana
8. *hygrobius* (Jensen-Haarup), 1920 *(Mendocinia)*	Argentina
9. *insularis* Barber, 1918	Southern United States, Neotropical
10. *iowensis* Andre, 1937	Iowa, Kansas, Missouri
11. *leucopterus* (Say), 1831 *(Lygaeus)*	Central & Eastern United States
synonyms: *albipennis* Dallas, 1852	
albivenosus Fitch, 1856 *(Micropus)*	
apterus Fitch, 1856 *(Micropus)*	
basalis Fitch, 1856 *(Micropus)*	
devastator LeBaron, 1850 *(Rhyparochromus)*	
dimidiatus Fitch, 1856 *(Micropus)*	
femoratus Fitch, 1856 *(Micropus)*	

[1]S. & W., Slater and Wilcox; S. & S., Slater and Sweet; S. & M., Slater and Miyamoto; S. & A., Slater and Ahmad; S.A.W., Slater, Ashlock, Wilcox; W. & S., Wagner and Slater; S. & H., Slater and Harrington; S. & Ash., Slater and Ashlock.

fulvivenosus Fitch, 1856 *(Micropus)*	
immarginatus Fitch, 1856 *(Micropus)*	
melanosus Riley, 1875 *(Micropus)*	
nigricornis Fitch, 1856 *(Micropus)*	
rufipedis Fitch, 1856 *(Micropus)*	
validus Blatchley, 1926	
subspecies: *hirtus* Montandon, 1893	Eastern United States
12. *minutus* (Blatchley), 1925 *(Ischnodemus)*	Florida
synonym: *pusillus* Blatchley, 1925 *(Ischnodemus)* (preocc.)	
13. *mixtus* Barber, 1937	California
14. *nanus* Barber, 1937	Kansas, Missouri?
15. *occiduus* Barber, 1918	Western United States, Canada
16. *omani* Barber, 1937	Arizona
17. *parasitaster* (Bergroth), 1903 *(Neoblissus)*	Argentina, Brazil, Uruguay
18. *penningtoni* Drake, 1941	Argentina
19. *planarius* Barber, 1937	Colorado, Kansas, Wyoming
20. *planus* Leonard, 1968	Grenada (West Indies)
21. *pulchellus* Montandon, 1893	Honduras, Panama, Costa Rica
22. *richardsoni* Drake, 1940	Peru, Argentina, Brazil
23. *slateri* Leonard, 1968	Puerto Rico
24. *sweeti* Leonard, 1968	Texas, Mexico
25. *villosus* Barber, 1937	California
26. *weiseri* (Drake), 1951 *(Neoblissus)*	Argentina
27. *yumana* Drake, 1951	Arizona
BOCHRUS	
1. *foveatus* Distant, 1879	Vietnam, Assam, Burma, India
synonyms: *hoabinhensis* Distant, 1918	
tonkinensis Distant, 1918	
2. *poecilopterus* Stål, 1861	Java
CAPODEMUS	
1. *bispinosus* S. & S., 1972	South Africa
2. *darwini* (Slater), 1964 *(Ischnodemus)*	South Africa
3. *distinctus* S. & S., 1972	South Africa
4. *elegiae* S. & S., 1972	South Africa
5. *herbosus* S. & S., 1972	South Africa
6. *hirsutus* S. & S., 1972	South Africa
7. *navis* (Slater), 1964 *(Blissus)*, new combination	Rhodesia
8. *pentameri* S. & S., 1972	South Africa
9. *rostratus* (Slater), 1964 *(Blissus)*	South Africa
10. *rusticoides* S. & S., 1972	South Africa
11. *rusticus* (Stål), 1865 *(Blissus)*	South Africa
12. *sabulosus* S. & S., 1972	South Africa
13. *stuckenbergi* S. & S., 1972	South Africa
14. *tenuatus* S. & S., 1972	South Africa
15. *variabilis* S. & S., 1972	South Africa
16. *wilcoxae* S. & S., 1972	South Africa
CAVELERIUS	
1. *antennatus* S. & M., 1963	Assam, Burma
2. *excavatus* (Distant), 1901 *(Macropes)*	India
3. *illustris* Distant, 1903	Burma, Malaya
4. *minor* S. & M., 1963	India
5. *mishmiensis* S. & M., 1963	Burma, India
6. *nigrolimbatus* S. & M., 1963	Burma

7. *obscuratus* S. & M., 1963	Nepal
8. *saccharivorus* (Okajima), 1922 *(Blissus)*	Japan, Okinawa, Taiwan, Amami-Oshima (Ryukyus)
9. *sweeti* S. & M., 1963	Pakistan, India
10. *tinctus* (Distant), 1904 *(Macropes)*, new combination	India
CAVELOBLISSUS	
1. *americanus* S. & W., 1968	Paraguay, Brazil
CHELOCHIRUS	
1. *atrox* Spinola, 1839	Borneo, Java, Malaya
synonym: *fasciatus* (Distant), 1901 *(Macropes)*	
2. *confertus* S. & A., 1965	Sumatra
3. *pirkimeroides* S. & A., 1965	Borneo
4. *talpus* (Walker), 1872 *(Ischnodemus)*	Malaya, Sumatra, Java
DENTISBLISSUS	
1. *corniger* Slater, 1968	Australia
2. *divisus* (Walker), 1872 *(Ischnodemus)*	Australia
3. *umbrosus* Slater, 1968	New Guinea
4. *venosus* (Breddin), 1900 *(Ischnodemus)*	New Guinea, New Britain, "Malaya," New Ireland
synonym: *humboldti* (Distant), 1903 *(Macropes)*	
DIMORPHOPTERUS[1]	
1. *annulatus* (Slater), 1964 *(Blissus)*	Africa
2. *anomalus* Slater, 1974	India
3. *atromaculatus* (Distant), 1909 *(Ischnodemus)*	India
4. *bicoloripes* (Distant), 1883 *(Blissus)*	China, Japan, India, Thailand
5. *blissoides*[1] (Baerensprung), 1859 *(Micropus)*	Eastern Palearctic, Japan
synonyms: *japonicus*[1] (Hidaka), 1959 *(Blissus)*	
signoreti (Kuschakevitch), 1861 *(Micropus)*	
staphylinus (Jakovlev), 1874 *(Ischnodemus)*	
6. *brachypterus* (Rambur), 1839 *(Pachymerus)*	Southern Europe, Africa
synonym: *curtulus* (Dohrn), 1860 *(Micropus)*	
7. *cornipes* (Hesse), 1925 *(Blissus)*	West Africa, Southwest Africa
8. *cornutus* Slater, 1974	Australia
9. *doriae* (Ferrari), 1874 *(Blissus)*	Southern Palearctic
variety: *obscurus* Reuter, 1888	
10. *erebus* (Distant), 1909 *(Ischnodemus)*	India
11. *fulgidus* (Slater), 1964 *(Blissus)*	South Africa
12. *gibbus* (Fabricius), 1793 *(Acanthia)*	India, China, Philippines, Java, New Guinea, New Britain
synonyms: *kyushensis* (Hidaka), 1959 *(Blissus)*	
sauteri (Bergroth), 1914 *(Ischnodemus)*	
13. *graminum* (Lindberg), 1958 *(Blissus)*	Cape Verde Islands
14. *hessei* (Slater), 1964 *(Blissus)*	South Africa, Rhodesia
15. *hirsutulus* (Bergroth), 1916 *(Blissus)*	Madagascar
16. *indicus* Slater, 1974	India
17. *latoides* (Slater), 1967 *(Blissus)*	South Africa
synonyms: *obscurus* (Slater), 1964 *(Blissus)* (preocc.)	
18. *latus* (Distant), 1909 *(Euhemerus)*	Thailand, Vietnam, India, Ceylon
19. *lepidus* S. & W., 1969	Thailand
20. *littoralis* S. & W., 1973	South Africa
21. *nubicus* (W. & S.), 1964 *(Stenoblissus)*	Egypt, Sudan
22. *oblongus* (Stål), 1865 *(Blissus)*	South Africa
synonym: *longirostris* (Stål), 1874 *(Blissus)*	

[1]Subsequent to submission of the present paper Josifov, M. and Kerzher, I. M. have published a paper (Heteroptera of Korea II. 1978. Fragmenta Faunistica [Warsaw]) vol. 23, pp. 137-196 in which *obsoletus* Jakovlev is synonymized with *blissoides*; and *thoracicus* Jakovlev and *japonicus* Hidaka synonymized with *spinolae*.

23. *obsoletus* (Jakovlev), 1881 *(Ischnodemus)*[1]	Turkestan, Caucasus
24. *pallipes* (Distant), 1883 *(Blissus)*	Japan
25. *pilosus* (Barber), 1958 *(Caenoblissus)*	Yap, Bismarcks, New Guinea, Australia
26. *rondoni* S. & W., 1969	Thailand
27. *similis* (Slater), 1964 *(Blissus)*	South Africa, Zaire, Senegal
28. *spinolae* (Signoret), 1857 *(Micropus)*	Palearctic
variety: *geniculatus* Horvath, 1882	
29. *sumatrensis* Slater, 1974	Sumatra
30. *syrtis* S. & W., 1973	South Africa
31. *tenuatus* (Slater), 1964 *(Blissus)*	South Africa, Zaire, Sudan?, Nigeria?
32. *thoracicus* Jakovlev, 1881[1]	Siberia
33. *typicus* (Distant), 1909 *(Esmun)*	India
34. *upembensis* (Slater), 1964 *(Blissus)*	South Africa, Zaire, Chad
35. *zuluensis* (Slater), 1964 *(Blissus)*	South Africa, Mozambique
EXTARADEMUS	
1. *collaris* (Signoret), 1857 *(Micropus)*	Bolivia, Argentina, Venezuela, Colombia
2. *collaroides* S. & W., 1966	Brazil, Argentina
3. *discalis* (Barber), 1947 *(Ischnodemus)*	Cuba
4. *humerus* S. & W., 1966	Panama
5. *macer* (Van Duzee), 1921 *(Ischnodemus)*	Southwestern United States, Neotropical
synonym: *cahabonesis* (Distant), 1893 *(Ischnodemus)*	
umbratus (Distant), 1893 *(Ischnodemus)*	
6. *mundus* S. & W., 1966	Mexico
7. *tumerosis* S. & W., 1966	Panama, Guatemala
8. *tylosis* S. & W., 1966	Mexico
EXTARAMORPHUS	
1. *magnatarsus* S.A.W., 1969	Vietnam
GELASTOBLISSUS	
1. *rugosus* S. & W., 1969	Madagascar
GEOBLISSUS	
1. *barchanorum* (Kiritshenko), 1913 *(Blissus)*	Turkestan
2. *hirtulus* (Burmeister), 1835 *(Blissus)*	"Fr. Sudan," Egypt, Sudan, Cyprus, Syria, India, China, Japan, Thailand, Borneo
synonym: *rotundatus* Hidaka, 1959	
3. *magnofuscus* S. & W., 1973	Southwest Africa
4. *mekongensis* S.A.W., 1969	Laos
5. *niger* (Slater), 1964 *(Blissus)*	South Africa
6. *putoni* (Jakovlev), 1875 *(Blissus)*	Southern Palearctic
7. *siccus* S. & W., 1973	Angola
HEINSIUS	
1. *explicatus* Distant, 1901	Australia
synonym: *anthropophagorum* (Kirkaldy), 1908 *(Macropes)*	
2. *pallidus* S. & S., 1963	Australia

[1]See footnote p. 50.

HETEROBLISSUS	
1. *anomilis* Barber, 1954	Argentina, Brazil
IPHICRATES	
1. *angulatus* Slater, 1961	New Guinea, Solomons
2. *cervinellus* Slater, 1961	New Guinea
3. *gressitti* Slater, 1966	Taiwan
4. *lativentris* (Bergroth), 1918 *(Anisosoma)*	Malaya, Philippines
5. *lineatus* Slater, 1961	Australia, New Guinea
6. *malayensis* Slater, 1961	Malaya, Sumatra
7. *montaguei* (Distant), 1920 *(Macropes)*	New Caledonia
8. *neotenicus* Slater, 1966	New Guinea
9. *nigritus* Slater, 1961	New Guinea
10. *papuensis* Slater, 1961	New Guinea
11. *pseudolineatus* Slater, 1968	Australia
12. *rex* Slater, 1966	Philippines
13. *spathus* Slater, 1961	Australia, Tasmania
14. *spinicaput* (Scott), 1874 *(Ischnodemus)*	Japan
15. *subauratus* Distant, 1903	Ceylon
ISCHNOCORIDEA	
1. *elegans* Horvath, 1892	Ghana, Cameroon, Congo Republic
synonym: *picipes* (Haglund), 1895 *(Ischnocoridella)*	
ISCHNODEMUS	
1. *agilis* (Spinola), 1852 *(Micropus)*	Argentina, Chile
2. *ambiguus* S.A.W., 1969	Thailand, Vietnam
3. *antennatus* S. & W., 1969	Argentina
4. *asciaformis* S. & H., 1969	Zaire, Cameroon, Ghana, Guinea
5. *atricolor* Berg, 1892	Uruguay, Argentina
6. *badius* Van Duzee, 1909	Southeastern United States
7. *basalis* Walker, 1872	South Africa, Rhodesia
8. *basilewskyi* Slater, 1964	Cameroon, Congo Republic, Equatorial Guinea, Zaire
9. *bequaerti* Slater, 1964	Zaire, South Africa
10. *bosqi* S. & W., 1969	Brazil, Argentina, Uruguay
11. *brevicornis* (Stål), 1855 *(Micropus)*	South Africa, Chad, Angola, Southwest Africa, Ruanda, Zaire
synonym: *curticornis* Stål, 1874	
12. *brevirostris* Bergroth, 1916	West Africa
13. *brincki* Slater, 1964	South Africa
14. *brunnipennis* (Germar), 1837 *(Pachymerus)*	Southeastern United States
15. *canaliculus* Slater, 1964	South Africa
16. *canus* Slater, 1967	Madagascar
17. *caspius* Jakovlev, 1871	Southern Palearctic
varieties: *nigricornis* Stichel, 1958	
tetricus Stichel, 1958	
18. *congoensis* Slater, 1964	Zaire
19. *conicus* Van Duzee, 1909	Southeastern United States
20. *consobrinus* (Distant), 1918 *(Macropes)*	India
21. *crassipes* Slater, 1964	Zaire
22. *dentatus* Wagner, 1963	North Africa
23. *diplachne* S. & H., 1970	South Africa, Rhodesia, Botswana
24. *discolor* (Walker), 1870 *(Micropus)*	Egypt
25. *falicus* Say, 1831	Eastern United States
synonym: *punctatus* (Provancher), 1872 *(Rhyparochromus)*	
26. *fallax* S. & H., 1970	Africa

27. *formosensis* S. & W., 1969	Argentina, Brazil
28. *fulvipes* (DeGeer), 1773 *(Cimex)*	South America, Central America, West Indies, Florida
synonyms: *longus* Walker, 1872	
sallei (Signoret), 1857 *(Micropus)*	
subspecies: *schaffneri* S. & W., 1969	Mexico
29. *fumidus* S.A.W., 1969	Thailand
30. *gayi* (Spinola), 1852 *(Micropus)*	Chile
synonym: *flavitarsus* (Reed), 1900 *(Romicpus)*	
31. *genei* (Spinola), 1837 *(Micropus)*	Southern Palearctic
synonym: *championi* Saunders, 1876	
32. *grossinigrus* S. & W., 1969	Argentina
33. *grossus* Slater, 1964	East Africa
34. *hesperius* Parshley, 1922	Central United States
synonym: *brevicornis* Parshley, 1922 (Preocc.)	
35. *inambitiosus* B. White, 1879	Brazil
36. *inornatus* S. & H., 1970	Tanzania, Kenya
37. *jaxartensis* Reuter, 1885	Southern Palearctic
38. *lactipennis* S. & W., 1969	Argentina, Brazil, Paraguay
39. *linearis* (Stål), 1855 *(Micropus)*	South Africa, Rhodesia, Zaire
synonym: *ochripoides* Slater, 1964	
40. *lobatus* Van Duzee, 1919	Southeastern United States
41. *madagascariensis* S. & W., 1970	Madagascar
42. *mendax* S. & H., 1970	Tanzania, Zaire, Congo Republic
43. *missouriensis* Froeschner, 1944	Central United States
44. *montanus* S. & H., 1970	Kenya
45. *neotropicalis* S. & W., 1969	Paraguay, Argentina
46. *nigripes* Stål, 1874	Colombia, Panama
47. *nigrocephalus* S.A.W., 1969	Laos
48. *nigromaculatus* S. & W., 1969	Brazil, Argentina, Bolivia
49. *nigrostillatus* Stål, 1858	Brazil
50. *nigrovenosus* S. & W., 1969	Brazil
51. *noctulus* Distant, 1901	Rhodesia, Ceylon, Sumatra, Malaya, India
synonyms: *macrotomus* Bergroth, 1894	Vietnam, Thailand, Java, Borneo
nubilis Slater, 1964	Venezuela, Bolivia, Brazil, Guyana, Trinidad, Paraguay
52. *notandus* S. & W., 1969	South and Central America
53. *oblongus* (Fabricius), 1803 *(Lygaeus)*	Zaire, Zambia, Tanzania, Mozambique, South Africa
synonym: *variegatus* (Signoret), 1857 *(Micropus)*	Ethiopia, Kenya, South Africa
54. *obversus* S. & H., 1970	South Africa
55. *ocellaris* S. & H., 1970	
56. *ochripes* (Stål), 1855 *(Micropus)*	
synonyms: *ochropus* (Stål), 1865 *(Blissus)*	
quadrispinosus Slater, 1964	
57. *oculatus* Slater, 1967	Madagascar
58. *parabasalis* Slater, 1964	South Africa, Rhodesia, Zaire, Tanzania
59. *paramoides* S. & W., 1969	Argentina, Paraguay
60. *parathoracicus* S. & W., 1970	South Africa, Mozambique
61. *perplexus* S. & H., 1970	Northern Ethiopian Region
62. *praecultus* Distant, 1883	South and Central America, Southern United States
synonym: *atramedius* Blatchley, 1926	Brazil, Argentina
63. *proprius* Slater, 1966	Brazil
64. *pseudotibialis* S. & W., 1969	Brazil, Paraguay
65. *pulchellus* S. & W., 1969	

66. *pullus* S. & W., 1969	Argentina
67. *quadratus* Fieber, 1837	Southern Palearctic
synonyms: *atlanticus* Lindberg, 1932	
parallelus (Costa), 1841 *(Pachymerus)*	
68. *ranavalonus* S. & W., 1970	Madagascar
69. *robustus* Blatchley, 1926	Florida
70. *rottensis* Statz and Wagner, 1950	Oligocene (Germany)
71. *rufipes* Van Duzee, 1909	Southern United States
synonyms: *intermedius* Blatchley, 1926	
72. *sabuleti* Fallen 1826, *(Lygaeus)*	Palearctic
synonyms: *brunnipennis* Rey, 1887 (preocc.)	
decuratus Herrich-Schaeffer, 1837 *(Pachymerus)*	
palustris Carayon, 1944	
73. *schoutedeni* Slater, 1964	Malawi, Tanzania, Zaire, Ruanda
74. *severus* S. & W., 1970	Argentina
75. *signoreti* Berg, 1883	Argentina
76. *sinuatus* S.A.W., 1969	Malaya, Burma, China, Vietnam, Thailand, Borneo, New Guinea, Nepal
77. *slossoni* Van Duzee, 1909	Eastern United States
78. *sordidus* Slater, 1968	Western Australia
79. *spatulatus* S. & W., 1969	Brazil, Argentina, Chile
80. *stali* (Signoret), 1858 *(Micropus)*	Argentina, Uruguay
81. *staliellus* S. & W., 1969	Argentina
82. *subflavus* S. & W., 1969	Argentina
83. *suturalis* Horvath, 1883	Southern Palearctic
84. *tenebrosus* S. & H., 1970	South Africa, Rhodesia
85. *thoracicus* (Distant), 1909 *(Macropes)*	Nepal, Vietnam, South Africa
86. *tibialis* Stål, 1858	South America
87. *tibialoides* S. & W., 1969	Paraguay
88. *torquatus* S. & H., 1970	Ethiopia
89. *transitius* S. & W., 1969	Brazil
90. *ulugurus* Scudder, 1962	Tanzania
91. *umbrosus* S. & H., 1970	Zambia, Zaire
92. *venustus* Slater, 1964	Urundi, Ruanda, Kenya, Zaire, Congo Republic
93. *wittei* Slater, 1964	Zaire
94. *zavattarii* Mancini, 1953	Ethiopia, Kenya, Sudan, Tanzania, South Africa, Zaire
?95. *aleocharoides* (Jakovlev), 1905 *(Dimorphopterus)*, new combination	Palearctic

LEMURIBLISSUS

1. *acuminatus* Slater, 1967	Tanzania, Madagascar

LUCEROCORIS

1. *brunneus* Slater, 1968	Philippines
2. *nigrotibialis* Slater, 1968	Philippines

MACCHIADEMUS

1. *acuminatus* S. & W., 1973	South Africa
2. *angustus* S. & W., 1973	South Africa
3. *capensis* (Slater), 1964 *(Ischnodemus)*	South Africa
4. *diplopterus* (Distant), 1903 *(Blissus)*	South Africa
5. *nigritus* S. & W., 1973	South Africa

MACROPES

1. *africanus* S. & W., 1973	Tanzania, Zaire
2. *albosignatus* Distant, 1918	Africa
3. *alternatus* S. & W., 1973	India
4. *australis* (Distant), 1901 *(Ischnodemus)*	Australia, Philippines, Ceylon, New Guinea, Malaya, Taiwan, Hainan Island
synonym: *longurio* (Bergroth), 1918 *(Rhabdomorphus)*	
5. *bacillus* (Gerstaecker), 1873 *(Ischnodemus)*	Tanzania, Chad
6. *brunneus* S. & W., 1973	India
7. *burmanus* S. & W., 1973	Burma
8. *comosus* S.A.W., 1969	Cambodia
9. *consimilis* Distant, 1918	India
10. *crassifemur* S. & W., 1973	Pakistan
11. *dilutus* Distant, 1901	India, Burma, Ceylon, Thailand, Vietnam
variety: *nesiotus* Breddin, 1907	China, Vietnam
12. *exilis* S. & W., 1973	Laos, Pakistan, India, Sumatra, Nepal
13. *femoralis* Distant, 1918	China, Taiwan
14. *harringtonae* S.A.W., 1969	Afghanistan
15. *hoberlandti* S. & A., 1967	Philippines
16. *lacertosus* Bergroth, 1918	India, China, Thailand, Vietnam, Sumatra
17. *lobatus* S.A.W., 1969	China
18. *maai* S. & W., 1973	Malaya
19. *maculosus* S. & W., 1973	Taiwan, China
20. *major* Matsumura, 1913	
synonym: *fossor* Bergroth, 1914	Vietnam
21. *minor* S.A.W., 1969	Zambia, Zaire, Senegal
22. *nigrolineatus* Distant, 1918	Japan, China, Bonin Islands, Guam, Vietnam
23. *obnubilus* (Distant), 1883 *(Ischnodemus)*	Philippines
24. *philippinensis* Distant, 1909	Laos, Thailand
25. *pilosus* S.A.W., 1969	Burma, Laos
26. *praecerptus* Distant, 1904	Ceylon, Taiwan, India
27. *privus* Distant, 1909	
synonym: *abbreviatus* Distant, 1918	India, Vietnam
28. *pronotalis* Distant, 1910	Laos, Thailand
29. *pseudofemoralis* S.A.W., 1969	India, Pakistan
30. *punctatus* (Walker), 1872 *(Ischnodemus)*	India, Laos, Java, Vietnam, Thailand
31. *raja* Distant, 1909	India
32. *rufipes* Distant, 1911	Philippines
33. *simoni* Distant, 1918	Ceylon, India, Vietnam, Thailand, Cambodia, Laos
34. *spinimanus* Motschulsky, 1859	
synonyms: *centralis* (Walker), 1872 *(Ischnodemus)*	
dentipes Motschulsky, 1858 (?)	
leucodermus Breddin, 1907	
singularis Distant, 1909	
sinhalanus Kirkaldy, 1907 (?)	
35. *subauratus* Distant, 1904	India, Malaya, Vietnam, Laos
36. *sultanus* Distant, 1901	East Africa
37. *umbrosus* S. & W., 1973	Ceylon
38. *uniformis* Distant, 1909	India, Laos
39. *varipennis* (Walker), 1872 *(Ischnodemus)*	Cambodia, Vietnam, Laos, Thailand
synonym: *annamita* Bergroth, 1894	
40. *yoshimotoi* S.A.W., 1969	Vietnam, Thailand

MERINADEMUS	
1. *baraoides* Slater, 1967	Madagascar
MICAREDEMUS	
1. *antennatus* Slater, 1967	Madagascar
synonym: *decolor* Slater, 1967	
2. *capitatus* Slater, 1967	Madagascar
3. *coatoni* S. & W., 1973	South Africa
4. *congoensis* (MS)	West Central Africa
5. *denticulatus* (Slater), 1964 *(Ischnodemus)*	South Africa, Mozambique
6. *eleganoides* Slater, 1967	Madagascar
7. *elegans* Slater, 1967	Madagascar
8. *gillonae* (MS)	West Africa
9. *kerzhneri* S. & W., 1970	Madagascar
10. *lemuriensis* Slater, 1967	Madagascar
11. *obscurellus* Slater, 1968	Madagascar
12. *pilosulus* (Horvath), 1924 *(Ischnodemus)*	Madagascar
13. *pilosus* Slater, 1968	Madagascar
14. *pusillus* (Dallas), 1852 *(Micropus)*	Rhodesia, South Africa, Zaire, Ruanda, Tanzania, Urundi
15. *quadratus* S. & W., 1970	Madagascar
16. *wilcoxae* (MS)	East Africa
PATRITIODEMUS	
1. *albomaculatus* S. & A., 1969	Brazil
2. *clavatus* S. & A., 1969	Peru
3. *delicatus* S. & W., 1968	Brazil
4. *dilutipes* (Stål), 1858 *(Ischnodemus)*	Brazil, Argentina
synonym: *punctiger* (Stål), 1874 *(Ischnodemus)*	
5. *minutus* S. & A., 1969	Argentina
6. *nigellus* S. & A., 1969	Peru
7. *singularis* S. & A., 1969	Brazil
8. *unicoloris* S. & A., 1969	Boliva
PATRITIUS	
1. *alternatus* S. & W., 1966	Colombia
2. *colombianus* S. & W., 1966	Colombia
3. *cubensis* Barber, 1947	Cuba
4. *fusconervosus* (Stål), 1858 *(Ischnodemus)*	Brazil
5. *grossus* (Haglund), 1868 *(Papirius)*	Argentina, Paraguay, Uruguay, Brazil
synonym: *velutinus* (Walker), 1872 *(Ischnodemus)*	
6. *laevus* (Stål), 1858 *(Ischnodemus)*	Brazil, Argentina
7. *longispadix* S. & W., 1966	Brazil
PIRKIMERUS	
1. *bellus* S. & A., 1965	India
2. *burmanus* S. & A., 1965	Burma
3. *chinai* S. & A., 1965	Malaya
4. *esakii* Miyamoto & Hidaka, 1960	Japan
5. *japonicus* (Hidaka), 1961 *(Ischnomorphus)*	Japan, China, Vietnam
synonym: *davidi* S. & A., 1965	
6. *javanus* S. & A., 1965	Java
7. *nicobarensis* Distant, 1909	Malaya, Java, Penang Island, Nicobar Island
8. *ocellatus* S. & A., 1965	Vietnam
9. *papuensis* Slater, 1968	New Guinea
10. *parviceps* Bergroth, 1918	Philippines

11. *philippinensis* Slater, 1968	Philippines
12. *qadrii* S. & A., 1965	India
13. *sesquipedalis* Distant, 1904	Burma, India, Borneo
PRAEBLISSUS	
1. *albopictus* Barber, 1949	Mexico
PRAETORBLISSUS	
1. *gigas* Slater, 1966	Peru
2. *gradus* S. & W., 1968	Peru, Bolivia
3. *obrieni* S. & Ash., 1976	Costa Rica
4. *wilcoxae* S. & Ash., 1976	Peru
PROCELLADEMUS	
1. *consobrinus* S. & W., 1966	Bolivia
2. *venenatus* S. & W., 1966	Peru
PSEUDOBLISSUS new genus	
1. *trispinosus* (Slater), 1967 (*Blissus*)	Madagascar
RAMADADEMUS	
1. *anomalous* Slater, 1967	Madagascar
2. *multispinosus* Slater, 1967	Madagascar
3. *sakalava* Slater, 1967	Madagascar
RETICULATODEMUS	
1. *calcar* S. & W., 1966	Peru
2. *nitidus* S. & W., 1966	Argentina
3. *orbiculatus* S. & W., 1966	Bolivia, Colombia
4. *orbiculoides* S. & W., 1968	Brazil
5. *umbrosus* S. & W., 1966	Mexico
RIGGIELLA	
1. *distinctus* S. & A., 1965	Peru
2. *planus* S. & A., 1965	Brazil
3. *vianai* Kormilev, 1949	Argentina, Paraguay, Peru
SCANSIDEMUS	
1. *peregrinus* S. & W., 1969	Burma
2. *taprobanes* S. & W., 1969	Ceylon
SCINTILLADEMUS	
1. *gemmatus* Slater, 1968	New Guinea, New Britain
SLATERELLUS	
1. *hackeri* Drake & Davis, 1959	Australia
SPALACOCORIS	
1. *nigritus* S. & A., 1964	Java, Borneo
2. *philippinensis* S. & A., 1964	Philippines, Borneo
3. *rufusculus* S. & A., 1964	Sumatra
4. *sulcatus* (Walker), 1872 *(Ischnodemus)*	Vietnam, Malaya, Java, Borneo
5. *sulcifer* Stål, 1874	Vietnam, Malaya, Java, Borneo
TALPOBLISSUS	
1. *cydnoides* (Slater), 1964 *(Blissus)*	South Africa, West Africa
2. *latus* (Distant), 1918 *(Blissus)*	India
TOONGLASA	
1. *forficuloides* Distant, 1893	Mexico
XENOBLISSUS	
1. *lutzi* Barber, 1954	Brazil

KEY TO GENERA OF BLISSINAE OF THE WORLD

1. Dorsal surface of pronotum at least partially pruinose (fig. 4A-N) 2
1a. Dorsal surface of pronotum completely shining or sub-shining completely lacking pruinose areas (except rarely a very narrow pruinose strip along posterior pronotal margin) (fig. 4O) 14
2. Fore coxal cavities open (fig. 6-I) 3
2a. Fore coxal cavities closed (fig. 6K) 6
3. Anterior half of pronotum shining, posterior half pruinose (fig. 67) (Western Hemisphere) 4
3a. Pronotum with various combinations of shining and pruinose but never with anterior half shining and posterior half pruinose (figs. 24, 26) 5
4. Membrane completely white; posterior margin of pronotum tan, strongly contrasting with anterior dark area; body relatively elongate over 4½ mm. (fig. 29) ..... *Caveloblissus*
4a. Membrane dark brown with exception of a transverse sub-basal pale band; posterior pronotal lobe completely dark; body short, much less than 4 mm. in length (fig. 67) ..... *Praeblissus*
5. Dorsal surface of pronotum completely pruinose; apical corial margin of macropters concave (Western Hemisphere) (fig. 24) ..... *Blissus (+Neoblissus)*
5a. Dorsal surface of pronotum partially shining, usually extensively so; apical corial margin of macropters straight (fig. 26) (South Africa) ..... *Capodemus*
6. Fore femora mutic 7
6a. Fore femora spinose 8
7. Anterior half of dorsal surface of pronotum shining, posterior half pruinose (figs. 27, 28) ..... *Cavelerius*
7a. Pronotum either entirely pruinose, or with pruinose and shining areas but never with anterior half completely shining and posterior half pruinose (figs. 43-51) ..... *Ischnodemus*
8. Membrane composed of numerous small reticulate cells (fig. 72) ..... *Reticulatodemus*
8a. Membrane not composed of reticulate cells .9
9. Fore femora with 1-2 spines 10
9a. Fore femora multispinose, at least 4 spines present 11
10. Males with numerous short acute spines on abdominal venter and spurlike development of seventh connexivum (figs. 8A, 34) (Western Hemisphere) ..... *Extarademus*
10a. Males lacking short acute spines on abdominal venter and without a spurlike projection of seventh connexivum ..... *Ischnodemus*
11. Males with genal tusks that project well forward of apex of tylus (fig. 31) (Australian region) ..... *Dentisblissus*
11a. Males without genal tusks or with very short ones that are not visible from above ... 12
12. Middle and hind femora mutic (South Africa) ..... *Ischnodemus*
12a. Middle and hind femora spinose (Neotropical) 13
13. Body very broad and flat; pruinosity on dorsal surface of pronotum confined to collar area and a narrow strip across transverse impression (fig. 73) ..... *Riggiella*
13a. Body relatively slender and elongate; dorsal surface of pronotum predominately pruinose or shining areas occurring as two broad bands, one in area of calli and second across humeri (fig. 61) ..... *Patritius*
14. Fore coxal cavities open (fig. 6-I) 15
14a. Fore coxal cavities closed (fig. 6K) 24
15. Fore femora multispinose (Western Hemisphere) 16
15a. Fore femora mutic or at most with 1 or 2 spines (Eastern Hemisphere) 17
16. Abdominal venter with a prominent stridulitrum on segments 3-6; metathoracic scent gland auricle simple and rounded (figs. 9G, 39) ..... *Heteroblissus*
16a. Abdominal venter lacking a stridulitrum; metathoracic scent gland auricle strongly produced anteriorly (fig. 68) ..... *Praetorblissus*
17. Anterior portion of tylus and juga bearing a series of short sharp thick spines (fig. 78) ..... *Talpoblissus*
17a. Anterior portion of tylus and juga lacking spines 18
18. Fore femora mutic 19
18a. Fore femora with 1 or rarely 2 ventral spines present 22
19. Scutellum with pruinose areas present laterally and/or anteriorly 20
19a. Scutellum completely shining and non-pruinose 21
20. Macropters with apical corial margin straight; brachypters and wings reduced to minute pads (micropters), at most only covering anterolateral area of first abdominal tergum and widely separated from one another mesally; antennae terete (fig. 26) ..... *Capodemus*
20a. Macropters with apical corial margin concave in part; brachypters with wings variable—if

short and padlike then relatively broad and nearly in contact mesally; usually with second and third antennal segments clavate (figs. 32, 33) ..... *Dimorphopterus*

21. Fore tibiae broadly expanded and flattened throughout, with a series of sharp spines running along almost entire margins of shaft (fig. 37) ..... *Geoblissus*

21a. Fore tibiae conventionally terete (figs. 32, 33) ..... *Dimorphopterus*

22. Scutellum completely shining (fig. 54)..... ..... *Macchiademus*

22a. Scutellum at least in part pruinose (figs. 5-I-L) 23

23. Macropters with apical corial margin straight; brachypters with wings reduced to minute pads (micropters), at most only covering anterolateral area of first abdominal tergum and widely separated from one another mesally; antennae terete ..... *Capodemus*

23a. Macropters with apical corial margin concave at least in part; brachypters with wings variable—if short and padlike then relatively broad and nearly in contact mesally, usually with second and third antennal segments clavate ..... *Dimorphopterus*

24. Fore femora mutic 25

24a. Fore femora spinose.....34

25. Hind femora spinose (figs. 64, 65) (Oriental) ..... *Pirkimerus*

25a. Hind femora mutic 26

26. Ovipositor produced conspicuously caudad (fig. 8H, I) (Australian) 27

26a. Ovipositor not conspicuously produced caudad (fig. 8C-G).....28

27. Third antennal segment noticeably narrower than segment 2 (fig. 38); forewing even in brachypters extending over two or three abdominal segments; lateral pronotal margins not sharply carinate; ninth paratergite of female not divided into two distinct sclerites (fig. 8H)..... *Heinsius*

27a. Second and third antennal segments subequal in thickness (fig. 21); forewing reduced to a minute pad not extending posteriorly onto abdominal terga; lateral pronotal margins sharply carinate; ninth paratergite of female divided (fig. 8-I) ..... *Australodemus*

28. Membrane with veins extensively anastomosing (fig. 76) (Australian) ..... *Slaterellus*

28a. Membrane veins not extensively anastomosing 29

29. Metathoracic scent gland auricle curving forward in a scimitar-shaped arc (fig. 9Q), body extremely elongate and slender (fig. 22) (Madagascar) ..... *Barademus*

29a. Metathoracic scent gland auricle ovoid or elliptical (fig. 9B-E, G-I) never curving forward as a scimitar-shaped arc; body often elongate but not usually so 30

30. Corium and clavus short with lateral area of corium thickened and apical margin markedly concave (fig. 23); usually less than 4 mm. in length (Ethiopian, Madagascar) ..... *Blissiella*

30a. Corium not greatly shortened and without strongly thickened lateral portion; apical corial margin straight; at least 5 mm. in length 31

31. Scutellum completely shining, non-pruinose; pronotal hairs elongate, upstanding and laterally directed anteriorly (Neotropical) (figs. 43-51) ..... *Ischnodemus*

31a. Scutellum at least pruinose laterally; pronotal hairs short, usually decumbent, sometimes almost glabrous, never elongate or directed anteriorly 32

32. Scutellum completely pruinose (Neotropical) figs. 43-51) ..... *Ischnodemus*

32a. Scutellum pruinose only laterally 33

33. Six mm. or more in length; labium extending well into mesosternum (Neotropical) (figs. 43-51) ..... *Ischnodemus*

33a. Less than 4 mm. in length; labium extending only between forecoxae (South African) (fig. 20) ..... *Atrademus*

34. Fore femora with only a large bifid spine ventrally near distal ends and a terminal spine distad (fig. 19); fourth antennal segment markedly petiolate (fig. 19) 35

34a. Fore femora either multispinose or with one to four distinctly separated spines; fourth antennal segment usually not markedly petiolate 37

35. Bucculae extended far forward of apex of tylus as broadened flaplike lobes (fig. 18) (Madagascar) ..... *Aradacrates*

35a. Bucculae not strongly produced forward of apex of tylus 36

36. Scutellum with pruinose areas present laterally; prosternum pruinose before and between coxae; membrane of fore wing thickened and opaque (fig. 75) (New Guinea)..... ..... *Scintillademus*

36a. Scutellum and prosternum both completely shining and non-pruinose; membrane of forewing thin and translucent (fig. 19) (Madagascar) ..... *Aradademus*

37. Apex of abdomen with a pair of large elongate projections present (fig. 79) (Neotropical)

..... *Toonglasa*

37a. Apex of abdomen lacking a pair of elongate projections 38

38. Fore femora multispinose (at least three or four spines present) 39

38a. Fore femora with only one or two spines present 51

39. All femora multispinose 40

39a. Middle and hind femora mutic 44

40. Male hind femora much larger and thicker than fore femora (fig. 25) ..... *Bochrus*

40a. Male hind femora not larger and thicker than fore femora 41

41. Metathoracic scent gland auricle strongly curving anteriorly in a crescent-like arc (fig. 12C) (Madagascar (fig. 71) .... *Ramadademus*

41a. Metathoracic scent gland auricle either curving slightly posteriorly, or straight, with a broadened and slightly anteriorly produced distal end 42

42. Body only moderately flattened; metathoracic scent gland auricle not enlarged strongly at distal end but curving slightly posteriorly (figs. 7K, 61) ..... *Patritius*

42a. Body greatly broadened and flattened; metathoracic scent gland auricle nearly straight for most of length but expanded and somewhat produced anteriorly at distal end (fig. 12B) 43

43. Scutellum pruinose laterally; pronotum completely pruinose laterally and ventrally and with a narrow pruinose strip dorsally across collar, ventral surface of head with short acute projections present, mesosternum lacking a median longitudinal furrow (fig. 73) (Neotropical) ..... *Riggiella*

43a. Scutellum and pronotum completely shining, non-pruinose; no projections present on underside of head, mesosternum with a deep median longitudinal furrow (fig. 74) (Oriental) ..... *Scansidemus*

44. Fore tibiae fossorial, enlarged and strongly toothed (fig. 30) (Oriental) 45

44a. Fore tibiae non-fossorial, chiefly terete, sometimes enlarged and swollen at distal ends. 47

45. Lateral half of corium not shining (at most only area of radial vein shining) (fig. 30) ..... *Chelochirus*

45a. Lateral half of corium shining (fig. 77) ...46

46. Pronotum subcylindrical with a deep longitudinal median groove on anterior pronotal lobe (fig. 77); labium not attaining mesosternum ..... *Spalacocoris*

46a. Pronotum sub-flattened, not subcylindrical, lacking a median longitudinal groove on anterior lobe (fig. 53); labium reaching well onto mesosternum ..... *Lucerocoris*

47. Hind tibia not appreciably longer than first metatarsal segment (fig. 35) (Oriental).... ..... *Extaramorphus*

47a. Hind tibia much longer than first metatarsal segment 48

48. Metathoracic scent gland auricle greatly enlarged at distal end (figs. 12A, 69) (Neotropical) ..... *Procellademus*

48a. Metathoracic scent gland auricle variable in shape but not strongly enlarged at distal end (Eastern Hemisphere) 49

49. Apical corial margin deeply concave (fig. 70) ..... *Pseudoblissus*

49a. Apical corial margin straight 50

50. Membrane of nearly uniform texture throughout (figs. 55-58) ..... *Macropes*

50a. Membrane of forewing with basal area dull pruinose, strongly contrasting with shining center portion of membrane (fig. 41)..... ..... *Ischnocoridea*

51. Males with prominent jugal extensions visible from above (figs. 6E-H, 40) (Oriental, Australian) ..... *Iphicrates*

51a. Males without jugal extensions.....52

52. Hind femora spinose (figs. 64, 65) (Oriental) ..... *Pirkimerus*

52a. Hind femora mutic 53

53. Apical corial margin concave 54

53a. Apical corial margin straight 57

54. Body elongate, parallel sided, length six times maximum width (fig. 59) (Madagascar)... ..... *Merinademus*

54a. Body robust, elliptical, not parallel sided, length much less than six times maximum width 55

55. Fore femora with two ventral spines; apical corial margin concave only along inner one-third (fig. 80) (Neotropical) .. *Xenoblissus*

55a. Fore femora with a single ventral spine; apical corial margin deeply concave for entire length (Madagascar) 56

56. Eyes laterally produced; abdomen ovoid; membranes of forewings only partially overlapping (fig. 36) ..... *Gelastoblissus*

56a. Eyes not laterally produced; abdomen elliptical; membranes of forewings completely overlapping (fig. 52) ..... *Lemuriblissus*

57. Metathoracic scent gland auricle lunately curving anteriorly (fig. 9Q) (Africa, Madagascar) ..... *Micaredemus*

57a. Metathoracic scent gland auricle lobate, rounded (fig. 10A) 58

58. Prothorax with pruinosity present on sternum

before coxae and usually on propleural area as well (fig. 5N-R) ..... *Ischnodemus*

58a. Prothorax completely shining both above and below (fig. 20) ..... *Atrademus*

WORLD KEY TO KNOWN FIFTH INSTAR NYMPHS OF THE BLISSINAE

The following key is based upon 24 genera and approximately 102 species. This key must be approached in a very different manner than that used when one is working with keys to the adults. Keys to adults include all the known genera or species, and if they are accurately prepared erroneous results should be obtained only when an undescribed species is involved, where the limits of variation are greater than was known at the time the key was prepared or where an inadvertent error was made in the construction of the key. This is not true of the key to fifth instar nymphs presented below. A great many genera and species of the Blissinae already "exist" for which no nymphs have been available for study. The key, therefore, is to be viewed more as a short hand guide to place an unknown nymph in some position relative to those already known, to indicate many things that it cannot be and, perhaps most importantly, to point up the kinds of characters and character states that appear to be most useful in the segregation of nymphs.

It is already evident that the morphology of the immature stages will ultimately be extremely valuable to phylogenetic analysis of the subfamily.

Slater and Wilcox (1973) have developed a letter coding for the various sclerotized areas of the abdomen. This system (see fig. 7N, O) has been used throughout the following key.

1. TM 2 present ..... *Barademus attenuatus*
1a. TM 2 absent 2
2. TM 3 present (sometimes reduced to a minute mesal spot) 3
2a. TM 3 absent 6
3. TM 4 present and separate from SGA 4-5 .. .. *Dentisblissus venosus*
3a. TM 4 absent, or if present fused with SGA 4-5 4
4. Mesothoracic wing pads sordid yellow .... *Blissiella castanea*
4a. At least distal third of wing pads dark brown 5
5. Fore femora mutic, abdomen a unicolorous sordid yellow; TM 3 ovoid, well developed; TM 6 absent .... *Blissiella micans*
5a. Fore femora with one or two small sharp ventral spines on distal one-third; abdomen variegated with red-brown and yellowish; TM 3 reduced to a minute mesal spot, TM 6 present as a transverse sclerite covering most of posterior half of tergum ..... *Ischnodemus sinuatus*
6. TM 4 present (sometimes reduced to a very small spot) 7
6a. TM 4 absent or fused with SGA 4-5 8
7. Abdomen (with exception of sclerites) uniformly dark red; SM 4 absent .... *Iphicrates nigritus*
7a. Abdomen a variegated red, yellow, and brown; SM 4 present, large and conspicuous ..... *Scintillademus gemmatus*
8. TM 5 present, distinctly differentiated 9
8a. TM 5 absent or fused with SGA 13
9. Fore femora mutic .... *Ischnodemus brunnipennis*
9a. Fore femora armed below with two or more spines 10
10. Fore femora armed below with two to threee spines 11
10a. Fore femora multispinose 12
11. TPC row conspicuous, composed of prominent black spots and dashes; TM 6 a narrow transversely elongate bar .... *Macropes lobatus*
11a. TPC row absent; TM 6 trianguloid .... *Macropes crassifemur*
12. Antenniferous tubercles truncate (fig. 6A, B), not produced anteriorly; head, pronotum, scutellum and mesothoracic wing pads a uniformly sordid yellow or yellowish brown; legs yellow ... *Iphicrates spathus*
12a. Antenniferous tubercles hooked (fig. 6E-G), distinctly produced antero-laterad into a blunt point; head, pronotum, scutellum, and proximal one-third of mesothoracic wing pads dark red-brown, remainder of wing pads shading to a contrasting bright yellowish brown; legs chiefly dark brown ..... *Iphicrates papuensis*
13. SM 4 present, distinct .... *Macropes* prob. *lobatus*
13a. SM 4 absent 14
14. SM 5 present and distinct 15
14a. SM 5 absent (sometimes a few small dots present)[1] 22

[1]This character is somewhat variable. With only a small series it may be desirable to "run" both ways at this couplet.

15. Fore femora armed below with only one to three short sharp spines 16
15a. Fore femora multispinose 21
16. TL 6 present 17
16a. TL 6 absent ..... *Dimorphopterus annulatus*
17. Fore femora armed below with three short sharp apines; antennal segments 2 and 3 brown ..... *Micaredemus coatoni*
17a. Fore femora armed with two spines (rarely one, sometimes a "hair" spine) (if vestige of third spine present then antennal segments 2 and 3 yellow, not brown) ... 18
18. Head, pronotum, scutellum, and wing pads light yellowish brown ..... *Micaredemus obscurellus*
18a. Head, pronotum, scutellum, and wing pads dark brown to black 19
19. Abdomen uniformly creamy white to yellowish white ..... *Micaredemus pusillus*
19a. Abdomen with red, yellow, and tan markings, or with terga 2 and 3 tan and 4 through 7 bright yellow 20
20. Antennal segments 2 and 3 yellow, strongly contrasting with dark brown fourth segment; abdominal segments 3-7 with red and yellow markings; labium relatively elongate, reaching between fore coxae, second segment attaining base of head (Madagascar Morojejy, 14°26′ S, 49°44′ E) ..... *Micaredemus* sp.
20a. Antennal segments 2 and 3 red-brown, not strongly contrasting with dark brown fourth segment; abdomen yellow and tan, lacking red markings; labium shorter, not reaching anterior margin of fore coxae, second segment remote from base of head (Madagascar Andranomalaza, 25°12′S, 46°52′E) ..... *Micaredemus* sp.
21. TL 6 present ..... *Macropes major*
21a. TL 6 absent ..... *Macropes* nr. *privus*
22. TL 6 present (sometimes reduced to a few small dots) 23
22a. TL 6 absent 30
23. Fore femora mutic 24
23a. Each fore femora armed below with one or more spines 26
24. Labium elongate, extending well beyond metacoxae ..... *Ischnodemus brincki*
24a. Labium shorter, not reaching metacoxae .. 25
25. TM 6 absent, mesothoracic wing pads relatively small, not attaining posterior margin of metanotum .... *Ischnodemus proprius*
25a. TM 6 present, distinct; wing pads conventional, reaching over anterior margin of tergum 3 ..... *Ischnodemus praecultus*
26. Abdomen with posteriorly directed spines present laterally on terga 8 and 9 ..... *Macropes australis*
26a. Abdomen lacking spines on terga 8 and 9 .. 27
27. Each fore femur armed below with a single spine ..... *Extarademus collaroides*
27a. Each fore femur with two or more spines present 28
28. Mesothoracic wing pads dark, with a prominent contrasting white macula in mesal area ..... *Macropes albosignatus*
28a. Wing pads completely dark brown, or with mesal area yellowish brown but without a contrasting white macula present 29
29. Abdomen variegated with red and yellow; TM 7 remote from anterior margin of tergum 7, TML 7 present and distinct; TPC row absent or reduced to minute spots ..... *Patritius grossus*
29a. Abdomen uniformly dark red; TM 7 covering entire tergum, TML 7 absent or fused; TPC row present with spots prominent .. *Macropes burmanus*
30. SGA sclerites greatly enlarged into a prominent ovoid or quadrate patch, dark and strongly contrasting with remainder of tergal surface 31
30a. SGA sclerites usually larger than SGP but not greatly enlarged into a prominent partch (if appearing enlarged then nearly unicolorous with remainder of tergal surface) 37
31. All femora multispinose; posterior TML spots greatly enlarged, as large as or larger than SGA sclerites ... *Ramadademus sakalava*
31a. At most only fore femora spinose; TML spots not greatly enlarged, smaller than SGA sclerites 32
32. Fore femora multispinose ..... *Ischnocoridea elegans*
32a. Fore femora mutic or with only a single spine present 33
33. Fore femora mutic ..... *Cavelerius saccharivorius*
33a. Fore femora with a single ventral spine present 34
34. TM 6 present as a very narrow transverse dash; tergum 3 reddish brown with a strongly contrasting yellow patch on each anterolateral area ..... *Extarademus collaroides*
34a. TM 6 absent; tergum 3 nearly uniformly yellowish, tan or red-brown 35
35. Labium relatively short, remote from fore

coxae, third segment barely attaining base of head; tergum 6 with contrasting red and yellow coloration ..... *Extarademus humerus*

35a. Labium longer, reaching at least between fore coxae; tergum 6 nearly uniformly deep pink, creamy yellow or tan 36

36. Labium relatively elongate, one-half of fourth segment reaching onto mesosternum; tergum 6 deep pink ..... *Extarademus mundus*

36a. Labium shorter, at most attaining anterior margin of mesosternum; tergum 6 creamy yellow or tan ..... *Extarademus macer*

37. TM 7 absent 38

37a. TM 7 present (sometimes nearly unicolorous with remainder of tergum; in some species reduced to a narrow transverse dash on either side of midline near posterior margin) 40

38. TML row present, spots prominent ..... *Extarademus macer*

38a. TML row absent 39

39. Fore femora armed below with two small and one large tuberculate spines on distal one-third, abdomen chiefly sordid yellow; usually micropterus, wing pads not extending beyond metanotum ..... *Heteroblissus anomilis*

39a. Fore femora with a single small spine below; abdomen creamy white; macropterus, wing pads extending over anterior half of abdominal tergum 3 ... *Heinsius pallidus*

40. TMA 7 present as a distinct (sometimes very small) spot (or if appearing obsolete then abdominal terga 3-7 uniformly pink and antennal segment 4 three and a half times as long as segment 3) 41

40a. TMA 7 absent or fused 49

41. Fourth antennal segment very elongate and robust, nearly three and a half times length of segment 3 ..... *Ischnodemus noctulus*

41a. Fourth antennal segment shorter, never more than three times as long as segment 3 42

42. Fore femora with a single very small sharp ventral spine present ..... *Capodemus variabilis*

42a. Fore femora mutic 43

43. SM 6 absent 44

43a. SM 6 present and well developed 46

44. TM 7 mesally divided into two separate patches ..... *Ischnodemus sabuleti*

44a. TM 7 a single undivided plate 45

45. Abdomen uniformly dull yellow ..... *Atrademus maritimus*

45a. Abdomen with terga 1 and 2 white, contrasting with dull brown color of terga 3 through 7 ..... *Ischnodemus asciaformis*

46. Anterior margin of TM 7 and SG sclerites broadly margined with black which contrasts strongly with dark yellowish brown color of remainder of sclerites; color deep orange ..... *Capodemus elegiae*

46a. TM and SG sclerites either uniformly colored throughout or with only very narrow incomplete traces of black margins; color light yellow or pink 47

47. SG 5-6 sclerotization elliptical, nearly twice as wide as long (longitudinally) ..... *Capodemus sabulosus*

47a. SG 5-6 sclerotization rectangular, much less than one and three-fourths times as wide as long 48

48. TML 7 and TMA 7 connected to form a completely sclerotized mesal area anteriorly on tergum; SM 7 very broadly truncate at anterior end ..... *Capodemus herbosus*

48a. TML 7 and TMA 7 not connected, forming three distinctly separated sclerites anteriorly on tergum; SM 7 oval, rounded, not broadly truncate at anterior end ..... *Capodemus pentameri*

49. TM 7 divided into two separate patches, one on either side of midline (sometimes narrowly fused posteriorly) 50

49a. TM 7 not completely divided into two separate sclerites 58

50. Fore tibiae greatly enlarged with 4-5 heavy spines at distal end and a row of stout spines along shaft 51

50a. Fore tibiae not greatly enlarged and spinose 52

51. Small species, under 4 mm.; fore femora mutic ..... *Geoblissus mekongensis*

51a. Larger species, over 7 mm.; fore femora multispinose ..... *Lucerocoris nigrotibialis*

52. Labium relatively elongate, attaining or exceeding mesocoxae 53

52a. Labium shorter, not attaining mesocoxae .54

53. TML row present . *Dimorphopterus cornipes*

53a. TML row absent ..... *Blissus leucopterus*

54. Body unicolorous, sordid yellow to white (except often a diffuse red in scent gland area) ..... *Ischnodemus genei*

54a. Abdomen red or light brown 55

55. Wing pads sordid yellow; abdomen red .... *Ischnodemus parathoracicus*

55a. Wing pads dark brown; abdomen light brown 56
56. Fore femora with a single sharp ventral spine present ... *Dimorphopterus brachypterus*
56a. Fore femora mutic 57
57. SM 6 broad, trianguloid, posterior margin in contact with SM 7 ..... *Dimorphopterus* sp. (Laos)
57a. SM 6 smaller, irregularly ovoid, remote from posterior margin of sternum and not in contact with SM 7 ..... *Ischnodemus nigrocephalus*
58. Abdomen with at least mesal area of terga 1 and 2 opaque white or yellowish and strongly contrasting with darker mesal area of tergum 3 59
58a. Abdomen with at least tergum 2 (although sometimes light colored) not strongly contrasting with tergum 3 76
59. TM 6 present (in some specimens reduced to a few small spots) 60
59a. TM 6 absent 68
60. Fore femora mutic 61
60a. Fore femora armed below with 1 or more short sharp spines 65
61. TM 7 large, quadrate, uniformly black ... 62
61a. TM 7 smaller, distinctly narrowed anteriorly, reddish or yellowish brown, sometimes laterally bordered with black 63
62. Antennal segments 1-3 a unicolorous sordid yellow; SM 6 present as a median triangular sclerite ..... *Ischnodemus fulvipes*
62a. Antennal segment 3 (and 4) nearly black, strongly contrasting with sordid yellow coloration of segments 1 and 2; SM 6 absent ..... *Ischnodemus oblongus* ?
63. Antennae uniformly dark red-brown to black; wing pads dark red-brown; TM 7 reddish brown 64
63a. Antennae with segments 1 and 2 sordid yellow, 3 and 4 becoming red-brown; wing pads honey yellow; TM 7 yellowish brown ..... *Ischnodemus* nr. *pulchellus*
64. TM 7 distinctly bordered with black; terga 3-5 with yellow areas anterolaterally that strongly contrast with mesal and posterior red areas ..... *Ischnodemus pulchellus*
64a. TM 7 not distinctly bordered with black; terga 3-5 nearly uniformly red with at most diffuse indistinct light areas anterolaterally not strongly contrasting with remainder of tergum ..... *Ischnodemus robustus*
65. Abdomen a nearly unicolorous pale yellow 66
65a. Abdomen variously colored, often variegated and banded, never uniformly pale yellow 67
66. Pronotum uniformly dark chocolate brown to black ..... *Atrademus capeneri*
66a. Pronotum bicolored with anterior two-thirds dark brown to black, posterior one-third a strongly contrasting testaceous to white ..... *Macchiademus angustus*
67. Pronotum uniformly dark brown to black ..... *Macchiademus diplopterus*
67a. Posterior one-third of pronotum white, strongly contrasting with dark anterior area (see Slater and Wilcox 1973, pp. 100, 111-112) ..... *Macchiademus* sp. I
68. TL 7 absent 69
68a. TL 7 present (somtimes reduced) 70
69. Pronotum and scutellum dark chocolate brown ..... *Blissus sweeti*
69a. Pronotum and scutellum honey yellow to light brown (Arizona) ..... *Blissus* sp.
70. TML spots large and conspicuous, especially posteriorly 71
70a. TML spots absent or very small and inconspicuous, or nearly unicolorous with remainder of dorsal surface 72
71. Fore femora mutic ..... *Dimorphopterus blissoides*
71a. Fore femora with a prominent sharp ventral spine present .. *Dimorphopterus zuluensis*
72. Labium relatively elongate, at least attaining posterior margin of mesocoxae 73
72a. Labium shorter, not attaining anterior margin of mesocoxae 74
73. Fore femora armed below with a single short stout spine ..... *Dimorphopterus pilosus*
73a. Fore femora mutic 75
74. Fore coxal cavities open (fig. 6-I) ..... *Dimorphopterus latus*
74a. Fore coxal cavities closed (fig. 6K) ..... *Ischnodemus nigrocephalus*
75. Antennae uniformly reddish brown ..... *Praeblissus albopictus*
75a. Antennae with segment 1-3 yellowish brown, segment 4 strongly contrasting red brown (or if segments 1-3 darker brown, labium barely attaining metacoxae, not reaching onto abdomen) ..... *Blissus* sp.[1]
76. TL 7 absent, fused or reduced to tiny dot .. 77
76a. TL 7 present, distinct and well developed .. 83
77. TM 6 absent 78

[1]See generic discussion of *Blissus*.

77a. TM 6 present 79
78. SM 6 nearly obsolete, reduced to a diffuse ovoid mesal patch, nearly unicolorous with remainder of sternum (S. Dakota) ..... *Blissus* sp.
78a. SM 6 small but distinct, light brown, contrasting with yellow sternum, transversely rectanguloid (Nicaragua) ..... *Blissus* sp.
79. Each fore femur armed below with a large bifid spine ..... *Macropes varipennis*
79a. Fore femora mutic 80
80. Abdomen nearly unicolorous, lacking variegated red, yellow, or orange markings (except diffuse areas where scent glands are visible) ..... *Ischnodemus falicus*
80a. Abdomen not unicolorous, variously marked with red, yellow, or orange 81
81. Mesothoracic wing pads uniformly dark chocolate brown ... *Ischnodemus conicus*
81a. Mesothoracic wing pads with at least distal two-thirds sordid yellow to testaceous 82
82. Large species, 6 mm. in length; abdominal terga 3-5 tinged with red along posterior margins ..... *Ischnodemus badius*
82a. Smaller species, less than 3.5 mm. in length; abdominal terga 3-5 yellow and white, not tinged with red along posterior margins, red only mesally where scent glands are visible ..... *Ischnodemus slossoni*
83. Abdomen dark red to red-brown on at least terga 3-7, lacking light markings (although sometimes becoming lighter along lateral margins) 84
83a. Abdomen variously colored with at least some light markings present on terga 3 and 4, or terga 3-7 unicolorous reddish orange, yellowish or gray without light markings 88
84. Fore femora mutic 85
84a. Each fore femur armed below with 1-2 spines 87
85. Abdominal terga 1 and 2 light yellow mesally, strongly contrasting with dark red coloration of remainder of tergum .... *Capodemus rusticus*
85a. Only abdominal tergum 1 light yellow mesally, tergum 2 uniformly red-brown or red and white 86
86. Labium elongate, reaching between metacoxae ..... *Dimorphopterus syrtis*
86a. Labium much shorter, at most attaining posterior margin of prosternum .... *Ischnodemus oblongus*
87. Fore femora armed below with two spines; TM 6 present and prominent (See Slater and Wilcox 1973, pp. 69-70) .... *Macropes* sp. I
87a. Fore femora armed below with a single spine; TM 6 absent .. *Dimorphopterus littoralis*
88. Fore femora multispinose, spines stout, of various lengths and scattered, often curved 89
88a. Fore femora mutic or with 1-2 spines or a bifid spine present; if occasionally 3-5 spines present, these slender, straight, of nearly equal length and placed in a straight row 94
89. TPC row absent ..... *Macropes obnubilis*
89a. TPC row present (sometimes spots reduced) 90
90. Abdomen nearly uniformly reddish orange, sclerites only slightly darkened, not strongly contrasting with remainder of tergum ..... *Macropes subauratus* (?)
90a. Abdomen not uniformly reddish orange; sclerites distinctly darkened and contrasting with tergal surface 91
91. TM 7, TMA 7 and TML 7 fused into a single sclerite ..... *Macropes punctatus* (?)
91a. TML 7 separate or narrowly fused across meson but distinctly separated from anterior margin of TM 7 92
92. Large species, over 6 mm. in length; all femora multispinose ..... *Patritius laevus*
92a. Smaller species, under 5.5 mm. in length; only fore femora multispinose 93
93. TML 7 and TMA 7 fused across meson but distinctly separate from sinuate anterior margin of TM 7 .... *Macropes harringtonae*
93a. TML 7, TMA 7 and TM 7 fused into a single sclerite with a straight anterior margin ..... *Macropes yoshomotoi*
94. TPC row absent 95
94a. TPC row present, spots sometimes very small 99
95. Abdomen chiefly light brown with contrasting white areas mesally on tergum 1 and a longitudinal patch on preconnexival area of terga 4 and 5; TM 7 nearly in contact with posterior margin of tergum 6 .... *Ischnodemus linearis*
95a. Abdomen white, testaceous, or unicolorous tan, lacking contrasting white areas; TM 7 small, remote from posterior margin of tergum 6 96
96. Head, pronotum, scutellum, and wing pads sordid yellow; antennal segments 1 and 2 testaceous, much lighter than brown seg-

ments 3 and 4 (some populations of *capeneri* have the head, pronotum, scutellum, and wing pads dark brown to black, but antennal segments 1 and 2 are light testaceous) ..... *Atrademus capeneri*

96a. Head, pronotum, scutellum and wing pads dark brown; antennae unicolorous brown 97

97. Fore femora armed below with 1 or 2 spines ..... *Capodemus bispinosus*

97a. Fore femora mutic 98

98. Larger species, length 4.80 mm. or more; TML row present as small but distinct spots on tega 4-6 ..... *Dimorphopterus gibbus*

98a. Smaller species, total length not over 2.76; TML row absent ..... *Blissus mixtus*

99. TM 6 present 100

99a. TM 6 absent, or at most represented by a few small dots 108

100. Fore femora mutic 101

100a. Fore femora armed below with one or more spines 103

101. TM 7 uniformly dark brown ..... *Ischnodemus obversus*

101a. TM 7 red-brown, bordered laterally with black 102

102. Dorsal preconnexival area, at least on terga 3-5, with anterior half yellow, posterior half contrasting red or orange ..... *Ischnodemus pulchellus*

102a. Preconncexival area uniformly dull yellowish or reddish, sometimes with a narrow longitudinal stripe present near lateral margins ..... *Ischnodemus praecultus*

103. Abdomen variegated red, white, and gray .. *Ischnodemus ochripes*

103a. Abdomen nearly uniformly gray, yellow or brownish yellow 104

104. Fore femora with three ventral spines present; labium relatively elongate, reaching well onto mesosternum, third segment surpassing fore coxae; abdomen brownish yellow 105

104a. Fore femora with a single spine below; labium relatively short, at most barely exceeding fore coxae 107

105. Pronotum with posterior one-fourth pale yellow, strongly contrasting with dark brown remainder of surface (See Slater and Wilcox 1973, pp. 100, 112) ..... *Macchiademus* sp. II

105a. Pronotum unicolorous light or dark brown 106

106. Head and pronotum very dark brown to black; SM 6 large, broadly in contact with both posterior and anterior margins of sternum; TML spots large and conspicuous on all terga, much larger than TPC spots ..... *Iphicrates papuensis*

106a. Head and pronotum reddish brown; SM 6 smaller, not attaining anterior or posterior margins of sternum; TML spots small and inconspicuous, only slightly larger than TPC spots ..... *Iphicrates angulatus*

107. Abdomen bright yellow; wing pads honey yellow ..... *Ischnodemus brevicornis*

107a. Abdomen gray; wing pads dark brown ..... *Ischnodemus diplachne*

108. Fore femora with 1 or 2 distinct sharp ventral spines present 109

108a. Fore femora mutic 110

109. Abdominal terga 3-7 nearly uniformly tan; wing pads dark brown ..... *Iphicrates angulatus*

109a. Abdomen banded red and yellow; wing pads honey yellow (Natal, S. Africa) ..... *Ischnodemus* sp.

110. Abdomen nearly unicolorous reddish, yellowish or tan, lacking contrasting light or dark patches 111

110a. Abdomen with at least terga 3 and 4 marked with contrasting red or yellow patches 113

111. TMA 7 and TML 7 separate, and not fused with TM 7; antennae unicolorous dark brown ..... *Dimorphopterus gibbus*

111a. TMA 7 and TML 7 fused at least across meson and also fused with TM 7 either mesally or completely; first three antennal segments yellow to light brown 112

112. SM 6 present, large trianguloid; TMA 7, TML 7, and TM 7 fused into a single large sclerite ..... *Ischnodemus proprius*

112a. SM 6 absent; TMA 7 and TML 7 fused across meson but connected with TM 7 only mesally, distinctly separate laterally (Machadodorp, TVL, South Africa) ..... *Ischnodemus* sp.

113. Head, pronotum, scutellum, and wing pads honey yellow; TMA 7 present and separate from TM 7 and TML 7; TML and TPC rows very large and conspicuous ... *Capodemus wilcoxae*

113a. Head, pronotum, scutellum and basal third of wing pads dark brown to nearly black, remainder of wing pads becoming lighter brown; TMA 7 absent or fused with TM 7 or TML 7; TML and TPC rows conventional, not large and conspicuous ..... *Patritiodemus dilutipes*

GENERA AND NUMBER OF SPECIES OF EACH PRESENT IN KEY TO FIFTH INSTAR NYMPHS

Atrademus 2 of 4
Barademus 1 of 1
Blissiella 2 of 5
Blissus 6+ of 24
Capodemus 8 of 15
Cavelerius 1 of 10
Dentisblissus 1 of 4
Dimorphopterus 11 of 35
Extarademus 4 of 8
Geoblissus 1 of 8
Heinsius 1 of 2
Heteroblissus 1 of 1
Iphicrates 4 of 15
Ischnocoridea 1 of 1
Ischnodemus 27 of 94
Lucerocoris 1 of 2
Macchiademus 4 of 5
Macropes 14 of 40
Micaredemus 5 of 16
Patritiodemus 1 of 8
Patritius 2 of 7
Praeblissus 1 of 1
Ramadademus 1 of 3
Scintillademus 1 of 1

Genera with nymphs known—24
Genera with nymphs unknown—22

DIAGNOSES OF GENERA

ARADACRATES SLATER AND WILCOX
Figure 18

Aradacrates Slater and Wilcox, 1968, p. 439.

TYPE SPECIES: *Aradacrates cochlear* Slater and Wilcox. Monobasic.

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, slender, linear. Metathoracic scent gland auricle elongate, narrow, slightly curving anteriorly, enlarged toward distal end. Fore femora short, incrassate, armed below on distal third with a very large bifid spine; middle and hind femora bearing several short, sharp spines. Tibiae very short, clavate, with several teeth present along shaft, hind tibiae bearing several small teeth along lateral margins. First tarsal segment of fore leg elongate, swollen, bearing a mat of soft hairs below. Entire body shining, no pruinose areas present. Apical corial margin slightly concave along inner portion. Membrane thin, hyaline, differentiated from clavus and corium, latter thickened along radial vein. Fore coxal cavities closed. Abdominal segments two through five fused without visible sutures. Ocelli small. Antennae with second and third segments clavate. Bucculae extending forward of tylus as large expanded semielliptical dorsally excavated flanged plates. Claspers somewhat scimitar shaped, inner projection absent, outer projection small and trianguloid. Sperm reservoir greatly reduced, wings absent, central cuplike area represented only by a small protruding scalelike projection arising from ejaculatory duct. Ovipositor unknown.

ARADADEMUS SLATER
Figure 19

Aradademus Slater, 1967, p. 5

TYPE SPECIES: *Aradademus mirificus* Slater. By original designation.

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Elongate, robustly linear. Metathoracic scent gland auricle elongate, strongly angled anteriorly to form an "L"-shaped structure (fig. 9O) or elongate, straight and enlarged at distal end (fig. 9M). Fore femora armed below with a large bifid spine. Fore tibiae short, swollen. Entire body completely shining and non-pruinose. Apical corial margin strongly concave. Membrane much thinner than corium. Fore coxal cavities closed. Ocelli small. Antenniferous tubercles large and curved. Fourth antennal segment with a narrow nearly pediculate proximal end. Sperm reservoir reduced to a tapering scalelike median projection and a pair of minute elliptical wings far removed from central projection. Spermatheca with very short thick pump (fig. 2C).

KEY TO SPECIES OF *ARADADEMUS*

1. Eyes very small and sessile, area behind eye swollen and enlarged, extending laterad nearly as far as eye (fig. 19) .... *mirificus* Slater

1a. Eyes large, occupying greater part of lateral

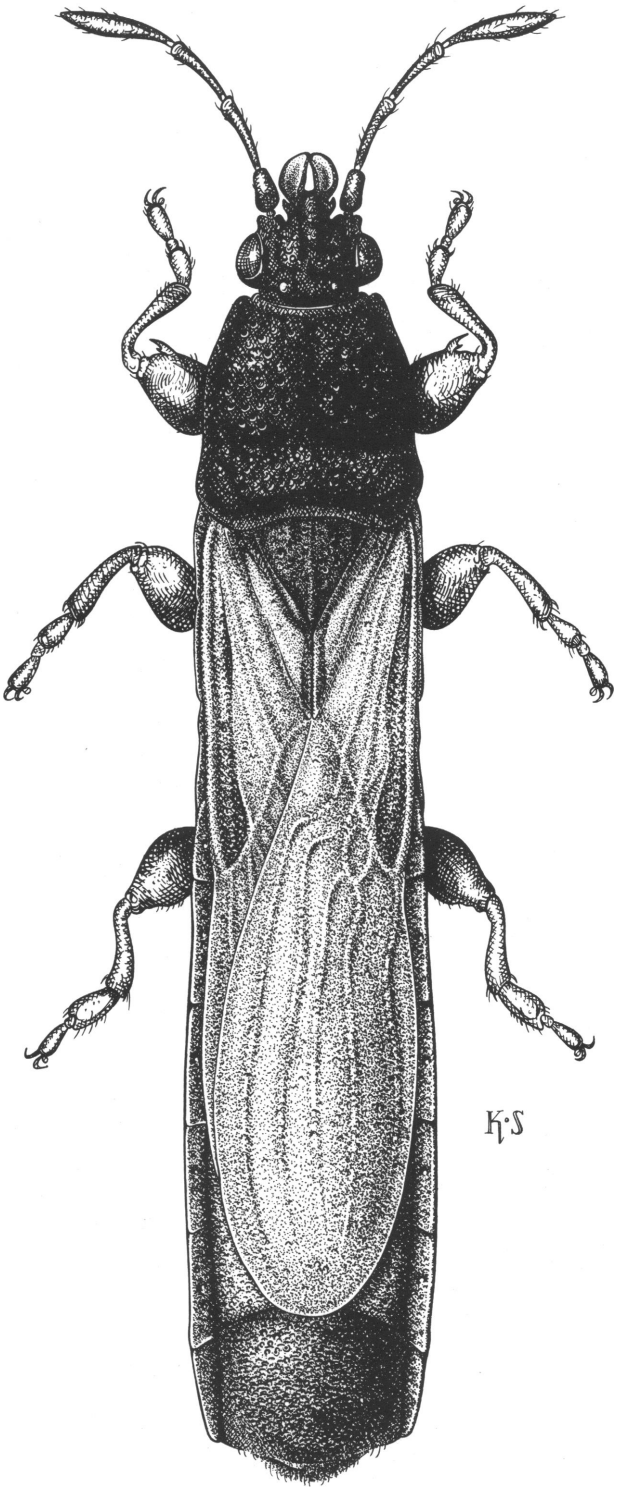


FIG. 18. *Aradacrates cochlear*, dorsal view.

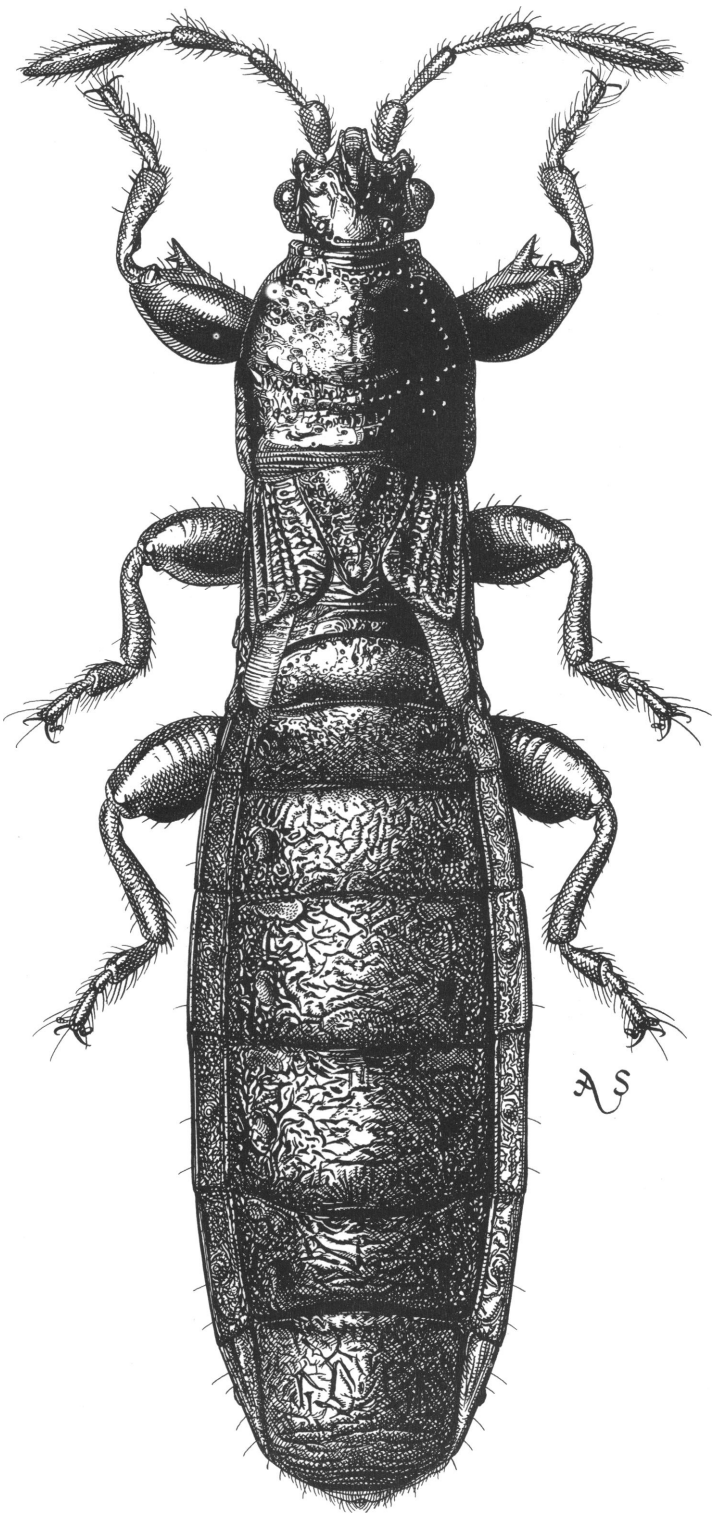


FIG. 19. *Aradademus mirificus*, dorsal view.

head margin, head strongly constricted and narrowing immediately behind eye ....*oculatus* Slater

ATRADEMUS SLATER
Figure 20

Atrademus Slater, 1967, p. 45.

TYPE SPECIES: *Ischnodemus capeneri* Slater. By original designation.

DISTRIBUTION: Africa, Madagascar.

BIOLOGY: Species known to breed on several genera of Gramineae.

DIAGNOSIS: Elongate, slender, linear; metathoracic scent gland auricle short, rounded, earlike; fore femora usually with one or two spines, occasionally mutic; head and thorax completely shining above, below almost completely shining at most with a small pruinose area on venter before anterior coxae; scutellum with pruinosity usually present basally and sometimes laterally; apical corial margins of macropters straight; brachypters and micropters common; membrane translucent, much thinner than corium; fore coxal cavities closed; ocelli small; antennae terete or slightly clavate; sperm reservoir cup large, wings elongate, slender, straplike; ovipositor elongate. Spermatheca with pump very elongate, curved and swollen distally (fig. 2R).

KEY TO SPECIES OF *ATRADEMUS*

1. Fore femora mutic; labium relatively short, reaching posteriorly only between fore coxae (South Africa) (fig. 20) ....*maritimus* S. & W.

1a. Fore femur with one or more ventral spines, or if mutic then labium longer, extending at least to middle of mesosternum 2

2. Labium very short not reaching mesosternum (Madagascar) .....*allaudi* Slater

2a. Labium much more elongate extending posteriorly at least to middle of mesosternum (South Africa) 3

3. Labium very elongate, extending well onto abdomen, third segment attaining anterior margins of metacoxae; macropters only known, with membrane of fore wing chiefly light brown, white only on apical one-third and as a diffuse patch adjacent to posterior end of corium .....*fusconervosus* (Stål)

3a. Labium shorter, not or barely reaching posterior margin of mesosternum; usually brachypterous or micropterous, macropters with membrane of forewing opaque white, only veins light brown or sometimes with a small diffuse brown area on center of disc ....*capeneri* (Slater)

AUSTRALODEMUS SLATER AND SWEET
Figure 21

Australodemus Slater and Sweet, 1963, p. 53.

TYPE SPECIES: *Australodemus elongatus* Slater and Sweet. Monobasic.

DISTRIBUTION: Australia.

BIOLOGY: Unknown.

DIAGNOSIS: Body very narrow and elongate, not flattened; metathoracic scent gland auricle small, rounded, earlike; fore femora with a single small spine present; head and pronotum of a somewhat dull appearance but without any indication of pruinosity either above or below, surface texture usually somewhat masked by presence of numerous flattened scalelike hairs; only micropters known; fore coxal cavities closed; ocelli small; antennae terete but very thick and stout; sperm reservoir reduced to a small median, distally rounded protrusion (fig. 1EE, FF). Ovipositor elongate, paratergites eight and nine strongly produced caudad of segment eight (fig. 8-I). Spermatheca with a simple non-flanged bulb and a short narrow pump.

BARADEMUS SLATER
Figure 22

Barademus Slater, 1967, p. 13.

TYPE SPECIES: *Barademus attenuatus* Slater. Original designation.

DISTRIBUTION: Southern Africa, Madagascar.

BIOLOGY: Known to breed on *Ischaemun arcuatum* (Nees) Stapf. (Panicoideae, Andropogoneae).

DIAGNOSIS: Body extremely elongate, slender, parallel sided, non-flattened; metathoracic scent gland auricle scimitar-shaped (fig. 9Q) curving forward; all femora mutic; head and pronotum above and scutellum completely shining; no trace of pruinosity laterally or ventrally, even corium and clavus completely shining; apical corial margins slightly concave; membrane hyaline, strongly differenti-

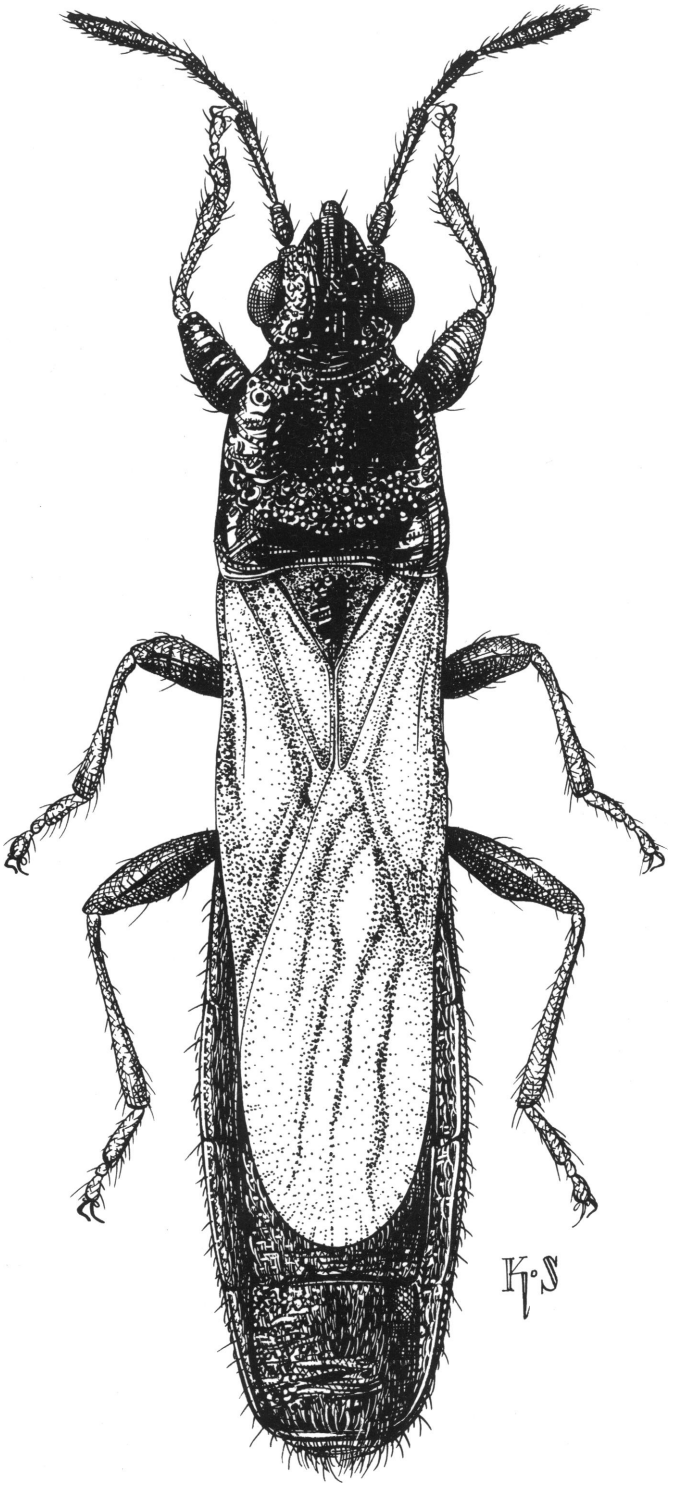


FIG. 20. *Atrademus maritimus*, dorsal view.

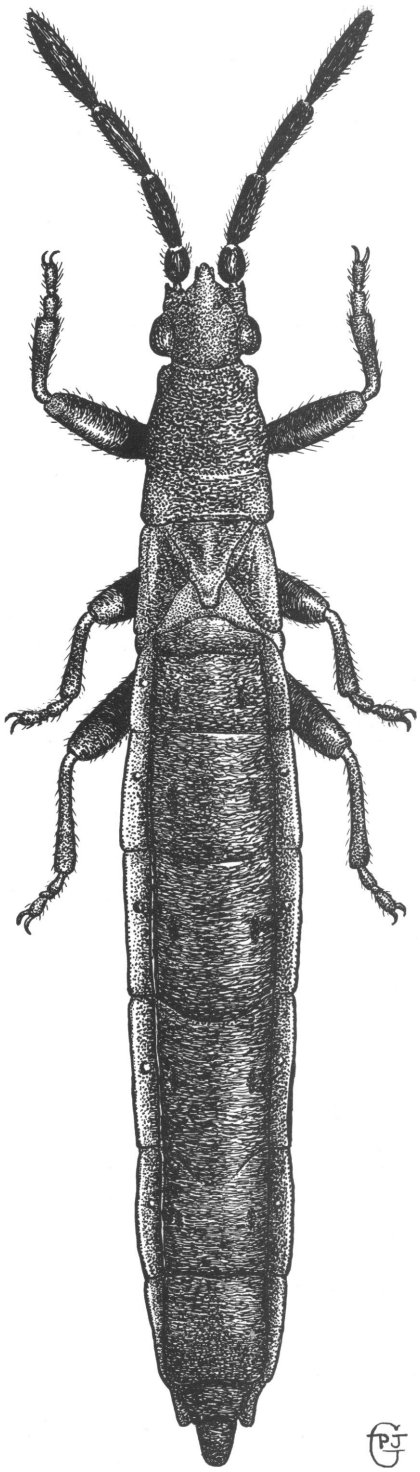


FIG. 21. *Australodemus elongatus*, dorsal view.

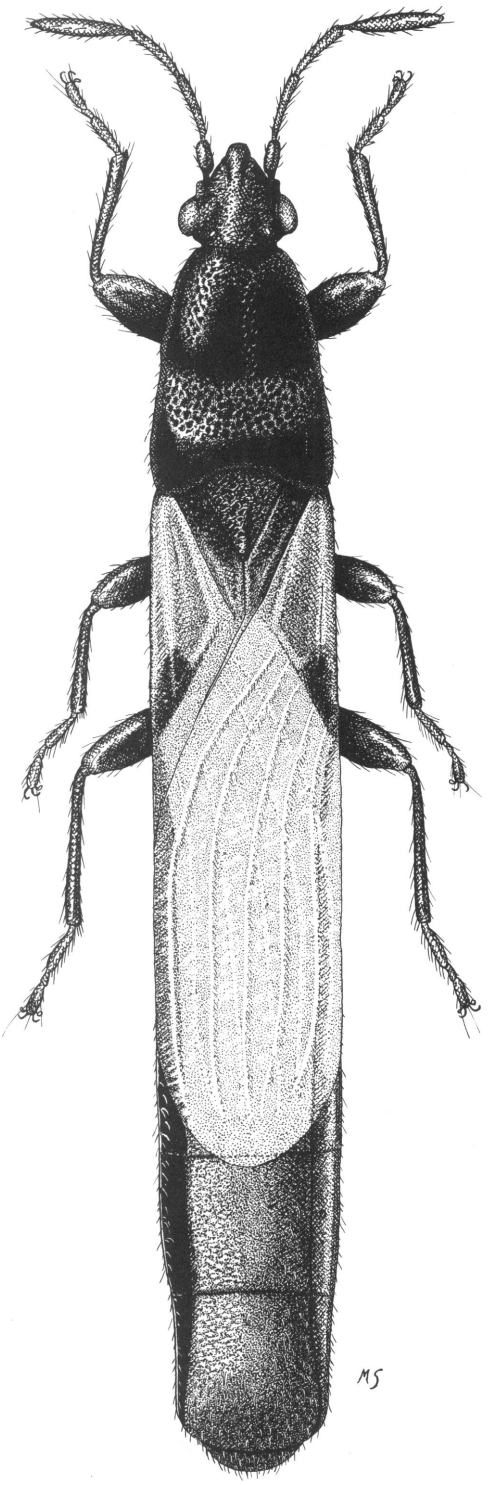


FIG. 22. *Barademus attenuatus*, dorsal view.

ated from corium; wing polymorphism present; fore coxal cavities closed; ocelli small; antennae terete; sperm reservoir greatly reduced, bulb minute, lacking wings; ovipositor elongate. Spermatheca with short simple pump (fig. 2G).

BLISSIELLA SLATER
Figure 23

Blissiella Slater, 1967, pp. 17, 19.

TYPE SPECIES: *Ischnodemus castaneus* Slater. Original designation.

DISTRIBUTION: Africa, Madagascar.

BIOLOGY: Known to breed on several genera of Gramineae.

DIAGNOSIS: Body thick, rather robust, elongate or stout, not flattened; scent gland auricle very small, rounded, button-like or earlike; all femora mutic; head, pronotum and scutellum completely shining; no pruinosity below, even corium and clavus completely shining; apical corial margin concave; corium considerably shortened even when an elongate membrane is present, thickened distally and heavily so along radial vein; brachyptery frequent; membrane nearly hyaline, strongly differentiated from corium; fore coxal cavities closed; ocelli small; antennae clavate; eyes large occupying most of lateral head surface, but not projected on a shelf; sperm reservoir with distally expanded bulb and small straplike wings (fig. 1Z, DD). Ovipositor elongate. Spermatheca with very short simple pump (fig. 2E).

KEY TO SPECIES OF *BLISSIELLA*

1. Small species, total length under 3.0 2
1a. Larger species, total length over 3.0.....3
2. Coloration black; eyes sessile and little extended beyond lateral head curvature; combined length of antennal segments 3 and 4 subequal to or slightly greater than head width (45:44, 47:44) (Madagascar) (fig. 23) .....*pauliani* Slater
2a. Coloration castaneus; eyes relatively larger and produced noticeably away from lateral head curvature; combined lengths of antennal segments 3 and 4 less than head width (Madagascar) .....*castanoides* Slater
3. Relatively large species, total length 5.0-6.0 mm. (Africa) .....*nidus* (Slater
3a. Smaller species, total length under 5.0 mm... 4
4. Dorsal surface bearing prominent sub-decumbent nearly tomentose silvery hairs (fig. 5E); color generally dark brown; antennal segment 2 one-fourth longer than segment 3 and at least two-thirds length of segment 4 (Africa; Madagascar) .....*castaneus* (Slater)
4a. Dorsal surface appearing nearly glabrous, bearing only short, non-tomentose hairs (fig. 5F); color usually black, shining; antennal segments 2 and 3 subequal in length, segment 2 only slightly more than one-half length of segment 4 (Africa) .....*micans* (Slater)

BLISSUS BURMEISTER
Figure 24

Blissus Burmeister, 1835, p. 290.
Neoblissus Bergroth, 1903, p. 253. NEW SYNONYMY.

TYPE SPECIES: Opinion 705 (1964) of the International Commission of Zoological Nomenclature placed *Blissus* on the official list of generic names with *Blissus hirtulus* Burmeister as type species. Since I treat *hirtulus* in the genus *Geoblissus*, an explanation is necessary. Slater and China (1961) recognized that the genus *Blissus* as then understood was composite and that *hirtulus* the monobasic type was not congeneric with the economically important "Chinch Bugs" of North America. Accordingly, Slater and China *(ibid.)* appealed to the Commission to set aside *hirtulus* Burmeister as type species and designate the North American Chinch Bug *Blissus leucopterus* (Say) as type species. Unfortunately, both Dr. China and I believed the request to be so obviously desirable that we did not ask the hemipterological community to support the appeal. Although this appeal received a majority of the commission votes (including, I believe, those of all the entomologists), it failed to receive a sufficient number of votes. My discussion of this matter with Dr. China in 1964 indicated that a negative letter had been received by the commission from Dr. Eduard Wagner who was concerned that such action would affect a number of European species at that time placed in the genus *Blissus*. This was unfortunate as the European species involved are not congeneric with either

Blissus in the sense of *leucopterus* (Say) or *hirtulus* Burmeister. Subsequently this colleague wrote the Commission and sought to "rectify" possible effects of his letter, but no action has been taken by the Commission. I believe that the matter is still basically unresolved despite the action of the Commission, and continue to use *Blissus* in the sense of *leucopterus* (Say) although this is not in accord with the action of the Commission.

A further complication arises from the lack of distinguishing characters between *Blissus*

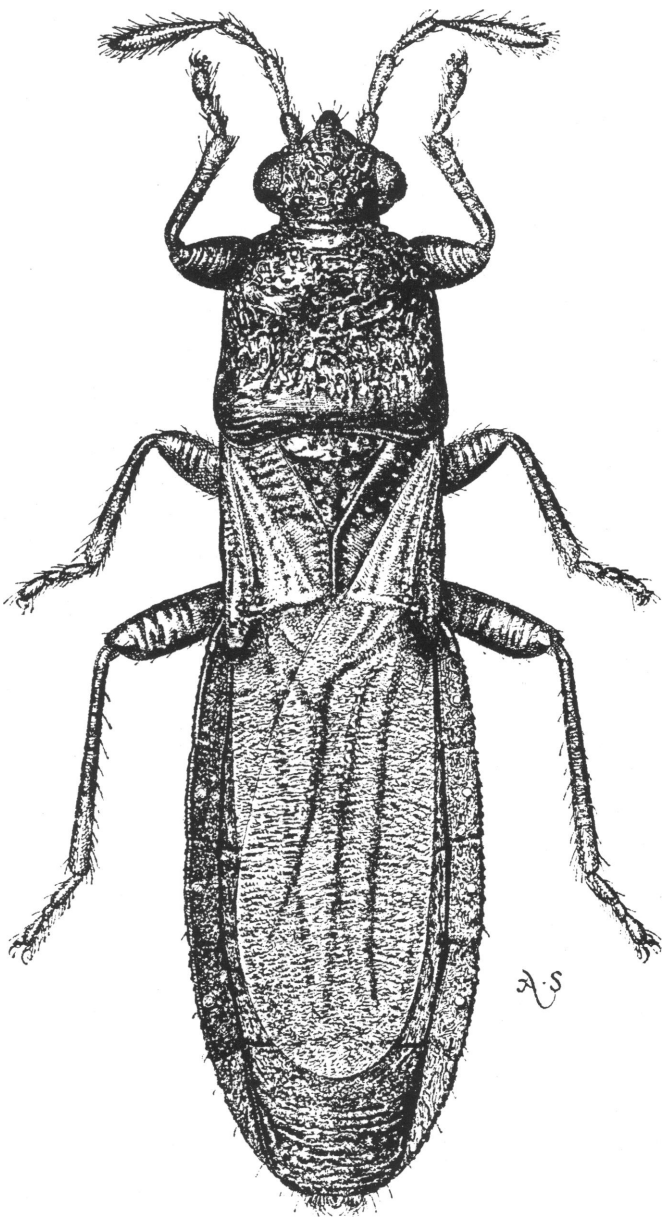


FIG. 23. *Blissiella pauliani*, dorsal view.

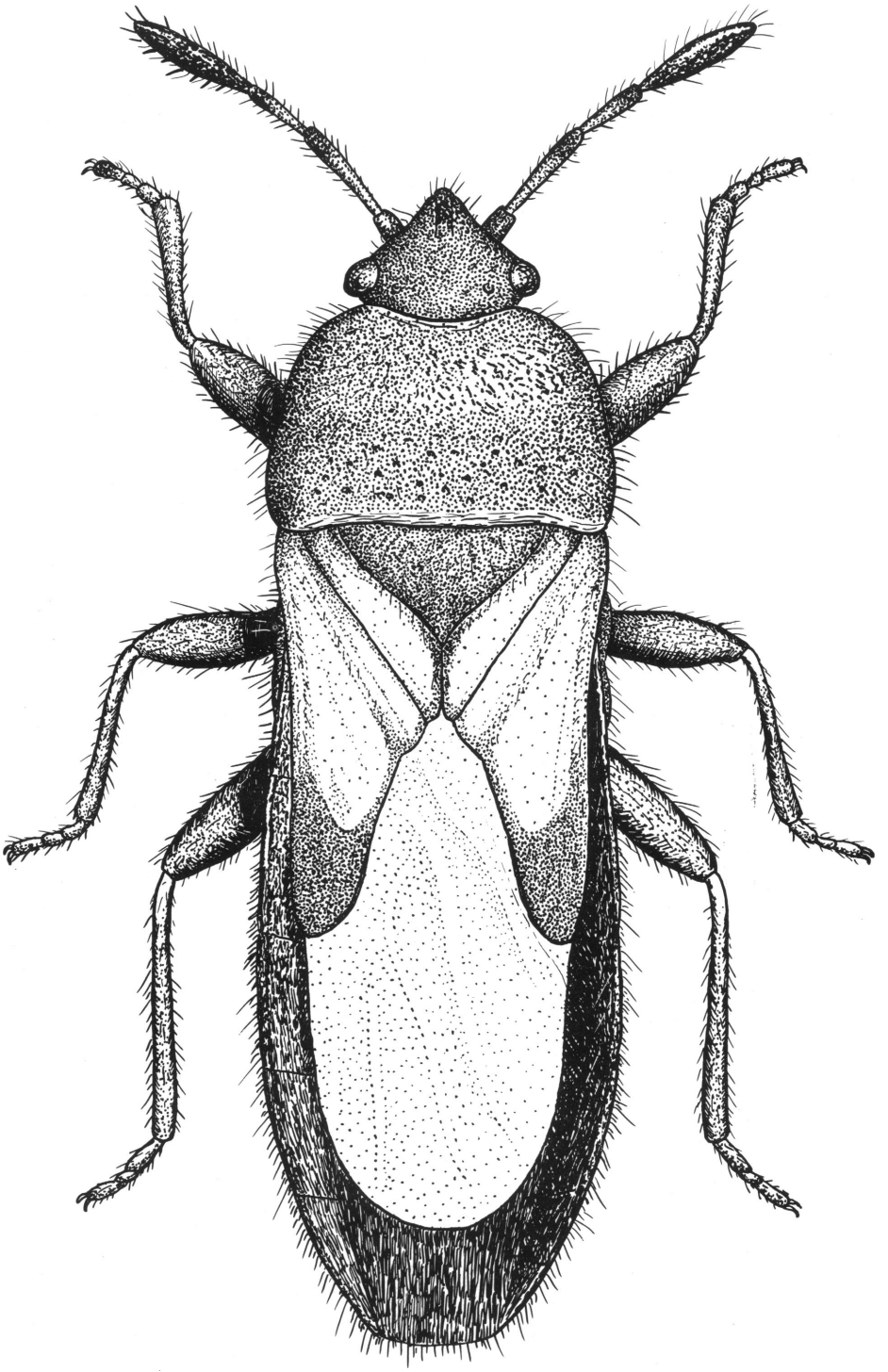


FIG. 24. *Blissus mixtus*, dorsal view.

(sensu leucopterus) and the South American myrmecophiles placed in the genus *Neoblissus*.

DISTRIBUTION: Western Hemisphere.

BIOLOGY: Some species serious pests of grain crops and lawn grasses. Breeding occurs on many species of Gramineae (see Slater, 1976).

DIAGNOSIS: Body short, stubby, thick; metathoracic scent gland auricle small, short, rounded and earlike (fig. 9K); all femora mutic; head, pronotum and scutellum above completely pruinose (only tylus shining); completely pruinose below on head and thorax; membrane comparatively thin and semitranslucent; wing polymorphism present, brachypters and micropters common; macropters with moderately concave apical corial margin; fore coxal cavities open; no marked sexual dimorphism; antennae terete or moderately clavate; ocelli small; sperm reservoir with large cup and elongate, slender, straplike wings; ovipositor elongate.

DISCUSSION: Unfortunately no key to the species of this important taxon is available. *Blissus* has been under revision by Dr. D. E. Leonard for a number of years. For keys to the North American species see Leonard (1966, 1968).

The genus *Neoblissus* does not appear to have any characteristics of generic significance that it does not share with *Blissus* and is here synonymized. The species of *Neoblissus* are inquilines in the nests of ants where according to Drake (1951) they feed and breed on the grasses growing inside the chambers. Drake *(ibid.)* while retaining *Neoblissus* noted that the genus was distinguishable "largely by the very short wing pads with wide and subtruncate apex in the brachypterous form." If one wishes to follow the action of the International Commission on Zoological Nomenclature as discussed above, *Neoblissus* Bergroth is available for use for the Chinch bugs of the Western Hemisphere.

BOCHRUS STÅL
Figure 25

Bochrus Stål, 1861, p. 145.

TYPE SPECIES: *Bochrus poecilopterus* Stål. Monobasic.

DISTRIBUTION: Southern Asia, Java.

BIOLOGY: Unknown.

DIAGNOSIS: Body broad, greatly flattened; metathoracic scent gland auricle very elongate, curving anteriorly throughout, expanded distally (fig. 13C); all legs multispinose; fore femora with only two or three distally located spines; hind legs much larger and more robust in male than in female; second tarsal segment very small; head and pronotum completely shining; traces of pruinosity present mesally along anterior margin or prosternum; scutellum pruinose laterad of a broad basally expanded central shining area; apical corial margin almost straight; membrane opaque, thickened; fore coxae closed; ocelli small; antennae terete; ovipositor dividing sternum six, elongate; a series of large calloused spots present on abdominal sternum. Sperm reservoir minute, apparently reduced to a small median distally rounded projection.

KEY TO SPECIES OF *BOCHRUS*

1. Pronotum bicolored, anterior half black, posterior half a strongly contrasting pale orange-yellow; legs with at least femora yellowish to ochraceous; male hind tibiae lacking a greatly enlarged basal spur. . . . . *poecilopterus* Stål

1a. Pronotum nearly uniformly black or very dark mahogany, never with anterior and posterior halves strongly contrasting (although sometimes with a narrow pale basal stripe); legs castaneous to nearly black; male hind tibiae with an enormous basal spur which is one-third to one-half length of tibiae (fig. 25) . . . . . *foveatus* Distant

CAPODEMUS SLATER AND SWEET
Figure 26

Capodemus Slater and Sweet, 1972, pp. 211-212.

TYPE SPECIES: *Blissus rusticus* Stål. By original designation.

DISTRIBUTION: Southern Africa.

BIOLOGY: Various species breed on Gramineae, Cyperaceae, and Restionaceae.

DIAGNOSIS: Body linear, moderately slender; metathoracic scent gland auricle elongately lobate, earlike, slightly curved posteriorly (fig. 9C); fore femora mutic or with a single minute ventral spine; tibiae unspecialized; head and

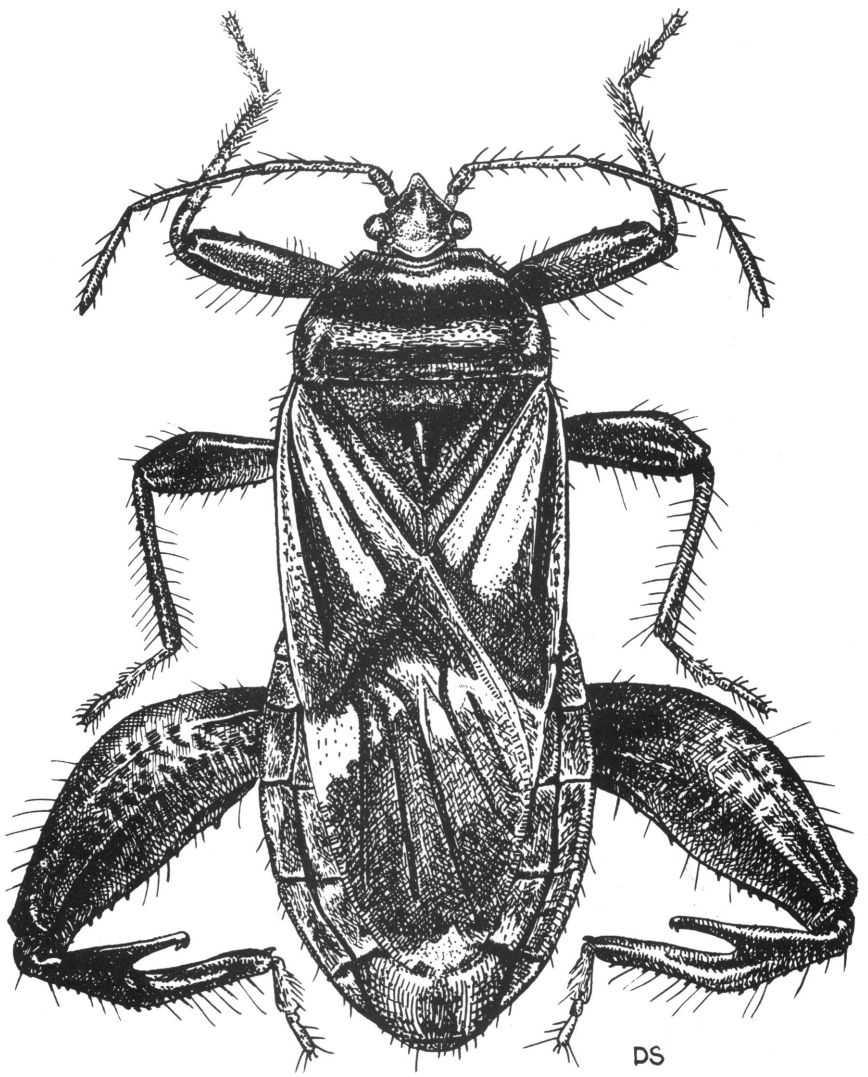


FIG. 25. *Bochrus foveatus*, dorsal view.

thoracic pruinosity variable, pronotum above usually, in large part, shining but frequently with pruinose areas present anteriorly and laterally in transverse impression; propleuron sometimes completely pruinose, sometimes with entire posterior lobe shining; apical corial margin straight, wing polymorphism frequent, often with extreme microptery; fore coxal cavities open; ocelli small; antennae terete; sperm reservoir with small cup and relatively narrow linear wings.

Blissus navis (Slater) is assigned to *Capodemus* but is quite isolated from the other species all of which form a closely related group.

KEY TO SPECIES OF *CAPODEMUS*

1. Labium very elongate, extending posteriorly beyond metacoxae . . . . . *.rostratus* (Slater)
1a. Labium shorter, never exceeding metacoxae, usually not extending caudad of mesocoxae 2

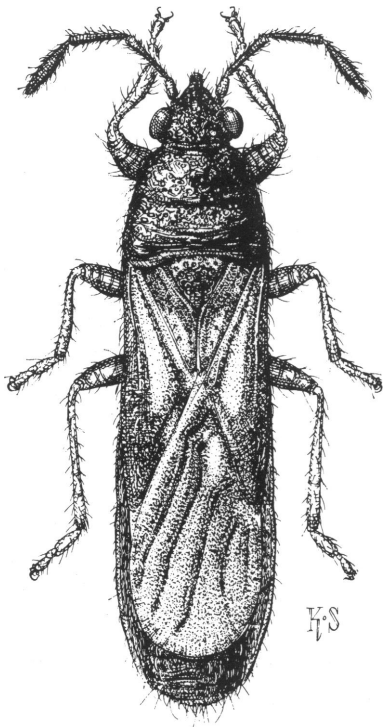


FIG. 26. *Capodemus pentameri,* dorsal view.

2. Fore femora with one or two small spines present below on distal half (spine often minute) 3
2a. Fore femora mutic 7
3. Fore femora with two distinct spines present ..... *bispinosus* Slater and Sweet
3a. Fore femora with only a single small spine present 4
4. Pruinosity on scutellum laterad of midline extending nearly to posterior end of scutellum 5
4a. Pruinosity on scutellum limited to anterior one-half or one-third 6
5. Acetabula shining; posterior margin of pleural area of prothorax with a narrow marginal shining strip ..... *wilcoxae* Slater and Sweet
5a. Acetabula pruinose; propleural area completely pruinose, including posterior margin ..... *stuckenbergi* Slater and Sweet
6. Prothoracic pruinosity extending dorsally above a dark shining bar near dorsal margin of propleural area onto lateral area of dorsal surface (fig. 4M) ..... *variabilis* Slater and Sweet
6a. Prothoracic pruinosity not present above shining lateral bar, thus not present laterally on dorsal surface (fig. 5N, O) ..... *tenuatus* Slater and Sweet
7. Scutellum completely shining ..... *navis* (Slater)
7a. Scutellum with pruinosity present at least on anterior third 8
8. Scutellar pruinosity laterad of midline extending posteriorly to or nearly to posterior end of scutellum 9
8a. Scutellar pruinosity limited to anterior one-third to one-half of scutellum 13
9. Posterior propleural area shining and non-pruinose adjacent to margin; mesosternum with a conspicuous longitudinal furrow present ..... *darwini* (Slater)
9a. Propleural area completely pruinose; meosternum lacking a conspicuous longitudinal furrow 10
10. Brachypters with wing pads rounded at distal ends (fig. 6L) ..... *sabulosus* Slater and Sweet
10a. Brachypters with wing pads acuminate at distal ends (fig. 6J) (macropters unknown) 11
11. Head relatively elongate, tylus exceeding distal end of first antennal segment; pronotal pruinosity extending mesally across transverse impression to mesad of level of ocelli ..... *elegiae* Slater and Sweet
11a. Head relatively short, tylus usually not exceeding distal end of first antennal segment; pronotal pruinosity not strongly developed across transverse impression mesad of ocelli 12
12. Eyes large, ovoid (fig. 7M) ..... *herbosus* Slater and Sweet
12a. Eyes smaller, subelliptical (fig. 7L) ..... *distinctus* Slater and Sweet
13. Prothoracic pruinosity not extending dorsally above shining bar (fig. 5N, O); posterior lobe of propleural area completely shining; acetabula shining (fig. 26) ..... *pentameri* Slater and Sweet
13a. Prothoracic pruinosity extending dorsad of shining bar onto lateral portion of dorsal surface (fig. 4M); posterior propleural area pruinose; at least fore acetabula pruinose 14
14. Meso- and meta-acetabula shining; dorsal surface densely clothed with elongate somewhat wooly pubescence ..... *hirsutus* Slater and Sweet
14a. All acetabula pruinose; dorsal pubescence relatively short and decumbent 15
15. Transverse striae on metanotum coarse, only three or four striae visible (fig. 6J); scutellum deeply foveate laterally; brachyp-

ters with pronotum relatively short, subequal to length of fourth antennal segment; fore coxae almost closed posteriorly (opening 0.015 mm. measured longitudinally) . . . . . *rusticoides* Slater and Sweet

15a. Transverse metanotal striae fine, nine to 10 striae visible (fig. 6L); scutellum weakly foveate laterally; pronotal length greater than length of fourth antennal segment; fore coxae more widely open posteriorly (opening 0.05 mm.) . . . . . *rusticus* (Stål)

CAVELERIUS DISTANT
Figures 27, 28

Cavelerius Distant, 1903, p. 44.

TYPE SPECIES: *Cavelerius illustris* Distant. Monobasic.

DISTRIBUTION: Southern Asia, Taiwan, Ryukyus, Japan.

BIOLOGY: Some species serious pests of sugar cane. Others taken on other grasses.

DIAGNOSIS: Body linear, moderately slender. Metathoracic scent gland auricle earlike, rounded but moderately elongate. Fore femora mutic. Pronotum dorsally with anterior half strongly shining, posterior half including humeral area pruinose. Lateral (below bar) and ventral surfaces of thorax and scutellum pruinose. Apical corial margin straight, membrane opaque but thin, noticeably differentiated from adjacent corium. Fore coxal cavities closed. Ocelli small. Antennae terete. Wing microptery, brachyptery, and submacroptery common. No noticeable sexual dimorphism. Spermatheca with large basal flange of bulb; pump short or elongate, always broadened noticeably at distal end.

DISCUSSION: This genus is very closely related to *Ischnodemus*. The large bulb and wings of the sperm reservoir (fig. 111) reinforce the external similarities. Nevertheless the more apomorphic species (in particular the type species *illustris*) have the caudolateral margins of the pronotum produced strongly backward to terminate in a subacute point. The situation is somewhat analogous to that of *Patritiodemus* in that the more plesiomorphic species are similar to species of *Ischnodemus* (although with synapomorphy) but the more apomorphic species are strongly differentiated.

KEY TO SPECIES OF *CAVELERIUS*

1. Second antennal segment uniformly brown or black, strongly contrasting with pale first segment and unicolorous or nearly so with segments three and four 2

1a. Second antennal segment white or light tan at least on proximal two-thirds, unicolorous with segment one; distal third of second and all of third and fourth segments dark or first three antennal segments light tan (if second segment largely dark then apex of abdominal connexivum seven acute) 6

2. Membrane tapering to a blunt point posteriorly, extending caudad only onto sixth abdominal tergum; membrane color in great part white with a large irregular central brown patch . . . . . *saccharivorus* (Okajima)

2a. Membrane either extending onto seventh abdominal tergum, broad and non-tapering at tip and entirely brown except for small pale areas at base, adjacent to apex of corium and at apex of hemelytra, or reduced to short pads 3

3. Length of second antennal segment greater than interocular space; femora black or very dark brown . . . . . *nigrolimbatus* Slater and Miyamoto

3a. Interocular space greater than length of second antennal segment; femora orange or yellow 4

4. Length of head greater than length of fourth antennal segment; tylus extending forward to distal end of first antennal segment (hemelytra frequently reduced to short "pads") (fig. 27) . . . . . *mishmiensis* Slater and Miyamoto

4a. Fourth antennal segment longer than length of head; tylus extending forward only onto anterior third of first antennal segment 5

5. Posterior margin of pronotum laterad of base of scutellum extended posteriorly as prominently produced lobes, these lobes frequently acute at apices; fourth antennal segment only slightly more than one and one-half times length of segment three . . . *illustris* Distant

5a. Posterior margin of pronotum nearly evenly concave, not produced into prominent posteriorly directed lobes laterad of base of scutellum; fourth antennal segment long, more than one and three-fourths times as long as segment three . . . . . *obscuratus* Slater and Miyamoto

6. First three antennal segments uniformly bright orange-yellow, only fourth segment darkened 9

6a. First and proximal two-thirds to four-fifths of second antennal segments white to pale yellow, remainder of antennae dark brown to black 7

7. Small species less than 5 mm. in length; interocular space more than one and one-fourth times as great as length of third antennal segment; membrane broad and non-tapering to apex reaching onto seventh abdominal tergum . . . . . *.minor* Slater and Miyamoto

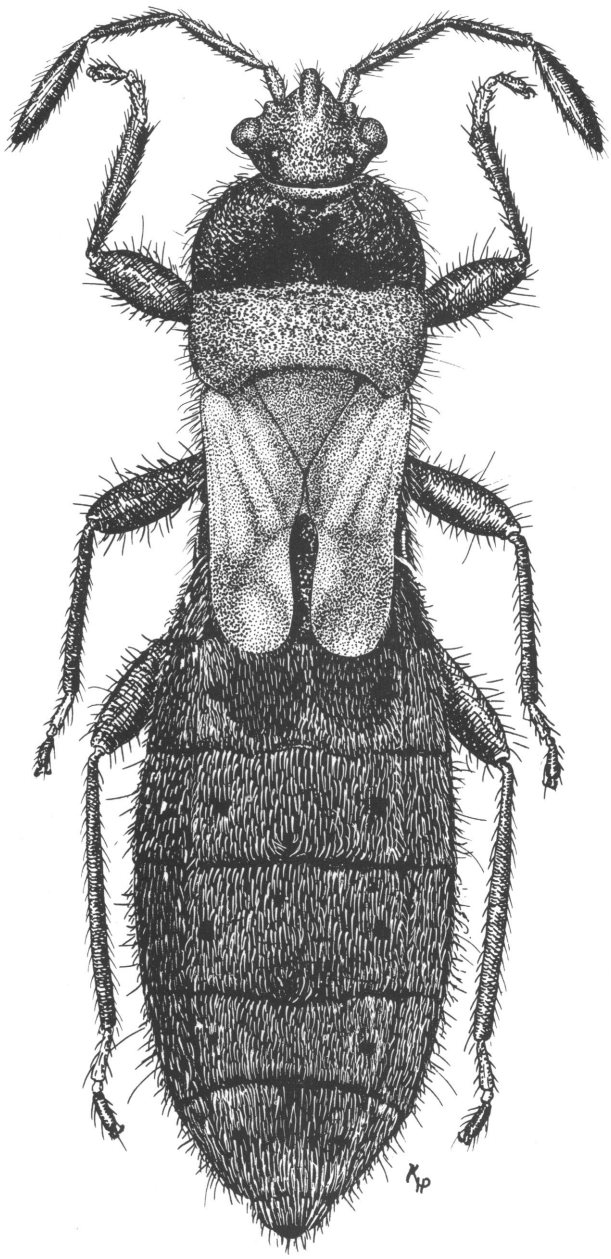


FIG. 27. *Cavelerius illustris*, dorsal view.

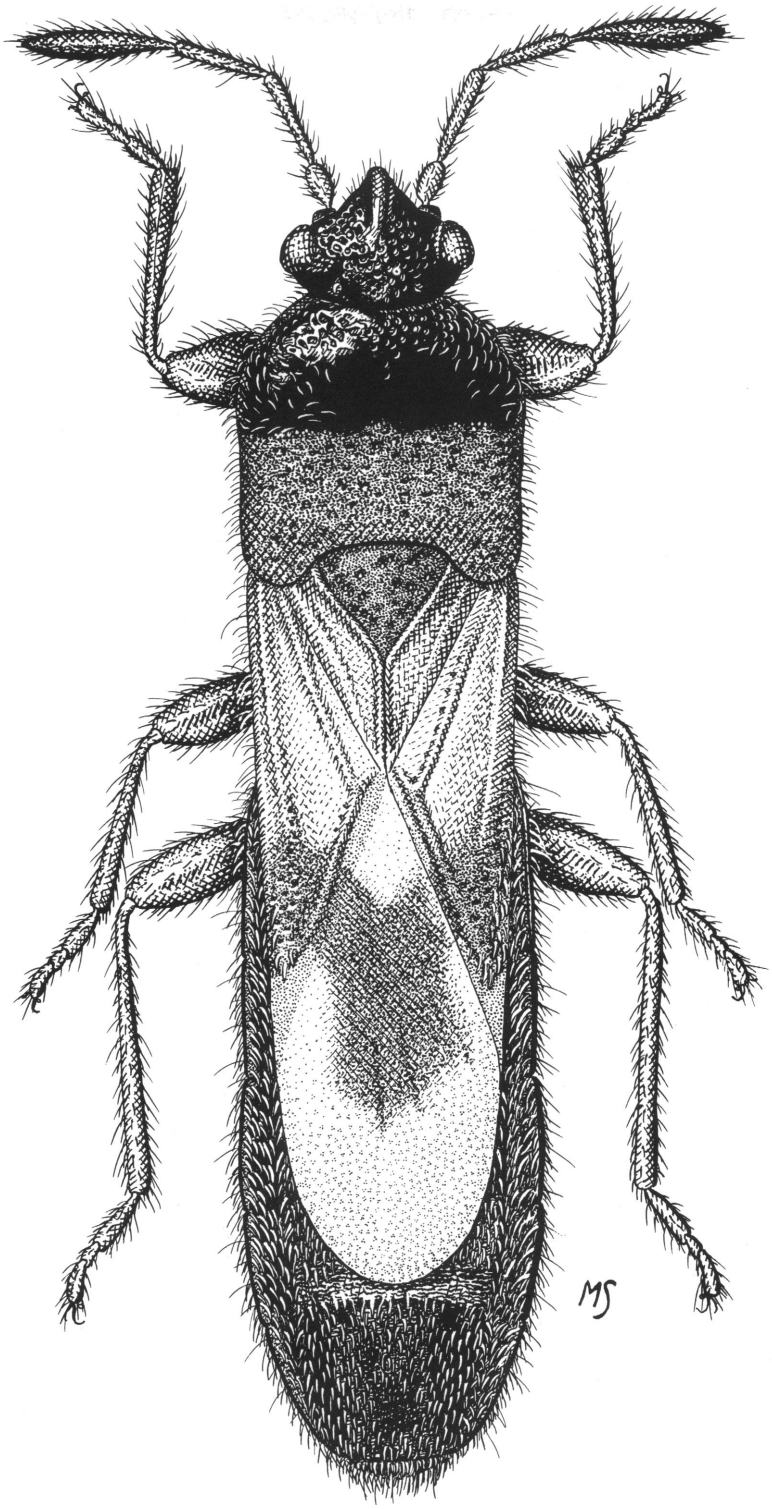


FIG. 28. *Cavelerius tinctus*, dorsal view.

7a. Large species well over 5.5 mm. in length; interocular space less than one and one-fourth times as great as length of third antennal segment; membrane somewhat narrowed to apex, extending caudad only onto sixth abdominal tergum 8

8. Length of second antennal segment greater than or subequal to interocular width; fore femora dark brown; spiracles large, those on segment seven nearly one-third as great as total width across connexivum; subbasal lobe of paramere flat on distal surface ....*sweeti* Slater and Miyamoto

8a. Interocular space greater than length of second antennal segment; femora bright yellowish; spiracles very small only about one-eighth of the total connexival width; subbasal lobe of paramere rounded .....*excavatus* (Distant)

9. Antennal segment 2 considerably longer than interocular space ....*antennatus* Slater and Miyamoto

9a. Interocular space greater than length of second antennal segment (fig. 28) ....*tinctus* (Distant)

CAVELOBLISSUS SLATER AND WILCOX
Figure 29

Caveloblissus Slater and Wilcox, 1968, pp. 42-45.

TYPE SPECIES: *Caveloblissus americanus* Slater and Wilcox. Monobasic.

DISTRIBUTION: South America.

BIOLOGY: Unknown.

DIAGNOSIS: Body stocky (but elongate relative to sister group); metathoracic scent gland auricle short, rounded, earlike; all femora mutic; pronotum above with anterior one-half shining, posterior one-half pruinose; venter of head, sternum, posterior half of propleuron and scattered areas of anterior portion of propleuron pruinose; apical corial margin moderately concave mesally; membrane thinner textured than corium, translucent; fore coxal cavities open, ocelli small; no sexual dimorphism; antennae terete; sperm reservoir with large slender "cup" and elongate slender straplike wings. Spermatheca with large bulb and short straight pump that enlarges slightly at proximal end (fig. 2H).

CHELOCHIRUS SPINOLA
Figure 30

Chelochirus Spinola, 1839, pp. 1-4.

TYPE SPECIES: *Chelochirus atrox* Spinola. Monobasic.

DISTRIBUTION: Southeast Asia, East Indies.

BIOLOGY: Unknown.

DIAGNOSIS: Body large, elongate, robust, broadened, and somewhat flattened. Metathoracic scent gland auricle large, elongate, usually strongly curved anteriorly in a lunate arc (fig. 10E) but sometimes recurved into a hooklike structure (fig. 10G). Fore femora enormously enlarged and incrassate, armed below with several huge spines or spurs. Fore tibiae shortened, thickened, toothed distally and apparently fossorial. First tarsal segment somewhat flattened, considerably enlarged. Body above strongly shining. Prothorax below either completely shining or shining anterior to acetabula and pruinose posterior to acetabula. Corium shining along radial vein and extensively along lateral margins. Membrane thickened and opaque nearly unitextured with corium. No sexual dimorphism evident and no wing reduction known. Ocelli very large and conspicuous. Antennae clavate at distal ends, short and very thick throughout (similar to those of *Spalacocoris*). Sperm reservoir reduced to a small median projection with tiny blocklike or straplike diverging wings present; spermatheca with bulb large, but basal flange reduced or absent; pump short, much broadened distally. Ovipositor reduced.

KEY TO SPECIES OF *CHELOCHIRUS*

1. Labium reaching to and usually exceeding metacoxae, extending onto base of abdomen; corium dark chocolate-brown, nearly unicolorous with pronotum and membrane (fig. 30) .....*atrox* Spinola

1a. Labium not extending caudad to metacoxae; corium either brick-red or variegated yellow and black, strongly contrasting with dark pronotum and membrane 2

2. Body relatively elongate and slender; fore femora only moderately incrassate, ventral surface possessing a series of spines of nearly equal size; labium not attaining mesocoxae .....*pirkimeroides* Slater

2a. Body very broad and subflattened; fore femora enormously enlarged with a very large spurlike spine present ventrally on distal one-third; labium at least attaining mesocoxae 3

3. Labium reaching mesocoxae, corium uniformly brick-red; fore femora lacking a serrated

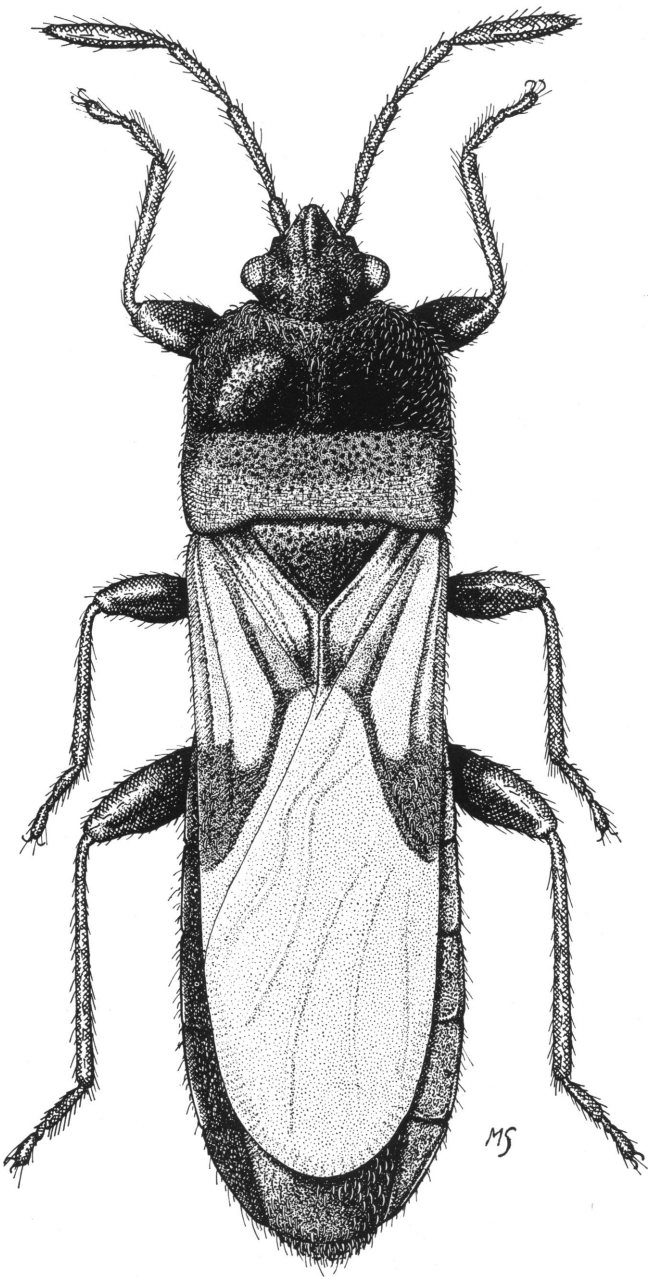


FIG. 29. *Caveloblissus americanus*, dorsal view.

flange distally on inner surface; legs black; metathoracic scent gland auricle curving posteriorly (fig. 10G) ..... *talpus* (Walker)

3a. Labium exceeding mesocoxae, nearly attaining metacoxae; corium variegated with yellow and black stripes; fore femora bearing an expanded serrate flange distally on inner surface; legs pale yellow; metathoracic scent gland auricle curving anteriorly (fig. 10E) ..... *confertus* Slater and Ahmad

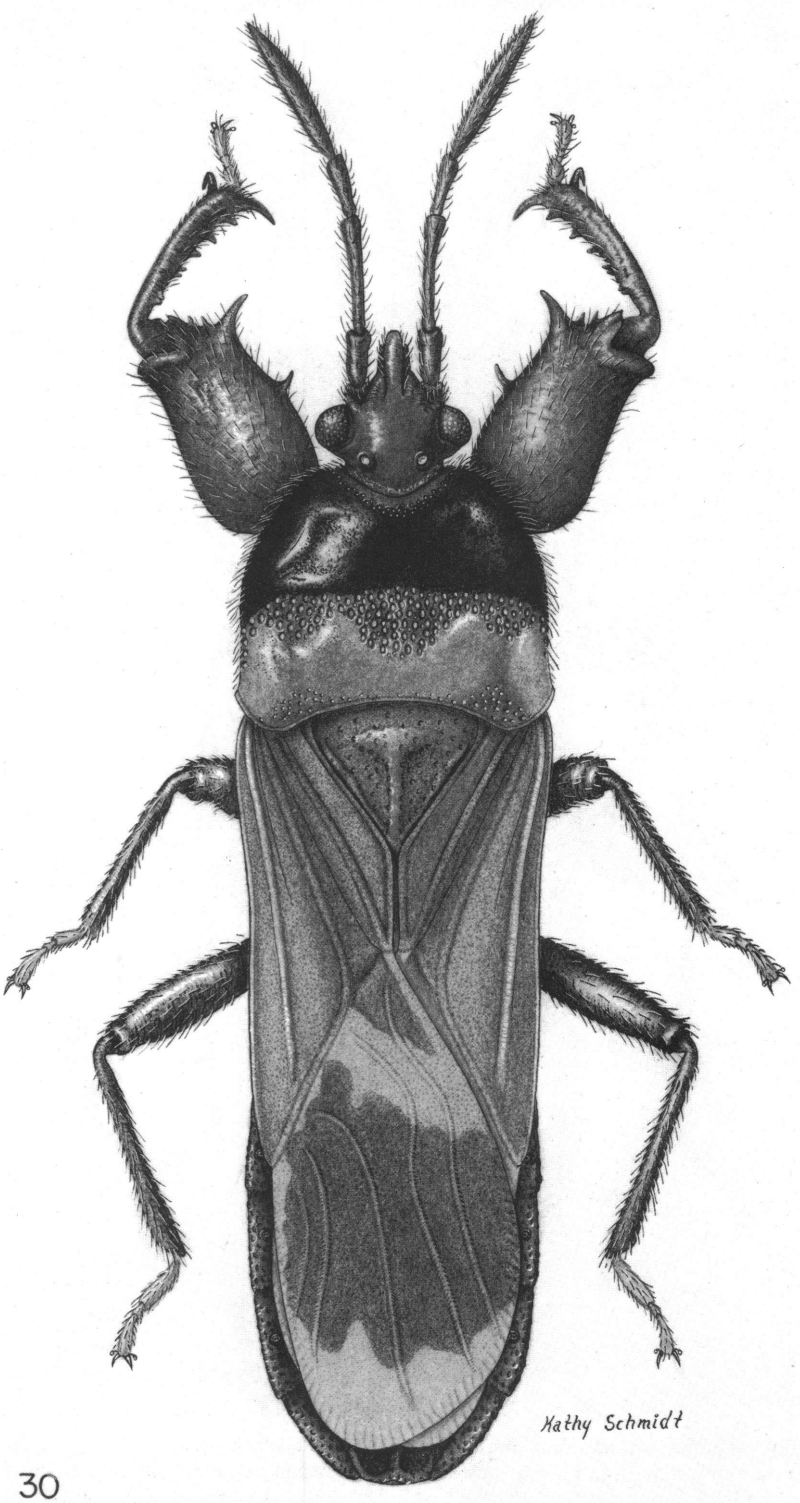


FIG. 30. *Chelochirus atrox*, dorsal view.

DENTISBLISSUS SLATER
Figure 31

Dentisblissus Slater, 1961, pp. 481-482.

TYPE SPECIES: *Ischnodemus venosus* Breddin, 1900. By original designation.

DISTRIBUTION: Australia, New Guinea, New Britain, New Ireland.

BIOLOGY: Breeding records on wild sugar cane.

DIAGNOSIS: Body relatively broad but not strongly flattened; metathoracic scent gland auricle (fig. 1II) elongate and backward curving, either rounded or acute at distal end; all legs multispinose, middle and hind femora with very short stubby spines (almost absent in females); first tarsal segment very large, broadened with a "pad" of hairs below; head completely shining, pronotum in large part shining, usually with a broad pruinose band across center of disc and a narrower anterior band just behind "collar" and sometimes an additional pruinose band across basal area; almost completely pruinose below; scutellum pruinose but with a shining center stripe; both corium and membrane thick and opaque; apical corial margin straight for most of length, concave at base; fore coxal cavities closed; ocelli small; strong sexual dimorphism present, males with large bifid genal "tusks" (fig. 31); antennae somewhat clavate; sperm reservoir very small with an elongate basal stalk, wings short and broad, somewhat pear-shaped, broadly knobbed distally (fig. 1CC). Ovipositor elongate. Spermatheca with "double flanged" broad pump; bulb lacking a conspicuous basal flange (fig. 2P).

KEY TO SPECIES OF *DENTISBLISSUS*

1. Forewing uniformly dark brown to black, with at most a minute light streak at base of membrane (fig. 31) ..... *.umbrosus* Slater
1a. Forewing with white areas present on clavus, corium and at least apex of membrane ...2
2. Third antennal segment relatively short (ratio-interocular space/length segment three average 1.33); ventral head "tusk" of male long[1]: (ratio-length "tusk"/interocular space 1.40) ..... *.corniger* Slater
2a. Antennal segment three relatively longer (ratio-interocular space/length segment three average 1.06, range .94-1.20); "tusk" shorter (ratio-length "tusk"/interocular space, average 1.09, range .77-1.30) 3
3. Labium extending onto anterior margin of mesosternum with segment one nearly reaching base of head (ratio-length labium/interocular space average 3.11, range 3.02-3.85) ..... *.divisus* (Walker)
3a. Labium shorter, barely extending beyond fore coxae, segment two exceeding base of head by nearly one-half its length (ratio-length labium/interocular space average 2.64, range 2.40-2.84) ..... *.venosus* (Breddin)

[1]Measured ventrally from posterior margin of eye to apex of "tusk."

DIMORPHOPTERUS STÅL
Figures 32, 33

Dimorphopterus Stål, 1872, p. 44.
Esmun Distant, 1909, p. 330.
Euhemerus Distant, 1909, p. 331.
Caenoblissus Barber, 1958, p. 186.
Stenoblissus Wagner and Slater, 1964, p. 69.

TYPE SPECIES: *Micropus spinolae* Signoret, 1857. By original designation.

DISTRIBUTION: Eastern Hemisphere.

BIOLOGY: Breeding reported on many species of Gramineae.

DIAGNOSIS: Body generally short and stout, sometimes elongate; metathoracic scent gland auricle short, rounded, earlike; fore femora mutic or armed below with one or two ventral spines; meso- and metafemora mutic; fore tibiae either terete or expanded, flattened and spinose; dorsal surface of head and pronotum shining or subshining, always lacking pruinosity; scutellum usually completely pruinose; apical coral margin usually concave; membrane thin, translucent at least in part; fore coxal cavities open; brachypters and micropters common; ocelli small; antennae generally moderately clavate; sperm reservoir with cup large and wings slender and straplike. Spermatheca variable often with elongate curving pump; bulb usually with well developed basal flange (fig. 2N, O).

KEY TO SPECIES OF *DIMORPHOPTERUS*

1. Fore femora with one or two spines (rarely three) present below on distal third 2
1a. Fore femora mutic 14
2. Fore femora with two spines present below .3

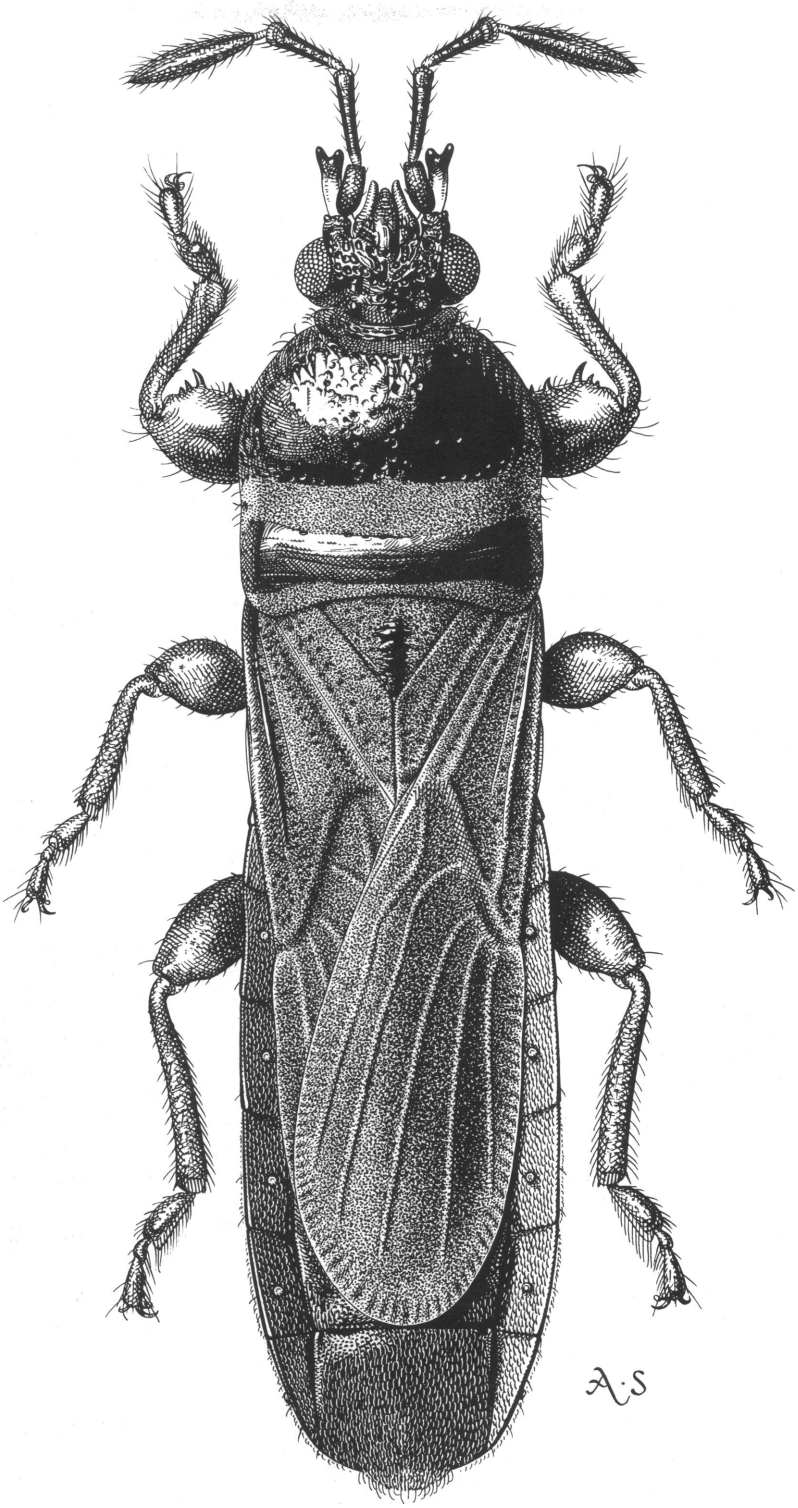


FIG. 31. *Dentisblissus umbrosus*, dorsal view.

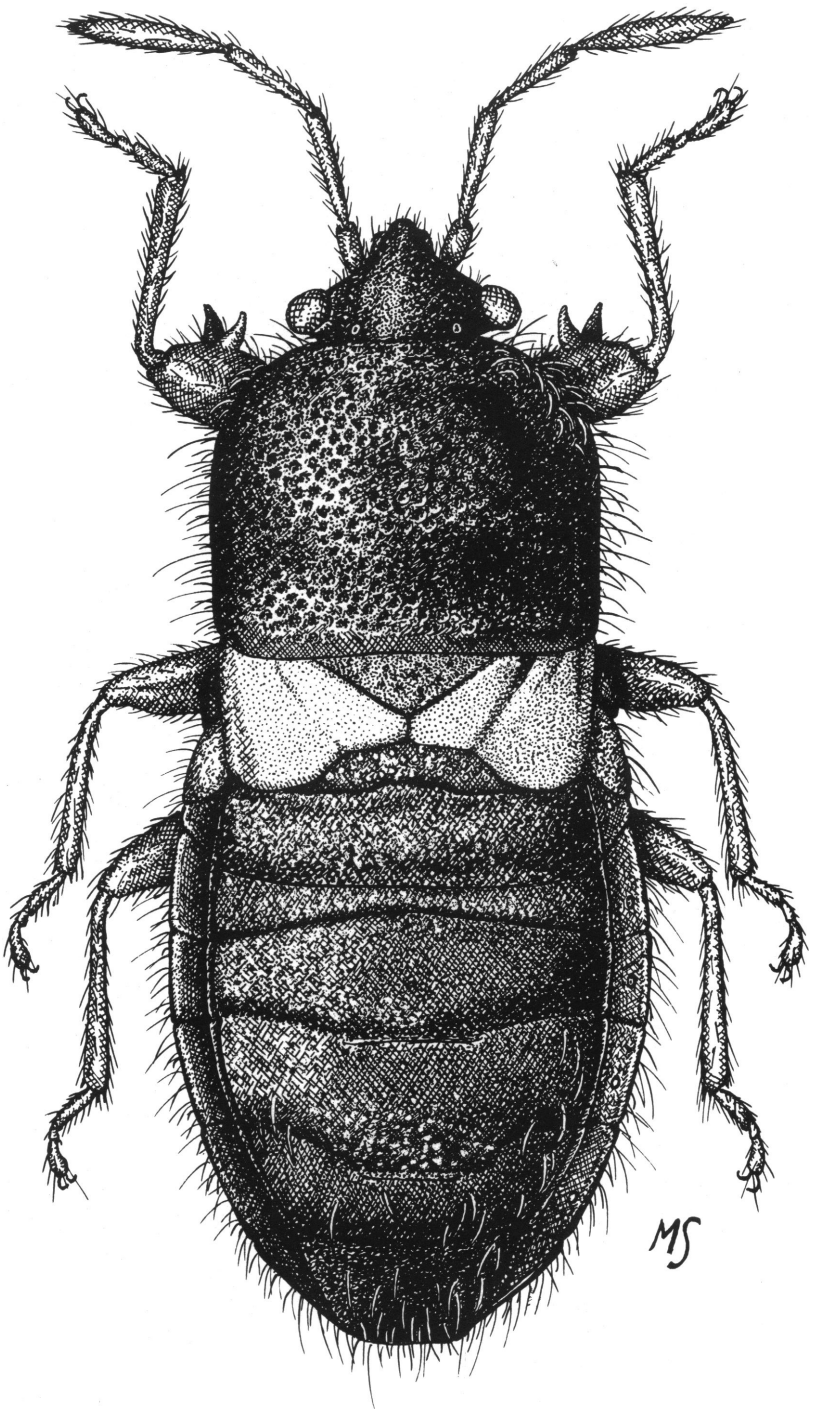


FIG. 32. *Dimorphopterus cornutus*, dorsal view.

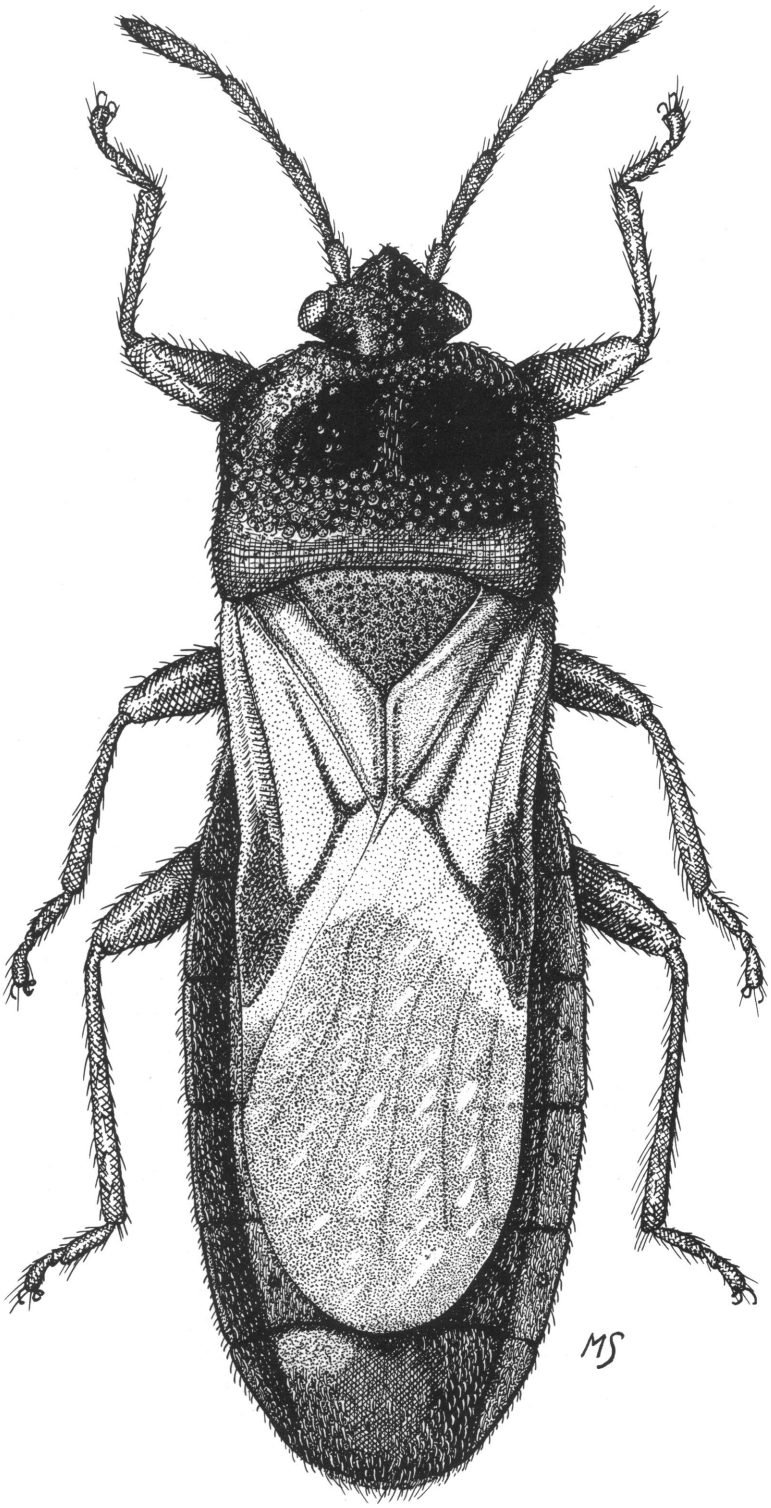


FIG. 33. *Dimorphopterus gibbus*, dorsal view.

2a. Fore femora with only a single spine present ventrally (some specimens of *zuluensis* have two spines on one femur) 4

3. Body elongate; fore femoral spines small, short, and simple (Africa) ....*annulatus* (Slater)

3a. Body very short and stout; fore femoral spines large, stout and "tusklike," inner spine sharply curved at apex to form a right-angled hook (Australia) (fig. 32) ....*cornutus* Slater

4. Fore tibiae strongly expanded on distal half, somewhat flattened and strongly toothed to give a fossorial appearance 5

4a. Fore tibiae usually somewhat swollen distally, but rounded, not forming a ventrally flattened fossorial structure 6

5. Labium relatively short, at most extending between or slightly beyond mesocoxae, not attaining posterior margin of metacoxae (South Africa) .....*hessei* (Slater)

5a. Labium elongate, extending posteriorly to or beyond posterior margin of metacoxae (Australia) .....*pilosus* (Barber)

6. Labium relatively short, extending posteriorly at most only between mesocoxae 7

6a. Labium elongate, extending to or almost to metacoxae, always exceeding posterior margin of mesocoxae 9

7. Large, relatively elongate species (over 3.6 mm.) 8

7a. Small, relatively short and stout species (less than 3.5 mm.) (Africa) ....*similis* (Slater)

8. Labium extending well between mesocoxae; at least antennal segments 2 and 3 yellow to brownish yellow; propleuron pruinose to lateral shining line (Africa) ....*zuluensis* (Slater)

8a. Labium shorter, not reaching mesocoxae; antennal segments 2 and 3 red-brown; propleuron shining (Siberia)[1] ....*thoracicus* Jakovlev

9. Propleural area of pronotum lacking a band of pruinosity above acetabula; head, pronotum, and scutellum predominantly red-brown (Africa) .....*cornipes* (Hesse)

9a. Propleural area with a distinct band of pruinosity above acetabula, or if pruinosity reduced then head, pronotum, and scutellum predominantly black 10

10. Length of antennal segment 2 much more than 2.5 times length of segment 1 11

10a. Second antennal segment less than 2.5 times length of segment 1 12

11. At least hind tibiae nearly black and concolorous with femora; membrane with large diffuse brown area adjacent to apical corial margin (Cape Verde Islands) ....*graminum* (Lindberg)

11a. Tibiae yellow or light brown, much paler than dark femora, membrane uniformly opaque white (Egypt, Sudan) ....*nubicus* (Wagner and Slater)

12. Very small species, ♂ not over 2.7 mm., ♀ 3.0 mm.; macropters with clavus and corium nearly uniformly bright yellowish tan, lacking a distinct black macula apically on corium; brachypters with wing pads very small and distinctly separated mesally; color frequently reddish brown (Palearctic) ....*doriae* (Ferrari)

12a. Larger species, ♂ always more than 2.8 mm. in length, usually over 3.0 mm.; ♀ over 3.3 mm., usually more than 3.5 mm. in length; both macropters and brachypters with hemelytra contrastingly black and white with a large conspicuous black macula apically on corium; brachypters with hemelytra usually broadly in contact along midline; head and pronotum usually chiefly black 13

13. Size relatively large, over 3.5 mm.; fore femur is usually black and strongly contrasting with bright reddish or yellowish brown tibiae; antennae longer, ratio of total antennal length to interocular width usually well over 3.0 (South Africa) ....*littoralis* Slater and Wilcox

13a. Size smaller, usually not over 3.0 mm.; fore femora usually reddish brown and little contrasting with tibiae; antennae shorter, ratio of total antennal length to interocular width usually less than 3.0 (Palearctic, Ethiopian) .....*brachypterus* (Rambur)

14. Labium elongate, extending to, or well between, or caudad of metacoxae 15

14a. Labium relatively short, usually not exceeding mesocoxae, but if so not extending between or beyond metacoxae 20

15. Metathoracic scent gland auricle acutely pointed at distal end 16

15a. Scent gland auricle evenly and broadly rounded at distal end 17

16. Labium exceeding metacoxae, reaching posterior margin of metasternum (Oriental) ....*lepidus* Slater, Ashlock, and Wilcox

16a. Labium shorter, reaching only to anterior mar-

[1]See footnote p. 50.

gin of metacoxae (Oriental) ..... *sumatrensis* Slater

17. Propleural area of prothorax lacking pruinosity above acetabula (South Africa) ..... *fulgidus* (Slater)

17a. Propleural area with pruinosity present above acetabula 18

18. Membrane of fore wing chiefly hyaline with a contrasting opaque area anteriorly and broadly in contact with apical margin of corium (fig. 33); size 3.0 mm. or less (Oriental) ..... *rondoni* Slater, Ashlock, and Wilcox

18a. Membrane uniformly opaque white throughout; size larger, 3.9 mm. or greater 19

19. Labium extremely elongate, extending midway to apex of abdomen (South Africa) ..... *oblongus* (Stål)

19a. Labium shorter, scarcely exceeding posterior margin of metacoxae (South Africa) ..... *syrtis* Slater and Wilcox

20. Scutellum completely shining and non-pruinose (Oriental) ..... *anomalus* Slater

20a. Scutellum either completely pruinose or with pruinosity present basally and laterad of shining median area 21

21. Membrane with posterior portion hyaline or subhyaline, strongly contrasting with opaque anterior postion lying adjacent to apical corial margin, or membrane almost entirely hyaline 22

21a. Membrane completely opaque throughout .. 28

22. Body very elongate and linear; macropters with distance from apex corium to apex abdomen more than twice basal width of pronotum (brachypters unknown) (South Africa) ..... *tenuatus* (Slater)

22a. Body relatively broad and stout, macropters with distance from apex corium to apex abdomen subequal to or less than twice basal width of pronotum (some species frequently brachypterous) 23

23. Pronotun appearing nearly glabrous with only extremely short inconspicuous hairs present; large species, over 4.5 mm. (Oriental) (fig. 33) ..... *gibbus* (Fabricius)

23a. Pronotum appearing hirsute with conspicuous often upstanding although frequently only semi-decumbent hairs present; not more than 3.8 mm. in length (or if hairs short and inconspicuous than smaller species not over 4.25 mm. in length) 24

24. Apical corial margin deeply concave for most of extent (Oriental) ..... *latus* (Distant)

24a. Apical corial margin straight or convex for most of length, becoming concave only mesally near distal end of claval commissure 25

25. Larger species, over 4.0 mm. in length; prothoracic pruinosity confined to anterior portion of sternum, not extending dorsad of acetabula (Oriental) ..... *indicus* Slater

25a. Smaller species, less than 3.75 mm.; pruinosity extending dorsad of acetabula on prothorax 26

26. Distal area of corium with darkened area occupying entire apical angle and continuing as a complete broad band along entire apical margin and across distal ends of clavi to form a continuous arcuate stripe across hemelytra; body relatively slender and elongate, total length considerably more than three and a quarter times width across pronotum (Oriental) ..... *typicus* (Distant)

26a. Darkened distal area of corium sometimes narrowly extending to and along cubital vein but never forming a complete broad arcuate stripe across hemelytra; body relatively short and stout, total length less than three and a quarter times pronotal width 27

27. Propleuron with a distinct pruinose area dorsal to acetabula; scutellum completely pruinose (Oriental; Japan) ..... *bicoloripes* (Distant)

27a. Propleuron with pruinose area not extending as a broad band dorsally above acetabula; scutellum with a median traingular shining elevation (Oriental) ..... *erebus* (Distant)

28. Membrane fuscous brown with a broad white lunate transverse vitta extending across membrane just distad of distal end of corium (Oriental) ..... *atromaculatus* (Distant)

28a. Membrane generally pale or suffused with fuscous, but always lacking a conspicuous white vitta beyond disal end of corium 29

29. Size smaller, usually less than 3.5 mm. in length; if larger *(latoides)* then membrane of hemelytra hyaline, opaque only anteriorly adjacent to corium 30

29a. Size larger, generally 4.0 mm. or more in length; if smaller over 3.5 mm. and with membrane of hemelytra opaque throughout 33

30. Scent gland auricle sharply pointed at distal end (Oriental) ..... *sumatrensis* Slater

30a. Scent gland auricle broadly rounded distally. 31

31. Pronotal hairs semierect; body shape subovoid (Madagascar) ..... *hirsutulus* (Bergroth)

31a. Pronotal hairs completely declivent; body form

subparallel and relatively elongate (Africa) 32
32. Labium extending posteriorly well between mesocoxae; fourth segment longer than segment 3 and subequal to segment 2 (body length 3.15 mm.) .....*upembensis* (Slater)
32a. Labium not attaining mesocoxae; fourth labial segment equal in length to segment 3 and shorter than segment 2 (body length 3.8 mm.) .....*latoides* (Slater)
33. Anterior acetabula pruinose (Palearctic)..... .....*pallipes* (Distant)
33a. Anterior acetabula shining 34
34. Legs with at least femora dark brown to black, usually contrasting with pale tibiae, antennae nearly unicolorous dark brown (Palearctic)[1] .....*spinolae* (Signoret)
34a. Legs and first, second and third antennal segments yellowish brown, fourth and sometimes third antennal segment contrasting dark red-brown (Palearctic)..... .....*blissoides* (Baerensprung)[1]

EXTARADEMUS SLATER AND WILCOX
Figure 34

Extarademus Slater and Wilcox, 1966, pp. 62-63.

TYPE SPECIES: *Macropes collaris* Signoret, 1957. Original designation.

DISTRIBUTION: South and Central America, southern North America, Cuba.

BIOLOGY: Breeding known to occur on several genera of Gramineae.

DIAGNOSIS: Body elongate, slender, non-flattened; metathoracic scent gland auricle elongate, tapering, curving forward, scimitar-shaped (fig. 9N) or occasionally rounded at distal end; femora with one ventral spine; males of some species with a large ventral spine on hind femur; pruinosity variable, frequently with head above shining mesally, pruinose laterally, occasionally completely shining; pronotum dorsally varying from condition of maximum pruinosity where shining areas are present as a pair of large triangular calli patches and a complete humeral band, to completely shining; scutellum and lateral and ventral surfaces of prothorax completely pruinose; apical corial margin straight; membrane subhyaline or opaque but much thinner than corium; brachyptery common; fore coxal cavities closed; ocelli small; most species strongly sexually dimorphic, males usually with more incrassate hind femora, patches of spines and tubercles on abdominal venter (fig. 8A) and sometimes head and pronotal modifications; antennae terete; sperm reservoir with small often stalked "cup" and elongate, slender, diverging straplike wings (fig. 1E, F); ovipositor elongate. Spermatheca with large bulb, short distally expanded pump and elongate tube.

[1]See footnote p. 50. These authors believe *blissoides* as treated here is synonymous with *spinolae*.

KEY TO SPECIES OF *EXTARADEMUS*

1. Dorsal surface of pronotum in large part pruinose, never shining over entire surface (fig. 4A-D, I) 2
1a. Pronotum shining over entire dorsal surface..4
2. Tylus much broadened at anterior end to form a splayed-out truncate apex; males with a pair of sharp spines projecting from ends of connexiva seven .....*tylosis* Slater and Wilcox
2a. Tylus narrow and of uniform width throughout, never broadly splayed out and truncate at apex; males either with or without acute spines projecting from ends of abdominal connexiva 3
3. Second antennal segment relatively elongate, always more than one and one-quarter times as long as interocular space (1.31-1.50); males with a pair of acute spines projecting from ends of abdominal connexiva; abdominal sterna 5, 6, and 7 swollen, tumid and armed with a series of acute tubercles..... .....*tumorosis* Slater and Wilcox
3a. Length of second antennal segment usually subequal to or only slightly greater than interocular distance (never more than one and one-fifth interocular distance); males lacking caudally projecting spines at end of connexiva; abdominal sterna with a series of small tubercular spines, but segment 5, 6, and 7 not tumid and swollen (fig. 8A)..... .....*macer* (Van Duzee)
4. Membrane with a large distinct median dark discal spot (Cuba) .....*discalis* (Barber)
4a. Membrane often suffused, but lacking a discal spot 5
5. Labium extremely short, extending only a short distance onto prosternum, remote from fore coxae, with third labial segment not attaining base of head; males with a sharply anteriorly bent "hook" present on underside of prothorax (fig. 34C)..... .....*humerus* Slater and Wilcox

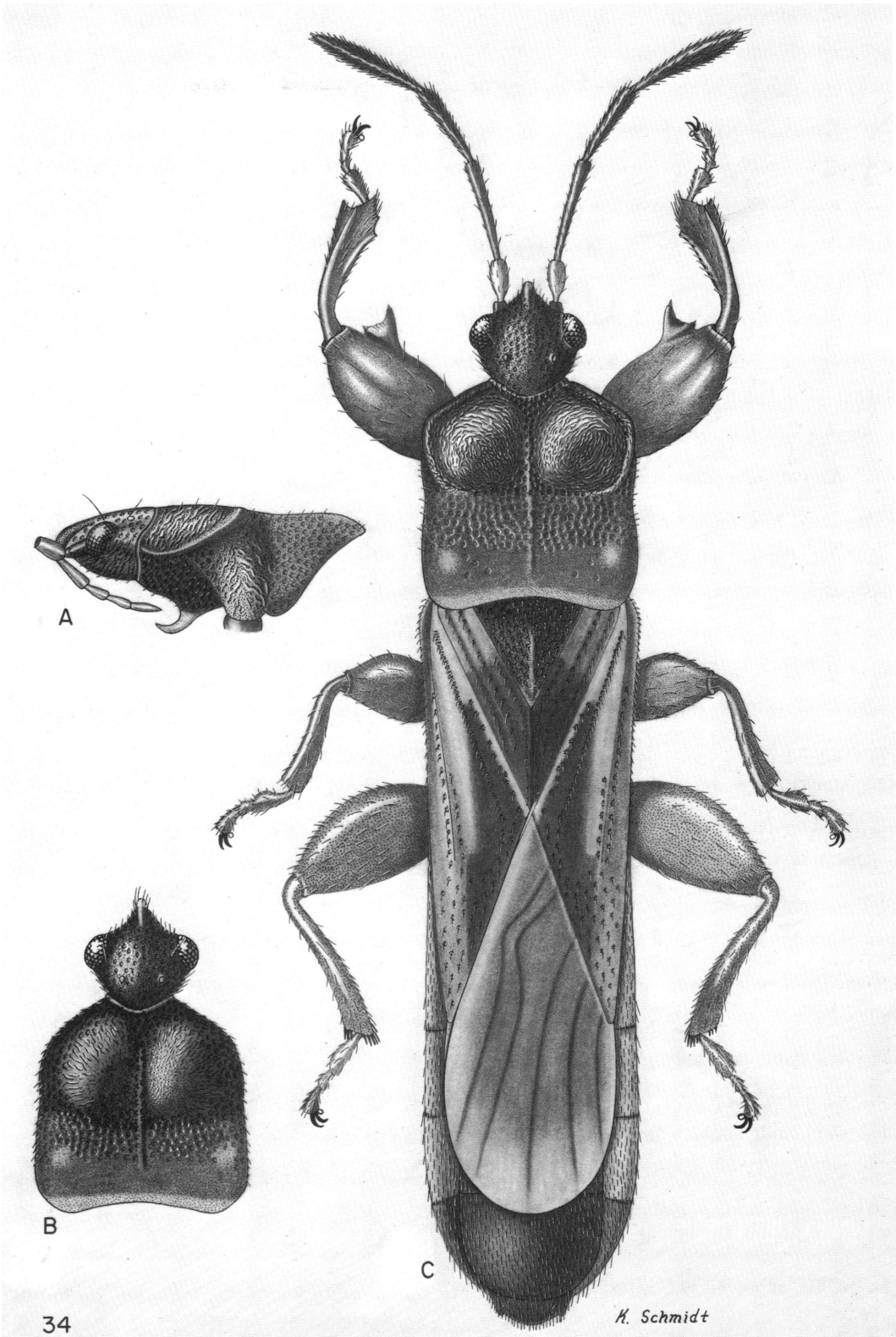


FIG. 34. A *Extarademus humerus*, male, dorsal view. B. Same, head and prothorax, lateral view. C. *Extarademus humerus*, female, head and pronotum, dorsal view.

5a. Labium more elongate, extending posteriorly almost to fore coxae, third labial segment considerably exceeding base of head 6
6. Extreme posterior portion of pronotum with a very narrow marginal pruinose band, contrasting with shining area of rest of pronotum; males with hind femora strongly incrassate and bearing a series of short spines near middle of ventral surface; metathoracic scent gland auricle relatively broad .....*mundus* Slater and Wilcox
6a. Pronotum completely shining even along extreme posterior margin; males with hind femora only moderately incrassate, unarmed below; metathoracic scent gland auricle elongate and slender 7
7. Males with elongate median spine projecting from posterior margin of eighth sternum... .....*collaris* (Signoret)
7a. Males lacking a projecting spine from posterior margin of eighth sternum, latter with serrate edges and median bulge, but lacking a distinct spine ...*collaroides* Slater and Wilcox

EXTARAMORPHUS SLATER, ASHLOCK, AND WILCOX
Figure 35

Extaramorphus Slater, Ashlock, and Wilcox, 1969, pp. 698-699.

TYPE SPECIES: *Extaramorphus magnatarsus* Slater, Ashlock, and Wilcox. Monobasic.

DISTRIBUTION: Southeast Asia.

BIOLOGY: Unknown.

DIAGNOSIS: Elongate, sublinear, extremely flattened dorsoventrally. Metathoracic scent gland auricle strongly bent anteriorly, "L"-shaped. Fore femora strongly incrassate, multispinose. Middle and hind femora enlarged, shortened, strongly thickened with a series of subbasal spines below; hind tibiae extremely short and stout, scarcely longer than greatly swollen and enlarged first tarsal segment. Body above and below completely shining, no pruinose areas present. Membrane much thinner than corium. Apical corial margin straight. Fore coxal cavities closed. Ocelli small. Abdomen truncate apically with connexivum seven posteriorly produced into blunt points with additional sharp toothlike spines present dorsally along posterior margin. Clasper with outer lobe place far distinct from base. Sperm reservoir with a dorsal sclerotized plate developed from modified cup and with a pair of prominent laterally projecting winglike structures present.

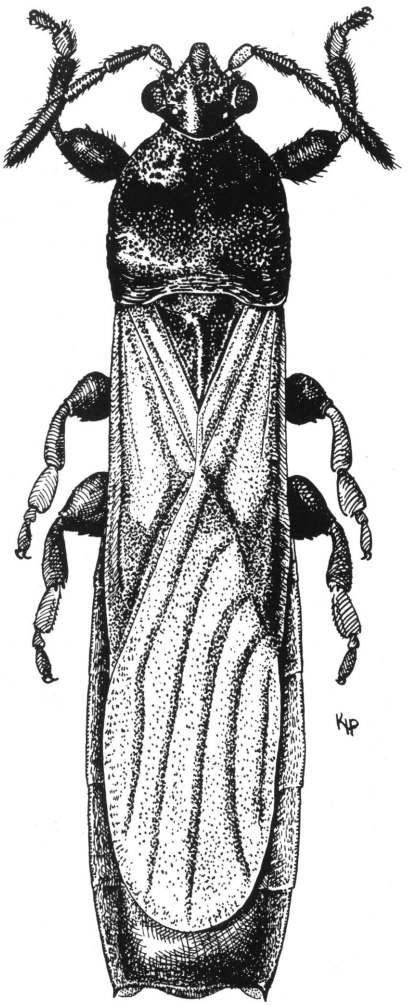


FIG. 35. *Extaramorphus magnatarsus*, dorsal view.

GELASTOBLISSUS SLATER AND WILCOX
Figure 36

Gelastoblissus Slater and Wilcox, 1968, pp. 435, 438.

TYPE SPECIES: *Gelastoblissus rugosus* Slater and Wilcox. Monobasic.

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Body stout, robust, elliptical. Abdomen very strongly, ovately expanded and rounded. Metathoracic scent gland auricle narrowly lobate, short and rounded. Fore femora

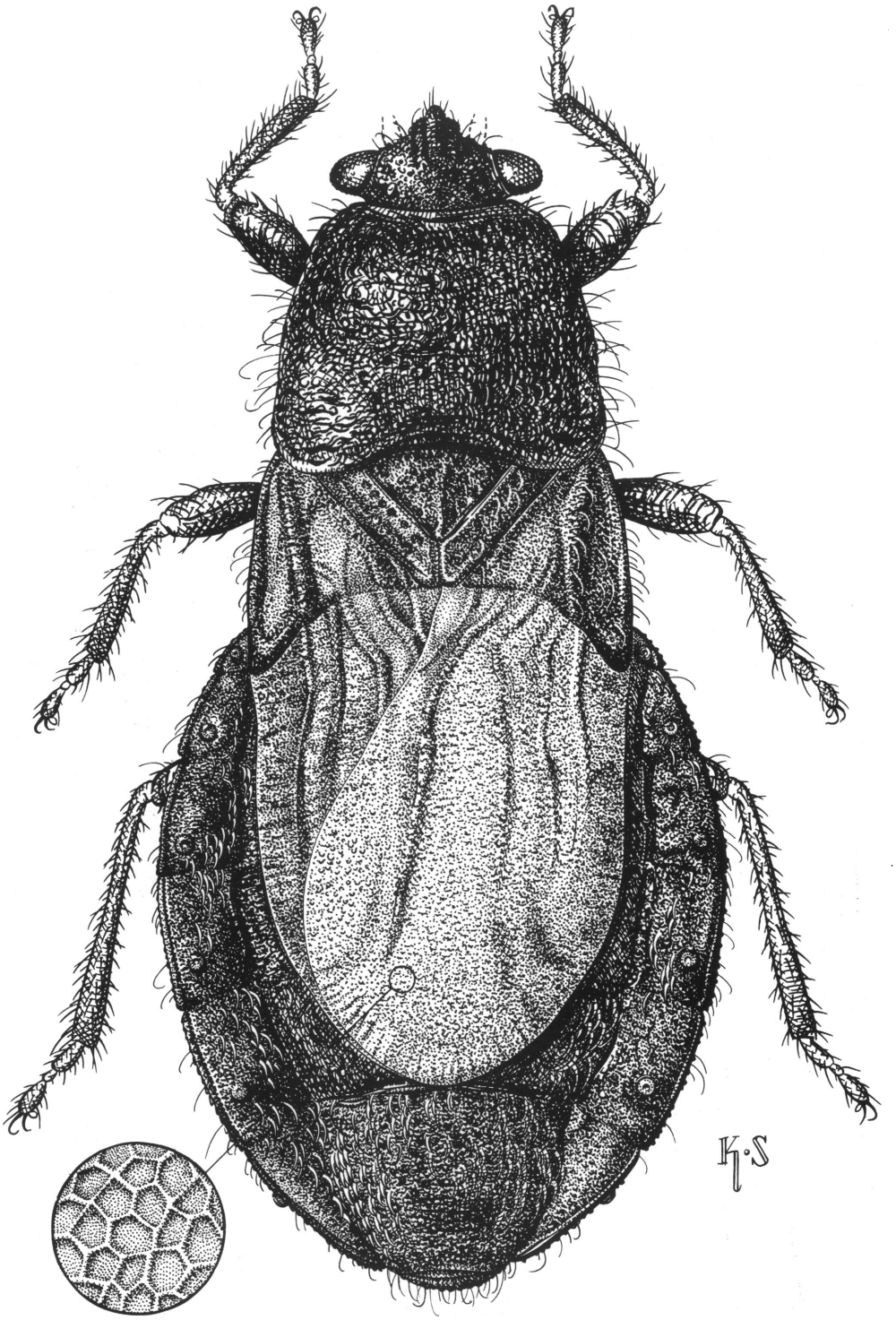


FIG. 36. *Gelastoblissus rugosus*, dorsal view.

moderately incrassate armed below on distal third with a single, very elongate, toothlike spine; middle and hind femora mutic. Entire body subshining above and below, completely lacking pruinose areas. Apical corial margin concave. Membrane thin, subhyaline, strongly differentiated in texture from corium; membrane composed of tiny reticulate cells. Fore coxal cavities closed. Ocelli small. Clavus and corium much shortened, membrane not covering seventh abdominal tergum thus submacropterous with membrane of one wing only partially covering membrane of other wing. Eyes laterally produced and rather transverse. Antennae and genitalia unknown.

GEOBLISSUS HIDAKA[1]
Figure 37

Geoblissus Hidaka, 1959, pp. 269-270.

TYPE SPECIES: *Geoblissus rotundatus* Hidaka. Monobasic.

DISTRIBUTION: Africa, Asia, Southern Eurasia, Japan, East Indies.

BIOLOGY: Reported as injuring sugar cane and on grasses of the genera *Elymus* and *Aristida*.

DIAGNOSIS: Body short, stout, thick; metathoracic scent gland auricle short, broadly rounded, earlike, with a short distal "hook"; fore femora mutic; fore tibiae broadly expanded and armed with rows of spines along margins; head and pronotum above and scutellum completely shining; prothorax pruinose below in front of and below coxae and behind coxae dorsad to lateral margins; body covered with elongate upstanding hairs; apical corial margins strongly concave; membrane hyaline, much differentiated from coriaceous corium; fore coxal cavities open; ocelli small; brachypters unknown; antennae clavate; sperm reservoir with well-developed cup and straplike slender wings.

KEY TO SPECIES OF *GEOBLISSUS*

1. Fore wing with entire membrane dark chocolate brown to black (Africa) ..... *magnofuscus* Slater and Wilcox
1a. Fore wing with membrane chiefly white or transparent hyaline 2

[1]See discussion of type species of *Blissus* Burmeister.

2. Scutellum with anterolateral angles produced into short tubercular spines 3
2a. Scutellum usually lacking anterolateral spines. 5
3. Entire corium white to translucent, at most tinged with yellowish or tan on distal one-fourth (Africa) ..... *siccus* Slater and Wilcox
3a. At least distal one-fourth of corium marked with brown (or if brown area reduced then labium reaching onto mesoternum but remote from mesocoxae) 4
4. Relatively large species, ♀ 4.15-4.20 (♂ unknown); dark brown coloration on corium extending anteriorly half-way along cubital vein (Africa) ..... *niger* Slater
4a. Smaller species, under 4.0; dark brown coloration on corium usually confined to distal one-fourth (sometimes with small brown area on vein at "notch" of inner margin) (Africa) ..... *hirtulus* (Burmeister)
5. Propleuron and prosternum completely shining, lacking pruinosity (Palearctic) ..... *barchanorum* (Kiritshenko)
5a. Prosternum pruinose before coxae and usually on propleuron posterior to acetabulum 6
6. Width of head much greater than half pronotal width; length of scutellum much more than half of scutellar width (30:49) (Oriental) (fig. 37) ..... *mekongensis* Slater, Ashlock, and Wilcox
6a. Width of head less than half pronotal width; scutellar length half width (40:80) (Palearctic) ..... *putoni* (Jakovlev)

HEINSIUS DISTANT
Figure 38

Heinsius Distant, 1901, p. 469.

TYPE SPECIES: *Heinsius explicatus* Distant. Monobasic.

DISTRIBUTION: Australia.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, linear, not flattened; metathoracic scent gland auricle rounded, lobate; fore femora with a single small ventral spine present; body lacking pruinosity above and below; body and appendages clothed with numerous conspicuous flattened scalelike hairs; apical corial margin concave; membrane much thinner than corium, lacking reticulate veins; corium shortened; antennae short, stout, segments rather nodular, segments three and four narrower than segments one and two; ninth and tenth female abdominal para-

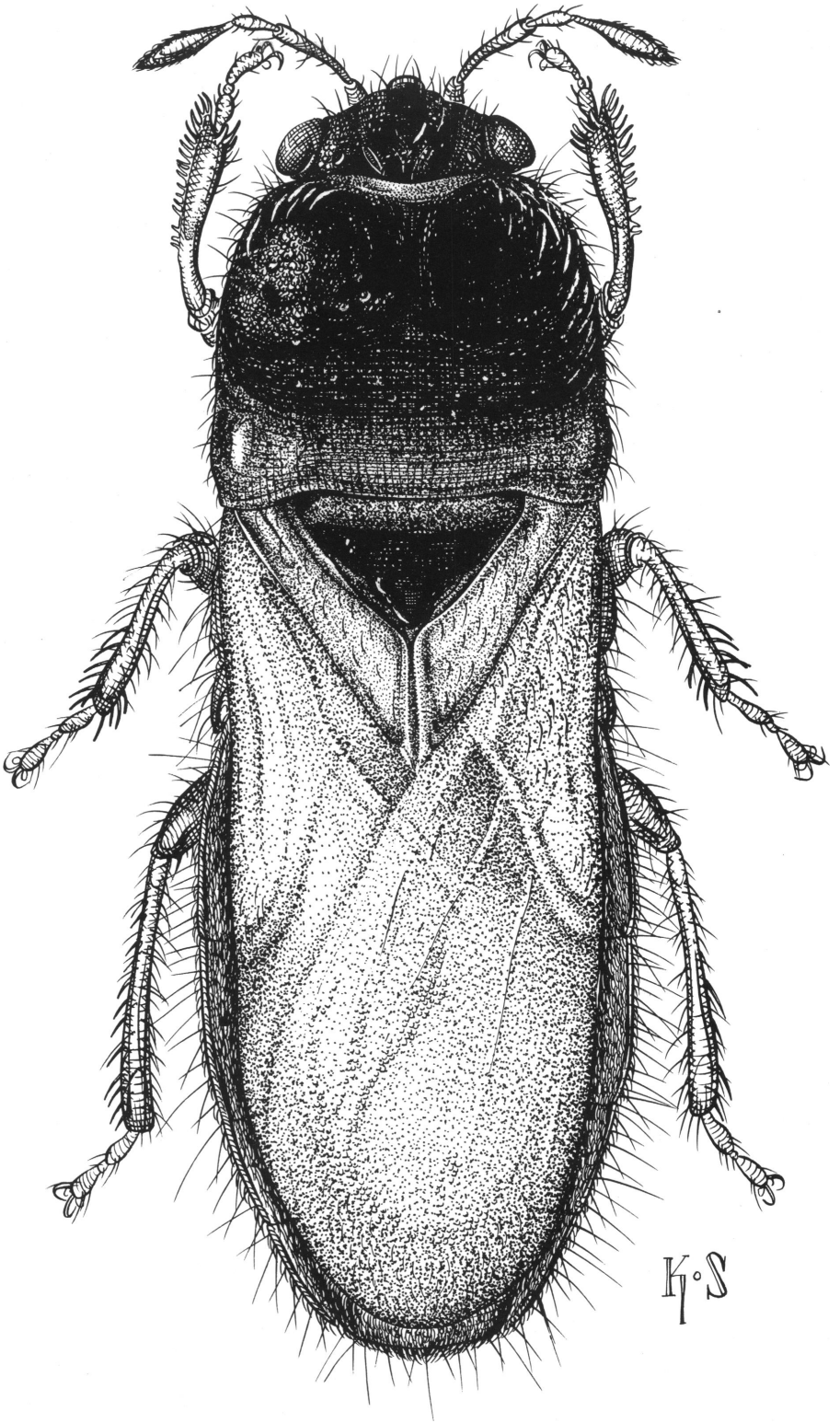


FIG. 37. *Geoblissus mekongensis*, dorsal view.

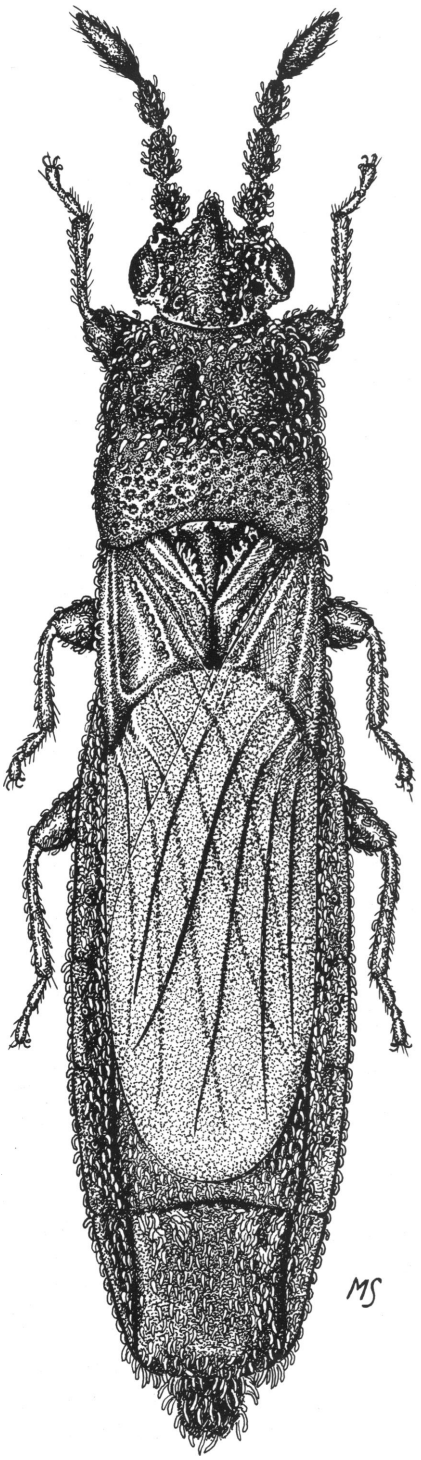


FIG. 38. *Heinsius explicatus*, dorsal view.

tergites elongated and extending conspicuously caudad of segment eight (fig. 8H); abdominal sterna three thru six each with only two trichobothria present; sperm reservoir reduced to a small distally acute scalelike process (fig. 1T, U). Spermathecal bulb appearing to be secondarily invaginated; with a short pump (fig. 2F); fifth instar nymph lacking conspicuous posterior sclerotization.

KEY TO SPECIES OF *HEINSIUS*

1. Head width less than one and one-fourth times interocular distance, antenniferous tubercles projecting straight or nearly straight forward; veins of membrane pale . . . . . *.pallidus* Slater and Sweet

1a. Head width greater than one and one-fourth times interocular distance; antenniferous tubercles diverging strongly cephalolaterad from bases; veins of membrane chocolate-brown, contrasting conspicuously with pale membrane . . . . . *.explicatus* Distant

HETEROBLISSUS BARBER
Figure 39

Heteroblissus Barber, 1954, p. 221.

TYPE SPECIES: *Heteroblissus anomilis* Barber. Monobasic.

DISTRIBUTION: South America.

BIOLOGY: Unknown.

DIAGNOSIS: Body robust, stout but moderately linear. Metathoracic scent gland auricle short, rounded, earlike (fig. 9G). Fore femora incrassate armed below with one large and several small spines. Body above and below completely shining, lacking pruinose areas. Apical corial margin concave basally but straight for greater portion of length. Membrane thin, semihyaline, considerably thinner than adjacent corium. Fore coxal cavities open. Fore tibiae not swollen but with a series of small tubercles along shaft. Ocelli small. Extreme microptery common with wings reduced to tiny scalelike pads that do not reach abdomen. Abdomen with a rather large striated (apparently stridulatory) area present. Sperm reservoir variable sometimes with very large distally broadened bulb and wings broad basally and tapered distally (fig. 1AA). In some species bulb appear-

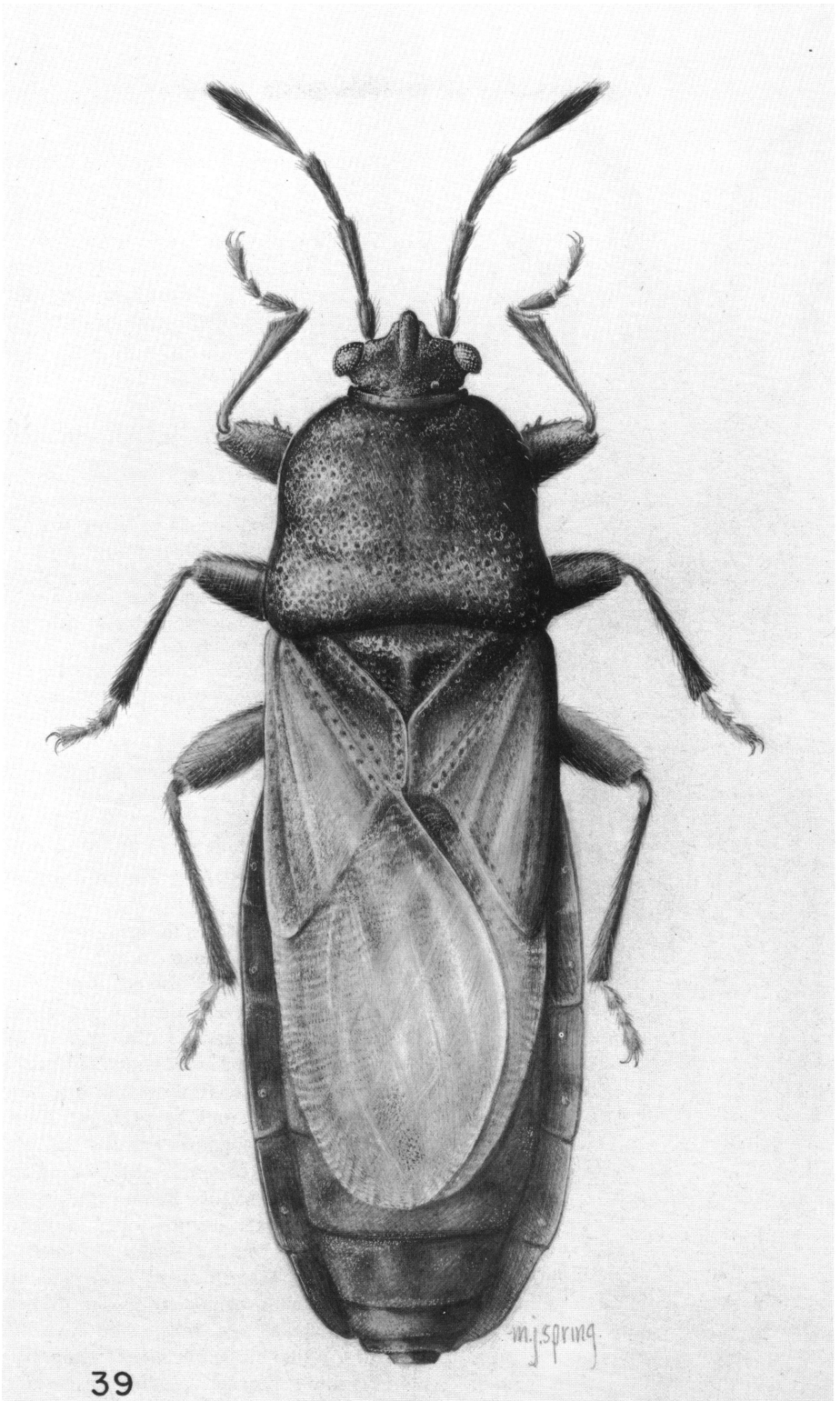


FIG. 39. *Heteroblissus anomilis*, dorsal view.

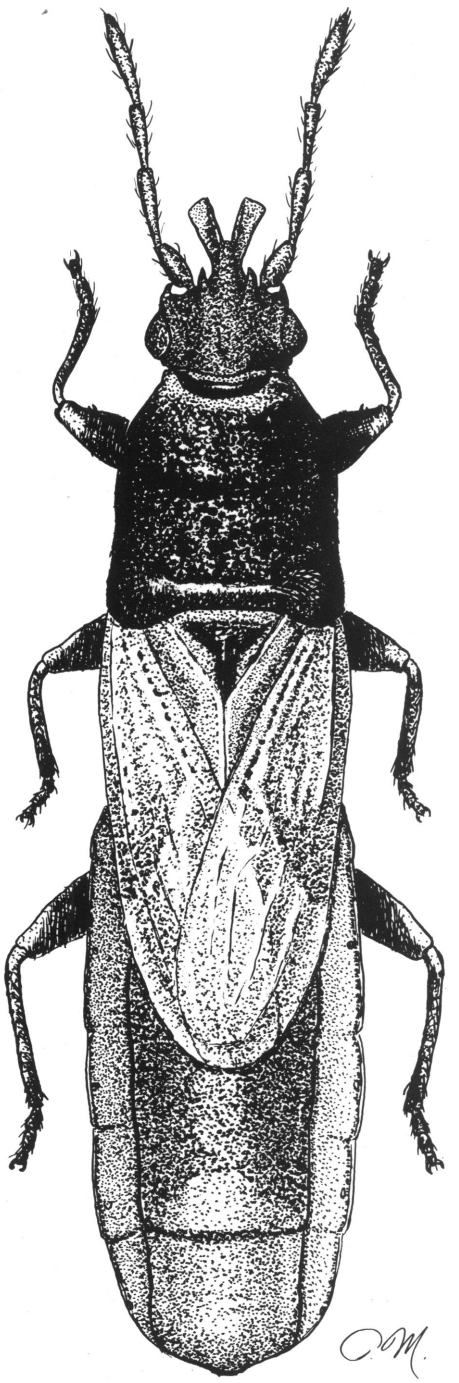


FIG. 40. *Iphicrates gressitti*, dorsal view.

ing to be completely membranous with irregular sclerotized areas probably representing wing remnants. Ovipositor elongate. Spermathecal bulb very large, pump short and stout (fig. 2-I).

IPHICRATES DISTANT
Figure 40

Iphicrates Distant, 1903, pp. 44-45.
Anisosoma Bergroth, 1918, pp. 69-70.

TYPE SPECIES: *Iphicrates subauratus* Distant. Monobasic.

DISTRIBUTION: Australia, New Caledonia, Solomon Islands through East Indies to Southern Asia, Taiwan, Japan, Philippines.

BIOLOGY: Poorly known, some evidence of breeding on bamboos and other grasses.

DIAGNOSIS: Body moderately elongate, linear, not strongly flattened. Metathoracic scent gland auricle little produced above adjacent body surface, usually straight, not strongly tapered to distal end, occasionally curved anteriorly and sometimes angled posteriorly (fig. 11B, C, D, F). Fore femora moderately incrassate usually armed below with two spines. Middle and hind femora usually mutic occasionally with a series of small spines present. Pruinosity variable. Dorsal surface of head and pronotum subshining, sometimes appearing granulose, with a partial or complete ring of pruinosity present anteriorly just behind collar. Lateral and ventral surfaces with variable pruinosity—from completely shining to completely pruinose. Scutellum laterally either pruinose or shining. Apical corial margin usually straight but sometimes strongly concave. Membrane much thinner than corium. Fore coxal cavities closed. Ocelli small. Marked sexual dimorphism present, males with bucculae much enlarged projecting forward in front of tylus and frequently distally expanded. Antennae terete or moderately clavate. Antenniferous tubercles hooked (fig. 6E-G). Juga of males frequently raised above head surface and elongated as a pair of projecting horns. No noticeable transverse pronotal impression present. Microptery uncommon but known to occur, submacroptery common. Tarsi sometimes two-segmented. Claspers conventional. Sperm reservoir with

bulb stalked, margin thick, wings protruding at right angles to bulb, broad basally, distally terminating in an anvil-shaped apex (fig. 1BB) in some species much reduced. Spermathecal pump double flanged (fig. 2K), similar to condition found in *Macropes*.

KEY TO SPECIES OF *IPHICRATES*

1. Dorsal surface of each abdominal connexival segment bearing a brown patch on anterior one-third to one-half (only extreme micropters known with clavus and corium fused, membrane reduced to a small marginal flap and extending posteriorly only onto anterior portion of second abdominal tergum) (New Guinea) ..... *neotenicus* Slater

1a. Dorsal surface of connexivum lacking differentiated dark brown patches (occasionally a small black spot present on posterolateral areas) (usually macropterous or submacropterus, if wings reduced then with clavus and corium distinct, membrane well developed and extending posteriorly at least well onto third abdominal tergum) 2

2. Males 3

2a. Females 21

3. Apical corial margin deeply concave; veins of membrane brown, strongly contrasting with light ground color 4

3a. Apical corial margin straight or only slightly concave along inner one-third; veins of membrane at most only slightly darker than ground color, not strongly contrasting ...6

4. Large species (9.20 mm.); labium extending only to anterior margin of fore coxae; bucculae produced forward as narrow, straight spikes, widely separated mesally for entire length (fig. 6H) (Philippines) ...*rex* Slater

4a. Smaller species (under 7.0 mm.); labium reaching slightly caudad of posterior margin of prosternum; bucculae curved, in contact with one another either basally or apically (fig. 6E-G) 5

5. Bucculae not in contact immediately anterior to tylus, then curving inward and in contact for most of length, apices bluntly rounded (fig. 6G) (New Caledonia) ..... *montaguei* Distant

5a. Bucculae in contact with one another basally, divergent distally, ending in a pair of sharp "points" (fig. 6E) (Australia) ..... *pseudolineatus* Slater

6. Bucculae narrow and linear or converging, never strongly broadened and expanded distally; if slightly expanded distally then juga attaining or exceeding apex of tylus 7

6a. Bucculae becoming strongly expanded distally (fig. 6F) 12

7. Bucculae acute at apices 8

7a. Bucculae either rounded or truncate at apices 10

8. Bucculae in contact with one another mesally before tylus, broad and curving to acute apices (New Guinea; Queensland) ..... *lineatus* Slater

8a. Bucculae projecting forward as small slender subacute spikes, very broadly separated from one another for entire length 9

9. Middle and hind femora bearing a series of small spines and setae on ventral surfaces; each fore femur with single straight spine below, no bifid spine present on distal one-third; membrane transparent hyaline (New Guinea) ..... *angulatus* Slater

9a. Middle and hind femora mutic; each fore femur bearing a large bifid spine below on distal one-third; membrane opaque, usually tan to dark brown (testaceous in some specimens) (New Guinea) ..... *nigritus* Slater

10. Juga attaining or exceeding apex of tylus, long and slender; apices of bucculae truncate (fig. 6F) (Malaya) ..... *malayensis* Slater

10a. Juga much shorter, remote from apex of tylus; bucculae rounded at apices, not truncate 11

11. Bucculae converging, broadly in contact with one another along midline ..... *montaguei* (Distant)

11a. Bucculae nearly linear, never broadly in contact with one another along midline (Japan) ..... *spinicaput* (Scott)

12. Bucculae strongly angulate from inner angles to lateral corners, or broadly rounded ..13

12a. Bucculae nearly straight across apices, never strongly angulate from mesal to lateral angles (fig. 6F) 16

13. Bucculae narrow and straight for most of length, sharply expanded apically; each fore femur armed below distally with two sharp spines 14

13a. Bucculae gradually expanded for greater portion of length, lateral margins strongly convex, dorsal surfaces concave, having a "scooped-out" appearance; each fore femur with three sharp ventral spines 15

14. Labium relatively short, not exceeding fore coxae, second segment attaining base of head; pronotum uniformly shining, lacking a complete distinct pruinose band posterior

to collar area; small species (3.64-3.75 mm.) (New Guinea) ..... *cervinellus* Slater

14a. Labium longer, nearly reaching posterior margin of prosternum, second segment surpassing base of head by half its length; pronotum with a complete, narrow, but distinct pruinose band across area posterior to collar; larger species (3.92-4.04 mm.) (Taiwan) (fig. 40) ..... *gressitti* Slater

15. Bucculae with lateral margins terminating in an acute point, sometimes slightly recurved; juga rounded and thick; pronotum black except at humeral angles; basal width of pronotum greater than median length ..... *angulatus* Slater

15a. Bucculae with lateral margins evenly rounded, not terminating in an acute angle; juga sharp and acute; pronotum with posterior one-third usually dark reddish brown; median pronotal length subequal to width across humeri (Tasmania) ... *spathus* Slater

16. Bucculae meeting or nearly meeting along midline for some distance in front of apex of tylus; juga very elongate, exceeding apex of tylus, projecting cephalo-mesad (Ceylon) ..... *subauratus* Distant

16a. Bucculae usually separated from one another along meson, if in contact then with juga short, thick and not attaining apex of tylus 17

17. Veins of membrane broadly darkened, strongly contrasting with uniformly opaque white ground color of remainder of membrane ... 18

17a. Membrane of fore wing usually hyaline with veins nearly unicolorous 19

18. Apical corial margin deeply and evenly (arcuately) concave; pronotum nearly completely shining with only a small patch of pruinosity present anterolaterad and remote from midline; three central veins of membrane broadly "connected" with a dark area along apical corial margin ..... *rex* slater

18a. Apical corial margin shallowly sinuate, not deeply and arcuately concave; pronotum with a complete pruinose band across meson posterior to collar area; two central membranal veins separated from apical corial margin by a pale area ..... *pseudolineatus* Slater

19. Bucculae concave along anterior margins and often in contact or nearly so (Philippines; Malaya) ..... *lativentris* (Bergroth)

19a. Bucculae convex or nearly straight on anterior margins, broadly separated along meson ... 20

20. Each fore femur with three sharp spines below, distal two spines divergent, each set on a stout tubercle; antenniferous tubercles very long, acute, exceeding juga in length (New Guinea) ..... *papuensis* Slater

20a. Each fore femur with two straight spines below; antenniferous tubercles short, stubby, slightly curved, much shorter than juga (New Guinea) ..... *cervinellus* Slater

21. Bucculae not surpassing apex of tylus, distal ends of bucculae angled mesocephalad to terminate near apex of tylus 22

21a. Bucculae exceeding tylus, if by only a short distance then their apices acute or subacute and not angled against lateral margins of tylus 25

22. Pronotum bearing a strip of pruinosity anteriorly which is complete across midline; scutellum pruinose basally and laterad of median elevation 23

22a. Pronotum lacking dorsal pruinosity even anteriorly; scutellum shining, lacking pruinose area basally and laterally 24

23. Pronotum strongly bicolored with light brownish yellow posterior half strongly contrasting with black anterior half; abdomen above uniformly bright yellow ..... *subauratus* Distant

23a. Pronotum not strongly bicolored, chiefly black, with a red-brown band confined to humeral area remote from transverse constriction; abdomen above red-brown with connexiva sometimes a lighter yellowish brown (fig. 40) ..... *gressitti* Slater

24. Antennae and femora (except at distal ends) black, concolorous with head and pronotum; antenniferous tubercles projecting anterolaterad as straight spinelike processes (fig. 6H) ..... *angulatus* Slater

24a. Antennae and femora bright red-brown, conspicuously lighter than black head and pronotum; antenniferous tubercles curving anterolaterad, not projecting as straight, acute spinelike processes (fig. 6F) ..... *lativentris* (Bergroth)

25. Bucculae projecting beyond apex of tylus and in contact with one another mesally either at distal ends or along entire mesal margins with exception of apical area 26

25a. Bucculae barely projecting beyond apices of tylus, or if so projecting then separated from one another for entire length 27

26. Bucculae in contact with one another mesally immediately before tylus, separate only dis-

tally; membrane translucent hyaline, lacking dark brown markings ..... *lineatus* Slater

26a. Bucculae separate from one another for most of length, in contact along midline only at distal ends; membrane opaque white with veins and a diffuse vitta on inner half contrastingly dark brown ..... *montaguei* (Distant)

27. Bucculae produced beyond apex of tylus as large rounded "scooplike" lobes, noticeably excavated on dorsal surfaces ..... *spathus* Slater

27a. Bucculae produced forward of apex of tylus either as acute or rounded projections but never strongly excavated on dorsal surfaces 28

28. A prominent bifid spine present on each fore femur ..... *nigritus* Slater

28a. No bifid spine present on each fore femur 29

29. Labium extending posteriorly onto anterior portion of mesosternum ..... *spinicaput* (Scott)

29a. Labium not exceeding posterior margin of prosternum 30

30. Bucculae conspicuously exceeding apex of tylus, usually by a distance subequal to length of juga ..... *papuensis* Slater

30a. Bucculae very short, only very slightly exceeding apex of tylus, by much less than length of juga 31

31. Labium relatively short, not attaining fore coxae, second segment not reaching base of head (ratio length segments 1 + 3 × 100 / interocular distance = 70) ..... *cervinellus* Slater

31a. Labium longer, attaining fore coxae, second segment reaching to or beyond base of head (ratio length segments 1 + 3 × 100 / interocular distance = 82-92) ..... *malayensis* Slater

ISCHNOCORIDEA HORVATH
Figure 41

Ischnocoridea Horvath, 1892, p. 260.

TYPE SPECIES: *Ischnocoridea elegans* Horvath. Monobasic.

DISTRIBUTION: Western Africa.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, robust; metathoracic scent auricle rounded, earlike (fig. 9H); propleuron not excavated for reception of fore femora; fore femora multispinose; head and pronotum above completely shining, prothorax below narrowly pruinose to level above acetabula, dorsal portion of propleuron shining; scutellum with some pruinosity present laterally near base; apical corial margin straight; membrane broadly pruinose adjacent to apical corial margin, remainder strongly shining, membrane texture thickened nearly equal to that of corium; fore coxal cavities closed; ocelli small; antennae somewhat clavate; sperm reservoir small with cup holding slender, diverging, distally enlarged wings (fig. 1W), ovipositor elongate. Spermatheca with large bulb and straight, thick pump that is not double-flanged (fig. 2Q).

ISCHNODEMUS FIEBER
Figures 43-51

Ischnodemus Fieber, 1837, pp. 337-338.
Micropus Spinola, 1837, pp. 218-221.
Thops Gistl, 1848, p. x.
Romicpus Reed, 1900, pp. 66-67.

TYPE SPECIES: *Ischnodemus quadratus* Fieber. Monobasic.

DISTRIBUTION: All major zoogeographic regions.

BIOLOGY: Most abundant on various species of Gramineae. Also known to breed on Cyperaceae, Juncaceae, Zingiberales, and Haemodoraceae.

DIAGNOSIS: Body moderately to very elongate, slender, linear, not strongly flattened. Metathoracic scent gland auricle variable but generally rounded and earlike, or similar in conformation but more elongate (figs. 10A, B, C; 9A, B, J). Fore femora mutic or with one or two short spines present on ventral surface, rarely with three or four spines present. Middle and hind femora always mutic. Pruinosity variable from completely pruinose to completely shining above and below. Apical corial margins straight. Membrane usually much thinner than corium, rarely thickened, opaque and similar in texture to adjacent corium. Fore coxal cavities closed. Ocelli small. Sexual dimorphism generally not evident. Microptery, brachyptery, and submacroptery common. Antennae terete or

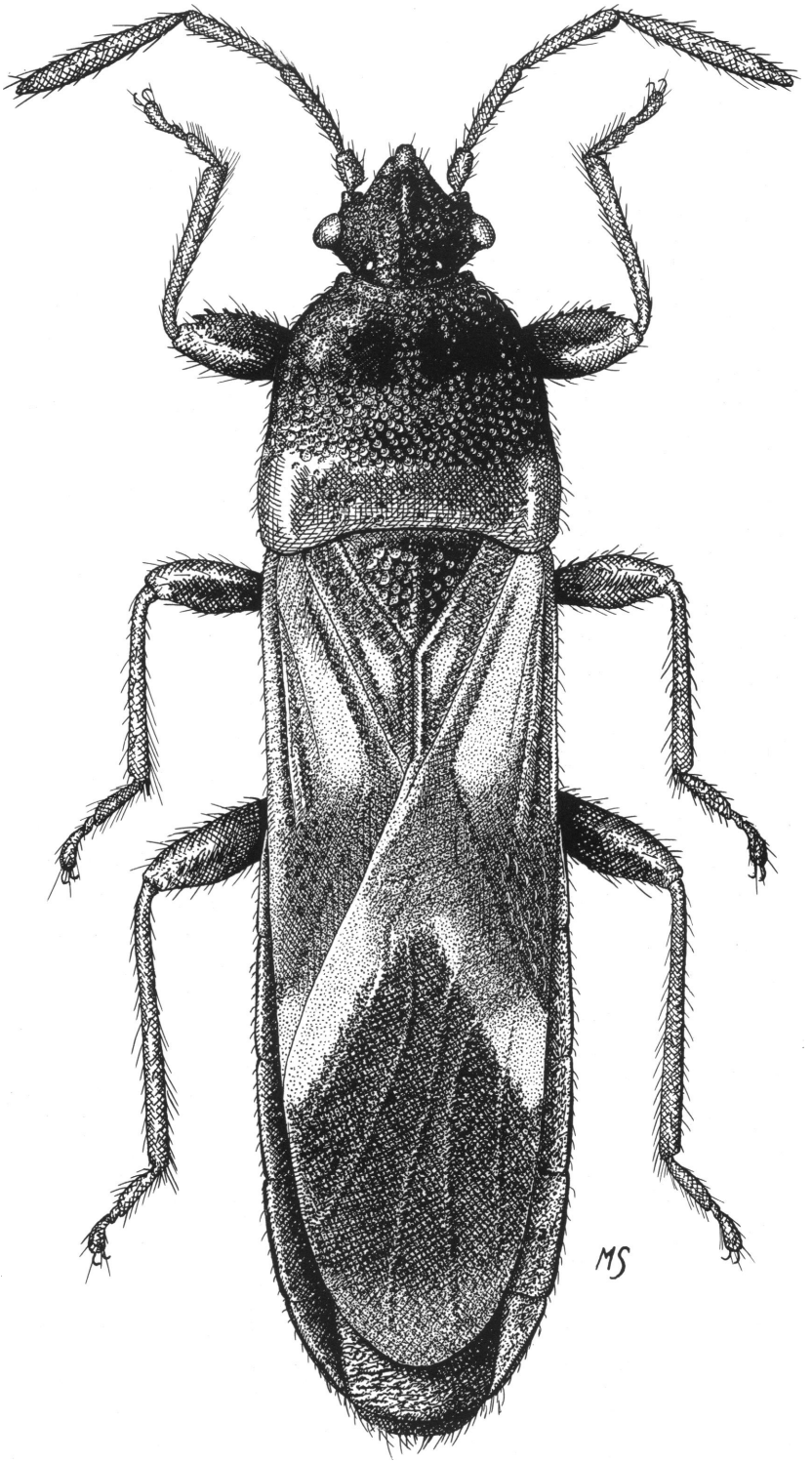


FIG. 41. *Ischnocoridea picipes*, dorsal view.

slightly clavate. Claspers generally of a plesiomorphic type. Sperm reservoir extremely variable from plesiomorphic with a large cup and straplike wings to reduced to a tiny cup and minute wings or a very large cup and extremely large flattened platelike wings that cover most of the membranous portion of cup (see fig. 1G-O, Q-S) (see also Slater and Harrington, 1970). Ovipositor variable in length.

DISCUSSION: *Ischnodemus aleocharoides* (Jakovlev) is a very unusual and anomalous species. It has apparently not been discussed in the literature since the original description by Jakovlev in the genus *Dimorphopterus*. Through the kindness of the British Museum, I have been able to examine a single micropterus female. The fore coxae are strongly closed indicating that it is not a species of *Dimorphopterus*. Lack of apomorphic features other than microptery and pruinosity loss would seem to relate it to my paraphyletic concept of *Ischnodemus*, where I place it provisionally. It is not included in the following key. However, it is not closely related to any other species of *Ischnodemus* thus far known. The head, entire prothorax (both above and below) and the scutellum are completely shining and lack any indications of pruinosity. The scutellum is very large, nearly as long as the pronotum, noticeably convex and coarsely punctate. The wings are reduced to small undifferentiated testaceous pads widely separated mesally and extending posteriorly only over the anterolateral corner of the second abdominal tergum. The fore femur is strongly incrassate and mutic. The metathoracic scent gland auricle is broadly splayed out distally to become somewhat mushroom-shaped. It has many of the same highly modified features of the African *Ischnodemus crassipes* yet does not appear to be closely related, the scent gland auricle of the latter being much smaller and conventionally lobate. Also the pronotum of *crassipes* is strongly widened anterior to the well-developed transverse impression, whereas in *aleocharoides* the pronotum is nearly evenly cylindrical with the transverse impression at most scarcely discernible. Macropterous and male specimens must be examined to more adequately place this most anomalous species.

PHYLOGENETIC RELATIONSHIPS OF *ISCHNODEMUS*

Thus far it has proven impossible to find synapomorphic characters to place all of the species of *Ischnodemus* into a scheme of branching dichotomies. This is particularly true at the base of the cladogram. The scheme illustrated (fig. 42) appears to most accurately reflect not only our state of knowledge but also what is reasonably recoverable from a study of extant species alone. Certainly *Ischnodemus* is an old genus with many of the ancestral "lines" extinct. What does seem to emerge, however, are four reasonably definable clades within each of which a series of grades is evident.

I conceive the ancestral *Ischnodemus* to be an only moderately elongate bug with a single spine on each of the fore femora, a completely pruinose head, thorax and scutellum, a wing without prominent color markings, a rounded lobate earlike metathoracic scent gland auricle, an ovipositor that reaches anteriorly to abdominal sternum five, and a labium extending onto the mesosternum.

GROUP I (FIG. 42A): The species which most closely approximate this condition are those which I call the *oculatus* group and include *oculatus* itself, two additional Madagascar species, *canus* and *madagascariensis* and two African species, *diplachne* and *schoutedeni*. These species seem to represent a group very close to the hypothetical plesiomorphic *Ischnodemus*. All of these species also have a plesiomorphic sperm reservoir with a rounded bulb and straplike wings (*diplachne* and *schoutedeni* have the wings curled at the tips, presumably a slightly derived feature). In *canus, oculatus,* and *madagascariensis* there is a modification of the fore femora in that *madagascariensis* has two fore femoral spines present, and in *canus* the fore femoral spines are absent.

GROUP II: A second group comprises only two species, the Oriental *noctulus* and Southwest Australian *sordidus*, which are discussed in some detail in the zoogeographic section. Both of these species have completely pruinose dorsal surfaces but show synapomorphies in the

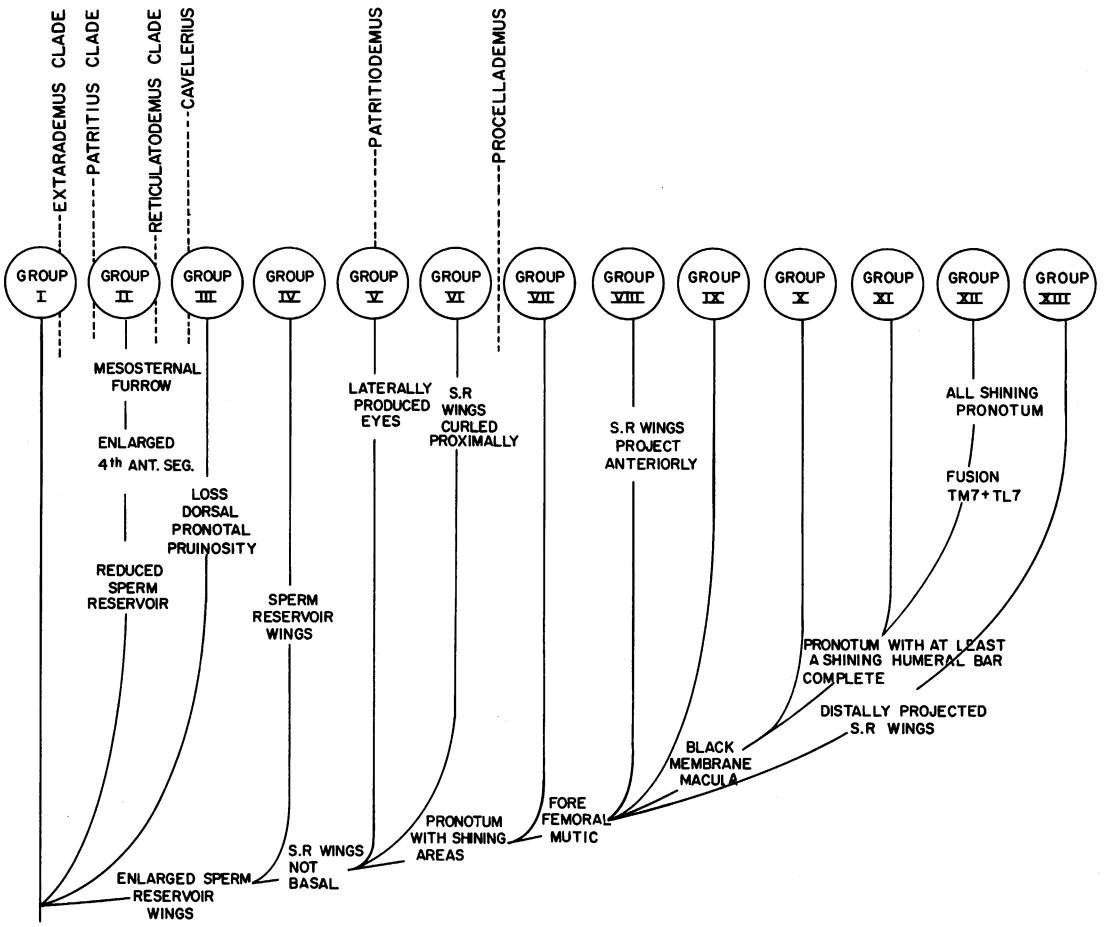


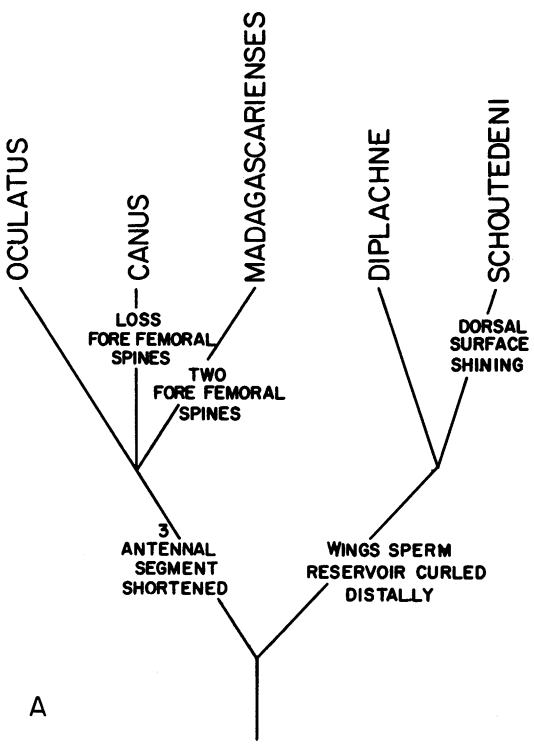
FIG. 42. Cladogram of "Groups" of *Ischnodemus* (continued on consecutive pages). A. Cladogram of species of *Ischnodemus* Group I. B. Cladogram of species of *Ischnodemus* Group III. C. Cladogram of species of *Ischnodemus* Group VI. D. Cladogram of species of *Ischnodemus* Group VIII. E. Cladogram of species of *Ischnodemus* Group IX. F. Cladogram of species of *Ischnodemus* Group X. G. Cladogram of species of *Ischnodemus* Group XI. H. Cladogram of species of *Ischnodemus* Group XII. I. Cladogram of species of *Ischnodemus* Group XIII.

enlarged fourth antennal segment, the presence of a metasternal furrow, and particularly in the nature of the reduction of the sperm reservoir in which the bulb is very small and the wings reduced to extremely small "scales" arising from the extreme distal end of the bulb (sperm reservoir type IX of Slater and Harrington, 1973).

GROUP III (FIG. 42B): The third group is less homogenous than either of the two previously discussed. Essentially it consists of species that have retained the pleisomorphic sperm reservoir but have partially or completely lost the dorsal pruinosity so that the head, pronotum, and sometimes even the scutellum are completely shining above. Some of these species also have a hyaline membrane. Within this group, however, I include such species as *genei* and *brincki*, which show incomplete loss of the dorsal pruinosity, and a number of species that have lost the fore femoral spine, including *genei, nigrocephalus, parathoracicus, thor-*

acicus, consobrinus, and *crassipes*. There is also a tendency for reduction of the sperm reservoir bulb, which is rather marked in such species as *brevicornis, sinuatus, dentatus, brincki,* and *ulugurus*. There is no strong apomorphic character that "holds" all of these taxa together. They do seem to form a relatively plesiomorphic group, but show a strong tendency toward pruinosity reduction and a grade tendency toward loss of fore femoral spines.

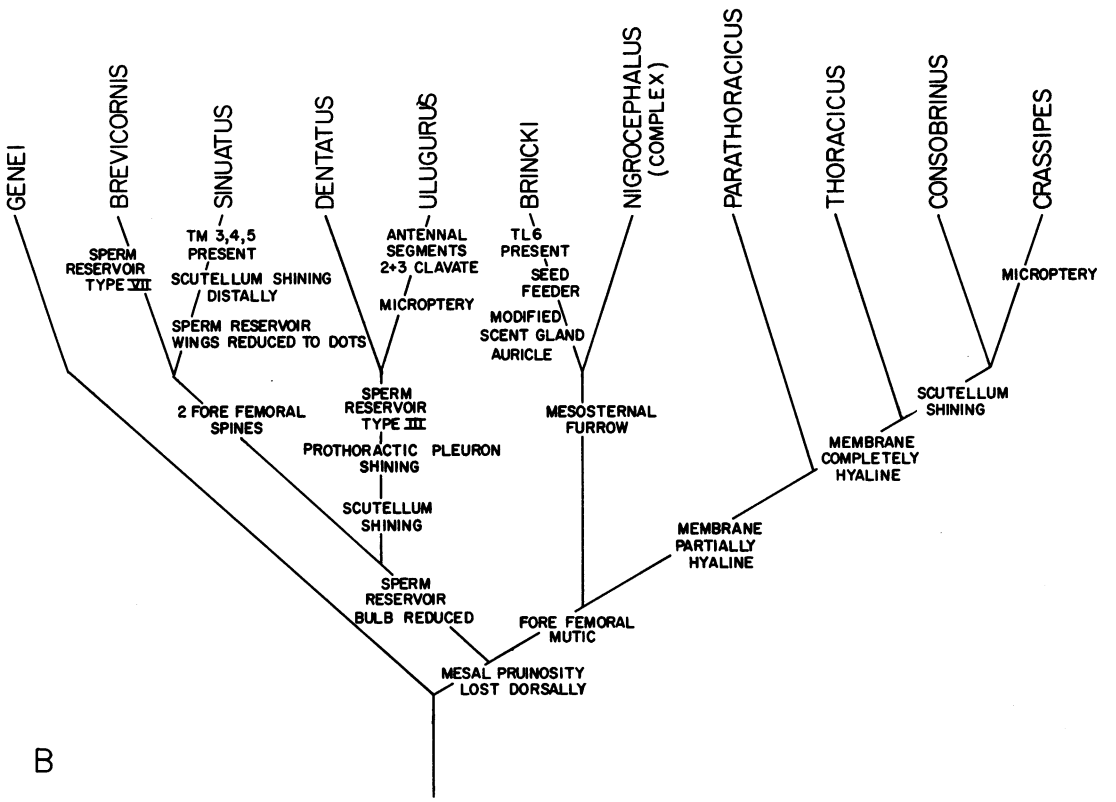
The three groups discussed above constitute the more generalized known species of *Ischnodemus*. They are all confined to the Eastern Hemisphere. The most important feature separating them from the remaining groups of *Ischnodemus* (discussed below) is that none of them have a highly derived sperm reservoir (except in the sense of reduction), whereas the remaining groups do have what we consider to be an important synapomorphic character in that the bulb of the sperm reservoir has become enlarged, with extremely wide, flattened, platelike wings (usually curled at the lateral ends) present. It should be noted that there are characters in the nymphal sclerites which may be very useful in eventually establishing better cladistic relationships in the three groups mentioned above, but unfortunately nymphs are known for so few species of these groups that speculation is probably unwarranted at the present time. It is my impression that a number of the major clades in the Blissinae have been derived from common ancestors of species within the above three groups. For example, it is probable that species of *Cavelerius* are closely related to such *Ischnodemus* species as *genei*; that species of *Extarademus* have arisen early, probably near a common ancestor with the *oculatus* group; that *Patritius* and its relatives have arisen from an ancestor not unlike that from which *madagascariensis* has arisen; that the clade that contains *Reticulatodemus* and its relatives has arisen from an ancestor similar to such species as *Ischnodemus brevicornis* and *sinuatus*. When one realizes that species such as these are rather plesiomorphic elements of the three major clades of the more "apomorphic blissines," one can see the important position of these



groups of *Ischnodemus* as possible sister groups of the more derived genera. Of the *Ischnodemus* species with enlarged platelike sperm reservoir wings there still are taxa which present some problems.

GROUP IV: There are two closely related species in Africa, *congoensis* and *bequaerti*, in which the wings of the sperm reservoir, while definitely flattened and platelike, are smaller and placed more basad than they are in other species. This may be the ancestral condition of this sperm reservoir type or it may be a secondary condition. The latter seems more likely, for also in Africa are such species as *wittei, ocellaris,* and *canaliculus* in which the sperm reservoir bulb is reduced, the wings have a somewhat "flapped" appearance proximally, and *wittei*, at least on external appearance, is quite similar to *congoensis* and *bequaerti*.

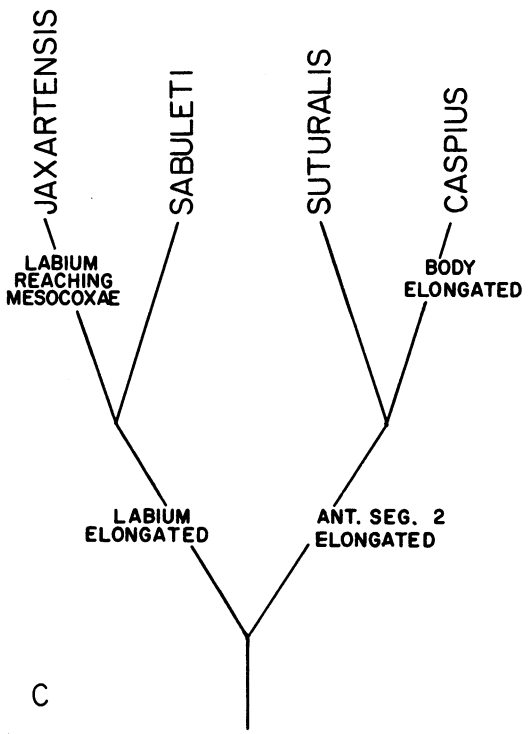
In South America there is a group of species which has been placed previously by us (possibly prematurely) as a separate genus *Pa-*



tritiodemus. These *Patritiodemus* species have very large, well-developed sperm reservoir wings but completely pruinose pronota and somewhat produced eyes. Within the "genus," mutic, simple spined, and enlarged bifid spined femora are present. It is this latter condition which led Slater and Ahmad (1971) to consider a separate genus to be involved. Some species of *Patritiodemus* are very similar to two other Neotropical species, *transitius* and *proprius*, which also have completely pruinose pronota and which are treated here as Group V.

GROUP VI (FIG. 42C): The only other *Ischnodemus* complex or group which has completely pruinose pronota is a Palearctic complex that includes the widespread species *sabuleti*. In these species the fore femora are always mutic, the nymphs have the Tm7 sclerite divided mesally (and Ta7 always present) in species whose nymphs are known, and very importantly, the sperm reservoir wings are curled "under" along the proximal margins rather than laterally as they are in most other members of these enlarged sperm reservoir-wings-complexes. This seems to be a rather isolated group, and I would suggest has its closest relationships not with extant African elements but probably with the ancestors of the more generalized species of Group V.

All the remaining species of *Ischnodemus*, which constitute the majority of the species, are forms which have at least some shining areas on the dorsal surface of the pronotum. This is a character which is difficult to evaluate, as it occurs in a number of different conditions and appears to show grade levels of organization in different clades of *Ischnodemus* species. Therefore, it is sometimes difficult to separate convergences and parallelisms from cladistic relationships.

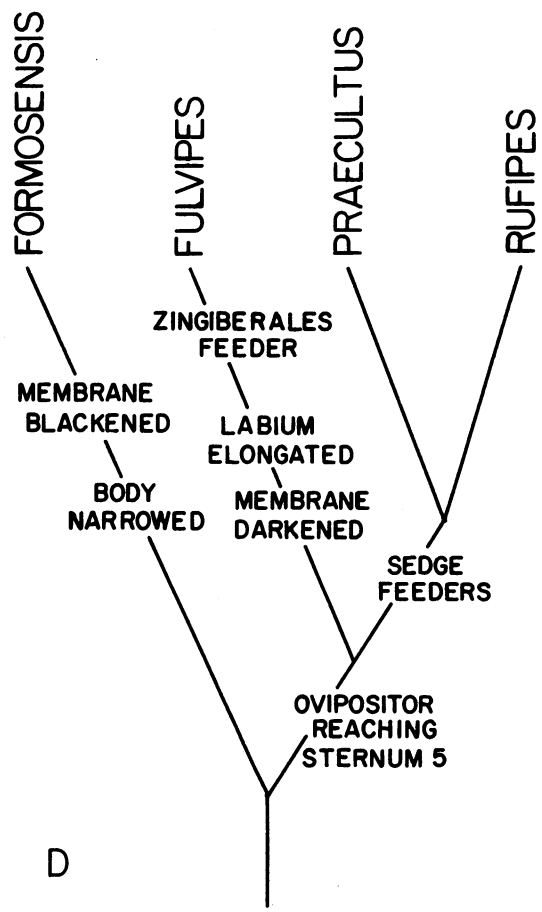


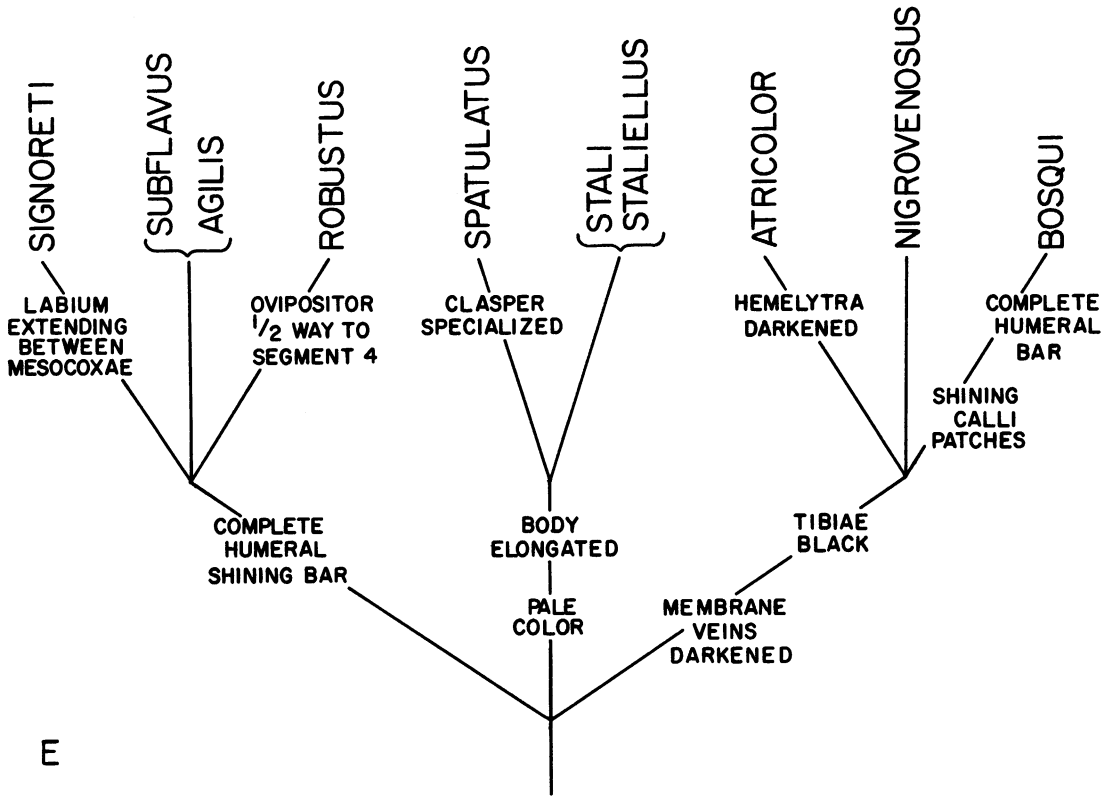
GROUP VII: There are only two species of those discussed in the preceding paragraph that have fore femoral spines. These are the southern African species *ochripes* and *linearis*, the former sometimes having four or five spines present on the fore femora. The sperm reservoir wings are very large and subquadrate in these two species, actually more similar to the type of sperm reservoir found in the majority of Neotropical and Nearctic species of *Ischnodemus* than that found in the other Ethiopian species.

The relationships of the Neotropical and Nearctic species with enlarged sperm reservoir wings are difficult to interpret. In all of them the sperm reservoir wings are large, relatively subquadrate similar to the condition found in the African species *ochripes* and *linearis*. They do appear to form a single phyletic lineage, although I have not been able to find a synapomorphic character of substance to separate them from other *Ischnodemus*. Within the Neotropics, however, several groups are present.

GROUP VIII (FIG. 42D): The *fulvipes* group seems to be a well-defined complex. In this group the lateral edges of the sperm reservoir wings project anteriorly, the eyes are produced laterad, and the clasper shape is rather distinctive. It is interesting to note that none of the species whose feeding habits are known feed upon grasses but upon other monocots such as sedges, zingiberales, and others. In addition to *fulvipes* itself, *formosensis, praecultus,* and *rufipes* belong to this group.

GROUP IX (FIG. 42E): The *stali* group may not be a monophyletic assemblage. I have included here such species as *stali, staliellus, spatulatus, atricolor, nigrovenosus, bosqi, signoreti, agilis, subflavus,* and possibly *robustus*. Most of the species are relatively elongate, pale





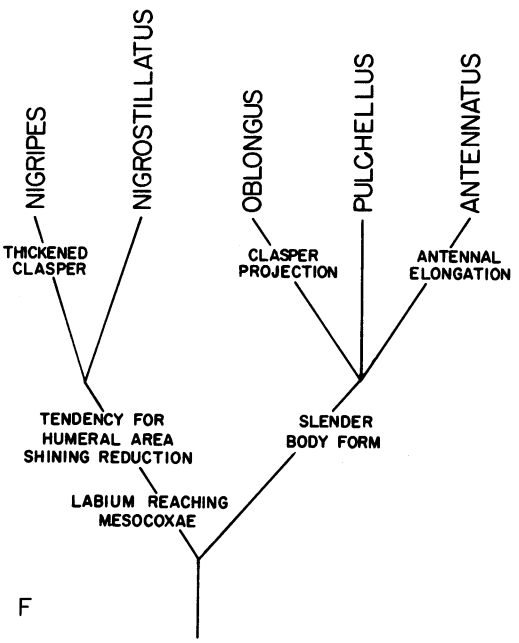
testaceous forms without a definite black macula on the membrane of the fore wing. They include species with a complete shining bar across the humeri such as *subflavus, signoreti,* and *agilis* and those in which there are three definite spots present such as *stali, staliellus,* and *spatulatus*. These species seem to be grass feeders and to be chiefly savanna insects.

In the Neotropics there are a number of species that have a large black macula on the membrane. These species might seem to be held together by a superficial character. I believe there are two distinct phyletic lines represented.

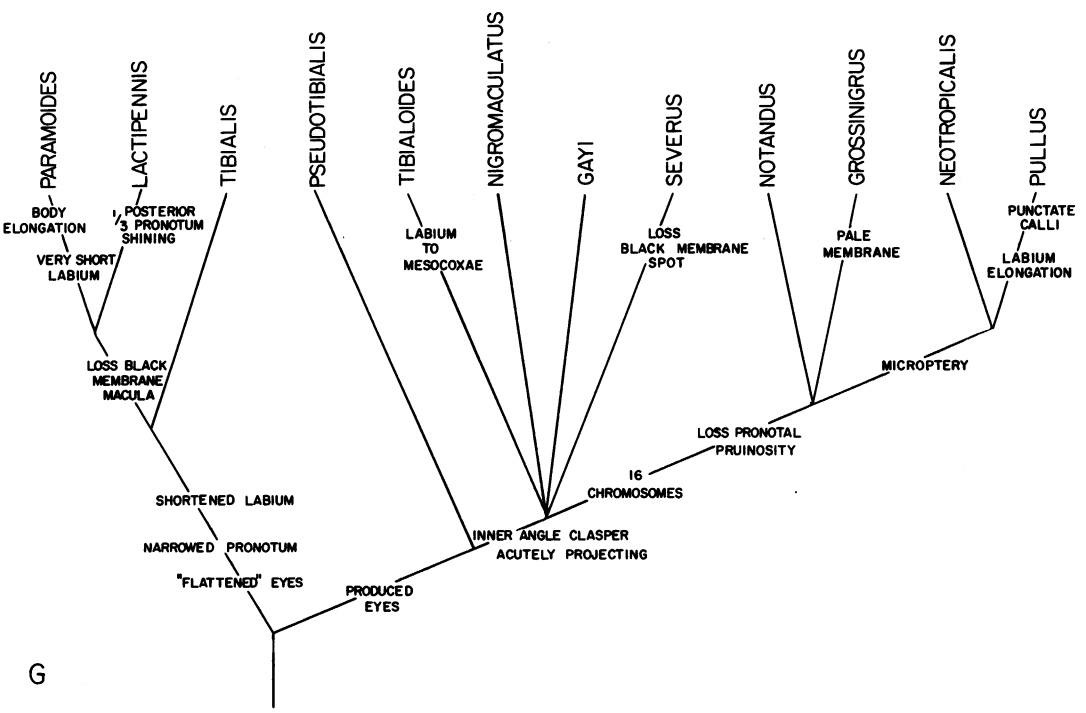
GROUP X (FIG. 42F): The first of these maculate complexes I call the *oblongus* group. It contains five species. *Ischnodemus oblongus, antennatus,* and *pulchellus* constitute a very closely related complex and are unquestionably sister species. The other two species, *nigrostillatus* and *nigripes*, are somewhat more isolated, and it is possible that they represent a more ancestral condition, since the humeral shining bar is often very much "reduced" and the labium extends to the mesocoxae. This group has an apparently synapomorphic character in the shape of the clasper and I do not argue strongly for the unity of the group. However, it is obvious that this group is quite distinct from the following which contains a number of species with a black membranal macula.

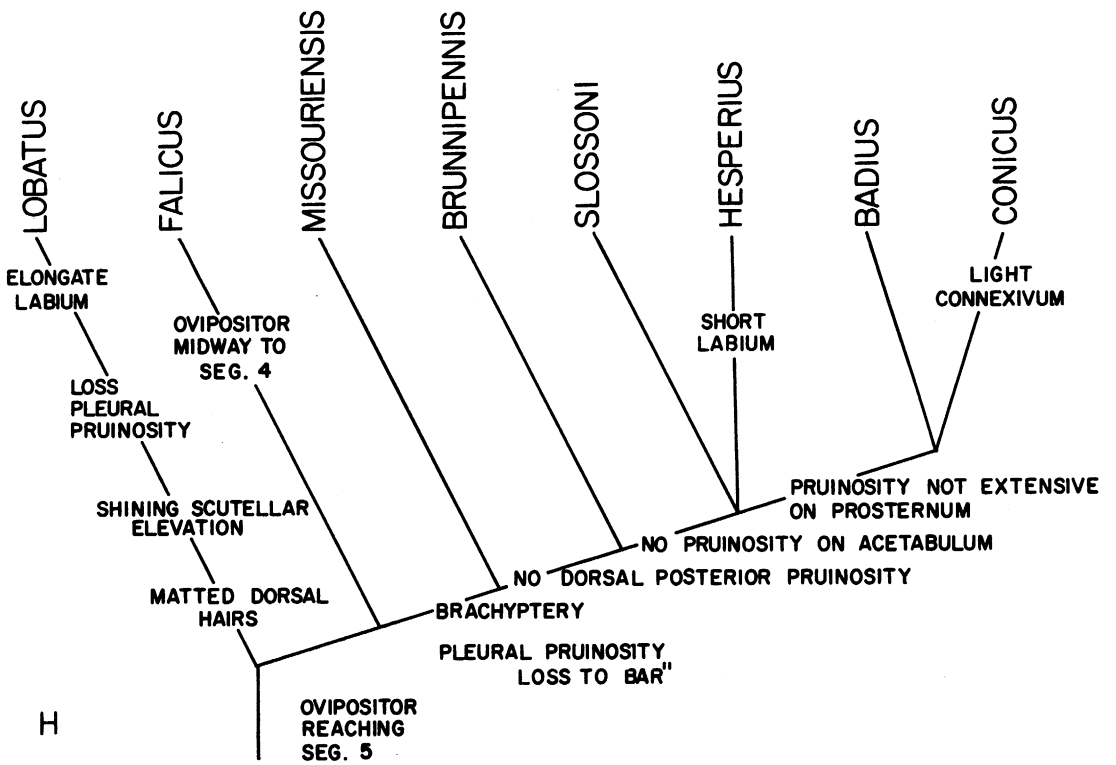
GROUP XI (FIG. 42G): This second maculate group I call the *tibialis* group. These species are characterized by a quite different body shape from the species of Group X, being for the most part elongate and slender, having a differently shaped clasper and laterally tapering wings to the sperm reservoir. They have a complete shining bar across the humeral area of the pronotum. To this complex belong several species which do not have the black macula. Thus, such species as *paramoides* and *lactipennis*, which lack the black macula, indicate that

the other features used to hold the group together are of importance. The species belonging to this complex, in addition to *tibialis*, are such closely related species as *pseudotibialis, tibialoides* and *nigromaculatus*, and somewhat more isolated species such as *gayi, severus, paramoides,* and *lactipennis*. It is also evident that within this group there has been anagenetic grade loss of the pronotal pruinosity, and thus such dorsally shining species as *notandus, grossinigrus,* and probably *neotropicalis* and *pullus* also belong here. These last four species are completely shining above but, particularly the first two, show close resemblance in most other characteristics to the other members of the *tibialis* group.



GROUP XII (FIG. 42H): The other *Ischnodemus* group found in the New World is essentially Nearctic. This constitutes the *falicus* group and makes up the great majority of the species found in North America. It includes *lobatus, slossoni, falicus, missouriensis, brunnipennis, hesperius, badius,* and *conicus*. These species are all characterized by dorsally shining pronota, for the most part elongate ovipositors and a fusion in the nymphal sclerites of Tm7 and Tl7. There seems to be no question but

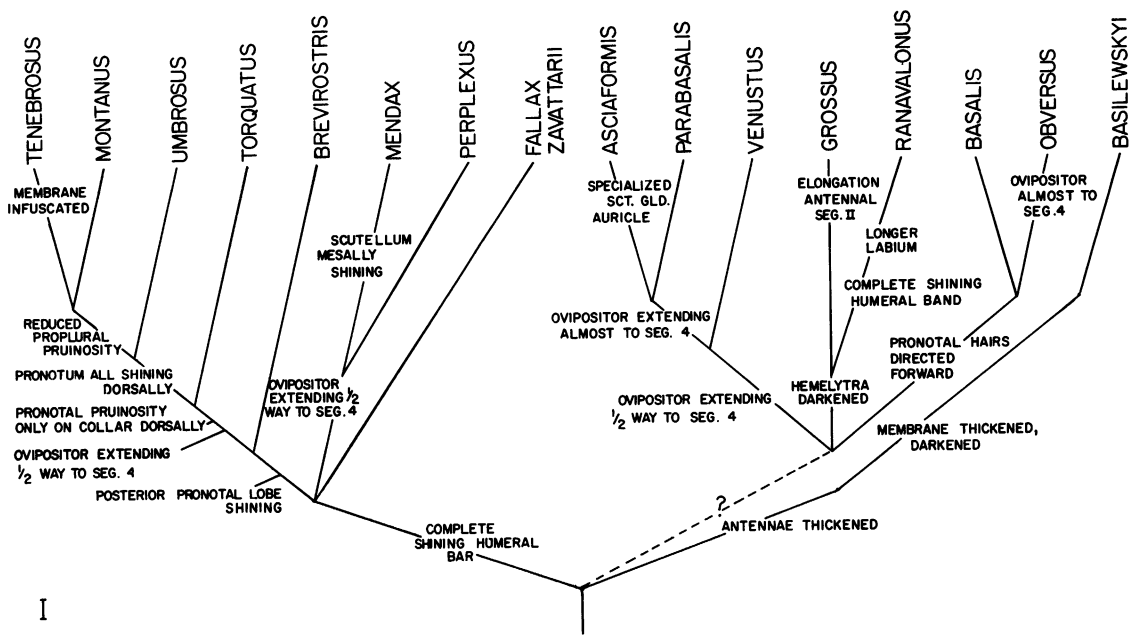




that these species constitute a very distinct, isolated group, the difficulty being in trying to establish its affinities. It is tempting to believe that the *falicus* group has arisen from a common ancestor with some of the most advanced species of the *tibialis* complex, such as *notandus* and *pullus*.

GROUP XIII (FIG. 42I): With the exception of *ochripes* and *linearis* the African species with enlarged sperm reservoir wings have these wings "shifted" distally. This African complex, which is "held together" by the synapomorphic character of distally placed sperm reservoir wings, constitutes a reasonably closely related clade. However, within this complex there are, of course, subgroups. There is a subgroup held together by the presence of a complete shining humeral bar, but the species are rather dissimilar and again show a grade anagenesis to a complete dorsal shining pronotal surface. This subgroup is composed of *mendax, perplexus, zavattarii, fallax, brevirostris, torquatus, umbrosus, montanus,* and *tenebrosus*. Such species as *grossus, ranavalonus, basalis,* and *obversus* form a closely related subgroup which probably also should include *venustus, parabasalis,* and *asciaformis*. This latter subgroup is the more plesiomorphic as indicated by the presence of three well-separated shining humeral spots.

In summary, the genus *Ischnodemus* appears to be a complex containing a number of African and Madagascan species that show many plesiomorphic conditions; a presumed clade in the Neotropics divisible into several distinct groups and a highly apomorphic African group subdivisible into two primary subunits. It is possible that a dichotomous cladogram may be produced of all these *Ischnodemus* species when sophisticated information on nymphs, host plants, chromosome numbers, and so forth, is available but I am not optimistic that this will be the case. It does not seem to me likely, as previously discussed, that complex speciation processes, such as are present in *Ischnodemus*, plus obvious grade and anagene-



tic changes in several phyletic lines, are capable of being reduced to simple branching dichotomies.

KEY TO SPECIES OF *ISCHNODEMUS*[1]

1. Fore femora armed below with one or more spines 2
1a. Fore femora mutic 14
2. Vertex of head pruinose at least narrowly along midline, usually head shining dorsally only on tylus and frequently as a small dash or L-shaped mark adjacent to each ocellus (but *ochripes* sometimes with more extensive shining area present) ... 3
2a. Vertex of head shining, at least mesally .. 8
3. Pronotum with conspicuous shining areas at least posteriorly across humeral region (figs. 43, 44, 45, 46, 47, 48, 49, 51) .4
3a. Pronotum completely pruinose even posteriorly on and between humeri except for shining irregular or V-shaped area on calli (fig. 50) 5
4. Membrane of fore wing with a large dark brown to black central area strongly contrasting with pale apical portion; mesosternum lacking a deep troughlike median longitudinal furrow; calli not completely shining but with extensive interspersed areas of pruinosity (figs. 46, 48); fore femora never with more than two spines present (Africa) ..... *wittei* Slater
4a. Membrane uniformly pale buffy yellow to sordid white with only veins darkened; mesosternum with a deep troughlike median longitudinal furrow; area of calli subtriangular, mostly shining (fig. 43); fore femora frequently with four spines present (South Africa) ..... *ochripes* Stål
5. Fore femora with a pair of divergent spines present (Madagascar) .... *madagascariensis* Slater and Wilcox
5a. Fore femora with a single spine present ... 6
6. Membrane of fore wing conspicuously darkened over greater portion of surface (Africa) ..... *congoensis* Slater
6a. Membrane of fore wing sordid white with only veins darkened 7
7. Femora unicolorous sordid yellow; eyes large, protrudent, occupying major portion of lateral head surface (fig. 6D) (Madagascar) ..... *oculatus* Slater
7a. Femora dusky brown, becoming lighter distally; eyes smaller, not occupying major portion of lateral head surface (fig. 6C) (Africa) .... *diplachne* Slater and Harrington
8. Dorsal surface of pronotum completely shining (fig. 44) 9

[1] *inambitiosus* Buchanan White is unknown, the type apparently lost. It perhaps belongs to the *tibialis* complex.

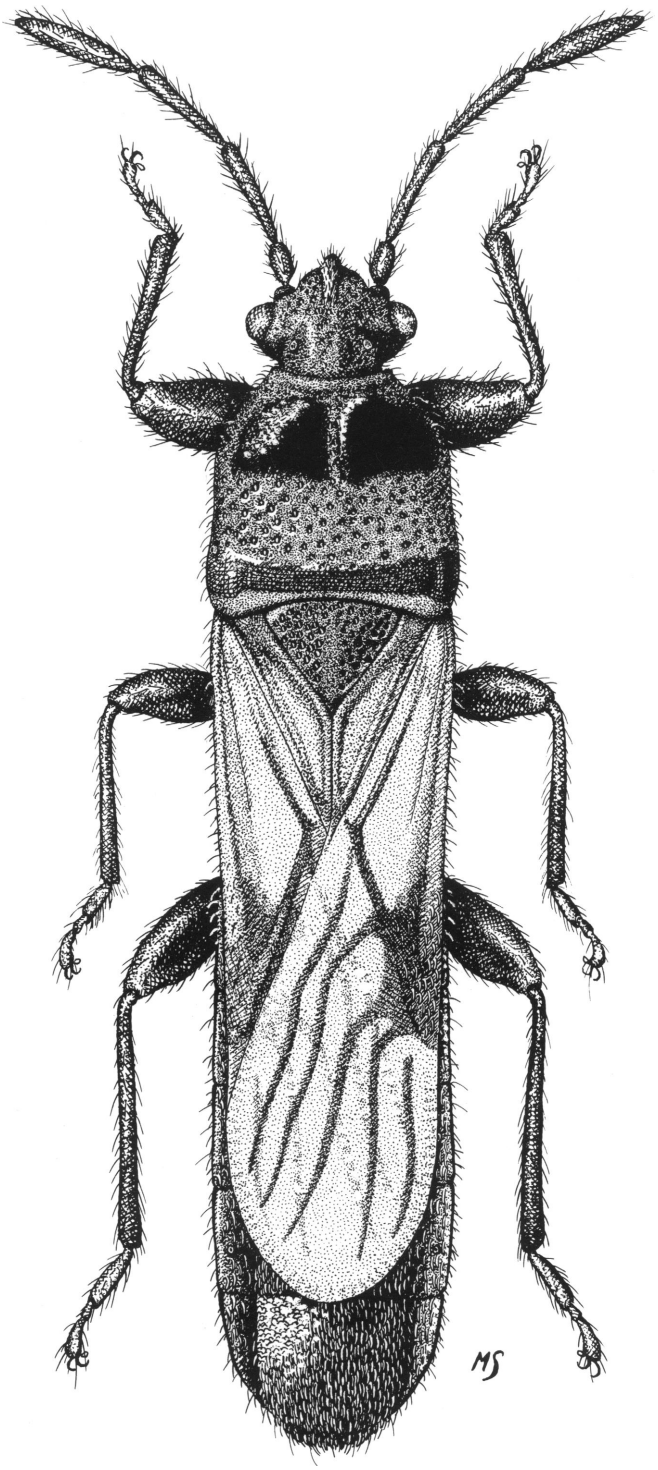


FIG. 43. *Ischnodemus bosqi*, dorsal view.

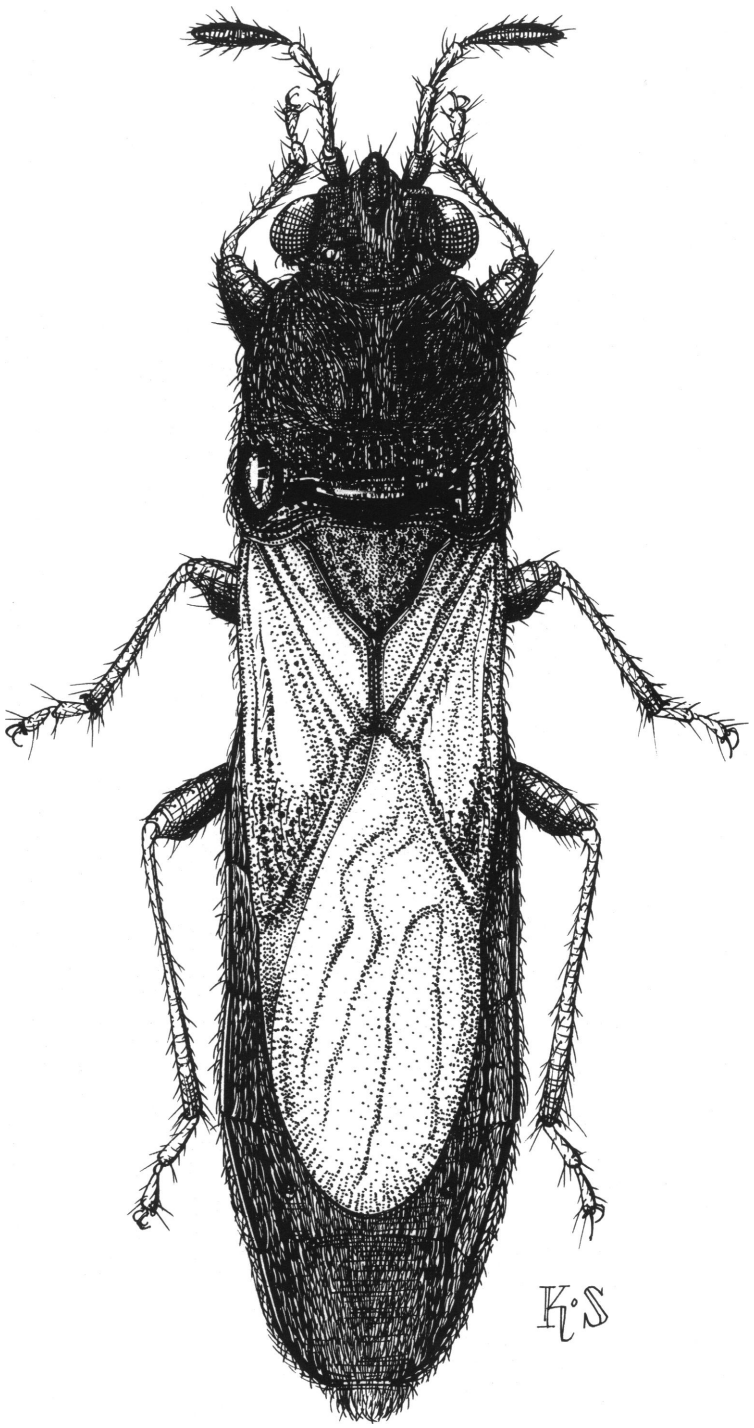


FIG. 44. *Ischnodemus brevicornis*, dorsal view.

8a. Dorsal surface of pronotum not completely shining, either patterned with pruinosity in collar region (fig. 4N), in area of transverse impression and narrowly along posterior margin (fig. 4J), or pronotum completely pruinose except for shining areas in region of calli and/or as a subbasal transverse bar across humeral area (fig. 43) 13

9. Total length labium subequal to width of head across eyes (Africa) (fig. 44) ..... *brevicornis* Stål

9a. Total length labium greater than width of head across eyes 10

10. Fore femora with a single spine present .. 11

10a. Fore femora with a conspicuous bifid or double spine present (fig. 7-I) (Orient) ..... *sinuatus* Slater, Ashlock, and Wilcox

11. Scutellum completely pruinose (figs. 43, 51); legs completely or in large part dark blackish brown (Africa) ..... *bequaerti* Slater

11a. Scutellum completely shining or subshining; legs reddish brown or bright yellow 12

12. Labium relatively elongate, reaching onto anterior portion of mesosternum, second segment surpassing base of head; antennal segments 2 and 3 short, clavate, their combined length less than interocular distance (.30-.34 mm.); anterior pronotal lobe black, lacking contrasting light coloration in collar area (Africa) ..... *ulugurus* Scudder

12a. Labium shorter, not reaching beyond fore coxae, second segment remote from base of head; antennae with segments 2 and 3 longer, terete, their combined length more than interocular distance (.50-.40 mm.); anterior pronotal lobe black with contrasting yellowish brown band present across collar area (North Africa) ..... *dentatus* Wagner

13. Tylus reaching more than halfway to distal end of antennal segment 1; length of labium greater than length of pronotum and more than twice interocular distance (Africa) ..... *schoutedeni* Slater

13a. Tylus not reaching more than halfway to distal end of antennal segment 1; total length labium less than length pronotum and less than twice interocular distance (Africa) ..... *linearis* Stål

14. Pronotum with shining areas present at least on posterior lobe as shining bar or spots (figs. 43, 46, 48, 49, 51) 15

14a. Pronotum completely pruinose, or with at least posterior lobe pruinose, lacking shining bar or spots (fig. 50) 88

15. Dorsal surface of pronotum usually with distinct pruinosity pattern i.e., the combination of anterior collar area always distinctly shining mesally, a pair of mesally separated very large shining calli patches present and a broad complete shining bar across humeral area (fig. 4G) 16

15a. Pronotum dorsally shining, or pruinose or patterned with shining and pruinose areas but not in combination shown above, if pattern similar then anterior collar area completely pruinose (figs. 4F, 43) or large shining calli patches contiguous at meson and not separated by a median pruinose strip (fig. 4J) *(genei)* 18

16. Labium very elongate, reaching between or beyond mesocoxae, second labial segment attaining fore coxae; mesosternum with a deep troughlike median longitudinal furrow; antennae black (Africa) ..... *brincki* Slater

16a. Labium relatively short, extending only between fore coxae, second labial segment at most reaching base of head; mesosternum lacking a deep median longitudinal furrow; antennae reddish brown to sordid yellow 17

17. Lateral pruinosity of anterior prothoracic lobe extending dorsally well beyond lateral shining bar and onto dorsal surface of pronotum (fig. 4M); pruinose area present dorsally on head behind eyes and along area of juga adjacent to eyes; anterior pronotal lobe mesally somewhat impressed but lacking a deep groove (Africa ..... *ocellaris* Slater and Harrington

17a. Lateral pruinosity of anterior prothoracic lobe not extending onto dorsal surface of pronotum beyond lateral shining bar (fig. 5O); head dorsally completely shining, lacking distinct pruinose areas behind and before eyes; anterior pronotal lobe with a deep, sharply defined median groove (Africa) ..... *canaliculus* Slater

18. Dorsal surface of pronotum shining, with at most narrow pruinose area along posterior margin or behind collar area, or narrowly along lateral margins of anterior lobe ... 19

18a. Dorsal surface of pronotum in large part pruinose, or if largely shining then a complete transverse pruinose band present

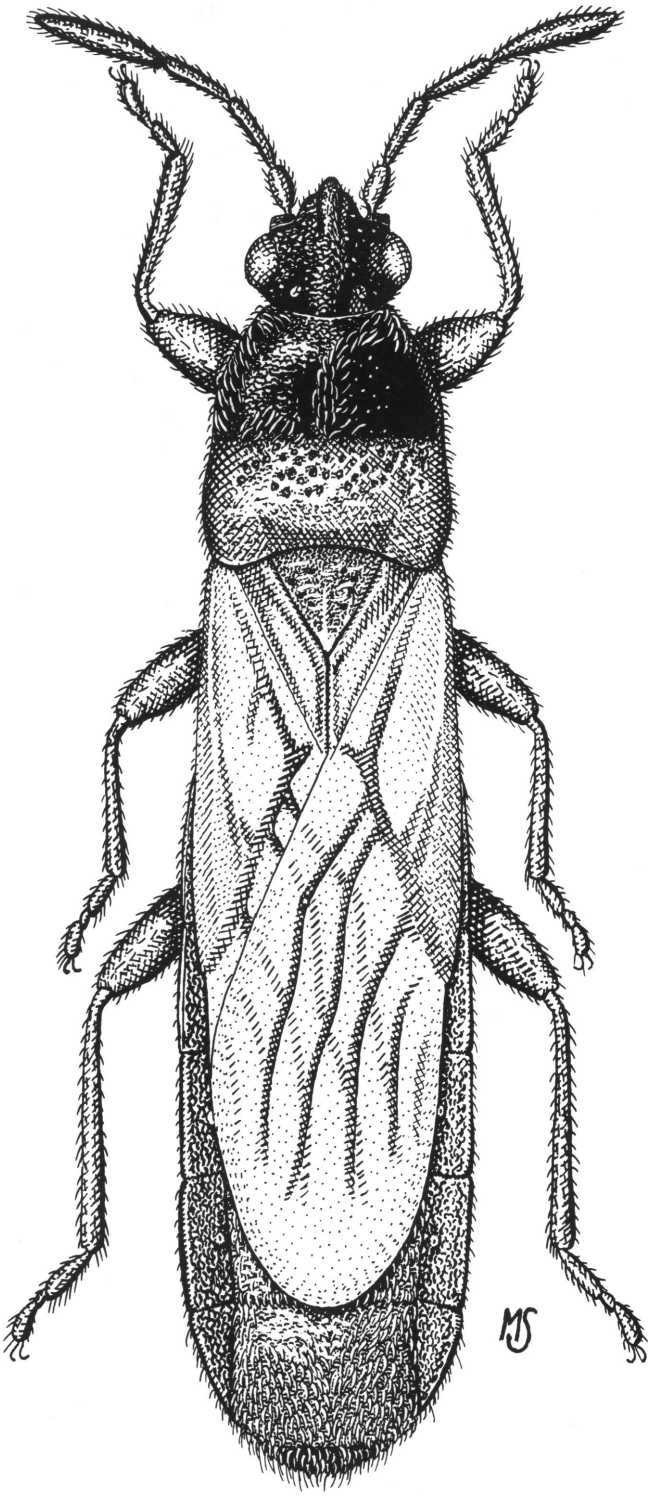


FIG. 45. *Ischnodemus brunnipennis*, dorsal view.

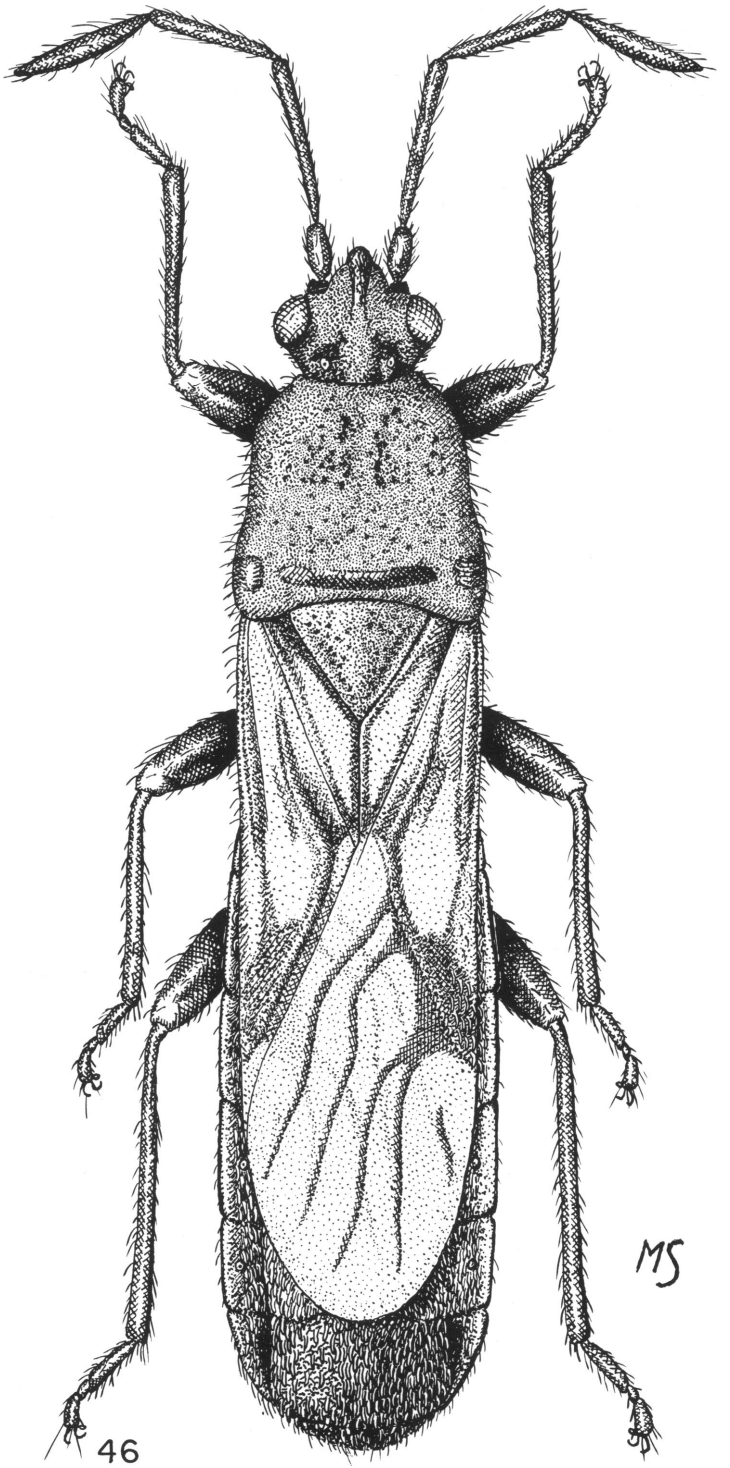


FIG. 46. *Ischnodemus nigrovenosus*, dorsal view.

across transverse impression (fig. 4H)... 42

19. Prothorax nearly completely shining above and below, pruinosity limited to at most a very narrow strip posteriorly on dorsum and a narrow strip anteriorly on sternum 20

19a. Prothorax with extensive pruinosity present at least on sternum between and anterior to fore coxae (fig. 5T) 26

20. Fore wing variegated; always macropterous, membrane well developed with a large conspicuous central macula present; darkened patches present along apical corial margins and apex of claval commissure (South America)..... ..... *notandus* Slater and Wilcox

20a. Fore wing lacking a conspicuous light and dark variegated color pattern; frequently brachypterous or micropterous species with membrane greatly reduced 21

21. Scutellum completely pruinose (fig. 5L), lacking a central shining area, or if appearing somewhat shining near apex, then anterior pronotal lobe with a deep conspicuous median groove 22

21a. Scutellum either completely shining or at least with a shining central area (fig. 5I, J, M) 24

22. Head and quadrate calli patches on anterior pronotal lobe concolorous (or if pronotal patches lighter than part of head, then vertex of head also lighter); connexivum dark or yellow only on lateral areas ..23

22a. Head darker than and contrasting with large quadrate patches on anterior pronotal lobe; connexivum usually entirely yellow (North America) .....*badius* Van Duzee

23. Relatively small species, ♂ barely over 5 mm.; pronotum dark red-brown to black; length second antennal segment less than interocular space (South America) (fig. 47)..... *neotropicalis* Slater and Wilcox

23a. Larger species, ♂ over 6 mm; pronotum light reddish brown; length second antennal segment usually more than interocular space (North America)..... ..... *conicus* Van Duzee

24. Pronotum with conspicuous long upright hairs, those on anterolateral area directed forward; large species, total length 8.64-9.70 mm. (South America) .....*grossinigrus* Slater and Wilcox

24a. Pronotum glabrous or sparsely clothed with short hairs, these directed posteriorly; smaller species, under 7 mm.....25

25. Labium barely attaining fore coxae, second segment not reaching base of head (Africa) .....*crassipes* Slater

25a. Labium reaching well onto mesosternum, second segment surpassing base of head by half its length (South America)..... ..... *pullus* Slater and Wilcox

26. Fore coxal cavities open (Orient)[1] (see Slater, Ashlock, and Wilcox, 1969) 27

26a. Fore coxal cavities closed 28

27. Membrane nearly uniformly smoky brown with diffuse white areas present at base and adjacent to distal end of corium; antennal segment two dark brown to black; first labial segment attaining or nearly attaining base of head..... ... *fumidus* Slater, Ashlock, and Wilcox

27a. Membrane except veins completely white or hyaline; antennal segment two pale testaceous; first labial segment remote from base of head..... *ambiguus* Slater, Ashlock, and Wilcox

28. Labium elongate, reaching between mesocoxae, or if labium slightly shorter then head and pronotom covered with thick matted hairs 29

28a. Labium not reaching mesocoxae 30

29. Head and pronotum densely clothed with thick matted, decumbent hairs, membrane opaque white (veins slightly darker); scutellum with shining median elevation on distal third (fig. 5J) (North America) .....*lobatus* Van Duzee

29a. Head and pronotum nearly glabrous, lacking conspicuous matted hairs; membrane smoky, almost entirely infuscated; scutellum completely pruinose (fig. 5I) (Orient)..... ... *fumidus* Slater, Ashlock, and Wilcox

30. Dorsal surface of pronotum with pruinosity present either anteriorly, laterally or posteriorly 31

30a. Dorsal surface of pronotum completely shining 33

31. Dorsal surface of pronotum lacking pruinose areas on anterior lobe (North America) .....*missouriensis* Froeschner

31a. Dorsal surface of pronotum with narrow pruinose areas laterally on anterior lobe and/

[1] *I. fumidus* and *I. ambiguus* really do not belong in *Ischnodemus* as earlier defined. Their relationship may be with *Capodemus*. There is also an undescribed ♀ micropter from Burma involved with a pruinose pronotum. For the present I prefer not to erect an additional genus in the hope additional material will become available.

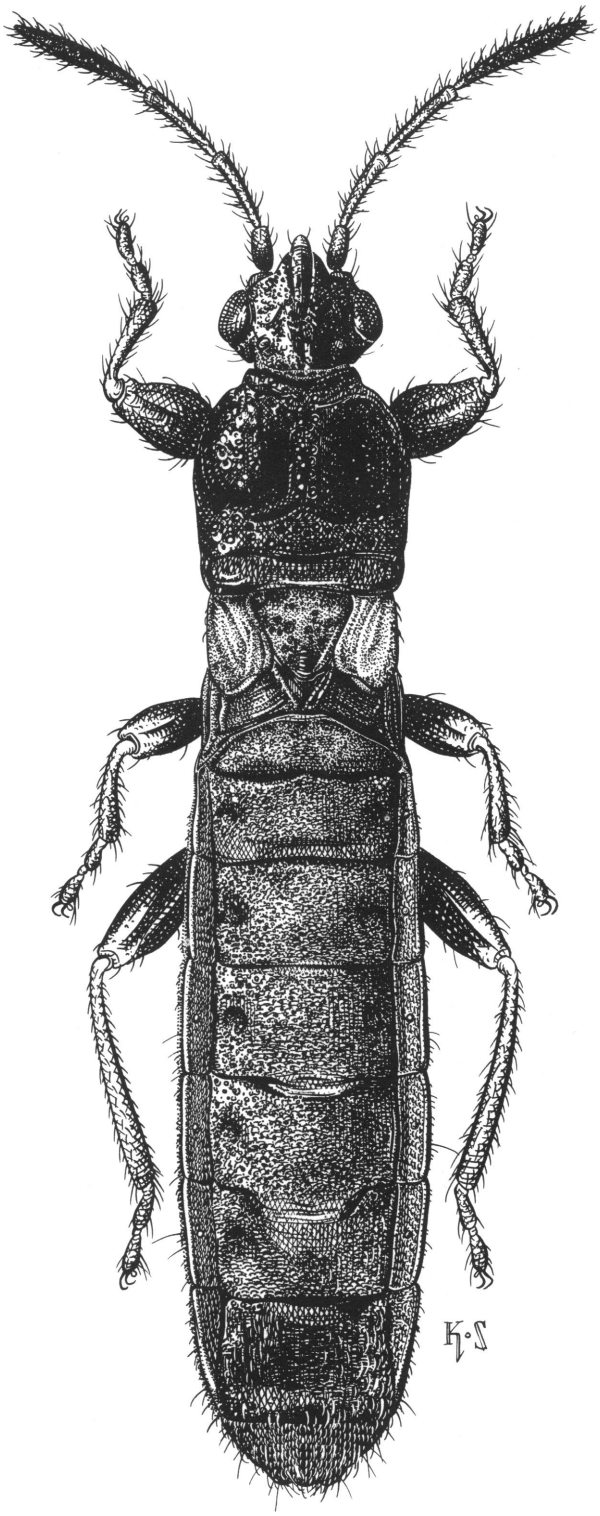


FIG. 47. *Ischnodemus neotropicalis*, dorsal view.

or a pruinose transverse band posterior to shining collar area (fig. 4N) 32

32. Labium relatively short, not attaining anterior margins of fore coxae (Africa) .... *torquatus* Slater and Harrington

32a. Labium longer, extending between fore coxae but not reaching anterior margin of mesosternum (Africa) .... *umbrosus* Slater and Harrington

33. Head black, strongly contrasting with bright tan pronotum (Orient) ..... *nigrocephalus* .....Slater, Ashlock, and Wilcox

33a. Head and at least anterior pronotal lobe uniformly black 34

34. Membrane almost completely fuscous with only apical portion pale (Africa) .... *tenebrosus* Slater and Harrington

34a. Membrane pale or hyaline with at most a small dark spot adjacent to apical corial margin and/or with veins sometimes darker 35

35. Membrane of hemelytra chiefly or entirely hyaline, transparent, at most opaque only anteriorly between coria 36

35a. Membrane of hemelytra entirely opaque white, often with darkened veins and/or spots 38

36. Membrane of hemelytra with anterior area adjacent to corium conspicuously opaque, strongly contrasting with hyaline texture of remainder of membrane (Africa) .... *parathoracicus* Slater and Harrington

36a. Membrane of hemelytra completely hyaline 37

37. Scutellum pruinose except for extreme posterior end (fig. 5K); labium extending well onto mesosternum, second segment exceeding base of head by more than half its length; mesosternum with a distinct median furrow (Orient, Africa) .... *thoracicus* (Distant)

37a. Scutellum largely shining, pruinose only narrowly along anterior and lateral margins; labium shorter, at most reaching anterior margin of mesosternum, second segment not exceeding base of head by half its length; mesosternum lacking a distinct median furrow (Orient) ....*consobrinus* (Distant)

38. Scutellum usually almost completely shining, narrowly pruinose across base, at least with a broad T-shaped shining median elevation (fig. 5-I) (Africa) .... *montanus* Slater and Harrington

38a. Scutellum nearly completely pruinose with at most a narrow shining elevation on distal third (North America) 39

39. Ventral prothoracic pruinosity usually extending at least partially over outer (lateral) surface of acetabula (fig. 5S), or if pruinose area appearing less extensive *(falicus)* then macropterus species with labium short and second segment remote from base of head 40

39a. Ventral prothoracic pruinosity confined to median portion of prosternum and bordered by sinuous longitudinal lines at level of lateral margins of coxal cavities (fig. 5T) 41

40. Species always macropterous or submacropterous; ratio antennal segment 2 to 4 usually exceeding 0.78; antennal segments 1-4 usually concolorous, dark, often wholly black; pronotal transverse impression dark and concolorous with anterior lobe, both contrasting with lighter posterior pronotal lobe (North America) .... *falicus* (Say)

40a. Species usually brachypterous or micropterous; ratio of antennal segment 2 to 4 usually less than 0.78; antennal segments 1-4 not of a single color (the change in color may be abrupt or gradual and nearly imperceptible, but segments 1 and 4 never concolorous); posterior pronotal lobe and transverse impression usually light reddish brown contrasting with nearly black anterior lobe (North America) (fig. 45) .... *brunnipennis* (Germar)

41. Length of labium less than twice as great as interocular space; veins of hemelytra pale and indistinct, not contrasting with ground color; brachyptery type "pointed" (fig. 7E) (North America) .... *hesperius* Parshley

41a. Labium more than twice as long as interocular space; veins of hemelytra indistinct, elevated, usually light brown contrasting with opaque white ground color; brachyptery type generally "narrowly lobate" (fig. 7I) (North America) ....7D *slossoni* Van Duzee

42. Pronotal calli with central area completely shining without interspersed dots of shining and pruinose on calli (fig. 43) 43

42a. Pronotal calli entirely pruinose or with at most intermixed irregular shining areas and pruinose areas interspersed, calli

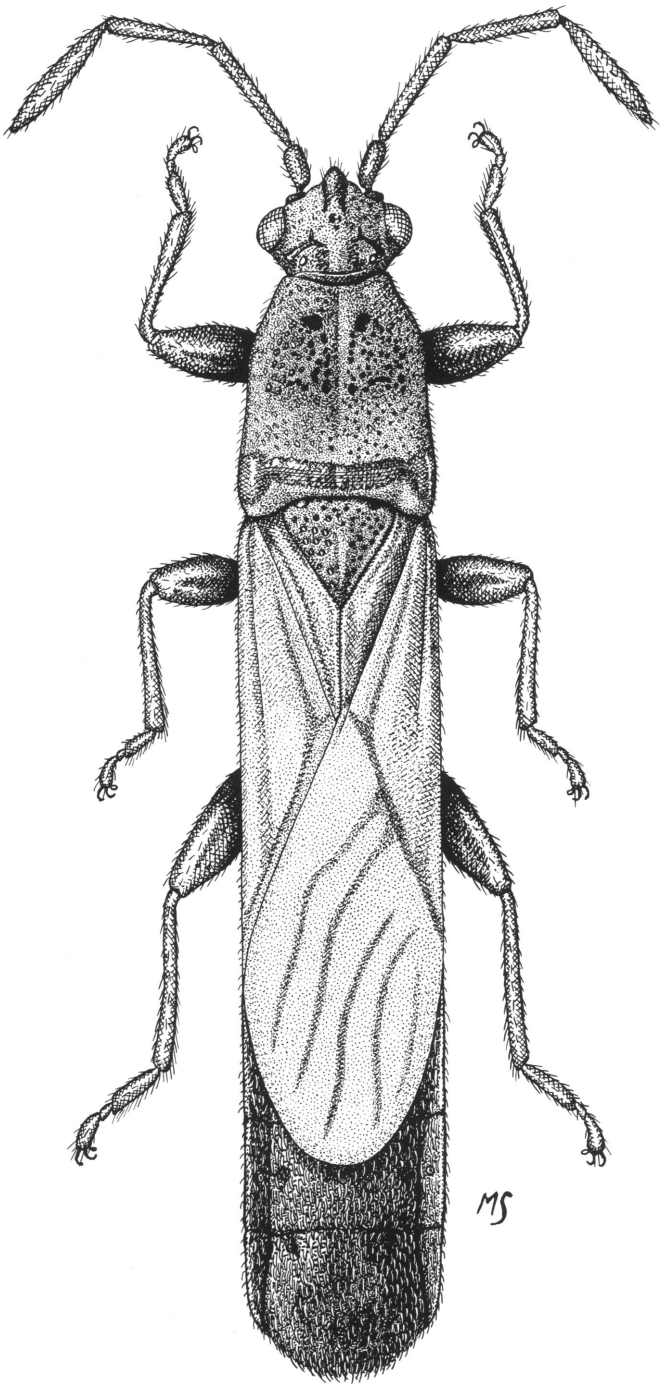


FIG. 48. *Ischnodemus paramoides*, dorsal view.

never completely shining (fig. 4A-C, I). 46

43. Shining pronotal calli area large, covering most of anterior lobe, sometimes complete or very narrowly separated across midline (fig. 4E, J) 44

43a. Shining pronotal calli area relatively small, trianguloid, well separated by wide pruinose mesal area (fig. 4G).....45

44. Scutellum and vertex of head mesally pruinose; membrane with veins dark brown, contrasting with white ground color, a diffuse brown spot present adjacent to apex of corium (South America) (fig. 43).... ..... *bosqi* Slater and Wilcox

44a. Scutellum with broad shining median elevation on distal two-thirds, head completely shining; membrane unicolorous white (Palearctic) .....*genei* (Spinola)

45. Labium very elongate, reaching between or beyond mesocoxae, second segment attaining fore coxae (S. Africa)..... ..... *brincki* Slater

45a. Labium short, reaching between fore coxae, second segment just attaining base of head (Africa) .....*brevirostris* Bergroth

46. Pronotum in large part pruinose but with a shining glabrous area complete sub-basally across humeri (fig. 4C, I), not divided into three separate patches[1] 47

46a. Basal area of pronotum with three distinct shining regions, i.e., pruinose areas present separating central elongate patch from oval lateral patches (fig. 46) 66

47. Fore wing variegated, membrane with a large conspicuous dark central macula which strongly contrasts with light ground color (in brachypters membrane macula sometimes light brown and diffuse) 48

47a. Fore wing usually not variegated, membrane lacking contrasting central macula, at most with veins darkened and/or small spot present adjacent to apical corial margin, or membrane nearly uniformly testaceous, tan, or smoky brown 52

48. Tibiae completely dark, concolorous with dark femora (South America)..... ..... *gayi* (Spinola)

48a. Tibiae pale, either strongly contrasting with dark femora, or with both tibiae and femora pale 49

49. Labium short, at most slightly exceeding fore coxae (South America) .....*tibialis* Stål

49a. Labium longer, reaching to or exceeding base of prosternum 50

50. Fore femora very dark brown to nearly black, strongly contrasting with pale tibiae (South America)..... ..... *nigromaculatus* Slater and Wilcox

50a. Fore femora and tibiae nearly uniformly bright yellow, concolorous; femora at most very slightly infuscated, never strongly contrasting with tibial coloration 51

51. Labium relatively elongate, extending to or almost to mesocoxae, third segment exceeding posterior margin of prosternum (South America)..... ..... *tibialoides* Slater and Wilcox

51a. Labium shorter, barely reaching onto mesosternum, third segment not attaining posterior margin of prosternum (South America)..... ..... *pseudotibialis* Slater and Wilcox

52. Hemelytra nearly uniformly dark chocolate brown, becoming narrowly light testaceous along lateral corial margins and at extreme base of hemelytra (Madagascar) .....*ranavalonus* Slater and Wilcox

52a. Hemelytra with membrane white to smoky gray, sometimes with veins light to dark brown and/or a small diffuse brown spot present adjacent to apical corial margin. 53

53. Pronotum with entire basal one third to one half and anterior collar area strongly shining, contrasting with remaining pruinose areas (fig. 4-I) (South America)..... ..... *lactipennis* Slater and Wilcox

53a. Pronotum almost entirely pruinose except narrow transverse band across humeri (fig. 48) 54

54. Tibiae and femora nearly uniformly dark brown to black, (or if appearing lighter then unusually elongate slender species, total length more than six times width) (Neotropical) 55

54a. Tibiae and usually femora pale to light brown 56

55. Labium short, barely attaining fore coxae; pronotum lacking a transverse impression (South America) (fig. 48)..... ..... *paramoides* Slater and Wilcox

55a. Labium longer, reaching onto mesosternum;

[1]Although this character is usually constant and reliable some species such as the African *fallax* group show considerable variation with several conditions present.

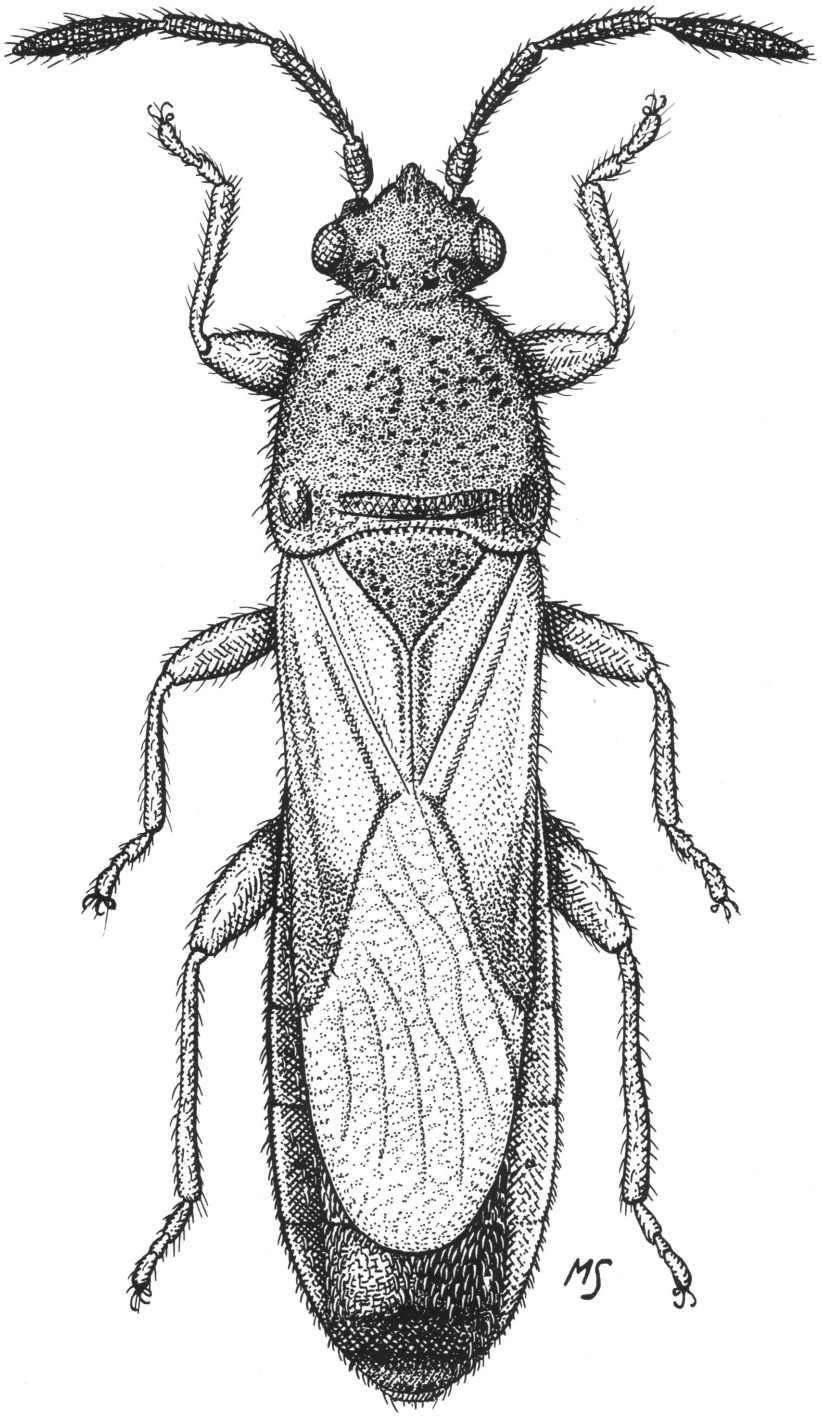


FIG. 49. *Ischnodemus praecultus*, dorsal view.

pronotum with broad, shallow complete transverse impression (South America) ..... *severus* Slater and Wilcox

56. Labium relatively elongate, extending posteriorly onto mesosternum 57

56a. Labium shorter, at most reaching between fore coxae 58

57. Labium extending between mesocoxae, second segment nearly attaining fore coxae (South America) ..... *signoreti* Berg

57a. Labium shorter, remote from mesocoxae, second segment not reaching fore coxae (Africa) ..... *parabasalis* Slater

58. Pronotal hairs directed anteriorly forward, at least on anterolateral area (Africa)..... ..... *obversus* Slater and Harrington

58a. Pronotal hairs directed posteriorly 59

59. Membrane testaceous with veins a contrasting dark brown; apical corial margin lacking a brown spot; antennae relatively broad, robust (North America)..... ..... *robustus* Blatchley

59a. Veins of membrane only slightly darker than ground color and/or a diffuse brown spot present adjacent to apical corial margin; antennae slender, terete 60

60. Labium relatively short, at most barely attaining anterior margin of fore coxae, second segment not surpassing base of head ..61

60a. Labium longer, reaching at least between fore coxae, sometimes extending onto anterior portion of mesosternum, second segment surpassing base of head 63

61. Mesal area of head vertex pruinose (Africa) ..... *fallax* Slater and Harrington

61a. Mesal area of head vertex shining.....62

62. Scutellum completely pruinose (fig. 5L); eyes small relative to head (Africa)..... ..... *inornatus* Slater and Harrington

62a. Scutellum with longitudinal shining area along median elevation (fig. 5I, J); eyes relatively large (Africa)..... ..... *mendax* Slater and Harrington

63. Membrane unicolorous white (South America) 64

63a. Membrane uniformly smoky gray or pale with a small diffuse brown spot present adjacent to apical corial margin (Africa) 65

64. Head relatively short and pronotum narrow [ratio of head length to width considerably less than ratio of pronotal length to width (62:88)]; antennae thick and stout; veins of membrane darker than membrane ground color (South America)..... ..... *agilis* (Spinola)

64a. Head relatively longer and pronotum broader [ratio head[1] length to width greater than or nearly equal to ratio pronotal length to width (78:75)]; antennae relatively slender; veins of membrane concolorous with ground color (South America)..... ..... *subflavus* Slater and Wilcox

65. Second antennal segment usually longer than interocular space, but never more than 1.25 times as long, sometimes with interocular space greater than length of second antennal segment (Africa)..... ..... *zavattarii* Mancini

65a. Second antennal segment shorter, ratio of second segment to interocular space greater than 1.25 (Africa)..... ..... *perplexus* Slater and Harrington

66. Membrane bearing a large black or dark brown macula which contrasts strikingly with pale basal and apical areas 67

66a. Membrane unicolorous or nearly so, most frequently pale testaceous but sometimes dark smoky gray to nearly black, at most with differentiated spots adjacent to apical corial margin, or with veins only contrastingly dark 73

67. Labium relatively short, not attaining anterior margin of fore coxae; clavus and corium nearly unicolorous light reddish brown (Africa) ..... *basilewskyi* Slater

67a. Labium longer, at least reaching between fore coxae; clavus and corium usually with some light areas present 68

68. Labium relatively elongate, extending nearly to mesocoxae, always reaching at least midway from anterior mesosternum margin to anterior margin of mesocoxae (Western Hemisphere) (fig. 51)..... ..... *fulvipes* (DeGeer)

68a. Labium shorter, sometimes extending onto mesosternum but always extending less than halfway from anterior margin of mesosternum to anterior margin of mesocoxae 69

69. All femora with at least a broad median black band and frequently entirely black with

[1]When this character was used in the Slater and Wilcox (1969) key to species, there was an error in couplet 26. The couplet should read: "Head relatively longer and pronotum broader, i.e., ratio of *head* length. . . . " rather than ratio of *pronotal* length.

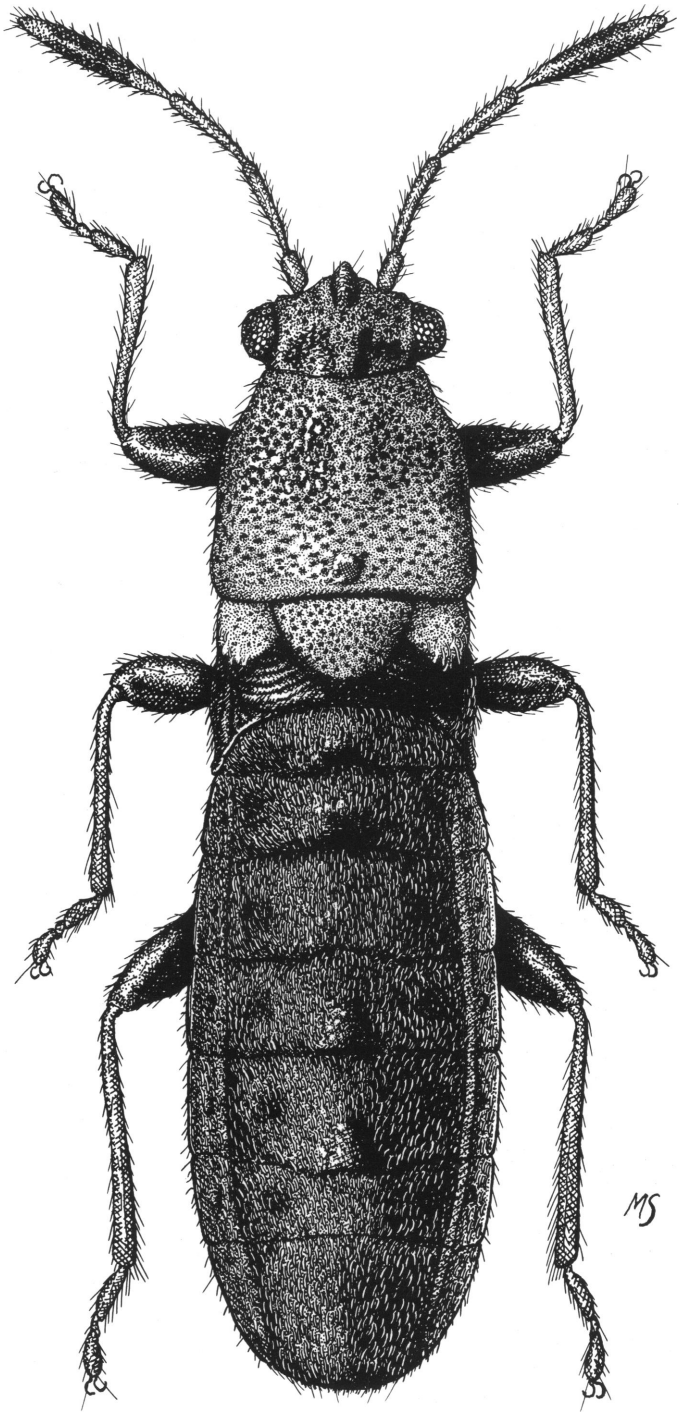


FIG. 50. *Ischnodemus proprius*, dorsal view.

the exception of basal and distal ends; second antennal segment less than 1 1/2 times as long as interocular distance (South America) . . . .*oblongus* (Fabricius)

69a. All femora pale yellow or reddish, concolorous with pale tibiae; second antennal segment more or less than 1 1/2 times as long as interocular distance, but if femora appear somewhat infuscated, then second antennal segment more than 1 1/2 times as long as interocular distance 70

70. Labium relatively short, usually not exceeding posterior margin of fore coxae and not or barely attaining posterior margin of prosternum 71

70a. Labium usually extending onto anterior portion of mesosternum, always exceeding posterior margin of fore coxae and attaining posterior margin of prosternum . . .72

71. Second antennal segment more than 1 1/2 times as long as interocular distance; combined length of second and third antennal segments more than 1 1/2 times width of pronotum; antennae relatively slender (South America) . . . . . .*antennatus* Slater and Wilcox

71a. Second antennal segment less than 1 1/2 times as long as interocular distance; combined length of second and third antennal segments slightly greater than pronotal width, always less than 1 1/4 times width of pronotum (South America) . . . . . .*pulchellus* Slater and Wilcox

72. Labium just attaining posterior margin of prosternum or at most with only distal half of fourth segment exceeding base of prosternum; second antennal segment less than 1 1/2 times as long as interocular distance; terminal third of membrane and greater portion of clavus and corium white, not suffused with smoky brown (South America) . . . . . .*formosensis* Slater and Wilcox

72a. Labium relatively more elongate with at least entire fourth labial segment exceeding base of prosternum; second antennal segment at least (and usually more than) 1 1/2 times as long as interocular distance; entire membrane, clavus and corium frequently suffused with dull smoky brown coloration (Western Hemisphere) (fig. 51) . . . . . .*fulvipes* DeGeer)

73. Tibiae and femora uniformly dark chocolate brown to nearly black 74

73a. Tibiae and femora nearly uniformly testaceous to light brown 75

74. Dorsal coloration including membrane a nearly uniformly dark chocolate brown to black; veins of membrane dark and not strongly contrasting with dark coloration of remainder of membrane (South America) . . . . . .*atricolor* Berg

74a. Hemelytra in large part white to testaceous with some dark markings; veins of membrane prominently dark brown, strongly contrasting with pale coloration of remainder of membrane (South America) (fig. 46) . . . . . .*nigrovenosus* Slater and Wilcox

75. Pronotal hairs directed anteriorly forward, at least on anterolateral area 76

75a. Pronotal hairs directed backward or upright 77

76. Posterior margin of ♀ fifth abdominal sternum (fourth visible) sinuate, segment conspicuously narrowed medially where ovipositor sclerites extend anteriorly (fig. 8G); pronotum usually tawny to pale reddish brown on posterior lobe, transverse impression and narrowly along collar; legs usually pale yellow to tawny (Africa) . . . . . .*obversus* Slater and Harrington

76a. Posterior margin of ♀ abdominal sternum 5 straight or nearly so, segment not noticeably narrowed medially (fig. 8E); pronotum dark blackish brown, only slightly paler across posterior lobe, no light area present along collar; legs usually dark brown (Africa) . . . . . .*basalis* Walker

77. Fore wing nearly unicolorous pale testaceous to opaque white (South America) 78

77a. Fore wing not unicolorous white, with at least veins darkened and/or a dark spot adjacent to corial apex 79

78. Length of second antennal segment greater than width of head across eyes; antennae pale tan to yellow with at most first segment darkened (South America) . . . . . .*stali* (Signoret)

78a. Length of second antennal segment less than width of head across eyes; antennae with at least segments 1 and 2 dark brown to black (South America) . . . . . .*staliellus* Slater and Wilcox

79. Labium relatively elongate, reaching well onto mesosternum, third segment attaining or nearly attaining posterior margin of prosternum 80

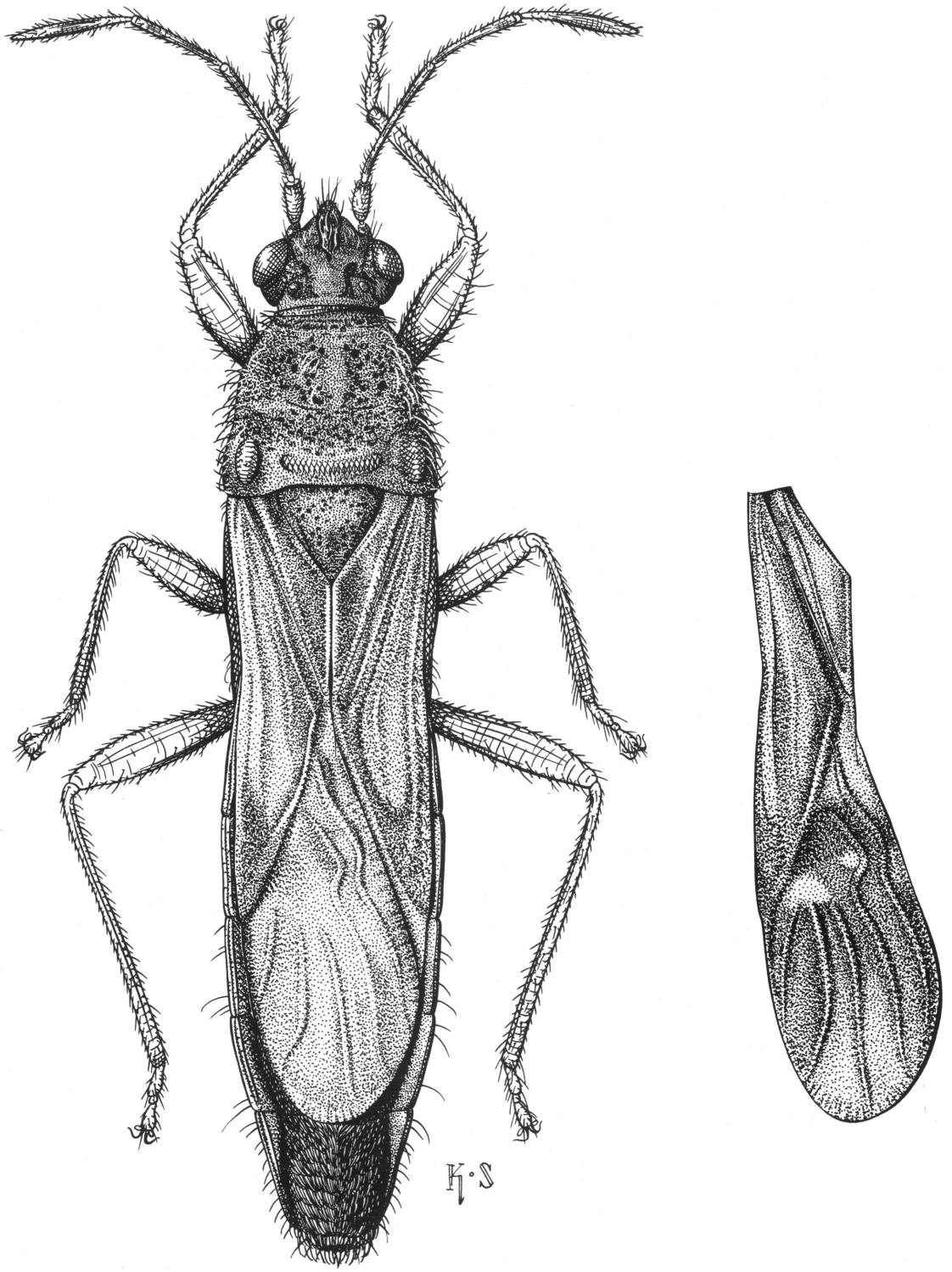


FIG. 51. *Ischnodemus fulvipes*, dorsal view.

79a. Labium shorter, at most barely reaching onto mesosternum, third segment remote from posterior margin to prosternum 82

80. Fore wing with ground color testaceous, veins of clavus and corium and distal third of corium brown (Africa) .... *parabasalis* Slater

80a. Fore wing in large part smoky or dark brown, membrane always nearly completely infuscated 81

81. Scent gland auricle curving forward, "club-like" (fig. 10C); body wall with shelflike protrusion projecting out over scent gland area; antennal segment 2 shorter than segment 4 (Africa) .... *asciaformis* Slater and Harrington

81a. Scent gland auricle conventionally shaped; body wall not protruding out over scent gland area; antennal segment 2 longer than segment 4 (Western Hemisphere) (fig. 51) ..... *fulvipes* (DeGeer)

82. Length of second antennal segment usually somewhat greater than interocular space, but never more than 1 1/4 times as great, sometimes with interocular space greater than length of second antennal segment. 83

82a. Second antennal segment longer, ratio length second segment to interocular space always greater than 1 1/4 85

83. Membrane creamy white but with veins contrasting dark brown[1]; antennae dark red-brown to black (except at distal ends of segments 2-4) (South America) .... *spatulatus* Slater and Wilcox

83a. Membrane white with veins at most only slightly darker, not strongly contrasting with ground color[1]; at least antennal segments 2 and 3 bright yellow-brown to light red-brown 84

84. Labial length less than 1 1/4 times head width; ratio antennal segment 2/segment 4 more than 0.63 (Africa) .... *zavattarii* Mancini

[1]This character is variable in *praecultus* with some specimens having dark brown veins. Total length can be used to separate *praecultus* from *spatulatus*. *I. praecultus* ranges from ♂ 4.44-5.64, ♀ 5.58-6.48 and *spatulatus* ♂ 5.94-6.60, ♀ 6.80-8.04. The labium is usually shorter in *spatulatus*, at most barely exceeding the fore coxae. In *praecultus* the labium extends well onto the mesosternum with the distal end of the third segment reaching the fore coxae, but in some specimens the labium barely attains the anterior margin.

84a. Labial length more than 1 1/4 times head width; ratio antennal segment 2/segment 4 less than 0.63 (Western Hemisphere) (fig. 49) ..... *praecultus* Distant

85. Ratio antennal segment 2/interocular space more than 1.60; posterior margin of ♀ abdominal sternum 5 nearly straight, not noticeably abruptly narrowed medially, only tapering slightly inward from lateral margins (fig. 8F) (Africa) *grossus* Slater

85a. Ratio antennal segment 2/interocular space less than 1.60; posterior margin of ♀ abdominal sternum 5 sinuate, segment abruptly narrowed medially at anterior extension of ovipositor (fig. 8G) 86

86. Dark coloration extensively developed on membrane (Africa) ..... *venustus* Slater

86a. At most a small dark spot present on membrane at corial apex, veins of membrane sometimes darkened 87

87. Ratio total length labium/length antennal segment 2 more than 1.90 (Africa) .... *parabasalis* Slater

87a. Ratio total length labium/length antennal segment 2 less than 1.90 (Africa) .... *perplexus* Slater and Wilcox

88. Labium elongate, extending to or nearly to metacoxae, at least well beyond mesocoxae, second segment attaining anterior margin of fore coxae 89

88a. Labium shorter, at most extending nearly to mesocoxae, second segment not attaining anterior margin of fore coxae 90

89. Second antennal segment relatively elongate, approximately 1 1/2 times length of segment 3; posterior pronotal lobe with a complete creamy yellow band across humeri contrasting with dull gray of remainder of pronotal surface (Palearctic) ..... *caspius* Jakovlev *(=discolor?)*

89a. Second antennal segment relatively short, much less than 1 1/2 times length of segment 3 (.50-.40); posterior pronotal lobe with contrasting creamy yellow area limited to a trianguloid patch adjacent to each humeral angle, not complete across midline (Palearctic) ..... *suturalis* Horvath

90. Membrane bearing a central black or dark brown macula which contrasts with pale basal and apical or lateral areas 91

90a. Membrane unicolorous or nearly so, or testaceous with veins darkened, or strongly micropterous with membrane lacking or represented by a small flap 93

91. Pronotum with area across humeri narrowly

bright yellow, strongly contrasting with dull gray to black remainder of pronotal surface (Palearctic) ..... *sabuleti* and *quadratus*

91a. Pronotum completely dull gray to black ..92

92. Tibiae pale, strongly contrasting with dark femora (South America) ..... *nigrostillatus* Stål

92a. Tibiae black or dark castaneous, unicolorous with dark femora (South America) ..... *nigripes* Stål

93. Pronotum with narrow bright yellow area across humeri or ovoid yellow spots on posterolateral areas strongly contrasting with dull gray to black remainder of pronotal surface 94

93a. Pronotum lacking strongly contrasting yellow area across humeri, either completely dull gray to black or with diffuse reddish brown areas posterolaterally not strongly contrasting with ground color of pronotum 96

94. Labium relatively elongate reaching mesocoxae, second segment surpassing base of head by two-thirds its length; antennae usually yellowish brown to reddish brown; legs light brown to yellow (Palearctic).. ..... *jaxartensis* Reuter

94a. Labium shorter, remote from mesocoxae, second segment usually barely surpassing base of head; antennae and femora except proximal and distal ends frequently dark brown to black (Palearctic) 95

95. Labium relatively short, not attaining anterior margin of mesosternum; membrane nearly uniformly light brown with diffuse light areas narrowly along inner margin on basal half and patch adjacent to distal end of corium (Manchuria) .....new species

95a. Labium longer, fourth segment extending well onto mesosternum; membrane usually chiefly testaceous at least on anterior third with contrasting brown veins (Palearctic) ..... *sabuleti* (Fallen)

96. Fourth antennal segment elongate, two to three times length of segment 3; membrane of fore wing usually nearly uniformly dark brown to black with a few diffuse lighter areas present 97

96a. Fourth antennal segment shorter, at most 1/3 longer than segment 3; membrane nearly uniformly light brown or testaceous with veins darker; or micropterous species with membrane absent or reduced to a small flap 99

97. Head relatively short and wide, "squared-off" anteriorly, juga reduced, usually not extending beyond base of 1st antennal segment; antennal segment 4 extremely elongate, 2 1/2 to 3 times length of segment 3 (Orient, Africa) ..... *noctulus* Distant

97a. Head longer, more acuminate, juga not reduced, extending at least 1/3 length of antennal segment 1; antennal segment 4 less elongate, little more than 2 times length of segment 3 98

98. Body and appendages nearly uniformly brown to black; labium relatively elongate, at least fourth segment extending onto mesosternum for its entire length (Australia) ..... *sordidus* Slater

98a. Legs yellow, membrane testaceous with veins darker; labium shorter, at most fourth segment extending onto mesosternum for 1/2 its length (South America) (fig. 49) ..... *praecultus* Distant

99. Labium short, at most extending between fore coxae, not attaining posterior margin of prosternum 100

99a. Labium longer, extending at least to posterior margin of prosternum (South America) ..... *transitius* Slater and Wilcox

100. Fourth antennal segment considerably longer than segment 3; fore wings reduced to small pads laterad of scutellum, not nearly in contact on midline, no membrane flange present (South America) (fig. 50) ..... *proprius* Slater

100a. Fourth antennal segment shorter than segment 3; fore wings reduced to small pads but clavi broadly in contact to form a distinct claval commissure, membrane present as a small flange meeting along midline (Madagascar) ..... *canus* Slater

LEMURIBLISSUS SLATER
Figure 52

Lemuriblissus Slater, 1967, p. 11.

TYPE SPECIES: *Lemuriblissus acuminatus* Slater. Monobasic.

DISTRIBUTION: Madagascar, E. Africa.

BIOLOGY: Unknown.

DIAGNOSIS: Body robust, moderately elongate, subelliptical, non-linear. Metathoracic scent gland auricle short, rounded, earlike. Fore femora armed below with a single short stout spine, middle and hind femora mutic.

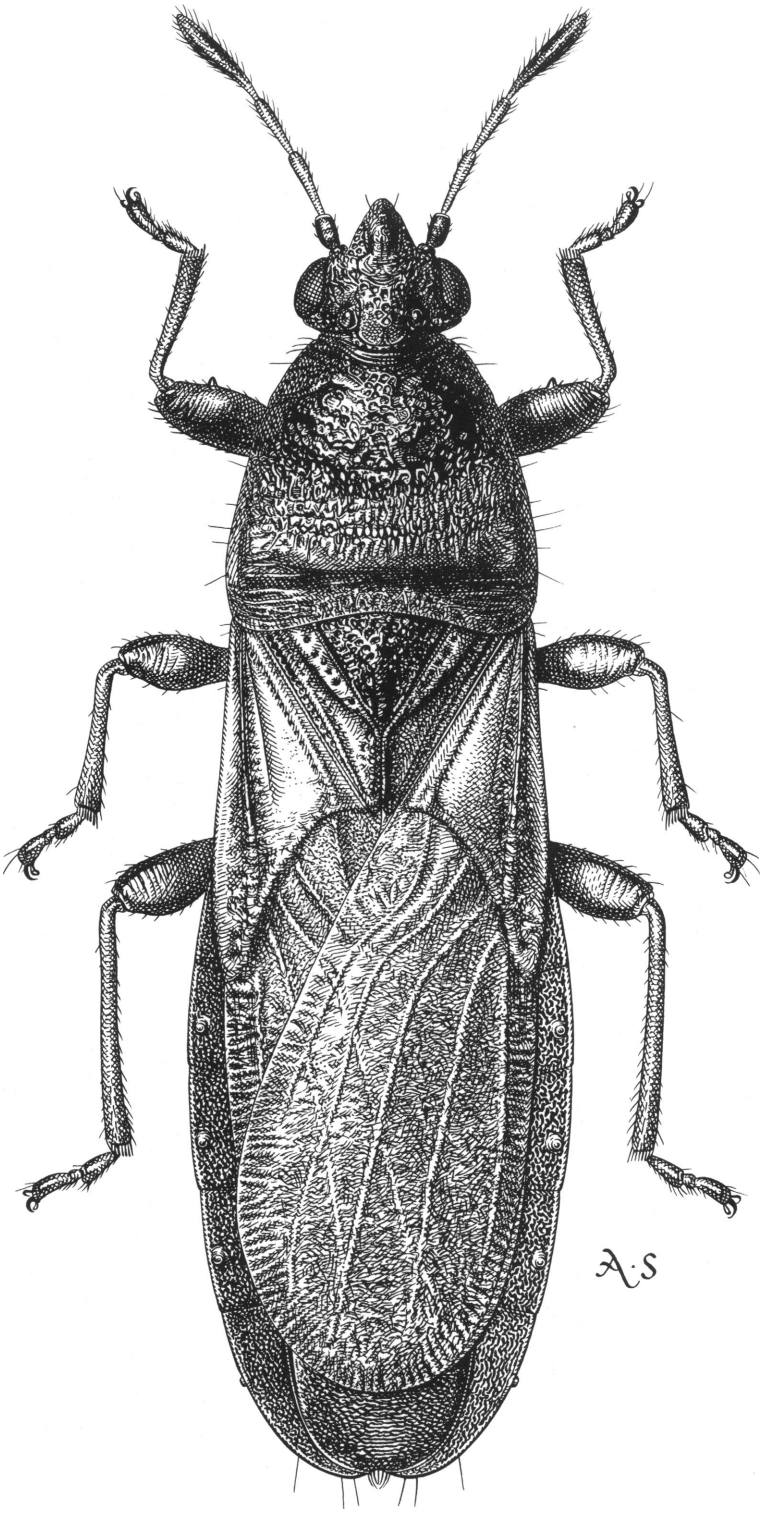


FIG. 52. *Lemuriblissus acuminatus*, dorsal view.

Entire body surface shining completely lacking pruinose areas. Apical corial margins strongly, deeply and evenly concave. Membrane thin, semitranslucent, much differentiated from surface of adjacent corium. Fore coxal cavities closed. Ocelli small. Antennae slender, prominently clavate. Genitalia unknown.

LUCEROCORIS SLATER
Figure 53

Lucerocoris Slater, 1968, p. 281.

TYPE SPECIES: *Lucerocoris nigrotibialis* Slater. By original designation.

DISTRIBUTION: Oriental Region: Philippines.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, linear, nonflattened, subcylindrical. Metathoracic scent gland auricle strongly curved anteriorly forming a nearly right angle curve. Fore femora short, strongly incrassate, armed ventrally with numerous short, stout spines. Fore tibiae short, expanded, toothed at distal end. Middle and hind femora mutic. Head and pronotum above completely shining, non-pruinose. Scutellum pruinose but with median elevation shining. Apical corial margin straight. Membrane thick, nearly unitexturous with adjacent corium, its distal third strongly shining but proximal two-thirds dull appearing subpruinose giving a two-textured appearance to membrane. Fore coxal cavities closed. Ocelli very large. Antennae short, stout, thick, second segment much shortened, shorter than segment one, subclavate. Claspers short, lobate, rounded. Sperm reservoir unknown. Ovipositor somewhat platelike, not completely dividing abdominal sternum seven.

KEY TO SPECIES OF *LUCEROCORIS*

1. Head and pronotum black; third antennal segment longer than combined lengths of segments 1 and 2 (fig. 53) ..... *nigrotibialis* Slater

1a. Head and pronotum bright red-brown; third antennal segment shorter than combined lengths of segments 1 and 2 ..... *brunneus* Slater

MACCHIADEMUS SLATER AND WILCOX
Figure 54

Macchiademus Slater and Wilcox, 1973, pp. 98-99.

TYPE SPECIES: *Blissus diplopterus* (Distant). By original designation.

DISTRIBUTION: South Africa.

BIOLOGY: Breeds on grasses chiefly of the genus *Ehrharta*. One species very destructive to wheat. Also known to breed on grasses of the genus *Pentaschistus* and *Pennisetum*. One species breeds on *Juncus*.

DIAGNOSIS: Body moderately elongate, sublinear. Metathoracic scent gland auricle slender, rounded, tapering to distal end. Fore femora incrassate with one or two spines present distally on ventral surface. Body lacking pruinosity both above and below except sometimes on metasternum. Apical corial margin straight. Membrane in large part transparent to translucent-hyaline, thinner than adjacent corium. Fore coxal cavities very narrowly open. Ocelli small. Antennae slender, terete or very slightly enlarged at distal end of segments two and three. Clasper generalized. Sperm reservoir unique with bulb large and ellipsoidal and with a median sclerotized band extending completely or partially through center of dorsal surface (see Slater and Wilcox, 1973), wings subtriangular or deeply incised, curving strongly ventrad so as to be scarcely visible in dorsal view. Ovipositor extending anteriorly to posterior margin of abdominal sternum five. See figure 2L for morphology of the spermatheca.

KEY TO SPECIES OF *MACCHIADEMUS*

1. Head broad across strongly protruding eyes (fig. 6B), the latter strongly angled mesad posteriorly, in brachypters width of head across eyes greater than pronotal length; macropters lacking a darkened macula or marginal stripe at apex of corium ..... *capensis* Slater

1a. Head rounded with eyes longitudinal (fig. 6A), only moderately produced and rather evenly narrowed mesad posteriorly; brachypters and macropters with pronotal length greater than width of head across eyes; macropters always with apex of corium darkened as a macula or marginal stripe 2

2. Corium with distal half dark brown to black,

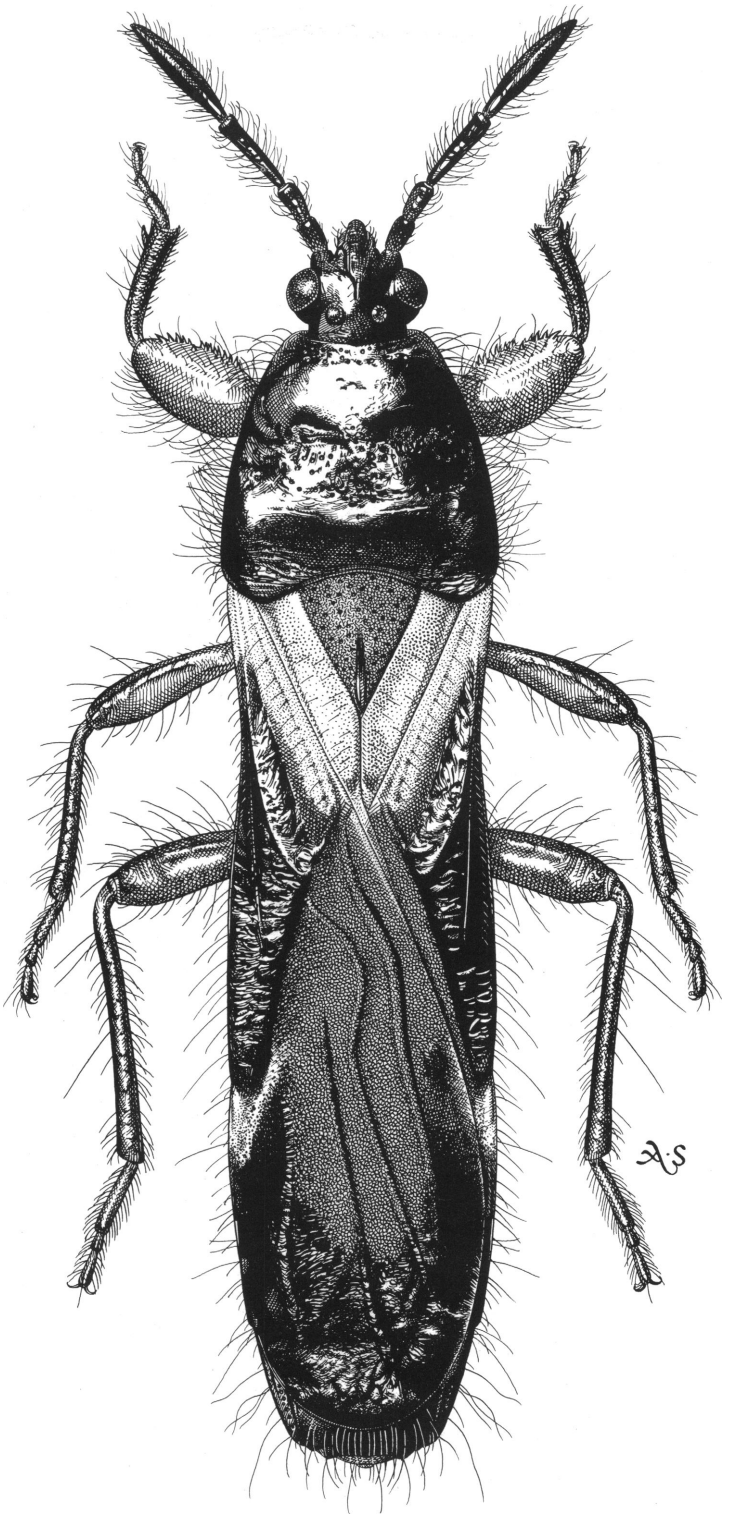


FIG. 53. *Lucerocoris nigrotibialis*, dorsal view.

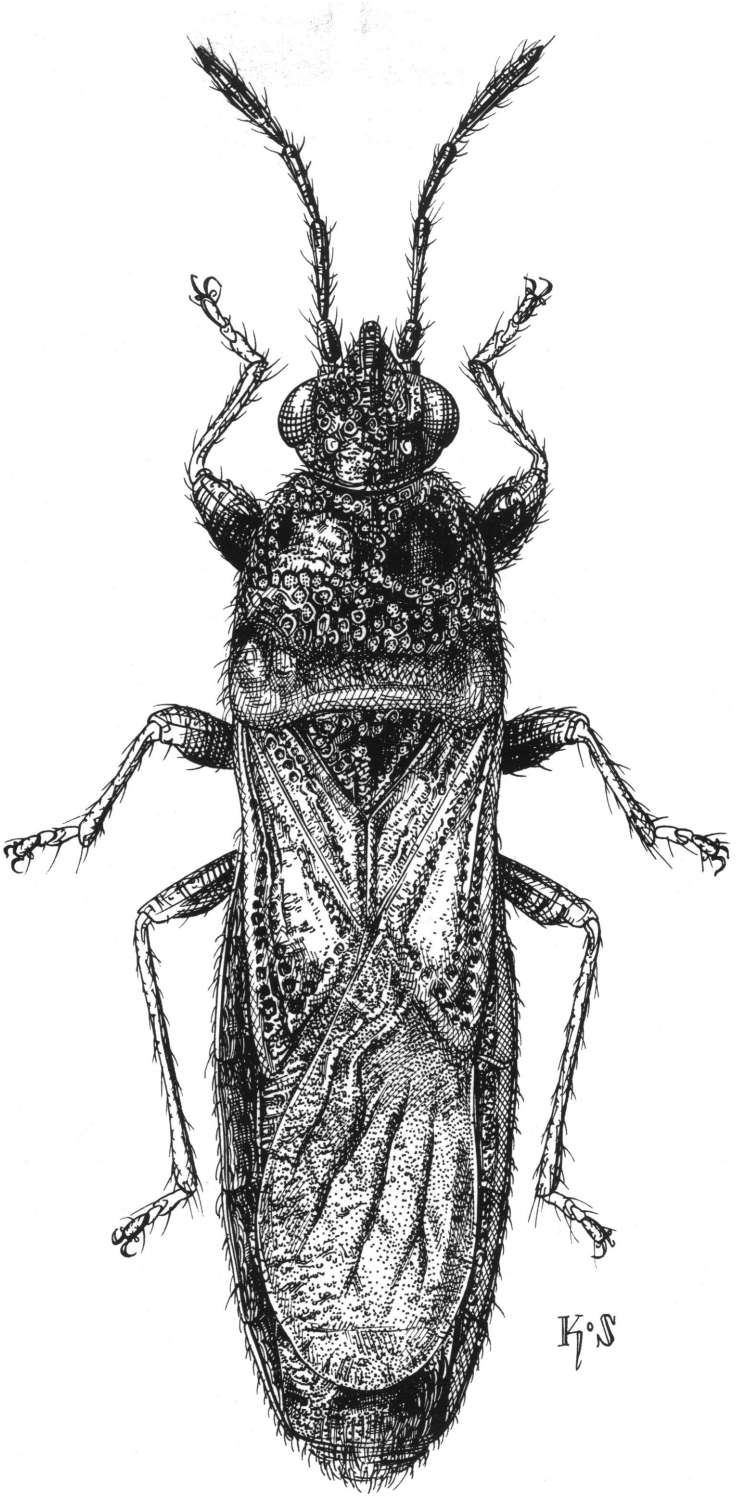


FIG. 54. *Macchiademus diplopterus*, dorsal view.

extending anteriorly to posterior end of claval commissure; tylus usually exceeding distal end of first antennal segment; membrane (macropters) of fore wing with a large dark central macula 3

2a. Corium with darkened distal area reduced, remote from distal end of claval commissure; tylus shorter, not or only very slightly exceeding distal end of first antennal segment; membrane of fore wing lacking a dark central macula, but with veins usually darkened centrally 4

3. Labium elongate, extending well between or beyond mesocoxae, first labial segment attaining or nearly attaining base of head... .....*acuminatus* Slater and Wilcox

3a. Labium not or at most barely attaining mesocoxae, first labial segment remote from base of head .....*nigritus* Slater and Wilcox

4. Metasternum completely pruinose; abdominal sternum including connexival area completely dark chocolate brown to black..... .....*angustus* Slater and Wilcox

4a. Metasternum shining or sub-shining mesally, abdominal venter with lateral connexival area bright reddish or yellow-brown and strongly differentiated from dark coloration of remainder of sternum (fig. 54)..... .....*diplopterus* (Distant)

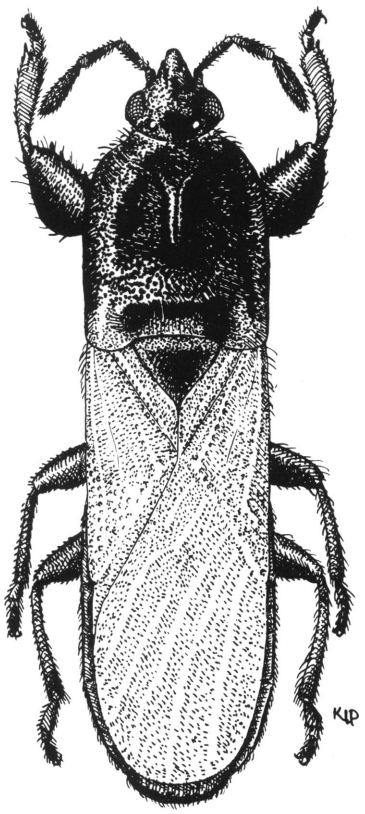


FIG. 55. *Macropes uniformis*, dorsal view.

MACROPES MOTSCHULSKY
Figures 55-58

Macropes Motschulsky, 1859, p. 108.
Rhabdomorphus Bergroth, 1918, pp. 68-69.

TYPE SPECIES: *Macropes spinimanus* Motschulsky. Fixed by Distant 1904.

DISTRIBUTION: Africa, southern Asia to Australia.

BIOLOGY: Several species associated with bamboos but grasses of the genera *Sporobolus* and *Saccharum* also reported as host plants.

DIAGNOSIS: Body elongate, sublinear, varying from slender to robust. Metathoracic scent gland auricle either narrow and straplike (fig. 9E, I) or lobate (figs. 13B, 9D, F, P). Fore femora enlarged, incrassate, multispinose, usually lying closely appressed to a lateroventrally excavated anterior portion of prothorax. Head and prothorax shining, completely nonpruinose both above and below. Apical corial margin straight. Membrane varying from thin and subhyaline to thickened and nearly of same texture as adjacent corium. Fore coxal cavities closed. Ocelli small. Sexual dimorphism and wing reduction not or little evident but submacroptery common. Some species with male fore femora more strongly incrassate than those of females. Antennae either terete or with segments two and three distally enlarged and subclavate. Fore tibiae usually somewhat swollen and armed with terminal or subterminal spines. Tarsi short, swollen, second segment generally relatively narrow and small. Head small. Claspers frequently scimitar-shaped with outer knob frequently placed far from base of clasper (fig. 2B), inner projection often obsolete. Sperm reservoir with a generally small rounded or elliptical cup, wings slender and straplike. Spermathecal pump usually double flanged, i.e., separated into two parts by a transverse "suture" (fig. 2D, J).

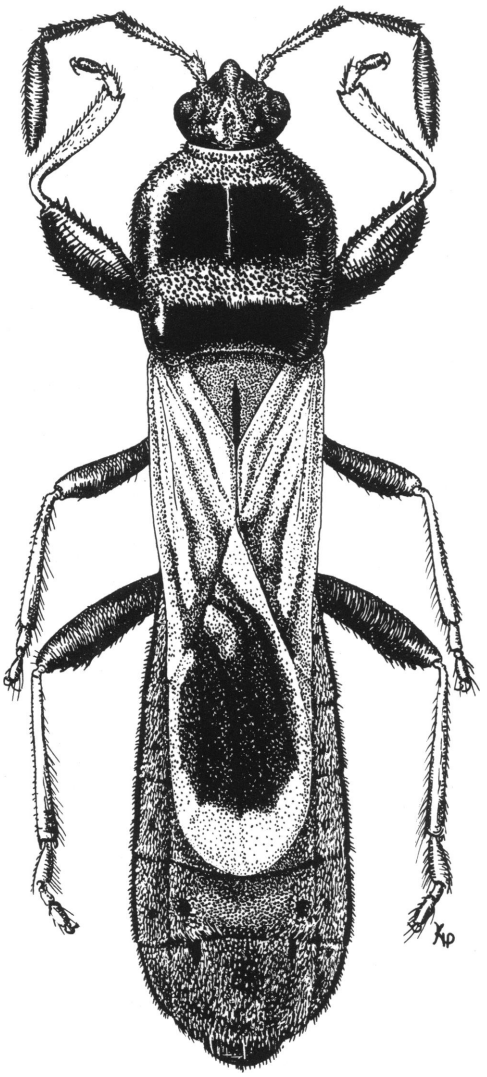


FIG. 56. *Macropes raja*, dorsal view.

KEY TO SPECIES OF *MACROPES*[1]

1. Membrane either completely shining and somewhat translucent, or dull anteriorly and contrasting shining distally (fig. 7A, B) 2
1a. Membrane in large part opaque and dull textured (at most somewhat shining at extreme apex and sometimes in light areas of species with a large central dark membranal macula) (fig. 7C) 20
2. Membrane shining (often translucent) throughout (sometimes extreme anterior area dull) 3
2a. Membrane with anterior dull area extending posteriorly at least halfway along apical corial margins, posteriorly shining 13
3. Membrane nearly uniformly smoky gray-brown with a strongly contrasting white, usually dull semi-opaque, area at extreme anterior end between inner angles of apical corial margins .....*privus* Distant

[1]*bacillus* and *sultanus* not included.

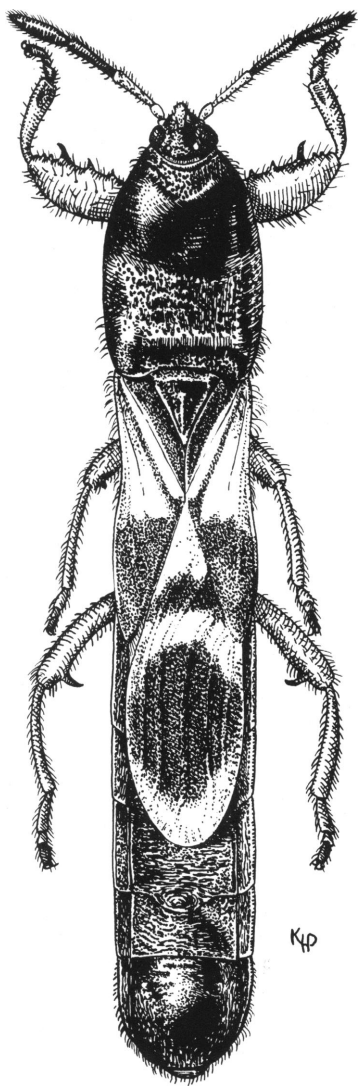


FIG. 57. *Macropes varipennis*, dorsal view.

3a. Membrane with exception of veins uniformly pale or translucent throughout, or if slightly darkened then lacking a contrasting white opaque anterior area 4

4. Distal fourth of corium brown; membrane of fore wing milky white, not markedly translucent; antennal segments 2, 3, and 4 black or dark chocolate brown; ♂ with a prominent "button-like" median protrusion on abdominal sternum 4; calli strongly pubescent .....*obnubilus* (Distant)

4a. Distal fourth of corium usually testaceous, unicolorous with remainder of corium, if appearing somewhat infuscated (African) then antennal segments 2, 3, and 4 brown, not black; calli shining, nearly glabrous (except in *pilosus*); no sternal protrusion on abdominal sternum 4; membrane strongly translucent 5

5. Pronotum relatively short and broad, ratio of pronotal length to width less than 0.85; total length less than 4.0..... .....*pilosus* Slater, Ashlock, and Wilcox

5a. Pronotum relatively more slender and elongate, ratio of pronotal length to width more than 0.88 (in some specimens the ratio is less than 0.88, but these are relatively elongate); total length over 5.0 (range 5.08-7.20) ..6

6. Pronotum with posterior lobe light yellowish brown, the light coloration extending anteriorly midway across transverse impression, usually to anterior margin of impression .....*pronotalis* Distant

6a. Pronotum red-brown or yellowish brown across humeri, lighter coloration at most reaching posterior margin of transverse impression. 7

7. Scutellum with a broad, shining area covering greater part of surface, pruinose areas confined to basal strip and narrow sub-basal areas 8

7a. Scutellum with shining non-pruinose area confined to a narrow, elevated mesal strip sometimes broadened basally 10

8. Median length of pronotum considerably greater than width across humeri (fig. 58) .....*australis* (Distant)

8a. Median length of pronotum subequal to or less than width across humeri 9

9. Pronotum wider across calli than across humeri; interocular space more than 1 1/2 times as great as length of second antennal segment; evaporative area of metapleuron coarsely punctate; corium uniformly testaceous (fig. 55) .....*uniformis* Distant

9a. Pronotal width across calli subequal to width across humeri; interocular space less than 1 1/4 times as great as length of second antennal segment; evaporative area of metapleuron impunctate or nearly so; apical area of corium with brown infuscations..... .....*africanus* Slater and Wilcox

10. Body very elongate, total length of body always more than seven times length hind tibia; legs generally uniformly bright yellow .....*subauratus* Distant

10a. Body somewhat less elongate, total length of body less than seven times length hind tibia; femora generally fuscous to very dark brown 11

11. Pronotum with humeral width greater than median length, lateral pronotal margins usually slightly but evenly and distinctly tapering from humeral angles to anterior margin; ratio of head width to pronotal width less than 0.55.....*pseudofemoralis* Slater, Ashlock, and Wilcox

11a. Pronotum with mesal length as great as or greater than humeral width; lateral pronotal margins nearly parallel-sided from humeral angles to area of calli; ratio of head width to pronotal width 0.55 or greater 12

12. Antennal segment 4 twice or more than twice length of antennal segment 2; pronotum appearing to taper gradually from humeral angles to area of calli .... *femoralis* Distant

12a. Antennal segment 4 less than twice length of antennal segment 2; pronotum appearing nearly parallel-sided from humeral angles to area of calli..... *harringtonae* Slater, Ashlock, and Wilcox

13. Dull area of membrane confined to extreme anterior portion, not extending more than midway along apical corial margin (fig. 7B) .....*privus* Distant

13a. Dull area of membrane extending posteriorly adjacent to apical corial margin at least almost to distal end of corium (fig. 7A)... 14

14. Smaller species, less than 4.72 mm. long; radial vein of corium shining but area laterad (to margin) contrastingly dull..... .....*maculosus* Slater and Wilcox

14a. Large elongate species, over 6.5 mm.; lateral area of at least anterior three-eighths of corium including radial vein completely shining to margin 15

15. Entire lateral area of corium including radial vein completely dark brown..... .....*alternatus* Slater and Wilcox

15a. Lateral area of corium at least in part white or pale testaceous, or if appearing dark then middle and hind femora multispinose...16

16. Membrane with anterior dark area and large

median dark macula dull, lunate transverse pale vitta present just beyond apices of coria and distal pale area contrastingly shining 17

16a. Membrane with dull area confined to anterior area and along apical corial margin, median dark macula shining as are lunate pale vitta and apical pale area 18

17. Eyes relatively sessile, not strongly produced above head surface; inner (median) vein of corium usually pale anterior to posterior end of claval commissure; anterior end of membrane between coria usually dark; lunate transverse white vitta across membrane often obsolete and reduced to lateral spots ..... *albosignatus* Distant

17a. Eyes prominently elevated above head surface; inner vein of corium usually darkened for some distance anterior to posterior end of claval commissure; anterior portion of membrane usually pale or at least with pale spots; pale lunate vitta on membrane complete ..... *nigrolineatus* Distant

18. Scutellum completely pruinose ..... *lobatus* Slater, Ashlock, and Wilcox

18a. Scutellum shining on median carina and adjacent areas on distal fourth 19

19. Dark macula on hemelytral membrane not attaining lateral margins, latter broadly pale ..... *punctatus* (Walker)

19a. Dark membranal macula broadly attaining lateral margins ..... *nigrolineatus* Distant

20. Hemelytra predominately light brown or yellow, at most with veins of membrane and distal third of corium darkened, never with a variegated contrasting black or brown and white pattern on hemelytra (occasional specimens of *burmanus* and *exilis* show an obscure darkening on the membrane mesally but not a sharply contrasting macula and the veins in the area in such cases are always much darker and strongly contrasting) 21

20a. Hemelytra dark brown or with a variegated black or brown and white pattern usually including a large central dark membranal macula 30

21. Radial vein dark brown, shining throughout and coalescing distally with shining apical corial margin; membrane including veins uniformly dull brown throughout ..... *brunneus* Slater and Wilcox

21a. Radial vein generally nearly unicolorous with adjacent areas of corium and shining only on anterior two-thirds or if appearing shining throughout then membrane including veins not unicolorous dull brown 22

22. Labium short, not extending posteriorly to fore coxae ..... *rufipes* Distant

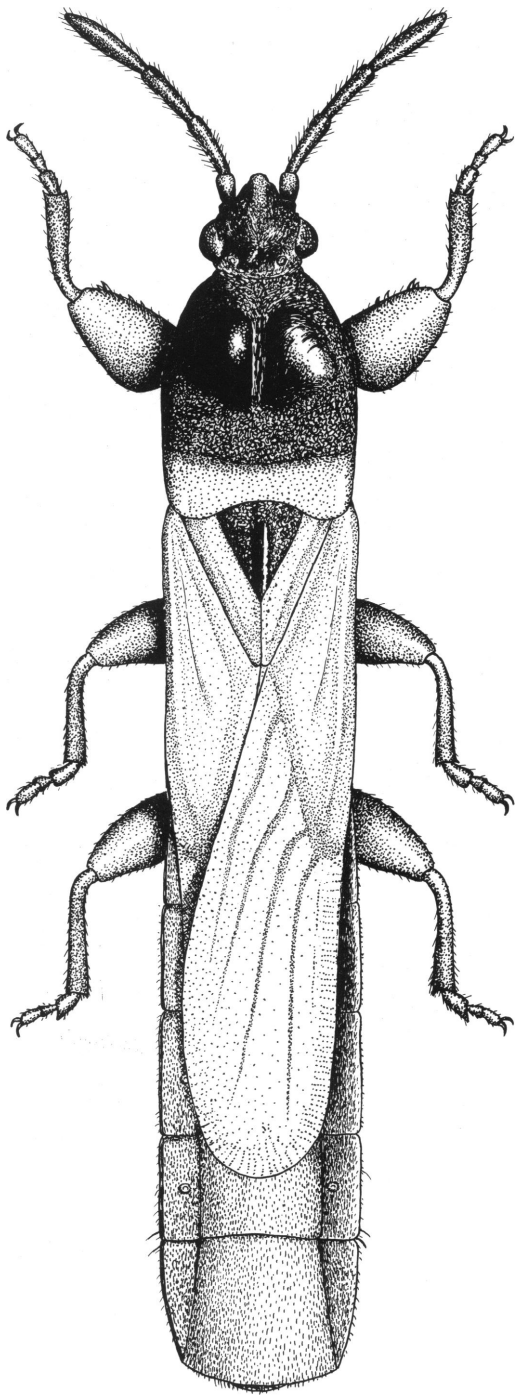


FIG. 58. *Macropes australis*, dorsal view.

22a. Labium more elongate, always extending between fore coxae and usually attaining posterior margin of mesosternum 23

23. Pronotum strongly produced laterally anterior to transverse impression, conspicuously wider across calli than across humeri; or if only slightly wider across calli in macropters, then large species, over 8.1 mm.... 24

23a. Pronotum nearly parallel sided from humeri to area of calli with width across calli subequal to that across humeri; or if somewhat wider across calli then small species, under 7.6 mm.....25

24. Broad rather flattened species; pronotal calli smooth and glabrous with three foveate depressions present; apex of tylus exceeding apex of first antennal segment..... .....*hoberlandti* Slater and Ashlock

24a. Elongate, more linear, not conspicuously flattened; pronotal calli without foveate depressions, shallowly punctate, often conspicuously pubescent; apex of tylus at most attaining apex of first antennal segment .....*maai* Slater and Wilcox

25. Veins of membrane light to dark brown, contrasting with yellowish to testaceous ground color of membrane, or if membrane with brown macula then veins nearly unicolorous brown 26

25a. Veins of membrane transparent or testaceous, unicolorous or nearly so with ground color of membrane 28

26. Legs dark chocolate brown to nearly black; distal third of corium nearly uniformly chocolate brown..... .....*exilis* Slater and Wilcox

26a. Legs nearly uniformly pale yellow to light brown; distal third of corium testaceous at least on lateral half (some specimens of *burmanus* have the distal third of corium darkened but in such cases the pronotum is wider than long) 27

27. Stout, robust species, body length less than five times humeral width; labium reaching onto anterior margin of mesosternum, second segment nearly reaching anterior margin of fore coxae; ♂ with "button-like" protrusion mesally on sternum 4 (third visible) .....*burmanus* Slater and Wilcox

27a. Elongate, slender species, body length at least 5 2/5 times humeral width (usually six or more times); labium shorter, not exceeding fore coxae, second segment barely surpassing base of head; ♂ lacking protrusion on fourth sternum (fig. 58)..... .....*australis* (Distant)

28. Distal fourth of corium dark fuscous, strongly contrasting with pale testaceous proximal area; ♂ with a prominent "buttonlike" protrusion mesally on abdominal sternum 3.. .....*obnubilis* (Distant)

28a. Entire corium uniformly light testaceous, lacking dark fuscous coloration apically; ♂ lacking a median sternal protrusion 29

29. Body relatively short and stout, only four times as long as wide...*consimilis* Distant

29a. Body relatively elongate and slender, at least five times as long as wide..... .....*pronotalis* Distant

30. Pronotum with a deep non-punctate median groove running longitudinally on midline between calli; hind femora generally conspicuously armed with small spines (except in *dilutus*) (*raja* complex) 31

30a. Pronotum lacking a deep median non-punctate longitudinal furrow between calli, sometimes with one or two rows of indented punctures in the area forming a shallow groove or with a fine impressed line on either side of meson, or if appearing grooved, then ♂ hind femora with a swollen protrusion midway along ventral margin (see *spinimanus*); with or without spines on posterior femora (*spinimanus* complex) 37

31. Middle and hind femora mutic..... .....*dilutus* Distant

31a. Middle and hind femora spinose 32

32. Middle and hind tibiae light yellow to testaceous, strongly contrasting with dark femora (fig. 56) .....*raja* Distant

32a. All tibiae dark brown to black, unicolorous or nearly so with dark femora (posterior tibiae sometimes lighter brown on distal half... 33

33. Clavus and at least anterior third of corium nearly uniformly opaque white..... .....*crassifemur* Slater and Wilcox

33a. Clavus and/or anterior third of corium with at least veins contrasting dark brown 34

34. Membrane with a large, round, dark median macula not attaining lateral margins and separated from basal dark area by a broad, transverse, pale, lunate vitta adjacent to apex of corium (the vitta sometimes interrupted with diffuse narrow brown areas) .....*philippinensis* Distant

34a. Membrane dark coloration not a distinct, black, round spot, entire basal two-thirds

membrane black, or with at most a small light area at extreme base adjacent to distal end of corium and a small diffuse light area in center of disc; dark membranal area broadly in contact with lateral margins 35

35. Antennae relatively short, length of segment 2 equal to or barely greater than interocular distance . . . . . *comosus* Slater, Ashlock, and Wilcox

35a. Antenna relatively long, length of segment 2 at least 1.33 times interocular distance 36

36. Large, robust species (8.28-10.92 mm.); pronotum noticeably wider across area of calli than across humeral angles; length of pronotum subequal to basal width; metathoracic scent gland auricle short, broad, very slightly curving anteriorly . . . . . *major* Matsumura

36a. Smaller, less robust species (7.56 mm.); distance across pronotal calli subequal to width across humeral angles; length of pronotum greater than basal width; scent gland auricle narrow, linear, strongly curving anteriorly . . . . . *minor* Slater, Ashlock, and Wilcox

37. Labium very short, remote from fore coxae; ♂ with extremely elongate, curving spines distally below on hind femora (fig. 57) . . . . . *varipennis* (Walker)

37a. Labium extending caudad to or beyond fore coxae; hind femoral spines, if present, very short and stout 38

38. At least anterior fourth of corium uniformly dark brown . . . *umbrosus* Slater and Wilcox

38a. Anterior fourth of corium with some pale markings or areas present 39

39. Membrane chiefly black from base to apex, dark coloration extending to apical and lateral margins along entire membrane except in area of ovoid white spot at distal end of corium 40

39a. Large dark macula on membrane, for the most part remote from apical and lateral margins (sometimes attaining lateral margin across subapical third) 41

40. Length of body greater than 7.0 mm. . . . . *praecerptus* Distant

40a. Length of body less than 6.5 mm. . . . . *lacertosus* Bergroth

41. Scutellum with anterolateral angles produced into upward-tipped, shining tubercles (sometimes very inconspicuous); antennae with at least segments 1 and 2 pale yellow 42

41a. Scutellum lacking lateral tubercles; all antennal segments red-brown to black 43

42. Small species, under 6.25 mm. (range 4.23-6.24 mm.); ♂ with a swollen protrusion midway along ventral margin of hind femur; legs usually chocolate to yellowish brown . . . . . *spinimanus* Motschulsky

42a. Larger species, over 6.5 mm. (range 6.48-6.90 mm.); ♂ lacking swollen protrusion on hind femur; legs usually bright yellow . . . . . *yoshimotoi* Slater, Ashlock, and Wilcox

43. Labium exceeding fore coxae; ♂ with hind femora mutic; clavus nearly uniformly light brown . . . . . *simoni* Distant

43a. Labium not extending caudad of fore coxae; ♂ with a series of spines on hind femur; clavus with distal half pale between veins . . . . . *lacertosus* Bergroth

MERINADEMUS SLATER
Figure 59

Merinademus Slater, 1967, p. 16.

TYPE SPECIES: *Merinademus baraoides* Slater, Monobasic.

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Body extremely elongate, slender, linear, not strongly flattened. Metathoracic scent gland auricle elongate, broadening to a strongly rounded distal end. Fore femora strongly incrassate armed below on distal third with a single large, elongate, acute spine. Fore tibiae short, stout, broadening distally. All legs short and stout. Body above and below completely shining, no pruinosity present. Apical corial margin strongly concave. Membrane thin, semitranslucent. Fore coxal cavities closed. Ocelli small. Submacropterous. Antennae with segments two and three short and conspicuously clavate.

MICAREDEMUS SLATER
Figure 60

Micaredemus Slater, 1967, p. 29.

TYPE SPECIES: *Micaredumus elegans* Slater. By original designation.

DISTRIBUTION: Madagascar, Africa.

BIOLOGY: Breeding known on several genera of grasses.

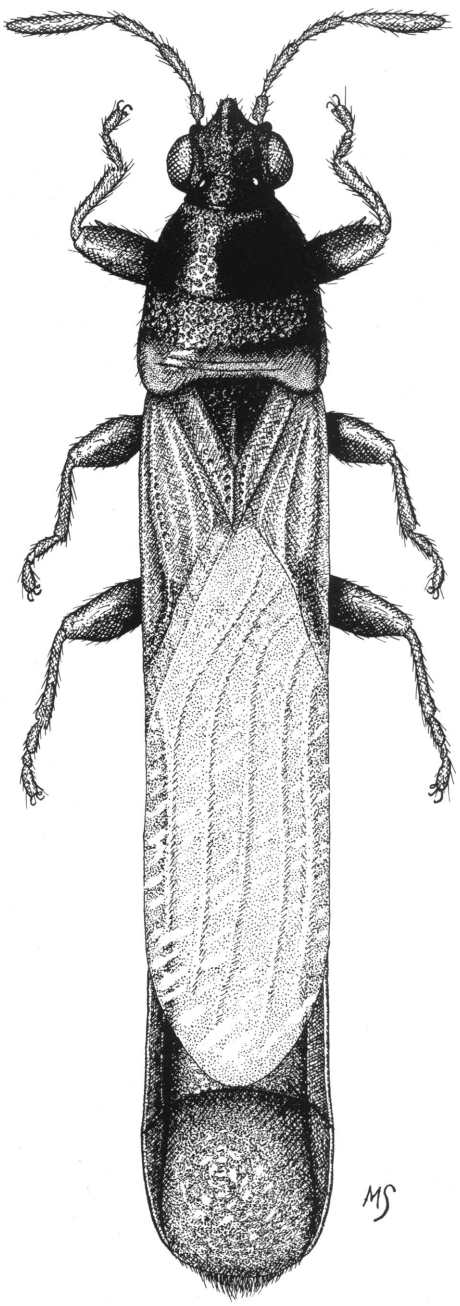


FIG. 59. *Merinademus baraoides*, dorsal view.

DIAGNOSIS: Body elongate, moderately broad, not strongly flattened. Scent gland auricle strongly, lunately curving forward (fig. 10F). Fore femora with one, two, or rarely more small spines. Body completely shining above and below, even clavus and corium shining. Apical corial margin straight. Membrane hyaline, well differentiated in texture from corium. Fore coxal cavities closed. Ocelli small. Brachyptery and submacroptery frequent. Antennae terete or with segments 2 and 3 narrowly clavate. Claspers slender, inner projection obsolete, outer knob sub-triangular. Sperm reservoir minute, reduced to a small median scooplike projection (fig. 1GG), wings absent. Ovipositor elongate. Spermatheca with bulb lacking a basal flange; pump thick distally, strongly curved, elongate and tapering to a narrow proximal end (fig. 2M).

KEY TO SPECIES OF *MICAREDEMUS*

1. Fore femora armed below with two or more sharp spines 2
1a. Fore femora armed below with a single sharp spine 13
2. Fore femora armed with three or more spines 3
2a. Fore femora armed with two spines 6
3. Membrane of fore wing with a central longitudinally ovoid diffuse brown macula (West Africa) ..... *gillonae* Hamid and Slater
3a. Membrane translucent to transparent hyaline, lacking a central brown macula 4
4. Fore femora armed with three spines; labium extending onto mesosternum, second segment surpassing base of head by two-thirds of its length (South Africa) ..... *coatoni* Slater and Wilcox
4a. Fore femora armed with four or five spines (occasionally reduced to three spines on first femur); labium shorter at most extending to fore coxae, second segment barely exceeding base of head 5
5. Small species (3.12-3.52 mm.); male fore femoral spine configuration unique (fig. 7F) (female unknown); pronotum wider across anterior lobe than across humeri (Madagascar) ..... *quadratus* Slater and Wilcox
5a. Larger species (5.0-6.0 mm.); fore femoral spines in conventional row on ventral surface; pronotum parallel sided for most of length, not wider across anterior lobe than across humeri (South Africa) ..... *denticulatus* Slater
6. Labium elongate, extending caudad at least midway onto mesosternum (Madagascar) (fig. 60) ..... *pilosulus* (Horvath)

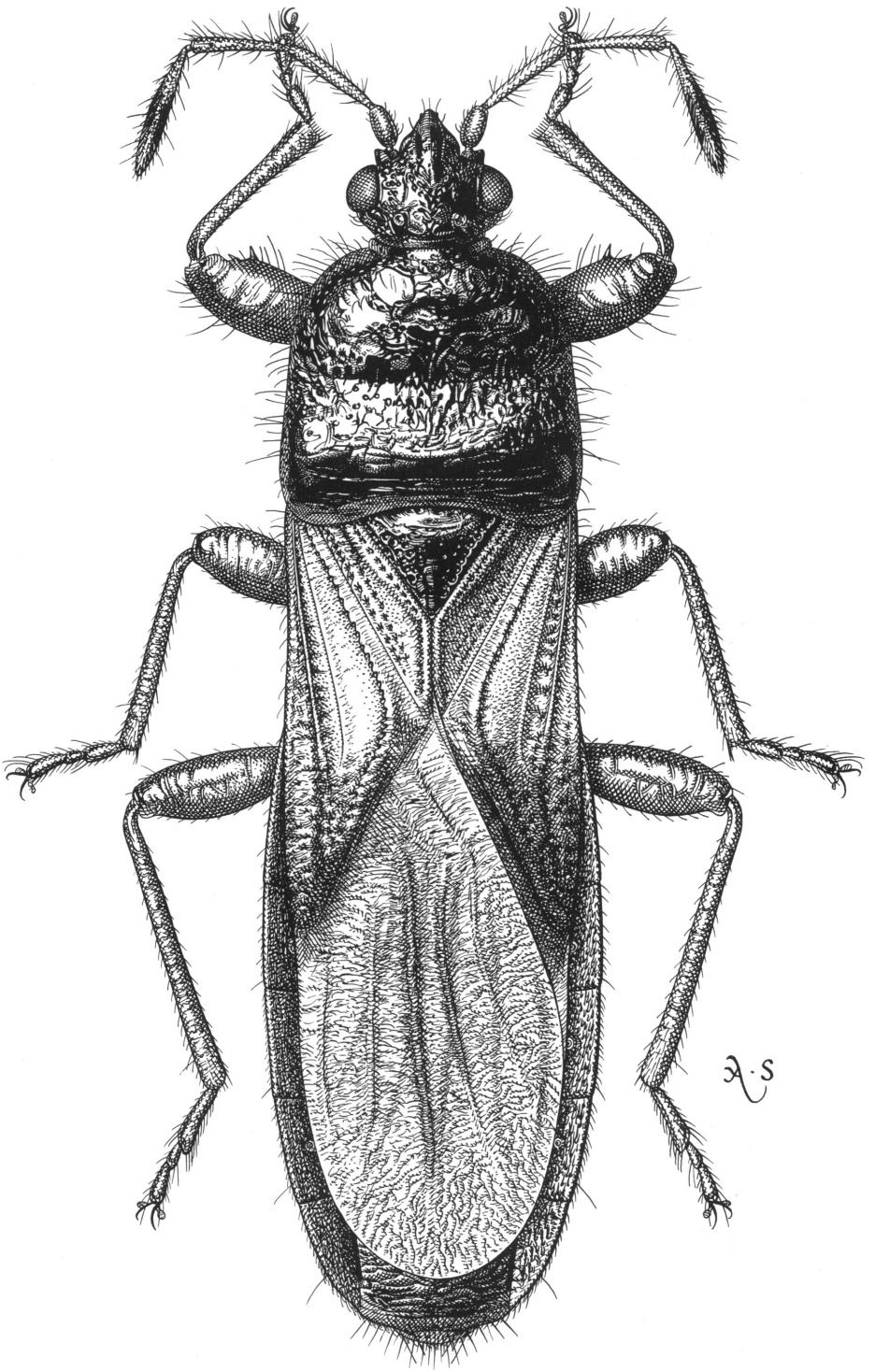


FIG. 60. *Micaredemus pilosulus*, dorsal view.

6a. Labium shorter, at most extending between or slightly beyond fore coxae 7
7. Length of antennal segment 3 greater than interocular distance (Madagascar) ..... *antennatus* Slater
7a. Length of antennal segment 3 less than interocular distance 8
8. Clavus pale testaceous to transparent hyaline, strongly contrasting with dark scutellum .. 9
8a. Clavus chiefly chocolate brown to black, not strongly contrasting with dark scutellum .. 10
9. Prontoum densely clothed with decumbent silvery hairs, posterior lobe bright reddish brown, strongly contrasting with black anterior lobe (Madagascar) ..... *pilosus* Slater
9a. Pronotum nearly uniformly black, at most becoming dark brown across humeri, sparsely clothed with short semi-decumbent hairs (Africa) ..... *pusillus* (Dallas)
10. Legs and antennae in large part brown 11
10a. Legs and first three antennal segments bright yellow or ochraceous 12
11. Labium short, barely attaining fore coxae, second segment extending just beyond base of head; fore femoral spines divergent, set on small tubercle (Madagascar) ..... *obscurellus* Slater
11a. Labium longer, reaching anterior margin of mesosternum, second segment extending well beyond base of head; fore femoral spines parallel, not set on tubercle (East Africa) ..... *wilcoxae* Hamid and Slater
12. Head deeply concave between eyes in area of base of tylus (fig. 5A); anterior pronotal lobe convex on inner half, but laterally sharply flattened and depressed to give a ledgelike appearance to outer third (Madagascar) ..... *eleganoides* Slater
12a. Head normally convex between eyes (fig. 5B); pronotum convex, curving evenly downward from meson to lateral margin with no evidence of a flattened shelflike lateral third (Madagascar) ..... *elegans* Slater
13. Head deeply concave between eyes in area of base of tylus (fig. 5A); anterolateral pronotal margin flattened and shelflike (Madagascar) ..... *capitatus* Slater
13a. Head normally convex between eyes in area of base of tylus (fig. 5B); anterolateral area of pronotum not flattened and shelflike 14
14. Length third antennal segment greater than interocular space (Madagascar) ..... *antennatus* Slater
14a. Length third antennal segment less than interocular space 15
15. Pronotum wider than long (Congo, Africa) .. *congoensis* Hamid and Slater
15a. Pronotal width and length subequal, or length greater than width 16
16. Pronotal length and width subequal (length 1.12 mm., width 1.15 mm.); scutellum wider than long; femora pale ochraceous yellow; tylus extending to anterior third of first antennal segment (Madagascar) ..... *lemuriensis* Slater
16a. Pronotal length greater than width; scutellum longer than wide; femora chocolate to dark brown; tylus extending to or surpassing anterior end of first antennal segment (Madagascar) ..... *kerzhneri* Slater and Wilcox

PATRITIODEMUS SLATER AND AHMAD

Patritiodemus Slater and Ahmad, 1969, pp. 128-129.

TYPE SPECIES: *Ischnodemus dilutipes* Stål. By original designation.

DISTRIBUTION: South America.

BIOLOGY: Unknown.

DIAGNOSIS: Moderately elongate, stout, linear. Metathoracic scent gland auricle usually broad and rounded at distal end. Fore femora either mutic with a single spine or with a hooked bifid spine present. Pronotum including humeral area completely pruinose above and below. Apical corial margins straight. Membrane thinner than adjacent corium. Fore coxal cavities closed. Ocelli small. Antennae terete. Eyes conspicuously laterally produced on short stalks. Labium very short not reaching fore coxae. Claspers conventional. Sperm reservoir with large cup and very large platelike, quadrate, laterally curled wings. Spermatheca with large bulb and proximal flange, pump variable in length, tube usually rather elongate.

KEY TO SPECIES OF *PATRITIODEMUS*

1. Fore femora armed with at least one short spine below on distal third 2
1a. Fore femora mutic 5
2. Fore femoral spine simple, small and inconspicuous; small species little over 5.00 mm. long (♀ unknown); membrane of hemelytra with a pale spot near base 3
2a. Fore femora with a very large spurlike spine

with an acute accessory spine extending at right angles to it; large robust species, over 7.0 mm. long; no pale spot on membrane of hemelytra 4

3. Labium reaching base of prosternum; hemelytra lacking a diffuse dark central area..... .....*delicatus* Slater and Wilcox

3a. Labium not quite attaining anterior margins of fore coxae; hemelytra with a diffuse dark area present..... .....*albomaculatus* Slater and Ahmad

4. Pronotum and abdominal tergum unicolored, dark chocolate brown; antennal segments two and three slender; claspers without distinct inner lobes; male gonopore very small; spermathecal pump narrow and elongate .....*nigellus* Slater and Ahmad

4a. At least part of pronotum and abdominal tergum pale brown, antennal segments two and three distinctly clavate; clasper with well-developed inner knob; male gonopore large; spermathecal pump wide and short relative to duct.....*clavatus* Slater and Ahmad

5. Antennae and legs black or very dark chocolate brown.....*unicoloris* Slater and Ahmad

5a. Legs and at least basal segments of antennae light yellow to reddish brown.....6

6. Membrane strongly suffused with dark brown on basal half; inner knob of clasper little produced; scutellum distinctly broader than long .....*dilutipes* (Stål)

6a. Membrane pale on basal half as well as distally; inner knob of clasper strongly produced; scutellum as long as basal width 7

7. Males less than 4.5 mm. long; second antennal segment subequal to length of scutellum; base of sperm reservoir lacking an accessory "yokelike" sclerite..... .....*minutus* Slater and Ahmad

7a. Males over 6.0 mm. long; second antennal segment considerably longer than scutellum; base of sperm reservoir with a distinct "yokelike" accessory sclerite..... .....*singularis* Slater and Ahmad

PATRITIUS DISTANT
Figures 61, 62

Papirius Stål, 1865, p. 122. (Preoccupied).
Patritius Distant, 1901, p. 468 (new name for *Papirius*).

TYPE SPECIES: *Papirius grossus* Haglund 1868. First included species.

DISTRIBUTION: South America, Cuba.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, linear, non-flattened. Metathoracic scent gland auricle elongate, slender, tapered distally, curving either anteriorly or posteriorly (fig. 7J, K). All legs multispinose. Males frequently with enlarged hind femora. Thoracic pruinosity variable from completely pruinose above and below to completely shining above, frequently chiefly pruinose above with sub-basal shining area and large shining "patches" or bands in area of calli. Membrane usually somewhat thinner than corium. Fore coxal cavities closed. Ocelli small. Usually with short genal tubercles or protrusions. Antennae terete, relatively thick. Sperm reservoir with elongate, slender, twisted wings, bulb slender (fig. 1C, D).

DISCUSSION: *Patritius* as currently delimited contains a number of rather dissimilar species. My interpretation of the cladistic relationships are as in figure 63. This cladogram includes four as yet undescribed species (each known from a single specimen). These undescribed species are important phylogenetically as they include the two most plesiomorphic species and also the most apomorphic. The plesiomorphic species resemble some species of *Ischnodemus* and indicate that *Patritius* is derived from an *Ischnodemus* clade with pruinosity still present on the dorsal pronotal and scutellar surfaces and before the development of enlarge platelike wings on the sperm reservoir. Within *Patritius* apomorphies are generally similar in nature to those that occur in other blissine phyletic lines, i.e., reduction of pruinosity, modification of scent gland auricle shape, sexual dimorphism of the posterior femora etc.

KEY TO SPECIES OF *PATRITIUS*

1. Metathoracic scent gland auricle curving posteriorly (fig. 7K) 2

1a. Metathoracic scent gland auricle curving anteriorly (fig. 7J) 4

2. Pronotum entirely black shining (fig. 61) 3

2a. Pronotum with alternating bands of shining and pruinose surface texture (fig. 62)..... .....*alternatus* Slater and Wilcox

3. Either antennal segment 2 or 3 considerably longer than any individual labial segment (53:61) ....*colombianus* Slater and Wilcox

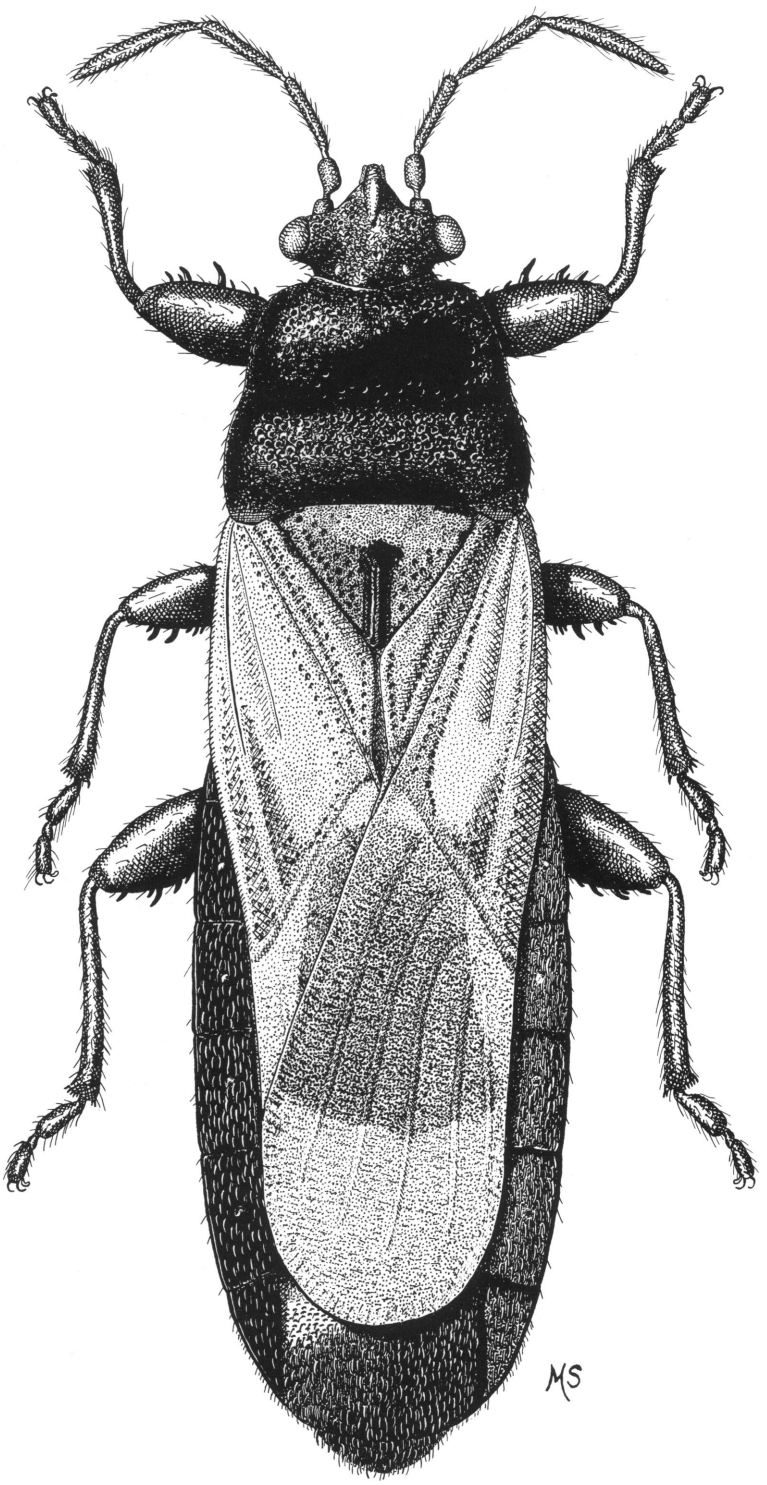


FIG. 61. *Patritius colombianus*, dorsal view.

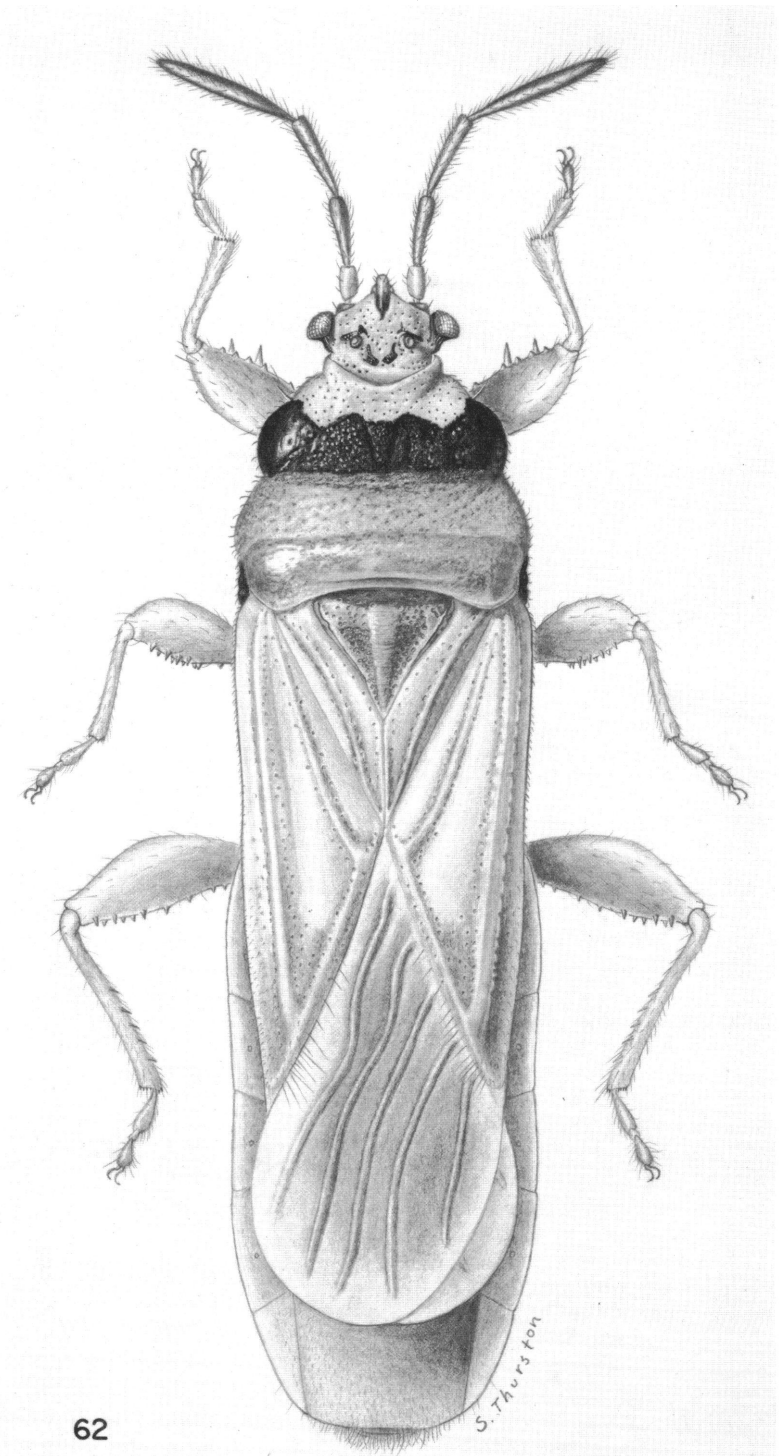


FIG. 62. *Patritius* new species, dorsal view.

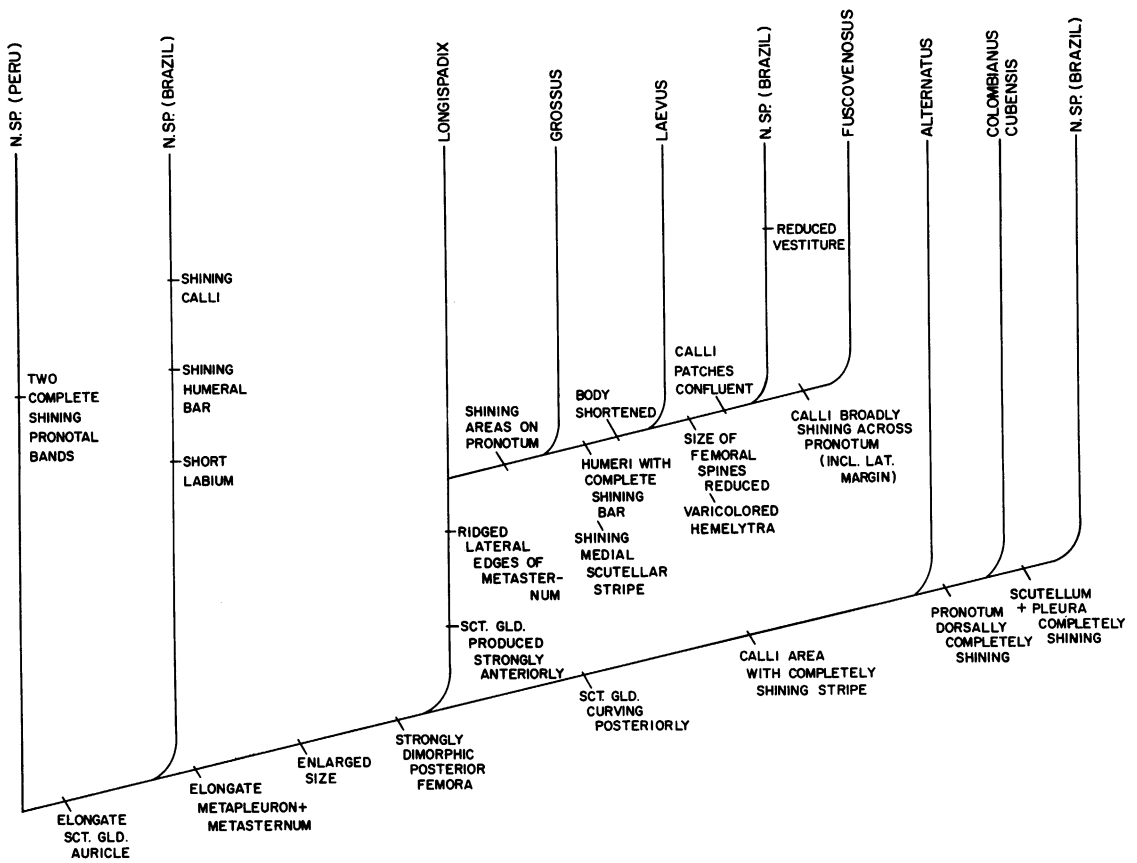


FIG. 63. Cladogram of *Patritius* species.

3a. Either second or third antennal segment subequal to or shorter than any individual labial segment ..... *.cubensis* Barber

4. Pronotum with a complete broad shining band across area of calli and a second band across area of humeri ..... *.fusconervosus* (Stål)

4a. Area of calli with at most a pair of shining triangular areas, never with a complete broad shining band; basal pronotal area either with or without shining area 5

5. Posterior lobe of pronotum completely pruinose; lacking shining sub-basal areas between humeri ..... *.longispadix* Slater and Wilcox

5a. Posterior lobe of pronotum with a narrow shining area between humeral angles 6

6. Shining area between humeri separated into three distinct patches, central elongate, lateral ovoid with a narrow but distinct pruinose area separating them..... ..... *.grossus* (Haglund)

6a. Shining pronotal area between humeri complete, without a narrow pruinose area separating lateral and central patches ... *.laevus* (Stål)

PIRKIMERUS DISTANT
Figures 64, 65

Pirkimerus Distant, 1904, pp. 21-22.
Ischnomorphus Hidaka, 1961, pp. 255-256.

TYPE SPECIES: *Pirkimerus sesquipedalis* Distant. Monobasic.

DISTRIBUTION: Southern Asia, Japan, Philippines to New Guinea.

BIOLOGY: Collecting records from bamboo.

DIAGNOSIS: Body slender, elongate, often subcylindrical; metathoracic scent gland auricle unique, ovoid (fig. 13A); fore femora strongly incrassate, mutic or armed with one to four

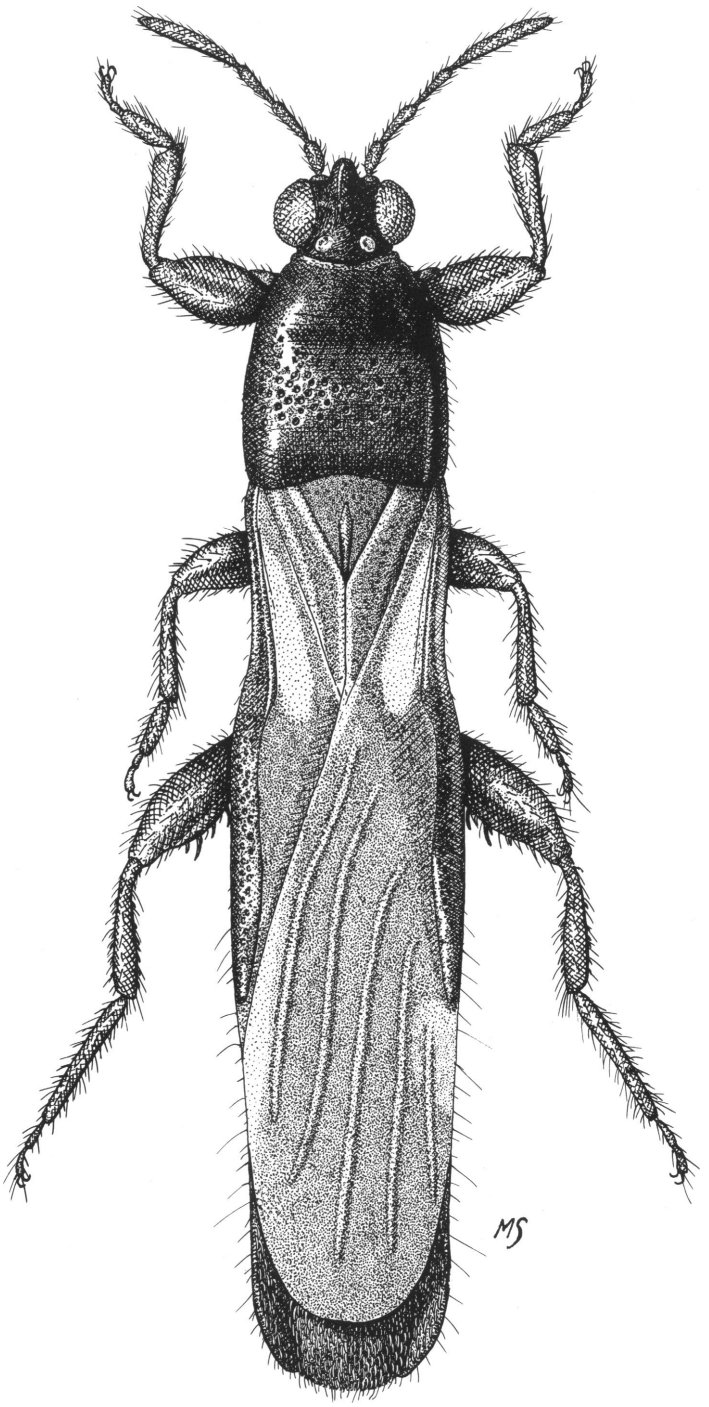


FIG. 64. *Pirkimerus sesquipedalis*, dorsal view.

small spines; hind legs enlarged, thickened, hind tibiae usually thickened, shortened and bearing a series of spines and teeth, hind femora toothed ventrally; corium elongate, tapering.

Head and pronotum above shining, polished, at most pruinose as an anterior collar, propleuron pruinose or shining; scutellum pruinose except along midline, hemelytra pruinose but often with a shining lateral stripe and radial vein. Fore coxal cavities closed. First tarsal segment enlarged, flattened with a "pad" of hairs below, first hind tarsal segment very elongate. Ocelli very large. Eyes frequently dimorphic, when so then larger in females. Labium frequently very short. Antennae in apomorphic species stout, clavate. Claspers small and stout lacking lateral "knob," sometimes blocklike; sperm reservoir with bulb reduced to a slender median projection, wings variable from absent to moderately large diverging lobes; spermatheca with short stout pump, tube variable from very short to elongate and completely coiled. Ovipositor much reduced, not laciniate.

DISCUSSION: This genus, as may be seen by reference to figure 15, is one of the most "advanced" of all the genera of Blissinae. The species are held together by the strongly apomorphic character of the unique ovoid and highly modified metathoracic scent gland auricle (fig. 13A). Within the genus (fig. 66) there are two major components: a plesiomorphic element containing four closely related species, *japonicus, qadrii, javanus,* and *burmanus* which are characterized by relatively elongate nearly terete antennal segments, slender elongate hind tibiae, similar eyes in both males and females, elongate hairs on the body surfaces and generally a pruinose non-shining corium. The peculiar species *papuensis* (fig. 65) from New Guinea is somewhat intermediate between these generalized forms and the advanced species discussed below. *Iphicrates papuensis* is a remarkable insect because of the highly modified abdominal segments (see Slater, 1968) but retains some of the generalized features of *japonicus* and its allies, particularly the elongate non-spinose hind tibia. The antennae, however, are shortened and clavate and thus more similar to the advanced forms of *Pirkimerus*. Unfortunately, the male is not known so one cannot tell whether or not *papuensis* has dimorphic eyes. The more apomorphic species of *Pirkimerus* are quite unusual in the strongly flattened eyes of the males in contrast to the large globose eyes of the females and particularly in having the hind tibia very much shortened, thickened, usually covered with numerous short spines. Within this complex, as the cladogram (fig. 66) indicates, there is a progressive reduction in size and an increase in the narrowness and the cylindrical shape of the body until one reaches such minute species as *nicobarensis, parviceps* and *philippinensis*. Within the genus *Pirkimerus*, as within many other lineages in the Blissinae, there is a loss of pruinosity which is evident in this advanced group. A reduction sequence is apparent, from *P. bellus*, which has well-developed pruinosity on the propleuron almost up to the dorsal surface, through *P. chinai*, which has propleural pruinosity reduced but still evident dorsal to and posterior to the acetabula, to the small advanced forms, where if prothoracic pruinosity is present at all it is confined to the extreme anterior collar area and to the center anterior to the fore coxae. The accompanying cladogram (fig. 66) is a hypothesis of the probable cladistic relationships of the known species. *Pirkimerus esakii* is not included as I have not been able to reexamine specimens.

KEY TO SPECIES OF *PIRKIMERUS*

1. Posterior margin of sixth abdominal tergum uniquely modified, projecting over seventh tergum and ending posteriorly in a series of teeth and crenulations (fig. 65) (New Guinea) ..... *papuensis* Slater

1a. Abdominal tergum 6 conventional, not modified as above 2

2. Corium pruinose over entire surface, lacking a polished longitudinal stripe on at least basal half in area of radial vein; hind tibiae elongate and slender, at most armed with a few tiny inconspicuous tubercles; eyes not sexually dimorphic, relatively small, protruding beyond lateral curvature of head in both sexes 3

2a. Corium with a narrow shining glabrous longitudinal stripe at least on basal half in area

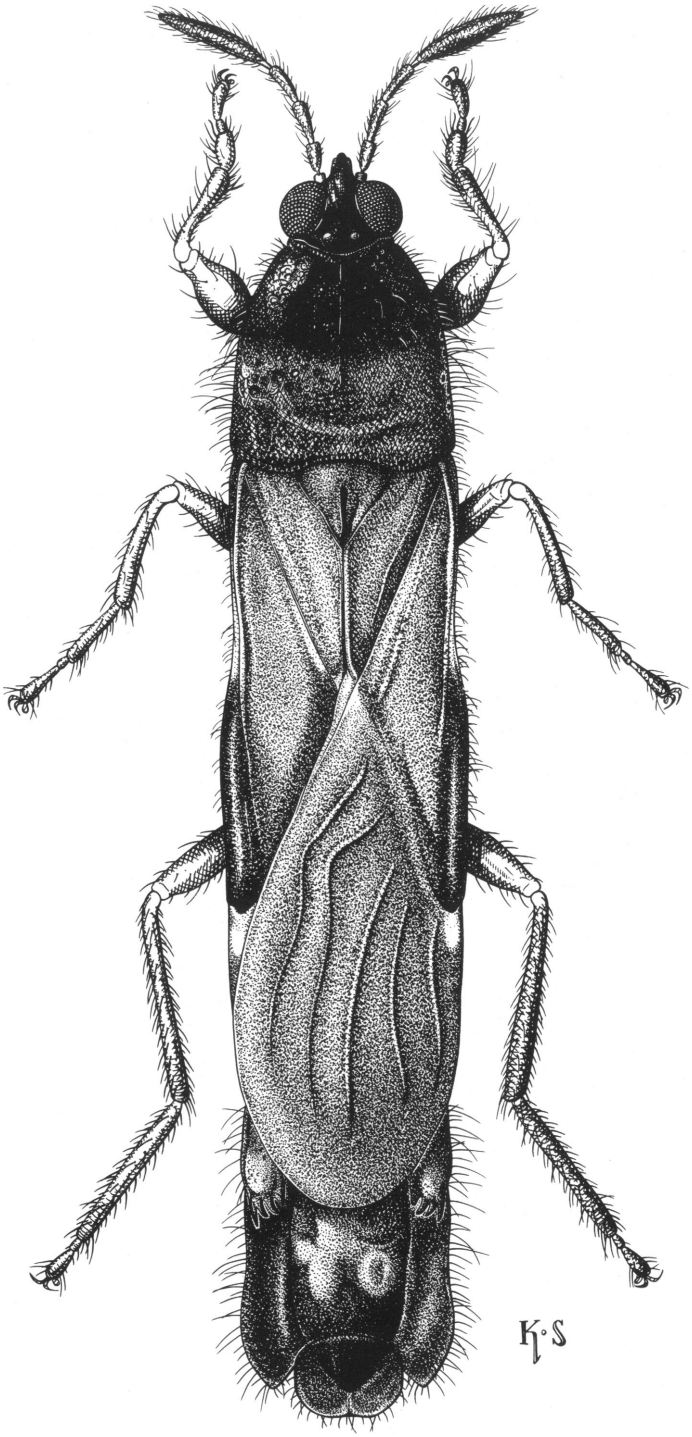


FIG. 65. *Pirkimerus papuensis*, dorsal view.

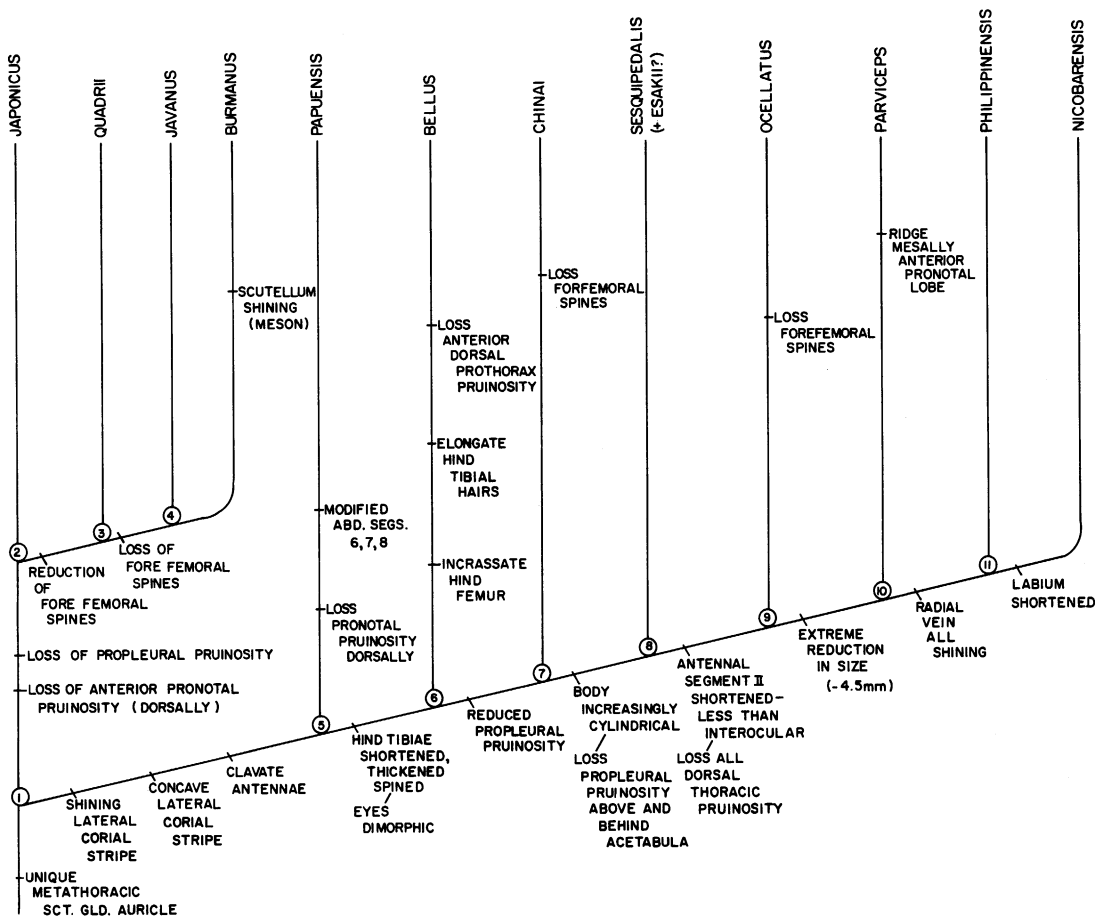


FIG. 66. Cladogram of *Pirkimerus* species.

of radius; hind tibiae short and thickened, bearing a series of prominent spines and tubercles; eyes strongly sexually dimorphic, in ♂ forming a nearly even curvature with lateral head margins 6

3. Fore femora mutic 4

3a. Fore femora with one to three small spines on ventral surface 5

4. Scutellum completely pruinose, lacking a shining glabrous median carina on distal half (fig. 5L); basal half of corium and all of clavus uniformly bright yellow; femora light yellow; posterior margin of pronotum very shallowly concave .... *javanus* Slater and Ashlock

4a. Scutellum possessing a glabrous, shining median carina distally (fig. 5K); corium and clavus chiefly dark red-brown to blackish, at most with small testaceous patches on corium; legs frequently entirely blackish brown; posterior margin of pronotum deeply concave .... *burmanus* Slater and Ashlock

5. Fore femora with ventral spines confined to distal third; hind tibiae of ♀ less than six times as long as first antennal segment (♂ unknown) ..... *qadrii* Slater and Ashlock

5a. Fore femora with ventral spines located centrally, one on inner face and one opposite on outer face; hind tibiae of females more than seven times as long as first antennal segment ..... *japonicus* Hidaka

6. Membrane of fore wing with a discrete brown central macula separated from lateral and

apical margins by distinct white areas.... .....*esakii* Miyamoto and Hidaka

6a. Membrane with brown area extending broadly to lateral and apical margins at least on distal third 7

7. Prothorax completely pruinose below, lacking shining areas except on acetabulae..... .....*bellus* Slater and Ashlock

7a. Prothorax shining or subshining below, lacking pruinose areas 8

8. Corium with narrow area laterad of shining radial vein contrastingly pruinose brown .....*parviceps* Bergroth

8a. Corium with area laterad of radial vein shining 9

9. Pronotum with a narrow pruinose band present adjacent to anterior margin (fig. 64)..... .....*sesquipedalis* Distant

9a. Pronotum completely shining, lacking anterior pruinose band 10

10. Fore femora armed below on distal third with a single sharp spine (very short and inconspicuous in *ocellatus*) 11

10a. Fore femora mutic 12

11. Large species, over 8.0 mm. long; fore femora with a long sharp curving spine below on distal third..... .....*chinai* Slater and Ashlock

11a. Smaller species, under 6.0 mm.; fore femora with a short, inconspicuous spine below .....*ocellatus* Slater and Ashlock

12. Labium relatively short, not or barely attaining anterior margin of fore coxae, second segment scarcely reaching base of head; pronotal length and width subequal..... .....*nicobarensis* Distant

12a. Labium longer, nearly reaching posterior margin of prosternum, second segment exceeding base of head by more than half its length; pronotum much longer than wide .....*philippinensis* Slater

PRAEBLISSUS BARBER
Figure 67

Praeblissus Barber, 1949, p. 141.

TYPE SPECIES: *Praeblissus albopictus* Barber. Monobasic.

DISTRIBUTION: Mexico.

BIOLOGY: Intercepted at quarantine stations on orchids.

DIAGNOSIS: Body short, stubby, thick; metathoracic scent gland auricle small, short, rounded and earlike; all femora mutic; anterior half of pronotum above and head above and below strongly shining; posterior half of pronotum above and all of thorax below completely pruinose; wing polymorphism present, brachypters and micropters known; macropters with only moderately concave apical corial margin; fore coxal cavities open; no marked sexual dimorphism; antennae terete or moderately clavate; ocelli small; sperm reservoir with large cup and elongate, slender straplike wings; ovipositor elongate.

PRAETORBLISSUS SLATER
Figure 68

Praetorblissus Slater, 1966, pp. 3-11.

TYPE SPECIES: *Praetorblissus gigas* Slater. Monobasic.

DISTRIBUTION: South and Central America.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, robust, linear or sometimes slightly sub-elliptical often broadened. Metathoracic scent gland auricle large, almost spatulate, distally often curving anteriorly. All femora usually multispinose. Dorsal pruinosity absent, sometimes with pruinose areas present on ventral surface of head, mesally between and before coxae on prosternum and as a narrow strip across anterior margin of mesosternum and mesopleuron. Apical corial margin straight or slightly concave on inner third. Membrane thick, opaque, not strongly differentiated from adjacent corial surface. Eyes sessile. Ocelli small. Extreme microptery common with wing pads reduced to minute scalelike pads that do not reach abdomen. Antennae terete. Fore coxal cavities open. Claspers slender, lacking a conspicuous inner projection. Sperm reservoir small with a nearly membranous bulb and slender wings.

KEY TO SPECIES OF *PRAETORBLISSUS*

1. Fore femora with a posterior as well as an anterior series of ventral spines 2

1a. Fore femora with only an anterior row of ventral spines 3

2. Length of second antennal segment subequal to interocular width; body color black; relatively small, less than 8.0 mm. long..... .....*obrieni* Slater and Ashlock

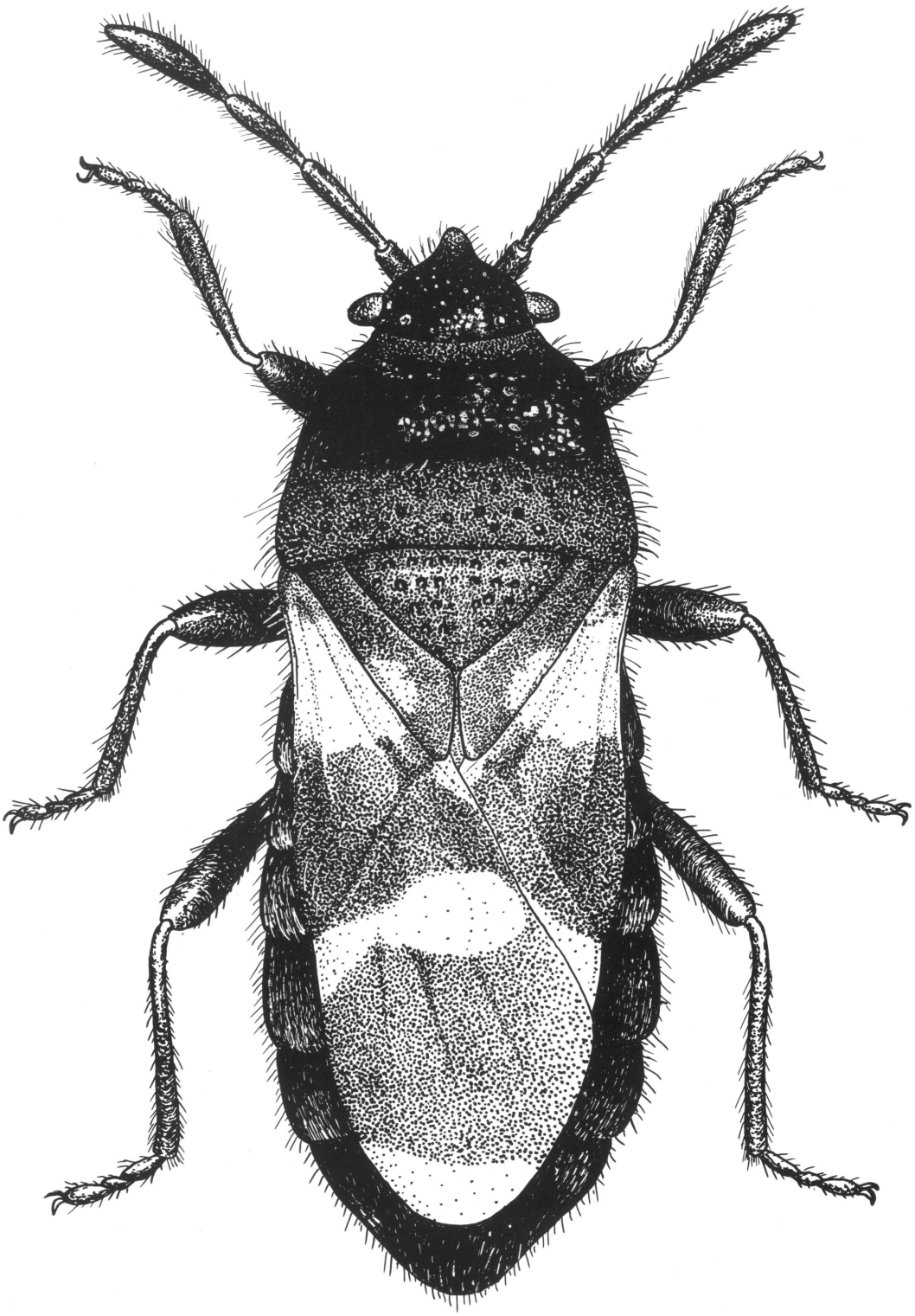


FIG. 67. *Praeblissus albopictus*, dorsal view.

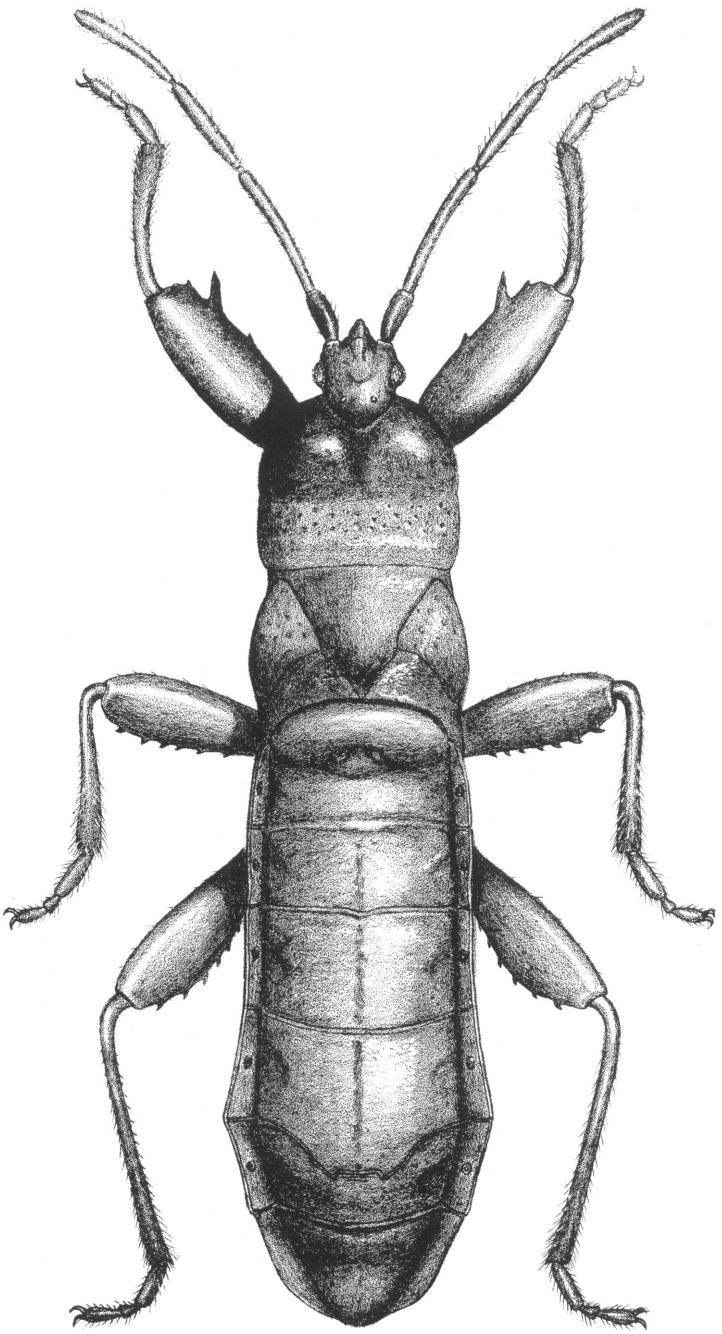


FIG. 68. *Praetorblissus gigas*, dorsal view.

2a. Length of second antennal segment 1-1/2 times as great as interocular width; body color reddish brown; relatively large, more than 12.0 mm. long (fig. 68) ..... *.gigas* Slater

3. Second and third antennal segments subequal in length; middle and hind femora mutic (only micropters known) ..... *.gradus* Slater and Wilcox

3a. Second antennal segment at least 1-1/3 times as long as segment 3; middle and hind femora armed with a series of short but distinct spines (only macropters known) ..... *.wilcoxae* Slater and Ashlock

PROCELLADEMUS SLATER AND WILCOX
Figure 69

Procellademus Slater and Wilcox, 1966, p. 69.

TYPE SPECIES: *Procellademus venenatus* Slater and Wilcox. By original designation.

DISTRIBUTION: South America.

BIOLOGY: Unknown.

DIAGNOSIS: Body elongate, robust. Metathoracic scent gland auricle very large, lobate (fig. 12A). Fore femora strongly incrassate, multispinose; middle and hind femora mutic. Head and pronotum shining above, the latter pruinose below on sternal and pleural surfaces. Scutellum completely pruinose. Apical corial margin straight. Membrane thin, well differentiated from much thicker corium. Fore coxal cavities closed. Ocelli small. No wing reduction or sexual dimorphism known. Antennae terete. Ovipositor elongate. Sperm reservoir with relatively small bulb but large platelike wings. Spermathecal bulb small and elliptical, pump slender, moderately elongate.

KEY TO SPECIES OF *PROCELLADEMUS*

1. Second antennal segment subequal to or slightly longer than interocular space (ratio 1.02-1.11); labial segment one as long as, or slightly longer than segment two; larger, more elongate species (7.0-8.0 mm.) (fig. 69) ..... *.venenatus* Slater and Wilcox

1a. Length of second antennal segment less than interocular space (ratio 0.80-0.88); labial segment one slightly shorter than segment two; shorter, relatively more robust species, little more than 6.0 mm. long (6.08-6.12) ..... *.consobrinus* Slater and Wilcox

PSEUDOBLISSUS, NEW GENUS
Figure 70

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Head, thorax, and scutellum shining, completely lacking pruinosity ventrally or laterally; antennal segments 2 and 3 clavate, fourth segment fusiform, strongly and abruptly narrowed on proximal one-fifth; prosternum compressed anterior to coxae, prominently produced mesally; fore coxal cavities closed; scutellum lacking a median elevation; fore femora strongly incrassate, armed below with three or four stout spines, distal spines broad, usually bifid, angled toward bases of tibiae, latter somewhat swollen at distal ends with series of short spines present, but not flattened; metathoracic scent gland auricle short, broadly ovoid, earlike; eyes small, set well away from anterior margin of pronotum; antenniferous tubercles simple, truncate, not produced as curved processes; only micropters known, wing pads broad, not meeting at midline; apical corial margins deeply concave. Sperm reservoir reduced to a median plate.

TYPE SPECIES: *Blissus trispinosus* (Slater).

DISCUSSION: Slater (1967) tentatively placed *trispinosus* in the genus *Blissus (sensu lato)* but pointed out the anomalous nature of the species and its questionable relationship to *Blissus* and its relatives. The closed fore coxal cavities and lack of prothoractic and scutellar pruinosity indicate that *trispinosus* is not at all closely related to either *Blissus* or *Dimorphopterus*, and that it must be considered to represent a distinct genus. Despite striking differences in habitus, *Pseudoblissus* appears to be most closely related to *Aradademus* which is also endemic to Madagascar. The heavy bifid angulated fore femoral spine arrangement, strongly tapered, nearly petiolate proximal fourth antennal segment and the completely non-pruinose bodies are all common to the two genera. *Aradademus*, with its produced antenniferous tubercles, greatly flattened body, highly specialized eyes and unique metathoracic scent gland auricle is readily recognizable. Actually *Pseudoblissus* probably represents a more generalized taxon similar to the common ancestor

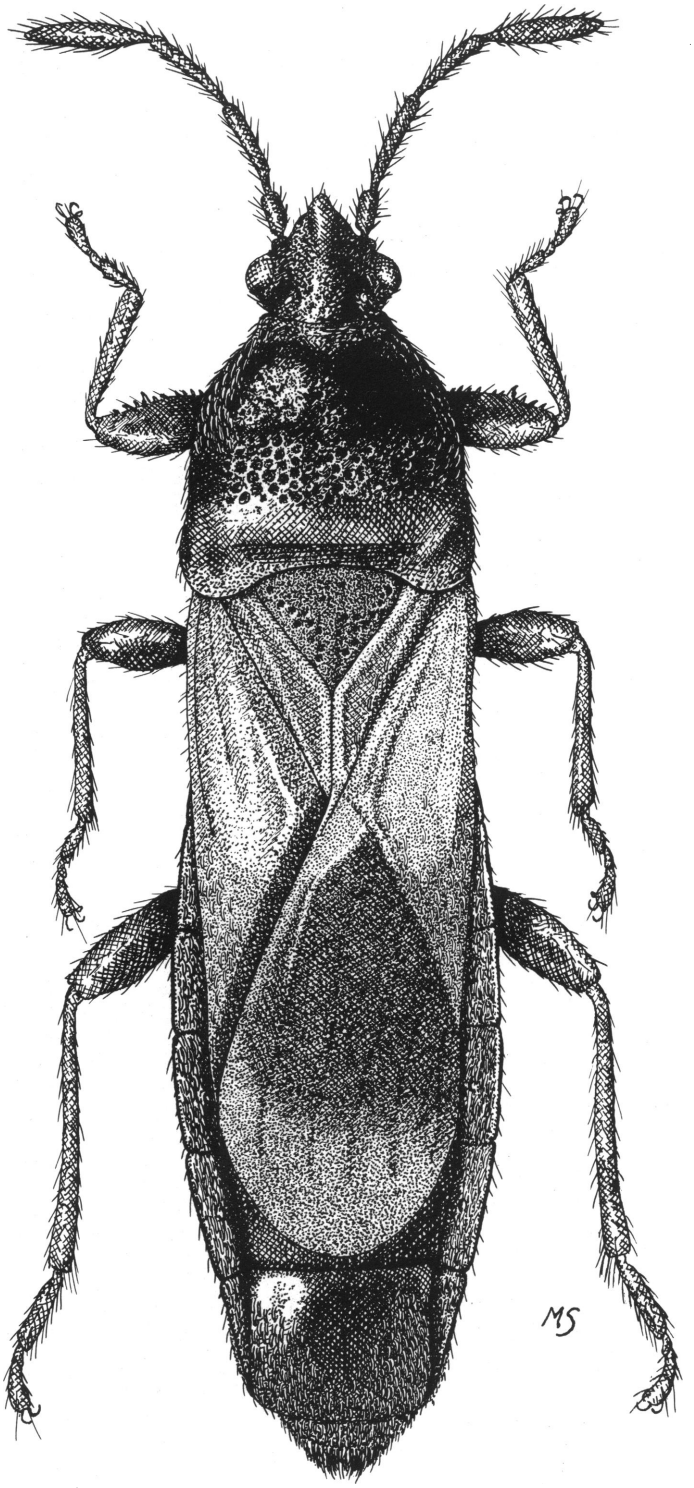


FIG. 69. *Procellademus venenatus*, dorsal view.

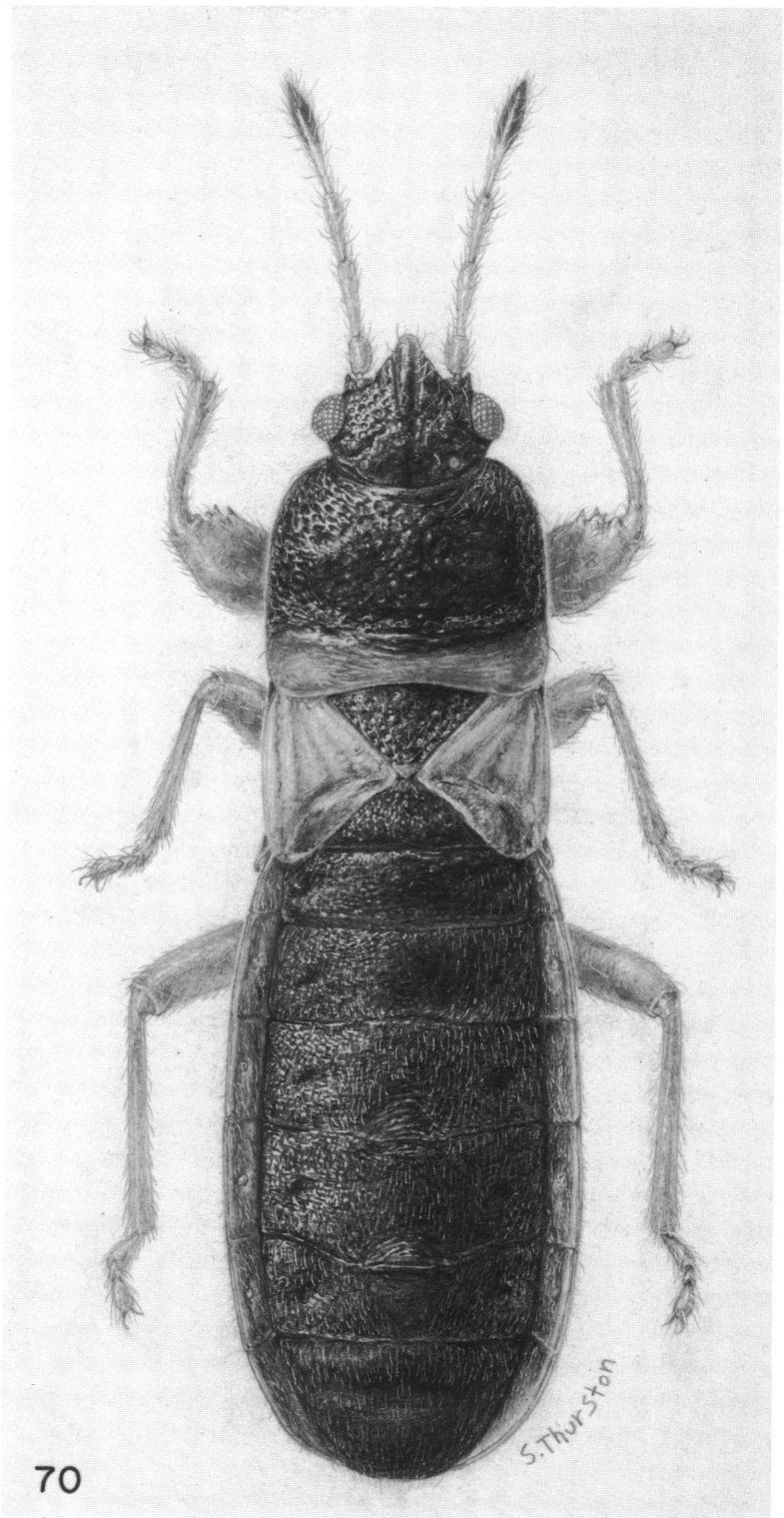


FIG. 70. *Pseudoblissus trispinosus*, dorsal view.

from which the more specialized *Aradademus* stocks have evolved. The compressed and produced prosternum anterior to the coxae is a unique condition in the Blissinae so far as I am aware.

RAMADADEMUS SLATER
Figure 71

Ramadademus Slater, 1967, pp. 23-24.

TYPE SPECIES: *Ramadademus multispinosus* Slater. By original designation.

DISTRIBUTION: Madagascar.

BIOLOGY: Unknown.

DIAGNOSIS: Large, very broad, strongly flattened. Metathoracic scent gland auricle elongate, strongly curving anteriorly, its margins rugulose (fig. 12C). All femora multispinose, or fore femora sometimes with a pair of large protruding spines that form a median groove for reception of tibiae. Fore tibiae curved, somewhat flattened; first tarsal segment very elongate, usually longer than segments two and three combined, second segment minute. Body completely shining above and below including corium and clavus, no pruinosity present. Apical corial margins straight. Membrane semitransparent, much thinner and obviously of different texture than corium. Fore coxal cavities closed. Ocelli small. Antennae slender and terete or nearly so. Clasper elongate with a narrow blade strongly curving toward apex, outer lobe short and thick, but tapering, inner lobe not strongly developed. Sperm reservoir broadly elliptical, basally stalked with thin nearly membranous distally broadened, somewhat tear-drop shaped lobes arising from distal end of bulb (may not be homologous with wings) (fig. 1HH).

KEY TO SPECIES OF *RAMADADEMUS*

1. Fore femora bearing a series of large prominent ventral spines (fig. 71) ..... *multispinosus* Slater
1a. Fore femora on anterior face bearing only a single large protrusion or spur with at most a few additional scattered setiferous spinules. 2
2. Anterior lobe of pronotum with a deep median longitudinal groove; fore femora lacking a close set series of setiferous spinules ventrally on posterior margin .. *sakalava* Slater
2a. Anterior lobe of pronotum lacking a median longitudinal groove; fore femora ventrally possessing a closely set series of short acute setiferous spinules ..... *anomalous* Slater

RETICULATODEMUS SLATER AND WILCOX
Figure 72

Reticulatodemus Slater and Wilcox, 1966, pp. 70-71.

TYPE SPECIES: *Reticulatodemus calcar* Slater and Wilcox. By original designation.

DISTRIBUTION: South America, Mexico.

BIOLOGY: Unknown.

DIAGNOSIS: Body moderately elongate, linear, non-flattened; metathoracic scent gland auricle sub-rectangular, little elevated above body surface (fig. 11A); fore femora armed below with one large spine; head and thoracic pruinosity variable: often with head pruinose laterally, broadly shining in central area; pronotum with a very broad posterior shining stripe and broadly shining in area of calli even across midline; males completely pruinose below, sometimes head and pronotum completely shining above and shining below on prothorax except mesally between fore coxae; scutellum pruinose laterally; apical corial margin straight; corium and membrane of different texture, latter thin, composed of minute hexagonal and quadrate cells. Fore coxal cavities closed; ocelli small; antennae terete. Antenniferous tubercles "hooked." Sperm reservoir with small bulb and strongly ventrally curved sublinear wings; claspers generalized. Spermatheca variable, usually with short pump.

KEY TO SPECIES OF *RETICULATODEMUS*

1. Pronotum with dorsal surface completely shining (sometimes an extremely narrow pruinose transverse band along posterior margin) 2
1a. Pronotum pruinose at least on anterior lobe (except broadly in area of calli) 3
2. Second antennal segment considerably more than twice length of segment 1 (56:21), as long as or longer than interocular distance; pronotal calli coarsely punctate over entire surface; membrane with a large brown discal area leaving only apex and area adjacent to apical corial margin pale ..... *umbrosus* Slater and Wilcox
2a. Second antennal segment only twice length of segment 1 (31:15), considerably shorter than interocular space (30:38); pronotal calli

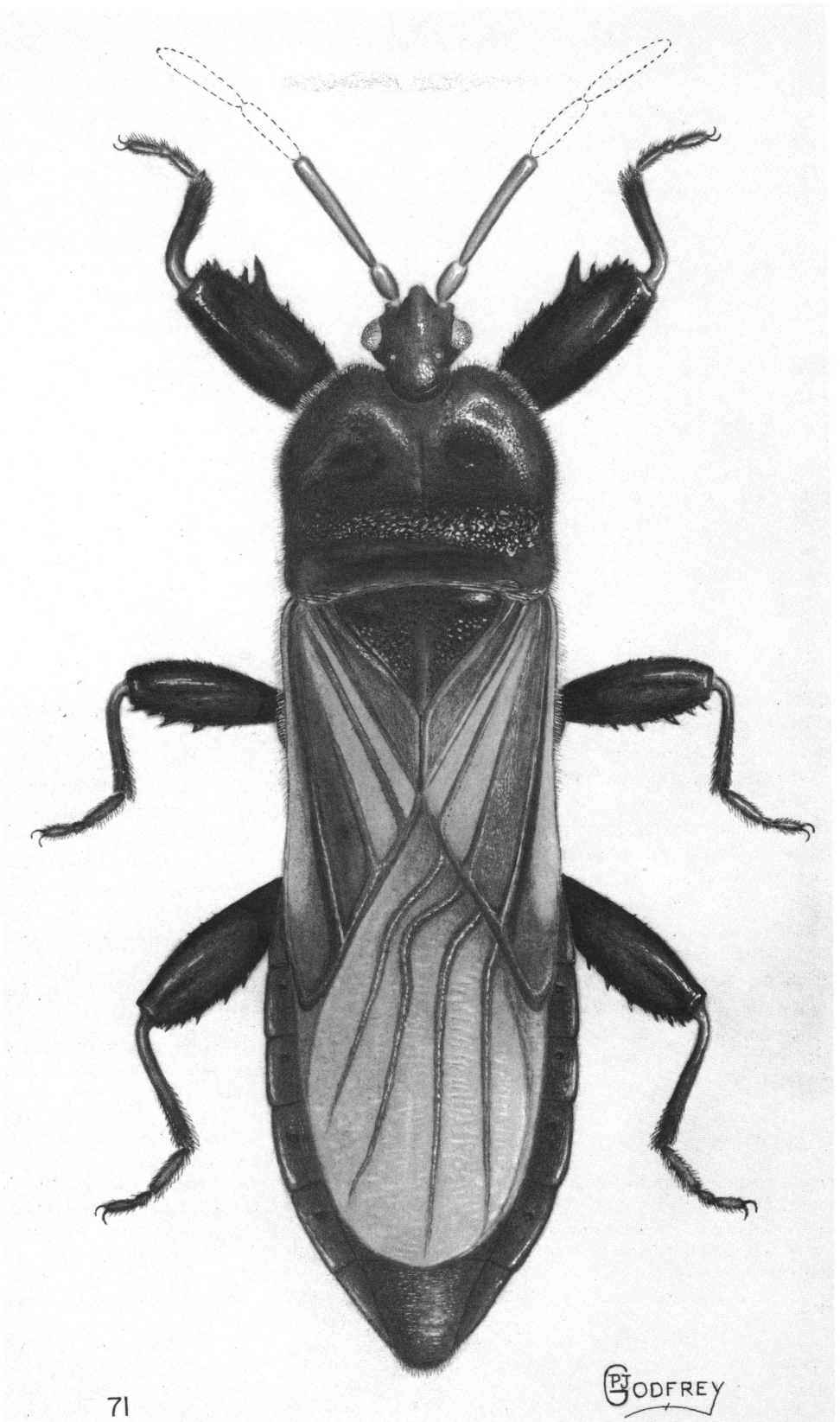


FIG. 71. *Ramadademus multispinosus*, dorsal view.

smooth, shining; membrane in large part testaceous, infuscated along veins but never with a large complete discal spot (fig. 72) ..... *nitidus* Slater and Wilcox

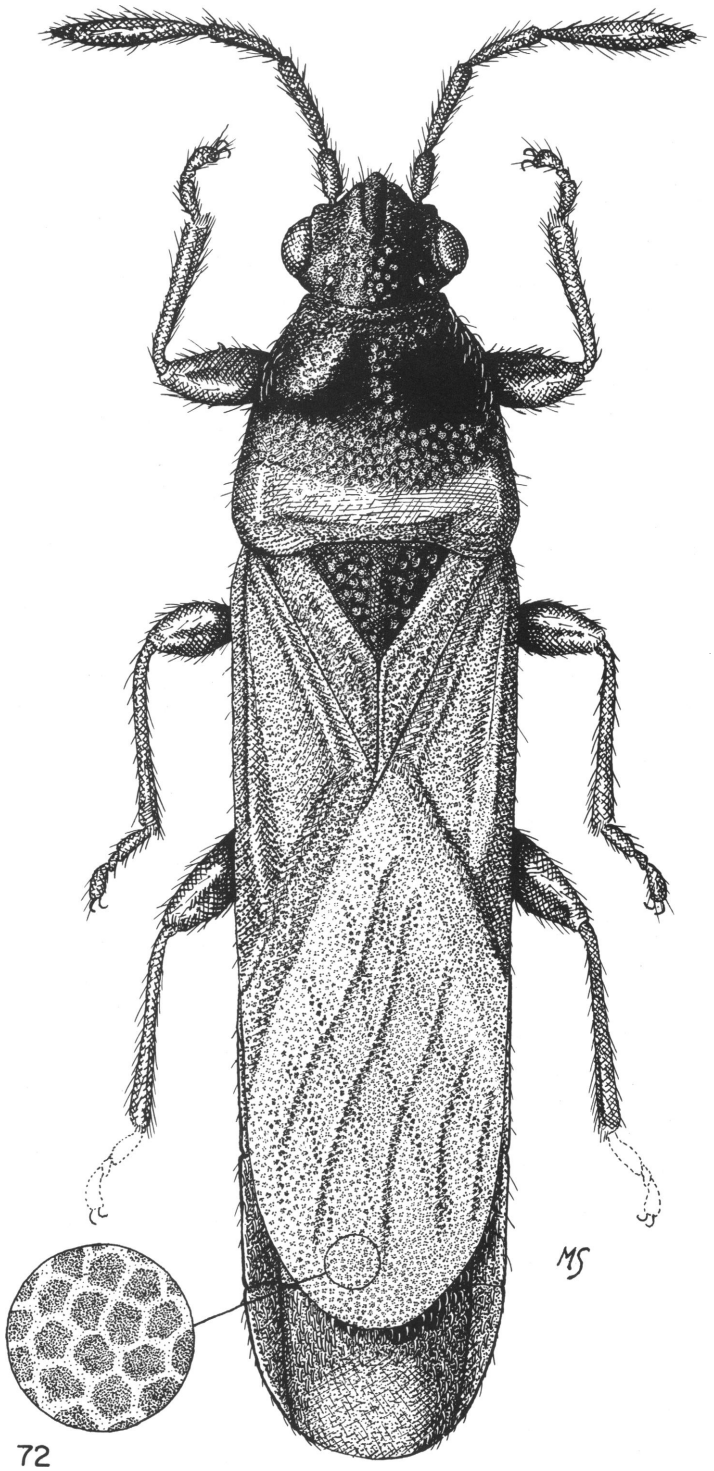


FIG. 72. *Reticulatodemus nitidus*, dorsal view.

3. Eyes strongly protrudent, set well away from head curvature; second antennal segment shorter, less than half as long as width of head across eyes ..... *calcar* Slater and Wilcox

3a. Eyes very narrow transversely, only very slightly extended beyond head curvature; length of second antennal segment greater than one-half width of head across eyes . .4

4. Width of head across eyes 1½ times as great as interocular width; with black "points" at caudolateral angles of abdominal connexiva 4-7 ..... *orbiculoides* Slater and Wilcox

4a. Width of head across eyes appreciably less than 1 1/2 times as great as interocular width (1.44); a small but distinct black "point" present at each caudolateral angle of abdominal connexiva 4-7 ..... *orbiculatus* Slater and Wilcox

RIGGIELLA KORMILEV
Figure 73

Riggiella Kormilev, 1949, pp. 4, 6.

TYPE SPECIES: *Riggiella vianai* Kormilev. Monobasic.

DISTRIBUTION: South America.

BIOLOGY: Collecting records from bamboo.

DIAGNOSIS: Body very broad, flattened. Metathoracic scent gland auricle elongate, not curving forward but enlarged at distal end (fig. 12B). All legs multispinose; no sexual dimorphism. Fore tibiae distally with hooked spines; first tarsal segment large, inflated, with a pad of hair below. Head and pronotum either almost completely shining with only anterior pronotal collar pruinose or with a narrow pruinose strip complete across transverse impression; pruinose below on prothorax except posteriorly and around fore coxae, head pruinose below; scutellum pruinose laterally with a broad shining central area; corium inconspicuously shining from just mesad of raised radial vein to lateral margin. Corium and membrane unitextured, latter thick and opaque. Apical corial margins straight. Fore coxal cavities closed. Ocelli small. Antennae terete. Short stubby genal "tusks" present. Ovipositor elongate. Clasper with elongate shaft and short blade. Sperm reservoir unique, apparently composed of a small distally "opened" bulb and two minute comma-shaped wings (fig. 1V).

KEY TO SPECIES OF *RIGGIELLA*

1. Pronotum with a transverse groove complete across center of disc, the groove pruinose in contrast to shining glabrous surface of remainder of pronotum; corium with two longitudinal stripes, inner not touching claval suture; groove of scent gland auricle curving caudad; legs dark brown to black; males with a heavy spur present on fore tibiae ..... *distinctus* Slater and Ahmad

1a. Pronotum lacking a complete pruinose transverse furrow, this represented only by a deep irregular, sometimes foveate, groove at lateral margins (fig. 73); corium with a single longitudinal stripe, this adjoining the claval suture; legs usually bright yellow; both sexes lacking a tibial spur; groove of scent gland auricle curving anteriorly or almost straight (fig. 12B) 2

2. Second antennal segment considerably longer than interocular space; hind tibiae and fore femora nearly subequal in length; first valvifer with posterior margin curved and rounded anteriorly (fig. 73) ..... *vianai* Kormilev

2a. Length of second antennal segment subequal to interocular space; length of hind tibiae considerably greater than that of fore femora; posterior margin of first valvifer nearly flat ..... *planus* Slater and Ahmad

SCANSIDEMUS SLATER AND WILCOX
Figure 74

Scansidemus Slater and Wilcox, 1969, pp. 2-3.

TYPE SPECIES: *Scansidemus taprobanes* Slater and Wilcox. Original designation.

DISTRIBUTION: Burma, Ceylon.

BIOLOGY: Unknown.

DIAGNOSIS: Body very broad, flattened. Metathoracic scent gland auricle elongate and strongly angled anteriorly near distal end. All femora multispinose. Head, pronotum both above and below and scutellum completely shining. Corium pruinose but with radial vein shining narrowly on basal three-fourths, costal margin also narrowly shining, membrane opaque, thickened. Fore coxal cavities closed. No sexual dimorphism. Almost straight apical corial margin. Terete antennae. Elongate ovipositor. Sperm reservoir with bulb reduced to a narrow median projection but with small straplike wings present.

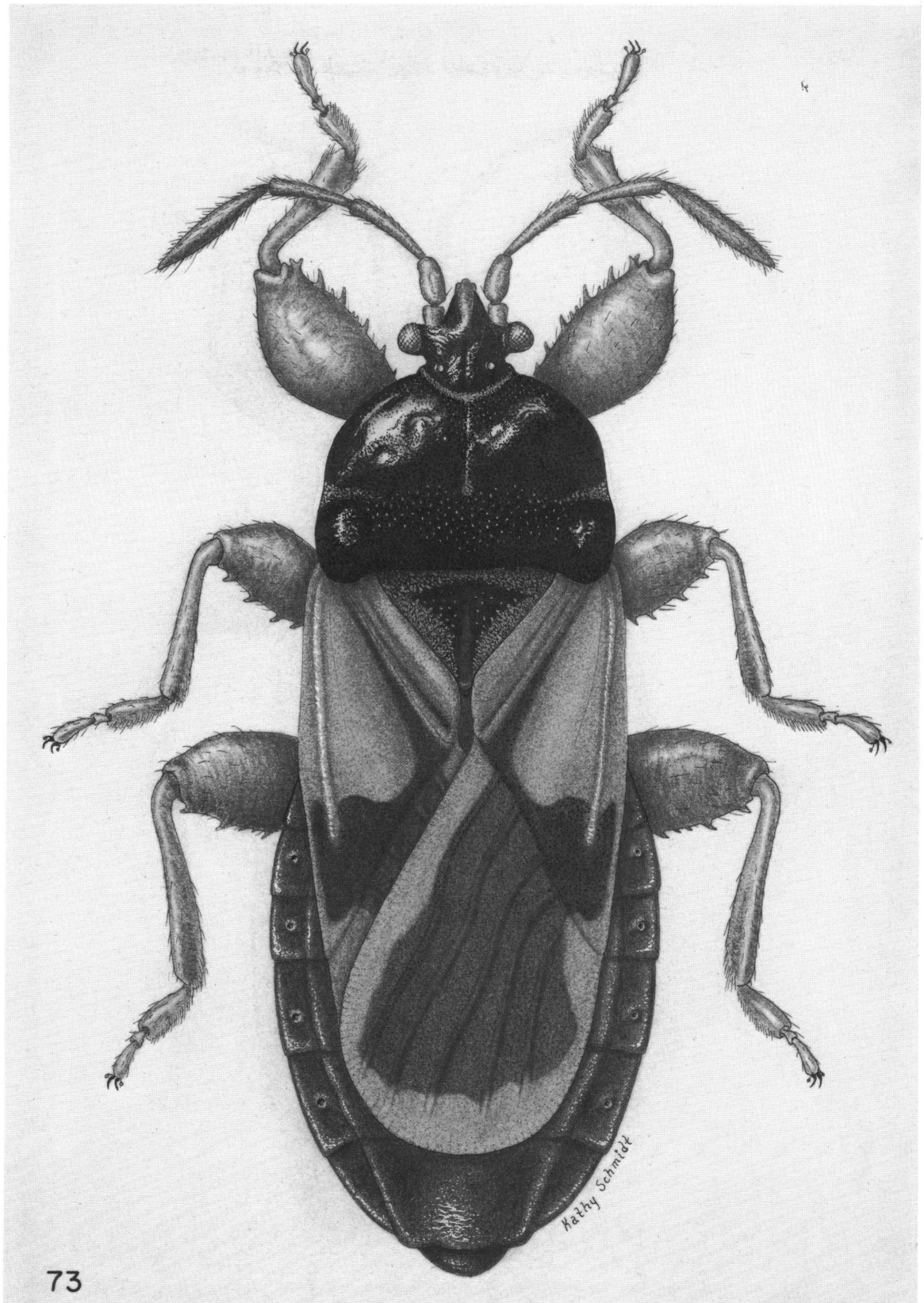


FIG. 73. *Riggiella vianai*, dorsal view.

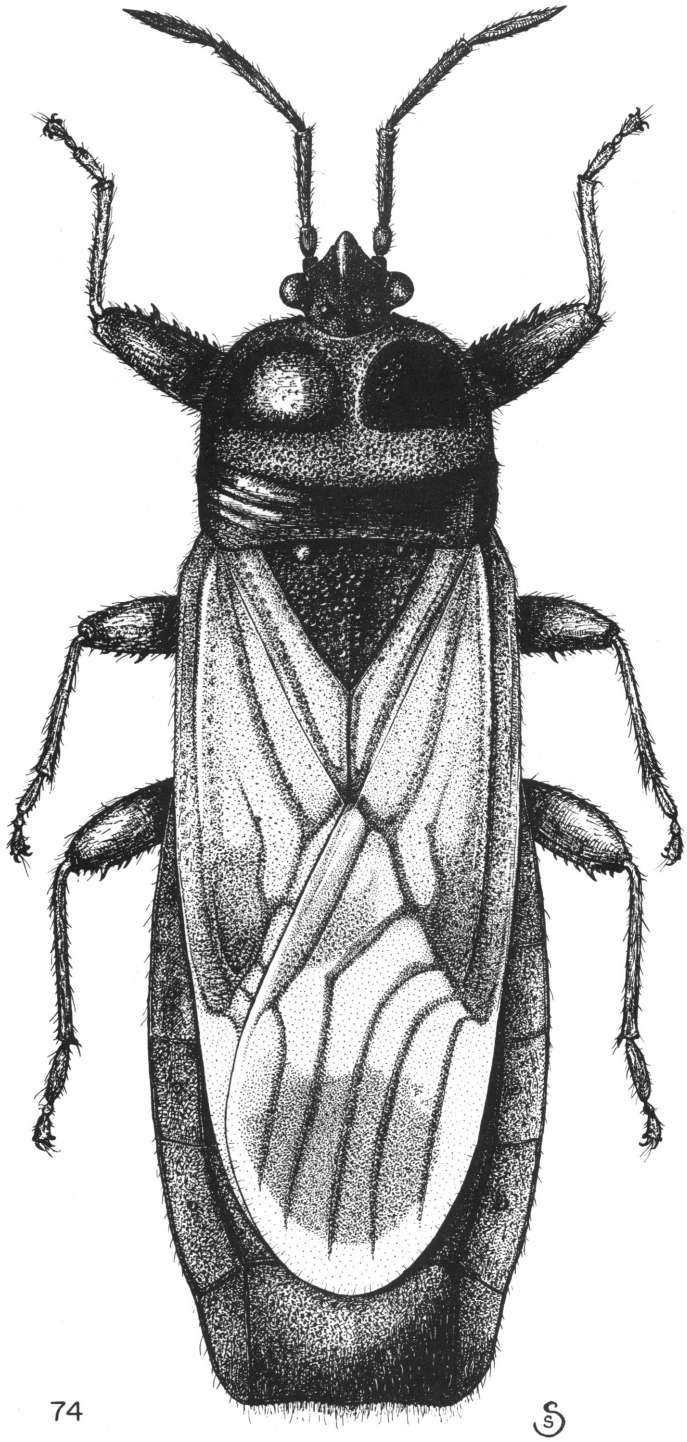


FIG. 74. *Scansidemus taprobanes*, dorsal view.

KEY TO SPECIES OF *SCANSIDEMUS*

1. Labium elongate, extending to or nearly to mesocoxae; prothorax completely shining below; lateral pronotal margins evenly and arcuately rounded (fig. 74) ..... *taprobanes* Slater and Wilcox

1a. Labium relatively short, not attaining posterior margin of prosternum but exceeding fore coxae; prothorax below pruinose mesad of coxae; lateral pronotal margins with a distinct "notch" in area of transverse impression, margin narrowing mesad obliquely anterior to transverse impression, not arcuately rounded ..... *peregrinus* Slater and Wilcox

SCINTILLADEMUS SLATER
Figure 75

Scintillademus Slater, 1968, p. 284.

TYPE SPECIES: *Scintillademus gemmatus* Slater. Monobasic.

DISTRIBUTION: New Guinea, New Britain.

BIOLOGY: Unknown.

DIAGNOSIS: Body moderately broadened, somewhat flattened; metathoracic scent gland auricle elongate with a broad irregularly rounded distal end (fig. 11H). Fore femora with a large bifid ventral spine present and a deep subdistal excavation immediately beyond bifid spine, middle and hind femora mutic. Head and pronotum completely shining above, pruinose below and narrowly above acetabula, but pruinosity not attaining dorsal margin; scutellum pruinose laterally with a broad shining central area; corium largely shining until almost distal end of cubital vein and with an elongate shining stripe on clavus. Corium and membrane nearly unitextured, latter thick and opaque. Apical corial margin very strongly concave. Fore coxal cavities closed. Ocelli small. No marked sexual dimorphism. Antennae terete or moderatly clavate. Sperm reservoir with a small elliptical cup and large thumblike strongly divergent wings (fig. 1X). Ovipositor elongate.

SLATERELLUS DRAKE AND DAVIS
Figure 76

Slaterellus Drake and Davis, 1959, pp. 24-25.

TYPE SPECIES: *Slaterellus hackeri* Drake and Davis. Monobasic.

DISTRIBUTION: Australia.

BIOLOGY: Reported under bark of wilga and other trees.

DIAGNOSIS: Body short, stout, robust. Metathoracic scent gland auricle rounded, lobate. All femora mutic. Pruinosity absent both above and below, sub-shining, clothed with numerous flattened decumbent scalelike hairs. Apical corial margin somewhat concave. Membrane thin, membranous, much differentiated from thickened corium. Corium short and very stout, membrane with numerous anastomosing veins. Antennae short, stout, sublobate or beadlike. Fore coxal cavities closed. Ocelli small. Clasper rather plesiomorphic but with outer lobe located somewhat farther distad along shaft than in general. Sperm reservoir reduced to a small median scalelike flap (fig. 1A, B). Ovipositor not dividing abdominal sternum six.

DISCUSSION: This monotypic genus was originally described as a new sub-family, the Slaterellinae. Several authors have commented on its close affinities to the Blissinae but it appears to not previously have been formally placed in this subfamily. Despite its numerous apomorphic features *Slaterellus* is a true blissine in all essential features and the subfamily Slaterellinae becomes a junior synonym of the Blissinae.

SPALACOCORIS STÅL
Figure 77

Spalacocoris Stål, 1874, pp. 129-130.

TYPE SPECIES: *Spalacocoris sulcifer* Stål, 1874=*Ischnodemus sulcatus* Walker, 1872. Monobasic.

DISTRIBUTION: Southeast Asia, East Indies, Philippines.

BIOLOGY: Record of a specimen sucking the roots of a zingiberaceous plant.

DIAGNOSIS: Robust, elongate, subcylindrical, non-flattened. Metathoracic scent gland auricle elongate, grooved, curved strongly forward (fig. 10D), sometimes angulate. Fore femora enormously incrassate, multispinose; fore tibiae short and thick, enlarged and spined at distal end. Head and pronotum completely shining above and below; scutellum with a median shining elevation and lateral pruinosity. Corium with apical margin shallowly concave; corium

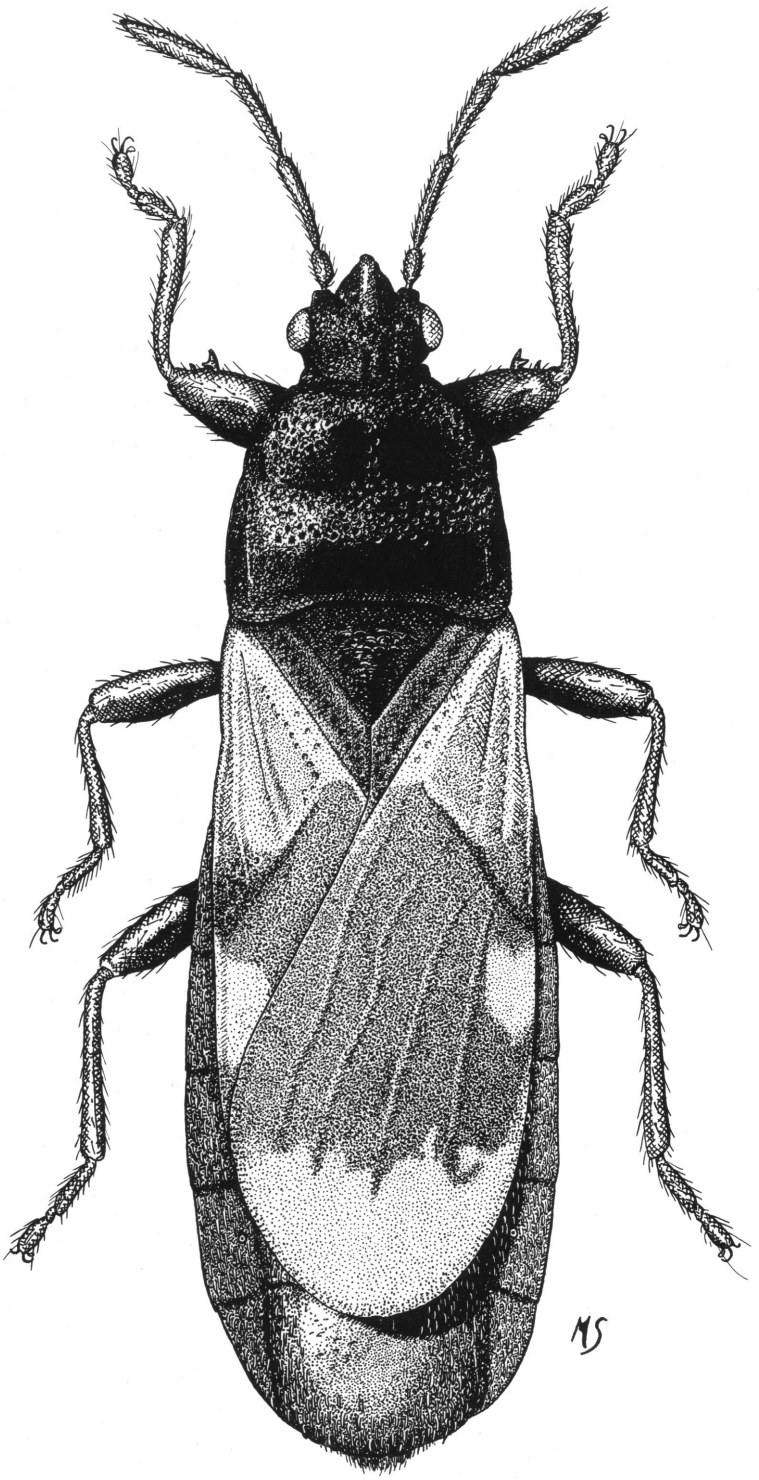


FIG. 75. *Scintillademus gemmatus*, dorsal view.

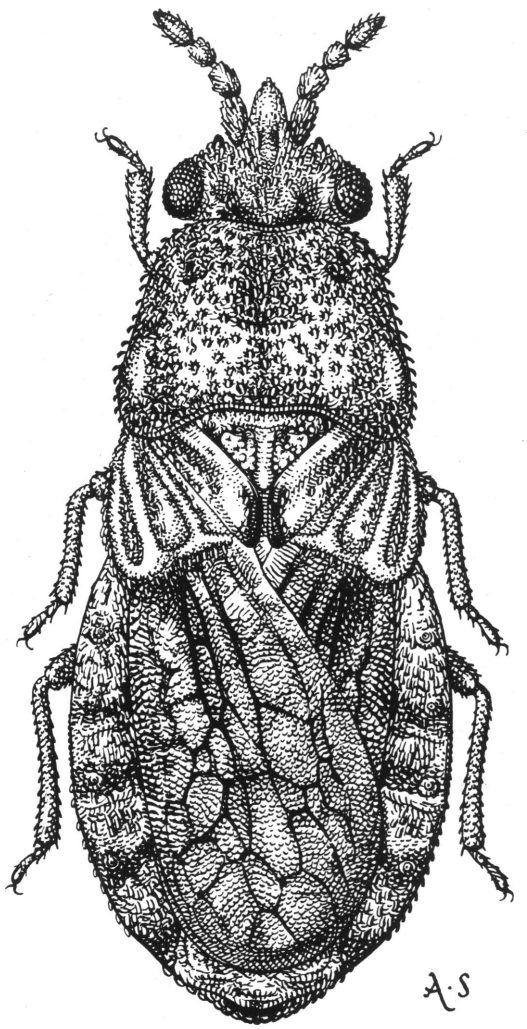


FIG. 76. *Slaterellus hackeri*, dorsal view.

two textured, area laterad of radial vein strongly shining, area mesad of radial vein pruinose, membrane thickened, opaque, similar in texture to corium. Fore coxal cavities closed. Ocelli very large. Genae somewhat swollen and produced. Pronotum with posterior lobe strongly produced caudad. Labium very short, not attaining fore coxae. Antennae clavate. Parameres blocklike without differentiated basal area and shaft. Sperm reservoir reduced to a distally tapering median projection. Ovipositor not laciniate, reduced to broad blocky plates. Spermatheca with bulb large, bearing a conspicuous basal flange; pump short and broad especially at distal end.

KEY TO SPECIES OF *SPALACOCORIS*

1. Legs uniformly yellow 2
1a. Mid and hind legs dark brown to castaneous, fore femora either yellow or dark 4
2. Scent gland auricle sharply angulate; pronotum lacking a median longitudinal trough; basal width of pronotum greater than median length .....*rufusculus* Slater and Ahmad
2a. Scent gland auricle crescentic, never sharply angulate (fig. 10D); anterior lobe of pronotum with a deep median trough; median length of pronotum greater than basal width 3
3. Larger, generally 12-15 mm. long; claspers strongly curved in the middle; apical portion of sperm reservoir broad and arrowhead shaped (fig. 77) ....*philippinensis* Slater and Ahmad
3a. Smaller, generally 8.5-11.0 mm. long; claspers almost flat in middle; apical portion of sperm reservoir narrow, tapering and compressed .....*sulcatus* (Walker)
4. Large species, generally 13.0-16.0 mm. long; all legs uniformly dark reddish brown; claspers pointed at apices; apical portion of sperm reservoir small, knoblike and blunt; anterior inner margin of scent gland auricle truncated .....*nigritus* Slater and Ahmad
4a. Smaller species (10.83 mm.); fore femora dull, yellowish; claspers rounded at apices; apical portion of sperm reservoir large and broadly rounded at apex; anterior inner margin of scent gland auricle rounded . . . .*sulcifer* Stål

TALPOBLISSUS SLATER AND WILCOX
Figure 78

Talpoblissus Slater and Wilcox, 1973, p. 94.

TYPE SPECIES: *Blissus cydnoides* (Slater). By original designation.

DISTRIBUTION: Africa, India.

BIOLOGY: Presumably live on grasses.

DIAGNOSIS: Body short, stout, thick, robust. Metathoracic scent gland auricle elongately rounded, earlike. Fore femora strongly incrassate, armed below on distal third with a single conspicuous sharp spine. Fore tibiae strongly expanded distally, concave and armed marginally with a series of stout spines to form a large fossorial structure (fig. 7G, H). Head and pro-

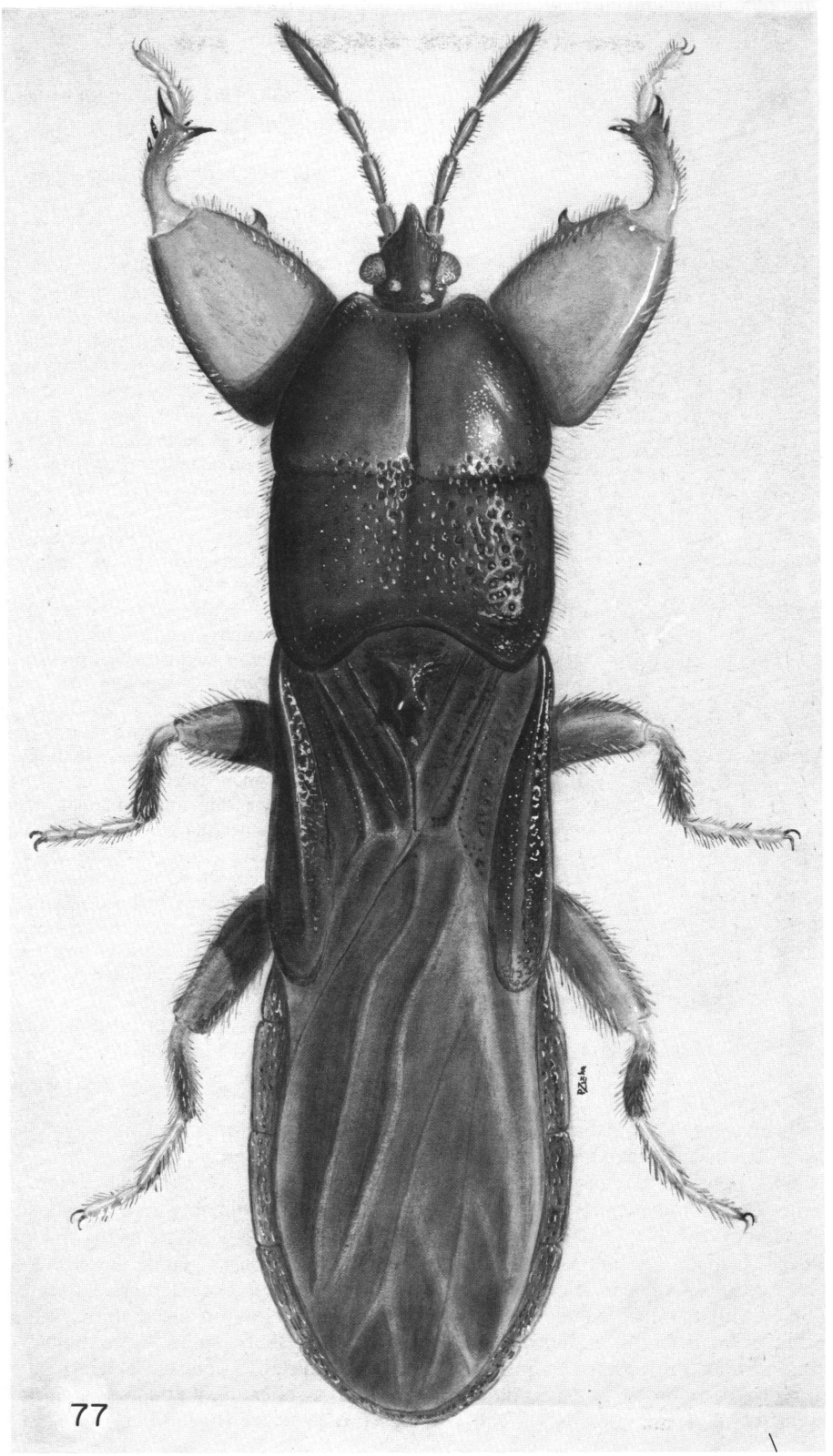


FIG. 77. *Spalacocoris philippinensis*, dorsal view.

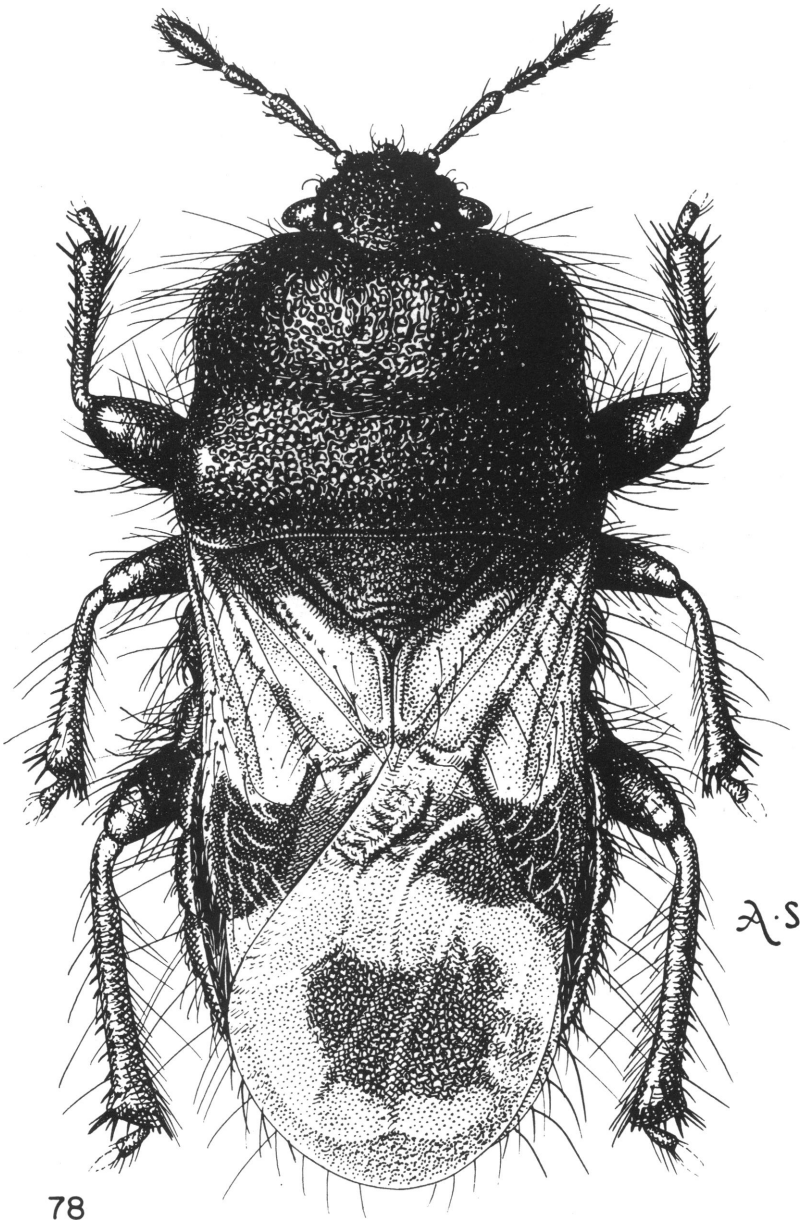


FIG. 78. *Talpoblissus cydnoides*, dorsal view.

notum above shining, non-pruinose; laterally propleuron lacking pruinosity above acetabulae, latter shining; prosternum with a narrow pruinose area anteriorly mesad of acetabula. Scutellum completely pruinose. Apical corial margins strongly concave. Membrane unitextured, opaque but thinner than adjacent corium. Fore coxal cavities open. Ocelli small. Wing microptery and brachyptery occur. Second and third antennal segments strongly clavate. Body and appendages thickly clothed with very elongate upstanding hairs. Pronotum subquadrate in shape, nearly as broad across calli as across humeri. Eyes strongly transverse with

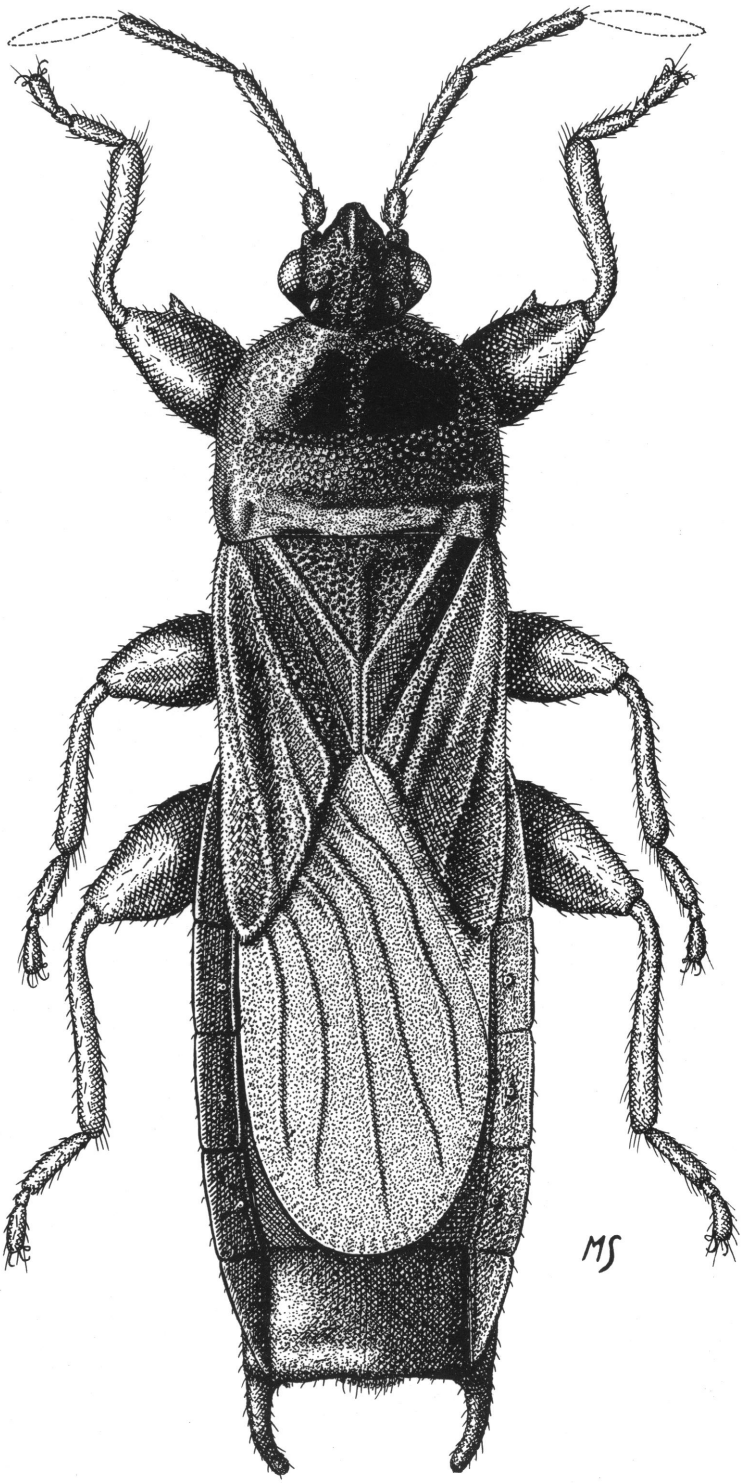


FIG. 79. *Toonglasa forficuloides*, dorsal view.

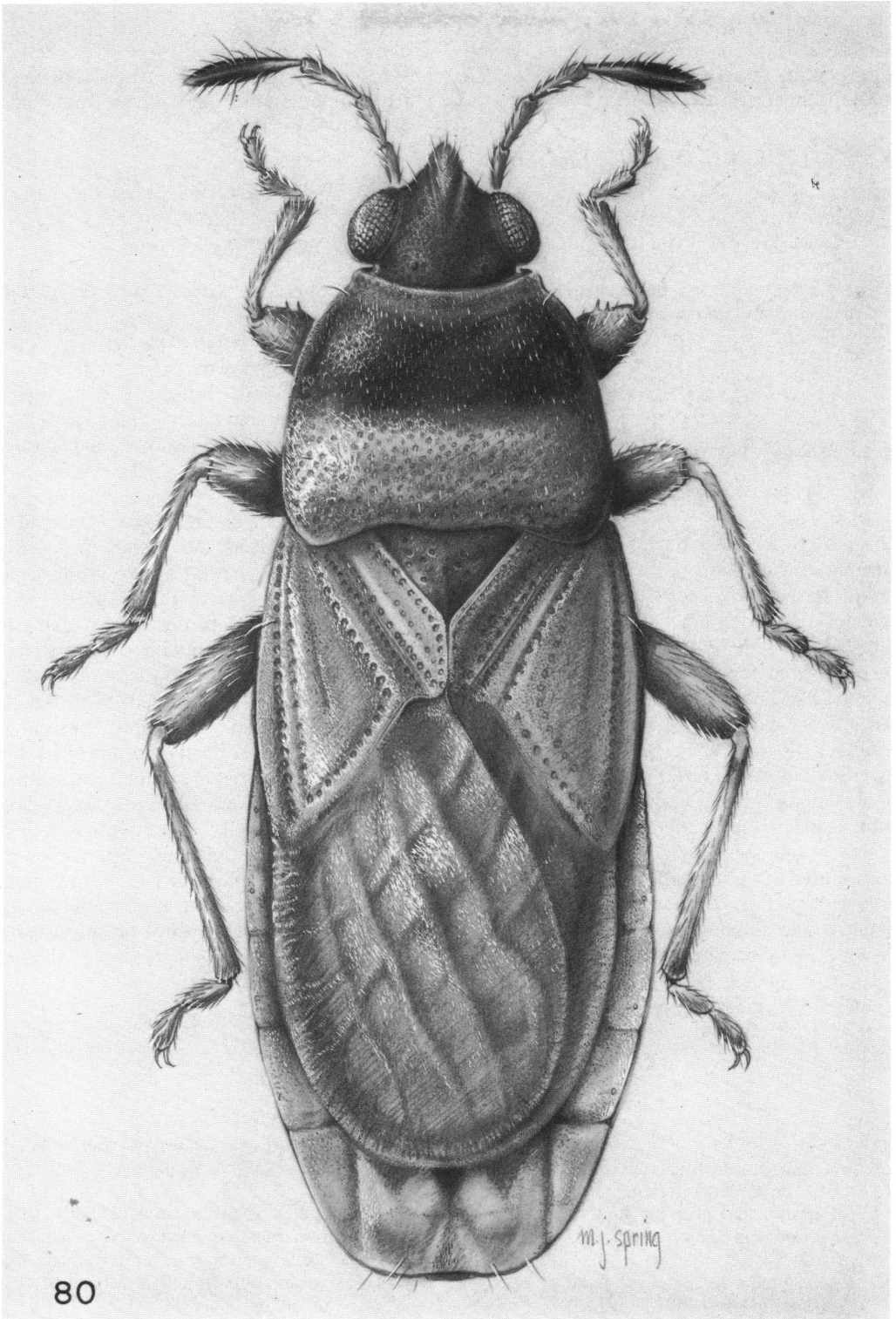


FIG. 80. *Xenoblissus lutzi*, dorsal view.

posterior margins concave. Claspers generalized; sperm reservoir with large cup and straplike slender wings (fig. 1P).

KEY TO SPECIES OF *TALPOBLISSUS*

1. Heavy spines present along non-expanded (proximal) portion of fore tibiae as well as expanded distal portion (fig. 7G) (Africa) (fig. 78) ..... *cydnoides* Slater
1a. Heavy spines on fore tibiae restricted to expanded distal portion (fig. 7H) (Orient) .... *latus* (Distant)

TOONGLASA DISTANT
Figure 79

Toonglasa Distant, 1893, pp. 391-392.

TYPE SPECIES: *Toonglasa forficuloides* Distant. Monobasic.

DISTRIBUTION: Mexico.

BIOLOGY: Unknown.

DIAGNOSIS: Large, broad, robust, somewhat flattened. Fore femora strongly incrassate armed below with a large prominent spine; middle and hind femora mutic. Head pruinose, pronotum above pruinose with shining areas across humeri and a pair of large quadrate shining patches in calli area; completely pruinose below. Scutellum pruinose with a shining median elevation. Apical corial margin straight. Membrane relatively opaque, nearly as thick as adjacent corium. Submacropterous. Fore coxal cavities closed. Ocelli small. Antennae terete or slightly enlarged at distal ends of antennal segments two and three. Seventh abdominal segment with a pair of elongate curving prominent projections extending posteriorly from each lateral angle. Details of genitalia unknown. Known only from the holotype from "omilteme in Guerrero 8,000 feet." It is obviously a highly apomorphic derivative from an *Extarademus*-like ancestor.

XENOBLISSUS BARBER
Figure 80

Xenoblissus Barber, 1954, p. 223.

TYPE SPECIES: *Xenoblissus lutzi* Barber. Monobasic.

DISTRIBUTION: South America.

BIOLOGY: Unknown.

DIAGNOSIS: Body short and stout, non-flattened. Metathoracic scent gland auricle rectangular, little raised above body surface, angled caudolaterad (fig. 11E). Fore femora with a pair of small spines below appearing to almost arise from a single base, mid and hind femora mutic. Head and pronotum subshining above completely non-pruinose; pruinose areas well developed on prosternum and on anterior half of propleuron, pruinosity also extensively present on mesopleuron above acetabulae and on mesosternum and metasternum; scutellum pruinose laterally. Thickened scalelike hairs present on head and pronotum. Apical corial margin moderately sinuate. Corium thicker than membrane; membrane cellular and reticulate (sometimes faintly so). Fore coxal cavities closed. Ocelli small. Antenniferous tubercles hooked. Antennae clavate. Sperm reservoir unique with large elliptical cup, wings straplike moderately elongate lying in a membranous ellipse arising from distal third of bulb (fig. 1Y). Very elongate ovipositor reaching abdominal sternum five.

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