

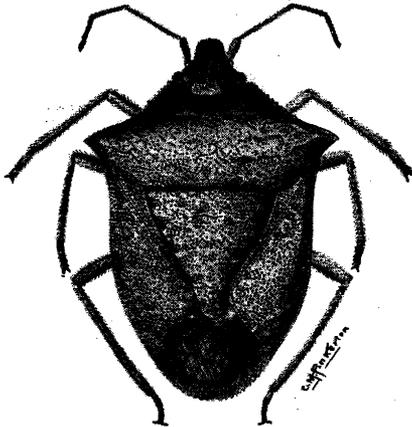
HETEROPTERA OR TRUE BUGS OF EASTERN NORTH AMERICA

WITH ESPECIAL REFERENCE TO THE FAUNAS
OF INDIANA AND FLORIDA

By

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"Boulder Reveries," "Indiana Weed Book," "Orthoptera
of Northeastern America," etc., etc.



"Although I am an insect very small,
Yet with great virtue am endow'd withall."

—*Theatr. Ins.*

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"To fill the vacant mind with 'wondrous things,'
Dame Nature works in fields and floods and air."

—*Howitt's Martyr.*

"Shame not to drink three Wall-lice mixt with wine,
And garlick bruised together at noon-day,
Moreover a bruised Wall-louse with an egg, repine
Not for to take, 'tis loathsome, yet full good I say."¹

—*Quintus Serenus.*

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By W. S. BLATCHLEY.

"Nature hath nothing made so base, but can
Read some instruction to the wisest man."

—*Aleyn.*

"Some men prescribe seven Wall-lice² for to drink
Mingled with water, and one cup they think
Is better than with drowsy death to sink."³

—*Theatr. Ins.* 1634.

¹Remedy for tertian agues. ²Bedbugs. ³Remedy for lethargy.

INTRODUCTION.

This is the fourth and last of my manuals or treatises on certain groups of the insects of Eastern North America.⁴ These works were conceived of necessity and brought forth with great labor. However, they have or will perhaps justify their existence in two ways, first by giving needed employment for the brain of a human who by virtue of inherited tendencies has too strong a predilection for work; second, by furnishing beginners in one volume a means of identifying and classifying their specimens taken afield.

Forty and more years ago I began the collecting of beetles, bugs, grasshoppers and their near kin, in the fields and woods of Indiana. For a quarter of a century the work was continued in that State whenever opportunity offered and at all seasons of the year. In 1911 I began to pass my winters in southern Florida, there to collect, between the months of October and May, insects of the same orders. At the very beginning of my collecting, the classification and naming of my specimens became a serious problem. Their original descriptions were scattered through hundreds of pamphlets, periodicals and books, many of which had been out of print for scores of years. Entomological libraries were, and are still, very scarce in the middle west, and specialists in the respective orders were few and too busy to give much attention to the needs of a beginner. Therefore of necessity I began also the collecting of entomological literature, and to prepare for my own use tables or keys of certain groups. The needs of the tyro, based on my own experience, were ever before me, and led to the belief that my tables and accession notes would be of some value, hence the preparation of my "Orthoptera of Indiana" in 1903, and "Coleoptera of Indiana" in 1910. Having broadened my collecting field to include Florida, I also broadened the area covered by my last three works to include the United States east of the Mississippi River and Canada east of the 90th Meridian. Many of the species of Heteroptera herein treated have a much wider range, but I have included

⁴The other three are "The Coleoptera of Indiana," issued in 1910; "Rhyngophora or Weevils of Northeastern America," prepared by Chas. W. Leng and myself and issued in 1916, and the "Orthoptera of Northeastern America," issued in 1920.

only those which have a fairly reliable record of occurrence in the territory mentioned.

As my personal collecting has been done mainly in the States of Indiana and Florida I have, throughout this work, given especial attention to the local distribution of the species occurring in those two states. Since the days of Thomas Say very little has been written on the Heteroptera of Indiana; in fact nothing but a few published notes by myself (1895; 1896) and the casual mention of a few records by Van Duzee and others. Say (1831) published at New Harmony, Ind., a notable paper entitled "Descriptions of New Species of Heteropterous Hemiptera of North America," only a few copies of which are now extant.⁵ In this paper he described as new 135 species; 40 of these he mentioned specifically from Indiana and 14 from Florida. The others he mainly noted as "Inhabits United States," which, I take it, would denote that they were of general distribution throughout this country; or "Inhabits Missouri," which, in 1831, comprised not only the territory of the present State of Missouri, but that of the states northwest of it between the Mississippi River and the Rocky Mountains. A number of other species were described by Say in various scattered papers. As his types were destroyed by fire, a few of his species are at present unknown, others have been proven to be synonyms, but the great majority of them are valid and comprise some of our best known and widely distributed forms.

The distribution of Heteroptera in Florida is much better known than that in Indiana. Mrs. A. T. Slosson, W. T. Davis, Van Duzee, Drake, Hubbell and others have collected them in many parts of the State. Van Duzee (1909) published a paper on the results of his collecting, in which he listed with full notes 168 species, 8 of which he described as new. H. G. Barber (1914) compiled and published an annotated list of all Hemiptera recorded or known from the State up to that time. This included 372 species of Heteroptera, 8 of which were new. Aside from my own collecting, it is from the records of Van Duzee and Barber in the papers mentioned, that most of my distributional notes on the Florida species were derived.

The literature pertaining to the Heteroptera of this country is more scattered and difficult to obtain than that of either

⁵This paper was afterward reprinted by Dr. Asa Fitch (1857) and also by Leconte (1859) and the second reference after each of Say's species in this work is to the Leconte edition, which is the one at present most available to students.

the Coleoptera or Orthoptera. Many of our species have been described by Stal, Reuter, Signoret, Horvath, Bergroth and other European authors in foreign periodicals. Up to 1910 about the only Americans who had studied and described the species of this country were Say, Uhler, Van Duzee and Heidemmann. Since that date a flood of literature by specialists in certain groups has appeared. However the only work covering all the known species of a certain area of this country is the "Hemiptera of Connecticut," issued under the supervision of Dr. W. E. Britton in 1923, and which I have found of much aid.

As in my former works, this manual has been prepared mainly for the use of the tyro and not for the specialist who has a large library at his command. For that reason it has been couched mainly in simple and easily understood language. Characterizations of all families and of most genera are given in some detail, with keys leading up to their treatment. Keys to and full descriptions of all species are then given in proper sequence. These keys are based on the more salient and important structural or color characters separating the groups or species to which they pertain, the primary object being to give to the student a work by which he can readily obtain the scientific name of the specimen in hand. In most instances, to avoid repetition and save space, the characters mentioned in the keys are not repeated in the descriptions which follow, and the keys should, therefore, *always be used in connection with the descriptions*. Moreover, the characters used and statements made both in keys and descriptions are for the most part to be considered as applying only to those species occurring in the territory covered by this work. They may be, and doubtless are, capable of much wider application, but it is not safe to assume that such is the case.

Following the description of each species are notes on its local habitat, general distribution, food habits, etc. These notes are based not only upon my field accession notes, more than 4,000 in number on the Heteroptera, but also on the data accompanying specimens which have been loaned me for study and on the published local lists and other works cited in the Bibliography near the end of the volume. The synonymy of numerous species is, however, so much confused that the general range, as given, especially where it extends beyond the territory covered, is to be considered as open to correction. The

dates of occurrence as given in the notes are usually the earliest and latest at which the species has been noted in the locality cited, and therefore show only approximately the actual time of the appearance or disappearance of the imago or mature insect.

The great majority of the species of Heteroptera treated in this work are represented in my personal collection and, unless otherwise stated, all types of new species described by me are contained therein. When not so represented I have been able to borrow examples of many named specimens from other collectors, so that, as far as possible, I was able to study, in connection with the original description, undoubted correctly named specimens and draw up new descriptions from them. Thus, of the first 600 species treated, I had in hand in preparing the descriptions examples of all but twenty. In the families Miridae and Corixidae, I was, however, unable to secure specimens of a number of the species for examination and the descriptions of these, as given, were therefore of necessity compiled from those extant.⁶ The source of the specimens in hand as I prepared the descriptions is usually given in the notes. Where not so given they were collected by myself. Thus "Raleigh, N. Car. (*Brimley*)" indicates that the specimens were taken at Raleigh and loaned or presented to me by C. S. Brimley of that place; while "Marco, Fla., March 4 (*W. S. B.*)" signifies that the specimens were taken by me at Marco on that date. The native and established species are numbered consecutively throughout the work, while the few species included as adventives or whose present status is doubtful are not numbered. The number in parenthesis following the serial number is that of Van Duzee's "Catalogue of the Hemiptera of America North of Mexico," a comprehensive reference work which has been of great use to me.

CLASSIFICATION.—The classification and sequence followed in this work represent my own opinions and not those of any previous author. There has been too much of a tendency by the writers of this country to follow strictly the con-

⁶Of the 27 individuals from whom I asked the loan of specimens for study, 23 cordially granted me the favor, and stated that they were pleased to do so. Of the remaining four, two wholly ignored both of the letters which I sent each of them. A third was "too busy with his classes to spare the time to send me any specimens of Tingitidae" while the fourth wrote: "I might loan you large numbers of Miridae, but I will have to be satisfied that you are giving me first opportunity to work over and describe any possible new forms in your collection. I cannot afford to loan you specimens from my collection and have you turn and use them as a basis to recognize new forms; not until I at least have had that opportunity. No doubt you would like to do in ten months what it has taken me ten years to work out, but the only way for you to travel that fast is to compile the literature."

clusions of Stal, Kirkaldy, Reuter and other European authors. They, for the most part, were "closet naturalists," who studied insects in museums or those which had been sent to them by other parties, and which they had never seen in the field. They therefore knew nothing of the local environments which brought about minor changes in structure or color. Bueno (1909, 402) has well said: "While we should respect the work of our predecessors, the pioneers in a sterile field, I fail to see the necessity of following in their footsteps, stepping cautiously into each footprint like Indians on the warpath."

I have raised to family or subfamily rank a number of groups formerly regarded as subfamilies or tribes, as the differences separating them from their allies are greater than those separating similar divisions among the Coleoptera and other orders of insects. Where the names I have used for the higher groups differ materially from those used by present day specialists, their names are given in parenthesis or are referred to in footnotes, and the student can use them if he so desires.

As with the higher groups so with the genera. I have not always adopted the generic names which have been proposed in recent years for certain of our species. A genus should be based on certain definite and fixed structures and once so founded all species then or thereafter assigned to that genus should possess those structures. Strictly speaking, a genus does not exist in nature but is only an artificial concept proposed by man to enable him the more readily to group his species. As to what really constitutes a set of generic characters there are about as many individual opinions as there are proposed or adopted genera. My reasons for rejecting or adopting certain questionable genera are usually set forth and the student can use his own judgment as to whether they are sound or not.

The subgenera and other minor groups of certain authors are not generally recognized in this work. In their place and solely to shorten and simplify the keys I have sometimes used "groups," usually without definite names, as they lead up more easily and with less confusion to the main object sought—the scientific name of the specimen in hand.

Throughout the work I have used trinomials to designate races, varieties, variants, subspecies, incipient species and sometimes even color varieties, usually noting which of these

minor forms I consider the third name to represent. The name of the typical variety, if more than one exists, is not printed as a trinomial. I thus use *Eustictus tristigmus* (Say), not *Eustictus tristigmus tristigmus* (Say). In many cases I have not recognized the so-called geographical races or color varieties of recent authors. Where a well known species ranges over a large area, the different environments due to altitude, variation in mean annual temperature, atmospheric conditions, difference in topography, drainage and soils, varied food plants and many other causes, are sure to bring about certain changes in its color or external structure. If only the extremes of these variants be at hand they are often so different in appearance as to cause them to be considered races or even different species. However, where a large series from all parts of the range are present, intermediates are almost sure to be found and there is little use and often much resulting confusion in giving or recognizing a name for each slightly variable form. A geographical race, or even a species may be wholly based on color characters alone, provided those characters are fairly constant, as in the fixed color of an antennal joint or the presence of a cross-bar on pronotum or elytra, but to name numerous color varieties based upon the variation of the amount of fuscous or red of the pronotum or elytra, as has been done in *Paracalcoris* and other genera, is nonsense. One might as well give to each spotted dog a varietal scientific name.⁷

BIBLIOGRAPHY.—The bibliography near the end of this volume is not a complete list of the works pertaining to the Heteroptera of Eastern North America, but contains only the names of those works to which especial reference has been made in the text, and a few additional ones which it was thought might at times be of use to the student of our fauna. In the bibliography the list of papers is arranged alphabetically by authors and each author's works chronologically by years. Where more than one paper by the same author appeared in any one year the letters *a*, *b*, *c*, etc., follow the year. Thus a citation in the text to Van Duzee (1916b, 100) will be found, by reference to the bibliography, to refer to page 100 of his paper entitled "Monograph of the North American Species of *Orthotylus*," published in the Proceedings of the California Academy of Sciences, Vol. VI, No. 5, pp. 87-128. After the name of each family, subfamily, genus and species

⁷See Journ. N. Y. Entom. Soc., XXXII, 1924, p. 150.

as recognized in this work, is given the name of its author or founder with year and page number of the work where the family or genus was founded or the species described and named. Thus *Orthotylus catulus* Van Duzee, 1916b, 106, refers to the original description of that species on page 106 of the paper above mentioned; while *KOLENETRUS* Barber, 1918c, 49, means, as a reference to the bibliography will show, that the genus *Kolenetrus* was founded by H. G. Barber, on page 49 of his paper entitled "Concerning Lygaeidae—No. 2," which appeared in the Journal of the New York Entomological Society, Vol. XXVI, 1918, pp. 49-66. For the most part the names of the authors cited are spelled out, but that of J. R. de la Torre-Bueno has been shortened to Bueno.⁸ No attempt has been made to cite all the references to each species in the literature pertaining to the Heteroptera of the region covered, as such mention or synonymy would fill several volumes by itself. The student is referred to the Van Duzee Catalogue above cited for detailed reference to each species up to the year 1917, and to the "Bibliography of the North American Hemiptera-Heteroptera" by H. M. Parshley for the full titles and place of publication of the great majority of the papers pertaining to the Heteroptera of this country up to June, 1925.

MEASUREMENTS.—The measurements used in this work are given in millimeters or decimals thereof. A millimeter (mm.) =.0394, or a little more than 1/25 of an inch. For all practical purposes it may be remembered that 2.5 mm.=1/10 inch; 3 mm.=1/8+ inch; 4 mm.=1/6+ inch; 5 mm.=1/5 inch; 7.5 mm.=3/10 inch; 10 mm.=2/5 inch; 12.5 mm.=1/2 inch; 15 mm.=3/5 inch; 17.5 mm.=7/10 inch; 20 mm.=4/5 inch.

The measurements as given are usually those of the extremes of the series at hand and thus represent fairly well the variation in size of the different parts measured. The length of the body in macropterous forms is taken from the tip of the tylus to the apex of the membrane of elytra, and in the brachypterous ones to the apex of abdomen.

Where, in the original description, the specific name was placed by the author in a genus different from that to which it is now referred, the name of the author or its abbreviation is placed in parenthesis.

ILLUSTRATIONS.—The illustrations used in this work have been derived from various sources, and credit is given under

⁸Royal Palm Park in extreme southern Florida, where I have collected extensively, is, in the distribution notes, also abbreviated to "R. P. Park."

each to its author or the one who first used it. The drawings for those marked "original" were made by Miss Mary C. Foley, artist for the Bureau of Entomology at Washington, D. C. Through the kindness of Dr. W. E. Britton, State Entomologist of Connecticut, I was able to borrow a number of the cuts prepared for the "Hemiptera of Connecticut," recently published by the Connecticut Geological and Natural History Survey. Under each of these credit is given its author and that work.

Dr. Wm. A. Riley and Prof. A. G. Ruggles, of the University of Minnesota, kindly loaned me such of the cuts as I desired which were used by Otto Lugger, former State Entomologist of Minnesota, and they are credited to Lugger or their original author. From Dr. M. W. Blackman, Chief of the Department of Forest Entomology at the New York State College of Forestry, Syracuse, N. Y., I was able to secure a number of the cuts of Heteroptera used in Technical Bulletin No. 16, published by that Department, and credit under each of these is given that work. Mr. Harry B. Weiss, of the State Department of Agriculture, Trenton, N. J., kindly furnished a number of the cuts of Tingids used by Barber and Weiss in their "Lace Bugs of New Jersey." Dr. S. A. Forbes and Mr. T. H. Frison, of Urbana, Ill., furnished numerous cuts used in the publications of the Illinois State Natural History Survey, and Dr. W. J. Holland some from the Annals of the Carnegie Museum. In addition to the above a number of illustrations in previously published papers on Heteroptera have been reproduced and due credit is given the author under each.

ACKNOWLEDGMENTS.—When I first began to form my private collection of Heteroptera on which this work is mainly based, Prof. P. R. Uhler, of Baltimore, Md., was the leading authority in this country on the group. He bore, in fact, to our knowledge of American Heteroptera the same relation that Leconte and Horn did to that of Coleoptera and S. H. Scudder to Orthoptera. In other words he was the pioneer who laid the foundation of our present knowledge of American Heteroptera. To Uhler I sent many of the first species I collected for naming and from him I received without delay the lists of names with comments on those species which were to him of especial interest. A few of his determinations have since proved to be wrong, and to a number he gave "Uhler,

Ms." as the author, some of which he never described. But to him and his published works I owe much of my early knowledge of the classification of the group.

Mr. E. P. Van Duzee, then of Buffalo, N. Y., now Curator of Entomology in the Museum of the California Academy of Sciences, is a leading American authority on Heteroptera who identified many species for me in former years and who has determined others and loaned me numerous specimens during my preparation of this work.

To Prof. H. G. Barber, of Roselle, N. J., the leading authority on American Lygaeidae, I am indebted for many favors, not only in the identification and loaning of specimens, but in the solving of numerous knotty problems of synonymy and nomenclature.

As in my works on Coleoptera and Orthoptera, so in this, my friend and fellow naturalist, W. T. Davis, of Staten Island, N. Y., has been of great service. Anything I wanted which he could furnish in the way of specimens or literature he gladly sent, and he also furnished many notes on distribution and habits.

The work in its present form would not have been possible had it not been for Wm. J. Gerhard, of the Field Museum of Natural History at Chicago. He possesses one of the best private collections of Heteroptera in this country, which was placed at my command, and also an excellent library of the literature of the group from which he loaned me many scarce papers by foreign authors which I could not secure elsewhere.

C. S. Brimley, Entomologist of the North Carolina State Department of Agriculture, who is much interested in Heteroptera, placed at my disposal their entire collection, and sent me many specimens from that section of the country which I otherwise might not have seen.

Prof. J. J. Davis, Chief of the Department of Entomology at the Purdue Agricultural Experiment Station, secured for me much literature and furnished numerous specimens from the Station collection.

Mr. W. E. China, Curator of Hemiptera in the British Museum at London, England, sent me numerous specimens from the collection in that Institution, and compared others for me with the rare types therein.

Others who aided either by the loan or identification of specimens, or both, were Dr. Herbert Osborn, Columbus, Ohio,

one of the American authorities on Hemiptera; Nathan Banks, Curator of Insects in the Museum of Comparative Zoology, Cambridge, Mass.; J. R. de la Torre Bueno, of White Plains, N. Y., an authority on aquatic Heteroptera; Dr. Wm. L. McAtee, Curator of Hemiptera in the U. S. National Museum; Drs. Carl J. Drake and H. H. Knight, of the Department of Entomology, Iowa State College, specialists respectively in Tingididae and Miridae; Dr. S. B. Fracker, State Entomologist, Madison, Wis.; Harry B. Weiss, widely known Entomologist of Trenton, N. J.; Dr. H. B. Hungerford, State Entomologist and student of aquatic Heteroptera, Lawrence, Kan.; Dr. A. J. Mutchler and C. E. Olsen, Curators of Insects in the American Museum of Natural History, New York City; Prof. C. R. Crosby, Entomologist, Cornell University, Ithaca, N. Y.; Prof. R. F. Hussey, Washington Square College, New York City; Prof. T. R. Frison, Curator of Insects, State Natural History Survey, Urbana, Ill.; Prof. C. E. Mickel, Curator of Insects, University of Minnesota, St. Paul, Minn., and C. A. Frost, Entomologist, Framingham, Mass.

To one and all of those mentioned and to numerous others in a minor degree my thanks are due, and are herewith gratefully given for the favors shown.

RELATION OF THE HETEROPTERA TO OTHER ANIMALS.

If we compare the body of a true bug or other insect with that of any vertebrate animal, as a fish, bird or squirrel, we find at once great and important differences. The vertebrate is an animal with an inner bony skeleton, two pairs of jointed limbs or appendages, and breathes by means of lungs or gills, according as it dwells in air or water. The bug is an animal which has no inner skeleton or bones whatever, but only a hard crust on the surface which surrounds the muscles and vital organs. This crust is composed of separate rings, placed end to end.

Animals whose bodies are thus composed of rings are called *Articulata*. They are in turn divided into two great groups, the *Vermes* and the *Arthropoda*. The *Vermes* (worms) have all the rings composing the body very nearly alike, not hardened into an outer crust or exoskeleton, and without paired limbs which are jointed. The *Arthropods* have a part of the rings bearing paired jointed appendages, and have the cuticle or outer surface consisting largely of a peculiar substance called "chitin,"

which is secreted or exuded by the cells which compose the cuticle. Chitin itself is insoluble and is not composed of cells, but consists of fine, irregular plates. It hardens the cuticle and thus aids the latter in protecting delicate vital organs within, and also in forming a framework to which the muscles of movement may be attached. Between the joints the cuticle is devoid of chitin and is thin, delicate and flexible, thus allowing the necessary freedom of motion.

The Arthropoda are divided into four classes, as follows:

(a) *Crustacea* (crayfish, lobster, etc.), mostly aquatic; having the head and thorax usually united and distinct from the abdomen; breathing by means of gills or directly through the skin, the exoskeleton with carbonate and phosphate of lime in addition to chitin.

(b) *Arachnida* (spiders, mites, etc.), terrestrial; head and thorax usually combined, and bearing four pairs of legs; breathing by means of tracheæ.

(c) *Myriapoda* (myriapods, centipedes, etc.), terrestrial; usually worm-like, with only the head distinct; legs numerous; breathing by means of tracheæ.

(d) *Insecta* (grasshoppers, flies, beetles, bugs, etc.), in great part terrestrial; legs six; adults usually with one or two pairs of wings; breathing by a system of tubes called tracheæ, which branch and ramify through every portion of the body, and which open externally in about ten places on each side of the body instead of at the front end. The rings of the body are grouped in three regions; the *head*, the *thorax* and the *abdomen*. In general it may be said that the head contains or bears the organs of sense and of prehension and mastication of food; the thorax the organs of locomotion, and the abdomen those of reproduction.

THE EXTERNAL STRUCTURE OF A TRUE BUG.

Having thus shown that a bug belongs to the class *Insecta* it is thought best, before giving its relation to the other orders of that class, to describe briefly the external parts of a typical specimen. The beginner may thus the more readily grasp the name and location of the parts used in classification, as well as the meaning of many of the technical terms which, of necessity, have to be used in such a work as this. These parts are well set forth by Dr. H. H. Knight in the accompanying figure from the "Hemiptera of Connecticut," though all the parts

shown in the figure are not present in the species of many families of Heteroptera. The three regions of the body, the head, the thorax and the abdomen with their appendages, will

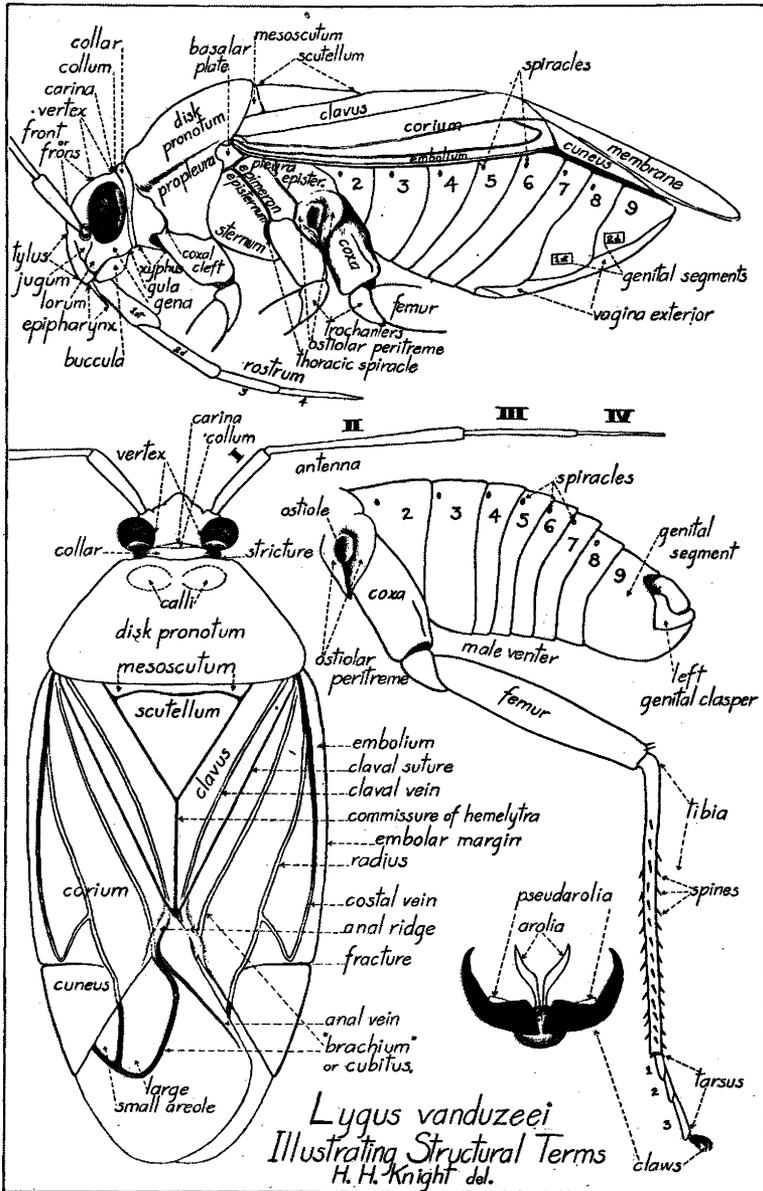


Fig. 1. ILLUSTRATING THE EXTERNAL PARTS OF A BUG.
 (After Knight, in Hemiptera of Connecticut).

therefore be considered in order and as represented in the figure.

THE HEAD.—The heads of Heteroptera vary much in form and size and are composed of four or more segments or rings, solidly fused together to form a single cavity or hard box of chitin, known as the *epicranium*. This contains the brain and accessory ganglia, and the mouth cavity. It bears or gives support to the antennae, mouth parts, eyes and ocelli; also internally to the muscles moving the rostrum or beak. The broad basal portion of the epicranium back of the eyes is known as the *occiput*, the narrower portion between the eyes, the *vertex*, while the long, often more or less deflexed frontal portion is the *front* or face. Below the front and between it and the base of beak there are usually three more or less distinct parts, separated by sutures or grooves. The median one of these is the *tylus*, sometimes called the *clypeus*. The parts adjoining this on either side are known as the *jugae* or upper cheeks. On the outer sides of the jugae and in front of the eyes are the *lorae*, these however being often indistinct or even wanting. Below the eyes and between the lorae and gula or throat are the *genae* or lower cheeks. The lower side of the head is composed of the *gula* or throat, lying above the base of the beak when the latter is in repose. On the front of the gula and each side of the base of beak are usually two plates known as the *bucculae*.

On the upper sides of the head are the two *compound eyes*. They vary much in shape, size and convexity and are often larger in the males than the females of the same species. Each is made up of many hundreds of six-sided facets or lenses, in each of which ends a single filament of the optic nerve. Two small simple eyes or *ocelli* are present in most Heteroptera, but are absent in the largest family, the Miridae, and hence are not shown in figure 1. They are usually situated on the vertex between the basal halves of the compound eyes. These ocelli are thought to be inherited from the obscure eyes of the worm-like ancestry of the bug, while the many faceted compound eyes of insects and crustaceans have been evolved to satisfy the needs of the more recent existence of these groups.

The *rostrum*, or *beak* as it is called in this work, is to the bug the most necessary external appendage of the head. It is attached to the lower front part of the head, close to the tip of the tylus and when not in use is carried flat, usually in a groove,

along the lower part of the body and between the coxae. It consists of two parts (fig. 2), a sheath or tube-like outer part of horn-like chitinous texture and an inner sucking organ proper composed of four very slender hair-like setae which are somewhat dilated at the base. The sheath consists of an elongated grooved *labium* or lower portion which is divided into

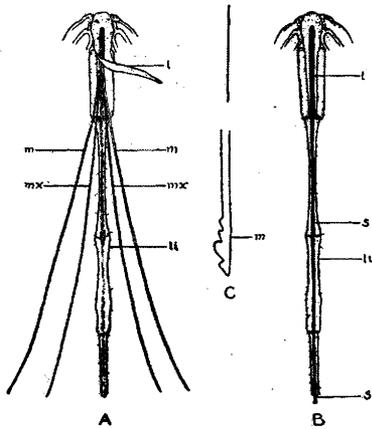


Fig. 2. Beak of *Nezara viridula* (L.). A, dorsal view with setae pulled out from sheath; B, same with setae in normal position within sheath; l, labrum; ll, labium; m, mandible; mx, maxillae; s, setae within sheath, their tips protruding; C, tip of mandible greatly enlarged, showing barbed tip. (After Drake).

segments or joints of variable length and one to four in number, and a short upper flexible portion covering the base of the setae and corresponding to the *labrum* of other insects. The sheath serves as a wrap or protection for the delicate setae, and also, in some of the predaceous Heteroptera, as a piercing or defensive organ. The setae are fine flexible rods which can be fitted closely together to form a tube. They vary in length, sometimes being much longer than the sheath and are capable of protrusion. Their tips are very sharp and for the most part

make almost invisible pricks in the epidermis of leaf or larvae of insects. Usually they alone are used in piercing the object used as food. The outer pair are generally barbed near the tips and when inserted in a victim readily maintain their hold. Sometimes the struggles of the prey pull the setae out of and to one side of the sheath. The bug then releases its hold and draws the beak between the front tarsi, in the same manner that an ant cleans its antennae, thus forcing the setae back within the sheath. The relative length of the beak and of its segments are much used in the classification of the Heteroptera.

The antennae of a bug are usually inserted in shallow cavities on the front or sides of the head and articulate with the latter by a ball and socket joint. In the aquatic forms they are shorter than the head and are generally concealed in small pockets or cavities on the under side of the head. They are usually composed of only four or five segments which vary

much in relative length and thickness and this variation is extensively used in classification.

THE THORAX AND ITS APPENDAGES.—The middle region of the body of a bug or other insect is called the *thorax*. To study its parts aright, the wings and legs attached to it should be removed, when it will be seen to consist of three rings or segments. These are known as the *prothorax*, *mesothorax* and *metathorax*. Within these rings are located the muscles for moving the wings and legs, as well as some of the digestive organs.

The prothorax of the bug usually has its entire dorsal surface, and sides in great part, covered by a large piece known as the *pronotum*. This varies much in shape and size in the different families of Heteroptera. Its upper surface is called the *disk*, and its deflexed sides or flanks the *propleura*. The outer edges separating the propleura from the disk are the *lateral margins*. These are sometimes carinate or raised and sharp and are often sinuate, toothed or crenate. The disk is often divided crosswise by a groove or impressed line, thus forming two divisions or lobes. The front one of these sometimes has a second impressed line or *stricture* just behind its apex, the area in front of this being known as the *collar*. On the upper surface of the front lobe, or front portion of the disk, are often two slightly elevated, usually smooth areas known as *callosities* or *calli*. The angles where the lateral margins of the disk meet the hind margin of the pronotum are known as the *lateral* or *humeral angles*, but are sometimes called the *humeri*. The under or ventral side of the prothorax is a narrow, somewhat movable piece called the *prosternum*. Near its outer ends are shallow sockets in which are attached the coxæ of the front pair of legs. Between the bases of these coxæ is a triangular piece known as the *prosternal xyphus*.

The *mesothorax* and *metathorax*, the second and third segments of the thorax, are, in the bug, rather firmly united with the basal abdominal segment of the abdomen to form a firm walled box. Lying immediately above the mesothorax is the *mesoscutum*. This is usually covered by the hind lobe of pronotum and base of outer wings, though sometimes it is partly exposed as in figure 1. To the mesothorax are attached the elytra, or outer pair of wings and the second or middle pair of legs. To the metathorax are joined the inner wings and the third or hind pair of legs. The under or ventral portion of these seg-

ments are called respectively the *mesosternum* and *metasternum*, and their side pieces the *meso-* and *metapleura*.

In most of the plant-feeding Heteroptera there is present each side on the inner end of the metapleuron and near the hind coxa a small opening known as the *osteole* (or *ostiole*). It is usually borne upon a somewhat elevated and delimited area of the metapleuron known as the *osteolar peritreme*. This osteole is the external orifice of the stink gland, and through it is emitted at the will of the bug a liquid or vapor which gives off the characteristic odor of the insect. The visible portion of the osteole varies greatly in form. Sometimes the rim of the opening is expanded to form an auricle or is prolonged outwardly as an open canal-like duct. Again, the opening may be at the end of a closed tube which extends outwardly on the peritreme for some distance from the coxa. These variations are used extensively in the classification of the Scutelleridae, Anthocoridae and other families.

Behind the pronotum and lying above the meso- and metathorax and between the bases of the outer wings is the *scutellum* or shield. This, in the Heteroptera, is usually much larger and better developed than in other insects, sometimes covering almost the entire abdomen and outer wings. It is usually more or less triangular in shape and, in certain families, its side margins are furnished with a ridge or fold known as the *frenum* on which in repose the inner edge of the clavus rests. The shape, size and sculpture of the scutellum are much used in classification.

The outer or front wings of the Heteroptera are known as *hemelytra* (or in this work as *elytra*). They differ greatly in texture and form from the inner ones and this, taken in connection with their peculiar structure, gives name to the order, the word Heteroptera meaning "diverse-winged." They close above and in great part or wholly cover the abdomen, the basal portion being more or less horny in texture, the apical one usually membranous and overlapping. The thicker basal portion of the elytron is divided into two parts, the *corium* or larger outer portion and the *clavus* or narrow part lying next to the scutellum and separated from the corium by the *claval suture*. In the Miridae and allied families (fig. 1) the outer or costal part of the corium is usually sharply delimited by a suture and is called the *embolium*, while the apical triangular portion of the corium is separated by the *fracture* and is known as the

cuneus. Where the two clavi (plural of *clavus*) meet behind the apex of scutellum their suture or line of union is known as the *commissure*. The *membrane*, or apical membranous portion of the elytron, is usually veined, and in certain families, as the Miridae, the veins unite to form one or more closed cells or *areoles*. The elytra in some of the individuals of many species of Heteroptera are often abbreviated. These are termed *brachypterous* forms and in them the membrane, and sometimes the *clavus*, is often absent or much shortened.

The inner or hind wings of a bug are almost wholly membranous and are little used in classification. When at rest they are folded across the apical portion and concealed beneath the elytra.

The legs of a bug are six in number, arranged in pairs, one pair being joined to each of the divisions of the thorax. They are composed of five parts, viz.: the *coxa* or basal segment which in the terrestrial families is united by a ball and socket joint to the thorax; the *trochanter*, a small triangular segment united to the base of femur and apical part of coxa; the *femur*, a long and usually stout segment which is often more or less clavate and toothed or spined beneath; the *tibia*, also long but more slender, and usually with two or more rows of slender spines or setae, and the *tarsus* or foot, which is composed of one to three movable joints, the terminal one usually ending

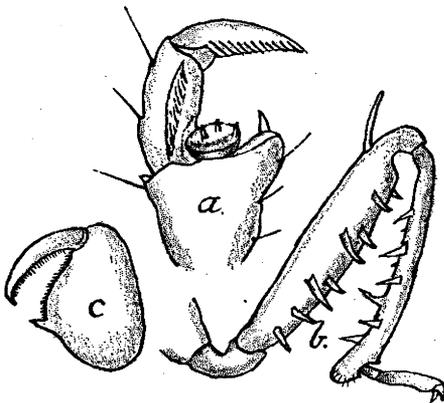


Fig. 3. Prehensile fore legs of bugs. *a*, of a hog-louse; *b*, of a soldier bug, *Podisus*; *c*, of an ambush bug, *Phymata*. (After Luggler).

in a pair of claws. In many species the claws have attached to their bases a pair of slender appendages known as *arolia*, and sometimes an accessory pair of *pseudarolia*. In many species of predaceous bugs the front tarsi and femora are raptorial or armed beneath and otherwise modified to form (fig. 3) grasping or prehensile organs, which are used to

catch and hold their prey. In the aquatic bugs part or all of the tibiae are often more or less flattened and beset with numerous ciliae for aid in swimming.

THE ABDOMEN.—The abdomen or hind portion of the body of a bug is composed of nine or ten more or less complete segments, so united as to be movable in a small degree. Each segment is composed of two parts, a *tergum* or upper portion, and a *ventral* or under piece. The ventral of the first or basal abdominal segment is united firmly to that of the metathorax. Seven or eight of the ventral segments of the bug have a small opening near the ends or lateral margins. These are *spiracles* or external openings of tubes which serve as air passages. The side margins of the abdomen in the Heteroptera are usually more or less flattened and expanded to form the *connexivum* (see fig. 17), the upper and lower surfaces of the abdomen proper meeting along its inner edge.

The eighth and ninth ventrals of the bug are more or less modified in both sexes. In the female they are known as *genital segments* and in many species each bears a pair of processes so modified as to form an ovipositor. This serves both as a cutting instrument to make slits in the epidermis of plants and also as a tube-like organ to place the eggs therein. In repose the ovipositor is in great part concealed. In the male the last ventral is modified to form a secondary sexual organ, also known as the *genital* segment. It bears a pair of clasping organs, the variations of which are, by some authors, much used in classification.

The above constitute the more important external parts of a true bug, the characters of which are used in determining the name and position of any member of the order Heteroptera. As will be seen in the pages which follow, these different parts vary much in size and in form, but the names given to them apply as well to the members of one family as to another. By referring to the accompanying figures, and by observing carefully the parts of the specimen in hand, the beginner need have little hesitation in deciding as to whether the description agrees with that specimen.

In order to simplify and shorten the keys and descriptions in the main body of this work I have used in a modified form many of the terms above mentioned. I thus use *beak* for rostrum, *cheeks* for jugae, *elytra* for hemelytra, *joint* for segment, and antennal, dorsal, ventral, connexival, tarsal, etc., for the different segments or divisions of the parts to which they pertain.

THE RELATION OF HETEROPTERA TO OTHER INSECTS

All true insects can be separated into one or the other of two great groups, based upon the kind of changes or transformations which they undergo before reaching the adult or winged stage. To one group, the *Metabola*, belong those insects which undergo what is called a *complete metamorphosis*. In this group there are four distinct stages, the egg, larval, pupal and imago, in the order named.

The second group, the *Heterometabola*, comprises those insects in which the *metamorphosis* is *incomplete*; the young, when hatched from the egg being wholly wingless and of the same general form as the parent. As the insect grows it moults its skin a number of times and wings develop gradually, there being no sharp line defining the larval and pupal stages. The young of all stages are called *nymphs* and continue active and feed from the time of hatching until they reach the final moult and emerge therefrom mature or in the imago stage.

It is to this second group, the *Heterometabola*, whose members undergo an incomplete metamorphosis, that the Heteroptera, the order of which this paper treats, belong. From other orders of the group as the Orthoptera or locusts, Odonata or dragonflies, etc., the Heteroptera may be known by having the wings, when present, four in number, *more or less net veined, the outer or front pair more horny than the hind ones, folding flat on the back, their apical portion more membranous than the basal one; front of head not touching the coxae; mouth parts sucking, consisting of a proboscis or movable beak which, when at rest, is concealed beneath the body*. The members of the order Homoptera possess a somewhat similar beak, and they and the Heteroptera are usually considered as suborders of the order Hemiptera. However in the Homoptera the outer wings cover the abdomen in a roof-like manner and are usually of the same texture throughout; while the front of the head is much inflexed so that in repose it is in contact with the front coxae. These and other differences lead me to treat the Heteroptera as a separate and distinct order.

HABITS OF HETEROPTERA.

FOOD AND MATING HABITS.—The food and mating habits of the Heteroptera are almost as diversified as the species themselves. Uhler (1884, 205) has well said: "They are either aerial, terrestrial, riparian, or aquatic. Some pass their lives

in the upper parts of trees, others chiefly on the lower limbs; still others prefer the protection of roots, stones, or rubbish on the ground; a large number of species select a home beneath the surface of the earth, often in the holes of ants or other insects; a conspicuous assemblage of dull-colored forms occurs only in the crevices or under the bark of trees and shrubs; while a host of others skim over the surface of placid waters, and a few are found remote from land upon the rarely disturbed waves of the tropical and sub-tropical oceans."

In this work the general habitat and food habits of each group are briefly treated in the notes under the family or generic heading, and those of the species in the notes following the description. Those species which are plant feeders occur on or near their host plant. Some are to be found on the ground hidden beneath dead leaves and other debris about or between its roots; others on the lower leaves or, if it be a tree or shrub, in the crevices of or beneath the bark; still others higher up on the flowers or leaves of the upper branches. The predaceous species, which feed upon caterpillars and other larvae, are liable to be found anywhere that their prey occurs. while the subaquatic and aquatic forms are usually found only near, within, or upon the surface of water. However, the adults of some aquatic species, especially during the mating season, fly freely to light.

In the keys to families and elsewhere in this work certain terms are used to signify in one word the general or local *habitat* of the group or species, and also the character of its food. Thus, *aquatic* means living in the water; *semiaquatic*, on the surface of water; *subaquatic*, or *hygrophilous*, close to the water, along the margins of ponds, streams, marshes, etc.; *littoral*, living on the sandy or mucky shores of oceans, lakes or streams; *maritime*, on the waters of the ocean; *submaritime*, along its shores; *subterrestrial*, living beneath the ground; *terrestrial*, living on the surface of the ground or on herbs or low shrubs close thereto (sometimes, in a more general sense, the opposite of aquatic); *thamnophilous*, living on shrubs; *arboreal*, on trees. Terms relating to food habits are *phytophagous*, leaf-eating or vegetable feeders; *predaceous* or *predatory*, searching for and feeding upon other forms of insect or lower form of animal life; *parasitic*, living and preying upon man or other animals.

As with the Coleoptera, it will be found that the best collecting grounds are along the sides of lanes, roads and cultivated

fields. Few species occur in dense woodland, and those mainly on the boles of trees, in the moss growing on or about their roots or in bunches of dead leaves which have collected in the forks of their branches. Many species fly to light, especially during the mating season.

In mating the terrestrial bugs mostly pair end to end. However, in the Phymatidae, and perhaps other families, the male mounts the back of the female as in the Coleoptera. Their eggs are deposited on or near the host plant, and after hatching the young moult or change the outer skin four or five times, at intervals of a few days each, to become adults. Growth is thereby permitted, the wing pads and body after each moult become one size larger and aside from size and absence of wings, there is usually but a slight difference to be noted between nymphs of the last two stages and the adults.

DEFENSIVE HABITS.—When approached or disturbed many species of bugs feign death, folding their antennae and legs closely beneath the body and therefore, if above the ground, tumble thereto. Others are very alert, quickly flying when alarmed, while some of the ground frequenting species, as the long-necked *Myodocha serripes* (Oliv.), when uncovered run swiftly to a new hiding place beneath nearby debris. When handled, or often when captured in the sweep net or beaten into an umbrella, those species with osteola present emit their characteristic defensive odor. In many species this odor is not unpleasant, and that of some has been likened to the smell given off by a ripe pear. In the family Pentatomidae or "stink-bugs" and Coreidae or squash-bugs it is, however, notorious and offensive. Birds, and people too, for that matter, soon learn to avoid the bugs which excrete this odor. Many a boy, while berry hunting in the country, has clapped a number of berries into his mouth, only to experience a smarting sensation and a nauseating taste, brought about by the acidulous liquid from the glands of a stink-bug which accompanied the berries. In this way, if in no other, the boy learned the virtues of the protective principles possessed by the stink-bug tribe and future stink-bugs, if not the one in the mouth, profited as a result. Birds probably learn to avoid the use of stink-bugs as food in much the same manner; though, like many other traits of the lower animals, this knowledge may in them be instinctive rather than acquired.

The beak of many species of bugs is used as a defensive

organ against humans and probably other animals. This is especially true of the larger predaceous species belonging to the families Reduviidae and Naurocoridae. When picked up and handled without care they can and often do pierce the fingers, inflicting a deep wound which is more painful and lasting than that of the sting of a bald hornet. The beak of these larger forms is also often used to kill and hold their prey.

The Heteroptera apparently have few natural enemies among the higher forms of life. Birds as a rule avoid them on account of their offensive odor, but spiders appear to pay little attention to this, as I have taken several rare species from their maws or webs. Like the Orthoptera they are attacked by several kinds of mites, the most common of which is a red species of *Trombidium*. I have found it attached to a number of species of bugs, even to that most slender-bodied form, *Hydrometra martini* Kirk. They are also, during long spells of warm moist weather, often attacked by vegetable fungi.

THE COLLECTING AND PRESERVATION OF HETEROPTERA.⁹

As will be noted in the pages which follow, each species of Heteroptera has its favorite local habitat or chosen haunt, the place where it finds the struggle for existence least fierce, food most abundant, protection or concealment from its enemies most easy. Here the collector will find that species most abundant and for the beginner a few directions for its capture and preservation will perhaps be useful.

INSECT NETS.—The most efficient device for taking the majority of forms of Heteroptera is a strong sweep net. The frame of the folding steel landing net made for fishermen and sold in most sporting-goods houses serves admirably for the frame of a sweep net. When unfolded it should have a diameter of about 16 inches; and the handle should be preferably of one piece and not over 30 inches long. The bag should be made of heavy unbleached muslin and should be 20 to 24 inches in depth. Such a net can be easily used with one hand both in sweeping from side to side herbs and small shrubs as one walks leisurely along, or it can be used more forcibly in quick upward sweeps against the branches of larger shrubs and trees, thus jarring the insects into the net, where they can be captured with fingers or forceps, or by placing the mouth of the killing bottle quickly over them. This net also serves well

⁹For more detailed directions on this subject see Torre-Bueno (1925).

instead of an umbrella as a beating receptacle. For this purpose it is held under the foliage with one hand while the limb is struck a quick, sharp downward blow with a strong stick. The sweep net serves best in the capture of such Heteroptera as do not fly quickly and which are resting, for the most part invisible until caught, on the foliage of herbs and shrubs. These include most of the terrestrial leaf-eating species. The one disadvantage in the use of the sweep net is that it prevents the host plant from being definitely known, unless, as is seldom the case, the vegetation is of a single species.

For the taking of Cydnidae, Lygaeidae and other ground-frequenting species, especially during the months from October to April, a sifting net will be found of great service. Many species can be taken with it which would probably be missed otherwise. It is easily made by taking a circular piece of wire netting about nine inches in diameter and with a mesh of one-fourth or one-half inch, and fastening to it firmly a piece of heavy unbleached muslin, so as to make a cylindrical bag 15 to 18 inches in length. To the top of the bag should be attached a ring of heavy wire of the same diameter as the bottom, this being held in one hand the other used to grasp the bottom and shake it back and forth or up and down over a newspaper, piece of canvas or other receptacle spread out on a level piece of ground. The sifting should be done when the sun is shining, and close watch should be kept for any movement amidst the fine debris which passes through the bottom of the net. Many of the insects will immediately try to escape by running swiftly to the sides of the receptacle, but others feign death, often for several moments, then begin to kick or heave the debris, thus disclosing their presence. The sifting of moss or vegetable debris about the roots of trees or that beneath boards, partially decayed logs, piles of weeds, dry and desiccated cow or horse dung, and other similar matter will often result in the taking of many species not otherwise obtainable. Especial attention should be given to the roots of large clumps of dead grass. They should be held over the newspaper or receptacle and thoroughly pulled apart and the resulting debris then sifted. I have taken many rare species of hibernating bugs and beetles from such clumps of grass.

The use of a water net is indispensable for the taking of most aquatic Heteroptera. A form with bottom of copper wire and sides of light linen crash is sold by supply houses, but

it is rather cumbersome and unwieldy. Bueno describes one used by him as follows:

"The net ring should be of heavy wire and between 8 and 9 inches in diameter; the necessary length of wire is about 33 to 36 inches. Bend the two ends of the wire 4 inches from the tip at about right angles, then bend the wire to form the ring, so that the straightened ends will be parallel to each other. These ends should then be put into a brass or copper tube about one-half to three-fourths inches inside diameter, the latter being the better size, and about twice as long as the straight ends. The latter are fastened into the tube by pouring in melted lead. To prevent this from running out, a short cork is driven in from the lower end until it touches the tips of the ring ends. Any stick about six feet long will do for a handle. To prevent the net from being pulled off the handle, a small (one-eighth inch diameter) hole is drilled through the tube and an ordinary brass screw-eye is screwed into the handle through the hole. The net proper is made of stout brussels netting. The upper part binding around the ring is of heavy unbleached muslin and about 4 to 6 inches deep, the netting being about 4 inches deep only. Such a net as this is very strong and little likely to get tangled and torn on rocks or stumps in the water."

The ordinary butterfly or insect net with bag of gauze, brussels or mosquito netting is little used in the capture of Heteroptera, except for wary or quick flying species such as the Saldidae and some Miridae. The one advantage in its use is that the insect is visible when captured, whereas one must open the sweep net and peer into its depths, thus giving many a fine specimen a chance to dart out and away.

For the tree-inhabiting Heteroptera *beating* into an umbrella or into the sweep net above described is an excellent method of capture. Care should be taken in sorting over the debris which falls into the umbrella, as many species cling closely to the small twigs and are apt to be thrown out. If this debris be thrown onto a rubber blanket and then gone over a second time numerous specimens will often be found. In winter or early spring the beating of dead limbs, bunches of dead vines or leaves, clumps of Spanish moss and other accumulated rubbish in the forks of the branches will often bring down many hidden or hibernating species.

The larger Pentatomids, Coreids, etc., are often visible, clinging to leaf or twig and are easily taken by holding the mouth of a large bottle beneath them and letting them tumble into it. Many subaquatic or hibernating species are to be found clinging to the under side of boards or stones, or resting in the rubbish beneath them. These can be easily taken with the fingers, or preferably a pair of forceps, if one does not care to

run the risk of a severe wound by their ever ready defensive beaks. In fact, the true bugs, like the beetles, are to be looked for almost everywhere, the main requisites for a good day's capture being a quick eye and a search in all sorts of strange and unlikely places.

KILLING BOTTLES.—After capturing a specimen for a cabinet it is best to kill it as quickly as possible before its antennae, legs or other delicate appendages are broken. This is best accomplished by the cyanide bottle which is made by placing in a large mouthed bottle, preferably of the form shown in figure 4, small broken pieces of potassium or sodium cyanide to a depth of two-thirds of an inch. Cover this with about one-half inch of plaster paris. Moisten the latter with just enough water to cause it to set and hold the cyanide in place. Then cover with two thicknesses of blotting paper so cut as to closely fit the inside of the bottle. Keep the bottle tightly corked and *in a place where children cannot reach it, as the cyanide in any form is a most deadly poison.* Any bug placed in the bottle will usually be killed in a few minutes. Several bottles of different sizes for both large and small specimens should be taken on each day's trip. After six months or more the cyanide usually loses its poisonous qualities and must be renewed or the bottle discarded for a fresh one. The cork for the bottle should be long, to make it easy to take out and put in. To support the insects narrow ($\frac{1}{4}$ - $\frac{1}{8}$ inch) strips of any absorbent paper should be put into the bottle. The paper also absorbs any moisture the insects give off. A little of the curled paper should be packed down, not too tightly, and the rest put in loosely, about halfway up the bottle.



Fig. 4. A cyanide bottle with paper strips enclosed to keep the insects from jostling too freely. (After Banks).

When the insect falls in, it falls among the coils and seldom gets away. The cyanide bottle, after being used several times,

will often be found to contain much moisture. It should then be wiped out with dry cotton and new pieces of blotting paper substituted for the moist ones.

The use of a liquid known as carbon tetrachloride instead of cyanide as the killing agent is recommended by Bueno. It is nonpoisonous, quick and certain of action. Of its use he says:

"A wad of absorbent cotton is put at the bottom of the tube or bottle, wet, but not dripping, with the tetrachloride. This is held in place by two or three blotting paper disks, or by one of thin sheet cork. It is well to put in another piece of cork or blotting paper about one-half to three-fourths inch above the charge to form a gas chamber. The upper partition may be held up by a short ($\frac{3}{4}$ inch) length of glass tubing slightly smaller than the inside dimension of the bottle or tube. In hot weather evaporation of the tetrachloride is rapid and it condenses on the sides of the tube, wetting the insects. This gas chamber prevents the sweating and also makes the bottle last longer. Such bottles are ready for use as soon as prepared and will last for quite some time—as much as five or six expeditions. These bottles have many advantages over cyanide. They are clean, absolutely harmless, not unpleasant in odor, easily prepared, full strength until completely exhausted, and from the point of view for their purpose, absolutely quick and efficient. Insects may be left in over night and will be quite flexible the next day. And finally, small, delicate forms may be put into smaller tubes, and the gas from the tetrachloride tube *poured in* (it being heavier than air). In this way Mirids and other delicate forms may be kept separate and quite dry. Its perfect harmlessness makes it ideal for the use of students and young collectors. Tetrachloride is cheap and easily obtained. It is not affected by the laws governing the sale of poisons."

After the day's collecting the specimens should be either mounted or, if away from home, packed for carrying or shipment. The larger ones are best transported by placing them between thin layers of felt, or of cotton separated by layers of tissue paper, in small pasteboard boxes, and these then packed firmly in small cigar boxes. If in a moist climate and packed too closely they are apt to mold in a short time. The smaller ones can be transported easily by placing a few specimens in Nos. 1 or 0 ordinary gelatine capsules with a small wad of cotton or tissue paper placed above them (not too closely) to hold them firmly in place. The harder bodied forms may also be transported in small vials of alcohol.

LABELLING SPECIMENS.—With each layer of specimens in a box or in each capsule place a label giving the date and place of capture and an accession number referring to a similar number in a notebook. This number in the book should be followed by any special data regarding the occurrence, food plant or other information concerning the specimens which may be of

value in the future. When mounted, each pin should bear below the insect a locality and date label and also the accession number referring to the notebook data. Without such labels a specimen is of little scientific value. I would at any time rather have a label without a specimen than a specimen without a label.

Dried specimens can be relaxed sufficiently for mounting by placing between thoroughly moistened layers of blotting paper in a tightly closed box or other receptacle for 10 or 15 hours. If the weather is very warm a drop or two of carbolic acid or alcohol had best be sprinkled over the blotting paper. The mold or grease on specimens can be removed by using a camel's hair brush and alcohol to which a few drops of carbolic acid have been added, or they can be immersed and soaked in carbon tetrachloride.

PINNING SPECIMENS.—In pinning a specimen of Heteroptera for the cabinet care should be taken to so locate and pass the pin as to hold it firmly, avoid the breaking of legs or the spreading of wings and, at the same time, not interfere with its future study. By experience I have learned that this is best done by passing the pin through the basal third of pronotum, inclining the point slightly backward so that it will pass through the meso- or metasternum and between the coxae, thereby holding the specimen rigidly in place. A No. 1 or 2 standard insect pin is sufficiently large for most of the true bugs.

The smaller species of Heteroptera, including most Lygaeidae and Miridae, through which a No. 1 pin cannot be passed without injury, should be mounted, as is the beetle in fig. 5, with transparent glue or shellac on the tip of a small narrow triangular card or point through the base of which a pin has been run. Only a very small amount of the glue is necessary, it being most readily applied to the card with the tip of a wooden toothpick. The legs should be carefully spread before mounting and the body then pressed down firmly

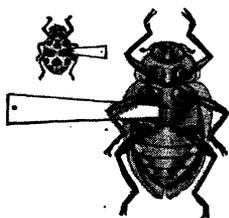


Fig. 5. Showing method of gluing an insect on a paper point.
(After Banks).

on the glued card, which should be placed at right angles on the left side of the pin with the head of the insect away from the person. The points can, with a little practice, easily be cut by a small pair of scissors from a strip of heavy drawing paper

as wide as the length of the point. The best glue which I have found for mounting is Kay's "Coaguline," which does not deteriorate with age and when too thick is thinned by the simple addition of a drop or two of water. It is made at Stockport, England, and comes in two-ounce vials. Bueno recommends a glue "made of clear white granulated cooking gelatine dissolved in glacial acetic acid and fairly thick."

MUSEUM PESTS.—All soft-bodied Heteroptera are subject to the attacks of museum insect pests, such as Dermestids, etc. They should, as far as possible, be kept in insect-proof boxes. Flakes of naphthaline kept in each box will usually serve as a repellent for such pests. Each box should be examined three or four times a year, and if by dust, exuvia or other debris, the presence of pests is indicated, a few drops of carbon bisulphide should be poured in the box and the lid quickly closed. The vapor of this will soon destroy the eggs, larvae or other living form of any pest. However, its vapor is ill-smelling, poisonous and easily inflammable, and a safe and equally effective remedy is proposed by Bueno. It is the paradichlor-benzene, used by horticulturists in killing peach tree borers. A little of this dissolved in carbon tetrachloride and poured into the box will soon vaporize and the vapor quickly kill all living forms therein.

* * *

"Joy's soul lies in the doing,
And the rapture of pursuing
Is the prize."

Family XXVIII. TERMATOPHYLIDÆ Reuter, 1884a, 218.

Small elongate-oval species having the head longer than broad, declivent in front, its apex truncate or obtusely pointed; ocelli wanting; beak 4-jointed; antennæ much longer than head, 4-jointed, the last two joints more slender than the basal ones; pronotum trapezoidal, longer than head; elytra entire with the usual divisions including embolium and cuneus present; membrane with a single large cell; cell of inner wings without a hamus; hind femora compressed, movable only inward and outward; tarsi 3-jointed, claws without arolia; stigmas located on the sides of ventrals 2—7. Genital segment of female split at middle and enclosing a sheath for the ovipositor as in the Anthocoridæ. The family is a small one comprising only four genera and about 10 species. One genus, represented by a single species, occurs in this country.

I. HESPEROPHYLUM Reuter & Poppius, 1912, 16.

In this genus, mainly characterized as above, the head is much longer than broad, strongly declivent and pointed; eyes glabrous, separated by a narrow groove and, viewed from above, with inner margin concave; tylus long and narrow; beak reaching beyond middle coxæ, joint 1 very short, reaching only middle of eyes, 2 as long as 3 and 4 united; pronotum with basal margin broadly rounded, nearly three times as wide as front one, hind lobe convex, moderately declivent forward, rather thickly and strongly punctate, front lobe not punctate, closely and finely wrinkled, without apical stricture, transverse impression or calli; scutellum flat, smooth, about as long as broad; elytra smooth, surpassing abdomen, cuneus as wide at base as long; membrane with cell almost semicircular; osteolar channel straight, not margined. One species is known.

636 (874). HESPEROPHYLUM HEIDEMANNI Reuter & Poppius, 1912, 17.

Oblong-oval. Black, strongly shining, the front portion of pronotum alone dull; basal half of pronotum and elytra blackish-brown; scutellum yellowish-white, the tip darker; membrane fuscous-brown, strongly iridescent, a paler spot near tip of cuneus; edges of propleura, beak in part, and tibiæ pale yellow, the basal halves of tibiæ somewhat darker. Antennæ with joints 1 and 2 black, 1 reaching slightly beyond middle of tylus, 2 strongly thickened, its sides flattened, slightly longer than pronotum, nearly five times as long as 1, 3 and 4 pale yellow, 4 about as long as 1, slightly longer than 3. Vertex not quite twice as broad as the diameter of the eyes. Length, 4 mm.

The above is a free translation of the original characterization of genus and species. The latter was described from a single female taken on Mt. Washington, New Hamp., and has since been recorded by Barber from Arizona. The type is in the Heidemann collection at Cornell University.

Family XXIX. MIRIDÆ Hahn, 1831, 234 (*Capsidæ* Burm.).

THE LEAF BUGS.

This, the largest family of Heteroptera, comprises species of small or medium size and fragile structure, having the head porrect, usually more or less declivent in front; eyes large, rather coarsely granulated; ocelli absent; antennæ 4-jointed, usually with joints 3 and 4 more slender than 1 and 2, the latter sometimes much thickened; beak 4-jointed, not received in a groove, the first joint as long as or longer than head; pronotum variable in form, usually with two oval, smooth convex areas (*calli*) on front half; scutellum distinct; mesoscutum usually in part exposed; elytra and wings large in proportion to the body, usually surpassing the abdomen and normally separated into clavus, corium, cuneus and membrane, the embolium often not very distinct from the corium; membrane with two basal cells, one larger than the other, the small one sometimes vague or obsolete, otherwise without veins; tarsi 3-jointed, rarely (*Peritropis*) 2-jointed; tarsal claws two, divaricate, often with a pair of slender appendages (*arolia*) between them, these sometimes accompanied by a pair of pseudarolia at the inner base of the claws. Female with genital segments cleft at middle, enclosing the sheath of an ovipositor which is capable of exertion.

The parts of a Mirid used in classification are excellently set forth on the accompanying plate by Knight. Our species vary greatly in form, but are usually elongate or oblong with sides of elytra subparallel, or subovate with sides feebly curved. The male is generally more slender than the female and both sexes are usually macropterous, the male almost always so. The body is generally clothed with fine hairs or pubescence, sometimes also with hair-like scales which are easily abraded. The name *Capsidæ* was used until recently for these leaf bugs. Probably 1,500 or more species are known and new ones are turning up every day. Van Duzee included more than 400

in his Catalogue from America north of Mexico, and Knight and others have since described one hundred or more from the same region. They are, for the most part, plant feeders, but a large number prey upon the young or soft-bodied forms of other insects. Of their habits Knight (1923, 422) has said:

"The predaceous habit is only partially developed in certain species, and thus animal blood serves merely to supplement the sap obtained from particular food plants. Probably the greater number of species are limited to a single host plant, or to a genus of plants, while a very few, such as *Lygus pratensis* Linnæus and *Halticus citri* Ashmead, have a wide range of food plants. Forms which are chiefly predaceous are more frequently found on miscellaneous plants. Even among species which always breed on a single host plant, a general dispersal of individuals usually takes place. Following the time of emergence and mating, individuals of *Tropidosteptes cardinalis* Uhler, *Lopidea staphyleæ* Knight, and others, have been observed to migrate from their host plant to shrubbery in the general vicinity; from thence they doubtless become dispersed over wider territory and to new plants, although in the normal course of their life, eventually returning to suitable growth of the preferred host plant for the purpose of oviposition."

The literature treating of our eastern species of Miridæ is widely scattered. The principal papers used in the preparation of the text which follows are those by Reuter, 1876, 1878, 1904, 1909, 1910, 1912a, 1913; Distant, 1883; Uhler, 1887, 1887a, 1887b, 1890, 1892, 1901; Kirkaldy, 1902, 1902b, 1906, 1906a; Van Duzee, 1916a, 1916b, 1916c, and the numerous papers of Knight cited in the bibliography near the end of this volume. In this work 467 species and numerous varieties of Miridæ are described from the eastern states.

Our eastern species are separated by Knight (1923, 425) into nine subfamilies, the following being a modification of his key so as to bring the sequence (with the exception of the *Orthotylinæ*) as near to that of the Van Duzee Catalogue as possible. In my keys under the subfamily headings I have but rarely, however, used the characters pertaining to the male genitalia in the separation of either genera or species. Students desiring to so use them are referred to Dr. Knight's works, especially the one in the "Hemiptera of Connecticut."

KEY TO EASTERN SUBFAMILIES OF MIRIDÆ.⁷⁷

- a. Arolia present, erect and prominent, approximate at base between the claws (figs. 33—60).
- b. Arolia divergent or divaricate and frequently dilated towards their tips (figs. 55—60).

⁷⁷The figures cited in this key refer to those on Plate X.

- c. Pronotum not constricted near apex to form a ring-like collar, sometimes with a preapical impression, but this never extending over the sides, its lateral margins usually carinate, the carinæ

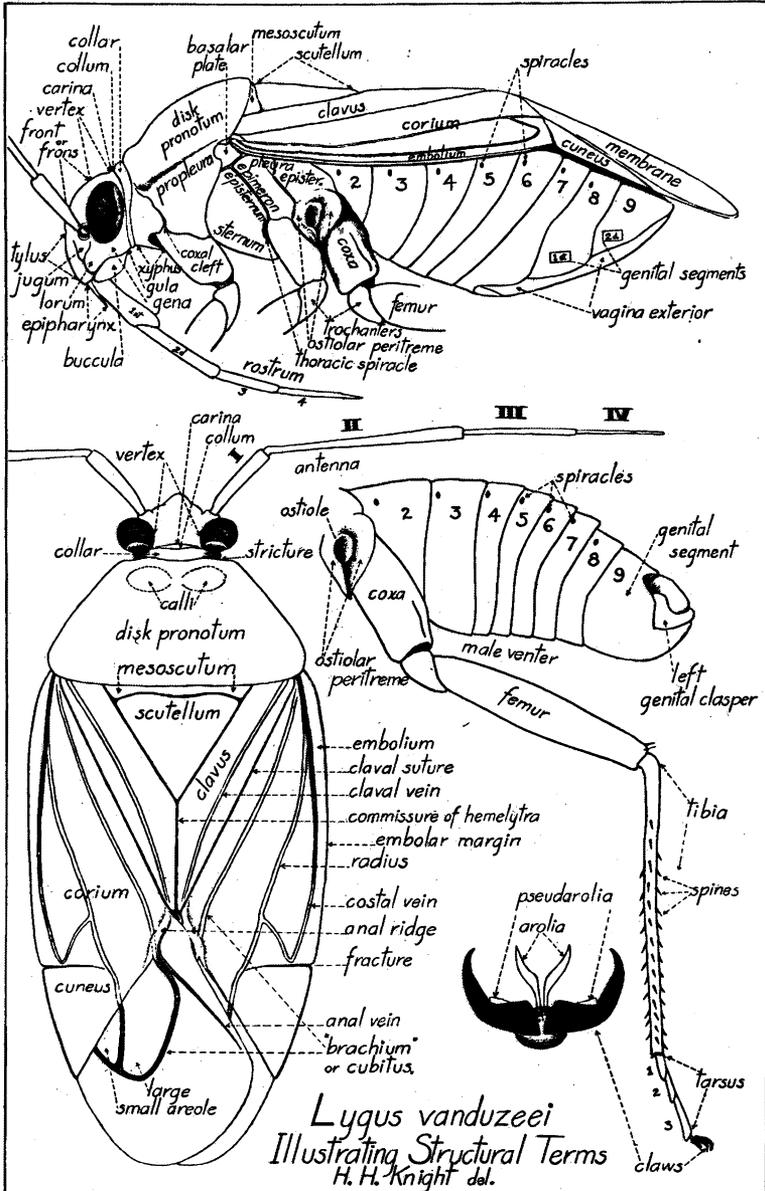


Plate IX. ILLUSTRATING THE STRUCTURAL TERMS USED IN THE CLASSIFICATION OF MIRIDÆ.

(After Knight, Hemiptera of Connecticut.)

reaching the front angles; joint 1 of tarsi much longer than and equal in thickness to joint 2; tarsal segments scarcely overlapping at joints and thus very flexible (straw climbers).

Subfamily I. MIRINÆ, p. 665.

- cc. Pronotum constricted near apex to form a distinct collar, the constriction sometimes interrupted above, but always extending over the sides; lateral margins of pronotum frequently carinate, but the carinæ never reaching the front angles; joint 1 of tarsi short, rarely longer than joint 2, if longer (Tribe *Resthenini*) then much thicker than 2; tarsal segments with tips overlapping the joints, thus practically inflexible (leaf walkers).

Subfamily II. CAPSINÆ, p. 681.

- bb. Arolia not divergent or divaricate, but converging toward tips (figs. 33—54); pronotum without a collar.

Subfamily III. ORTHOTYLINÆ, p. 796.

- aa. Arolia absent, or present but bristle-like in form (figs. 25—32); sometimes difficult to distinguish from hairs on the tarsus.

- d. Last tarsal joint swollen, always thicker than the one preceding (fig. 22); tibiæ destitute of spines; loræ confluent with the genæ; pseudarolia very large, united to the claws along their inner curve (figs. 22—24).

Subfamily IV. BRYOCORINÆ, p. 866.

- dd. Last tarsal joint slender; tibiæ usually finely but distinctly spinose; loræ usually distinct from genæ; pseudarolia not as above.

- e. Pronotum with apical third convex, rounded in front and prolonged forward as a hood-like projection above the base of the vertex; stricture of the usual collar visible only at the sides from which an impressed line extends inward to behind the calli.

Subfamily V. CLIVINEMINÆ, p. 876.

- ee. Pronotum without an apical hood above the base of vertex.

- f. Pronotum constricted near apex to form a collar, this sometimes vague above at middle, but distinct on sides.

- g. Tarsal claws simple and slender, rarely widely spread (figs. 25, 26); tibiæ weakly spinose, usually long and tapering apically, sometimes greatly shortened in which case the basal joint of tarsi is unusually long, the head transverse and eyes strongly protruding.

Subfamily VI. CYLAPINÆ, p. 876.

- ffg. Tarsal claws thick, either sharply bent (fig. 21) or broadly curved (fig. 27), or more sharply curved and cleft or lobed within near base (figs. 28—32).

- h. Body not elongated; claws usually cleft near base (figs. 28—32); arolia bristle-like; elytra not hyaline or glassy.

Subfamily VII. DERÆOCORINÆ, p. 882.

- hh. Body usually elongated, often linear; claws usually sharply bent, not cleft near base (figs. 18—21); elytra often hyaline or glassy, sometimes with a sharply defined inverted Y-shaped red or fuscous mark.

Subfamily VIII. DICYPHINÆ, p. 905.

- ff. Pronotum not constricted to form a collar; sometimes with a somewhat flattened apical collar, then the abdomen constricted at base and the claws curved only at extreme tips (figs. 1—17).

Subfamily IX. PHYLINÆ, p. 914.

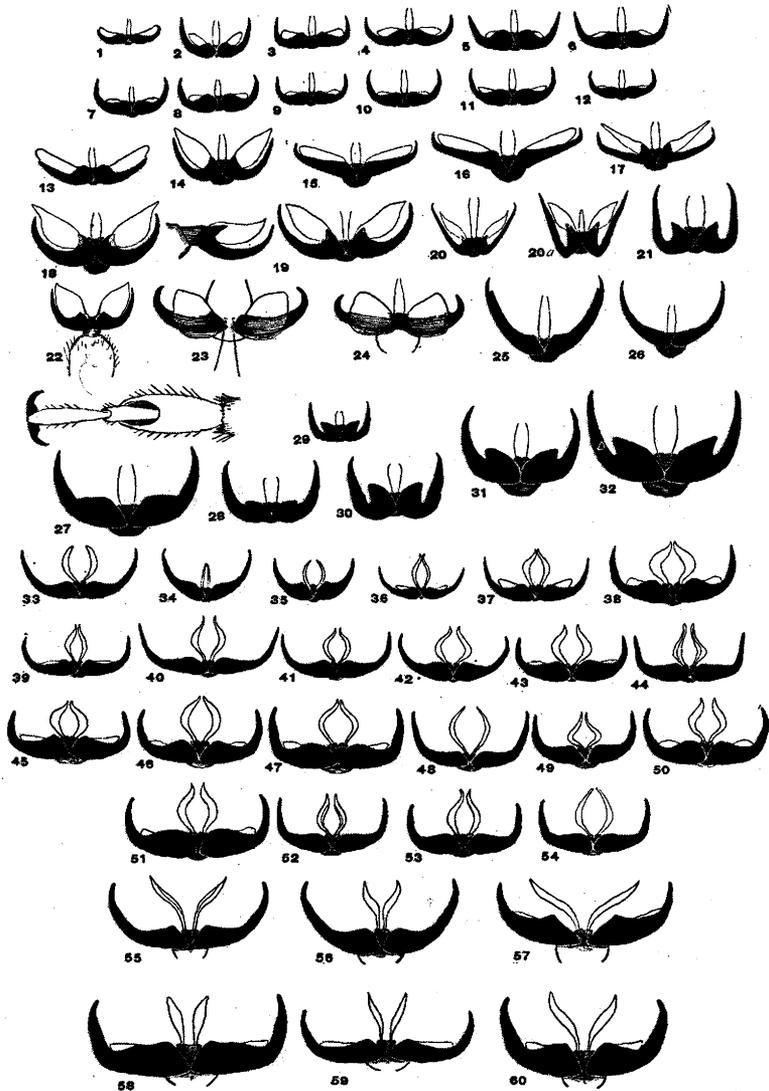


Plate X. TARSAL CLAWS AND AROLIA OF MIRIDÆ.

PHYLINÆ, tribe PHYLINI, figs. 1—12—1, *Chlamydatus associatus* (Uhl.); 2, *Reuteroscopus ornatus* (Reut.); 3, *Lepidopsallus rubidus* (Uhl.); 4, *Microsynamma bohemanii* (Fall.); 5, *Rhinocapsus vanduzeei* Uhl.; 6, *Criocoris saliens* (Reut.); 7, *Psallus ancorifer* (Fieb.); 8, *Lepidopsallus minusculus* Kngt.; 9, *Campylomma verbasci* (Meyer); 10, *Plagiognathus obscurus* Uhl.; 11, *Plagiognathus annulatus* Uhl.; 12, *Microphylletus modestus* Reut. PHYLINÆ, tribe ONCOTYLINI, figs. 13—14—13, *Lopus decolor* (Fall.); 14, *Macrotylus scagutatus* (Prov.). PHYLINÆ, tribe HALLODAPINI, figs. 15—17—15, *Teloorhinus davisii* Kngt.; 16, *Orectoderus obliquus* Uhl.; 17, *Coquillettia mimetica* Osb. DICYPHINÆ, figs. 18—21—18, *Macrolophus separatus* (Uhl.); 19, *Dicyphus agilis* (Uhl.); 20, *Dicyphus discrepans* Kngt.; 20a, *Dicyphus famelicus* (Uhl.); 21, *Hyalitodes vitripennis* (Say). BRYOCORINÆ, figs. 22—24—22, *Monalocoris filicis* (Linn.); 23, *Pycnoderes dilatatus* Reut.; 24, *Sireonotus insignis*

Subfamily I. MIRINÆ Reuter, 1910, 128, 155.

Species above the medium in size and of an elongate form having the head porrect, its front portion usually strongly declivent; pronotum longer than wide, narrowed in front, impressed above near apex but without a distinct collar, the lateral carinæ entire; scutellum large, triangular, with basal half usually swollen and in part concealed; elytra often dimorphic, when entire the clavus distinct, corium with a central nervure; membrane usually with only one distinct cell, the smaller one vague or obsolete; cuneus elongate, its suture often indistinct; hind coxæ almost contiguous; hind femora elongate, not much swollen; basal joint of tarsi as long as or longer than the other two united; arolia large, free, often clavate. To this subfamily, as thus characterized, belong ten of our eastern genera.

KEY TO EASTERN GENERA OF MIRINÆ.

- a. Pronotum widest at the base, not noticeably swollen at the middle.
 b. Head strongly exserted; eyes placed near its middle at some distance from the front margin of pronotum; median sulcus of vertex short but distinct. I. COLLARIA, p. 666.
 bb. Head not or only slightly exserted; eyes usually in contact with pronotum or nearly so.
 c. Pronotum distinctly deeply punctured; hind margin of pronotum truncate or nearly so.
 d. Joint 1 of antennæ thickly clothed with long pubescent hairs; punctures of pronotum and scutellum deep, closely placed. II. STENODEMA, p. 668.
 dd. Joint 1 of antennæ with very short pubescence or glabrous; punctures of pronotum and scutellum sparse and deep. III. MESOMIRIS, p. 670.
 cc. Pronotum impunctate or nearly so.
 e. Antennal segments, at least the basal one, thickly clothed with rather coarse stiff hairs.

Reut. CYLAPINÆ, figs. 25—26—25, *Cylapus tenuicornis* Say; 26, *Fulvius brunneus* (Prov.). CLIVINEMINÆ, fig. 27—27, *Largidea davisi* Kngt.—claws and hind tarsus. DERWOCORINÆ, figs. 28—32—28, *Derwocoris pinicola* Kngt.; 29, *Derwocoris nebulosus* (Uhl.); 30, *Derwocoris ruber* (Linn.); 31, *Eurychipterella luridula* Reut.; 32, *Eustictus venatorius* Van D. ORTHOTYLINÆ, figs. 33—54—33, *Labops hespericus* Uhl.; 34, *Semium hirtum* Reut.; 35, *Parthenicus vaccini* (Van D.); 36, *Halticus citri* Ashm.; *Halticus intermedius* Uhl.; 38, *Strongylocoris stygica* (Say); 39, *Orthocephalus mutabilis* (Fall.); 40, *Sericophanes heidemanni* Popp.; 41, *Alepidia gracilis* (Uhl.); 42, *Pilophorus amarus* Uhl.; 43, *Pseudoaenetus scutellatus* (Uhl.); 44, *Ceratocapsus modestus* Uhl.; 45, *Lopidea robiniae* (Uhl.); 46, *Hadronema militaris* Uhl.; 47, *Imacora malina* (Uhl.); 48, *Orthotylus flavosparsus* (Sahlb.); 49, *Orthotylus catulus* Van D.; 50, *Orthotylus dorsalis* (Prov.); 51, *Heterocordylus malinus* Reut.; 52, *Mecomma glivipes* (Stal); 53, *Reuteria irrorata* (Say); 54, *Diaphniidia pellucida* Uhl. MIRINÆ, figs. 55—56—55, *Pithanus mærkelti* (H.-S.); 56, *Stenodema trispinosum* Reut. CAPSINÆ, figs. 57—60—57, *Barbierella apicalis* Kngt.; 58, *Platytyellus insitivus* (Say); 59, *Phytocoris lastomerus* Reut.; 60, *Lygus vanduzeei* Kngt. (After Knight in Hemiptera of Connecticut).

- f.* Hind margin of pronotum subtruncate; mesoscutum without a deep fovea each side.
- g.* Median longitudinal sulcus of vertex deep, distinct; joint 1 of antennæ as long as pronotum and scutellum united; eyes contiguous with front angles of pronotum; body almost glabrous. IV. MEGALOCERÆA, p. 671.
- gg.* Median sulcus of vertex nearly or quite obsolete; joint 1 of antennæ not longer than pronotum; eyes slightly distant from front angles of pronotum; body clothed with fine long suberect pubescence. V. MIRIS, p. 671.
- ff.* Hind margin of pronotum deeply concavely sinuate; mesoscutum broadly exposed, with a large deep oblique fovea each side and a distinct transverse impressed line behind the foveæ. VI. EIONEUS, p. 673.
- ee.* Antennal segments clothed with very fine pubescence; body nearly glabrous, at most with very short pubescence; hind margin of pronotum deeply concave, leaving the mesoscutum broadly exposed.
- h.* Head long and pointed, its front projecting sharply beyond base of antennæ; median sulcus of vertex deep; basal joint of antennæ not so long and attenuate as in *hh*. VII. TRIGONOTYLUS, p. 674.
- hh.* Head short and flattened, its front scarcely projecting beyond the base of antennæ; median sulcus of head replaced by a broad and shallow basin; basal joint of antennæ slender, curved, thickest near base, then tapering and slightly enlarged at apex. VIII. TERATOCORIS, p. 677.
- aa.* Pronotum distinctly swollen at middle, as wide or wider there than at base.
- i.* Head constricted into a short neck behind the eyes; basal joint of antennæ longer than width of vertex; tylus convex, its base distinct from the front; pronotum extending back to basal angles of elytra. IX. MIMOCEPS, p. 679.
- ii.* Head not constricted behind the eyes; basal joint of antennæ shorter than width of vertex; tylus flattened, merged with the front; pronotum not extending back to basal angles of elytra. X. PITHANUS, p. 680.

I. COLLARIA Provancher, 1872, 79.

Elongate, slender, pubescent species having the head porrect, prolonged forward, its front declivent; vertex with a median longitudinal groove and a transverse impression between base of eyes, thence feebly narrowed backward into a neck; tylus prominent, strongly shining; antennæ about as long as body, joint 1 stoutest, as long as or slightly longer than width of head, 2 about three and one-half times as long as 1, 3 and 4 more slender, the former one-third or more the longer; beak

reaching hind coxæ, its basal joint stoutest; pronotum subcampanulate, the front lobe subcylindrical, impressed and constricted above to form the semblance of a collar, the constriction not cutting the lateral carinæ, the calli prominent, hind lobe finely and closely punctate, its basal margin straight, and disk with an oval opaque, velvety-black spot near each hind angle; elytra with sides subparallel, membrane usually surpassing abdomen, its cell longer than the cuneus. Other characters as in key and under subfamily heading. Four species occur in North America, three in our territory.

KEY TO EASTERN SPECIES OF COLLARIA.

- a. Hind lobe of pronotum and scutellum black; calli of pronotum strongly convex, nearly as high as base of pronotum.
637. MEILLEURII.
- aa. Hind lobe of pronotum and scutellum brown or fuscous; calli much less convex.
- b. Tibiæ with numerous short bristle-like hairs; femora very indistinctly dotted with brown; longer (6.6—7 mm.) and more robust.
638. OCULATA.
- bb. Tibiæ thickly hirsute with long slender hairs; femora distinctly dotted with black; shorter (not over 6 mm.) and more slender.
639. EXPLICATA.

637 (875). *COLLARIA MEILLEURII* Provancher, 1872, 79.

Elongate, slender, subcylindrical. General color black, more or less shining; elytra usually in great part dull straw-yellow, the apex of corium and the clavus in part fuscous; sometimes wholly fuscous except the costal margins; femora, tibiæ, beak, except tip, and extreme base of antennæ, dull yellow, the femora with small blackish-brown dots; tarsi and antennæ fuscous, the basal joint of latter often paler; ventrals sometimes margined and spotted on the middle with yellow. Length, 6—7 mm.

Lake and Marion counties, Ind., June 19—July 9; frequent on grasses growing in the low alluvial soil of the White River bottoms. Its known range is northerly, extending from Ontario and New England west to Michigan and Illinois. Usually common where found on grasses in low moist grounds. In some specimens the elytra reach only to fifth dorsal.

638 (876). *COLLARIA OCULATA* (Reuter), 1876, 61.

Form of *meilleurii*, averaging slightly smaller. General color dull brownish-yellow; head, joints 2—4 of antennæ, front lobe of pronotum and abdomen tinged with reddish or fuscous; hind lobe of pronotum and scutellum dull brown, each with a narrow paler median line; elytra chiefly brown, often tinged with fuscous, the embolium paler; legs and

beak dull yellow, the tarsi darker and femora vaguely spotted with small brown dots; basal joint of antennæ testaceous, darker at base. Structural characters as above given. Length, 6.2—7 mm.

Frequent throughout southern Indiana, less so in the northern counties; May 12—Sept. 25. Dunedin and Ft. Myers, Fla., March 4—28 (*W. S. B.*). Recorded from six other stations in Florida. Occurs in Indiana mainly on grasses growing in dry soils along roadsides, railway embankments and other waste places; sometimes on sedges and grasses along swales in upland woods; also frequent on the low herbage of the sand flats in the dune region. Ranges from Quebec and New England west to Iowa and Kansas and southwest to Florida and Texas. The velvety-black spots on the brown background of pronotum are much more prominent than in *meilleurii*.

639 (877). *COLLARIA EXPLICATA* Uhler, 1887, 230.

Shorter and more slender than *oculata*. Pale brownish yellow, more or less tinged with fuscous; cheeks and tylus blackish-piceous; joint 1 of antennæ reddish-brown, the extreme base and some dots on under side blackish, 2—4 fuscous; basal lobe of head, pronotum, clavus and inner half or more of corium usually tinged with dark fuscous; collar and median carina of pronotum, median line and base of scutellum, embolium and sternum, pale straw-yellow; ventrals tinged with fuscous. Basal lobe of head and scutellum finely transversely wrinkled; of pronotum finely, closely, unevenly punctate. Length, 5.5—6 mm.

Dunedin and Ft. Myers, Fla., Feb. 21—April 25 (*W. S. B.*). Jamaica, W. I. (*Gerhard*). Described from Cuba and San Domingo. Recorded from Biscayne Bay, Fla. The Dunedin specimens were swept from prickly sida, *Sida spinosa* L., a semi-tropical introduced weed.

II. *STENODEMA* Laporte, 1832, 40.

Elongate, slender, greenish or straw-yellow species having the head porrect, rather long and pointed, inserted in thorax to eyes, the vertex with a short median groove; joint 1 of antennæ stout, slightly curved, thickly clothed with bristly hairs, 2—4 gradually more slender, 3 about one-half the length of 2, slightly longer than 4; beak reaching middle coxæ, its basal joint scarcely longer than head; pronotum trapezoidal, without transverse constriction, feebly narrowed from base to apex, its lateral carinæ distinct, entire, disk finely and closely punctate and with a faint smooth median longitudinal carina, this continued to apex of scutellum; elytra entire, sur-

passing abdomen; membrane with two distinct cells, the larger one longer than the cuneus.

Two species occur in our territory. A third, the *Stenodema virens* (Linn.), a common European species, is included by Van Duzee from "N. Amer.," without definite locality. Knight (1922, 288) states that it occurs from Colorado and Montana westward.

KEY TO EASTERN SPECIES OF STENODEMA.

- a. Hind femora armed beneath near apex with three spines, the posterior one very short; antennæ dull yellow. 640. TRISPINOSUM.
 aa. Hind femora unarmed; antennæ in great part reddish. 641. VICINUM.

640 (882). *STENODEMA TRISPINOSUM* Reuter, 1904, 4, 8.

Elongate-oval, slender. Color a nearly uniform pale green fading to straw-yellow; pronotum sometimes with two vague lateral stripes and a blotch on basal half fuscous; corium rarely with a faint fuscous stripe extending to apex of membrane; hind femora indistinctly dotted with brown; mesosternum, tarsi and a stripe along the sides of under surface often fuscous. Structural characters as under generic heading. Length, 6.8—7.5 mm.

Common throughout southern Indiana, less so in the northern counties, May 31—Oct. 21. Occurs on grasses in meadows and along roadsides, usually in dry soil. One specimen taken on juniper has a dusky stripe the full length of corium and membrane and four spines on hind femora. This is a palæ-arctic European species whose known range in this country is northern, extending from Quebec and New England west across the continent to British Columbia and California. Not recorded south of New Jersey except from Texas, probably in error, by Uhler (1876, 316) as *Brachytropis calcaratus* Fall.

641 (883). *STENODEMA VICINUM* (Provancher), 1872, 77.

Form of *trispinosum*, averaging slightly larger. Color much as there; pronotum with a narrow pale median stripe, often bordered each side by a wide fuscous one, extending from vertex back to end of scutellum; male with clavus and inner half of corium usually fuscous to blackish; antennæ in fresh specimens of a roseate hue, the basal joint often paler. Hind femora more slender than in *trispinosum* and usually without dark dots. Length, 7—7.5 mm. (Fig. 164).

Lake, Kosciusko and Marion counties, Ind., June 19—Oct. 26; swept from tall grasses along a railway embankment and from low herbage along the margins of woods (*W. S. B.*). Chicago,

Ill., July—August (*Gerhard*). Sherborn, Mass., May 22 (*Frost*). Various localities in North Carolina, July (*Brimley*). Ranges from Quebec and New England to the Pacific; occurring usually in abundance in June and July on grasses in low moist meadows, and hibernating as imago. Previously recorded mostly as *Miris instabilis* Uhler or *M. affinis* Reut., both of which are synonyms.

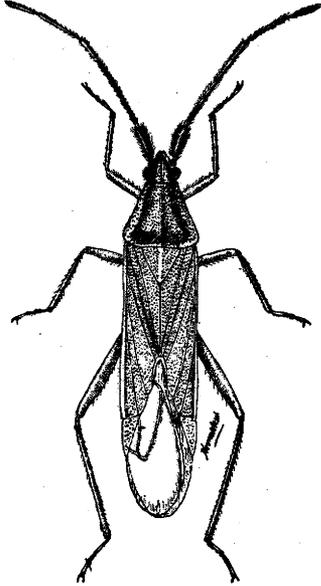


Fig. 164. *Stenodema vicinum* (Prov.), X 7. (After Luggler).

III. MESOMIRIS Reuter, 1909, 4.

Oblong suboval species having the head porrect, not longer than broad, about one-third narrower than base of pronotum, inserted in thorax to eyes, vertex with a deep median impressed line, tylus subvertical; beak reaching middle coxæ, its first joint not surpassing base of head; antennæ subglabrous, longer than body, joint 1 stout, elongate cylindrical, feebly curved, subequal in length to 4, 2 three times as long as 1, 3 about one-fourth shorter than 2; pronotum trapezoidal, as wide at base as long, sides feebly sinuate, basal half convex, sparsely and deeply punctate; scutellum about as long as head, transversely strigose, sparsely punctate; elytra slightly surpassing abdomen, sides feebly rounded, membrane with two distinct cells. One species is known.

642 (889). MESOMIRIS CURTULUS Reuter, 1909, 5.

Brownish-yellow or dark brown, often with a strong reddish tinge, margins of elytra paler; pronotum with narrow median carina extending back to tip of scutellum and edge of side margins yellow; legs and antennæ dull red; claval vein often fuscous. Pronotum distinctly, deeply, unevenly punctate, the carinæ of its side margins sharp, entire, reaching eyes. Hind femora unarmed. Length, 6—6.5 mm.

Staten and Long Islands, N. Y., August (*Davis*). Barnegat Bay District, N. J., Aug. 27 (*Gerhard*). Described from Maryland, where it occurs on wild rice. Known from southern New England west to Pennsylvania. Resembles *Stenodema vicinum*,

but readily distinguished by the shorter head and the very short, fine pubescence of the antennal segments.

IV. MEGALOCERÆA Fieber, 1858, 301.

Elongate linear pale greenish species having the head one-third longer than broad, nearly as long as pronotum; beak reaching or surpassing hind coxæ, its first joint longer than head; antennæ longer than body; hind femora moderately swollen, and subcylindrical throughout their length. Four species are recorded from North America, one from the eastern states.

643 (—). MEGALOCERÆA RECTICORNIS (Geoffroy), 1785, 209.

Elongate, slender. Greenish-yellow; pronotum brownish or brownish-yellow, the margins and median carina paler; scutellum with a brownish tinge, its median line yellow; membrane grayish, tinged with purplish, slightly iridescent, the inner cell and apex paler, veins whitish; legs greenish-yellow, the hind ones almost twice as long as middle pair, clothed with short blackish hairs; tips of tibiæ brownish; tarsi and claws fuscous. Antennæ brownish-yellow, joint 1 as long as pronotum and scutellum united, both it and basal two-thirds of 2 clothed with short black hairs; 2 and 3 subequal, each twice as long as 1; 4 one-third the length of 3. Pronotum with front margin of disk flattened, lateral carinæ prominent, not reaching front or hind angles; calli large, low, separated by a rather deep impression; hind lobe of disk minutely rugosely punctate. Length, 8—8.5 mm.

Chiltern Hills, England (*British Mus. Coll.*) A palæarctic European species taken by Fracker at Madison, Wis., June 27, on foxtail, *Chamæropsis glauca* L., and known in this country only from there. In England it is not uncommon in midsummer on plants growing along hedge rows.

V. MIRIS Fabricius, 1794, 183.

Elongate species of medium size having the head as wide as long, slightly exserted, porrect, its front half moderately declivent, vertex with a transverse depression just behind eyes; beak passing middle coxæ, its basal joint surpassing base of head; eyes prominent; pronotum trapezoidal, as wide at base as long, disk minutely rugose, not punctate, feebly constricted both before and behind the calli, the latter quite prominent; scutellum smooth; mesoscutum strongly convex, partly exposed; elytra dimorphic, usually entire, surpassing the abdomen; membrane with but one distinct cell, this one-half longer than cuneus. Two species occur in eastern North America.

KEY TO EASTERN SPECIES OF MIRIS.

- a.* Antennæ longer than body, joints 1 and 2 in female not stouter than in male; general color brownish-yellow with black or fuscous markings; brachypterous forms with membrane rudimentary.
644. DOLOBRATUS.
- aa.* Antennæ slightly shorter than body, joints 1 and 2 in female distinctly stouter than in male; general color brownish-pink, male, pale pink, female; brachypterous forms wholly devoid of membrane.
645. FERRUGATUS.

644 (879). *MIRIS DOLOBRATUS* (Linnaeus), 1758, 449.

Elongate, feebly tapering from base of elytra toward both ends. Color variable, either dull brownish-yellow with black or fuscous markings, or largely black with elytra paler. In the darker forms, usually the males, the head, antennæ, legs and under surface except sides of abdomen, are black, thorax with median stripe and lateral edges dull yellow; scutellum black, its apical half paler; elytra dull reddish-brown or brownish-yellow with clavus and corium often tinged with fuscous. In the paler forms, usually females, the black parts above mentioned are dull brownish-yellow, the only black marks being a forked median stripe on head; a broad stripe each side of pronotum extending onto mesoscutum, a stripe each side of under surface, some scattered dots on femora and a spot on mesosternum. In both forms the tarsi and apical half of beak are fuscous. All possible variations occur between the extremes of dark and pale forms. Antennæ with joint 1 stout, subcylindrical, feebly curved, as long as pronotum, 2 more slender, more than twice as long as 1, 3 one-half the length of 2, twice that of 4. Other characters as under generic heading. Length, 7—9 mm.

This species is known as the "meadow plant-bug," and in late spring and early summer it is the most common *Mirid* throughout Indiana, occurring by myriads in pastures, meadows and waste places on blue-grass, timothy and other forage grasses, and doubtless doing much damage to them. In central Indiana it winters in the egg stage and the nymphs are very common in late April and May, the first adults maturing about May 20. Osborn (1918) has given a full account of its life history. A brachypterous form, mostly females, in which the elytra reach only the fifth dorsal, is common. It is an introduced palæarctic European species ranging in this country from Quebec and New England west to British Columbia and Minnesota. Not recorded, though doubtless occurs, south of Maryland, New Jersey and Kentucky.

645 (880). *MIRIS FERRUGATUS* Fallen, 1807, 107.

Male—Form and size of *dolobratulus*. Head black with a stripe each side of vertex and a narrow line on middle of tylus yellow; collar of

pronotum black, with a median yellowish spot, disk with basal two-thirds pinkish-brown, the sides and median triangular spot yellowish; scutellum black with yellow median line, a reddish-brown spot each side of base; elytra pinkish-brown, inner margin of clavus often blackish, costal margin yellow; membrane grayish, inner nerve piceous, the others yellowish; legs brownish-yellow, clothed with short black hairs; femora with black dots more or less confluent, tarsi fuscous. Antennæ dull brownish-yellow thickly beset with short stout piceous hairs, joint 1 as long as pronotum; 2 cylindrical, two and a half times as long as 1, its middle third often reddish-brown; 3 and 4 slender, 3 three-fourths the length of 2, twice as long as 4. *Female*—Head yellow, vertex usually with two dark lines each side of the yellow center, a piceous stripe behind each eye; pronotum with collar piceous, basal two-thirds of disk pinkish, sides and middle of disk pale yellowish; scutellum yellowish, the basal angles pink, margins blackish; elytra and legs as in male. In the brachypterous form the elytra are pink and reach only to third dorsal, their tips divergent and narrowly rounded. Length, 7.5—8 mm.

Camberwell, England (*British Mus. Coll.*). A palæarctic European species recorded in this country only from Quebec and Alaska. In England the brachypterous form is common on grasses and other herbage along the margins of fields, the macropterous one rather scarce.

VI. EIONEUS Distant, 1893, 416.

Elongate, slender species having the head longer than its width across eyes, inserted in thorax to eyes; tylus subvertical, longer than cheeks, the triangular front of head prolonged over its base; vertex with a short median longitudinal groove; antennæ slender, longer than body, joint 1 and basal half of 2 thickly beset with stiff bristle-like forward inclined hairs; pronotum one-fourth longer at middle than wide at base, lateral margins feebly converging from the base, slightly sinuate near apex, their carinæ sharp, percurrent; front margin feebly concave, hind one deeply and broadly so; mesoscutum broadly exposed and with a large obliquely set funnel-shaped fovea each side, this followed by a deep sharp cut transverse line; elytra entire, their margins subparallel; hind femora reaching apex of membrane; hind tibiæ thickly beset with long slender black setæ.

This genus is closely allied both to *Miris* and *Trigonotylus*. From the former it differs by the concave hind margin of pronotum, peculiar structure of mesoscutum and lack of long pubescence on body; from the latter by the thickly pilose basal

joints of antennæ, and long setæ of hind tibiæ. Two species are known, one from Mexico and Central America, the other from Florida.

646 (—). *EIONEUS GUTTICORNIS* sp. nov.

Elongate, slender, sides subparallel. Pale greenish-yellow; head and pronotum each with three narrow vague percurrent reddish stripes, the median one continued back to apex of scutellum and on both it and pronotum with a slender yellowish carina along its middle; legs greenish-yellow, femora with scattered vague brownish dots, tarsi fuscous, hind tibiæ and basal joint of hind tarsi red; under surface with a reddish stripe extending from below eyes along the side margin to fifth ventral; mesosternum and coxæ with two similar stripes. Antennæ as long as body, joint 1 and basal half of 2 greenish-yellow, thickly flecked with reddish dots and beset with grayish hairs; 1 stout, cylindrical, almost as long as head and pronotum united; 2 two-thirds longer than 1, distinctly tapering from base to apex; 3 and 4 more slender, finely pubescent, 3 dull yellow, one-half longer than 2; 4 brownish, one-fourth the length of 3. Beak reaching hind coxæ, its first joint shorter than head. Pronotum smooth, its front half with two low oblong calli connected by a raised line at middle. Other characters as under generic heading. Length, 7.8 mm.

Described from a single female, taken near Dunedin, Fla., Nov. 21, by sweeping the grasses of a tidal marsh along the bay front. The *E. bilineatus* Dist. differs in having the first antennal dark ochraceous without reddish dots; hind tibiæ and base of hind tarsi bright castaneous, tips of all tibiæ black and apex of scutellum nodulose.

VII. TRIGONOTYLUS Fieber, 1858, 302.

Small elongate very slender species, usually green or greenish-yellow in hue, having the head porrect, distinctly longer than wide, inserted in thorax to eyes; tylus compressed, elevated above the cheeks; antennæ longer than body, joint 1 as long as or longer than head, finely pubescent, 2 about one-fourth longer than 3, the latter nearly three times longer than 4; beak reaching middle coxæ, first joint reaching base of head; pronotum trapezoidal, slightly wider at base than long, the carinæ of its side margins prominent, disk smooth or nearly so, its hind margin broadly concave; mesoscutum broadly exposed and with a deep fovea each side of base; elytra entire, surpassing abdomen, large cell of membrane entirely hyaline; tibiæ finely pilose; femora feebly swollen toward base. Seven species occur in North America, all in our territory.

KEY TO EASTERN SPECIES OF TRIGONOTYLUS.

- a. Head not distinctly elongated between the eyes and base of antennæ; eyes usually prominent, oval or nearly round.
- b. Hind tarsi and tips of hind tibiæ black. 647. TARSALIS.
- bb. Tarsi usually reddish, tips of hind tibiæ not black.
- c. Joint 1 of antennæ not or but slightly longer than head.
- d. Basal joint of hind tarsi slightly longer than remaining two united; pronotum usually with longitudinal fuscous stripes; antennæ reddish. 648. RUFICORNIS.
- dd. Basal joint of hind tarsi slightly shorter than remaining two united; pronotum without fuscous stripes.
- e. Head and pronotum each with three roseate stripes, those of head uniting at apex of tylus; antennæ reddish at base, fuscous toward apex. 649. PULCHER.
- ee. Head, pronotum and antennæ uniformly pale. 650. BREVIPES.
- cc. Joint 1 of antennæ one-half or more longer than head; pronotum with three or four pale orange or fuscous stripes, these sometimes prolonged backward onto scutellum and elytra.
- f. Larger, length 6.2—7.5 mm.; antennæ greenish-yellow, joint 4 dusky; eyes large, elongate-oval. 651. UHLERI.
- ff. Smaller, length less than 5 mm.; antennæ in great part red; eyes small, rounded. 652. LONGICORNIS.
- aa. Head distinctly elongated between front margin of eyes and base of antennæ, the sides at this point parallel; eyes not prominent, distinctly longitudinal; antennæ often pinkish. 653. CONFUSUS.

647 (893). TRIGONOTYLUS TARSALIS (Reuter), 1876, 60.

Color a nearly uniform pale greenish-yellow, fading to dull straw-yellow. Antennæ from middle of joint 2 to apex of 4 often reddish; joint 3 scarcely shorter than 2. Pronotum minutely transversely strigose, a distinct impression just in front of middle of disk. Elytra feebly tapering from middle to their conjointly rounded tips. Length, 5.5—6.2 mm.

Argo and Chicago, Ill., June 14—July 24; taken at light and by sweeping (*Gerhard*). Doubtless occurs in northern Indiana. Ranges from southern New England west to North Dakota and Manitoba and southwest to Kansas and Texas. Breeds on slough grass (*Spartina*).

648 (890). TRIGONOTYLUS RUFICORNIS (Geoffroy), 1785, 209.

Pale green fading to greenish-yellow; antennæ dull red throughout; pronotum often with four vague fuscous stripes with a narrow pale line between the two median ones; tarsi reddish, the claws black. Pronotum more widened behind than in our other species. Length, 5.5—6 mm.

Marion Co., Ind., June 5—Aug. 4; swept in some numbers from grasses and wild rye along a railway embankment (*W. S. B.*). Whiteface Mt., N. Y., July (*Davis*). Chicago, Ill., and St. Anthony Park, Minn., July (*Gerhard*). A European

species ranging in this country from Quebec and New England west to Alaska, Kansas and Colorado. Not recorded south of Maryland. Uhler (1872, 409) says that in Massachusetts it abounds upon the salt marshes near the coast.

649 (891). TRIGONOTYLUS PULCHER Reuter, 1876, 59.

Pale green or greenish-white; head and pronotum with roseate stripes as in key, these often vague in dried specimens, in fresh ones usually prominent, the median one extending to apex of scutellum and with a narrow yellowish line along its middle; elytra each with three similar yellowish lines along the principal veins, the lateral ones often reaching back to end of cuneus; femora with similar roseate stripes; third joint of tarsi and claws fuscous. Length, 4.5—5 mm.

Dunedin, Moore Haven and Cape Sable, Fla., Nov. 16—March 7 (*W. S. B.*). Agricultural College, Miss. (*Weed*). Recorded from nine additional Florida stations. Frequent about Dunedin in late autumn on goldenrod and tall grasses along the margins of ponds. Described from Texas. Recorded by Van Duzee as ranging from Maine to Colorado and south to Florida and Texas, but the northern records probably refer to *uhleri* as *pulcher* is not included in either Parshley's New England List or the "Hemiptera of Connecticut."

650 (892). TRIGONOTYLUS BREVIPES Jakovlef, 1880, 215.

Form and size of *pulcher*. Color a nearly uniform pale green fading to greenish-yellow; antennæ often with a reddish tinge; under surface (in dried specimens) pale brown, the hind margin of each ventral paler; tarsi tinged with reddish, the apical half of third joint and claws fuscous. Length, 4.8—5.2 mm.

Dunedin, Fla., April 21. Taken in numbers from a fine grass growing on the mucky borders of a pool on Hog Island. No previous definite station record for that State. A cosmopolitan sub-maritime species, known heretofore in this country from Connecticut, Maryland and California; also from Jamaica and Cuba.

651 (894). TRIGONOTYLUS UHLERI (Reuter), 1876, 60.

Pale green, fading to greenish-yellow; pronotum and elytra with rosaceous or fuscous stripes as in key, these prolonged backward to cuneus, but often subobsolete in dried specimens; antennæ greenish-yellow, the fourth joint dusky; ventrals and tarsal claws fuscous. Length, 6.2—7.5 mm.

Staten Island, N. Y., and Dennisville, N. J., June 24—Sept. 6 (*Davis*); taken on salt meadows. Known only from New Eng-

land, New York and New Jersey. It is our largest species and when fresh a very handsome one.

652 (—). *TRIGONOTYLUS LONGICORNIS* sp. nov.

Dark green fading to greenish-yellow; head in part dull yellow; pronotum with three vague fuscous stripes, the median one extending to tip of scutellum and enclosing a narrow pale median line; hind tibiæ and basal joints of tarsi red, third tarsal and claws blackish. Joint 1 of antennæ red, almost as long as head and pronotum united; 2 red, yellowish toward apex, scarcely twice the length of 1; 3 yellowish at base, red toward apex, slightly longer than 2; 4 red, two-fifths as long as 3. Length, 4.5—4.7 mm.

Dunedin, Fla., March 25—April 4; swept from dense clumps of coarse wire-grass along ditches near bay front. Resembles *pulcher*, but antennæ more reddish, with first joint twice as long.

653 (895). *TRIGONOTYLUS CONFUSUS* Reuter, 1909, 6.

Pale green; legs, and often the antennæ, concolorous, hind tibiæ and tarsi reddish; head with median line and pronotum with four percurrent lines greenish-fuscous; membrane whitish, the smaller cell coriaceous, greenish. Joints 1 and 3 of antennæ subequal in length, 1 rather stout, attenuate toward apex, as long as pronotum and half of head; 2 nearly twice as long as 1, 4 more slender, shorter than 1. Pronotum with base but little wider than that of head, the transverse impression located slightly behind the middle. Length, 4.3—5 mm.

Described from Paincy Point and Bay Ridge, Md.; not recorded elsewhere. Similar in size and color to *brevipes*, but legs and first antennal longer and base of pronotum narrower.

VIII. *TERATOCORIS* Fieber, 1858, 302.

Elongate or oblong, finely pubescent species having the head short, porrect, wider than long, slightly exserted, vertex transversely impressed; eyes prominent; antennæ as long as or longer than body, joint 1 as in generic key, 2 much more slender, as long as clavus, 3 one-half longer than 4, both very slender; beak reaching middle coxæ; pronotum narrowed toward apex, not declivent in front, its apical constriction distinct, but not cutting the marginal carinæ; elytra entire or abbreviated; membrane with the large cell wholly or in part opaque-punctate, confluent with the cuneus; basal joint of hind tarsi much longer than second. Three of the four known American species occur in our territory.

KEY TO EASTERN SPECIES OF TERATOCORIS.

- a. Upper surface in part fuscous or reddish-fuscous, basal angles of pronotum and margins of elytra paler; eyes very prominent; length, 5.5—6 mm. 654. DISCOLOR.
- aa. Pale greenish-yellow or straw color; pronotum trapezoidal; eyes of moderate size.
- b. Smaller, length 4—4.5 mm.; hind tibiæ dull yellow. 655. HERBATICUS.
- bb. Larger, length 5.7—6.8 mm.; hind tibiæ red. 656. PALUDUM.

654 (896). TERATOCORIS DISCOLOR Uhler, 1887b, 68.

Head, pronotum except side margins, scutellum, clavus, inner apical half of corium and base of membrane, fuscous, usually more or less tinged with reddish; two small vague spots on vertex, embolium, base of corium, middle of ventrals 1—4 and coxæ usually pale dull yellow; legs and joints 1 and 2 of antennæ reddish; remainder of antennæ and under surface, except base of ventrals, fuscous. Disk of pronotum with apical and median constrictions prominent, the apical fourth and basal third finely transversely rugose, marginal carinæ distinct. Scutellum minutely transversely rugose, its apex with a slight median carina. Elytra finely pubescent, slightly widened from base to middle, then feebly narrowed to apex. Length, 5.5—6.2 mm.

Lake Co., Ind., and Chicago, Ill., June 8—July 4 (*Gerhard*). East New York, June 4 (*Davis*). Ranges from Quebec and New England west to South Dakota and Colorado and south to Missouri. Hussey found it common in July in the *Juncus-Equisetum* zone at the edge of a marsh in Berrien Co., Mich. Knight states that it occurs on sedges and is frequently attracted to light.

655 (897). TERATOCORIS HERBATICUS Uhler, 1887b, 67.

Elongate, slender, sides subparallel, male; wider, more oval, female. Pale greenish- or straw-yellow; male with a narrow black stripe extending from base of tylus to tip of scutellum; antennæ, knees and tarsi tinged with brownish, femora with scattered dark dots. Antennæ reaching tips of elytra, gradually more slender toward tips. Pronotum trapezoidal, side margins of front portion strongly reflexed, humeral angles prominent; hind portion depressed, sparsely punctate. Elytra narrow with sides parallel, male, wider, more curved, the costal margin more reflexed, female; corium and clavus vaguely wrinkled, sparsely punctate, male, distinctly scabrous, female. Genital plate of male beset with stout erect bristles. Length, 4—4.5 mm.

Described from Ungava Bay and Hopedale, Labrador. Known also from Norway and Sweden.

656 (—). TERATOCORIS PALUDUM Sahlberg, 1871, 291.

Elongate, slender, sides subparallel. Pale green fading to straw-

yellow; joints 1 and 2 of antennæ in great part pinkish, 3 and 4 fuscous; knees and hind tibiæ pinkish-red. Pronotum with constrictions less deep than in *discolor*, the median area of disk with a distinct impression. Apex of scutellum with an obtuse tubercle. Length, 5.2—6 mm.

Chicago, Ill., May 23—June 13; taken at light (*Gerhard*). An introduced palæarctic species known in this country only from New York, Illinois and Minnesota. Occurs on *Carex vesicaria*.

IX. MIMOCEPS Uhler, 1890, 83.

Elongate, subcylindrical, shining species having the head subglobose, wider than front of pronotum, front subvertical; eyes large, hemispherical; antennæ slender, almost setaceous, as long as or longer than body, joint 1 strongly constricted near base, longer than head, 2 about three times as long as 1, 3 slightly shorter than 2, longer than 4; beak reaching almost to middle coxæ; pronotum as in key, subcampanulate, hind margin slightly sinuate; mesoscutum exposed; scutellum large, transversely impressed; elytra coriaceous, dimorphic, in macropterous form reaching or surpassing tip of abdomen, with cuneous not well defined but long, almost ligulate and cell of membrane long and large; legs slender, hind femora almost cylindrical. Two species are known, both occurring in our territory.

KEY TO SPECIES OF MIMOCEPS.

- a. Pronotum wider behind than at middle and with a bilobate convexity on front half; posterior lobe of pronotum slightly convex. 657. *INSIGNIS*.
 aa. Pronotum not wider behind than at middle, the convexity not bilobed; posterior lobe flat. 658. *GRACILIS*.

657 (916). *MIMOCEPS INSIGNIS* Uhler, 1890, 84.

Elongate, subcylindrical, widened and subdepressed behind the middle. Black, shining; elytra with a large triangular yellow spot at base, apical fourth of costal margin dull yellow; antennæ brownish-yellow, joint 1 fuscous at base; coxæ and trochanters bright yellow, femora and tibiæ brownish-yellow, tarsi and claws fuscous. Joint 1 of beak shorter than head, 3 much longer than any of the others. Elytra, macropterous form, much surpassing abdomen, the membrane distinct; brachypterous form, reaching apex of abdomen, their tips rounded. Front and middle legs widely separated, hind ones very long; basal joint of tarsi stoutest, as long as the others united. Length, 5—6 mm.

Described from Illinois and known only from that State and New York.

658 (917). *MIMOCEPS GRACILIS* Uhler, 1890, 85.

General color black, shining; elytra pale straw-yellow with a common broad postmedian blackish bar; legs and joints 1 and 2 of antennæ reddish-yellow, remainder of antennæ and tips of tarsi fuscous. Joint 1 of antennæ stout, feebly curved, slightly longer than head; 2—4 much more slender, 3 one-fourth shorter than 2, one-half longer than 4. Thorax subcylindrical, its subapical constriction deeper than the one at basal third, the space between them smooth, convex, the apical and basal areas finely rugose. Elytra, brachypterous form, reaching sixth dorsal, their tips broadly separately rounded. Length, 4—4.5 mm.

Argo, Ill., July 31—Aug. 7 (*Gerhard*). Ranges from Ontario and northern New York west to Wisconsin and Utah. Occurs on sedges and grasses in low meadows and pastures.

X. *PITHANUS* Fieber, 1858, 303.

Elongate, opaque, glabrous species having the head triangular, almost vertical, rather wide, apex not compressed; eyes subspherical, rather prominent, contiguous to pronotum; antennæ finely pubescent, joint 1 short, stout, curved, not reaching tip of tylus; beak reaching hind coxæ; pronotum feebly constricted near apex, its median area strongly swollen to form two prominent calli, the area behind these very short, finely transversely rugose, the hind margin subtruncate; scutellum convex, wholly visible, minutely strigose; elytra dimorphic, in macropterous forms surpassing abdomen, cuneus ill-defined, membrane with but one distinct cell; in brachypterous form strongly abbreviated, subequal in length to pro- and mesonota united; abdomen elongate or elongate-oval, base not constricted, margins strongly reflexed; first joint of hind tarsi twice the length of second. One species occurs in the eastern states.

659 (918). *PITHANUS MÆRKELII* (Herrich-Schaeffer), 1839, 78.

Brachypterous Female—Subcylindrical, rather robust. Black, subopaque, almost glabrous; first antennal, except base, two small transverse spots on vertex, entire corium, reflexed margin of dorsum, beak except tip and middle of ventrals 1—3, yellowish-white; legs reddish-yellow, a row of dots on under side of hind femora, tarsi in part and antennæ, except basal joint, fuscous. Joint 2 of antennæ about four times the length of 1, 3 and 4 filiform, united slightly longer than 2, 3 twice as long as 4. Elytra very short, barely covering first dorsal, their tips truncate. Clavus scarcely distinct from corium, finely transversely rugose. Male with tips of elytra rounded and inflexed connexivum fuscous. Length, 4.5—5 mm.

Honeoye Falls, N. Y., June 22 (*Davis*); swept from grasses growing along the edge of land set to nursery stock. An in-

roduced European species known in this country from Nova Scotia, Maine, New York and Victoria, B. C. The macropetrous form is very rare, both here and in Europe.

Subfamily II. CAPSINÆ Reuter, 1883, 566.

Oval, rarely elongate species having, in addition to the characters given in the subfamily key, the head short, usually broader across the eyes than long, its front portion more or less declivent; cheeks not prominent, rarely elevated above the tylus; pronotum generally subtrapezoidal, rarely without a distinct collar, if so the abdomen constricted at base, disk with calli more or less distinct, the carinæ of sides, if present, very fine, not reaching apical angles; scutellum triangular, broadly exposed; elytra usually entire, cuneus triangular, its suture distinct; membrane with two cells; tibiæ generally finely spinose; first joint of tarsi as in key.

The subfamily is very large and is represented in our territory by 27 genera. These are distributed among three tribes which are separated as follows:

KEY TO TRIBES OF SUBFAMILY CAPSINÆ.

- a. Form not ant-like; abdomen not distinctly constricted; side margins of pronotum more or less distinct, frequently finely carinate; costal margins of elytra straight or slightly curved.
- b. Pronotal collar convex, about as wide as calli; tibiæ without spines but sometimes with stiff black hairs; body opaque, impunctate, usually in part red or yellow; front of head vertical, rarely declivent, the cheeks high; osteolar peritreme ill defined, its margins low; joint 1 of hind tarsi twice as long and thicker than joint 2. Tribe I. RESTHENINI, p. 681.
- bb. Pronotal collar, narrow, convex, never as wide as calli; tibiæ with rows of spines, sometimes rather fine; body usually more or less shining, often punctate; front of head usually declivent, the cheeks of medium height or low; osteolar peritreme well defined, its margins elevated; joint 1 of tarsi rarely longer than joint 2 or, if so, never thicker than 2. Tribe II. CAPSINI, p. 689.
- aa. Slender ant-like species; abdomen constricted at base; side margins of pronotum indistinct, more or less sinuate; elytra coarctate at middle. Tribe III. MYRMECORINI, p. 794.

Tribe I. RESTHENINI Reuter, 1905, 20, 28. (*Horistini* Van D.).

To this tribe, as characterized in the key, belong three genera of the subfamily Capsinæ, two of which are represented in the eastern states.

KEY TO EASTERN GENERA OF RESTHENINI.

- a. Head short, vertical, when viewed from the side nearly square at apex; gula short, almost invisible; stricture of pronotal collar interrupted at side, not joining base of coxal cleft; second joint of hind tarsi not more than half the length of first.
- I. PLATYTYLELLUS, p. 682.
- aa. Head longer, declivent, when viewed from the side oblique, produced and narrowed to apex; gula rather long, oblique; stricture of pronotal collar joining base of coxal cleft; second joint of hind tarsi nearly or quite as long as first.
- II. OPISTHEURIA, p. 689.

I. PLATYTYLELLUS Reuter, 1907, 71.

Elongate or oblong, opaque, impunctate species having the head short, broad, vertical, immersed in thorax to eyes, vertex without a median groove; eyes prominent, male, less so, female; beak reaching or surpassing middle coxæ; pronotum subcampanulate, apex one-half to two-thirds narrower than base, front lobe with collar wide, very prominent, sides obtuse, not margined, hind lobe convex, declivent, its basal margin broadly rounded, hind angles obtuse; scutellum smooth, convex, shorter than pronotum; elytra entire, longer than abdomen, their sides feebly, very broadly, curved, membrane with two cells, the larger one elongate.

Of the 14 species included by Van Duzee in his Catalogue, eight occur in the eastern states, while four species and a number of varieties have since been described by Knight. Several of the species are based on color characters alone and part of them will, in time, doubtless prove to be synonymous. They have in the past been mostly recorded under the generic name *Resthenia*.⁷⁸

KEY TO EASTERN SPECIES OF PLATYTYLELLUS.

- a. Basal joint of antennæ not as long as width of vertex.
- b. Larger, length to end of elytra 8 or more mm.; head wholly blackish or with a black spot. 660. CONFRAERNUS.
- bb. Smaller, length less than 7.5 mm.; head red, its front rarely with a black spot.
- c. Disk of pronotum with a median red stripe; length of joint 1 of antennæ not more than one and a half times the lateral width of an eye.

⁷⁸Walker (1873, 91) mentions a specimen of *Capsus divisa* H.-S. from St. John's Bluff, Fla., as being in the British Museum. China writes that the species is not at present in the Museum. Van Duzee, in his Catalogue, presumably on the Walker record, gives "Fla." in the distribution notes. Barber (1906, 218) records *P. divisa* from Texas, and states that it has not been previously reported from the United States. It is therefore not considered in this work. The *Capsus incisus* Walker (1873, 92), listed by Van Duzee (1917, 312) as a *Platytyellus*, is said by China (Ms.) to be a *Paracalocoris*.

- d. Median stripe of pronotum extending back to join the red scutellum; basal half of hind femora orange-red.
661. RUBROVITTATUS.
- dd. Median stripe extending back only to middle of hind lobe; hind femora wholly black.
662. INTERCIDENDUS.
- cc. Disk of pronotum without a median red stripe; joint 1 of antennæ twice as long as lateral width of an eye.
663. NIGRICOLLIS.
- aa. Basal joint of antennæ equal to or greater than width of vertex.
- e. Pronotum wholly a uniform yellow or orange-red, elytra black.
- f. Scutellum orange-yellow; tibiæ clothed with short hairs, their length less than thickness of tibiæ; male genital without tubercles.
664. INSITIVUS.
- ff. Scutellum black; tibiæ clothed with longer hairs, their length greater than thickness of tibiæ; male genital with a tubercle each side.
665. NIGROSCUTELLATUS.
- ee. Pronotum in part black, rarely wholly bright red, but if so, the costal margins of elytra red or dull yellow.
- g. Larger, length, 9 or more mm.
- h. Joint 2 of antennæ three or more times the length of 1, distinctly longer than width of pronotum at base.
666. FRATERNUS.
- hh. Joint 2 of antennæ twice as long as joint 1, subequal in length to width of pronotum at base.
667. ROBUSTUS.
- gg. Smaller, length less than 8 mm.
- i. Lateral margins of elytra orange-red; pronotal disk in great part red with a black or fuscous stripe each side, or a fuscous blotch near base.
668. CIRCUMCINCTUS.
- ii. Elytra wholly black.
- j. Joint 1 of antennæ equal in length to width of vertex, plus one-third dorsal width of an eye; scutellum often with an orange or reddish median stripe; length, 7.5—7.7 mm.
669. RUBELICOLLIS.
- jj. Joint 1 of antennæ but slightly longer than width of vertex; length, 7.7 mm. or less.
- k. Head red, the tylus and more or less of juga and lora blackish; pronotum red, the greater part of hind lobe usually black.
670. INSIGNIS.
- kk. Head and scutellum black, basal margin of vertex narrowly red; pronotal collar red, usually blackish above; surface finely granulate.
671. BOREALIS.

660 (902). PLATYTYLELLUS CONFRATERNUS (Uhler), 1872, 411.

Head crimson or blood-red, tylus and vertex wholly or in part black or fuscous-black; middle of collar and center of disk of pronotum, scutellum, elytra, legs and antennæ black; membrane dark brown, its veins blackish; basal halves of femora often with a reddish tinge; coxæ dull yellow; genital region fuscous. Joint 1 of antennæ slightly shorter than width of vertex, 2 as long as pronotum and scutellum united, 3 one-half the length of 2, one-third longer than 4. Beak reaching to or between hind coxæ. Length, 8 mm.

Ormond, Fla., April 4 (*W. S. B.*); holotype of var. *collaris* Knight Ms. Denver, Colo., July 15 (*Gerhard*). The recorded range extends from Massachusetts west to Michigan and Colorado and southwest to Florida and Texas. Although re-described from Massachusetts by Uhler (1878, 399) and recorded by Parshley from both that State and Connecticut, Knight ignores it in his key (1923, 551). There is no previous definite station record from Florida. The black markings of head and pronotum vary much in size and the scutellum is said to be sometimes reddish at base. In the var. *collaris* Knight the upper surface of head, except jugæ, is wholly black and the pronotum red with a large black spot on middle of disk of hind lobe.

661 (910). *PLATYTYLELLUS RUBROVITTATUS* (Stal), 1862, 318.

Color above black; head except tylus and eyes, collar and median stripe of pronotum, scutellum except basal angles, basal joint of beak and under surface except a spot on mesosternum and another on sixth ventral, red or orange-red; legs black, the basal half of hind femora and coxæ in part orange-red. Joints 1 and 2 of antennæ of nearly equal thickness, 2 nearly four times as long as 1, male, three times as long, female, 3 two-thirds as long as 2, nearly twice the length of 4. Beak reaching hind coxæ. Upper surface finely granulate. Length, 5—5.3 mm.

Marshall Co., Ind., Aug. 8. Dunedin, R. P. Park and Moore Haven, Fla., Jan. 10—April 20. Frequent about Dunedin, hibernating beneath bunches of decaying weeds and other cover, and in spring swept from tall grass and herbage along the margins of ponds. Recorded by Barber from Sanford, Fla. Ranges from Nova Scotia and Massachusetts west to Northern Indiana and Colorado and southwest to Florida, Texas and Mexico.

662 (905). *PLATYTYLELLUS INTERCIDENDUS* (Distant), 1893, 426.

Basal lobe of pronotum, elytra, antennæ, tylus and legs black; head, collar, side margins and a short backward projecting spur on pronotum, scutellum except basal angles, and under surface, orange-red; spot on mesosternum and the genital region of abdomen fuscous. Beak reaching or slightly passing hind coxæ. Joint 2 of antennæ slightly more slender and nearly three times longer than 1, subequal in length to width of basal margin of pronotum, 4 two-fifths the length of 3. Elytra wider with sides behind middle more curved in female than in male. Length, 6.2—6.8 mm.

Dunedin and Ft. Myers, Fla., Nov. 26—April 26. Frequent about Dunedin in spring on low huckleberry plants in pine

woods and on herbage about the margins of ponds. Tarboro, N. Car., May 28 (*Brimley*). Described from Mexico. Recorded also from Biscayne Bay, Fla., and San Diego, Cal. The head of Distant's type was in part black, but Reuter (1913, 36) says that the color of head is variable, "etiam sanguineum, solum clypeo nigro," as in all the Florida specimens at hand. The basal half and more of pronotum is covered with a subcordate black spot, which reaches the hind angles.

663 (906). *PLATYTYLELLUS NIGRICOLLIS* (Reuter), 1876, 65.

Form and size of *intercidendus*. Color much the same, the pronotum with only the collar and side margins orange-red; all the coxæ and basal third of hind femora of the same hue. Joint 2 of antennæ nearly three times the length of 1, 3 one-fourth longer than 4. Length, 6—6.4 mm.

Lake County, Ind., June 29—July 14. Ranges from New England west to North Dakota and south to New Jersey.

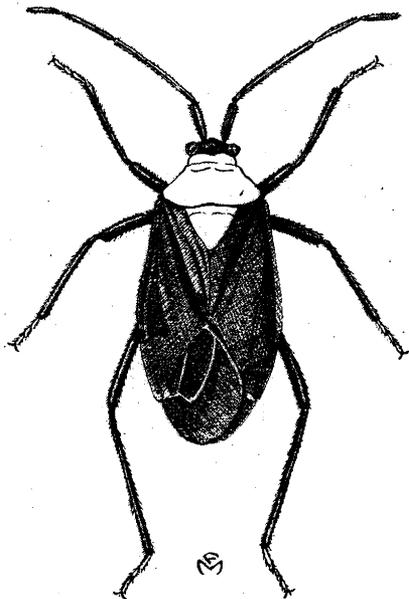


Fig. 165, X 4½. (Original).

664 (899). *PLATYTYLELLUS INSITIVUS* (Say), 1832, 21; I, 340.

Black, opaque, finely granulate; pronotum, scutellum, gula and prosternum wholly pale orange-yellow; beak fuscous, its basal joint tinged with yellow. Width of pronotal collar slightly greater than that of head. Joint 1 of antennæ one-fourth longer than width of vertex, 2 nearly three times longer than 1, 3 two-thirds the length of 2, twice as long as 4. Beak reaching or slightly passing hind coxæ. Length, 8.5—10 mm. (Fig. 165).

Marshall, Tippecanoe and Marion counties, Ind., June. Sanford, Istokpoga, Moore Haven, R. P. Park and Dunedin, Fla., March 3—April

13. Apparently scarce in Indiana but rather common in Florida, where it occurs in spring on foliage of shrubs and herbs along the borders of ponds and the paths and margins of moist dense hammocks. Recorded also from Crescent City, St. John's Bluff and Biscayne Bay. Described from Indiana and ranges

from Ontario and New England west to Colorado and south to Florida. Easily known by its large size and wholly pale pronotum and scutellum. Uhler (1884, 286) states that the head is sometimes yellow and that the "young occur upon wild blackberry and other bushes in the alleys of oak woods where the soil is damp and rich." Knight (1923, 556) has described from Maine a var. *angusticollis*, a small form (6.9—8 mm.) with width of pronotal collar less than width of head.

665 (—). *PLATYTYLELLUS NIGROSCUTELLATUS* Knight, 1923, 557.

Slightly larger than *insitivus*, color the same except that scutellum is black and sternum blackish with pleura orange-yellow. Genital of male with a prominent tubercle at base of left clasper and a smaller one at base of right clasper. Length, 9.2—9.7 mm.

Recorded only from New York and Pennsylvania.

666 (—). *PLATYTYLELLUS FRATERNUS* Knight, 1923, 557.

Head usually, except tylus, all or part of pronotum, and under surface crimson or orange-red; pronotum often with a large blackish blotch covering the median portion of hind lobe and sometimes with a small transverse median dark spot on collar; elytra either wholly sooty-black or with the margins paler; legs usually sooty-black, thickly clothed with long blackish-bristle-like hairs, coxæ paler. Antennæ sooty-black, joint 1, one-fifth longer than width of vertex, thickly clothed with inclined bristle-like hairs, 2 three times as long as 1, male, twice as long, female, clothed with short stiff dark hairs, 3 about one-third longer than 4. Beak reaching middle of hind coxæ. Length, 9—11 mm.

Ranges as a species from New England west to Minnesota and south and southwest to South Carolina and Florida. Knight (loc. cit) described three color varieties, separating them from the typical form as follows:

KEY TO COLOR VARIETIES OF *PLATYTYLELLUS FRATERNUS*.

- a. Elytra uniformly black; pronotum red, median line of disk, including calli, black, thus leaving lateral margins of disk broadly red; head with front and vertex chiefly black. 666. *FRATERNUS*.
- aa. Elytra with lateral margins pale or red.
 - (b.) Pronotal disk with broad median ray extending from black scutellum to anterior margin black; calli and spot on dorsal surface of collar black. 666a. var. *RUBROMARGINATUS*.
 - (c.) Pronotum and scutellum uniformly bright red, head, except tylus and the calli red. 666b. var. *REGALIS*.
 - (d.) Head, except tylus, and the calli red; scutellum black; central area of pronotal disk black, in dark specimens spreading to involve all but lateral margins and the calli. 666c. var. *DISCIFER*.

Variety *rubromarginatus* is recorded from New Hampshire, New York, Pennsylvania and Michigan. The range of variety *regalis* is southern, extending from New Jersey southwest to Florida. In a specimen taken at Dunedin, Fla., April 19, the scutellum is dull red tinged with fuscous, showing that these color varieties merge into one another and are scarcely worthy their varietal names. A single specimen of var. *discifer* was swept April 10 from low huckleberry in pine woods near Dunedin. It is known only from Florida and Maryland.

667. (903). *PLATYTYLELLUS ROBUSTUS* Reuter, 1913, 32.

Elongate-oval. Dilute cinnabar red, opaque, pronotum thickly clothed with short pale hairs. Elytra with similar blackish ones; tylus, eyes, small median spot on apical margin of pronotum, scutellum except the basal angles, elytra and legs black; pronotum with calli and triangular spot on basal half fuscous tinged with reddish. Joints 1 and 2 of antennæ densely pilose, 1 about one-fifth shorter than width of head across eyes; 2 twice as long as 1, its length equal to width of pronotum at base; 3 more slender, three-fifths the length of 2. Beak slightly surpassing hind coxæ. Pronotum about one-fifth shorter than wide at base. Scutellum one-third shorter than pronotum. Tibiæ densely blackish pubescent, the longest hairs equal to thickness of tibia. Length, 10 mm.

Described from a single female taken in Georgia. Except in the longer second antennal, the description differs little from some of the color varieties of *fraternus* Knight.

668 (911). *PLATYTYLELLUS CIRCUMCINCTUS* (Say), 1832, 23; I, 343.

Color in great part orange-red; head with front and tylus fuscous-black; color of pronotum as in key; scutellum reddish, the basal angles black; elytra black with embolium and outer margin of corium and cuneus reddish; antennæ and legs black, the coxæ and basal fourth of femora red; genital segment and middle of last two ventrals fuscous. Joint 1 of antennæ two-eighth longer than width of vertex, 2 three times longer than 1, 3 two-thirds the length of 2, one-half longer than 4. Length, 7—7.5 mm.

McCuller's and Cary, N. Car., September 13—15 (*Brimley*). Described from Indiana. Ranges from New England west to North Dakota and Utah. In one of the North Carolina specimens the pronotum is wholly red, in the other only tinged with fuscous near the base.

669 (—). *PLATYTYLELLUS RUBELICOLLIS* Knight, 1923, 555.

Black; collar, front margin of disk of pronotum and lower half of propleura orange-red to pink; scutellum sometimes (var. *vittiscutis* Knight) with an orange-red stripe; this rarely (var. *confluens* Knight) reaching forward to collar of pronotum. Joints 1 and 2 of antennæ black,

1 one-fifth longer than width of vertex; 2 slightly tapering from base to apex, thickly clothed with short black hairs, three times as long as 1; 3 and 4 fuscous, 3 three-fifths the length of 2, nearly twice as long as 4. Pronotum with basal margins of calli impressed, disk strongly convex, both it and elytra finely granulate, finely and densely pubescent. Length, 7.5—7.7 mm.

St. Anthony Park, Minn., June 2 (*Minn. Univ. Coll.*). Described from Minnesota, the two color varieties also from there and from Maine. Adults and nymphs of the typical form were taken on the figwort, *Schrophularia leporella* Bicknell.

670 (909). *PLATYTYLELLUS INSIGNIS* (Say), 1832, 22; I, 342.

Velvety-black, opaque, finely granulate; head except tylus, pronotum except part of the hind lobe and scutellum except the side margins or basal angles, red; ventrals black, the basal ones tinged with red. Joint 1 of antennæ but one-tenth longer than width of vertex, 2 nearly three times the length of 1, 3 about two-thirds the length of 2, one-half longer than 4. Beak reaching hind coxæ. Length, 6.7—7.5 mm.

Dunedin, Fla., April 10 (*W. S. B.*). Fairfax Co., Va., and Beltsville, Md., June 22—July 1 (*Davis*). Ranges from Ontario and New England west to Iowa and North Dakota and southwest to Florida and Texas. Recorded from many stations but part of the records doubtless should be referred to *rubrovittatus* and *intercidendus*, which it closely resembles in size and color. In Florida it is much less common than *rubrovittatus*.

670a (—). *PLATYTYLELLUS INSIGNIS FRATERCULUS* Knight, 1923, 554.

Differs from the typical form in having the scutellum black and ventral surface usually wholly red; hind lobe of pronotum black with its side margins narrowly pale, as is also often the case in typical *insignis*. Length, 5.1—6.6 mm.

Crawford and Posey counties, Ind., June 26—July 7. Laurel Hill, N. Car., June 22 (*Brimley*). Ranges from southern Indiana north to Minnesota. The North Carolina specimens have the ventrals wholly black, thus forming a connecting link between the typical form and Knight's variety.

671 (—). *PLATYTYLELLUS BOREALIS* Knight, 1923, 553.

Dull black; base of vertex, collar and a lateral stripe on flanks of pronotum, red; ventrals 1—4 orange-red. Joint 1 of antennæ as long as width of vertex, male, slightly longer, female; 2 two and three-fourths times the length of 1, 3 two-thirds as long as 2, 4 three-fourths the length of 3. Beak reaching between hind coxæ. Length, 6.3 mm.

Morrison Co., Minn., July 10 (*Minn. Univ. Coll.*). A species of northern distribution ranging from Ontario and New Eng-

land west to Alberta and North Dakota. Very close to *nigricollis* and may prove to be only a color variety of that species.

II. OPISTHEURIA Reuter, 1907a, 170.

Elongate or subobovate, opaque impunctate species having the head declivent, distinctly wider than collar of pronotum, about as long as width across eyes, male, somewhat longer, female; beak reaching middle coxæ; antennæ slender, as long as body; pronotum slightly wider at base than long, apex about one-half narrower than base, basal lobe feebly convex, declivent towards apex, its hind margin with sides rounded and middle subtruncate; elytra entire, surpassing abdomen, sides parallel, distinctly dilated behind the middle, claval commissure slightly longer than scutellum, cuneus longer than its base, membrane with two cells; legs pilose. Three species are known, one from our territory.

672 (913). OPISTHEURIA CLANDESTINA Van Duzee, 1915, 110.

Elongate, subparallel, male, obovate, female. Pronotum and ventral surface, except genital segments, orange-red; head red with front and tylus fuscous-black; scutellum and elytra fuscous-brown to black, the side margins of the latter broadly pale; antennæ and legs brownish-black, coxæ reddish, basal halves of femora often in part dull yellow. Joint 1 of antennæ slightly longer than head, 2 one-half longer than 1, 3 two-thirds the length of 2, one-third longer than 4. Loræ separated from the cheeks by a distinct suture. Collar prominent, longer than the calli. Length, 7—7.5 mm.

Harrison Co., Ind., Aug. 20. Sanford and Dunedin, Fla., Dec. 25—April 10. At Dunedin both nymphs and adults were taken in April by beating along the margins of wet hammocks. The Indiana specimen has the base of pronotum clouded with black. Described from Crescent City, Sanford and Ft. Myers, Fla. Knight (1918b, 115; 1923, 550) has recorded the typical form from New York and has named two color varieties, *dorsalis* having the pronotal disk largely black and ventrals orange-red, from New York and Ohio; and *ventralis* with pronotum and ventral surface chiefly black from New York and Wisconsin. As the color, like that of a horse, varies greatly, these names are superfluous.

Tribe II. CAPSINI Reuter, 1883, 566.

To this tribe, as characterized in the key, p. 681, belong the great majority of North American Miridæ of the subfamily

- ee. Joint 1 of hind tarsi shorter than joint 3; color not as above.
- f. Calli of pronotum vague or wanting; vertex with an impressed median line, both it and upper part of face opaque, distinctly obliquely striate. VI. CREONTIADES, p. 731.
- ff. Calli usually conspicuous; vertex shining, rarely (*Adelphocoris*) with distinct sulcus or stria.
- g. Dorsal surface distinctly pubescent, opaque or nearly so.
- h. Body above and below clothed with sericeous or tomentose pubescence; head slightly exserted, the eyes not in contact with pronotal angles; vertex with two small pale spots adjoining the inner border of eyes. VII. POLYMERUS, p. 733.
- hh. Body clothed only with simple pubescence, not tomentose; vertex without pale spots near eyes.
- i. Head broad, not exserted, the large eyes in contact with and overlapping the front angles of pronotum; hind margin of eyes sulcate and forming a curved line with base of vertex; pronotum without black spots.
- j. Head declivent; vertex convex; width of head across eyes distinctly less than width of pronotum at base. VIII. DICHROOSCYTUS, p. 741.
- jj. Head subvertical; vertex flat; width of head across eyes almost as great as width of pronotum at base. IX. BOLTERIA, p. 743.
- ii. Head narrower, more or less exserted, eyes convex behind and well removed from pronotal angles; pronotum usually with a vague black spot behind each callus.
- k. Joint 4 of antennæ equal in thickness to joint 2 at base; sides of pronotum without carinæ; collar of pronotum very narrow, its width not greater than thickness of antennal joint 4; color usually brown or fuscous, the margins of elytra paler. X. ADELPHOCORIS, p. 744.
- kk. Joint 4 of antennæ distinctly thinner than joint 2 at base; collar distinctly wider than thickness of joint 4; color a nearly uniform pale greenish-yellow. XI. CALOCORIS, p. 746.
- gg. Dorsal surface glabrous, highly polished.
- l. Beak reaching to or beyond hind margin of middle coxæ; second joint of antennæ almost glabrous; elytra not vitate. XII. HORCIAS, p. 747.
- ll. Beak shorter, but slightly surpassing front coxæ; second joint of antennæ thickly clothed with black, bristle-like hairs; elytra with black and yellow stripes. XIII. PÆCILOCAPSUS, p. 750.

I. NEUROCOLPUS Reuter, 1876, 69.

Rather robust species of medium size having the head pro-rect, slightly exserted, as broad across eyes as long, its front subvertical; eyes large, prominent; beak reaching hind coxæ, its basal joint reaching front ones; pronotum subcampanulate,

about as wide at base as long, strongly narrowed toward apex, its front portion with collar very distinct, side margins sinuate at middle, without lateral carinæ, hind lobe strongly convex, its hind margin broadly rounded; femora with apical halves thickly pilose; hind tarsi with joints 1 and 2 subequal, 3 slightly longer. One of the two known species occurs in our territory.

673 (920). *NEUROCOLPUS NUBILUS* (Say), 1832, 22; I, 341.

Elongate-oval, thinly pubescent with short inclined yellow hairs. Color exceedingly variable, usually some shade of brown, more or less tinged with greenish-gray and clothed with fuscous, often with numerous yellow dots or blotches; head, pronotum, scutellum, clavus, femora and under surface usually in great part clouded with fuscous; tibiæ yellow, all with three brown or fuscous rings; base of cuneus often tinged with reddish, its apex and the membrane usually tinged with fuscous. Antennæ with joint 1 and basal half of 2 reddish-brown, remainder fuscous; 1 stout, subclavate, slightly shorter than pronotum, thickly setose; 2 about twice as long as 1, much more slender at base, its apical half distinctly thickened; 3 and 4 very slender, subequal in length, united about one-third shorter than 2. Length, 6—8 mm. (Fig. 166).

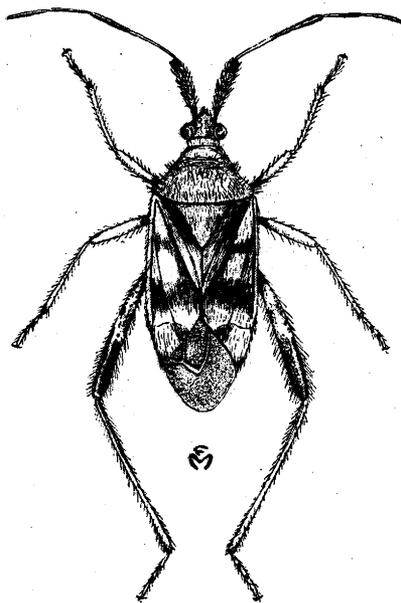


Fig. 166, X 7. (Original).

Common throughout Indiana, June 3—Oct. 13. Occurs on foliage and flowers of shrubs and herbs, especially in

and along the margins of dense moist woodlands. Taken in numbers in June from the flowers of false indigo, *Amorpha fruticosa* L.; staghorn sumac, *Rhus hirta* L.; alternate-leaved dogwood, *Cornus alternifolia* L.; and button-bush, *Cephalanthus occidentalis* L. Ranges from Quebec and New England west to South Dakota and Colorado and south to Florida and New Mexico. Not taken by me in Florida, but recorded by Van Duzee from Sevenoaks, near Clearwater.

II. *PARACALOCORIS* Distant, 1883, 263.

Elongate- or oblong-oval, opaque, impunctate, pubescent

species having the head porrect, inserted in thorax to eyes, its front declivent; eyes large, prominent, projecting outward beyond front angles of pronotum; beak reaching middle coxæ; antennæ with joint 1 swollen, terete, thickly clothed with stiff black inclined hairs, 2 gradually slightly thickened from the base, 3 and 4 much more slender than 2; pronotum subtrapezoidal, its width at base about three times that of apex, apical constriction distinct, side margins straight, not carinate, disk usually with black spots as in key, its basal half convex, strongly declivent toward apex with hind margin broadly rounded; elytra slightly surpassing tip of abdomen; legs moderately long, hind femora usually swollen, more or less curved; left clasper of male with a large rounded or pointed lobe on upper side at base. About a dozen species are known from North America, eight of which occur in the eastern states.

KEY TO EASTERN SPECIES OF PARACALOCORIS.

- a.* Hind tibiæ thickly clothed with long erect hairs which obscure or become confused with the tibial spines; joint 1 of antennæ slightly longer than pronotum; scutellum usually bright yellow or orange-red. 674. SCRUPEUS.
- aa.* Hind tibiæ with hairs shorter and more appressed, especially on inner side, the hairs not easily confused with the true spines.
 - b.* Pronotum black with a median orange-red cross-bar, the latter with a backward projecting spur; concavities behind ocelli present, but without black spots; apical joint of antennæ dull white. 675. INCISUS.
 - bb.* Pronotum without median pale cross-bar as above; black spots behind calli present; apical joint of antennæ not whitish.
 - c.* Joint 1 of antennæ distinctly longer than pronotum.
 - d.* Basal width of pronotum more than 2 mm.; color everywhere except discal spots of pronotum and membrane, pale or dark reddish-brown. 676. ADUSTUS.
 - dd.* Basal width of pronotum less than 2 mm.; color chiefly fusco-piceous, the costal margin frequently pale. 677. HAWLEYI.
 - cc.* Joint 1 of antennæ subequal to or shorter than length of pronotum.
 - e.* Color dull yellow or reddish, usually more or less mottled with fuscous; second antennal not exceeding 2.2 mm. in length.
 - f.* Color above pale greenish-yellow mottled with numerous fuscous spots or blotches, these enclosing minute yellow dots; apical third of scutellum a uniform yellow; legs and first antennal variegated with brown and yellow; second antennal with apical third black. 678. MULTISIGNATUS.
 - ff.* Color not as above; apical third of scutellum not wholly yellow.
 - g.* Color straw-yellow to dark brownish-gray or dark brown variegated with paler spots; second antennal with the ex-

- treme base and apical third blackish, the remainder brownish-yellow, but usually paler at each end next to black color; apex of corium with a fuscous or piceous mark. 679. COLON.
- gg.* Color dull tawney-red, often variegated with yellow; pronotum, scutellum and elytra indistinctly striped with yellow; apex of corium without a dark spot. 680. HEIDEMANNI.
- ee.* Color fuscous-black, not mottled; costal margin or more of corium usually pale; second antennal at least 2.4 mm. in length, usually longer; first antennal nearly equalling length of pronotum. 681. LIMBUS.

674 (979). *PARACALOCORIS SCRUEPEUS* (Say), 1832, 23; I, 342.

Color exceedingly variable, in the typical form black with pronotum behind the calli and scutellum bright orange-yellow, the former with collar, calli, and usually a small vague spot near each basal angle fuscous or black; the round impressed spot behind each callus velvety-black; tarsi and joints 3 and 4 of antennæ fuscous-brown, thickly and finely pubescent with yellowish hairs. Joint 2 of antennæ two-thirds longer than 1, 3 subequal in length to 4. Elytra sparsely clothed with short yellow inclined hairs. Length, 6.3—6.8 mm.

Frequent throughout Indiana, May 20—Aug. 1. Occurs especially on wild grape in and along the borders of thickets and woodlands. Henderson, Ky., June 3 (*Marshall*). Ranges from Quebec and New England west to Colorado and south to Georgia. McAtee (1916, 369) and Knight (1923, 611) have described and given keys to 18 color varieties. Of these the two most widely distributed are:

674a (—). *PARACALOCORIS SCRUEPEUS* PAR McAtee, 1916, 373.

Fuscous-black; pronotum with median spot and a narrow stripe just outside each discal black spot prolonged backward, dull yellow; costal margin of elytra and median stripe on scutellum also dull yellow.

Starke and Posey counties, Ind., June 3—July 1. Ranges from New York west to Nebraska.

674b (—). *PARACALOCORIS SCRUEPEUS* BIDENS McAtee, 1916, 374.

Fuscous-black; pronotum (except calli, collar and velvety spots behind calli), scutellum, embolium and outer half of corium, orange-red or reddish-yellow; cuneus scarlet-red, its tip blackish; clavus and inner half of corium fuscous-black. Length, 6—6.5 mm.

Marion Co., Ind., May 6—Aug. 14; frequent on foliage of herbs and shrubs in dense woodland (*W. S. B.*). Pine Island, N. Y., and Ramsey, N. J., June (*Davis*). Ranges from New England west to Illinois. All variations between this and typical *scrupeus* occur and the student wishing to name color

forms is referred to the papers of McAtee and Knight above cited.

675 (912). *PARACALOCORIS INCISUS* (Walker), 1873, 92.

Elongate-oval. Dark fuscous-brown to black; head with a vague pale spot each side of base of vertex; eyes brown with a pale curved line behind and beneath; pronotum fuscous or blackish with a wide median orange-red cross-bar, this usually widened on sides to cover side margins behind the collar and with median spur projected backward, this sometimes extending onto scutellum and dividing the black of basal half of pronotum into two large spots (*P. externus scissus* Knight); scutellum either wholly black (*P. externus totus* Knight) or orange-red with dark side margins (*P. verus* Knight); elytra wholly black, the membrane fuscous; legs black or fuscous, the basal halves of femora sometimes orange-red; tarsi fuscous-brown or paler; antennæ black with white apical segment, the basal joint sometimes with an orange base. Joint 1 of antennæ longer than pronotum, 2 twice as long as 1, 3 slightly longer and distinctly stouter than 4. Pronotum and elytra thinly clothed with very fine grayish appressed hairs. Length to tip of membrane, 7.5–8 mm.

Ormond, Dunedin, Bassenger and Lake Wales, Fla., Dec. 19—April 19. Numerous examples were taken from foliage of oak and bay along the margins and paths of dense moist hammocks. Easily known from our other species by the pale fourth antennal, lack of discal black spots and peculiar markings of pronotum and scutellum. The *P. verus* Knight Ms. and the variety *P. externus totus* Knight Ms. I swept on Dec. 19 from a branch of the same oak and they are mere color forms of the same species. The var. *scissus* Knight Ms., taken at Ormond April 15, differs only in having the median pale ray of pronotum prolonged backward to apex of scutellum, thus dividing the black area of both the basal half of pronotum and scutellum into two parts. According to China, who compared two of my specimens with Walker's type from St. John's Bluff, Fla., the typical *incisus* is the form with median pale ray of pronotum extending almost to base, and scutellum orange-red with black side margins, or the *P. verus* Knight Ms. China states that the *C. externus* H.-S. of Walker (1873, 91), also from St. John's Bluff, "is possibly another variety of *incisus*. It agrees very well with the colored figure of H. Schaeffer's *externus*." The *P. novellus* Blatch. (1926, 163) is a synonym of *incisus*. Whether *incisus* in turn is the same as *externus* cannot be judged from colored figures alone, but only by a comparison of the types. The latter species is placed by Van Duzee as a variety of *P. scrupeus* (Say). McAtee (1916, 366) states that in his opinion it is not

a *Paracalocoris*, as no member of that genus has the "first antennal joint as long as head and thorax together," as described and figured by H.-Schaeffer.

676 (984½). *PARACALOCORIS ADUSTUS* McAtee, 1916, 377.

Color a nearly uniform reddish-brown, rather thickly clothed above with short appressed yellow hairs; inner margin and apical third of clavus, second antennal, tibiæ and tips of tarsi more or less fuscous-brown; membrane dusky, its veins paler. Joint 1 of antennæ one-tenth longer than pronotum, 2 three-fifths longer than 1, 3 slightly longer than 4, the two united a little shorter than 2. Length, 8 mm.

Lakehurst, N. J., June 13, type (*Davis*). Recorded elsewhere only from Berrien Co., Mich., where Hussey took a few examples from willow in July.

677 (984¼). *PARACALOCORIS HAWLEYI* Knight, 1916b, 377.

Elongate, subparallel, rather robust. Color variable; head, apical third of pronotum and costal margins of elytra usually orange-red or dull yellow, cuneus reddish, remainder of upper surface fuscous-black; under surface except the region of genital plates, orange-red; legs and antennæ black, coxæ paler. Joint 1 of antennæ one-eighth longer than pronotum, 2 two-thirds longer than 1, 3 less than one-half the length of 2, 4 three-fifths the length of 3. Discal spots of pronotum usually merged with the dark color of basal portion. Length, 6.3—7.5 mm.

Marion and Martin counties, Ind., June 19—July 13. The known range extends from Massachusetts west to Indiana and south to Maryland. Breeds on cultivated hop and apple in New York. McAtee and Knight (*loc. cit.*) have described three color varieties. The Indiana specimens at hand belong to Knight's var. *ancora* in which the elytra are almost wholly fusco-piceous, without a pale stripe along the corium.

678 (983). *PARACALOCORIS MULTISIGNATUS* Reuter, 1909, 40.

Oblong-oval. Pale greenish-yellow, more or less blotched with fuscous; pronotum with front and hind margins and a stripe back of each discal spot fuscous, flecked with small yellow dots, the space between the dark stripes and also the sides of disk lemon-yellow; apical third of scutellum, apex of clavus and middle of cuneus lemon-yellow; corium with a large irregular spot near middle, a smaller one near apex and numerous scattered dots of the same hue; membrane dusky, marbled with paler; under surface and legs pale yellow, the apical third of femora, two rings on tibiæ, tips of tarsi and usually some vague markings on sides of ventrals fuscous. Joint 1 of antennæ fuscous mottled with yellow, subequal in length to pronotum, 2 twice as long as 1, its apical third black, remainder reddish-brown, with yellow ring at base and another in front of middle; 3 and 4 subequal, each about half the length of 2. Length, 6—7 mm.

Swannanoa, N. Car., July (*Brimley*). Ranges from Maryland southwest to Texas. Variable to some extent in color.

679 (980). *PARACALOCORIS COLON* (Say), 1832, 25; I, 346.

Grayish-brown or brownish-yellow, rather thickly clothed with fine silky yellow hairs and usually more or less variegated with pale fuscous and small yellow spots, the fuscous often forming large blotches on basal half of pronotum, scutellum and clavus and along the inner margin of corium; membrane fuscous, paler at middle, its veins yellow; legs dull yellow, the apical third or more of femora and two rings on tibiæ brownish or blackish; under surface brownish with paler linear markings each side. Joint 1 of antennæ brownish, spotted with yellow, one-fifth shorter than pronotum, 2 twice the length of 1, colored as in key; 3 and 4 fuscous, very slender, 3 two-fifths the length of 2, one-fourth longer than 4. Length, 5.8—6.5 mm.

Described from and found throughout Indiana, but scarce, June 3—Aug. 30. Staten Island, N. Y. (*Davis*). Henderson, Ky., May 25 (*Marshall*). Occurs on the foliage of Virginia creeper, poison ivy and other shrubs in moist woodland. Ranges from Ontario and New England west to Kansas and Colorado. McAtee has described three color varieties, two of which are fairly constant in hue.

679a (—). *PARACALOCORIS COLON CASTUS* McAtee, 1916, 382.

Color a nearly uniform dull straw-yellow to pale reddish-brown without paler spots; middle of scutellum and base of third antennal paler; cuneus tinged with reddish. Length, 5.5—7 mm.

Marion Co., Ind., June 19—30 (*W. S. B.*). Staten Island, N. Y., Aug. 17 (*Davis*). Ranges from New York to Maryland. Occurs on willow.

679b (—). *PARACALOCORIS COLON COLONUS* McAtee, 1916, 383.

Differs from typical *colon* in having joint 2 of antennæ pale or brownish on basal half, but without a distinctly paler ring next to the blackish base; pronotum orange-red to fuscous, frequently vittate with pale yellow; elytra dark reddish-brown to fusco-piceous, both they and pronotum more or less spotted with yellow. Length, 5.5—6.5 mm.

Marion, Knox and Floyd counties, Ind., June 8—July 16. Ranges from New England west to Minnesota and south to New Jersey. A form of this in which the elytra are devoid of yellow spots is var. *amiculus* McAtee.

680 (982). *PARACALOCORIS HEIDEMANNI* Reuter, 1909, 40.

General color pale orange-yellow to dark reddish-brown or mahogany-red, thickly clothed with prostrate golden yellow hairs; head reddish-yellow with diagonal lines each side, these usually darker; front margin

of pronotum and median and two vague lateral stripes on both pronotum and scutellum, outer margin of apical half of clavus, commissure, costal margin and diagonal stripe on apical half of corium, usually yellowish or tinged with yellow; membrane dusky with paler markings, veins yellowish; legs reddish-brown, femora dotted with yellow; under surface with alternate yellow and darker stripes. Joint 1 of antennæ as long as pronotum, pale reddish-brown flecked with yellow, its tip blackish; 2 as long as width of hind margin of pronotum, or about three-fourths longer than 1, its apical half piceous; 3 and 4 united subequal in length to 2, their apical two-thirds or more blackish. Beak reaching tips of hind coxæ, its apex black. Length, 6—7 mm.

LeRoy, Ala., June 12 (*Minn. Univ. Coll.*). Recorded elsewhere only from Maryland and the two Virginias, where it is said to breed on the shrubby St. Johnswort, *Hypericum prolificum* L. McAtee (1916, 386) has named the pale form var. *ablutus*, though Reuter expressly states that the general color of the typical form is "pallide flavo-testaceus, leviter nitidulus."

681 (984½). PARACALOCORIS LIMBUS McAtee, 1916, 380.

Fuscous-black, rather thickly clothed with prostrate black hairs; head, except a median spot on vertex, collar and median area around discal spots of pronotum and marginal stripe of elytra widened behind and extending back to tip of cuneus, orange-red; membrane brownish-fuscous; legs fuscous, some vague spots on femora and tarsi pale; under surface reddish-yellow, the ventrals more or less fuscous. Joint 1 of antennæ blackish, thickly clothed with inclined bristly hairs; 2 and 3 fuscous-brown with shorter hairs, the former about two-thirds longer than 1; 4 paler, slightly longer and more slender than 3. Length, 7.5—8 mm.

Spring Hill, Ala., April 27 (*Gerhard*). Described from Clayton, Ga., and recorded elsewhere only from Massachusetts.

III. GARGANUS Stal, 1862, 321.

Small, elongate, subparallel species having the head porrect, wider across the eyes than long, its front subvertical; eyes prominent, distinctly projecting outward beyond apical angles of pronotum; beak passing hind coxæ, its basal joint longer than head; joint 1 of antennæ filiform, longer than pronotum, 2 much more robust, fusiform, densely clothed with stiff inclined black hairs, 3 very slender, one-half the length of 2, one-third longer than 4; pronotum subtrapezoidal, one-half wider at base than long, disk declivent with sides straight, strongly converging from base to apex, collar very narrow, calli obsolete; elytra with side margins parallel. Four species are known, one from our territory.

682 (971). GARGANUS FUSIFORMIS (Say), 1832, 24; I, 344.

Color above black or fuscous-black; base of third antennal, collar of pronotum, a wide median stripe on scutellum, a narrower one along commissure and each costal margin, ivory-white; legs, basal joint of antennæ and base of abdomen reddish-yellow; membrane, tarsi and third and fourth antennals in great part fuscous. Length, 4—5 mm.

Marion, Putnam, Knox and Orange counties, Ind., scarce, May 30—Oct. 10; not taken but doubtless occurs in the northern counties (*W. S. B.*). Raleigh, N. Car., July 23 (*Brimley*). Agricultural College, Miss. (*Weed*). Occurs on low herbage in moist places. Ranges from Ontario and New England west to Michigan and Kansas and south to Florida, where it has been recorded only from Jacksonville and Crescent City. Of its occurrence in southern Michigan Hussey says: "This agile Mirid was common in the grass in damp localities from June 20 to Sept. 1."

IV. PHYTOCORIS Fallen, 1814, 10.

Elongate-oval or subparallel Mirids of medium size having the head short, porrect, as broad as or broader across the eyes than long, its front declivent; eyes prominent, longer than wide; vertex usually without a median groove, not carinate at base; beak reaching beyond middle coxæ, joints 1 and 2 of equal length, 3 longer than 4, which is about one-half as long as 2; antennæ slender, almost filiform, as long as or longer than body, its joints variable in length and thickness according to species, the first sparsely clothed with stiff hairs; pronotum short, subtrapezoidal, its subapical constriction distinct, collar very short, calli more or less distinct, disk moderately declivent from the base forward, its hind portion convex and hind margin subtruncate or broadly rounded, slightly emarginate at middle; mesoscutum narrowly exposed; elytra surpassing abdomen, cuneus long, triangular, both it and membrane usually deflexed; hind tarsi with joints 2 and 3 subequal, 1 shorter.

The genus is a very large one, 37 North American species having been recognized by Van Duzee in his Catalogue and 30 or more having since been described by Knight. Of these 57 occur in our territory.⁷⁹ For convenience of study they are,

⁷⁹The *P. inops* Uhler (1877, 413), recorded by Van Duzee from several eastern states, was described from Colorado and, according to Knight (*Ms.*), the eastern records are erroneous. Uhler later (1878, 402) redescribed it from Massachusetts and New Hampshire, but his second description varies widely from the first, and Knight states was based upon a specimen of *Neurocolpus*.

following Knight (1923, 615), separated into four groups, as follows:

KEY TO GROUPS OF EASTERN SPECIES OF PHYTOCORIS.

- a. Membrane of elytra speckled or irrorate with small fuscous and pale spots; median lobe of male genital structure provided with a flagellum (fig. 16)⁸⁰ without or rarely (*junceus*) bearing distinct teeth.
 - GROUP I, p. 700.
- aa. Membrane either uniformly fuscous, nearly pale, or marbled with pale, never distinctly speckled, but the margins of fuscous areas sometimes with small pale dots; median lobe of male genital structure with a flagellum bearing distinct teeth (fig. 1).
 - b. Basal joint of antennæ shorter than width of head.
 - GROUP II, p. 711.
 - bb. Basal joint of antennæ distinctly longer than width of head.
 - c. General color fuscous or blackish on a paler background; antennæ more blackish or fuscous than pale, if joint 2 broadly pale at middle then the dorsum chiefly fuscous to blackish.
 - GROUP III, p. 714.
 - cc. General color usually yellowish to reddish over a paler background; antennæ more nearly pale-yellowish or reddish, than blackish, joint 2 sometimes fuscous at apex and near base, but more pale than fuscous.
 - GROUP IV, p. 724.

GROUP I.—PHYTOCORIS.

In this group the membrane of elytra is irrorate or flecked with small fuscous pale dots; the basal joint of antennæ is variable in length, but always longer than the width of head across the eyes. It corresponds to Group I of Knight in the "Hemiptera of Connecticut," and comprises 17 of our eastern species. They occur mainly in crevices in the bark of the trunks of trees and are probably largely predaceous in habit.

KEY TO EASTERN SPECIES OF GROUP I, PHYTOCORIS.

- a. Basal joint of antennæ greatly thickened, cylindrical, its thickness nearly equal to dorsal width of an eye.
 - b. Joint 2 of antennæ yellowish, its apical fourth blackish; joint 1 slightly longer than head and pronotum united, thickly clothed with long inclined black hairs; form elongate, subparallel; length 7.5—8.5 mm.
 - 683. LASIOMERUS.
 - bb. Joint 2 of antennæ uniformly yellowish, scarcely dusky at apex.
 - c. Basal joint of antennæ with two distinct types of hairs, erect black bristle-like ones with shorter more recumbent sparsely set black ones between them; scutellum reddish each side of median line, clothed with silky white pubescence.
 - 684. PALLIDICORNIS.

⁸⁰The figures of male genitalia cited under certain species of *Phytocoris* refer to those on Plate XI, p. 712.

- cc. Basal joint of antennæ with the shortest hairs almost as long as the erect bristle-like ones; scutellum uniform yellowish sparsely clothed with simple erect pubescent hairs. 685. RUBROPICTUS.
- aa. Basal joint of antennæ more slender, its thickness distinctly less than dorsal width of eye.
- d. Joint 2 of antennæ uniformly yellowish, sometimes somewhat dusky at apex and near base; upper surface chiefly reddish or fuscous on a pale yellowish background. 686. ULMI.
- dd. Joint 2 of antennæ chiefly blackish or fuscous-brown, usually annulated with pale.
- e. Joint 2 of antennæ black at base with a pale ring somewhat removed from base.
- f. Length of first antennal equal to that of head and pronotum united, also equal to width of pronotum at base; basal submargin of disk of pronotum with two black calloused densely pilose spots each side of middle; length, 5—6 mm. 687. ANTENNALIS.
- ff. Length of first antennal only equal to length of pronotum plus one-third that of head, also shorter than width of pronotum at base; length, 7 mm. 688. PALMERI.
- ee. Joint 2 of antennæ with a pale ring at base, blackish beyond.
- g. Third antennal with a pale ring at base and another at middle.
- h. Upper surface with both black and yellowish scale-like hairs turned on edge; lower half of face more or less fuscous; propleura pale on lower half, but without a distinct white line above middle of coxal cleft. 689. CONSPURCATUS.
- hh. Upper surface without scale-like hairs; lower half of face white; propleura white, black along its dorsal margin and with a clearly cut black line across lower half of coxal cleft. 690. DAVISI.
- gg. Third antennal with a pale ring only at base, or none.
- i. Joint 2 of antennæ broadly pale yellowish to dusky at middle, dark fuscous only at apex and next to pale ring at base; small slender species, length, 5—5.3 mm. 691. MINUTULUS.
- ii. Joint 2 of antennæ black or fuscous-brown, a pale band at base, but (except in *tuberculatus*) only narrowly pale on middle.
- j. Third antennal uniformly brownish-black.
- k. Disk of pronotum with base and side margins black, the extreme basal edge pale, central area yellowish-green, often with a narrow median black streak, calli black; tibiæ brownish-black with vague pale spots; length, 8.5—9 mm. 692. JUNCEUS.
- kk. Disk of pronotum a nearly uniform reddish-brown, with only irregular fuscous markings near base; calli unicolorous with disk; tibiæ dull yellow tinged with fuscous, their tips alone blackish; upper surface with patches of long yellowish-white pubescence; length, 7—7.8 mm. 693. FENESTRATUS.
- jj. Third antennal pale at base.

- l.* Lower half of head blackish without clearly marked white areas; length, 6.6 mm. 694. CORTICEVIVENS.
- ll.* Lower half of head chiefly white, sometimes with a black bar across middle of tylus, dorsal margin of juga and loræ dark reddish-black, but the white areas never obscured.
- m.* Corium with a longitudinal black stripe, set on a grayish background, along middle of apical half; joint 1 of antennæ equal in length to distance between tylus and basal margin of pronotum. 695. VITTATUS.
- mm.* Corium without a longitudinal black stripe on a grayish background.
- n.* Joint 2 of antennæ with pale band placed at slightly beyond middle; tylus with a distinct black band across middle, its lower margin just in line with dorsal margins of loræ. 696. DIMIDIATUS.
- nn.* Joint 2 with pale band at middle; tylus without a heavy black band across middle, but often with a vague dark reddish spot at that point.
- o.* Pronotum strongly sulcate at sides and immediately behind calli; apical half of hind femora with three or four large pale marks, these often in part confluent. 697. SULCATUS.
- oo.* Pronotum not distinctly sulcate at sides or behind calli; hind femora black with not more than one prominent white band on apical half.
- p.* Hind femora brownish-black, apical half with small pale dots only; pale band at middle of second antennal subobsolete or wanting. 698. FUMATUS.
- pp.* Hind femora black with a distinct white oblique band just before apex; pale band at middle of second antennal very distinct. 699. TUBERCULATUS.

683 (922). PHYTCORIS LASIOMERUS Reuter, 1909, 34.

Pale reddish-brown, rather thickly clothed with silky yellowish appressed hairs; pronotum with sides often clouded with fuscous, sometimes with a reddish tinge; clavus and corium vaguely clouded with fuscous, embolium usually paler; cuneus straw-yellow, its apex fuscous; membrane dusky, sprinkled with small vague yellowish spots, the veins reddish; legs dull yellow, the apical half or more of femora thickly flecked with reddish-brown; under surface reddish to fuscous-brown. Joint 1 of antennæ reddish-brown dotted with yellow, nearly two-thirds longer than pronotum; 2 as in key, about twice as long as 1; 3 paler at base, its apical half and all of 4 dusky, 3 two-thirds as long as 2, one-third longer than 4. Length, 7.5—8.5 mm. (Fig. 167, a).

Denver, Colo., July 16 (*Gerhard*). A species of northern distribution, ranging from Quebec and New England west to North Dakota, Colorado and Victoria, B. C. Not taken, but doubtless occurs in northern Indiana. It was found near Cranberry Lake, N. Y., in July and August on willows and weeds.

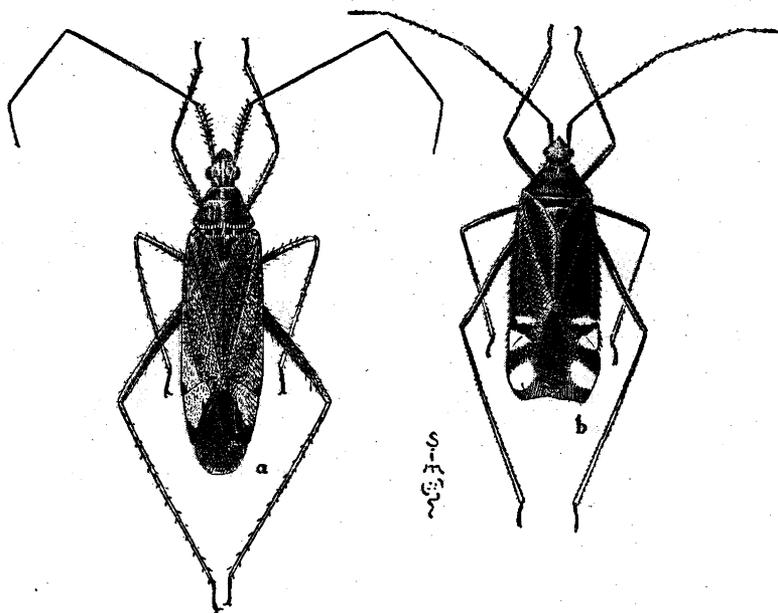


Fig. 167, *a*, *Phytocoris lasiomerus* Reut., X 6; *b*, *Macrotylus sexguttatus* (Prov.), X 12.
(After Drake, Tech. Pub. No. 16, N. Y. St. Coll. For.).

684 (923). PHYTOCORIS PALIDICORNIS Reuter, 1876, 69.

Pale brownish-yellow; elytra thickly flecked with reddish-brown spots and clothed with pale silky appressed hairs; extreme apex of cuneus brown; membrane pale fuscous flecked with whitish spots, the veins reddish; femora thickly sprinkled with reddish dots, apical third of hind ones with a yellowish band; tips of front and middle tibiae and base of hind ones reddish-brown. Joint 1 of antennae but slightly longer than pronotum, dull yellow, thickly flecked with reddish spots, pubescent as in key; 2 uniformly reddish-yellow, finely pubescent, much more slender and twice as long as 1; 3 dull yellow, fuscous at tip, about two-thirds the length of 2; 4 fuscous-brown, three-fourths the length of 3. Length, 6.4—6.8 mm.

Oak Bluffs, Mass., Aug. 3 (*Olsen*). Described from Wisconsin. Ranges from New England west to Colorado. Readily distinguished from *lasiomerus* by the much shorter basal antennal and wholly yellow second one.

685 (—). PHYTOCORIS RUBROPICTUS Knight, 1923, 619.

Elongate, slender, male; more oval, female. Dull reddish; elytra sparsely clothed with yellowish pubescence; pronotum with calli and quadrangular area on center of disk, yellowish, the disk beset with rather short blackish hairs, its margins with longer ones; clavus and