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An investigation of the male genitalia as taxonomic characters in the miridae (Hemiptera)

Leonard Alexander Kelton

Iowa State College

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AN INVESTIGATION OF THE MALE GENITALIA AS
TAXONOMIC CHARACTERS IN THE MIRIDAE (HEMIPTERA)

by

Leonard Alexander Kelton

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major Subject: Entomology

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Iowa State College
1957
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INTRODUCTION

This investigation was undertaken in an effort to establish the structural pattern of the male copulatory structures in the species of the subfamilies, to observe the stability of these structures, and to determine whether these structures could be used in the overall classification of the Miridae. The application of the male genital parts in the taxonomy of the Miridae, particularly in the determination of relationships of species and allied genera, has been successfully employed in the past years. The claspers and the details of the vesica have been particularly useful in separating the species of the same genus or closely related genera. The works of Reuter (1883), and particularly Knight (1917), have established the differentiating characters in the claspers, and Knight (1926), Wagner (1940), Southwood (1953), and Kelton (1955) have demonstrated that the details of the vesica could be employed in specific determinations.

The vesica has not been tested or observed for the degree of variability in its basic pattern within a large group, and its usefulness as a basic tool in the classification has not been determined. Consequently, in this study an attempt was made to compare the modifications in the male copulatory structures within the tribes and subfamilies, and on the basis of these modifications, to present the observations or indications concerning the phylogenetic relationships between genera and higher categories of the family as Slater (1950) had indicated for the female genital structures. In this study an attempt was made, not so much to work out the
specific differences between species and related genera, but rather to observe whether the male genital parts, particularly the vesica, indicate the phylogenetic relationships between genera and higher categories.

The second important aspect of the study has been an attempt to establish some type of correlation between the male genitalia and the tarsal arolia. To the present time the arolia have been assumed to be typical for each particular subfamily, and it was felt that the study of the male genitalia might reveal whether the vesica or the tarsal arolia are more resistant to change when the external appearance of the various species assumed extreme modifications from the generalized forms of the group. It is hoped that this study will serve as a stimulus for further studies upon genera and species of the family, particularly those genera that appear highly modified or anomalous in the group, with the result that the added knowledge of the arolia and the genitalia may substantially contribute to the understanding of relationships of the genera within the family.

The present study indicates that the arolia must be used with considerable caution when separating subfamilies, for they are subject to change and modification in form as is the external appearance of the species that bear them. Kullenberg (1947b) has been of the opinion that the tarsal claw structures are not of high phylogenetic value, and suggests that these structures are highly adaptable and unstable, so as to be not nearly as basic for establishing relationships as are the genitalia of the female.

The present study of the male genitalia also seems to support this view, and the results observed indicate that the male structures are equally as important as the female genitalia in establishing the
relationships of the species. It was observed that the basic structure of the vesica continues to display group characteristics while the tarsal arolia and external morphology undergo considerable variation. It is felt that as more genera are studied it will probably be found that the arolia are too plastic to serve as a fundamental subfamily characteristic, and consequently may lose their exaggerated value as a guide to relationships in the genera of the Miridae.

The two structures of the male genitalia considered in this study were the vesica and the claspers. Considerable more emphasis was given to the vesica since it appeared to possess a structural pattern of extreme taxonomic and phylogenetic value that could be employed in establishing the generic limits and relationships of species. Thus the vesica appears to be an extremely reliable criterion on which to base generic, and subfamily relationships of the family.

The regions of the vesica found to be of considerable value have been the design or the appearance of the gonopore, the ductus seminis, and the type of processus vesicae surrounding the gonopore. The phallotheca also appears to be of some value in specific determination, and undoubtedly good characters also exist in the phallobase (Fig. 2) that possibly could be used at tribal or subfamily level. However, attention was concentrated on the vesica since it showed considerable differentiation even within the closely related groups, and offered striking differences between species that were remotely related.

No major emphasis was placed on any particular subfamily, rather the number of species examined in each group was determined by the type material that was readily available for study. The large size of the family and the
distribution of certain species have made it impossible to study more than an extremely small portion of the species, representing only a relatively small number of genera. However, in the majority of cases an attempt was made to select what were considered to be the typical species for the group, as well as the morphologically distinct members of the group, so as to observe the degree of modification in the genital structures between these extreme species included in the same tribe or subfamily.

The structures of the vesica appear to be of extreme taxonomic importance and may serve as reliable indicators of group relationship, and thus used with considerable success in the classification of the Miridae. The genitalia of the species examined in the present study appear to indicate the relationships to their allies, even though the external morphology of the species may show no such affinity. In several instances the vesica suggests that the present taxonomic placement of a number of species based on their arolia is not in accord with the evidence offered by the genital structures studied.

It is the hope of the writer that this study will contribute substantially to the knowledge of the fundamental structure of the vesica in the Miridae, the importance of the vesica relative to taxonomy, and that other studies along this line may be initiated, with the ultimate result that the phylogenetic relationships of the species will become more adequately known, and that the classification of the family will become more reliable.

The present investigation is based on a study of nearly 500 specimens representing 300 species from approximately 120 genera of the Miridae. Whenever possible an attempt was made to examine more than one specimen of each species from widely separated localities. There appeared to be no
significant variations in the genital structures of the same species, particularly in the basic pattern of the vesica. The slight variations found were in the processus vesicae, and these were limited to the sclerites, and involved minor modifications in the length, curvature, or the degree of sclerotization of the parts. This was found to be particularly true when teneral material was examined. Perhaps the greatest difficulty encountered, and which could contribute substantially to the variations in the appearance of the vesica of the same species, was the incomplete inflation of the membranous processus vesicae when present.

Where possible an attempt was made to study the groups investigated by Slater (1950), with more diversified groups added, to bring the male and female studies into harmony and thus avail to the taxonomists a more complete understanding of the taxonomic structures that appear to be extremely useful in the classification of the Miridae.
The terminology of the structures under study is not excessive or complicated; the terms being provided by workers who have made morphological studies of the copulatory apparatus in the Hemiptera and illustrated the structures. As a consequence of the taxonomic or morphological researches of Knight (1917), Singh-Pruthi (1925), Ludwig (1926), Baker (1931), Snodgrass (1935), Kullenberg (1941), Marks (1951), and Bonhag and Wick (1953), the following homologies are provided. For more complete details of the male genitalia the reader is referred to the above papers which are readily available for further comparison.

Both the claspers and parameres are generally accepted terms for the clasping organs of the Hemiptera. The harpagoes of Snodgrass (1935), gonoforceps of Michener (1941) and Truxal (1952), and gonostyli of Bonhag and Wick (1953) are synonymous with the two former terms. In the present study, the term clasper was adopted because of its wide applicability and the long established usage by specialists in the Miridae of North America.

The terminology used for the regions of the claspers is that of Kullenberg (1941, 1947), with minor modifications.

The term vesica as it is used in this study consists of structures beyond the phallobase, and includes in part the ductus seminis with its gonopore, and the processus vesicae (Dupuis and Carvalho, 1956). The vesica is synonymous with the virga of Crampton (1922); the endosoma, ejaculatory duct, and the vesical appendages of Singh-Pruthi (1925); the aedeagus of Snodgrass (1935); and disticonjunctiva, the cricoid sclerite,
and vesica of Bonhag and Wick (1953). The secondary gonopore (Dupuis and Carvalho, 1956), that is, the terminal opening of the ductus seminis, is called the gonopore for brevity in this study. The term phallus is used to designate the intromittent organ as a whole (Snodgrass, 1935). The phallotheca is the sclerotized basal region of the phallus.

The vesica may consist only of ductus seminis with a simple sheath-like processus vesicae, or the latter may be modified into various forms bearing sclerites with different degrees of sclerotization. Often a number of membranous lobes possess strong spines or more strongly sclerotized rod-like structures. The ductus seminis may be either cylindrical throughout its length, or expanded before the gonopore into bladder-like enlargement, the latter possibly serving as a temporary depository for the sperm during their passage through the ductus seminis.

The phallotheca of Snodgrass (1935) is the structure enclosing the vesica and is the exposed part visible when the phallus is in the state of repose. The phallotheca is comparable to the theca of Sharp (1890), phallotheca of Singh-Fruthi (1925), and phallotheca of Bonhag and Wick (1953). In the Miridae the phallotheca was generally found to be strongly sclerotized, often possessing subapical plates or flanges.
REVIEW OF LITERATURE

The need for the study of genital structures in taxonomic work arose when the taxonomists realized that closely related species could not be readily separated from their allies by external features alone. Feuter (1883) was the first taxonomist to use the claspers as taxonomic structures in Miridae. For the first time, the claspers were dissected from the genital capsule and illustrated to show the differences between the species.

Van Duzee (1916) made an attempt to classify the North American species of Orthotylus, and illustrated the claspers of several species of the genus. Knight (1916) compared and illustrated the claspers of two very closely related species of Lygus, and later (1917) revised the genus on the basis of the genital claspers. From that time to the present, Knight (1921, 1923, 1941), and later workers continued to employ the claspers as a tool in demonstrating the differences between the species, since they appeared to offer a reliable means by which species could be identified.

Numerous authors employed the claspers in their systematic or taxonomic studies of the species in the Miridae, and illustrated the claspers with the descriptions of new species, or as a means of separating species. Crampton (1922) studied the claspers of the species of Lopidea; Lindberg (1930) used them in the description of new species of Lygus; Stichel (1930) relied on them to separate species of Orthops; and Miller (1937) used the claspers in the description of new species of Farasthenaridea. Wagner (1939) figured the claspers in the description of the new species of
Alloeotomus, while Schmidt (1939) illustrated them in the species of Laemocoris and Psallus. Hsiao (1941) diagrammed the claspers of Aretas; Stanger (1942) illustrated the differences in the claspers of certain species of North American Lygus; while Taylor (1947) employed them to point out the specific differences of East African Lygus. Kiritchenko (1951) illustrated the claspers of several species in the Orthotylinae and Phylinae. Linnauori (1951) accompanied the description of species of Calocoris with figures of claspers. Leston (1952) made an attempt to show the relationships of the Lygus groups by using the claspers. Bliven (1954) accompanied description of species of Phytocoris and Dichrooscytus with illustrations of claspers. Hussey (1954) accompanied the description of new species of Lygus with figures of claspers; and Seidenstucker (1954a) included the figures of the claspers of the species of Brachynotocoris. Woodward (1954) included figures of claspers of the new species of Felisacmus.

The aedeagus as a taxonomic character came into use when Singh-Pruthi (1925) made a morphological study of the male genitalia in the Hemiptera, and illustrated the aedeagus of a number of species of the Miridae. This contribution has played an important role in the taxonomy of the Miridae, particularly in the last 15 years in which the vesica has been used.

The following authors employed the claspers, and in addition illustrated the vesica in their taxonomic studies of the species. Knight (1926) made extensive use of the vesica (flagellum) in separating the species of Phytocoris. Usinger (1931) illustrated a portion of the vesica in the description of a new species of Platylurus; and Wagner (1940) compared and illustrated the details of the vesica in order to establish the specific
differences in the European species of *Lygus*.

The vesica came into prominence when Kullenberg (1941) made a morphological and taxonomic study of the copulatory apparatus of the male in the Miridae, illustrating the specific differences in the vesicae of *Phytocoris*, *Lygus*, and Phylinae groups.

China (1944) made use of the vesica for a more positive identification of the species; and Carvalho (1944) employed these structures in the revision of the genus *Burylonata*. Hoferlandt and Jordan (1944) compared the genus *Canoponotidea* with that of *Myrmicoris* by using the vesica. Lindberg (1951) used the vesica in the separation of species of the genus *Canariocoris*.

Linnnavuori (1952) included the vesica with the description of new species of *Atomoscelis*.

Stehlík (1952) illustrated parts of the vesica of the species in the genus *Orthotylus*; and Ossiannilsson (1953) included the vesica with the description of a new species of *Psallus*; and Seidenstucker (1954b) did likewise in describing a new species of *Dichrooscytus*. Moore (1955) compared the vesicae of the species of *Agnocoris*, and concluded that the genus was distinct from *Lygus*.

In addition to the claspers and vesica, Wagner and Slater (1952) also employed the female genitalia in demonstrating the structural differences in a number of Holarctic species of *Lygus* and *Miconocoris*. Southwood (1953) studied the male and female genital structures and published on the morphology and taxonomy of the genus *Orthotylus*; while Kelton (1955), using the male and female genital parts, grouped the species of the *Lygus* complex into genera and subgenera on the basis of their structural relationships.
In the above references an attempt was made to select only the paper of each author which was believed to be the first by that author in which the male genital structures were employed. If the same author first used the claspers and in the subsequent papers deals with the vesica, then each paper is listed in its proper sequence.
MATERIALS AND PROCEDURES

The insect specimens used in this study were dried, point-mounted museum specimens. The materials and techniques used during the course of this study have been similar to those used in other comparative genitalia studies.

The posterior portion of abdomen was detached from the remainder of the body by carefully chipping through the abdomen with a pair of very fine forceps. In a number of cases where the abdomen was extremely brittle, a bit of water was transferred to the area by means of the forceps, in order to soften the tissues and facilitate the separation.

The severed portion was then placed in approximately 10 per cent hot KOH to soften the tissues. After 3 to 5 minutes, it was transferred by means of a medicine dropper to a depression slide, and dissected in KOH under the microscope. Ordinary steel chucks holding minute needles were used for dissecting needles.

The extraneous material of the genital capsule was removed to expose the phallus (Fig. 2). The claspers were separated and the phallus gently squeezed out from the genital chamber, and the dorsal muscle attachments severed. The phallus was then observed for the normal position of the gonopore if visible, and for any appended structures present on the phallotheca. If unusual structures were present, the phallotheca was then illustrated, or only a short description is given.

The phallus was then transferred to a depression slide containing distilled water. This change from the KOH to distilled water caused the
membranous processus vesicae, when present, to expand and protrude out of the phallotheca opening. Usually complete unfolding and expansion of the lobes were achieved in about five minutes. If, however, the lobes did not inflate in that time, the phallus was left in the water for about 20 minutes, then with the forceps removed from the water and dipped for a second or two into KOH, and immediately returned to distilled water.

When the vesica was fully unfolded, the phallotheca was removed by splitting the opening towards the base and then carefully working around the base until separated from the point of attachment.

After dissection and study, the structures were neutralized in dilute acetic acid and placed in microvials containing a very small amount of glycerine, corked, and attached by the cork to the pin holding the specimen. The glycerine was introduced into the vial by means of a hypodermic needle.

The membranous nature of the vesica in the Mirinae, Deraeocorinae, and others, presented a continuous problem to insure uniform inflation of the lobes. In many cases this was accomplished by dissecting several specimens of the same species, and then selecting the vesica most fully extended. In many instances where the scarcity of material made it impossible to dissect more than one specimen the vesica was illustrated at the maximum inflation achieved; however, the basic structures were indicated to allow the recognition of the species.

The claspers, vesica, and other structures illustrated are drawn to the same scale, unless the structure proved to be too large in size. In such cases an individual line scale of the appropriate magnification was inserted by the structure; otherwise a single millimeter scale was used.
for each plate. All the structures are oriented to the position best
displaying the structural details.

The illustrations were prepared with the aid of a squared ocular
using a Bausch and Lomb dissecting microscope with 75 magnifications.
Pencil drawings were first made on Strathmore bristol board which was
previously lightly squared by lines one-half inch apart. The drawings
were inked with India ink.
GENERAL DISCUSSION OF THE SUBFAMILIES

The present classification of the Miridae is based primarily on the tarsal claw characteristics as proposed by Reuter (1910), and elaborated by Knight (1918). The latest classification and arrangement of subfamilies available are those of Carvalho (1955), who lists six subfamilies and takes into account not only the tarsal arolia, but also to a limited extent the female genitalia investigated by Kullenberg (1947b) and Slater (1950).

The present study of the family includes material from 17 tribes representing the six subfamilies of Carvalho. The evidence from the material examined appears to suggest that the present subfamily distinctions and allocation of genera as proposed by Carvalho are in general agreement with the relationships indicated by the male genitalia studied. However, in a number of cases the structures of certain species observed seemed to show a closer relationship to other tribes of the same subfamily. The genital parts of still other genera suggest that the present taxonomic placement of a number of species allocated to particular subfamilies on the basis of the tarsal arolia is not in accord with the evidence obtained from the study of the male genitalia.

The relationships of the subfamilies as indicated in the study of the female genital structures by Slater (1950) appear to be in general agreement with relationships evidenced in the male genital parts examined. There is, however, in a number of instances less variation in the basic structure of the male genitalia than in the female, so that a condition very likely exists where the male structures indicate a more pronounced
similarity between species in one group than do the female structures, and vice versa.

It is true that the amount of material examined during this investigation has been sufficient only insofar as to suggest tentative conclusions. However, the species studied seem to indicate the structural affinity to their allies, and suggest a considerable degree of phylogenetic relationship between genera and higher categories of the family. A further study of the male and female genitalia is necessary before definite conclusions regarding the relationships of the tribes and subfamilies can be accurately determined.

The subfamilies Bryocorinae and Phylinae are considered here to show the most simplified type of vesica studied. In the Bryocorinae the ductus seminis of the vesica is flexible at the base, with a sclerotized and stiffened distal portion, and a membranous processus vesicae. The phallo-theca is also membranous (Fig. 128). In the Phylinae, on the other hand, the vesica consists of a highly sclerotized ductus seminis and processus vesicae, the former without any flexibility at the base except at the point of articulation with the "Führungsstück" of Kullenberg (1941). The phallo-theca is also highly sclerotized and pointed at apex (Fig. 98).

The tribe Dicyphini which is included in the Phylinae seems to show no affinity to the Phylinae, if the vesica is to be considered as an indicator of relationship. The vesica is highly membranous, and very much unlike that found in the Phylini and Hallodapini. The ductus seminis is flexible throughout, with the processus vesicae membranous and completely enclosing the diffuse gonopore (Fig. 118). The Dicyphini show a closer
affinity to the Cylapinae (Fig. 126), and possibly to the Deraeocorinae (Fig. 9h).

No relationship of the Phylinae to the Orthotylinae was indicated by the male genitalia. The relationship to the Phylinae suggested by Slater (1950) is explained by the species studied, *Semium hirtum* Reut., which was considered to belong to the Orthotylinae but whose female structures showed an affinity to the Phylinae. This species seems to belong with the Phylinae as the present study of the male genital parts appear to indicate (Fig. 67). The tarsal arolia, although somewhat hair-like in appearance, have a tendency to show convergence, and it is likely this factor that has contributed to its annelant position.

The species of Cylapinae seem to show no close relationship to any other group studied, but the vesica is suggestive of the condition found in Dicyphini, and certain species of the tribe Halticini. The vesica has a flexible ductus seminis, the distal portion enclosed by a membranous sac-like processus vesicae, the latter supporting a number of spiculi within (Fig. 125). The type of gonopore and the surrounding membranous sac found in *Cylapus* are very similar to the vesica of Orthocephalus in the Halticini (Fig. 73), while the details of the vesica in *Fulvius* and *Peritropis* are similar to the type of vesica examined in the Dicyphini (Fig. 118). Since the number of species studied has been limited no further statement can be made of the subfamily relationships.

The Deraeocorinae is a somewhat specialized group in which the species show some degree of similarity to the species of the Mirinae. The claspers and the vesica also indicate a remote relationship in the
similarity of their basic structures, particularly the processus vesicae. In the Deraeocorinae the vesica consists of a flexible ductus seminis at the base and a highly tubular or bulbous processus vesicae, with several sclerotized spiculi, a condition similar to the Mirinae. The design of the gonopore, however, makes the group distinct and readily separated from the other subfamilies studied. The gonopore is of the depressed type, opening ventrally when the vesica is in repose, and may possess heavily sclerotized and ornately spined plates in the region of the gonopore as observed in a number of the Deraeocorini (Fig. 87). The type of gonopore found in the Deraeocorinae may be the generalized type from which the coil-like rim found in the Mirinae developed.

The Clivinemini and the Hyaliodini seem to be closely related to the Deraeocorini in the basic structure and details of the vesica and claspers. The Clivinemini appears to be more closely related to the Deraeocorini than is Hyaliodini, the latter showing closer relationship to the Clivinemini.

The subfamily Orthotylinae is a highly specialized group and appears to show no close relationship to the other groups examined, except possibly to the few species in the Deraeocorinae which appear to show some resemblance of similarity in the nature of the gonopore (Fig. 85). The fact that the tribes of the subfamily contain a heterogeneous mixture of species, some of which apparently belong to other subfamilies, will be discussed under the subfamily heading. It should be mentioned, however, that this fact of heterogeneity makes it extremely difficult to determine the limitations of each tribe.

The typical species of the Orthotylinae possess a distinctive vesica,
differing from the other groups studied in the type of the gonopore and the specialized processus vesicae. The rim of the gonopore is horseshoe-shaped in outline and opens ventrally when the vesica is in a state of repose as in the Derasocorinae. The processus vesicae take the form of sclerotized spiculi variously shaped, and arising dorsally to the ductus seminis, the latter being flexible throughout its length (Fig. 14).

The other type of processus vesicae generally found in the Halticini is the membranous sac-like structure containing several short spiculi within. It is probable that this membranous processus vesicae which is considerably different from the Orthotylini type may prove to be a reliable criterion on which to base the tribal distinction in this group. However, whether this modified structure is a sound basis for distinguishing a tribe will only be known when large number of species included in the tribe are examined. At the present time it seems clear that the vesica of Halticus approaches in simplicity of structure the vesica found in Geratocapsus in the Orthotylini, and Sericophanes in the Pilophorini. The vesicae of the above three genera appear to suggest that the three should at least be in the same tribe rather than in three separate tribes.

The one highly constant character found in the vesica of the Orthotylini and the Halticini is the unique and similar gonopore. From this it seems clear that the two tribes are extremely closely related, and that a tremendous amount of future work will be needed in these groups before the correct systematic position of the included species is accurately determined.

The tribe Pilophorini presents a very interesting and perplexing situation. The brief study of this tribe indicates that it contains an
assemblage of species belonging to other subfamilies. With few exceptions, the species of the tribe examined show no relationship to one another, and all the genera studied show an affinity to the Orthotylini, or to the other subfamilies of the Miridae.

The vesicae of Filophorus and Alepidea are very similar to each other, and possibly closely related to Cryptopeltocoris, but extremely different from the other genera of the subfamily, and very closely resemble the vesica of the Phylinae. The vesicae of these three genera consist of a highly sclerotized ductus seminis, gently curved, with a sclerotized processus vesicae in Filophorus and Alepidea originating below the gonopore (Fig. 80). The ductus seminis and the gonopore are very dissimilar to those of the other Orthotylini studied and obviously show no relationship to the subfamily, but rather display a close affinity to the species of the Phylinae. The genital claspers and the phalotheca also indicate this relationship to the Phylinae. The female genitalia, likewise, show no relationship to the Orthotylini, but rather to the Phylinae (Slater, 1950).

It appears that Filophorus, Alepidea, and Cryptopeltocoris belong to the Phylinae as indicated by the genital structures, and not to the Orthotylini where the genera were classified on the basis of the tarsal arolia.

The other genera studied under the tribe will be discussed under the subfamily heading.

The subfamily Mirinae certainly represents a highly specialized group as the Orthotylini, but unlike the latter, appears to be a homogeneous group. The structures seem to indicate that the included tribes are very closely related. No close relationship to the other groups is indicated by the genitalia, except for a possible remote relationship to the Deraeocorinae.
previously discussed.

The species of the Mirinae possess a distinctive vesica that readily stands out apart from the other groups studied. The gonopore is very characteristic in appearance, and is not readily confused with species of other subfamilies. The gonopore is ringlike in form, the rim simulating a coiled spring, and opens dorsally when the vesica is in a state of repose, unlike that of Orthotylinae and Deraeocorinae. The processus vesicae take on various forms, but generally are membranous, bulbous or tubular, and often possess sclerotized spiculi of different lengths and shape. The ductus seminis is flexible and cylindrical at the base, but in some genera may be modified in shape and structure before the apex (Fig. 3). The sub-apical shape of the ductus seminis may be a characteristic of some value in determining the tribal limitations of the subfamily.

The tribes of the subfamily studied are discussed under their headings which follow.
This is the largest subfamily of the Miridae, and at the present time is composed of seven tribes containing approximately 254 genera distributed over all the faunal regions of the world. Five of these tribes have been studied in the present investigation. These include the tribes Stenodemini China, Pithanini Douglas and Scott, Mirini Hahn, Resthenini Reuter, and Herdoniini Distant. The present study of the subfamily included 53 species representing 33 genera. No material was available for study from the other two tribes, Mecistoscelini Reuter, and Hyalopeplini Carvalho.

The subfamily Mirinae is distinguished by the large and free arolia arising between the tarsal claws, the arolia usually being spindle-shaped and divergent. The pronotal collar is generally present and separated from the remainder of pronotum by a furrow, except in certain members of Stenodemini and Pithanini, in which it is absent or poorly defined, but these tribes have other characteristics discussed under each tribe which place them in the Mirinae.

The male genital structures are also characteristic in shape, the left clasper being generally curved, usually C-shaped, terminating in an apical process directed ventrally. The right clasper is usually cylindrical and bears a short, slender process at its apex. The vesica is characteristic, made up of a number of bulbous, spindulate lobes, and occasionally possessing spiculi or sclerites of variable form. The most
distinguishing feature of the vesica is the nature and appearance of the
gonopore. The rim of the gonopore has the aspect of a coiled spring that
has been rolled in the form of a ring. The phallotheca is a simple,
membranous sheath, unless otherwise stated. The structure of the vesica
appears to have a real significance in the understanding of the phylo-
genetic and taxonomic relationships of this subfamily.

The five tribes of the Mirinae studied during this investigation
present an extremely interesting situation. In Pithanini Douglas and
Scott, the species are myrmecomorphic in form in which the hemelytra are
reduced and only partially cover the abdomen. The species appear to be
quite distinct from the Stenodemini China. However, apart from the ant-
like appearance of the species and certain external characteristics that
accompany such specialization the species of the two genera studied,
*Pithanus* Fieber, and *Mimoceps* Uhler, do not appear to have anything
sufficiently different in the genital structures to warrant tribal dis-
tinction from the Stenodemini. The absence of the lateral carina of the
pronotum is the type of specialization also found in *Collaria* Prov.,
presently placed in the Stenodemini. The females of *Leptopterna* Fieb., of
the same tribe, also show dimorphism in the length of the hemelytra. The
present study of the male genital structures seems to indicate that
*Pithanus* and *Mimoceps* are closely related to the genera of Stenodemini,
and the structural evidence on hand appears to suggest that the genera
should be included under the single tribe.

The biology of the two tribes also indicates that the genera are
closely related. The known host plants for a large number of species
have been recorded as grasses and sedges (Knight, 1941).
If the two tribes eventually come to be regarded as a single tribe, Pithanini Douglas and Scott would become the tribal name.

The tribes Resthenini Reuter, and Herdoniini Distant present a very interesting study. In Herdoniini, the species of the included genera are myrmecomorphic in form and are unusual in appearance when compared to the other species of the Mirinae. However, apart from the ant-like appearance of the species, and certain external characteristics that accompany such specialization, the genital structures of Dacerla formicina Parsh. strongly suggest a close relationship to the Mirini. The vesica appeared to indicate no significant differences in structure to warrant a tribal distinction from the Mirini.

In Resthenini a similar situation arises. The tribe is based on the reduction of the osteolar peritreme and certain other external characteristics. The species of Prepops Reut. examined during this investigation indicate typical Mirini genital characteristics. In the similar manner, the genitalia of the species studied failed to display anything significantly different to warrant tribal distinction from the Mirini. The investigation into the female genitalia by Slater (1950) also revealed no distinctive characteristics to substantiate the tribal distinction for the genera. If the two tribes come to be regarded as a single tribe, Mirini Hahn 1831 will become the tribal name.

Tribe STENODEMINI China, 19h3

The Stenodemini are characterized by their slender form, long legs and antennal segments; the scarcely overlapping tarsal segments very flexible, the first tarsal segment longer than second; the arolia large,
membranous, and divergent at apex; and the pronotum with lateral ridge, the collar usually incomplete.

Approximately 26 genera are included in the Stenodemini. Only 11 species from seven genera of the tribe were examined. The male genital structures of these species show typical group characteristics, and provide reliable differences within each genus for specific determination. The vesica is membranous, with tubular or bulbous lobes, with or without the spiculi. The ductus seminis is typically slender and cylindrical and very similar to the type found in the Pithanini. The phallotheca is a simple membranous sheath.

**Leptopterna** Fieber, 1858

Genus recognized by the lateral carina of pronotum; the long, black hairs on the first antennal segment; and the long erect hairs on the body.

One species, *L. dolobratus* (L.), formerly known as *Miris* dolobratus, was studied.

**Leptopterna dolobratus** (Linnaeus, 1758). Fig. 3.

Left clasper curved; sensory lobe moderate; body terminating in a point. Right clasper curved; thicker apically than basally, horizontal process at apex.

Vesica consisting of three membranous lobes, with two large, curving, and heavy sclerotized spiculi; ductus seminis cylindrical. Locality: Ames, Iowa. June 18, 1928. H. H. Knight.
Megaloceroea Fieber, 1858

Genus distinguished by the lateral carina of pronotum; the very fine punctures on pronotum; the very long first antennal segment with short pubescence; and the longitudinal groove at vertex of head.

The genital structures of two species, *M. recticornis* (Geoff.), and *curta* Kngr., were examined. The genitalia show pronounced specific differences.

*Megaloceroea recticornis* (Geoffroy, 1785). Fig. h.

Claspers similar to that of *Leptopterna dolobratus* but more slender; left clasper without a noticeable sensory lobe; body with a recurved process at apex. Right clasper with the apical process curved ventrally.

Vesica membranous, with bulbous spinulate lobes, two lobes with a long spiculum each; ductus seminis cylindrical and straight. Locality: Ames, Iowa. June 20, 1925. H. H. Knight.

*Megaloceroea curta* Knight, 1928. Fig. 5.

Left clasper curved as in *recticornis*; sensory lobe more prominent; body narrowing to a point and bearing two short processes at apex. Right clasper angled, with a slender basal half and greatly enlarged apical portion.

General form similar to that of *recticornis* but with highly modified membranous lobes, two of which are tubular; one curved spiculum arising from the lobe; ductus seminis as in *recticornis*. Locality: Yellowstone National Park, Wyo. Aug. 8, 1927. H. H. Knight.
Stenodema Laporte, 1832

Genus characterized by the lateral carina on the pronotum; and the long, dense hairs on the first antennal segment.

Three species of the genus were examined, S. virens (L.), vicinus (Prov.), and trispinosum Reut. It is doubtful whether true S. virens (L.) occurs in North America. The Nearctic species of Stenodema that were determined by several workers (Horvath, 1908, Knight, 1922), as virens (L.) and vicinum (Prov.) appear to be conspecific, and henceforth should be designated as vicinum. The European virens is slightly larger in size, and specific differences can be detected in the genitalia. The most striking difference is noted in the vesica, that of virens being nearly two times as large as that of vicinum, and possessing additional structures not evident in vicinum.

Stenodema virens (Linnaeus, 1767). Fig. 6.

Left clasper with a thick sensory lobe; body slender, sharply angled, forming an acute angle with the sensory lobe. Right clasper curved as in Leptopterna dolobratus but more slender, two short apical processes at apex.

Vesica entirely membranous, with a large median lobe and one elongate spinulate process at each lateral side similar to that of Megaloceroead curta; ductus seminis cylindrical. Locality: "Thuring. German."

Stenodema vicinum (Provancher, 1872). Fig. 7.

Claspers similar to those of virens in general form and appearance; left clasper with the body gradually narrowing to a sharp point. Right clasper thicker apically than that of virens, the apical process more
distinct.

Vesica similar to that of *virens*, but considerably smaller and lacks the spinulate, tubular processes. Locality: Ledyard, Iowa. Aug. 7, 1928. G. O. Hendrickson.

**Stenodema trispinosum** Reuter, 1904. Fig. 8.

General aspect of claspers as in *vicinum* but smaller. Right clasper less angled, and with only one process at apex.


**Trigonotylus** Fieber, 1858

Genus distinguished by the lateral carina of pronotum; the distinct longitudinal groove at vertex of head; and the short pubescence on the first antennal segment.

Two species, *T. ruficornis* (Geof.), and *tarsalis* Reut., were examined. The genital structures show pronounced specific differences and at the same time indicate characteristics typical of the Stenodemini.

**Trigonotylus ruficornis** (Geoffroy, 1785). Fig. 9.

Left clasper slender and angled, apex pointed. Right clasper narrower at base than apex, apex with a short horizontal process.

Vesica membranous, with several lobes and one spiculum; ductus seminis typical of Stenodemini. Locality: Batavia, N. Y. June 30, 1914. H. H. Knight.
Trigonotylus tarsalis (Reuter, 1876). Fig. 10.

Left clasper slender as in ruficornis but slightly larger, more acutely angled. Right clasper similar to Stenodema trispinosa in outline, but glabrous.

Vesica entirely membranous in structure, the lobes spinulate, spiculum absent; ductus seminis as in ruficornis. Locality: St. Anthony Pk., Minn. July 6, 1921. H. H. Knight.

Dolichomiris Reuter, 1882

Genus distinguished by the lateral carina of pronotum; the long first antennal segment covered by long semi-erect pubescence; the frons with an anterior protrusion; and the vertex of head with a longitudinal groove.

One species, D. linearis Reut., was examined. The genital structures show typical Stenodemi characteristics.

Dolichomiris linearis Reuter, 1882. Fig. 11.

Left clasper slender and evenly curved, recurved process at apex. Right clasper as in Trigonotylus tarsalis, but more slender.


Teratocoris Fieber, 1858

Genus distinguished by the lateral carina of pronotum; the very fine punctures on pronotum; the short flattened head; and the very long and curved first antennal segment, slightly thicker at base.

The genital structures of T. discolor Uhl. were examined.
Teratocoris discolor Uhler, 1877. Fig. 12.

Left clasper curved as in Megalocereoa curta, but more slender. Right clasper straight, narrower at base, rounded at apex with a short process.


Collaria Provancher, 1872

Genus distinguished by the absence of the lateral carina of pronotum; the strongly exerted head; and the location of the eyes, far removed from the pronotum.

One species, C. meilleurii Prov., was examined. The genital structures show typical Stenodemini characteristics.

Collaria meilleurii Provancher, 1872. Fig. 13.

Left clasper as Dolichomiris linearis but less angled. Right clasper broadest apically, with a short process at apex.

Vesica membranous, with four or five lobes, two of these tubular; one lobe with a series of short spines; ductus seminis as in the preceding species. Locality: St. Anthony Pk., Minn. July 1, 1921. A. Hertig.

Tribe PITHANINI Douglas and Scott, 1865

The Pithanini are characterized by the slender form, long legs and antennal segments; the scarcely overlapping tarsal segments, very flexible; the first tarsal segment longer than the second; the arolia large, membranous and divergent at apex; the pronotum rounded at the side, region of the
callus swollen; and the cuneus and membrane of hemelytra vestigial.

The three genera of this tribe, *Myrmecoris* Gorski, *Pithanus* Fieber, and *Mimoceps* Uhler, have been placed in the Pithanini on the basis of the myrmecomorphic form of the species. The latter two genera were examined during the present study. In addition, species of *Myrmecoris* illustrated by Kullenberg (1947a) indicate a type of genital structure similar to that observed in *Pithanus* and *Mimoceps*, and that all belong to the same general group. The genitalia of these species indicate typical Mirinae characteristics, and also appear to indicate a very close relationship to the Stenodemini. No apparent structures in the genitalia were found that appeared to be significantly different in these genera to place them apart from the Stenodemini.

If the two tribes should be combined under a single tribe, then Pithanini will have priority over the Stenodemini.

**Pithanus** Fieber, 1858

Genus distinguished by the absence of the cuneus and membrane; the rounded lateral margin of pronotum; the pronotum swollen at middle; and the short first antennal segment.

One species, *P. maerkelii* (H.-S.), was examined. The claspers and the vesica are similar to those of *Teratocoris* and *Mimoceps*.

**Pithanus maerkelii** (Herrich-Schaeffer, 1839). Fig. 1h.

Left clasper sharply curved, forming an acute angle between the sensory lobe and the body. Right clasper small, curved process at apex.

Vesica similar to *Teratocoris discolor* in size and form; ductus seminis as in *discolor*. Locality: "Europe."
Mimoceps Uhler, 1890

Both brachypterous and macropterous forms are known, the hemelytra showing no demarcation between the corium and the membrane. Genus distinguished by the rounded lateral margin of pronotum, and the swollen pronotum at middle.

The genital structures of *M. gracilis* Uhl. were examined. The claspers and the vesica indicate close relationship to *Pithama* and *Teratocoris*.

*Mimoceps gracilis* Uhler, 1890. Fig. 15.

Left clasper sharply bent at base forming a narrow enclosure between the sensory lobe and the body. Right clasper with the distal portion enlarged into a knob, a short curved process at the side.

Vesica similar to that of *Stenodema trispinosum* in size and number of membranous lobes; ductus seminis as in *Teratocoris*. Locality: Hamburg, N. Y. June 6, 1891. E. P. Van Duzee.

Tribe MIRINI Hahn, 1831

The Mirini are characterized by their oval form and robust size; the distinct pronotal collar; the greatly overlapping tarsal segments, the first tarsal segment usually shorter than the second; the large arolia spindle-shaped and divergent at apex.

The vesica of this tribe resembles the vesica observed in the other tribes of the Mirinae. The most distinguishing feature of the vesica is the coil-like nature of the rim of the gonopore which has been found to be a highly stable morphological structure. It thus appears to be an extremely important part of the vesica for use in taxonomy and classification of
genera. The processus vesicae, on the other hand, seem to be of significance in specific determinations and occasionally to indicate only the very close generic relationships. The phallotheca is generally a partly sclerotized, simple sheath, unless stated otherwise.

Approximately 175 genera comprise the tribe Mirini. In this study 37 species from 22 genera of the tribe were examined. The genital structures of these species show typical group characteristics that make it possible to compare the structural relationships between allied species and higher categories. The gonopore exhibits a high degree of uniformity throughout the tribe, and the subfamily. This appears to be a reliable criterion by which closely related species that have undergone extreme specialization and are morphologically different in external appearance, may be grouped with their allies when the genitalia are examined.

_Tropidosteptes_ Uhler, 1878

The genus _Heoborus_ Dist., has been placed in synonymy under _Tropidosteptes_ Uhler. (Carvalho, 1951).

Genus distinguished by the punctate pronotum between and in front of callus, often extending to the head; and the carinate lateral margin of pronotum.

Two species, _T. cardinalis_ Uhler., and _rufusculus_ (Knag.), were examined. These species appear to show no more than just specific differences in the slight modification of the genital structures. Very close relationship appears to exist between _Tropidosteptes_ and species of _Xenoborus_ Reut., and _Neoborella_ Knag.

The structures of the female genitalia of the above genera, except
Neoborella which was not studied, also suggest that a single generic component is involved (Slater, 1950). The present study supports this conclusion as the male genital structures do not appear to show any major differences to warrant the separation of the above groups into distinct genera.

Tropidosteptes cardinalis Uhler, 1878. Fig. 16.

Left clasper curved; sensory lobe large, the apex rounded; body terminating in a blunt point. Right clasper broadest at middle, terminating in a narrow process.

Vesica with two enfolding structures, partially concealing the spiculum on one side and the spinose sclerite on the other; short trough extends beyond the gonopore; ductus seminis slightly expanded at middle. Phallotheca with a small rounded flange near apex. Locality: Batavia, N. Y. June 24, 1915. H. H. Knight.

Tropidosteptes rufusculus (Knight, 1923). Fig. 17.

Claspers similar to that of cardinalis but smaller; apex of left clasper pointed, with a short tooth before apex. Right clasper slender, apical process truncate.


Xenoborus Reuter, 1908

Genus distinguished by the punctate pronotum as in Tropidosteptes; the striolate frons; and the rounded lateral margin of pronotum.
Two species, *X. plagifer* (Reuter) and *commissuralis* Reut., were examined. The genital structures illustrate a very close relationship to *Tropidosteptes*, and seem to suggest that a single generic group is involved.

**Xenoborus plagifer** (Reuter, 1909). Fig. 18.

Left clasper larger than that of *Tropidosteptes*, body more elongate, terminating in a sharp point. Right clasper short and broad, with a short tooth at apex.

Vesica very similar to that of *T. rufusculus* but larger. Phallotheca as in *rufusculus* but with a narrower and longer flange. Locality: Batavia, N. Y. Aug. 12, 1916. H. H. Knight.

**Xenoborus commissuralis** Reuter, 1908. Fig. 19.

Claspers similar to that of *plagifer* but body of left clasper longer and narrower, with a recurved tooth before apex. Right clasper less angular, apical process truncate.

Vesica similar to that of *plagifer* but more sclerotized and larger; ductus seminis as in *T. cardinalis*. Phallotheca as in *cardinalis*. Locality: Strawberry Point, Iowa. July 27-29, 1927. Harris & Johnston.

**Neoborella** Knight, 1925

Genus distinguished by the punctate pronotum as in *Tropidosteptes*; the striolate frons; and the rounded lateral margin of pronotum as in *Xenoborus*. *Neoborella* separated from *Xenoborus* by the longer second antennal segment. One species, *N. tumida* Knight, was studied.

**Neoborella tumida** Knight, 1925. Fig. 20.

Left clasper similar to that of *Tropidosteptes rufusculus* in size and
shape, but apical process pointed rather than truncate. Right clasper with a pointed apical process.


**Neurocolpus** Reuter, 1876

The present study suggests that this genus as well as *Taedia* Dist., and *Lampethusa* Dist., are very closely related and appear to fall into the same group. Slater (1950) investigating the female genital parts also studied the genus *Poeas* Dist., in addition to the above genera, and concluded that the four genera represent a single generic type.

Genus distinguished by the thickened first antennal segment, clothed with numerous flattened hairs.

One species, *N. nubilus* (Say), was examined. The genital structures are of similar basic design as those of *Taedia* and *Lampethusa*. The vesica has a large spherical gonopore, and a wide cylindrical ductus seminis. Specific differences are visible in the processus vesicae and the details of the spiculum. The vesica also appears to show some similarity to that of *Iribisia*, and possibly to that of *Stittocapsus* and *Adelphocoris*.

**Neurocolpus nubilus** (Say, 1832). Fig. 21.

Left clasper curved; sensory lobe large and rounded. Right clasper flattened, apex rounded.

Vesica membranous, trilobed at apex; larger lobe with a series of spines at apex; spiculum flattened, and supported by an adjacent sclerotized structure; ductus seminis broad and cylindrical, gonopore wide.

**Taedia** Distant, 1883

The genus *Paracaloecoris* Dist. has been placed in synonymy under *Taedia* Dist. (Carvalho, 1954).

The present study of the genital structures appears to indicate that this genus is very closely related to *Neurocolpus* Reut., and *Lampethusa* Dist., and seems to suggest a congeneric condition.

Genus distinguished by the cylindrical first antennal segment clothed with long, black hairs; and the subexcavated black spot situated behind each callus of pronotum.

Two species, *T. sorupeus* (Say), and *salicis* (Kngt.), were examined. The genital parts are very similar to those of *Neurocolpus* and *Lampethusa*, and indicate a very close relationship. The similarity of the vesicae also seems to indicate a relationship to *Ibrisia*, and more remotely to *Stitocapsus* and *Adelphocoris*.

**Taedia scrupeus** (Say, 1832). Fig. 22.

Claspers as in *Neurocolpus nubilus*; sensory lobe of left clasper large and pointed at apex. Right clasper with a short subapical tubercle.

Vesica as in *nubilus*, trilobed; spiculum originating at base with an accessory membranous structure beyond the middle to apex; gonopore and ductus seminis as in *nubilus*. Phallotheca as in *nubilus*. Locality: Portage, N. Y. June 27, 1915. H. H. Knight.
**Taedia salicina** (Knight, 1926). Fig. 23.

Claspers very similar in form to those of *Neurocolpus nubilus*, with minor specific differences.

Vesica very similar to that of *scruperus*. Phallotheca with a recurving tip. Locality: Ramsey Co., Minn. July 18, 1922. H. H. Knight.

**Lampethusa** Distant, 1884.

This genus falls into the *Neurocolpus* Reut., and *Taedia* Dist., group as mentioned above.

Genus distinguished by the flattened first antennal segment; and the subexcavated black spot situated behind each callus of pronotum.

One species, *L. anatina* Dist., was examined. The vesica did not appear to be significantly different in the basic structure to consider the genus distinct from the *Neurocolpus* group.

**Lampethusa anatina** Distant, 1884. Fig. 24.

Claspers very similar to *Neurocolpus nubilus* in form.

Vesica as in *nubilus*, with minor specific modifications; spiculum very slender and reduced in size. Phallotheca without a recurving tip. Locality: Chiriqui, Panama. Dec. 1918. N. L. H. Krauss.

**Irbisia** Reuter, 1879

This genus now contains as its junior synonym, the genus *Thyrillus* Uhler, 1894 (Carvalho, 1952). That a close relationship exists between the two genera may be realized by glancing at the form of the genitalia of the two species studied. Slater (1950) in his study of the female genital parts indicated this close relationship, and the present study of
the male parts further supports this view.

Genus distinguished by the black color; the rugose pronotum; and the long, dense pubescence on the head, pronotum, and hemelytra.

The two species examined were *I. sericans* (Stål), and *pacificus* (Uhler). The genital parts differ from one another in a number of small details, and suggest that a single generic component is involved.

**Irbisia sericans** (Stål, 1858). Fig. 25.

Left clasper acutely angled; sensory lobe moderately developed, bearing numerous bristles at apex; apex of body truncate. Right clasper subcylindrical, apex with two short processes.

Vesica bilobed, with a membranous lobe on each side of gonopore; sclerotized median structure furcate, one larger than the other; ductus seminis expanded subapically. Locality: Katmai, Alaska. Aug. 10, 1917. Jas. S. Hine.

**Irbisia pacificus** (Uhler, 1872). Fig. 26.

Left clasper curved; sensory lobe smaller than in *sericans*; apex of body with a recurved pointed process. Right clasper slender, cylindrical, terminating in a short pointed process.

Vesica similar to that of *sericans*, the lateral lobes larger; median structure bearing tooth-like serrations; ductus seminis as in *sericans*. Locality: Santa Maria, Calif. May 1, 1923. C. E. Hendrickson.

**Adelphocoris** Reuter, 1896

Genus superficially resembles *Stittocapsus* Kngr., separated from that genus by the longer rostrum which extends beyond the hind coxa, and
the shorter and broader cuneus.

Two species, *A. lineolatus* (Goeze), and *rapidus* (Say) were examined, and the former illustrated. The genital structures indicate the genus to be distinct, with a possible remote relationship to *Irbisia* and *Stittocapsus*.

*Adelphocoris lineolatus* (Goeze, 1778). Fig. 27.

Left clasper slender; apex with a short flat beak. Right clasper slender; apex with a short curved process.


*Stittocapsus* Knight, 1942

Genus distinguished by the long, narrow cuneus, two and one-half times longer than wide; the absence of the carina at vertex of head; the shallow longitudinal groove between the eyes; and the short rostrum extending to middle coxa.

The single species of the genus, *S. franseriae* Knight, was examined. The vesica is characteristic, essentially consisting of poorly differentiated processus vesicae, except for the spiculum, and a cylindrical ductus seminis. No close relationship to the other genera is indicated, except possibly a distant relationship to *Adelphocoris, Irbisia, Neurocolpus, Taedia* and *Lampethusa*.

*Stittocapsus franseriae* Knight, 1942. Fig. 28.

Left clasper curved; sensory lobe slight, with several stiff, short
hairs; apical fourth of body narrow, the apex with a short beak. Right clasper relatively slender with a short vertical process at apex.

Vesica tubular in outline, with a number of small membranous lobes beyond the gonopore; spiculum clavate and spinose apically; ductus seminis cylindrical. Locality: Mohawk, Ariz., April 6, 1937. Loyd L. Stitt.

**Calocoris Fieber, 1858**

Genus distinguished by the absence of the carina at vertex of head; and the short, black pubescence on the first antennal segment.

One species, *C. norvegicus* (Omel.), was examined. The genitalia appear to indicate a distinct generic group, not closely related to any other genus studied.

**Calocoris norvegicus** (Omelin, 1788). Fig. 29.

Left clasper broadly curved and uniformly slender; sensory lobe reduced; apex of body dorsoventrally flattened terminating in a short laterally compressed process. Right clasper uniformly slender with a curved apical process.

Vesica spicate rather than lobate, with six sclerotized processus vesicae; ductus seminis cylindrical, somewhat constricted before apex. Locality: "Mass."

**Polymerus Westwood, 1839**

Genus distinguished by the silky or woolly pubescence on the body and hemelytra; the small osteolar peritreme; and the slender third antennal segment, much thinner than second.

The genital structures of one species, *P. chrysopsis* Kngt., were
examined. The vesica is highly complicated in structure, having membranous lobes, spiculi, and sclerotized spinose processes. The right clasper is greatly reduced in size. These structures appear to indicate a distinct generic group.

*Polymerus chrysopsis* Knight, 1925. Fig. 30.

Left clasper slender, glabrous; sensory lobe poorly developed; body gradually narrows to a point. Right clasper cylindrical, greatly reduced in size, apex with a short tubercle.

Vesica membranous, with three spiculi, one of these recurved and poorly sclerotized at apex, connecting at base to a plate-like, serrate sclerite; similar serrate plate adjacent to the gonopore; ductus seminis tubular. Phallotheca with a sclerotized subapical tubercle. Locality: Jordan, Minn. Sand area. July 13, 1923. H. H. Knight.

*Allorhinocoris* Reuter, 1876

Genus distinguished by the very long and slender antennal segments, first segment longer than the length of pronotum; the shallowly sulcate vertex of head; the carinate side of pronotum; and the short, black bristles on hemelytra.

One species, *A. flavus* Sahlbg., was examined. The genital structures appear to show no close relationship to any other genera studied.

*Allorhinocoris flavus* Sahlberg, 1878. Fig. 31.

Left clasper gently curved; sensory lobe moderately developed, with short tubercles at base of hairs; body uniform in thickness, apex with a sharp beak. Right clasper slender, broader apically than basally, apex
with a short oblique process.


_**Stenotus Jakovlev, 1877**_

Genus distinguished by the elongate, narrow form; the absence of carina at vertex of head; and the first segment of hind tarsus longer than third. The genital structures of two species, _S. binotatus_ (F.), and _nigroquadristriatus_ (Kirk.), were examined. The genitalia seems to suggest no immediate relationship to any other genera studied.

**Stenotus binotatus** (Fabricius, 1794). Fig. 32.

Left clasper curved; the sensory lobe well developed, rounded; body laterally compressed at apex, with a ventral beak. Right clasper subcylindrical, terminating in a beaked process.

Vesica entirely membranous and spinulate, with four large bulbous lobes, and two small conical lobes; ductus seminis expanded subapically. Locality: Ames, Iowa. June 24, 1930. H. H. Knight.

**Stenotus nigroquadristriatus** (Kirkaldy, 1902). Fig. 33.

Left clasper broadly curved; sensory lobe well developed, conical; body irregular, the distal half dorsoventrally flattened with a ventral keel, the apical process laterally flattened and rounded. Right clasper with a subapical enlargement, terminating in a short process.

**Dichrooscytus Fieber, 1858**

Genus distinguished by the broad head and wide frons; the long rostrum reaching the genital segment; and the slanting eyes practically coming in contact with the pronotal angles.

One species, *D. suspectus* Reuter., was examined. No close relationship is indicated by the genitalia to the other genera studied.

**Dichrooscytus suspectus** Reuter, 1909. Fig. 34.

Left clasper gently curved, the sensory lobe well developed, rectangular in shape; body terminating in a short, notched beak. Right clasper broadest subapically, terminating in a curved and thickened apical process.

Vesica essentially bilobed, each lobe spinulate and with a number of sclerotized areas bearing heavy spines; ductus seminis simulate, moderately expanded subapically. Locality: North Haven, Conn. July 2, 1921. (no other data)

**Phytocoris Fallen, 1814**

Genus distinguished by the long, flattened hind femur, extending beyond the tip of abdomen; the enlarged lorum; and the long first antennal segment, thinner at middle, broader at base and apex, with a number of long stiff hairs.

Only two species of this large genus, *P. pallidicornis* Reut., and *tibialis* Reut., were illustrated. However, five other species were
examined, and the genital structures studied appear to indicate distinct characteristics for the genus. The vesica is featured by the presence of large tooth-like spines on one or more lobes.

Phytocoris pallidicornis Reuter, 1876. Fig. 35.

Left clasper curved; sensory lobe moderately developed; body slender, subapically expanded and dorsoventrally flattened, terminating in a short point. Right clasper very slender, somewhat angled near base, terminating in a short process.

Vesica membranous; apparently five-lobed, the lobes tubular with smaller lobes at base; one lobe with a row of heavy spines; ductus seminis expanded subapically and constricted at middle. Locality: Esterhazy, Sask. Aug. 14, 1954. Brooks & Wallis.

Phytocoris tibialis Reuter, 1876. Fig. 36.

Left clasper irregularly curved; sensory lobe small; body slender with a moderate enlargement and a row of spines at middle; apex dorsoventrally compressed and expanded into a short tubercle laterally, terminating in a sharp point. Right clasper long and slender, sharply angled at base, with a row of spines subapically; apex truncate and slightly notched.

Vesica membranous; five-lobed, the lobes tubular with smaller lobes at base; one lobe with a row of heavy spines, another with a dense crop of short bristles at apex; ductus seminis expanded subapically and slightly constricted at middle. Locality: Batavia, N. Y. Aug. 5, 1915. H. H. Knight.
Platylypus Van Duzee, 1915

Genus distinguished by the large size; the translucent and almost glabrous hemelytra; and the long rostrum.

One species, *P. grandis* Knight, was studied. The genitalia do not appear to show close relationship to any of the other genera studied. The vesica is characteristic in having a very large membranous lobe curving dorsally and anteriorly, the apex beset with a row of heavy curved spines.

**Platylypus grandis** Knight, 1918. Fig. 37.

Left clasper sharply curved; sensory lobe well developed, pointed at apex; body with a short subapical flange, apex with a beak. Right clasper rectangular in outline, bearing a long curving process.

Right lobe of vesica very large and furcate, curving dorsally and anteriorly, the larger portion edged with curved spines, the other membranous; base of lobe with a tubular process bearing a series of short spines; left process trilobed at apex; ductus seminis expanded subapically, constricted near middle. Locality: Mt. Lemon, Ariz. Santa Cat. Mts. July 26, 1917. Alt. 9000 ft. H. H. Knight.

Coccobaphes Uhler, 1878

Genus distinguished by the large size and red color, and the black second antennal segment densely clothed with short pubescence.

A single species of the genus, *C. sanguinarius* Uhle, was examined. The structures of the vesica show some unique and remarkable modifications, and seem to indicate a distinct generic group and not closely related to any of the other genera studied. The vesica is characteristic in having spinose, knob-like structures arising from the membranous lobes.
Cocobaphes sanguinarius Uhler, 1878. Fig. 38

Left clasper evenly curved; sensory lobe prominent, rounded and minutely serrate; apex of body with a flattened, curved beak. Right clasper relatively slender, terminal process flattened and curved.

Vesica essentially membranous, the right side greatly developed, with three spinose knobs, the two apical knobs connected by a row of spines; two other such knobs near the gonopore; gonopore large, the ductus seminis expanded subapically and constricted at middle. Phallotheca with a narrow lateral flange. Localities: Rock City, N. Y. Cattaraugus Co. July 4, 1915. H. H. Knight.

Capsus Fabricius, 1803

Genus distinguished by the black color; the clavate second antennal segment; and the tumid jugum.

One species, C. ater (L.), was studied. The genital structures do not appear to have features in common with any other genera studied. The shape of the vesica and the long clavate spiculum are quite distinctive.

Capsus ater (Linnaeus, 1758). Fig. 39.

Left clasper sharply angled; sensory lobe prominent; apex of body with a thick, curved process. Right clasper cylindrical, with a subapical concavity on the median side, broad oblique process at apex.

Vesica subsymmetrically Y-shaped, the arms of the Y appended by spinulate lobes at base; spiculum very long and slender originating near the base; ductus seminis expanded subapically, and constricted near middle. Localities: Batavia, N. Y. June 16, 1915. H. H. Knight.
Genus distinguished by the glabrous shining appearance of the pronotum and hemelytron; the immarginate vertex of head; and the prominent lorum.

The genitalia of two species, *H. dislocatus* (Say), and *seamaculatus* (Barb.), were examined. The structures of the vesica seem to indicate that either there is a great deal of variation among the species in the genus, or that *dislocatus* is not congeneric with *seamaculatus*. The presence of the flattened quills in *seamaculatus* and the tremendous differences in the characteristics of the vesica seem to point to independent generic identity. Certainly all available species must be studied before definite taxonomic conclusions can be drawn and the relationships of species determined.

**Horcia dislocatus** (Say, 1832). Fig. 40.

Left clasper evenly curved; sensory lobe well developed, rounded; body terminating in a short process directed ventrally. Right clasper broad, narrower apically than basally; terminating in a short process.


**Horcia seamaculatus** (Barber, 1906). Fig. 41.

Left clasper evenly curved; sensory lobe conical, the margin covered with numerous stiff hairs; apex of body somewhat dorsoventrally flattened, terminating in a short, pointed process. Right clasper cylindrical with a conical basal lobe, apex gradually narrowed into a curved process.
Vesica generally sclerotized, with three subapical membranous lobes; apex covered with numerous flattened quills; two curved, slender spiculi arise midway of the vesica, with a third curved spiculum laterad of the gonopore, and a tubular, spinose structure laterally and dorsally; ductus seminis expanded subapically and slightly constricted at middle. Locality: New Braunfels, Tex. June 22, 1917. H. H. Knight.

_Ganocapsus_ Van Duzee, 1912

Genus distinguished by the shining and glabrous appearance of the pronotum; and the long black first antennal segment, in length equal to the width of the head across the eyes.

One species, _G. filiformis_ Van D., was examined. The genital structures appear to indicate a distinct generic group, although some remote relationship may exist to _Horcasia sexmaculatus_ in the presence of long stiff hairs which may be homologous to the flat quills observed in _sexmaculatus._

_Ganocapsus filiformis_ Van Duzee, 1912. Fig. 42.

Left clasper sharply curved; sensory lobe very prominent, conical; body dorsoventrally compressed towards apex, with a short terminal process; sensory lobe and body forming a deep enclosure between them. Right clasper broadest subapically, terminating in an oblique spical process.

Vesica essentially membranous, the processus vesicae tubular; right lobe with a crown of spines, and a short curved spiculum arising at the base; left lobe with a number of long stiff hairs; ductus seminis expanded subapically, and constricted at middle. Locality: Tucson, Ariz. Aug. 29,
Poecilocapsus Reuter, 1878

Genus distinguished by the glabrous, shining appearance of the pronotum and hemelytron; and the short rostrum reaching slightly beyond the first coxa.

The genitalia of one species, P. lineatus (F.), were studied. The genital structures did not appear to show any close relationship to the other genera examined.

Poecilocapsus lineatus (Fabricius, 1798). Fig. 13.

Left clasper sharply curved, uniform in thickness; sensory lobe slight, forming a short conical process; body terminating in a curved, pointed process. Right clasper with two short tubercles near base, long curved process at apex.

Vesica membranous, processus vesicae spinulate and variously shaped; central lobes broad, two lateral lobes tubular, one shorter than the other; spiculum long and slender; ductus seminis expanded subapically and constricted at middle. Locality: Ithaca, N. Y. June 11, 1912. H. H. Knight.

Lygidea Reuter, 1879

Genus distinguished by the more or less spherical eyes, only slightly emarginate on the inner side, the eyes not extending below the ventral rim of the antennal fossa; the second antennal segment nearly as thick as the first; and the prominent depression behind each callus.

The genital structures of three species, L. viburni Kngr., rosacea
Reut., and salicis Kngt., were examined, and the genitalia of viburni were illustrated. The genital parts appear to be distinct for the genus.

Lysidea viburni Knight, 1923. Fig. 4b.

Left clasper sharply curved; sensory lobe prominent, rounded; apex of body flattened, terminating in a short process directed ventrally. Right clasper slender with a small lobe near base; apex with an oblique, flattened process.

Vesica membranous, trilobed, the lobes tubular; two larger lobes each bearing a series of curved spines at apex; ductus seminis expanded subapically and constricted at middle. Phallotheca with a narrow lateral flange before apex. Locality: Batavia, N. Y. June 24, 1915. H. H. Knight.

Tribe RESTHENINI Reuter, 1905

The Resthenini are characterized by the greatly reduced and almost invisible osteolar peritreme; the broad pronotal collar, with the mesal length usually as great as the width of callus; the pronotum and hemelytra usually covered with numerous papilla-like structures giving the members a velvety appearance; and the black color, with reddish or yellow markings.

The relationship of the genera as indicated by the genital structures appears to be to the genera of the Mirini. The claspers and the vesica are of the similar design and represent a characteristic morphological structure. Aside from the external differences which seem to be no more pronounced here than between other genera of the Mirini, the genitalia of the species examined in the tribe appear to reveal no significant differences in the structure of the vesica to support the present tribal distinction for the group. However, more material must be examined before definite conclusions
can be formulated regarding the relationships and taxonomic position of this tribe.

Approximately 14 genera are included in the tribe, and species from only one genus, *Prepops* Reuter, were available for study. The genitalia indicate typical Mirini characteristics.

*Prepops* Reuter, 1905

Carvalho (1952) considered *Opisthauria* Reut. as a synonym of *Platytylletus* Reut. Carvalho (1954) later considered *Platytylletus* as a synonym of *Prepops*. A study of representatives of these nominal genera seems to indicate a very close relationship in the form of the genital parts. The female genitalia also seem to indicate this close relationship (Slater, 1950).

The genital structures of *P. clandestina ventralis* (Knight), and *insitivus* (Say) were examined. The genitalia indicate the typical structures observed in the Mirini.

*Prepops clandestina ventralis* (Knight, 1918). Fig. 15.

Left clasper gently curved; sensory lobe small; body narrowing to a point at apex. Right clasper broader at base and gradually narrowing to a tooth at apex.

Vesica membranous with three tubular and three sclerotized processus vesicae; ductus seminis enlarged subapically and constricted at middle. 

*Prepops insitivus* (Say, 1832). Fig. 16.

Left clasper robust and angular; sensory lobe larger than in
clandestina ventralis; body enlarged before the apex, then narrowing to a beak. Right clasper with the apical beak at right angle to the body.

Vesica similar to that of clandestina ventralis but processus vesicae modified in shape; ductus seminis similar to that of clandestina ventralis.


Tribe HERDONIINI Distant, 1901

The Herdoniini are distinguished by the ant-like appearance; the constricted abdomen at base; and the lateral margin of pronotum rounded as in Pithanini.

The relationship of this tribe as indicated by the genitalia appears to be closer to the Mirini than to the other tribes. The claspers and the vesica are of the conventional design found to be common in the Mirini. The ant-like form is certainly a highly specialized adaptation, but the genitalia, possibly because of their higher resistance to adaptational change, remain relatively unchanged. Apart from the pronounced external difference between the members, the genital structures of the species examined did not appear to show differences of any significance to bring support to the tribal distinction for the group.

Approximately 18 genera are included in the present tribe, one of which was available for study. Certainly more material must be examined before the limitations and relationships of the tribe can be determined.

Dacerla Signoret, 1887

The genitalia of D. formicina Parsh., were examined. The genital parts illustrate characteristics that are similar to those of the
Mirini.

Dacerla formicina Parshley, 1921. Fig. 47.

Left clasper sharply curved; the sensory lobe small; body with a series of short spines; apex with a very short tooth. Right clasper sub-oval in shape, minute tooth at apex.

Vesica somewhat sclerotized, the gonopore between two bifurcate processes, one completely sclerotized, the other partly membranous toward apex; ductus seminis subcylindrical. Phallotheca with a short apical hook curving dorsally. Locality: Moscow, Idaho. Viola Grade, June 19, 1932. W. E. Shull.
This is the third largest subfamily of the Miridae, and at the present time is composed of three tribes containing approximately 138 genera. Material from these three tribes, Orthotylinae Van Duzee, Halticini Kirkaldy, and Pilophorini Reuter was available for study during this investigation. The present study of the subfamily included 36 species representing 26 genera.

The subfamily Orthotylinae is distinguished by the large and free arolia arising between the tarsal claws, the arolia usually spindle-shaped and parallel or convergent. The pronotal collar is generally present, but unlike that of the Mirinae is of the depressed type, and not separated from the remainder of the pronotum by the groove.

Because of their great variability in size and shape, the male claspers cannot be generalized for the subfamily. In the tribes Orthotylini and Halticini, the claspers are extremely irregular in form, and in general, the left clasper is smaller than the right clasper. In the Pilophorini the left clasper is larger than the right.

The vesica of Orthotylini is basically similar to that of Halticini, the most distinguishing feature being the nature and the appearance of the ductus seminis and the gonopore. The ductus seminis is a simple and flexible cylindrical tube, with the gonopore opening subapically and ventrally when the vesica is in a state of repose. In dorsal view the rim of the gonopore has a characteristic conical or horseshoe outline, and this feature has been found to be characteristic for Orthotylini and
Halticini.

The processus vesicae, when developed, is heavily sclerotized, and varies considerably in outline between genera and allied groups, from slender spiculum-like structures, to twisted, serrate, and flattened sclerites. The phallotheca generally is a simple membranous sheath.

The vesicae of the Pilophorini, like the claspers, show a highly pronounced difference in the basic structural pattern and seem to indicate no close relationship to the other two tribes in the subfamily. The vesica is highly sclerotized and rigid, the gonopore in appearance is very different from the tribes above, the opening facing dorsally when the vesica is in a state of repose.

The tribes of the Orthotylininae studied disclose a number of very interesting situations. In the Orthotylini, the vesica varies from a simple to a highly complex type. Orthotylus, Lopidea, and Labopidea represent one extreme and are typified by the presence of one to many sclerites of variable shape. Ceratocapsus represents the other extreme in that the sclerites are absent, and only the ductus seminis appears to be present with a sheath-like processus vesicae.

Also in the Orthotylini, Semium hirtum Reut. illustrates an unusual case. The genital structures indicate a strong similarity to those of the Phylinae, both in the likeness of the claspers and the details of the vesica. The female genital parts also suggest this relationship to the Phylinae (Slater, 1950). If the genital structures are to be considered as indicators of relationship, then Semium hirtum Reut. appears to be closely related to the genera of the Phylini, and it is the writer's conclusion that this genus rightfully belongs with the Phylinae.
The tribe Halticini contains what appears to be an assemblage of several unique forms. The genus Halticus presents an interesting situation. It is the only genus of the group studied which has a simplified type of vesica, while the other genera have such diverse specialization that the genital structures appear to show no apparent relationship to the type genus. The same situation may exist in this tribe as observed in the Orthotylini where both conditions of simplicity and complexity of structures were found to be prevalent in the group.

The relationship of Orthocephalus to the other members of the tribe appears to be quite unusual as far as can be detected from comparison of the vesicae, although the claspers do display considerable similarity. At first glance the vesica appears to be quite distinct from the other Orthotylini studied. However, the deviation in the vesica seems to be no greater than that found between members of the Phylini or the Deraeocorini. The puzzling structure is the subapical expansion of the ductus seminis, and the presence of a distinct membranous sac-like processus vesicae enclosing the gonopore and bearing two internal spiculi. It is reasonable to assume that this is a modified Orthotylinae type of vesica as the essential features are still evident although obscure. When the gonopore is viewed from lateral aspect it has a similar outline to that of typical members of the Orthotylini.

In the tribe Pilophorini six genera were examined and only two, Sericophanes and Pseudoxenetus, show their affinity to the Orthotylinae. In Pilophorus, Alepidea, and Cyrtopeltocoris the vesica is unique in being rigid and slender, with a subapical gonopore, and quite distinct from the other members encountered in the subfamily. This type of vesica has been
observed only in the Phylinae, and the present conclusion of the writer is that Pilophorus, Alepidea and Cyrtopeltocoris do not appear to belong to the Orthotylinae in spite of the convergent arolia possessed by the members, but rather to the Phylinae.

A study of the external appearance of these groups also appears to indicate the relationship to genera of the Phylinae. The pronotal collar is absent, and the ant-like appearance of the forms resembles certain members of the Phylinae. The convergent arolia is perhaps a modification to complement the myrmecomorphic appearance, as a further adaptation to a specialized type of habitat.

Sericophanes and Pseudoxenetus differ in their genital structures to the extent found between Orthotylus and Ceratocapsus. Pseudoxenetus is very closely related to the typical genera of the Orthotylini, while the vesica of Sericophanes approaches in similarity that of Ceratocapsus. The vesica appears to indicate a close relationship, and from these observations it seems logical that the two genera above should be included with the Orthotylini.

Cyphopelta apparently belongs to still another subfamily. The genitalia of C. modesta Van D. show a strong likeness to the genera of the Mirinae. The claspers are similar in form to the genera of the Mirinae. The vesica with the bulbous processus vesicae and the characteristic gonopore is also of the typical form found in the Mirinae. The slender arolia, however, have a tendency towards parallelism or slight oval convergence.

If the genitalia are to be considered of significance in interpreting
generic relationships then Pilophorus, Alepidea, and Cyrtopeltocoris do not appear to belong to the Orthotylinae but rather to the Phylinae, while Pseudoxenetus and Sericophanes seem to belong to the Orthotylini, and Cyphopelta to the Miriniae.

The vesica and its characteristic outline appear to indicate that this structure is of real significance in determining the taxonomic relationships between genera and higher categories of the subfamily. However, the scant suggestive evidence on hand certainly makes it apparent that a more extensive study of the genera included in this subfamily is necessary in order to determine the relationships and the generic and tribal limits of the included species.

Tribe ORTHOTYLINI Van Duzee, 1916

The Orthotylini are characterized by the extremely irregular or asymmetric claspsers, the left clasper generally smaller than right; the vesica with a cylindrical ductus seminis, rim of gonopore horseshoe-shaped, opening subapically; the sclerites slender, flattened, forked, or serrate, variable in number, arising dorsally to the ductus seminis; and the phallos-theca a simple membranous sheath.

Approximately 80 genera are included in the tribe. Only 20 species from 15 genera were examined during this study. The genital structures of these species show typical group characteristics and thus seem to provide a reliable means by which closely related genera and species may be placed into apparently natural groups.
Orthotylus Fieber, 1858

Genus distinguished by the pallid green color, occasionally with black markings; the elongate narrow form; and the prominent carina at vertex of head, without stout black bristles.

Two species, *O. notabilis* Knight, and *ornatus* Van D., were examined. The vesica is characteristic in having four long, slender sclerites, a condition not observed in the other genera studied.

**Orthotylus notabilis** Knight, 1927. Fig. 48.

Left clasper with slender, cylindrical sensory lobe, distal half densely clothed with pubescence; body extending obliquely away from the base of the sensory lobe, slender, the apex recurved into a hook. Right clasper flattened, subapical rounded expansion bearing a number of small spines on the median surface; apical portion curved inwardly and terminating in a short point.

Vesica consists of ductus seminis and four strip-like, curving and serrate sclerites, one with short side fork near base; sclerites attached to basal plate, apex bearing five short digitate spines. Locality: Riley Co., Kans. June 5, P. J. Parrott.

**Orthotylus ornatus** Van Duzee, 1916. Fig. 49.

Left clasper similar to that of *notabilis*, but distal half of sensory lobe more slender, with short arical process; body as in *notabilis* but apex sharply angled. Right clasper as in *notabilis* but expansion larger, the spines limited to the outer margin.

Vesica basically similar to that of *notabilis*, but specific differences evident in the sclerites. Locality: Horseye Falls, N.Y. June 23, 1916.
Melanotrichus Reuter, 1875

Genus distinguished by the small size; the scale-like hairs intermixed with nearly erect bristles on head, pronotum, and hemelytra; the head with a distinct posterior margin bearing long hairs; and the tibiae without black spots at base of spines.

One species, *M. althaeae* (Huss.), was examined. The genitalia indicate a relationship to a group characterized by the presence of three sclerites of the vesica, with an affinity to *Pseudopsallus*, *Reuteria*, and *Heterocordylus* studied. The claspers are quite simple in form and do not resemble anything studied in the tribe.

*Melanotrichus althaeae* (Hussey, 1924). Fig. 50.

Left clasper slender, evenly curved, terminating in a short apical process. Right clasper slender, broadly curved, the apex laterally compressed into a long terminal process.


Pseudopsallus Van Duzee, 1916

Genus distinguished by the green color; the white dense pubescence mixed with erect hairs on the body; and the black spots at base of spines on the tibiae.

One species, *P. artemisiicola* Kngt., was examined. The structures of the vesica seem to indicate an affinity to a group of genera featured by
the three sclerites as in *Melanotrichus*, *Reuteria*, and *Heterocordylus*, although closer relationship may exist to *Melanotrichus* than to others. The claspers, however, are quite different in the two genera.

**Pseudopsallus artemisicola** Knight, 1930. Fig. 51.

Left clasper triangular, flattened, one end with two short tubercles, other end with a long slender process. Right clasper quadrangular, two flattened processes medially.

Vesica with three sclerites, two of the sclerites serrate apically; other characteristics as in *Melanotrichus*. Locality: Hudson, Colo. Aug. 25, 1925. H. H. Knight.

**Reuteria** Puton, 1875

Genus distinguished by the pallid color of the hemelytra; the rounded eyes set near the middle of head and removed from the anterior margin of pronotum; and the two longitudinal black lines on the first antennal segment.

One species, *R. fuscicornis* Knight, was examined. The structures of the vesica seem to indicate an affinity to the general group characterized by the three sclerites, including *Melanotrichus*, *Pseudopsallus*, and *Heterocordylus*. The claspers, however, are quite distinct in *Reuteria*.

**Reuteria fuscicornis** Knight, 1939. Fig. 52.

Left clasper slender, apical portion of body divided into two processes with a short prong between. Right clasper with the basal and median processes multidentate; apical process long, slender and sharply bent at middle.
Vesica with three sclerites, two sclerites long and flattened with serrate margins, one of these with a short median fork; third sclerite long and very slender. Locality: Strawberry Point, Iowa. July 27-29, 1927. Harris & Johnston.

_Heterocordylus_ Fieber, 1858

Genus distinguished by the black or reddish color; the thickened sub-apical portion of the second antennal segment; and the scale-like pubescence intermixed with short regular pubescence.

One species, _H. malinus_ Reut., was examined. The genital structures indicate distinct generic characteristics with a possible relationship to the group including _Reuteria, Pseudopsallus_ and _Melanotrichus_. This affinity to the group is evidenced by the three sclerites of the vesica. The claspers and the vesica of this genus show a marked degree of modification from the other genera. _Pseudoxenetus_, presently placed in the Pilophorini, also may be closely related to this group of genera.

_Heterocordylus malinus_ Reuter, 1909. Fig. 53.

Claspers large and irregular; left clasper flattened with a number of slender processes and shorter tubercles as illustrated. Right clasper laterally compressed; short prong at base and three processes apically.

Vesica with three sclerites; two sclerites compressed and serrate near apex, other sclerite cylindrical basally, compressed apically, with serrate margin. Locality: Ithaca, N.Y. June 27, 1920. H. H. Knight.

_Ilopidea_ Uhler, 1872

Genus distinguished by the reddish-orange and black color; and the
oblique suture on the gena extending from antennal fossa to beneath the eye.

Three species, L. media (Say), confluens (Say), and teton Kngr., were examined. The genitalia of these species indicate significant specific characteristics and a possible relationship to the genera possessing two sclerotized processes of the vesica. This group includes Illacora, Illacorella, Slaterocoris, and Hadronema.

Lopidea media (Say, 1832). Fig. 54.

Left clasper greatly developed beyond the base into a rectangular structure; apex divided by a deep groove; sensory lobe with a short tubercle. Right clasper very large, with a long slender process; body broad, with a median tridentate tubercle; subapical tubercle quadridentate, apex with a row of teeth.

Vesica with two sclerites, one spiculum forked subapically, the other attached to a basal plate. Phallotheca with a shallow subapical notch.


Lopidea confluens (Say, 1832). Fig. 55.

Left clasper similar to that of media but smaller and more rounded rather than angular. Right clasper elongate, basal tubercle reduced, mesially located, curved; subapical tubercle short, apex broadened, one extremity rounded, the other with a sharp process, the area between studded with several rows of teeth.

Vesica very similar to that of media with minor specific differences.

Locality: "Ia. Exp. Sta. Ac. Cat. 739."
Lopidea teton Knight, 1923. Fig. 56.

Claspers similar to those of confluens in general form, but with pronounced specific differences.

Vesica similar to that of media and confluens with various specific modifications. Locality: 7 mi. NW Thompson, IA. June 30, 1928. G. O. Hendrickson.

Ilnacora Reuter, 1876

Genus distinguished by the green color; the body with black scales between light-colored bristles; the pronotum with black scaly spots; and the tibiae without dark spots at the base of spines.

One species, I. stalii Reut., was examined. The genital parts show an affinity towards the species of Lopidea examined. Except for the color difference of the species and the scale-like pubescence, the similarity of structures indicates a very close relationship.

Ilnacora stalii Reuter, 1876. Fig. 57.

Claspers similar to those of Lopidea; left clasper as in confluens, but more slender. Right clasper with a slender basal and median processes; subapical process quadridentate; apical portion slender, gently curving, serrate towards apex.

Vesica similar to those of I. media and confluens but the fork very short and the basal plate appears to be absent. Locality: Ames, Iowa. Sept. 29, 1924. H. H. Knight.

Ilnacorella Knight, 1925

Genus resembles Ilnacora, but may be separated from it by the black
bristles with silvery or black scales between; the pronotum without black scaly spots; and the first antennal segment much longer than the width of the vertex between the eyes.

One species, *I. sulcata* Knight, was examined. The structures of the vesica, by virtue of the two sclerites appears to show a relationship to species of Lopidea, *Ilacora*, Slaterocoris, and Hadronema studied. The genital claspers also show a similar tendency of relationship, although the modifications are more extreme.

*Ilacorella sulcata* Knight, 1925. Fig. 58.

Claspers very similar to those of *Ilacora*; left clasper with a long and slender apical process arising at a sharp angle. Right clasper angled, basal and median process slender, apical portion with a slender process and one shorter prong.

Vesica with two sclerites, one sclerite a large grooved process, the other short and forked, arising at the base of the other; other characteristics as in *Ilacora*. Locality: Shoshone N. Forest Wyo. Aug. 7, 1927. H. H. Knight.

*Slaterocoris* Wagner, 1956

This genus proposed by Wagner contains the North American species formerly placed in *Strongylocoris* Blanch. Wagner further suggests that the species of *Slaterocoris* have a greater affinity to the species of Orthotylini than to any other group. The present study of the genus is in full agreement with this view.

Genus distinguished by the black shiny color; the sharp well-defined carina of the head; the two disc-like impressions between the eyes; and the
generally pubescent form.

Two species, *S. stygicus* (Say), and *hirtus* (Knight), were examined. The genital structures of these species indicate a distinct generic group with an affinity to the genera characterized by the presence of two sclerites as in *Hadronema, Illacora, Illacorella* and *Lopidea*.

**Slaterocoris stygicus** (Say, 1832). Fig. 59.

Left clasper curved, slender, somewhat compressed apically. Right clasper broadly curved, basal process pentidentate, distal portion spread out into a row of four or five processes.

Vesica with two sclerites, one spiculum flattened and curved near apex, the other forked and serrate. Locality: Ames, Iowa. June 18, 1928. H. H. Knight.

**Slaterocoris hirtus** (Knight, 1938). Fig. 60.

Left clasper evenly curved, relatively uniform in thickness; apex with a very short process. Right clasper broadly curved, thicker at base, more slender beyond the median process, apex trifurcate.


**Hadronema** Uhler, 1871

Genus distinguished by the generally dark color, with traces of reddish; and carina at vertex of head with erect, stout, black bristles.

One species, *H. militaris* Uhler, was examined. The structures of the vesica seem to indicate an affinity to a general group characterized by the presence of two sclerites, as in *Lopidea, Illacora*, and *Illacorella*. 
studied. The presence of a membranous sac enclosing the gonopore region appears to presage the condition that becomes fully evident in certain genera of the Halticini, particularly Orthocephalus.

_Hadronema militaris_ Uhler, 1872. Fig. 61.

Left clasper long and cylindrical, densely clothed with long, curled, silvery pubescence; apex recurved into a short beak. Right clasper laterally compressed and gently curved; medially with a broad, short tubercle on mesial side; apex truncate with a very short point.

Vesica with two sclerites, one sclerite compressed and serrate on one side, giving rise to two very slender spiculi at apex; other sclerite tubular, spinulate; the above sclerites partially enclosed by a membranous sac. 


**Macrotyloidea Van Duzee, 1916**

Genus distinguished by the green color; the long rostrum extending beyond hind coxa; the very large clypeus; and the silvery scale-like pubescence intermixed with regular pubescence.

One species, _M. vestitus_ (Uhl.), was examined. The genitalia indicate distinct group characteristics, with a possible relationship to _Parthenicus_ and _Labopidea_. The affinity of this species for the above genera is indicated by the presence of only one sclerite adjacent to the ductus seminis. The genital claspers also bear out this relationship in their general similarity of form.

_Macrotyloides vestitus_ (Uhler, 1890). Fig. 62.

Left clasper curved, sensory lobe rounded, with minutely serrate
margin; body slender towards apex. Right clasper sharply angled, apex pointed.


Labopidea Uhler, 1877. Fig. 63.

This genus resembles Macrotyloidea but for the smaller clypeus, and rostrum not reaching hind coxa.

One species, L. simplex (Uhl.), was studied. The genital structures indicate a very close relationship to Macrotyloides vestitus (Uhl.). The similarity of the vesica and the genital claspers indicate an almost congeneric condition. Locality: Veta Pass, Colo. Aug. 9, 1925. H. H. Knight.

Parthenicus Reuter, 1876

Genus distinguished by the scale-like pubescence intermixed with ordinary bristles; vertex of head without carina; and the enlarged posterior femur.

One species, P. aridus Knight, was studied. The genital structures indicate a relationship to a distinct group including Macrotyloides and Labopidea. This affinity is indicated by the presence of one sclerite adjacent to the ductus seminis.

Parthenicus aridus Knight, 1918. Fig. 6h.

Left clasper sharply angled, with a short flattened tubercle at middle, apical portion compressed and greatly expanded to form a large, rounded subapical plate; apex flattened and truncate, curved into a
rounded process. Right clasper similar to the left but without the highly compressed and expanded apical portion.


**Ceratocapsus** Reuter, 1875

Genus distinguished by the thickened antennal segments, the three latter segments almost equal in thickness.

Two species, *C. modestus* (Uhl.), and *pumilus* (Uhl.), were examined. The genital structures suggest a distinct generic group with a possible relationship to *Halticus* and *Sericophanes*. The vesica is characteristic in its simplicity of form, essentially consisting of only the ductus seminis. The region of the gonopore is similar to that of other genera studied within the tribe, but the absence of the sclerotized processus vesicae indicates the most simplified type of vesica in the Orthotylini studied, with the gradual addition of sclerites from this genus to *Orthotylus*. The genital claspers are characteristic for the genus.

**Ceratocapsus modestus** (Uhler, 1887). Fig. 65.

Left clasper trifurcate, the processes variously shaped. Right clasper subcylindrical, gently curved, with a short tubercle near base and subapically.

Vesica consisting only of the ductus seminis, and undifferentiated processus vesicae; region of the gonopore of the typical form. Phallotheca slender and conical, sclerotized, with two dorsal flanges near base.

Ceratocapsus pumilus (Uhler, 1887). Fig. 66.

Left clasper similar to that of modestus; basal process of right clasper thinly compressed, triangular; median process elongate, narrow; distal portion somewhat delicately serrate.

Vesica similar to that of modestus but smaller; phallotheca as in modestus. Locality: Batavia, N. Y. Aug. 1, 1916. H. H. Knight.

Semium Reuter, 1875

The members of this genus have such a unique form that their unusual appearance has obscured the possible relationship of the genus to its allies. The male genitalia of the species studied show a striking affinity to the typical members of the Phylini. The vesica in particular display this extremely close relationship in the sclerotized, rigid, tube-like appearance of the ductus seminis, as well as in the curvature of the vesica. The phallotheca and the claspers also show a striking degree of similarity to the genera of the Phylinae.

The tarsal claw characteristics which have been used in considering this genus with the Orthotylinae are remarkable in their form. The feature of the genus is a pair of straight, somewhat thickened hair-like arolia between the claws. These hair-like arolia are parallel or slightly convergent at apex simulating the condition generally observed in the genera of Orthotylinae. The claws, however, by virtue of their slender, gently curving, and long form resemble the type of claws found in the members of the Phylinae.

Genus distinguished by the characteristics listed above; the lateral area of the pronotum separated from the dorsal part by a distinct suture;
the base of the pronotum raised, projecting above the scutellum, and the long, erect pubescence curved at the tips.

One species, *S. hirtum* Reut., was examined. The vesica and the claspers display characteristics that are typical of the Phylinae. The female posterior wall (Slater, 1950) was also found to be similar to that of the Phylinae. Knight (1941) had suspected this relationship to the Phylinae and placed the genus close to the Phylinae in his arrangement of the genera. The present study of the genus appears to suggest that *Semium hirtum* Reut. does not belong with the Orthotylinae but rather with the Phylinae.

*Semium hirtum* Reuter, 1876. Fig. 67.

Left clasper with the sensory lobe moderately developed, forming a receptacle with the body for the support of the vesica; body with a short subapical beak. Right clasper small, globular, and compressed, with a short apical process.


Tribe HALTICINI Kirkaldy, 1902

The tribe Halticini appears to exhibit the same general pattern in the gonopore as observed in the Orthotylini, although somewhat modified in structural details of the vesica. The genus *Halticus* exhibits a very simplified type of vesica with no apparent differentiation in the processus vesicae, while the other genera in the tribe follow a general group pattern in that the vesica has a sac-like membranous processus vesicae containing spiculi of variable size and number. In *Halticus* and *Labops*, the region of
the gonopore retains the cylindrical form as in the Orthotylini while the remaining genera have a distinctly flattened and expanded appearance when viewed from dorsal aspect. This modification in the region of the gonopore with the unique membranous sac appears to offer a sound group characteristic for the included genera studied, except for the type genus, Halticus.

Perhaps Halticus shows its greater affinity to Ceratocapsus of the Orthotylini rather than to the other genera of the present tribe. Only extensive study of this group and examination of a large number of species will disclose the natural relationships of the genera in this tribe, and their ultimate systematic position in the subfamily.

At the present time the tribe contains 23 genera, five of which were examined in this study. The vesicae of the nine species studied, with the exception of those belonging to Halticus, show unique group characteristics and thus provide what appears to be a useful criterion in determining the relationships of allied genera.

Halticus Hahn, 1832

Genus distinguished by the small size, oval form, and black color; the large hind femur modified for jumping, the head with a depression between the eyes; and the very long and slender antenna, the second segment four or five times as long as the first.

Two species, H. apterus (L.) and intermedius Uhl., were examined. The genital structures seem to indicate a distinct generic group, with a close relationship to the genera of Orthotylini. The genitalia also show an affinity to the other genera studied in the Halticini. The vesica is characteristic in its simplicity of form, essentially consisting only of
the ductus seminis, a condition also found in Ceratocapsus of the Orthotylini and Sericophanes of the Pilophorini. It is possible that the species of Halticus are more closely related to these two genera than to the other genera of Halticini. Studies of additional genera in the tribe are necessary before definite conclusions can be formulated.

Halticus apterus (Linnaeus, 1758). Fig. 68.

Left clasper curved; body broad at base, flattened subapically and sharply recurved, the margins serrate. Right clasper laterally compressed, broader apically than at base, apex with a large lateral tubercle.

Vesica very simple, with no differentiated processus vesicae; gonopore as in the genera of Orthotylini. Phallotheca dome-shaped. Locality: "Tschita Amur."

Halticus intermedius Uhler, 1904. Fig. 69.

Claspers similar to those of apterus but smaller; body of left clasper not noticeably flattened, and not recurved, apex blunt, with a slender subapical process directed toward the base. Right clasper less flattened, the lateral tubercle not as pronounced as in apterus.


Labops Burmeister, 1835

Genus distinguished by the distinctly pedunculate eyes.

Three species, L. hirtus Kngr., hesperius Uhln., and sahlbergi Fall., were examined. The genital structures indicate a distinct generic group with a close relationship to typical members of Orthotylini on one hand
and to the genera of the Halticini on the other. The distal region of the ductus seminis with its gonopore is similar in appearance to that region in the Orthotylini, while the membranous sac with the enclosed needle-like spiculi are reminiscent of certain members of the Halticini.

**Labops hirtus** Knight, 1922. Fig. 70.

Left clasper elongate slender; sensory lobe well developed, parallel to the body. Right clasper obtusely angled and laterally compressed, the angle with several short spines; distal portion apically expanded and rounded, with a short lateral process.


**Labops hesperius** Uhler, 1871. Fig. 71.

Left clasper similar to that of *hirtus* but with a gently curving body and smaller sensory lobe. Right clasper as in *hirtus* but spines replaced by stiff bristles; distal portion rounded as in *hirtus* but without the lateral process.


**Labops sahlbergi** Fallen, 1829. Fig. 72.

Left clasper as in *hesperius* but with a straight body. Right clasper similar to that of *hirtus* but without the lateral process.
Vesica as in the other species of *Labops* studied. Phallotheca with an additional apical sclerite. Locality: "Lac Nuorti Envald."

**Orthocephalus** Fieber, 1858

Gems distinguished by the black color; the white scale-like hairs with ordinary hairs or bristles; the head and pronotum with long stiff black bristles; and the vertex of head with two pale spots.

Two species, *O. mutabilis* (Fall.), and *brevis* Panz., were examined. The genital structures indicate a distinct generic group. The distal region of the ductus seminis is greatly expanded and sclerotized, similar to the condition observed in *Euryopicoris nitidus* and *Strongylocoris leucocephalus*. The membranous sac enclosing the gonopore, however, has two long spiculi rather than the needle-like spicules found in the other two genera studied. The genital claspers are also very similar in the three genera.

The vesica also appears to exhibit a certain amount of similarity to the vesica of *Cylapus* studied.

**Orthocephalus mutabilis** (Fallen, 1807). Fig. 73.

Left clasper angled; sensory lobe rounded; body slender with a short beak at apex. Right clasper laterally flattened, oval, margin serrate, apex rounded.

Orthocephalus brevis Panzer, 1798. Fig. 74.

This species is larger and less pubescent than mutabilis, with a rugose rather than smooth pronotum.

Left clasper similar to that of mutabilis; right clasper elongate, slightly flattened with a short tubercle at apex.

Vesica and phallotheca very similar to that of mutabilis. Locality: "Carinth, alp."

Euryopicoris Reuter, 1875

Genus distinguished by the small, black, oval form; the short and flat head, the posterior margin and the eyes lunate when viewed from above; and the second antennal segment shorter than width of head across the eyes.

One species, E. nitidus Mey., was examined. The details of the vesica seem to indicate the relationship to the group characterized by the expanded and flattened gonopore region and the membranous sac-like processus vesicae containing two to several short prongs or spicules. The genera with this type of genital structures are Orthocephalus and Strongylocoris. The genital claspers also indicate this relationship.

Euryopicoris nitidus (Meyer, 1843). Fig. 75.

Left clasper angled; sensory lobe with stiff bristles; body slender with a small serrate subapical flange, apex with a short beak. Right clasper obtusely angled, somewhat laterally compressed, body with several short spines and longer bristles, apex with a very short process.

Vesica with the subterminal region of the ductus seminis expanded and dorsoventrally flattened; membranous sac with several spike-like spicules. Phallotheca dome-shaped with a wider expansion towards base. Locality:
Strongylocoris Blanchard, 1840

In the recent paper by Wagner (1956) this genus has been divided into two distinct generic groups, the above genus extending into Europe, Asia, and North Africa, while Slaterocoris Wagner is restricted to North America.

The affinity of Strongylocoris is strongly towards Euryopicoris. The distinguishing characteristics listed for the latter genus also apply to Strongylocoris. The genera appear to be very closely related if not con-generic with each other.

One species, S. leucocephalus (L.), was examined. The details of the vesica show a strong affinity to the vesica of Euryopicoris, and a more distant relationship to Orthocephalus, and possibly Labops. The gonopore region is expanded and somewhat dorsoventrally flattened. The processus vesicae contain only four short spiculi. The genital claspers are very similar to that of Euryopicoris.

Strongylocoris leucocephalus (Linnaeus, 1758). Fig. 76.

Left clasper as in Euryopicoris nitidus but slightly larger; body with serrate edge. Right clasper as in nitidus but broader subapically and narrower at apex; apex without a process.

Vesica as in nitidus but larger, membranous sac with only four short spicules. Phallotheca with a large subapical dome-shaped serrate structure extending dorsally. Locality: "Thuring, German."
Tribe PILOPHORINI Reuter, 1883

The genera of this tribe studied exhibit unusual and interesting features in the structural details of the genitalia. As mentioned under the subfamily discussion, the genital structures found in Pilophorus are very different from those of the typical members studied in the Orthotylinae, in fact, the genital parts appear to be closer to those of the Phylinae than to the Orthotylinae. The vesica resembles the type found in the Phylini, both in structure and detail. The gonopore opens dorsally when the vesica is in a state of repose. The genital claspers also resemble those of the Phylini, with the left clasper larger than the right, the latter compressed and oval in outline. The arolia, however, are similar to those of Orthotylinae.

The tribe contains 27 genera, but only seven species from six genera of the present tribe were available for examination during this study. In addition to Pilophorus, two other genera, Alepidea and Cyrtopeltocoris, have been found to possess genital structures of the same general pattern, and all display their affinity to the genera of the Phylinae. The other genera studied appear to show greater affinity to the genera of Orthotylini or Halticini, and the subfamily Mirinae.

Species of Sericophanes have a simple type of vesica and approach the type found in Ceratocapsus and Halticus. Pseudoxenetus, on the other hand, is very much like a representative of the Orthotylini belonging to the general group of genera characterized by the presence of three sclerites appended to the dorsal side of the ductus seminis.

The genital structures of Cyphopelta modesta Van D. show characteristics
that have been found to be typical of the Mirinae. The bulbous, membranous
lobes and the coil-like rim of the gonopore appear to place this genus with
the genera of the Mirinae.

Sericophanes Reuter, 1876

Genus distinguished by the equal thickness of the second and third
antennal segments; the constricted abdomen at base; and the hemelytron
indentured at middle, with several silvery pollinose bands.

One species, *S. heidemanni* Popp., was examined. The genitalia appear
to show an affinity to the genera of Orthotylini rather than to Pilophorus.
Essentially, the vesica consists only of the ductus seminis with a typical
Orthotylini gonopore, thus showing a structural similarity to those of
*Ceratocapsus* and *Halticus*.

Sericophanes heidemanni Poppius, 1914. Fig. 77.

Left clasper gently curved, relatively slender; sensory lobe only
moderately developed; body with a short apical beak. Right clasper
globular, with a curving and flattened subapical process.

Vesica consists only of ductus seminis and undifferentiated processus
vesicae; gonopore region similar to that or Orthotylini. Phallotheca a

Pseudoxenetus Reuter, 1909

This genus shows an extremely strong affinity to the typical members
of the Orthotylini, particularly the group of species characterized by the
presence of three sclerites adjacent to the ductus seminis. Externally
the species show a high degree of specialization and this appearance is
atypical for the group with similar type of genital structures. However, the vesica and the claspers convincingly suggest the intimate relationship of *Pseudoxenetus scutellatus* (Uhl.) to the genera of the Orthotylini rather than to *Pilophorus*.

Genus distinguished by the elongate form; the long antennal segments; the absence of the carina between the eyes; the constricted pronotum in front; and the absent pronotal collar.

One species, *P. scutellatus* (Uhl.), was examined. The vesica and the genital claspers display typical characteristics found in the genera of the Orthotylini. The female genitalia (Kullenberg, 1947a, Slater, 1950) also indicate relationship to the Orthotylini.

*Pseudoxenetus scutellatus* (Uhler, 1890). Fig. 78.

Left clasper flattened; sensory lobe greatly developed, slender, with a very short tubercle at base; body curved, biramous at apex. Right clasper with a pronounced basal process, bidentate at apex, shallow concavity at base; apical portion globate with two short subapical tubercles.

Vesica with three sclerites; one sclerite slender and serrate apically; others broad, irregular, one with a deep subapical notch; region of the gonopore as in *Heterocordylus*. Locality: Portage, N. Y. June 22, 1916. H. H. Knight.

*Cyphopelta* Van Duzee, 1910

This genus shows a remarkable likeness to the typical members of the Mirinae. The vesica in particular displays an extremely close relationship in the similarity of the gonopore and the bulbous processus vesicae. The coiled spring-like rim of the gonopore has been observed only in the
vesicae of the Mirinae, and it is this characteristic that appears to indicate the relationship of this genus to the genera of the Mirinae. The arolia are unusual, and are atypical for both the Orthotylinae and the Mirinae as they consist of a pair of parallel or slightly convergent hair-like structures, thus indicating further the inconsistency and variability of this criterion in certain species of the Miridae.

Genus distinguished by the strongly tumid scutellum; the long antennal segments; the constricted pronotum in front; and the first segment of the hind tarsus longer than second, a condition found in some species of the Mirinae.

One species, C. modesta Van D., was studied. The genitalia reveal typical characteristics observed in the genera of the Mirinae. Cyphopelta may be related to Closterocoris, presently placed in the Phylinae, but probably is more closely related to the genera of the Mirinae as the genitalia appear to indicate.

Cyphopelta modesta Van Duzee, 1910. Fig. 79.

Left clasper curved; sensory lobe well developed into a dome-shaped protrusion; body slender, terminating in a short hook. Right clasper cylindrical, short oblique process at apex.

Vesica membranous, with several bulbous, spinose lobes, variously shaped; ductus seminis expanded subapically; gonopore typical of the Mirinae. Locality: Mt. Tamalpais, Marin Co., Cal. May 23, 1909. E. C. Van Dyke.

Pilophorus Westwood, 1876

Genus distinguished by the slender ant-like form; the constricted
hemelytra at middle, with silvery pubescent bands; and the vertex of head compressed and carinate, overlapping the anterior margin of pronotum.

Two species, *P. amoenus* Uhl., and *strobicola* Kngr., were examined. The genitalia are very unique when compared to the other genera of the Orthotylinae, and do not appear to show any close relationship to the subfamily. However, the affinity appears to be clearly indicated to the genera of the Phylinae when the vesicae and claspers are examined. The genital parts seem to be extremely similar to the genitalia that are typical of the Phylinae.

The membranous and convergent arolia place the genus with the Orthotylinae. However, if the genitalia are to be considered as an indicator of relationships, then Pilophorus appears to be more closely related to the genera of the Phylinae than to the Orthotylinae. The ant-like appearance of the members also place the genus closer to the Phylinae than to the Orthotylinae.

_Pilophorus amoenus* Uhler, 1887. Fig. 80.

Sensory lobe of left clasper greatly developed, equaling the body of the clasper in length, forming a broad depression between. Right clasper oval, laterally compressed, terminating in a short apical process.

Vesica slender, gently curved; ductus seminis highly sclerotized; gonopore located subapically; slender spiculum below the gonopore. Phallotheca sclerotized and curved to the left as in the Phylinae. Locality: Vienna, Virginia. July 23, 1926. H. H. Knight.

_Pilophorus strobicola* Knight, 1926. Fig. 81.

Claspers very similar to those of *amoenus*.

*Alepidia* Reuter, 1909

This genus has a similar aspect to that of *Pilophorus* but the members are smaller in size and the hemelytra lack the silvery pubescent bands.

One species, *A. gracilis* (Uhler), was studied. The genitalia indicate an extremely close relationship to *Pilophorus* and the two genera may prove to be congeneric. The vesica and the claspers do not appear to show significant differences in the structures to warrant distinct generic status for the members.

*Alepidia gracilis* (Uhler, 1895). Fig. 82.

Left and right clasper very similar to those of *Pilophorus* studied.


*Cyrtopeltocoris* Reuter, 1875

The genus shows an extremely strong affinity to the typical members of the Phylinae. The vesica and the claspers are very similar to those of the Phylini, and the hair-like arolia, although they have a tendency to converge at apex, are more like the type observed in the Phylinae.

Genus distinguished by the narrow form; the tumid scutellum; and the impunctate pronotum.

One species, *C. albofasciatus* Reut., was examined. The genital structures display characteristics typical of the Phylinae.
Cyrtopeltocoris albofasciatus Reuter, 1876. Fig. 83.

Left clasper with the sensory lobe greatly enlarged and expanded, with short spine at base; body truncate at apex. Right clasper very small, laterally compressed with a short apical process.

SUBFAMILY DERAEOCORINAE DOUGLAS AND SCOTT, 1865

This is a relatively small subfamily of the Miridae, composed of five small tribes containing approximately 60 genera. Material from only three tribes, Deraeocorini Douglas and Scott, Clivinemini Reuter, and Hyaliodini Carvalho and Drake, was available for study during this investigation. The study of the subfamily included 14 species representing eight genera.

The subfamily Deraeocorinae is distinguished by a pair of straight hair-like arolia between the claws as in the Phylinae, but the pseudo- arolia associated with the claws are absent. The claws are generally toothed or thickened at the base and sharply angled. The body is deeply punctured and bears long pubescence; the pronotal collar is present.

The claspers of this subfamily show considerable diversity in form. In general terms it may be stated that the left clasper is gently or sharply curved, with the sensory lobe showing variable types of development. The left clasper is consistently larger than the right clasper. The general overall appearance of the claspers tends to display an affinity to the claspers found in the Mirinae.

The vesica is highly distinctive for the entire subfamily with slight or more pronounced modifications in its structure, but not sufficiently different to obscure traces of relationship between genera and tribes of the subfamily. The most distinctive feature of the vesica is the unique construction of the region bordering the gonopore and the bulbous processus vesicae. The ductus seminis is flexible at the base. The appearance of the vesica in the Deraeocorinae strongly resembles the vesica of the
Mirinae in the ductus seminis and the processus vesicae. However, the rim of the gonopore is of an entirely different nature and does not resemble the coil-like pattern found to be so characteristic in the Mirinae. The phallotheca is likewise similar in the two subfamilies.

The vesica of the three tribes of the Deraecorinae studied disclose a certain degree of relationship to each other, with the closer affinity existing between those of Deraecorini and Clivinemini than with the Hyaliodini. However, the genital structures of the genus Hyaliodes show more resemblance to the genera of Deraecorinae than to any other group studied. The genitalia examined in the genera of Dicyphini also appear to show a certain amount of relationship to the Clivinemini and Hyaliodini rather than to the genera of the Phylinae.

The genitalia of the Deraecorinae are very distinctive and appear to be highly significant in interpreting the relationships of allied species and groups, generic limits, and limitations of higher categories.

Tribe DERAEOCORINI Douglas and Scott, 1865

The Deraecorini are distinguished by the medium-sized to large form; the generally dark color; and the vesica similar to that of Mirinae but for the margin of the gonopore, the gonopore opening into a depressed area or partially surrounded by thin serrate plates. The phallotheca is a simple membranous sheath.

The present tribe contains approximately 26 genera, five of which were studied. The genitalia of the ten species examined show characteristics that are typical for the tribe and thus provide a reliable criterion by which related species and genera could be compared and allocated to
naturally related groups.

**Deraeocoris** Kirschbaum, 1855

Certain Nearctic species of *Deraeocoris* can not be correctly keyed to the genus using the key to genera of Carvalho (1955). The members of the genus are extremely variable in form, and their further study is necessary before certain species of *Deraeocoris* could be correctly keyed to the genus using the key to the world genera.

In view of this difficulty, a number of characteristics that are present in the species of *Deraeocoris* are listed below, even though they may appear to be contrary to the characteristics listed in the couplets of the key by Carvalho. It is extremely important to check each branch of the key and to pay due respects to the faunal regions listed for the distribution of the genera.

Genus recognized by medium-sized to large species; the smooth frons; the pronotum and hemelytra distinctly punctate, and the clypeus not projecting beyond apex of the first antennal segment. The following list of characteristics appear in certain species of *Deraeocoris*: rostrum reaching middle or hind coxa; lateral margin of pronotum rounded, or sharply carinate; second antennal segment with simple type of pubescence, or with additional long setae; vertex of head carinate or smooth; and the collar of pronotum covered by white fuzzy pubescence or glabrous.

The genital structures of six species, *D. sayi* Reut., *fasciolus* Kngt., *aphidiphagus* Kngt., *ruber seguisinus* (Mull.), *atriventris* Kngt., and *histrionicus* Reut., were examined. The genital claspers resemble to a marked degree the claspers of the genera in the *Mirinae*. The vesica, although similar to
that found in the Mirinae, is distinctive by virtue of the unique gonopore, which is quite different from that found in the Mirinae.

The species studied in this genus display two closely related, but structurally distinct types of gonopores. The species, atriventris Knütt., histrio Reut., and ruber segusinus (Mull.) represent one type where the gonopore opens into a depressed area. The vesicae of these species have no sclerotized plates below the gonopore (Fig. 84).

The other type, including sayi Reut., fasciolus Knütt., and aphidiphagus Knütt., has a similar depressed gonopore, but in addition the gonopore is flanked by plate-like structures laterally, these plates being ornately serrate at their margins. The basal portion of the vesica also has a number of sclerotized plates (Fig. 87).

It is interesting to note that the type of vesica without the excessive sclerotization near the gonopore indicates a reasonable amount of similarity to the vesica possessed by certain species of the Orthotylinae. When viewed from lateral aspect the nature of the gonopore seems to display suggestive similarity to species of Orthocephalus and other Halticini. On the other hand, the similar type of bulbous processus vesicae but with the specialized type of gonopore found in the Mirinae indicate the same condition of similarity in the vesicae but to the other extreme. The relationship to the Orthotylinae was also suggested by the female genitalia investigated by Slater (1950).

Another interesting fact observed is the presence of bristle-like spines in the vesicae of D. histrio Reut., and atriventris Knütt. This type of condition has been found to be quite common in certain genera of Halticini. In the Mirini, Canocapsus filiformis Van D. and Horcias
sexmaculatus (Barb.) were found to possess structures of similar nature. This may be another indication of the distant relationship of the Orthotylinae and the Mirinae to the Deraeocorinae.

Deraeocoris atriventris Knight, 1921. Fig. 64.

Left clasper curved; sensory lobe developed into a conical process; body compressed, apex with a short beak-like process. Right clasper with a small subapical depression.


Deraeocoris histrio Reuter, 1876. Fig. 85.

Left clasper curved; sensory lobe developed into a truncate process; body slender, apex pointed. Right clasper subcylindrical, area before the apex somewhat excavated, apical process pointed.

Vesica similar to that of atriventris, two larger lobes each bearing a short apical process; spiral sclerite larger than in atriventris with bristle-like spicules, longer; gonopore opens into a depressed area. Locality: Ft. Madison, la. July 12-13, 1927. Harris & Johnston.

Deraeocoris ruber segusimus (Muller, 1766). Fig. 86.

Left clasper gently curved; sensory lobe developed into a curved conical process; body somewhat flattened, with a sharp inner ridge, and a short subapical beak. Right clasper cylindrical, apical process broad.

Vesica membranous, with three short sclerites; lobes tubular, one

Deraeocoris sayi Reuter, 1876. Fig. 87.

Left clasper gently curved; sensory lobe large, projecting into a conical process; body somewhat flattened, short process at apex. Right clasper subcylindrical; apex T-shaped.

Vesica very distinctive; gonopore bordered by two lateral plates, margins with multidentate projections; structures below the gonopore highly sclerotized; processus vesicae above the gonopore consisting of membranous lobes bearing variously shaped sclerites. Locality: Payne County, Oklahoma. Electric light. May 19, 1921. W. J. Brown.

Deraeocoris fasciolus Knight, 1921. Fig. 88.

General aspect of claspsers similar to that of sayi; left clasper with a large sensory lobe but without the conical process.

Vesica very similar to that of sayi in the region of the gonopore, membranous lobes, and the sclerites, with slight modifications in these structures. Locality: Elkader, Iowa. July 28, 1927. Harris & Johnston.

Deraeocoris aphidiphagus Knight, 1921. Fig. 89.

Left clasper as in sayi, but the conical process of sensory lobe much larger; body cylindrical, apex without the beak. Right clasper angled, very short beak at apex.

Vesica similar to that of fasciolus but membranous lobes larger and more numerous; sclerites somewhat modified; gonopore and surrounding structures similar to that of fasciolus. Locality: Batavia, N. Y. July 7, 1916. H. H. Knight.
Deraeocapsus Knight, 1920

This genus has the same distinguishing characteristics listed under Deraeocoris. Distinguished from Deraeocoris by the distinctly clavate second antennal segment; the tarsal claws not toothed at base; and the first segment of hind tarsus considerably longer than in Deraeocoris.

One species, D. fraternus Van Dusen, was examined. The claspers and the vesica display a striking similarity to Deraeocoris, particularly the group characterized by the presence of plate-like structures below the gonopore as in sayi, fasciolus, and aphidiphagus. The genital parts are so alike that a very close relationship is indicated. Indeed, the differences in the genitalia are less pronounced between these two genera than between species of Deraeocoris.

Deraeocapsus fraternus Van Dusen, 1916. Fig. 90.

Claspers similar to that of Deraeocoris ruber seguinus; sensory lobe of left clasper with a broad conical process; body flattened with a beak at apex. Right clasper more flattened and elongate than in seguinus, but apical process similar.

Vesica generally with membranous processus vesicae, two larger lobes tubular; two sclerites present, one paddle-shaped, the other slender; gonopore as in Deraeocoris; two sclerotized plate-like structures below the gonopore, the area between studded with short barbs. Phallotheca with a short subapical flange. Locality: Anthony-Cutchflat Trail, 7100-7850 ft. Blue Mts., Ore. Aug. 8, 1929. H. A. Scullen.

Eustictus Reuter, 1909

Genus distinguished by the striate frons and sulcate vertex; and the
very large eyes, thus leaving only a very narrow sulcate vertex between the eyes.

One species, *E. catulus* (Uhl.), was studied. The structures indicate the group to be distinct within the tribe. The affinity of the genus may be towards *Klopicoris* and *Eurychilopterella*. The gonopore is in the form of a trough, the margins serrate. A broad plate partially surrounds the base of the vesica.

**Eustictus catulus** (Uhl., 1894). Fig. 91.

Sensory lobe of left clasper large, suboval, bearing long bristles curved at apex; body perpendicular to the lobe, slender, apex pointed. Right clasper subovate, apical process slender and curved. Vesica membranous above gonopore, bilobed, the lobes tubular; gonopore opens into an elongate scooped-out area, margins serrate; base partially enfolded by serrate sclerite. Locality: Gillette, Tex. June 26, 1917. H. H. Knight.

**Klopicoris** Van Duzee, 1915

Genus distinguished by the clavate second antennal segment; the slightly tumid scutellum; the glabrous and impunctate hemelytra, except for the claval suture; and the deep cuneal fracture.

One species, *K. phorodendronae* Van D., was examined. The genital structures indicate a distinct generic group with a possible relationship to *Eurychilopterella* and *Eustictus*. The gonopore is of the excavated type, spoon-shaped, with two plate-like structures and a spiculum below the gonopore, and tubular lobes above.
**Klopicoris phorodendronae** (Van Duzee, 1914). Fig. 92.

Sensory lobe of left clasper small; body slender at base, expanded and flattened apically, terminating in a sharp point. Right clasper subcylindrical, bent near middle.

Vesica membranous above the gonopore, lobes tubular; gonopore region excavated, the concavity studded with barbs; two thin plate-like structures and a short spiculum present below the gonopore. Locality: Chiricahua Mts., Ariz. Alt. 6200 ft. June 20, 1928. A. A. Nichol.

**Eurychilopterella Reuter, 1909**

The species of this genus have the same general aspect as species of *Deraeocoris*, but are distinguished by the projecting clypeus which extends beyond the apex of first antennal segment.

One species, *E. luridula* Reut., was examined. The structures of the genitalia appear to show a distinct generic group. Relationship to *Klopicoris* is suggested by the similarity in the claspers and the vesica, with more remote affinity to *Eustictus*. The vesica has an elevated ridge below the gonopore which appears to be similar to the plate-like structures observed in the preceding species.

**Eurychilopterella luridula** Reuter, 1909. Fig. 93.

Left clasper very similar to *Klopicoris phorodendronae*, but with a larger sensory lobe, and apical portion of body not as flattened. Right clasper wedge-shaped at apex.

Vesica membranous above the gonopore, the processes tubular with one spiculum; gonopore region depressed, suboval; thin ridge joins the base of vesica with the gonopore. Locality: Holly, N. Y. July 8, 1914. H. H. Knight.
Tribe CLIVINENMINI Reuter, 1875

The genera of this tribe are distinguished by the impressed line running from antero-lateral corner of pronotum to posterior of the callus. Some members of the tribe are very diverse in form, exhibiting a number of characteristics, such as hooded pronotum, very dense, long pubescence and fuzzy white pubescence, or a completely glabrous condition. The tarsal claw characteristics are as in the Deraeocorini.

Of the ten genera included in the tribe, species of only two genera were available for study. In addition, species of Bothynotus illustrated by Kullenberg (1947a) indicate that the species have similar type of genital structures as observed in Larvidea and Clivinema, and that all belong to the same general group of genera. In spite of the extreme morphological variation between genera, the genital structures are distinct and indicate an affinity towards certain species of Klopicoris and Eurychilopterella of the Deraeocorini. The phallotheca is a simple dome-shaped sheath.

Clivinema Reuter, 1875

Genus distinguished by the unique pronotum projecting over the head in the form of a hood; the dense, somewhat flattened and apically curved pubescence of the pronotum and hemelytra; the tumid scutellum covered with dense pubescence; and the second antennal segment as thick as first.

One species, Clivinema villosa Reut., was examined. The genitalia show an affinity to Eurychilopterella and Klopicoris in the form of the claspers and the vesica. The gonopore reflects to a certain degree the type observed in Deraeocorini, particularly the scooped-out region forming a trough from the opening of the gonopore to the apex of the vesica.
Clivinema villosa Reuter, 1876. Fig. 94.

Sensory lobe of left clasper moderately small, fairly uniform in thickness throughout; body slender, the apical portion only slightly flattened, apex pointed. Right clasper short, cylindrical, apex notched, with two short processes.

Vesica partly membranous, with several lobes; broad sclerite adjacent to gonopore; gonopore opening into a shallow trough; free slender spiculum originating near base of vesica. Locality: College Station, Tex. Oct. 12, 1928. Light trap. S. E. Jones.

Largidea Van Duzee, 1912

Genus distinguished by the cystiform rather than hooded anterior margin of the pronotum; the carinate lateral margin of pronotum, and the stout and clavate second antennal segment.

One species, L. rubida (Uhl.), was studied. The affinity of this genus appears to be to that of Clivinema. The claspers are very similar to those of Clivinema, but the vesica is slightly modified in having no terminal sclerite, and the membranous sac is fused to the spiculum for support. The vesica is very similar to that of Bothynotus illustrated by Kullenberg (1917a).

Largidea rubida (Uhler, 1904). Fig. 95.

Claspers very similar to that of Clivinema villosa; basal development of left clasper slightly larger. Right clasper broader apically than basally.

Vesica membranous with several spinulate lobes; one slender rib-like sclerite adnate to the sac, giving rigid support to the lobes beyond the

Tribe HYALIODINI Carvalho and Drake, 1943

The tribe is distinguished by narrow, slender form; the hyaline, transparent and glassy hemelytra; and the greatly enlarged emboliar margin.

A close relationship of this tribe may exist to the genera of Dicyphiini as certain external and genitalic characteristics were found to be common to both of these tribes (Slater, 1950), although each has been placed under a different subfamily. As can be ascertained from the material on hand, the Dicyphini appear to be closer to the Cylapinae and to the tribes of Deraeocorinae than to the tribes of Phylinae.

Presently the tribe contains 14 genera, and species from only one genus, Hyaliodes, were available for this study.

Hyaliodes Reuter, 1876

Genus distinguished by the elongate-slim form; and the eyes not noticeably large, occupying the anterior lateral portion of the head, removed from the collar by a distance approximately equal to the eye.

Two species, _H. vitripennis_ (Say), and _harti_ Knüg., were examined. The genital structures are distinctive for the group. The genus shows some relationship to genera of Clivinemini, certain genera of Deraeocorini, and likely to genera of Dicyphini. The genital claspers are slender, the left clasper sharply bent near the base and partially constricted near apex. The vesica consists of several membranous lobes terminating in slender sclerotized processes or several spine-like
structures along the lobe. The gonopore is similar to that of the Deraeocorinae, particularly to *Largidea* and *Clivinema*, but lacking the trough-like depression of *Clivinema* that continues beyond the gonopore opening. The gonopore opens ventrally as in the other genera of Deraeocorinae. The phallotheca is a simple, dome-shaped sheath.

**Hyalioodes vitripennis** (Say, 1832). Fig. 96.

Left clasper slender, uniform in thickness, sharply bent near base; body constricted subapically, terminating in a pointed process. Right clasper slender, sinuate.

Vesica membranous, the lobes terminating in a slender, spiculum-like processes; ductus seminis flexible as in the other genera of the subfamily. Locality: Ottumwa, Iowa. July 15, 1927. Harris & Johnston.

**Hyalioodes hartii** Knight, 1941. Fig. 97.

Left clasper similar to that of *vitripennis* but with deeper constriction near apex. Right clasper broader and more angled.

SURFAMILY PHYLINAE DOUGLAS AND SCOTT, 1865

At the present time this is the second largest subfamily of the Miridae, composed of three tribes containing approximately 190 genera. Material from the three tribes, Phylini Douglas and Scott, Hallodapini Van Duzee, and Dicyphini Reuter, was available for examination. The study of the subfamily included 27 species representing 18 genera.

The subfamily Phylinae is distinguished by the pair of straight hair-like arolia between the claws instead of the swollen, or membranous arolia found in the Mirinae and Orthotylinae. The pseudarolia are present or absent, either free or connected with the claws, and arise from the base or inner margin of the claws. The pronotal collar is usually absent.

The genital structures of the Phylini and Hallodapini studied display extreme uniformity in outline and thus can be generalized as typical for the tribes. The Dicyphini differ considerably from the other two tribes, both in the external appearance and the genitalia, and suggest no immediate relationship to the other two tribes.

In the species of Phylini and Hallodapini, the genital claspers are very similar in outline. The left clasper is typically biramous, the process of the sensory lobe and the process of the body forming a concavity between them in which rests the terminal part of the phallus when in a state of repose. The right clasper is smaller than the left, generally laterally compressed, oval in outline, and bears a short process at apex. The distinguishing feature of the vesica is the highly sclerotized and rigid ductus seminis, variously twisted and terminating in one or two slender
processes. The gonopore is oval in outline and may be situated anywhere beyond the middle of the vesica or just below the apex. The phallotheca is characteristic in that the terminal portion is rigid and sharply bent to fit the contour of the vesica.

The species of the two tribes above illustrate a homogeneity of structures with very little variation in the basic pattern of the genital parts, although there is considerable difference in the external appearance of the Phylini as compared to the Hallo dapini. The genital structures seem to indicate such a very close relationship of these two tribes, both in the likeness of the claspers and the details of the vesicae, that it may be argued that they represent only a single tribe.

*Closterocoris amoenus* (Prov.), of the tribe Hallo dapini, indicates an unusual situation. The genital structures indicate typical Mirinae characteristics, both in the similarity of the claspers and the anatomy of the vesica. The arolia, however, appear to be a pair of parallel hair-like structures, a condition more typical of the Phylini than the Mirinae. This species reflects a condition found in Cyphopelta modesta Van D., now in the Orthotylineae, to which *Closterocoris* may be somewhat closely related. If the genital structures are to be considered of taxonomic value as indicators of relationship, then *Closterocoris amoenus* (Prov.), should probably be placed in the Mirinae.

The tribe Dicyphini presents a perplexing picture. It is interesting to note that this tribe has been considered under the subfamily Dicyphinae (Oshanin, 1912), and later the subfamily also contained the tribe Hallo dapini and a host of genera (Van Duzee, 1917), which are now placed under Phylineae, Orthotylineae, Deraeocorinae, and Mirinae. From the present
study it appears as though the relationship of the tribes Phylini and Hallo-
dapini to the Dicyphini is quite remote. The broad pronotal collar and
the tarsal claw characteristics, combined with an entirely different type
of claspers and the vesica, remove the Dicyphini from the Phylinae. The
affinity of this tribe appears to be closer to the Cylapinae and the
Deraeocorinae than to any other subfamily. Also a distinct subfamily
may be indicated.

The nature of the claspers and the vesica, and their characteristic
appearance indicate that these structures of this subfamily are of extreme
significance in determining natural affinity of species, and in placing
the allied genera in the proper systematic order. It is apparent that
more work is necessary in this large subfamily before the systematic
position and the generic limits can be accurately determined.

Tribe PHYLINI Douglas and Scott, 1865

The Phylini are distinguishable by the biramous left clasper;
flattened right clasper, generally oval in shape; and the sclerotized
phallotheca angled to the left and pointed at apex.

The tribe contains approximately 125 genera, of which representatives
of 12 genera were examined. The genital structures of the 16 species
studied show typical group characteristics which are sufficiently
different from the other tribes and subfamilies studied to provide a
reliable means by which anomalous species encountered in different sub-
families and tribes placed there entirely on the basis of the arolia and
external morphology could be correctly placed with their allies.
Plagiognathus Fieber, 1858

Genus distinguished by the dark spines of the hind tibia, usually with dark spots at base; the minute or not visible pseudarolia; the vertex of head not carinate between the eyes; the margin of eye separated from the antennal fossa by not more than one-eighth of the antennal fossa, the margin of eye emarginate near the antennal fossa; and the hemelytra with one type of pubescence, yellowish or dark in color.

The genital structures of four species, P. blatchleyi Reut., moerens Reut., longipennis (Uhl.) and obscurus fratermus Uhl., were examined. The outline of the claspers and the vesica indicate distinct group characteristics. The claspers are very typical for the Phylini and Hallodapini, with very little variation in the basic pattern. The vesica is featured by two slender apical processes.

Plagiognathus blatchleyi Reuter, 1912. Fig. 98.

Left clasper with a moderately elongate process arising from the sensory lobe; body gently curved, terminating in a point. Right clasper elongate-oval, laterally compressed, apex with a short process.

Vesica bispiculate, highly sclerotized, rigid; gonopore opening elongate-oval, with a slender process above; second process originating below the gonopore. Locality: Lancaster, N. Y. Aug. 1886. E. P. Van Duzee.

Plagiognathus obscurus fratermus Uhler, 1895. Fig. 99.

Claspers similar in design to that of blatchleyi, with only minor specific differences.
Vesica of the same general pattern as in *blatchleyi*. Locality: Golden, N. Y. July 1885. E. P. Van Duzee.

*Plagiognathus moerens* Reuter, 1909. Fig. 100.

Claspers very similar to those of *blatchleyi*.

Vesica as in the preceding species, with minor specific differences.


*Plagiognathus longipennis* (Uhler, 1895). Fig. 101.

Claspers with noticeable specific differences but similar to that of *blatchleyi*.


*Microphyllum* Reuter, 1909

This genus shows a close affinity to the species of *Plagiognathus* and has the same distinguishing characteristics, except for the absence of dark spots at the base of black spines of the hind tibia.

One species, *M. longirostris* Knight, was examined. The general appearance of the claspers and the vesica indicate typical Phyllini characteristics. The genital structures and the external appearance of this genus are similar to that of *Plagiognathus*, and indicate a very close relationship.

*Microphyllum longirostris* Knight, 1923. Fig. 102.

General aspect of claspers similar to that of *Plagiognathus*. 

Oncotylus Fieber, 1858

Genus distinguished by the larger size and light color; the second antennal segment thicker than hind tibia; the hind tibia with dark spines having dark spots at base; the pseudarolia minute or not visible; the margin of eye separated from antennal fossa by more than one-third the diameter of fossa; and the margin of eye near fossa straight.

One species, *O. guttulatus* Uhler, 1894, was studied. The general aspect of the genital claspers and the vesica indicates typical Phylini features. The genital structures seem to indicate a distinct generic group, with a close relationship to *Plagiognathus* and *Microphylellus*.

Oncotylus guttulatus Uhler, 1894. Fig. 103.

General aspect of the claspers as in *Microphylellus longirostris*. Right clasper truncate at apex, with a short anical process.

Vesica similar to that of *longirostris* but gonopore located more apically; one process broad and rounded, the other process slender. Phallotheca of the typical type, apex with a short beak. Locality: Seligman, Ariz. Sept. 5, 1931. H. H. Knight.

Atractotomus Fieber, 1858

Genus distinguished by the scale-like hairs intermixed with common pubescence; the vertex not carinate; the head extending in front of antennal bases as seen from above; and the second antennal segment strongly thickened.
One species, *A. hesperius* (Uhl.), was examined. The genital structures are typical of the tribe, and seem to indicate an affinity to the members of *Plagiognathus* and *Microphyllellus*.

**Atractotomus hesperius** Reuter, 1909. Fig. 10i.

Claspers typical for the tribe; left clasper with the sensory lobe produced into two conical processes. Right clasper sinuate on one side, short process at apex.


**Psallus** Fieber, 1858

Genus distinguished by the silvery, scale-like hairs intermixed with common pubescence; the head produced in front of antennal bases; and the prominent clypeus.

One species, *P. ancorifer* (Fieb.), was studied. The genital structures display typical *Phylini* characteristics, with a possible relationship to the general group featured by the two processes of the vesica, as in *Oncotylus*.

**Psallus ancorifer** (Fieber, 1859). Fig. 105.

General aspect of the claspers similar to that of *Atractotomus hesperius*, small differences evident. Right clasper oval, short apical process at middle.

Vesica with one flattened process extending beyond the shorter and rounded process above the gonopore. Locality: Washington, D. C. June 30,
1926. H. H. Knight.

**Macrotylus** Fieber, 1858

This genus appears to contain members whose external appearance varies considerably more between the species than encountered in the genus *Plagiognathus*, or even between the species of *Plagiognathus* and species of *Microphylla*.

Genus distinguished by the distinctly toothed claws at base; the large and free pseudarolia, reaching beyond the apices of claws; and the strongly protruding clypeus.

Two species of this genus, *M. tristis* Uhler., and *polemonii* Kngr., were examined. The genital structures show typical Phylini characteristics, and feature a single terminal process of the vesica.

**Macrotylus tristis** Uhler, 1890. Fig. 106.

Claspers typical for the tribe; left clasper with a large sensory lobe. Right clasper with a short oblique apical process.

Vesica with one terminal process, this process with minute bristles.

Locality: "California, Coquillett."

**Macrotylus polemonii** Knight, 1932. Fig. 107.

Claspers as in *tristis* but left clasper with a smaller sensory lobe; process of body truncate. Right clasper with a short apical tubercle at middle and a short lateral process.

Vesica similar to that of *tristis* but gonopore further removed from apex. Phallothaca with a broad lateral flange subapically. Locality: Mt. Rainier, Wash., Aug. 14, 1931. H. H. Knight.
Lepidopsallus Knight, 1923

Genus distinguished by the short second antennal segment, the length shorter than the width of head across the eyes; and the flattened silvery scale-like hairs on the body, intermixed with common pubescence.

One species, \textit{L. rubidus} (Uhl.), was studied. The genitalia are typical for the tribe and indicate a possible relationship to the genera possessing a single process of the vesica. The vesica consists only of the ductus seminis with an apical gonopore as found in \textit{Macrotylus}, \textit{Monosynamma}, \textit{Campylomma}, \textit{Cricorits}, and \textit{Chlamydatum}. \textit{Semium birtum} Reut., now placed in the Orthotylini, as well as \textit{Cyrtopeltocoris} now placed in the Pilophorini, probably belong with this group of species.

\textit{Lepidopsallus rubidus} (Uhler, 1895). Fig. 108.

Claspers typical for the tribe and similar to those of \textit{Macrotylus}.


\textit{Monosynamma} Scott, 1864

Formerly this genus was known as a junior synonym of \textit{Microsynamma} Fieber, 1864. Carvalho (1952) has revived the genus on the basis of page priority.

Genus distinguished by the single type of yellowish pubescence; the margin of eye well separated from the antennal fossa, the margin of eye near fossa almost straight; and the pseudaroliala minute or not visible.

One species, \textit{M. bohemani} (Fall.), was studied. The genitalia show an
affinity to a group having only one apical process of the vesica. This type of vesica was found in *Macrotylus*, *Lepidopsallus*, *Campylomma*, *Criocoris*, and *Chlamydatus*.

*Monosynamma bohemani* (Fallen, 1926). Fig. 109.

Claspers as in *Lepidopsallus*.

Vesica with a pointed and angled apical process. Locality: Lancaster, N. Y. July 12, 1889. E. P. Van Duzee.

*Campylomma* Reuter, 1878

Genus distinguished by the light color of the body and hemelytra, without scale-like hairs; the short second antennal segment, in length less than the width of the head across the eyes; and the dark spots on the hind tibia.

One species, *C. verbasci* (Mey.), was studied. The genital structures are as in the preceding species, and indicate the relationship to *Macrotylus*, *Lepidopsallus*, *Monosynamma*, *Criocoris*, and *Chlamydatus*, the latter two species illustrated only (Figs. 111, 112).

*Campylomma verbasci* (Meyer, 1843). Fig. 110.

Claspers as in the preceding species but smaller.


*Reuteroscopus* Kirkaldy, 1905

Genus distinguished by the light color; the dark spines of hind tibia without dark spots at base; and the silvery scale-like pubescence intermixed
with common hairs.

One species, *R. ornatus* (Reut.), was examined. The genital structures show a very distinct generic group not closely related to any of the other genera studied. The claspers display a moderate amount of similarity to the other species of the tribe, but the vesica is markedly different, and does not appear to show immediate relationship to the other groups examined. The terminal portion of the vesica is very unique for the tribe as it is equipped with a series of flat plates bearing a dense set of short and long hairs. In addition there are two short spiculi, and a slender spiculum almost reaching the apex of the long hairs. The basal portion of the vesica, however, is very similar to that of other genera of the tribe studied.

*Reuteroscopus ornatus* (Reuter, 1876). Fig. 113.

Sensory lobe of left clasper without a pointed process; apical half of body broadly flattened. Right clasper relatively large for the size of the species, broadly concave on one side, laterally flattened.

Basal half of vesica as in the other species of the tribe; apical half with a series of plates bearing bristles of variable lengths surrounding the gonopore; two short spiculi near base, another spiculum protruding beyond the plates, and a forked process on left side of the plates. Phallotheca with a short lateral beak. Locality: Hollister, Mo. July 22, 1915. H. H. Knight.

Tribe HALLODAPINI Van Duzee, 1916

The genera of Hallo dapini are characteristically ant-like in appearance, with abdomen constricted at base; the pronotum triangular or elongate; and
the hemelytra generally bearing white or yellow bands or pale areas.

In spite of these extreme external differences between the Phylini and Hallodapini, the genital structures display a surprisingly similar pattern. The claspers of Hallodapini are very similar in shape and outline to those of the claspers found in the Phylini. Likewise, the vesica shows a striking degree of similarity to the vesica of the preceding tribe. The vesica consists of a rigid, highly sclerotized ductus seminis, with a single apical process, extending beyond the gonopore as found in a number of genera in the Phylini. The phallotheca is also sclerotized and has the same general aspect as in the Phylini.

The present tribe contains approximately 42 genera, of which only four species representing three genera were studied. The genital structures of these species, except Glococorocoris amoena (Prov.), show a remarkable affinity to the species of the Phylini, and consequently indicate a very close phylogenetic relationship to that group. On further study of the species in each group, the two tribes may prove to be synonymous. The species of Glococorocoris appear to show their relationship to the members of the Mirinae.

Coquillettia Uhler, 1876

Genus distinguished by the large size and elongate form; the linear second antennal segment; and the free pseudarolia, attached only at the base.

Two species of the genus, C. insignis Uhl., and mimetica Osb., were examined. The genital structures indicate a close relationship to the Phylini, both in the likeness of the claspers and the similarity of the
vesica. The differences observed between the genera of the tribes are no
greater than differences between the genera of Phylini or Hallodapini.

Coquillettia *insignis* Uhler, 1890. Fig. 114.

Claspers of the same general design as observed in Phylini.

Vesica highly sclerotized; gonopore opening just before apex; short and
curved process above the gonopore. Locality: Mancos, Colo. Aug. 13,
1925. H. H. Knight.

Coquillettia *mimetica* Osborn, 1898. Fig. 115.

Claspers very similar to those of *insignis*; right clasper with a short
vertical process.

Vesica as in the preceding species. Locality: 4 mi. NE Beloit, Ia.

*Orectoderus* Uhler, 1876

This genus has the same general aspect as Coquillettia, but for the
incrassate second antennal segment, and pseudarolia completely united to
the claws.

One species, *O. obliquus* Uhl., was studied. The affinity of this
species appears to be to the Phylini as the genital structures exhibit a
high degree of similarity to the species of that tribe.

*Orectoderus obliquus* Uhler, 1876. Fig. 116.

Claspers very similar to those of the species of Phylini.

Vesica similar to that of certain species of Phylini; region surrounding
the gonopore expanded and narrowed beyond into a slender process; gonopore
depressed and bordered on one side by a spiculate wall. Phallotheca bent

Closteroecoris Uhler, 1890

The myrmecomorphic appearance of the species of this genus has long obscured the actual relationship to their allies. The study of the species indicates that the present systematic position of the genus is untenable, as the genital structures show an extremely close affinity to the typical members of the Mirinae. The vesica in particular displays this close relationship in the coil-like rim of the gonopore and the membranous processus vesicae bearing the sclerites. The genital claspers also show a higher degree of similarity to the species of Mirinae than to the Phylinae.

The tarsal claw characteristics which have been extensively used in the classification of the Miridae are very remarkable in the species studied. The species possess a pair of straight hair-like structures between the claws, more closely approaching the condition found in the Phylinae than in the Mirinae.

A similar condition was observed in Cyphopelta modesta Van D., presently placed in the Orthotylinae, which has the typical gonopore found in the Mirinae. Judging by the similarity of appearance these two species they may not be too distantly related.

Genus distinguished by the triangular pronotum and flattened collar; the eyes removed from the collar; and the narrow elongate form.

One species, C. amoena (Prov.), was studied. The genital parts indicate typical characteristics observed in the genera of the Mirinae. The presence
of the pronotal collar and the long first segment of the hind tarsus also indicate that the genus is more closely related to the Mirinae than the Phylinae.

_Closterocoris amoenus_ (Provancher, 1887). Fig. 117.

Left clasper gently curved; sensory lobe small, body rounded at apex.
Right clasper cylindrical with a stout oblique tubercle at apex.

Vesica with typical Mirinae gonopore; processus vesicae membranous, variously folded, with two heavily sclerotized processes; two smaller lobes near the gonopore. Locality: Carmel, Colo. June 20, 1918. C. L. Hubbs.

**Tribe DICYPHINI Reuter, 1883**

The present systematic position of this tribe appears to be untenable, as no close relationship to the Phylinae could be detected in the study of the male genital structures. The external morphology of the species of this tribe, likewise, does not indicate any affinity to the species of the Phylinae. As can be ascertained from the study of the available material, species of Dicyphini resemble in certain respects a few members of the Cylapinae and Deraeocorinae, both in the external appearance and in the basic pattern of the genitalia. The study of the female genitalia (Slater, 1950) indicated the relationship to the genus _Hyaliodes_. From this suggestive evidence it seems that the relationship of Dicyphini to the Phylinae is quite remote, and that a possible relationship may exist to the Cylapinae or the Deraecorinae.

The Dicyphini are characterized by their slender form; the well developed pronotal collar; the second segment of hind tarsus longer than first; the tarsal claws sharply bent at base; and the large and free
pseudarolia arising from the base of the claws, with hair-like arolia between.

The genital structures are distinctive for the tribe. The left clasper is of the conventional type, but the right clasper is so greatly reduced in size in some species that it may often be missed during dissection. The vesica consists of a flexible ductus seminis, apically enclosed by a large membranous processus vesicae, which may or may not contain slender sclerites or other types of structures. The gonopore opens into the processus vesicae, but its rim has no definite outline as observed in the other groups studied (Figs. 118-124).

Presently the tribe contains approximately 23 genera. Seven species from three genera were examined. The genitalia of these species show characteristics that imply only remote relationship to the Phylinae. The claspers and vesica are of an entirely different pattern from those found in the Phylinae, and these differences are sufficiently apparent to suggest that the relationship of this tribe to the Phylinae is extremely remote. The genital structures of this tribe show a certain amount of similarity to those encountered in the Cylapinae and Deraeocorinae. It is possible that a distinct subfamily group may be represented by this tribe.

_Dicyphus_ Fieber, 1858

Genus distinguished by the slender form; the shiny impunctate pronotum and hemelytra; the large eyes arising near the middle of head; the concave base of pronotum, with a deep constriction behind each callus; and a broad pronotal collar.
Four species of the genus, D. pallidus (H.-S.), gracilentus Parsh.,

familicns (Uhl.), and uningeri Kngr., were examined. The genitalia of these

species indicate distinct group characteristics that are extremely different

from the species of the Phylini and Hallodapini. The right clasper is
greatly reduced in size, being very short and slender, the vesica consisting

of a flexible ductus seminis, and a well-developed sac-like processus

vesicae. The size and shape of this sac varies with the species as well as

the presence or absence of the enclosed sclerites (Figs. 118-121).

The pattern of the genital structures seems to indicate no apparent

relationship to the Phylinae.

*Dicycophus pallidus* (Herrich-Schaeffer, 1835). Fig. 118.

Both sexes of this species brachypterous with the abdomen only

partially covered.

Sensory lobe of left clasper somewhat rounded and compressed, with

several long bristles; body long and slender, curved subapically, apex

pointed. Right clasper short and slender.

Vesica membranous; ductus seminis partially enclosed by a relatively

large sac composed of several lobes and containing two slender sclerites,

Phallotheca conical, sclerotized, with a narrow lateral flange. Locality:

"Admont, Steierm. Strobl."

*Dicycophus gracilentus* Parshley, 1923. Fig. 119.

Left clasper gently curved; body with a large apical flattened area.

Right clasper very small.

Vesica membranous, ductus seminis short and wide. Phallotheca with

Perry A. Glick.

**Dicyphus familius** (Uhler, 1878). Fig. 120.

Left clasper gently curved; sensory lobe small; body flattened near apex, smaller than in *gracilentus*. Right clasper very small.


**Dicyphus usingeri** Knight, 1943. Fig. 121.

Left clasper sharply curved, uniform in thickness; sensory lobe small, with a number of stiff hairs; body greatly flattened for entire length; apex pointed. Right clasper small.


**Cyrtopeltis** Fieber, 1860

This genus has the same distinguishing characteristics as outlined for *Dicyphus*, except for the narrow pronotal collar and the eyes removed from the pronotum only by a short distance.

Two species, *C. geniculata* Fieb., and *varians* (Dist.), were examined. The claspers and the vesica indicate a distinct generic group and display characteristics typical for the tribe. The claspers are similar to those of *Dicyphus*. The vesica consists of a slender ductus seminis and sac-like processus vesicae.
Cyrtopeltis geniculata Fieber, 1861. Fig. 122.

Left clasper sharply curved; sensory lobe with a number of stiff hairs; body flattened subapically, apex pointed. Right clasper as in Dicyphus.

Vesica membranous with a slender ductus seminis and a large trilobed processus vesicae. Locality: "Europe."

Cyrtopeltis varians (Distant, 1883). Fig. 123.

Claspers similar to that of geniculatus but smaller; apex of left clasper more rounded, stiff hairs of sensory lobe more numerous.


Macrolophus Fieber, 1858

The distinguishing characteristics mentioned under Dicyphus also apply to this genus, except for the very small eyes removed from the pronotum by the length of the eye.

One species, M. brevicornis Knight, was studied. The genitalia display typical group characteristics of the Dicyphini. The pattern of the vesica resembles that of Dicyphus pallidus H.-S., except for the presence of a number of long bristles at apex. The phallotheca is also modified by the presence of sclerotized recurved plate at apex.

Macrolophus brevicornis Knight, 1926. Fig. 124.

Claspers similar to Cyrtopeltis varians with minor differences; left clasper with three subapical notches.
Vesica as in *Dicyphus pallidus* but sclerites more exposed and each of
different shape; apex of processus vesicae with a number of stiff hairs or
July 1, 1894. E. D. Ball.
SUBFAMILY CYLAPINAE KIRKALDY, 1903

This is a relatively small subfamily of the Miridae, consisting of three tribes and including approximately 13 genera. Material from two of the tribes, Cylapini Kirkaldy, and Fulviini Uhler, was available for study during this investigation. The study of the subfamily included only three species representing as many genera. The genital structures of these genera are extremely interesting and extraordinary as they display characteristics that are similar to that of the groups already studied.

The subfamily Cylapinae is distinguished by the pair of straight hair-like areolia between the claws and the absence of pseudoscleridia as in the Deraeocorinae. The claws, however, are not toothed or thickened at the base, but rather are long and slender, and may be toothed near apex. The hind tibia is weakly spinose, usually long and tapering apically. The pronotal collar may be obscured by the callus.

Specimens representing the tribes Cylapini and Fulviini possess genital structures that appear to be very divergent in their affinities. The genital parts of Cylapus tenuicornis Say show a striking degree of similarity to the tribe Halticini, particularly Orthocephalus mutabilis (Fall.). The genital parts of Fulvius brunneus (Prov.), and Peritropis saltiformis Uhl., show an unusual affinity to the tribe Dicyphini, particularly to Dicyphus pallidus and Macrolophus brevicornis.

In this subfamily a condition seems to exist where the included genera exhibit an extreme diversity of external form. The genitalia, however, appear to have remained relatively stable with only minor modifications,
and indicate the relationships to one another in the group, and to the more distant relatives.

The genital structures appear to present more reliable criteria than the external structures on which to base phylogenetic relationships, as evidenced during this study, but with such a small quantity of material studied in this group, it is impossible to state definitely at this time the limits and variations of this subfamily.

Tribe CYLAPINI Kirkaldy, 1903

The Cylapini are distinguished by the short, rounded, and deep head; the vertical frons and clypeus; the finely punctate pronotum and hemelytra; and the glabrous membrane.

Approximately 15 genera are included in the tribe. Material from one genus was available for study.

Cylapus Say, 1832

Genus distinguished by the eyes protruding considerable distance above the dorsum of head; the vertex with a deep longitudinal impression; the rounded side of pronotum; the very long and slender antenna, much longer than body, first segment greatly thickened; and the first segment of hind tarsus as long as the others united.

The species examined, C. tenuicornis Say, shows genital characteristics that are very perplexing, portraying the similar type of vesica encountered in Halticini. The situation indeed is very unusual as the details of the vesica are so alike as to be easily considered pertaining to a closely related group of genera. The gonopore is of the type found in Orthocephalus,
completely enclosed by a membranous sac, the latter bearing several internal sclerites of variable shape. The modifications in the structures enclosed by the sac may be of significance as they indicate the differences between Gylapus and Orthocephalus, if the present systematic position of the genera proves to be correct.

*Cylapus tenuicornis* Say, 1832. Fig. 125.

Left clasper gently curved; sensory lobe small; body slender, pointed at apex. Right clasper slender, sinuate, apex pointed.

Vesica very similar in basic structure to that of *Orthocephalus*; terminal region of ductus seminis expanded and somewhat dorsoventrally compressed; membranous processus vesicae with a series of variously shaped sclerites, consisting of two elongate processes and three knobbed structures.


Tribe *FULVIINI* Uhler, 1886

This tribe is distinguished by the long, pointed head; the horizontal frons; the concave base of pronotum; and the almost impunctate pronotum and hemelytra.

Presently the tribe contains 23 genera. Material from two genera was available for study.

*Fulvius* Stal, 1862

Genus distinguished by the long antennal segments, the first segment reaching beyond the apex of head; and the antennal fossa contiguous with the eye.

The species examined, *F. brunneus* (Prov.), shows genital structures
that portray close affinity to the tribe Dicyphini. Indeed, the vesica is so similar between the genera of the two tribes studied, that a very close relationship is indicated. The vesica consists of a membranous sac-like processus vesicae enclosing the distal half of the ductus seminis, and containing within several variously shaped sclerites. The gonopore is of the diffuse type observed in the Dicyphini.

The external appearance of the species also indicates an affinity for each other. It seems that too much stress has been placed on the absence of the pseudarolia, for this condition has been found to be variable within the other groups of genera studied. The present study of this group strongly suggests that the tribe Fulviini is closely related to the Dicyphini as revealed by the similarity of the vesica. However, no definite conclusions are advanced at this time, as a further study is necessary to determine the actual degree of variation of each group and to ascertain the limits of the genera and tribes.

Fulvius brunneus (Provancher, 1872). Fig. 126.

Left clasper relatively straight; sensory lobe small; body enlarged at middle, apex compressed, with a short subapical process. Right clasper small, spindle-shaped.

Vesica very similar in basic structure to that of Dicyphus; ductus seminis enclosed by a membranous sac, with two slender, internal spiculi, and one terminal spiculum. Locality: Mount Desert Island, Maine. Aug. 24, 1939. Wm. Procter.
Peritropis Uhler, 1891

Genus distinguished by the two-segmented tarsus; the shagreened body; and the obscured or absent pronotal collar.

One species, *P. saldiformis* Uhl., was examined. The genital structures show group characteristics that are similar to those of *Fulvius*. An affinity is also indicated towards genera of Dicyphini.

Peritropis saldiformis Uhler, 1891. Fig. 127.

Left clasper curved, uniform in thickness; apex of body notched. Right clasper strap-like, sinuate, somewhat compressed, short subapical tubercle on side.

Vesica similar to that of *Fulvius brunneus* but smaller; external sclerite subapical. Locality: Idabel, Okla. June 30, 1937. Standish & Kaiser.
The subfamily Bryocorinae is of moderate size, consisting of three tribes and including approximately 100 genera. Material from only one tribe, Bryocorini Baerensprung, was available for study during this investigation. The tribe contains approximately 70 genera. Five species representing five genera were studied.

The genital structures of these species are unusual in that they are extremely modified in outward appearance, and in a number of cases conceal the apparent relationship of the genera within the tribe. A more comprehensive study of the subfamily is needed before the actual relationships could be determined.

The subfamily is distinguished by the hair-like arolia between the claws; the large pseudarolia connected to the ventral surface of the claws; and the thickened third tarsal segment. The membrane has only one enclosed cell.

Tribe Bryocorini Baerensprung, 1860

Because of the unusual variation of the claspers and the vesica in the tribe, their size and shape cannot be generalized for the tribe. However, the condition found in Orthotylini where the right clasper is larger than the left, is also evident in some members of this tribe. To complement the extreme development of the right clasper, species of Halticotoma possess a stout, dorsally directed tubercle above the left clasper against which the right clasper holds the female abdomen in position during copulation.

The vesica is of the simple type, consisting only of the ductus seminis, or at most may possess membranous processus vesicae. The ductus seminis is
a sclerotized tube as in the Phylinae, except for the flexible basal portion. The phallotheca is a simple membranous sheath.

Hesperolabops Kirkaldy, 1902

Genus distinguished by the stylate eyes projecting dorsally, and the long rostrum extending beyond the posterior coxa.

One species, *H. picta* (Hunt., Pratt, & Mitch.), was studied. The genital structures are distinctive for the genus. The ductus seminis is flexible on basal half, sclerotized and rigid on distal half, with a membranous processus vesicae, and a subterminal gonopore.

The affinity of *H. picta* appears to be to *Halticotoma*, although the appearance of the two species studied is far from being common.

**Hesperolabops picta** (Hunter, Pratt, and Mitchell, 1912). Fig. 128.

Left clasper slender at base, curved; sensory lobe small; body broader towards apex, terminating in a twisted slender process. Right clasper large, somewhat flattened and expanded at middle, gradually narrowing to a point, broadly curved.


Halticotoma Reuter, 1913

Genus distinguished by the small size and oval shape; the orange pronotum; and the bluish-black color of the hemelytra.

One species, *H. valida* Reut., was examined. The similarity of the genital structures indicate a relationship to *Hesperolabops*. 
Halticotoma valida Reuter, 1913. Fig. 129.

Left clasper broad at middle, curved, apical process slender and twisted. Right clasper large, subcylindrical, broader at base than apically, apex curved at a sharp angle, pointed.

Vesica consisting of two parts, the sclerotized ductus seminis and the membranous processus vesicae; gonopore subterminal; basal portion of ductus seminis flexible. Locality: Castana, Iowa. Sept. 16, 1927. H. G. Johnston.

Pycnoderes Guerin, 1857

Genus distinguished by the greatly inflated pronotum; the broadly expanded and flat embolium; the very short pubescence and shiny areas on the hemelytra; and the obscured pronotal collar.

One species, P. medius Knight, was examined. The claspers and the vesica are distinctive in form, the vesica being greatly reduced in size, making it difficult to separate the phallotheca from the phallobase. However, the vesica can be seen to be a simple tube with no apparent processus vesicae, displaying considerable affinity to Sizamonotus and Monalocoris.

Pycnoderes medius Knight, 1926. Fig. 130.

Sensory lobe of left clasper triangular, relatively large for the size of the clasper; body slender, sharply curved, apex in the form of a hook. Right clasper irregular, sharply angled near base, the angle with a short knob; short tubercle at middle; apex with curving process.

Sixeonotus Reuter, 1875

Aspect of Pycnoderae, but for the only moderately inflated pronotum; the narrow and thick embolium; the long semi-erect pubescence; and the lack of silvery areas on the hemelytra.

One species, *S. nicholi* Knight, was studied. The genital structures show a close affinity to *Pycnoderae* and indicate the close relationship between the genera.

*Sixeonotus nicholi* Knight, 1928. Fig. 131.

Claspers very similar to those of *Pycnoderae medius*; right clasper larger, with a broader process at middle and apex.


Monalocoris Dahlbom, 1851

Genus distinguished by the small size, oval shape, and dark color; the pale pronotal color; and the dilated hemelytra at middle.

One species, *M. americana* Wagner and Slater, was examined. The genital structures are modified in certain details but nevertheless still show an affinity to species of *Sixeonotus* and *Pycnoderae*.

*Monalocoris americana* Wagner and Slater, 1952. Fig. 132.

Left clasper relatively slender; sensory lobe prominent, produced into a flattened process, apex rounded and bearing short bristles; body slender, narrowing to a point. Right clasper subcylindrical, gently curved, pointed at apex.
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PLATES
Explanation of Figures

The illustrations are designated as follows: A, left clasper; B, right clasper; C, vesica; D, region of the gonopore; E, phallotheca.

The aspect illustrated is given for each structure. The structures are drawn in a position which most clearly displays the characteristic features of that species. In most cases it is difficult to determine the normal position of the claspers and the vesica when they are not "in situ" on the specimen. In view of this, comparison of specimens with the figures should be made with care and it will frequently be necessary to orient the parts in several different angles before a view comparable to that illustrated is obtained. In most cases the similar structures were drawn from nearly identical views.
Fig. 1. *Leptopterna dolobratus* (L.). Apex of abdomen, dorsal view.

Fig. 2. *L. dolobratus* (L.). Phallus, right lateral view.

Fig. 3. *L. dolobratus* (L.). A, dorsolateral view; B, lateral view; C, ventral view (opposite the gonopore).

Fig. 4. *Megaloceroea recticornis* (Geof.). A, dorsolateral view; B, lateral view.

Fig. 5. *M. curta* Kngr. A, dorsolateral view; B, lateral view; C, ventral view.

Fig. 6. *Stenodema vires* (L.). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 7. *S. vicinum* (Prov.). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 8. *S. trispinosum* Reut. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 9. *Trigonotylus ruficornis* (Geof.). A, posterolateral view; B, lateral view; C, dorsal view (gonopore side).

Fig. 10. *T. tarsalis* (Reut.). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 11. *Dolichomiris linearis* Reut. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 12. *Teratocoris discolor* Uhl. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 13. *Collaria meilleri* Prov. A, posterolateral view; B, lateral view; C, ventral view.
Fig. 14. Pithamus maerkelii (H.-S.). A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 15. Mimoceps gracilis Uhl. A, posterolateral view; B, lateral view;
C, ventral view.

Fig. 16. Tropidosteptes cardinalis Uhl. A, posterolateral view; B, lateral
view; C, ventral view; E, right lateral view.

Fig. 17. T. rufusculus (Kngrt.). A, posterolateral view; B, lateral view;
C, ventral view.

Fig. 18. Xenoborus plagifer (Reut.). A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 19. I. commissuralis Reut. A, posterolateral view; B, lateral view;
C, ventral view.

Fig. 20. Neoborella tumida Kngrt. A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 21. Neurocolpus nubilus (Say). A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 22. Tcedia scrupeus (Say). A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 23. T. salicis (Kngrt.). A, posterolateral view; B, lateral view;
C, ventral view.

Fig. 24. Lampethusa anatina Dist. A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 25. Irbisia sericans (Stal). A, posterolateral view; B, lateral
view; C, ventral view.

Fig. 26. I. pacificus (Uhl.). A, posterolateral view; B, lateral view;
C, ventral view.

Fig. 27. Adelphoooris lineolatus (Coeze). A, posterolateral view; B,
lateral view; C, ventral view.
PLATE 3

Mirinae

Fig. 28. Stittocapsus franseriae Kngt. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 29. Calocoris norvegicus (Gmel.). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 30. Polymerus chrysopsis Kngt. A, posterolateral view; B, lateral view; C, right lateral view.

Fig. 31. Allorhinocoris flavus Sahl. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 32. Stenotus binotatus (F.). A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 33. S. nigroquadristriatus (Kirk.). A, dorsal view; B, lateral view; C, ventral view.

Fig. 34. Dichrooscytus suspectus Reut. A, dorsal view; B, lateral view; C, ventral view.

Fig. 35. Phytocoris pallidicornis Reut. A, lateral view; B, lateral view; C, ventral view.

Fig. 36. P. tibialis Reut. A, lateral view; B, lateral view; C, ventral view.

Fig. 37. Platyllygus grandis Kngt. A, lateral view; B, lateral view; C, dorsal view.
PLATE 4

Mirinae

Fig. 38. Cocobaphes sanguinarius Uhl. A, dorsolateral view; B, lateral view; C, ventral view.

Fig. 39. Capsus ater (L.). A, dorsolateral view; B, lateral view; C, ventral view.

Fig. 40. Horcia dislocatus (Say). A, lateral view; B, lateral view; C, dorsal view.

Fig. 41. H. sexmaculatus (Barb.). A, lateral view; B, lateral view; C, ventral view.

Fig. 42. Canocapsus filiformis Van D. A, lateral view; B, lateral view; C, ventral view.

Fig. 43. Poecilocapsus lineatus (F.). A, lateral view; B, lateral view; C, ventral view.

Fig. 44. Lygidea viburni Kngr. A, dorsolateral view; B, lateral view; C, ventral view.

Fig. 45. Prepops clandestina ventralis (Kngr.). A, lateral view; B, lateral view; C, ventral view.

Fig. 46. P. insitusus (Say). A, dorsolateral view; B, lateral view; C, ventral view.

Fig. 47. Dacerla formicina Pareh. A, lateral view; B, lateral view; C, dorsal view.
PLATE 5
Orthotylinae

Fig. 48. Orthotylus notabilis Kngr. A, lateral view; B, lateral view, C, dorsal view (opposite the gonopore); E, right lateral view.

Fig. 49. O. ornatus Van D. A, lateral view; B, lateral view; C, dorsal view.

Fig. 50. Melanotrichus althaeae (Huss.). A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 51. Pseudopsallus artemisicola Kngr. A, ventral view; B, mesial view; C, dorsal view.

Fig. 52. Reuteria fuscicornis Kngr. A, lateral view; B, lateral view; C, dorsal view.

Fig. 53. Heterocordylus malinus Reut. A, ventral view; B, lateral view; C, ventral view (gonopore side).

Fig. 54. Lopidea media (Say). A, ventral view; B, posterior view; C, dorsal view; E, right lateral view.

Fig. 55. L. confluens (Say). A, ventral view; B, lateral view; C, dorsal view.

Fig. 56. L. teton Kngr. A, ventral view; B, lateral view; C, dorsal view.
Fig. 57. *Ilmocera stali* Reut. A, dorsal view; B, mesial view; C, dorsal view.

Fig. 58. *Ilmocera sulcata* Kngt. A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 59. *Slaterecoris stygicus* (Say). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 60. *S. hirtus* (Kngt.). A, posterolateral view; B, lateral view; C, ventral view.

Fig. 61. *Hadronema militaris* Uhl. A, ventral view; B, lateral view; C, dorsal view.

Fig. 62. *Macrotydoides vestitus* (Uhl.). A, posterodorsal view; B, posterior view; C, dorsal view.

Fig. 63. *Labopidea simplex* (Uhl.). A, posteroventral view; B, anterior view; C, dorsal view.

Fig. 64. *Parthenicus aridus* Kngt. A, posterodorsal view; B, lateral view; C, dorsal view.

Fig. 65. *Ceratocapsus modestus* (Uhl.). A, lateral view; B, lateral view; C, dorsal view; E, dorsal view.

Fig. 66. *C. pumilus* (Uhl.). A, lateral view; B, lateral view; C, dorsal view.

Fig. 67. *Semium hirtum* Reut. A, lateral view; B, lateral view; C, right lateral view; E, dorsal view.

Fig. 68. *Halticus apterus* (L.). A, ventral view; B, lateral view; C, dorsal view; D, left lateral view.

Fig. 69. *H. intermedius* Uhl. A, ventral view; B, lateral view; C, right lateral view.

Fig. 70. *Labops hirtus* Kngt. A, ventral view; B, lateral view; C, dorsal view; D, right lateral view; E, right lateral view.
Orthotylinae

Fig. 71. *Labops hesperius* Uhl. A, ventral view; B, lateral view; E, right lateral view.

Fig. 72. *L. sahlbergi* Fall. A, ventral view; B, lateral view; E, right lateral view.

Fig. 73. *Orthocephalus mutabilis* (Fall.). A, ventral view; B, lateral view; C, dorsal view; D, left lateral view; E, dorsal view.

Fig. 74. *O. brevis* Panz. A, ventral view; B, lateral view.

Fig. 75. *Euryopicoris nitidus* (Mey.). A, ventral view; B, lateral view; C, left lateral view; E, dorsal view.

Fig. 76. *Strongylocoris leucocephalus* (L.). A, ventral view; B, lateral view; C, dorsal view; D, left lateral view; E, left lateral view.

Fig. 77. *Sericophanes heidemannii* Popp. A, ventral view; B, lateral view; C, dorsal view.

Fig. 78. *Pseudoxenetus scutellatus* (Uhl.). A, dorsal view; B, lateral view; C, ventral view.

Fig. 79. *Cyphopelta modesta* Van D. A, dorsal view; B, lateral view; C, ventral view.

Fig. 80. *Pilophorus amoenus* Uhl. A, ventral view; B, lateral view; C, right lateral view; D, dorsal view.

Fig. 81. *P. strobicola* Knqt. A, ventral view; B, lateral view; C, right lateral view.

Fig. 82. *Alepldea gracilis* (Uhl.). A, ventral view; B, lateral view; C, right lateral view.

Fig. 83. *Cyrtopeltocoris albofasciatus* Reut. A, lateral view; B, lateral view; C, right lateral view.

Deraeocorinae

Fig. 84. *Deraeocoris atriventris* Knqt. A, posterolateral view; B, lateral view; C, ventral view (gonopore side).

Fig. 85. *Deraeocoris histrio* Reut. A, posterolateral view; B, lateral view; C, left lateral view.
Fig. 86. *Deraeocoris ruber seguisinus* (Mull.). A, posterior view; B, lateral view; C, ventral view.

Fig. 87. *D. sayi* Reut. A, posterolateral view; B, lateral view; C, ventral view.

Fig. 88. *D. fasciolus Kngrt.* A, posterolateral view; B, lateral view; C, ventral view.

Fig. 89. *D. aphidiphagus Kngrt.* A, lateral view; B, lateral view; C, ventral view.

Fig. 90. *Deraecopsis fraternus Van D.* A, posterolateral view; B, lateral view; C, ventral view.

Fig. 91. *Eustictus catulus* (Uhl.). A, ventral view; B, lateral view; C, ventral view.

Fig. 92. *Klopticoris phorodendronae* (Van D.). A, lateral view; B, lateral view; C, ventral view.

Fig. 93. *Eurychilopterella luridula* Reut. A, lateral view; B, lateral view; C, ventral view.

Fig. 94. *Clavinema villosa* Reut. A, lateral view; B, lateral view; C, ventral view.

Fig. 95. *Largidea rubida* (Uhl.). A, lateral view; B, lateral view; C, ventral view.

Fig. 96. *Hyalodes vitripennis* (Say). A, lateral view; B, lateral view; C, dorsal view.

Fig. 97. *H. hartii* Kngrt. A, lateral view; B, lateral view; C, dorsal view.
PLATE 9

Phylinae

Fig. 98. Plagiognathus blatchleyi Reut. A, lateral view; B, lateral view; C, right lateral view; E, dorsal view.

Fig. 99. P. obscurus fratermus Uhl. A, lateral view; B, lateral view; C, right lateral view.

Fig. 100. P. moerens Reut. A, lateral view; B, lateral view; C, right lateral view.

Fig. 101. P. longipennis (Uhl.). A, lateral view; B, lateral view; C, right lateral view.

Fig. 102. Microphyllellus longirostris Kngrt. A, lateral view; B, lateral view; C, right lateral view.

Fig. 103. Oncotylus gutulatus Uhl. A, lateral view; B, lateral view; C, right lateral view.

Fig. 104. Atractotomus hesperius Reut. A, lateral view; B, lateral view; C, right lateral view.

Fig. 105. Psallus ancrier (Pieg.). A, lateral view; B, lateral view; C, right lateral view.

Fig. 106. Macrotylyus tristis Uhl. A, lateral view; B, lateral view; C, right lateral view.

Fig. 107. M. polemonii Kngrt. A, lateral view; B, lateral view; C, right lateral view.

Fig. 108. Lepidopsallus rubidus (Uhl.). A, lateral view; B, lateral view; C, right lateral view.

Fig. 109. Monosynema bohemani (Fall.). A, lateral view; B, lateral view; C, right lateral view.

Fig. 110. Campyloma verbasci (Mey.). A, lateral view; B, lateral view; C, right lateral view.

Fig. 111. Criocoris saliens Reut. A, lateral view; B, lateral view; C, right lateral view.
PLATE 9 (Con't)

Phylinae

Fig. 112. Chlamydatus associatus Uhl. A, lateral view; B, lateral view; C, right lateral view.

Fig. 113. Reuteroscopus ornatus (Reut.). A, posterolateral view; B, lateral view; C, right lateral view.

Fig. 114. Coquillettia insignis Uhl. A, lateral view; B, lateral view; C, right lateral view.

Fig. 115. C. mimetica Osb. A, lateral view; B, lateral view; C, right lateral view.

Fig. 116. Orectoderus obliquus Uhl. A, lateral view; B, lateral view; C, left lateral view.
PLATE 10

Phylinae

Fig. 117. Closterocoris amoenus (Prov.). A, dorsal view; B, mesial view; C, dorsal view.

Fig. 118. Dicyphus pallidus H.-S. A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 119. D. gracilentus Parsh. A, posterolateral view; B, lateral view; C, dorsal view; E, dorsal view.

Fig. 120. D. famelicus Uhl. A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 121. D. usingeri Kngr. A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 122. Cyrtopeltis geniculata Fieb. A, posterolateral view; B, lateral view; C, dorsal view.

Fig. 123. C. varians (Dist.). A, posterolateral view; B, lateral view; C, right lateral view.

Fig. 124. Macroluphus brevicornis Kngr. A, dorsal view; B, mesial view; C, left lateral view; E, dorsal view.

Cylapinae

Fig. 125. Cylapus tenuicornis Say. A, dorsal view; B, lateral view; C, dorsal view.

Fig. 126. Fulvius bruneus (Prov.). A, lateral view; B, lateral view; C, dorsal view.

Fig. 127. Peritropis saldiformis Uhl. A, posterolateral view; B, lateral view; C, ventral view.
PLATE 10 (Con't)

Bryocorinae

Fig. 128. Hesperolabops picta (Hunt., Pratt, & Mitch.). A, lateral view; B, lateral view; C, dorsal view.

Fig. 129. Halticotoma valida Reut. A, ventral view; B, lateral view; C, right lateral view.

Fig. 130. Pycnoderes medius Kngt. A, lateral view; B, lateral view; C, dorsal view.

Fig. 131. Sixeonotus nicholi Kngt. A, lateral view; B, mesial view; C, dorsal view.

Fig. 132. Monalocoris americanus Wag. & Slater. A, posterolateral view; B, lateral view; C, dorsal view.
PLATE 10 (Con't)

Bryocorinae

Fig. 128. Hesperolabops picta (Hunt., Pratt, & Mitch.). A, lateral view; B, lateral view; C, dorsal view.

Fig. 129. Halictocotoma valida Reut. A, ventral view; B, lateral view; C, right lateral view.

Fig. 130. Pycnoderes medius Knkt. A, lateral view; B, lateral view; C, dorsal view.

Fig. 131. Sixeonotus nicoili Knkt. A, lateral view; B, mesial view; C, dorsal view.

Fig. 132. Monalocoris americanus Wag. & Slater. A, posterolateral view; B, lateral view; C, dorsal view.