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A Systematic & Biological Study
Of the Acarina of Illinois

Entomology

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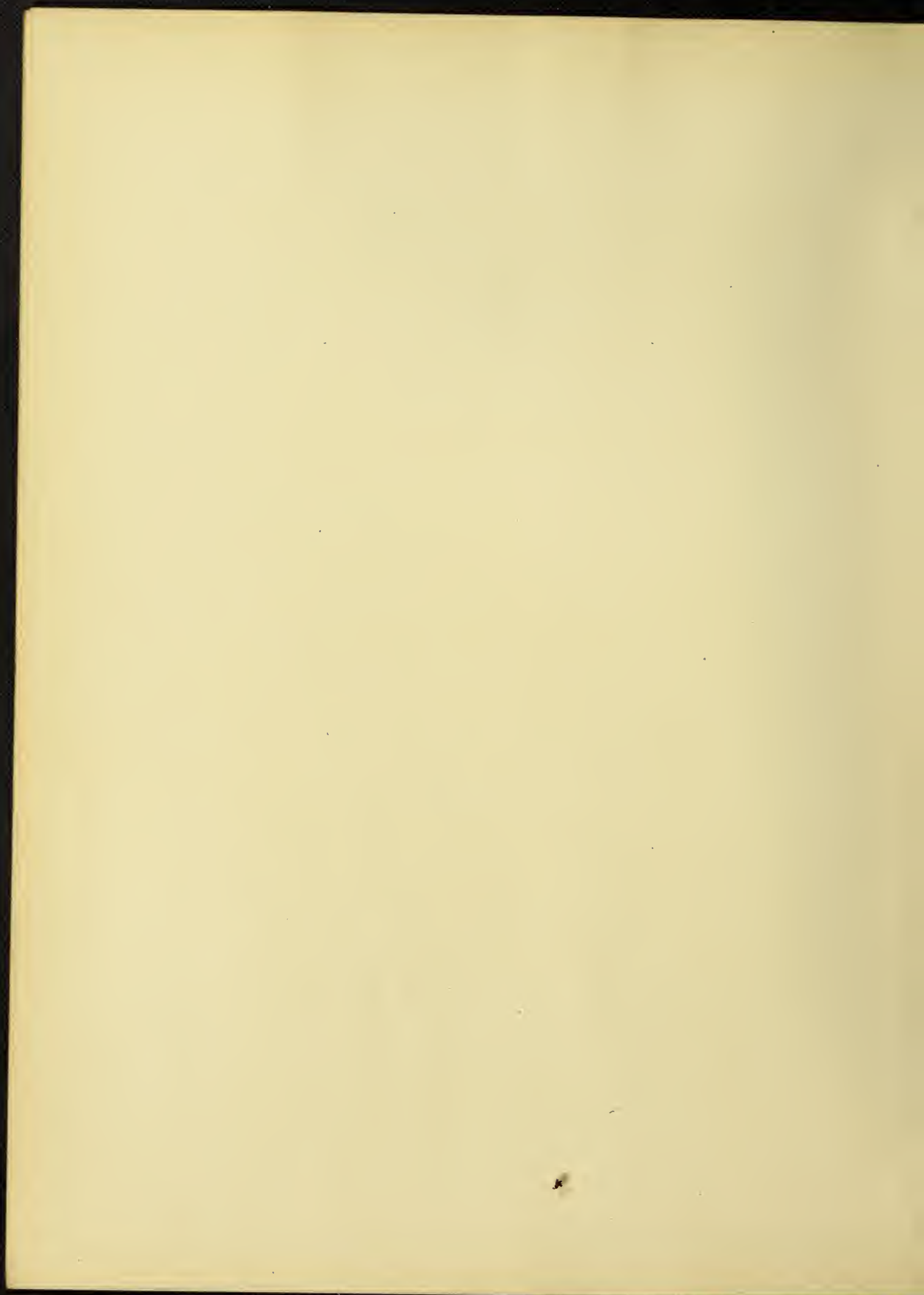
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A SYSTEMATIC AND BIOLOGICAL STUDY
OF THE ACARINA OF ILLINOIS

BY

HENRY ELLSWORTH EWING, A. B., 1906

THESIS

For the Degree of Master of Arts

in Entomology

IN THE

Graduate School

OF THE

University of Illinois

PRESENTED JUNE, 1908

1908
F. W. S.

UNIVERSITY OF ILLINOIS

June 1, 1908.

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

Henry Ellsworth Ewing, A. B., 1906

ENTITLED *A Systematic and Biological Study of the Acarina of Illinois*

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF *Master of Arts, in Entomology.*

Justus W. Folsom

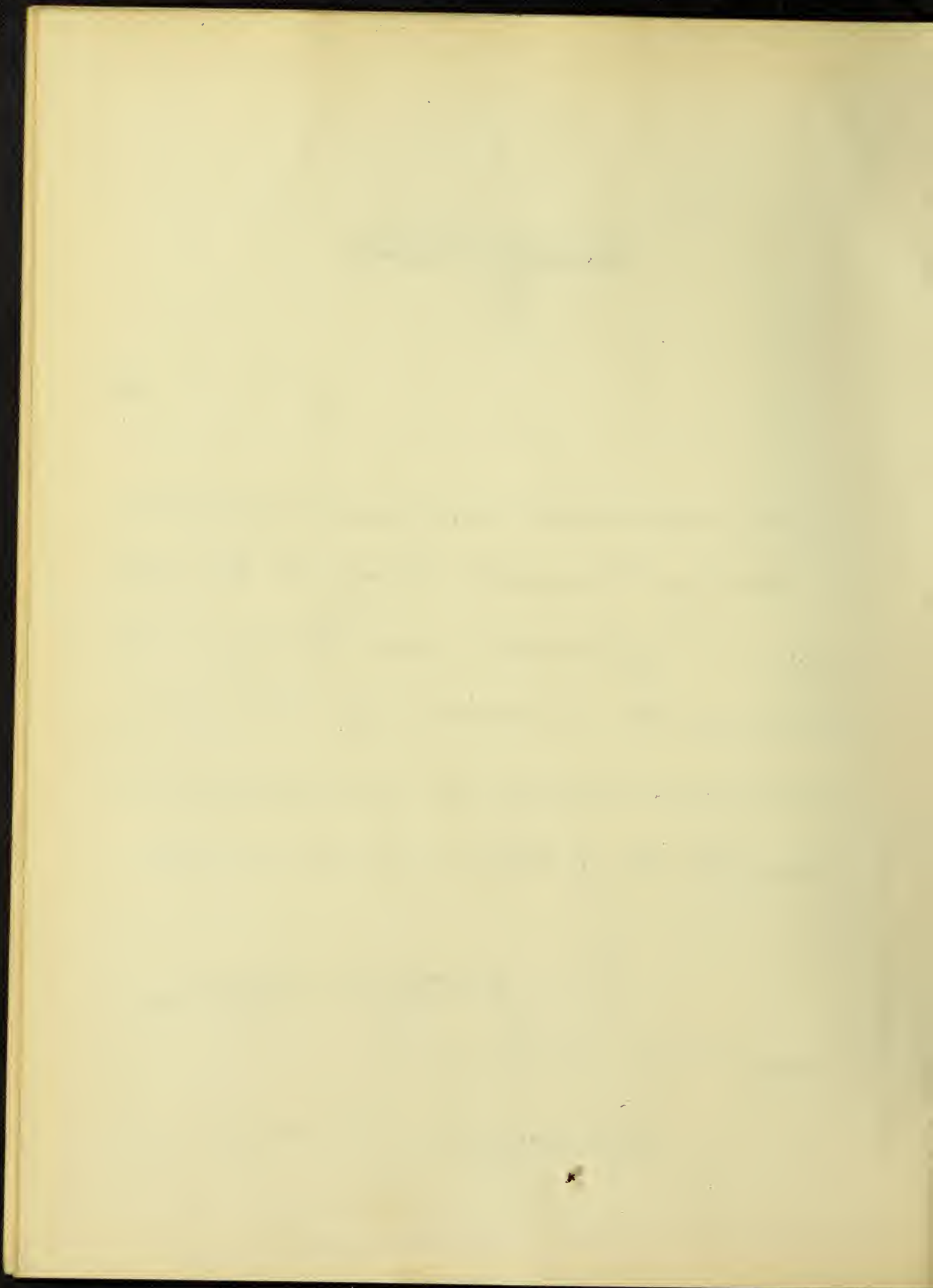
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1906
EWS

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1.

PREFACE.

The Acarina of America have not been studied extensively. Almost all the work on the group that has been done in this country has been either economic or systematic. In Europe, where the study of the Acarina has been pursued by many specialists for a much longer period than in America, the field has been much better explored. At present the work upon the Acarina has been extended much beyond the systematic and economic aspects and we now know the life histories of at least some of the species in each of the higher groups; investigations into the internal anatomy have been very extensive; but the physiology and embryology of the Acarina is almost entirely unknown.

This work was done while the author was in attendance at the University of Illinois. Much of the collecting of specimens was done by the writer during the past two years.

The collections were made in many parts of the state. Many of the species described in this paper are well-known European forms, while others are known to be distributed generally over the United States.

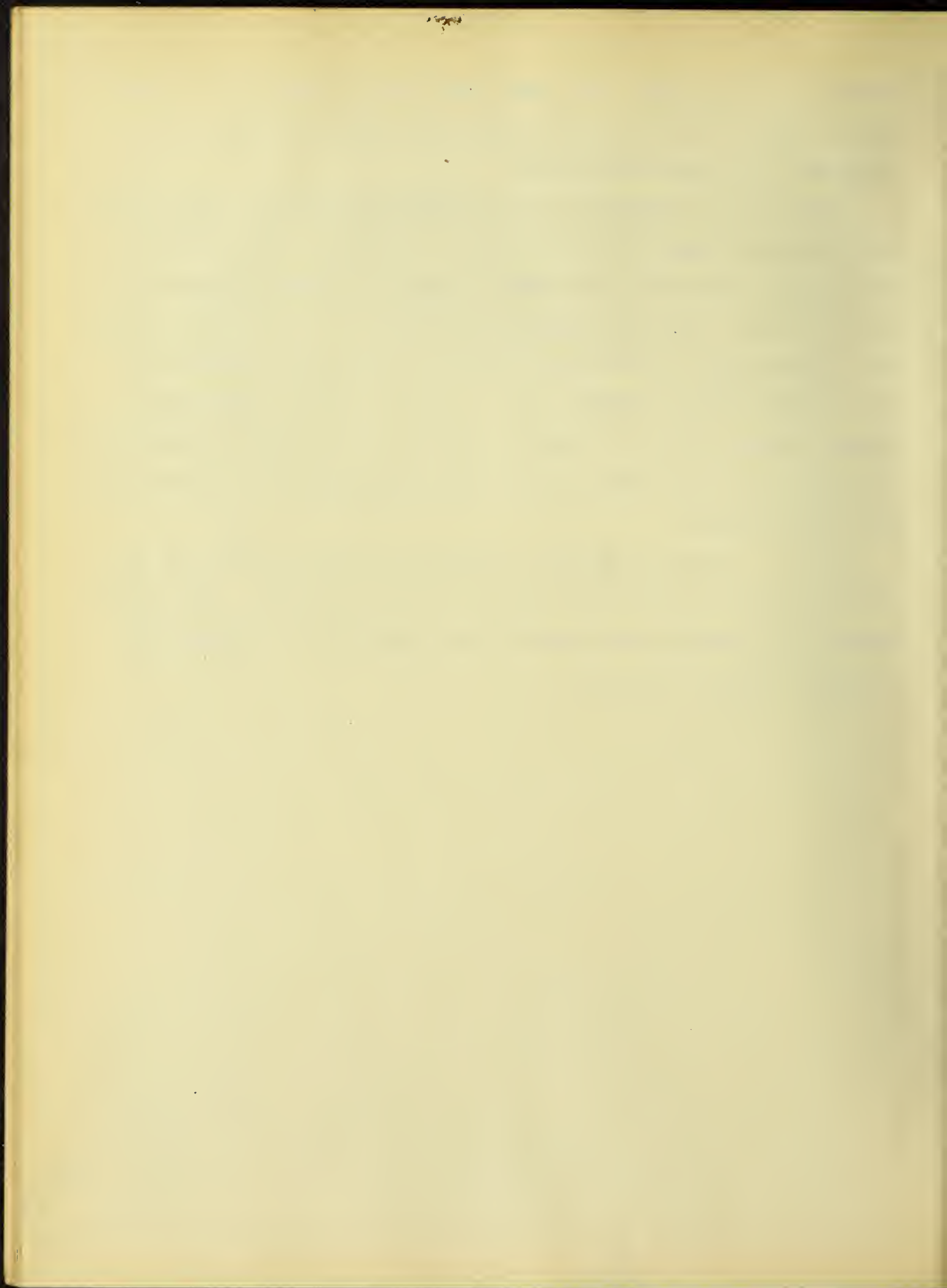
The writer is much indebted to Dr. J. W. Folsom of the department of zoology for his kindly assistance in many ways. I wish to express my thanks also to Mr. A. D. Michael of England, a master acarologist, who has greatly increased our knowledge of the internal anatomy, life histories and habits of the Acarina, and who has given us his unexcelled monographs on the Oribatidae and the Tyroglyphidae. Mr. Nathan Banks of the Smithsonian Institution has kindly compared many of the specimens described in the following pages with the originals which he possesses, and has also sent me several of his publi-

1
1880

cations on the Acarina. Mr. Banks has done systematic work in many of the families and has contributed much towards clearing up the synonymy of the American species.

The author is indebted to the following persons for their aid in collecting specimens: Mr. J. D. Hood, a student of the University who has done extensive collecting of Acarina and has furnished the writer in most cases with mounted specimens; Mr. C. A. Hart, systematic entomologist of the State Laboratory of Natural History; Mr. R. D. Glasgow and H. Glasgow, both students; and Mr. James Zetek, also a student. Mr. J. J. Davis, assistant to the State Entomologist, has aided the writer both in collecting specimens and in observations upon their habits.

Dr. S. A. Forbes has kindly permitted the author to work up the collections of the State Laboratory of Natural History. Type specimens of the species described have been deposited in the State Laboratory of Natural History.

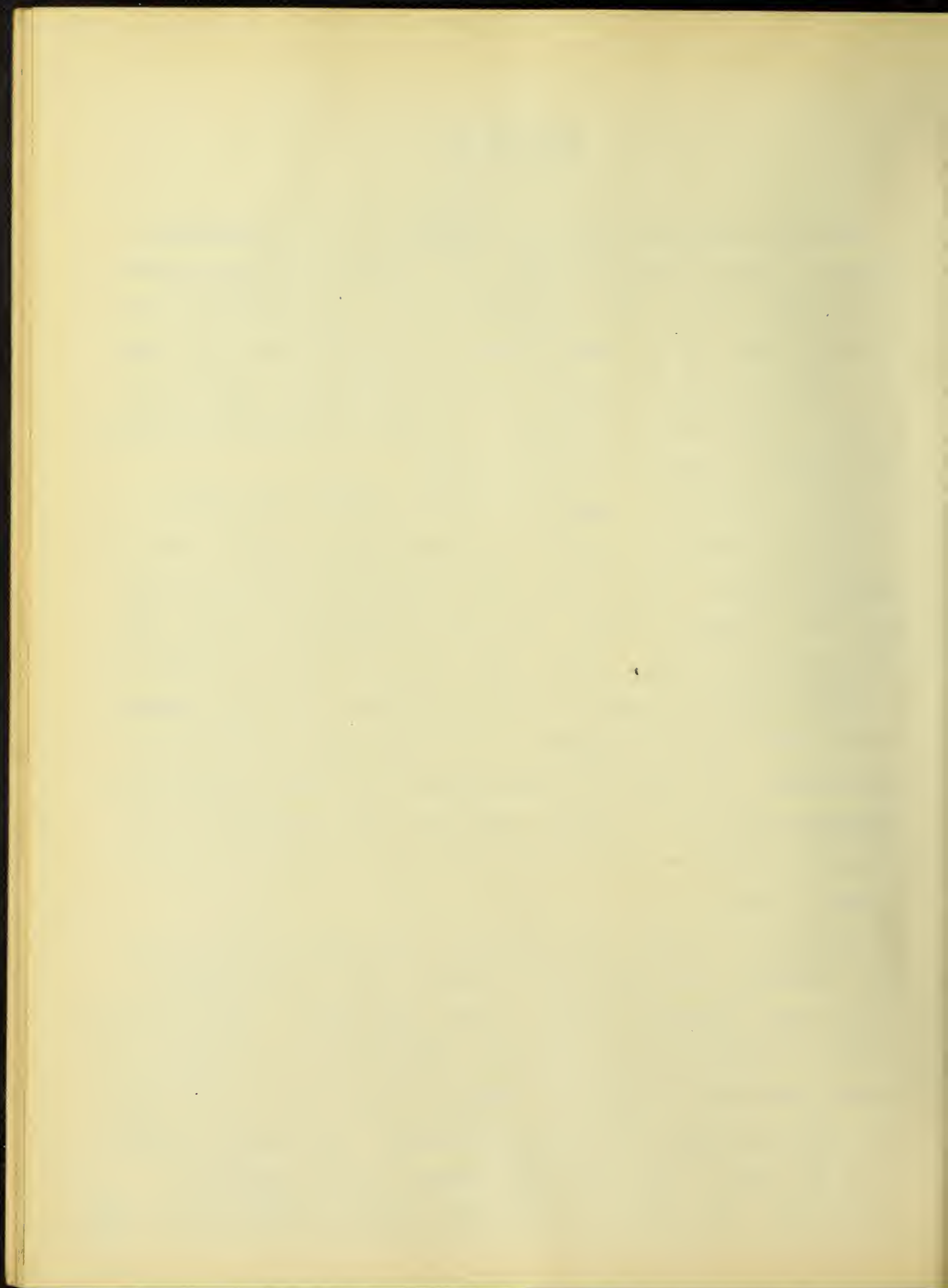


INTRODUCTION.

The mites constitute the order Acarina of the class Arachnida. They are characterized as follows. The cephalothorax and abdomen are broadly united, often coalescing so as to show no division between the two; the eyes when present are usually lateral and there are seldom more than two pairs; the mouth parts are usually united so as to form a beak, or rostrum; the larvae are usually six-legged, and growth is aided by a series of molts.

To most persons the Acarina are almost unknown, with the exception of a few of the largest forms and perhaps some of those of parasitic habits. Those forms which are popularly known commonly go under the name of "bugs." Many of the parasitic mites are popularly known as "lice," but a clear distinction should be made between the mite-lice and the lice which belong to the class Insecta. Often these two kinds of parasites are found side by side on the same animal. By means of a hand lens the lice which belong to the Acarina can at once be distinguished from those belonging to the Insecta by having no antennae and by having four pairs of legs instead of three.

Perhaps the largest and best known of the mites are the ticks. The common dog ticks and cattle ticks are good illustrations of these mites, which are of much economic importance. Some of the common "chicken lice" are mites, but they belong to a different family from that of the ticks. Anyone who has lived in the country is doubtless acquainted with the microscopic red creatures, smaller than the head of a pin, which are commonly called "chiggers." These small, red creatures attack human beings and cause much itch-




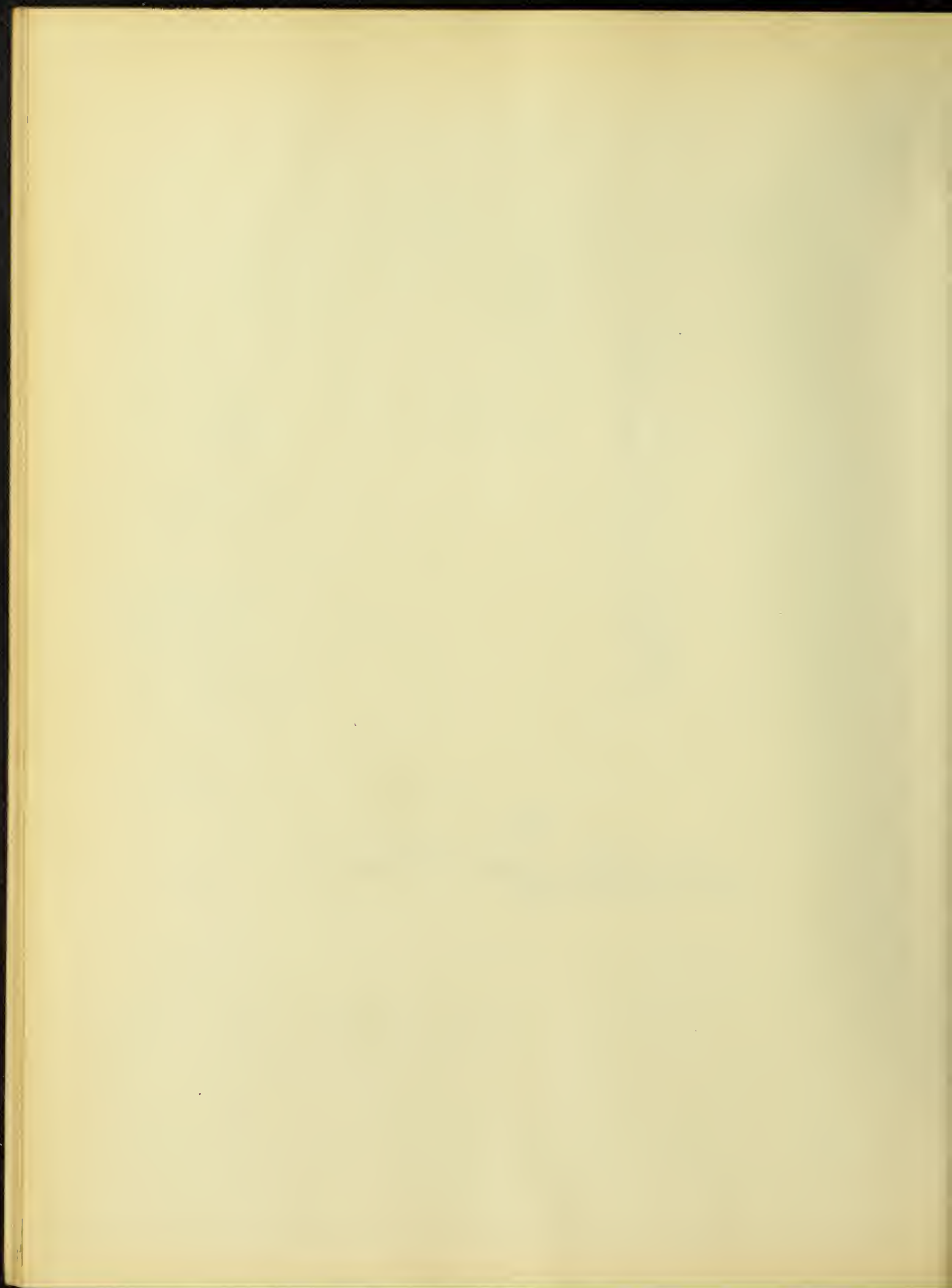


Fig. 1.

- *Damaeus nitens* C.L. Koch. Dorsal view, x 40.
(Photo by the author).



ing and discomfort~~ed~~ by burrowing into the skin. They are the young ✓
of the harvest mite-- a large, red mite found upon many plants.

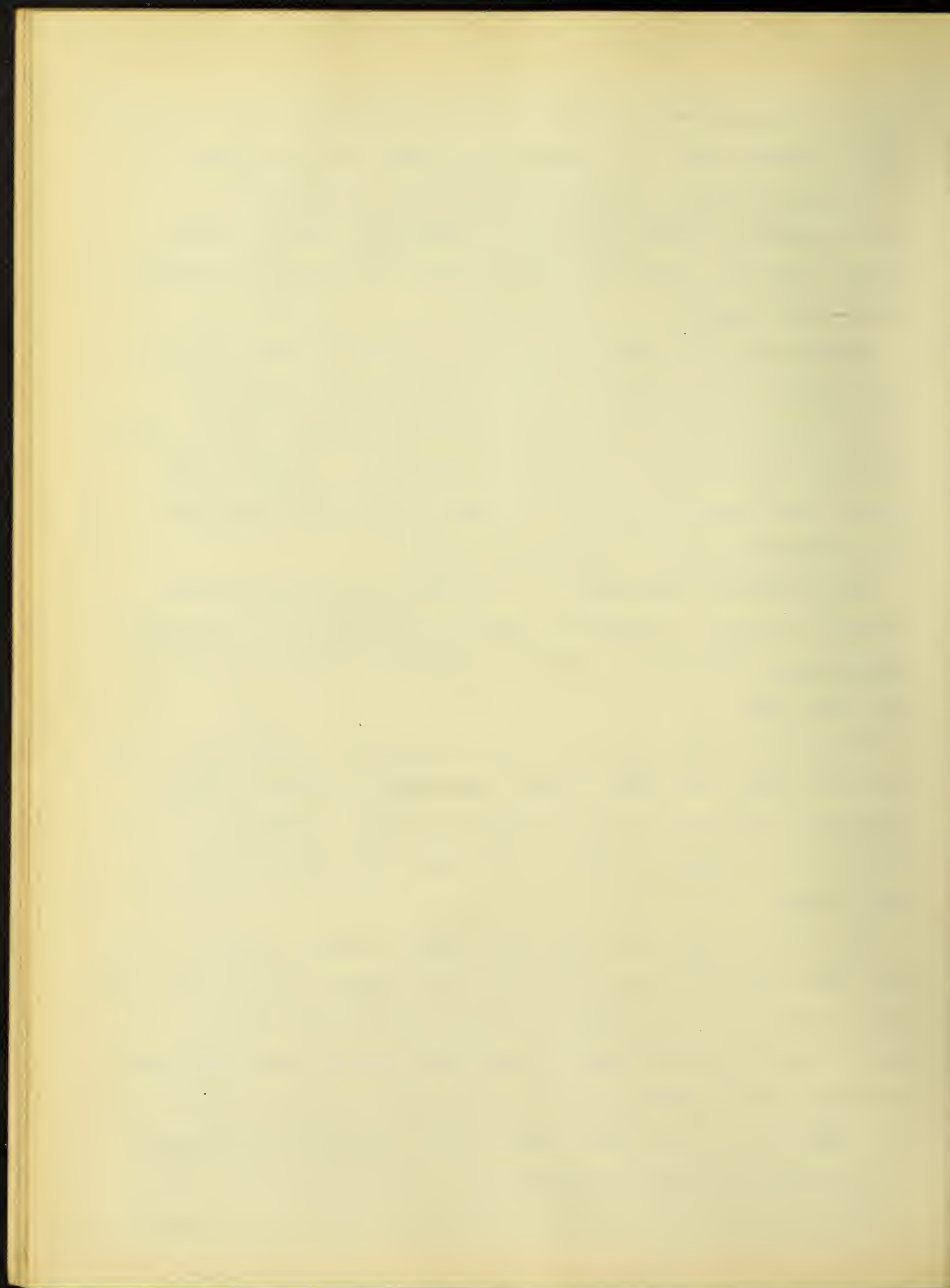
Nurserymen often find that the leaves of certain trees bear great numbers of small tubercles, or swellings, commonly called galls; these are often due to the presence of a minute four-legged mite— an eriophyid.

There are mites commonly called "red spiders," which are found running about upon flowers. They are well known to gardeners. It is true that these bright-colored species resemble spiders superficially in their habits and general appearance. Some of these mites, like the spiders, have the power of spinning threads and are consequently called "spinning-mites."

Physicians are acquainted with a disease of the skin termed "scabies," which is caused by a small mite belonging to the family Sarcoptidae; these mites produce an intense itching by burrowing into the skin.

Farmers and cattlemen often find that domestic animals have sores on their backs from which the hair comes off in places. Animals that are so affected are said to have the mange. Mange is due to a minute mite similar in habits to the itch mite, which attacks human beings.

The skin of swine sometimes shows numerous white tubercles which are due to a minute mite with a vermiform body and short, rudimentary legs. There is a mite similar to this species which lives in the skin of cattle, forming small, round swellings and thus lessening the value of the hides. But not all parasitic mites are injurious. The larva of one of our most common mites, Trombidium locustarium, is an important enemy of grasshoppers. The young of this species often collect in great numbers upon the wings and bodies of grass-

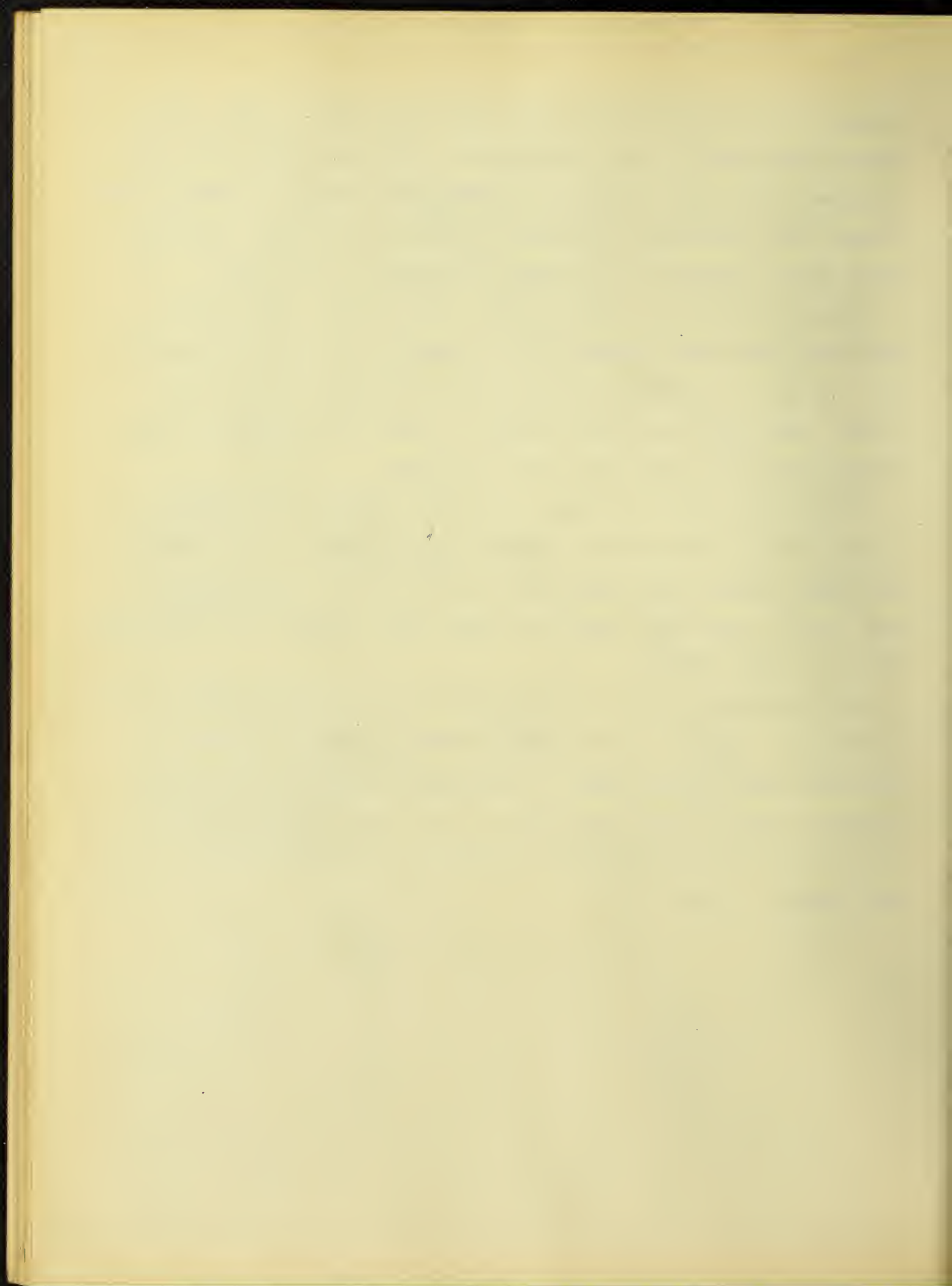


hoppers, and for that matter upon house flies also. I have even found them parasitic upon the mosquito. The young larva when once attached to the insect (usually a grasshopper) begins to feed and continues until its body is swollen to three or four times its former size, when it drops to the ground and changes to the adult.

Mites vary greatly in size, color, and habits. Many of the smaller forms cannot be seen with the naked eye, being between 0.1 and 0.2 mm. in length or even shorter. The largest mites, the ticks, may be half an inch in length. Some of the largest of the harvest mites are from 5 to 7 mm. in length.

Some of the mites are highly colored for example, the harvest mites and the "red spiders," but the Hydrachnidae or water mites have the brightest and most varied colors of any of the Acarina. The "beetle mites" are nearly all dark brown. Many of the mites are white or flesh colored.

The interesting habits of the mites will be taken up later on in this work. Many of the mites are predaceous, and are armed with powerful mandibles and palpi. The vegetable feeders are usually provided with piercing mouth parts. The forms which are parasitic are often provided with powerful claws for piercing the skin or for holding on to hairs.



A BRIEF HISTORY of the MORE IMPORTANT
LITERATURE RELATIVE to the ACARINA.

The study of the Acarina dates back to the time of Linnaeus. He treated the whole group as a single genus. De Geer* in 1778 was the first to make a classification of the order. G. Cuvier, in 1798 and Lamarck in 1801 both made a systematic study of the Acarina. Latreille, 1795 to 1829, did much towards the classification of the mites and made many of our present genera. About this time also Hermann did much to further the knowledge of these minute Arachnida.

C. von Heyden in 1828 made some revolutionary changes in the classification, few if any of which remain today.

Although all these writers did much towards stimulating an interest in the subject, yet the field was practically unexplored until in 1835-41, when C. L. Koch published his extended work† upon the crustaceans, the myriapods and arachnids of his country.

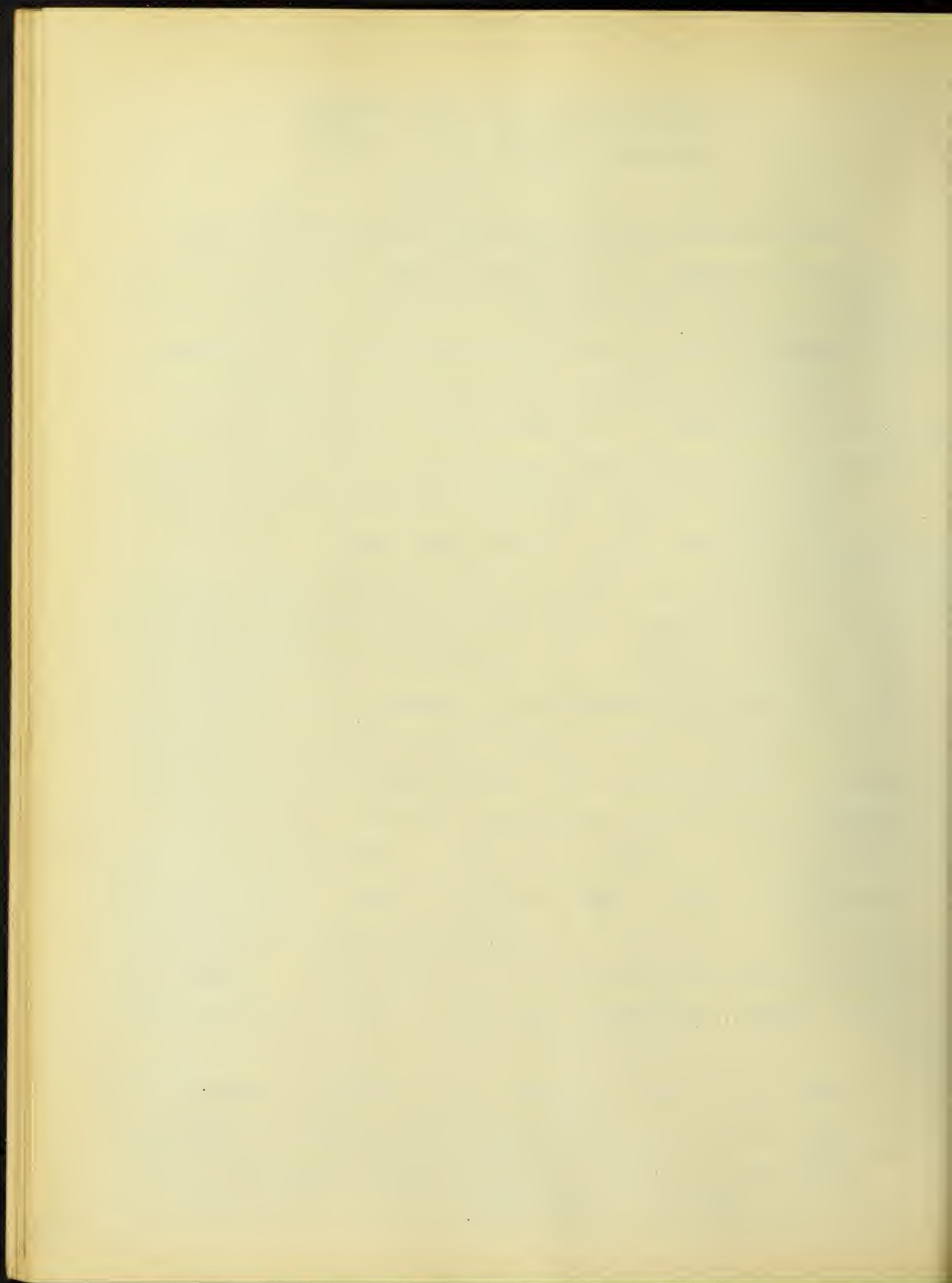
The work of C. L. Koch was and is yet one of the most extensive kind, but his collections were largely confined to a single neighborhood and he failed to distinguish the adult from the nymphal and larval forms and in some cases made two or three species out of the same nymph at different ages; although he gave no classification or descriptions of genera in his work, still it was for years the most extensive publication dealing with the entire order. At about this time A. Dugès‡, and several years later H. Nicolet§, did important

* Mémoires pour servir a l'hist.nat.des insectes, Stockholm, 1778.

† Deutschlands crustaceen, miriapoden und Arachniden. Regensburg, 1835-41.

‡ Recherches sur l'ordre des Acariens. Ann.Sci.Natur.(2), I, 1836.

§ Histoire Naturelle des Acariens qui se trouvent aux Environs de Paris. Archiv.du Museum, vol.7, 1855.



work. The latter author gave us an extensive knowledge of the internal anatomy of the "beetle mites."

M. H. Furstenberg* in 1861 published an important work on the itch mites.

P. Megnin made extensive studies of the habits and life histories of mites. In 1876 he published a monograph of the Gamasidae†. Megnin and A. D. Michael of England decided the long unsettled question as to the relation of the Hypopi mites to the Tyroglyphidae. They showed conclusively that the Hypopus is a normal and natural stage in the life history of the Tyroglyphus, for the purpose of migration.

Dr. L. Koch pursued an extended research upon the arctic fauna and in 1879 published an important work‡ in which he added many new species.

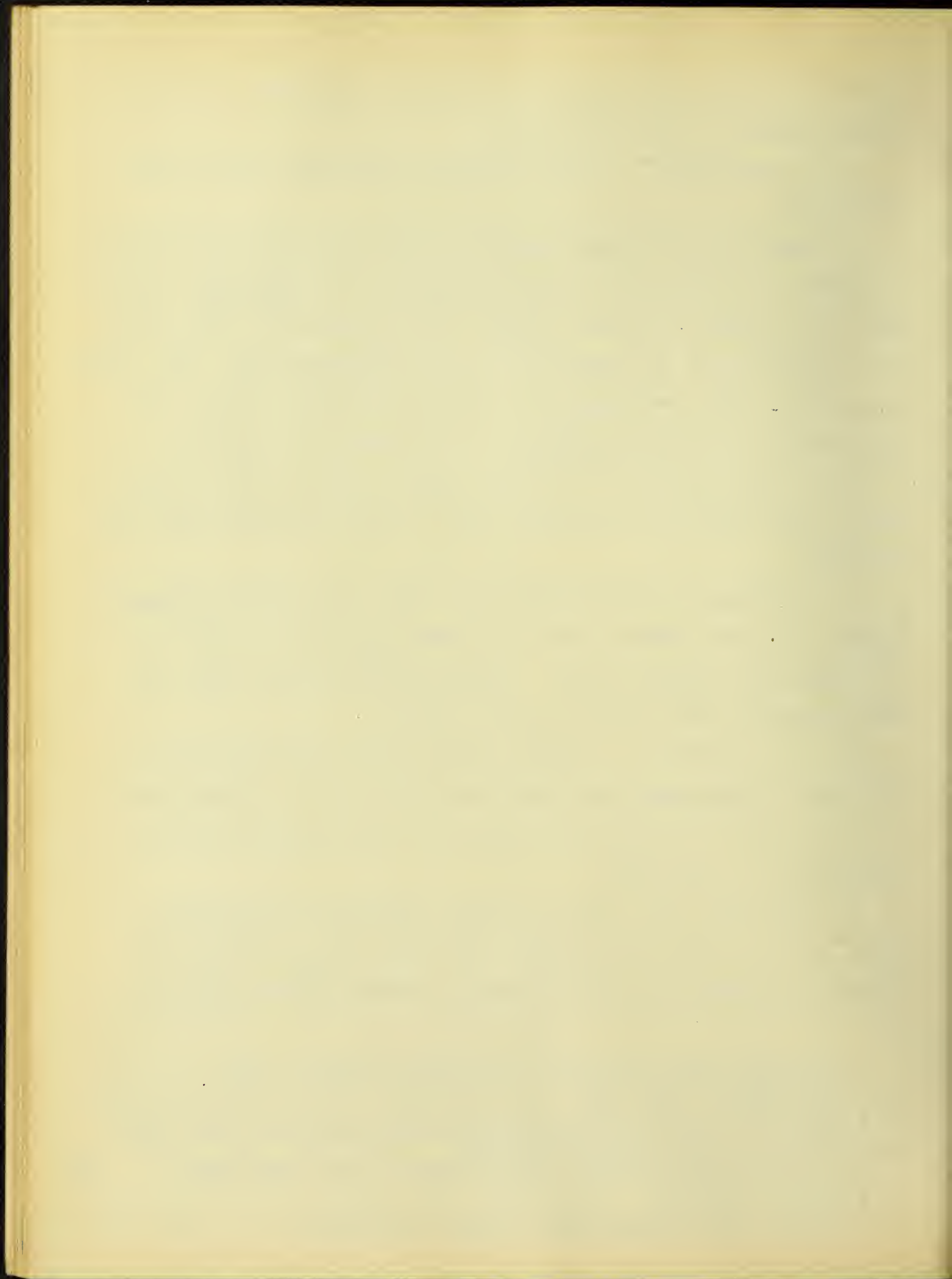
C. J. Neuman in 1880 published his work on the Swedish Hydrachnidae§. The work contains over one hundred pages and is well illustrated with colored plates. Ludwig Karpeller, about 1880, did much systematic work on the various families.

Mr. A. D. Michael|| in 1883-87 published his well known work on the English Oribatidae, and while the author does not assume that it is a monograph yet no where has this work been excelled in either completeness or exactness.

G. Canestrini has given us the most comprehensive systematic work** of any of the acarologists. His work, treating of all the families of land mites, was published in several parts, each part



*Die Kratzmilben der Menchen und Thiere. Leipzig, 1861.
† Monographie de la Famille des Gamasides, Jour.de Anat.et Physio. 1876, pp. 288-336, pls. 7-8.
‡ Arachniden aus Gibirien und Novaja Seneja. Rongl.Sven.Vet.-Akad. Handb., vol. 16, No.5, Stockholm, 1879.
§ Om Sveriges Hydrachnider, Kong Svenska Vet.- Akad.Handb., vol.17, No.3, 1880.
|| British Oribatidae. Roy.Society, vol.1 and 2.
**Prospetto dell' Acarofauna Italiana. 1885-1897.



dealing with a certain family or families. All the parts are well illustrated.

The Dutch Acarina have been worked up by Dr. A. C. Oudemans, who has published his works in several parts*.

Mr. A. Berlese has continued the work of Canestrini upon the Italian Acarina and has published many important works†.

In 1905 he published a monograph‡ of the genus Gamasus.

In 1898 Professor A. Nalepa gave an excellent review§ of the Eriophyidae. In the same year A. D. Michael reviewed the Oribatidae¶.

The water mites have been worked up by Dr. R. Piersig and Dr. H. Lohmann** who divide the two families of the group into sixty-seven genera.

I. Tragardh monographed*** the arctic Acarina in 1904.

In 1901 and 1903 Mr. Michael completed his work on the British Tyroglyphidae; it was published in two volumes.

Many other workers might be mentioned, but I will only give the names of a few and then pass to the history of the literature in America. Among some of the more prominent European acarologists might be mentioned; R. Moniez, A. L. Donnadieu, ~~A. Duges~~, E. Ehlers, P. Gervais, A. Murray, E. Nordenskiöld, C. Nörmer, E. Trouessart and others.

*List of Dutch Acari. Tijdsch. voor Entom., vols. 39-40, 1896-97; and supplements, vol. 43-45, 1900-02.

†Acari, Myriopoda et Scorpiones Nucusque in Italia reperta. Patovia 1880- .

‡ Monografia del Genere Gamasus Latr. Redia, vol. 3.

§ Das Tierreich. Lief. 4, Eriophyidae, 1898.

¶ Das Tierreich. Lief. 3, Oribatidae, 1898.

** Das Tierreich Lief. 13, Hydrachnidae und Halacaridae, 1901.

*** Monographie der arktischen Acariden. Inaugural-Dissertation, 1904.

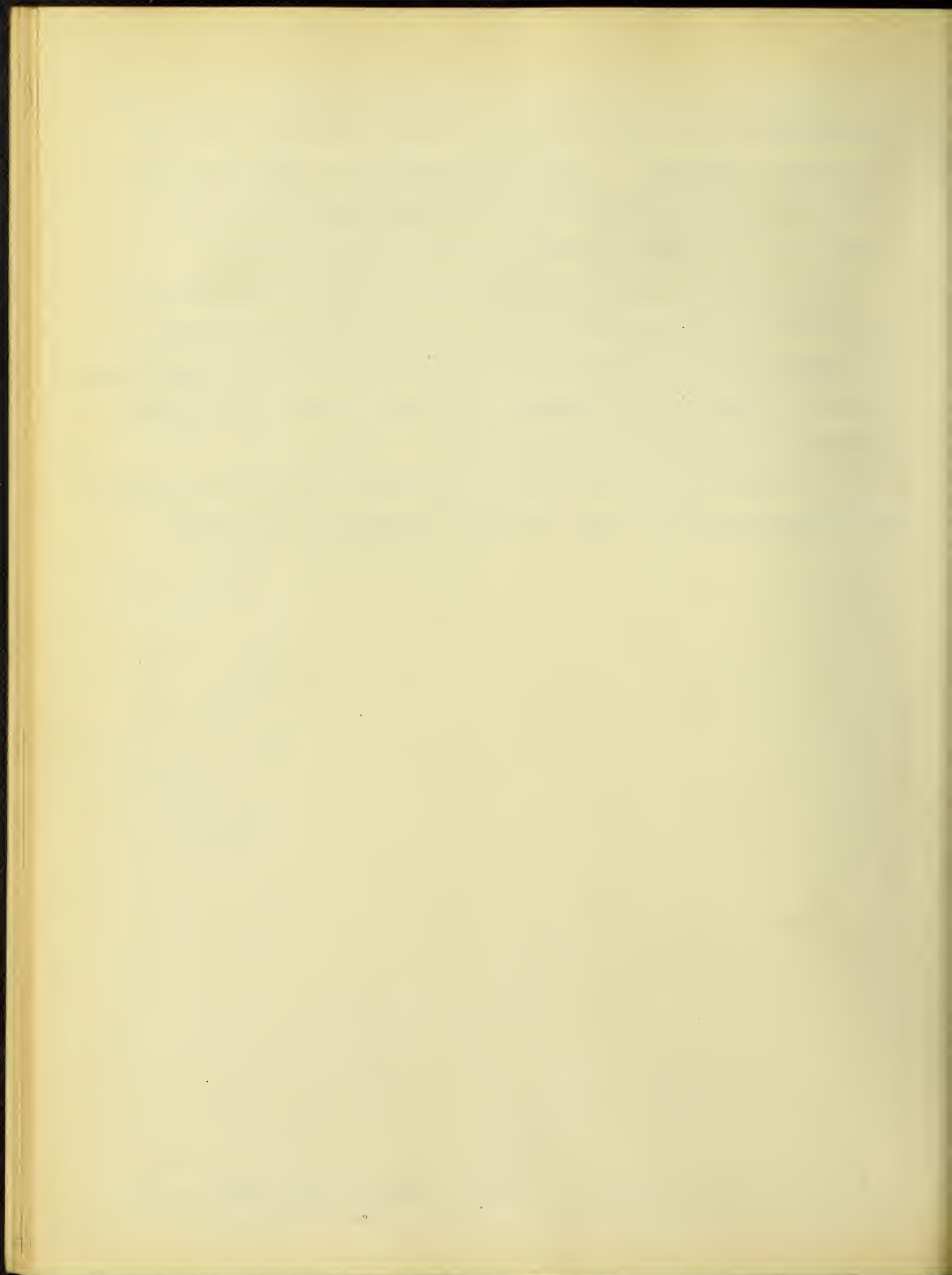


In America the history of the literature is brief. The species best known and about which there is the most literature are those of economic importance. Most of the literature relative to these species may be found in the reports and bulletins of the various states and of the United States Department of Agriculture.

The following persons have added much to the general literature of the order: Professor Wolcott, Dr. Koenike, and Miss Marshall in the Hydrachnidae; Dr. Haller and Professor Tyrrell in the Analgesidae; Professor Neumann in the Ixodidae; Professor Garman in the Eriophyidae and Mr. Banks in various families.

Mr. Banks has recently written a treatise on the mites* in which he gives an excellent classification of the genera of Acarina.

* A Treatise on the Acarina or Mites. Proc.U.S.Nat.Mus., vol.28, pp. 1-144.



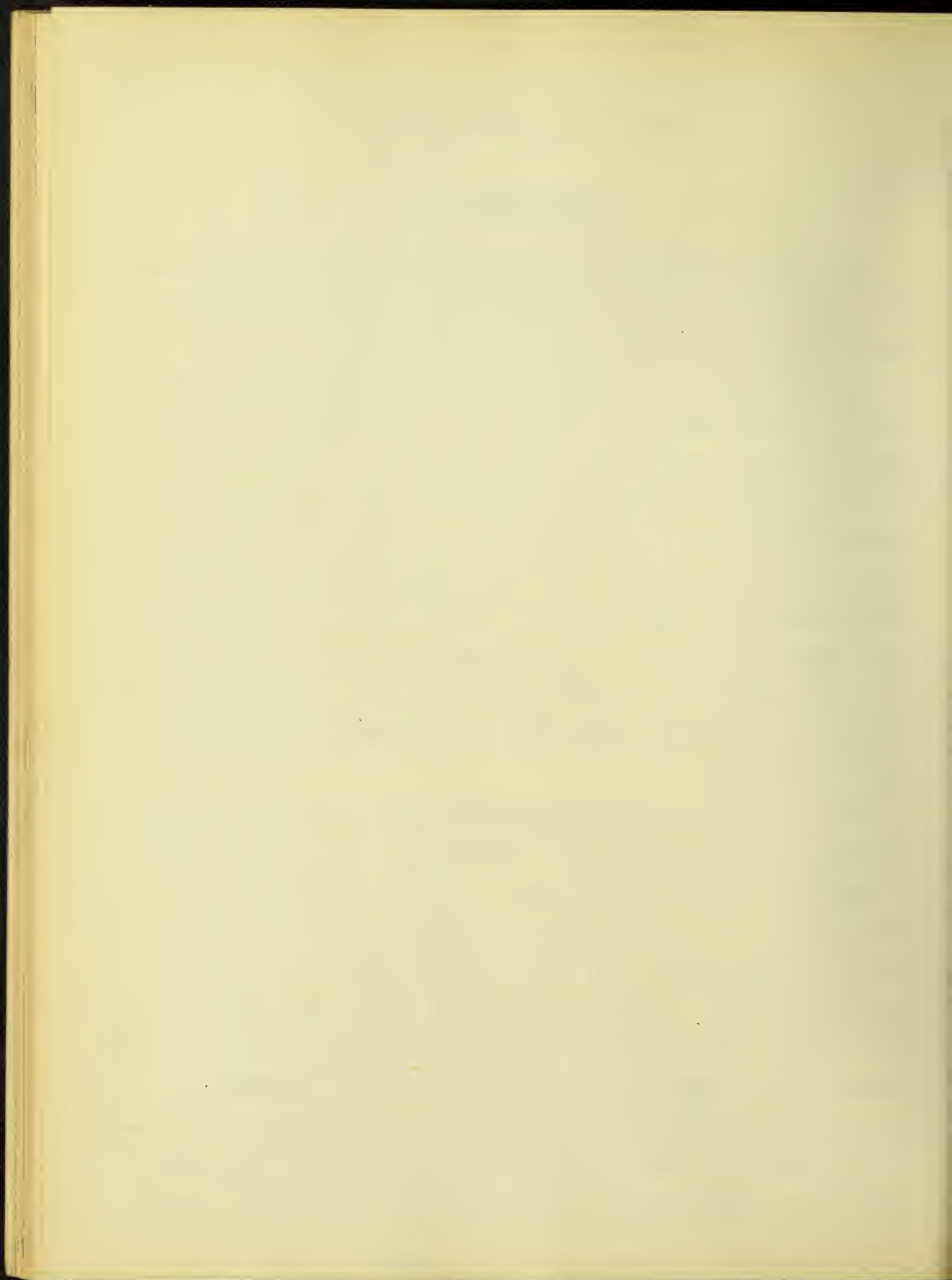
COLLECTING AND REARING MITES.

Collecting

The methods employed in collecting Acarina depend upon the kinds and habits of the mites, upon the quantity of specimens desired, and upon the purpose for which they are to be used.

Specimens which are intended for systematic work and are not desired in large quantities are best collected by means of a camel's hair brush and a small vial. The individual is transferred by means of the brush and is shaken off into a small vial. A one-fourth or one-half ounce vial will comfortably hold a score of individuals. The specimens may be kept alive in a vial for a day or even several days by placing a small green leaf in the vial and by not corking the same very tightly. In transferring mites with a brush, care should be taken not to introduce much dirt, for the specimens should be as clean as possible, especially when intended for mounting on microscope slides.

When I desire to keep specimens alive for some time in the laboratory in order to study their habits or in order to have plenty of new live material to work upon, I use the following methods. If the species live in moss, they may be shaken out over a white cloth. The mites thus shaken out with more or less dirt also, may now be placed in a small tin box or a paper bag, and a small quantity of moss added. More moss is now shaken over the white cloth and the shakings again placed in the box or bag with the other material. In this way a great number of Acarina may be kept in a small amount of dirt and moss. The boxes or bags are taken to the laboratory and the moss kept green by frequent watering. With only a little



attention mites may be kept alive for months in this manner.

If the mites live under bark some of the bark may be collected in bags and the rest shaken over a white cloth so as to collect the mites adhering to it. The mites thus obtained are placed in the bag with the few pieces of bark and are taken to the laboratory. In this condition the acarids will live for several days and if green bark is added often, they will live indefinitely.

For collecting mites in great quantities, I use a modification of the Berlese method. The material containing the ^aacarids is placed in a large funnel which is heated by means of a hot water jacket. The mites, driven out by the heat, fall into the funnel and are collected below. This "wholesale" method of collecting mites and other small arthropods is very serviceable when a large number of specimens are desired.

Rearing.

The rearing of mites in captivity is difficult. The two chief difficulties are: the keeping of the proper conditions of moisture and the supplying of the proper food.

For rearing purposes a small glass cell, placed upon a microscope slide, is the best, although small vials may be used for the larger forms. A cell can be made upon a microscope slide by cutting off small pieces of large glass tubing, from 2 to 5 mm. in length, and placing one of these short sections on end in the center of a microscope slide. In the cell thus made are placed the eggs or young to be studied and a suitable quantity of the right kind of food. The cell is covered with a large cover glass which may be held in place by a rubber band or a few small drops of glue.

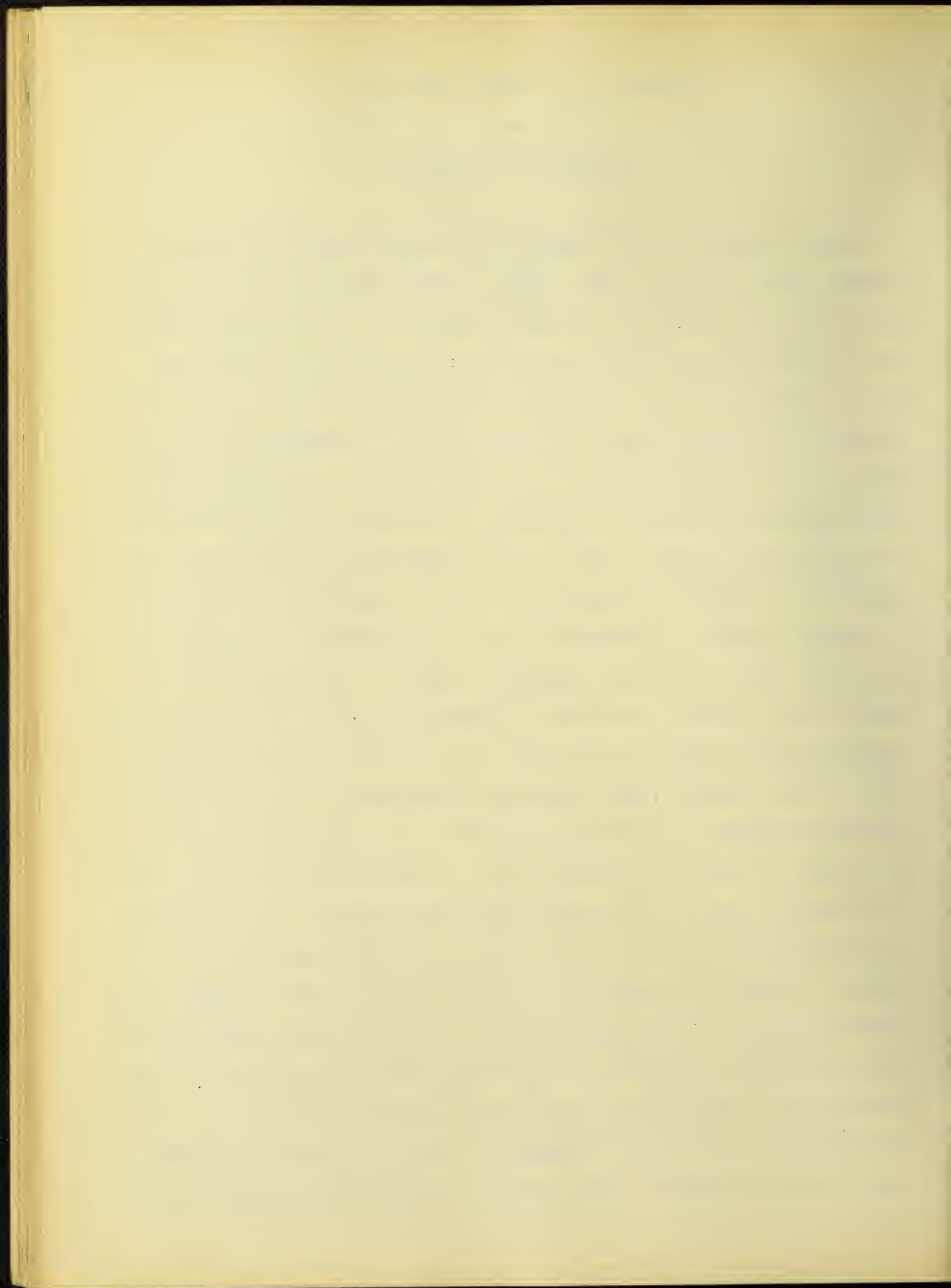
The advantage of having the cells onⁿ microscope slides is that the creatures may be easily studied with the compound microscope without opening up the cell and giving the mite a chance to escape.

When large forms are kept in small vials for studying the life histories, all the observations must be taken with a hand lens, unless the mite happens to be on the side of the vial, in which case the compound microscope can be used by placing the vial horizontally upon the stage of the microscope with the mite on the upper side.



METHODS of KILLING, MOUNTING,
and
PRESERVING SPECIMENS.

Several methods may be used with success in mounting and preserving mites, depending upon the size and character of the specimens. If it is desirable to mount specimens on microscope slides one of the following media may be used: Canada balsam, glycerine jelly, a mixture of glycerine and dilute acetic acid, or, better yet, a mixture of half and half glycerine jelly and commercial glacial acetic acid. Canada balsam is much the best for the larger forms with a heavily chitinized integument, and where it is not desirable to preserve the natural colors of the specimen; it has proved very successful in mounting Gamasidae, Ixodidae, and the adult Oribatidae. If balsam is used as a mounting medium for the soft, thin-skinned forms they soon become so transparent that it is very difficult to make out the smaller structures. Glycerine jelly is very serviceable in mounting the larger forms when it is desired to keep the original color of the creature, but unless the integument is rather thick, specimens mounted in glycerine jelly will shrivel up and the legs will contract and fold under the body. A mixture of glycerine and dilute acetic acid is a splendid preserving medium. By regulating the proportions of each a mixture may be obtained that will neither shrink or swell the tissues. It is too thin a liquid to make a good mounting medium for microscope slides. Last and most important of all is a mixture of about equal parts of glycerine jelly and glacial acetic acid. This mixture when kept in a corked bottle is a rather thick liquid, but when left exposed to the air it sets in a similar way to that of glycerine jelly when it cools from a melted condition.



I find that with this mixture the most delicate and transparent creatures may be successfully mounted without danger of shrinking or of becoming so transparent that the finer outlines are obscured. It is an excellent medium for such soft forms as the Sarcoptidae, Tyroglyphidae, Demodicidae, and the young of many of the larger, harder forms.

If specimens are intended to be mounted in Canada balsam, they may first be killed in hot alcohol, or in hot water, either causes the appendages to become extended. The next process is dehydration, and it is very important that all the water is out of the tissues before they are placed in a clearing agent. If specimens are killed in water, they may be placed in 70 per cent. alcohol and left for two or three hours and then placed in absolute alcohol for at least three or four hours. Specimens killed in commercial alcohol are at once placed in absolute alcohol.

If the specimens have not been well dehydrated, when they are placed in the clearing agent the legs will often fold in under the body and necessitate the remounting of the specimen. This is because clearing agents like xylol, oil of cloves, oil of bergamot, etc are not miscible with water and the presence of only a small quantity causes a distortion of the muscles of the legs and the consequent flexing of the same. The specimens are now taken from the absolute alcohol and placed in the clearing solution, preferably oil of bergamot, for two to six hours. While they are in the clearing reagent if any of the legs need straightening out, they may be straightened by means of a camel's hair brush. I prefer placing the specimen back downwards on a glass slide under a dissecting microscope and by adding a very slight amount of balsam, stick the legs into the position desired. A little oil of bergamot must be



added occasionally to keep the specimen from becoming dry. After all the legs have been extended in "spread eagle" fashion, the mite may be either mounted directly in balsam or returned to the oil of bergamot to be mounted later. If it is to be mounted at once, a drop of balsam is now placed in the center of the slide and the specimen with about a drop of the clearing reagent adhering to it is transferred with a camel's hair brush to the balsam on the slide, and a small cover glass is lowered upon the balsam and centered.

Specimens intended for glycerine jelly mounts are killed in either hot alcohol, dilute acetic acid or hot water; or if it is convenient, the live specimen may be placed directly into a drop or more of glycerine jelly on the microscope slide, and the cover glass added at once. The weight of the cover glass and the struggles of the mite will often cause the legs to become extended in fine shape.

If the specimens have been killed in any of the former mentioned reagents they are next placed in glycerine from which they are soon taken and placed on the middle of the slide. About a drop of glycerine usually adheres to the specimen during this process, which has the advantage of avoiding the introduction of air bubbles when the warm, melted glycerine jelly is added. Usually it is best to let the glycerine jelly set before placing the cover glass; while it is setting the specimen may be kept in the desired position by the use of a small bristle or by means of a camel's hair brush. After the glycerine jelly has set and fixed the creature in the desired position the cover glass is warmed very gently— just enough to melt the upper part of the jelly— and then it is placed in position. Of course it is necessary toring glycerine jelly mounts with some suitable substance as zinc, cement, asphalt, etc.

Where soft specimens like the Tyroglyphidae or Tarsonemidae are



to be mounted, glycerine jelly will not do as a medium, for it will nearly invariably cause the shrinkage and distortion of the mites. A mixture of glycerine and dilute acetic acid may be used. This mixture is a rather thin liquid and is most serviceable when concave or sunken slides are used, because when the mixture is placed in the sunken part of the slide it does not flow about too much. Specimens are killed in the same way for mounting in the mixture of glycerine and dilute acetic as for mounting in glycerine jelly.

Of the various mounting media with which I have experimented by far the best for the small, delicate forms is the mixture of about equal parts of glycerine jelly and glacial acetic acid. Specimens may be killed in dilute acetic acid, or in ninety-five per cent. alcohol and at once placed in the glycerine jelly acetic mixture on the microscope slide. After the cover glass has been placed, the slides must be set aside for about three or four hours; by this time the glycerine jelly will have set around the edges of the cover glass and is firm enough to be ringed with zinc cement or some other suitable substance.

Besides microscopical mounts it is desirable to have specimens unmounted. Specimens in bottles may be preserved in any of the common preserving fluids. Dilute acetic acid, (10 per cent. glacial acetic) makes a good preservative, preserving the tissues well and not changing the natural colors. A mixture of acetic acid and glycerine is excellent; the addition of the glycerine both prevents too great swelling of the tissues and also clears up the tissue so as to enable one to make out the structures very clearly.

Dry mounts, such as are generally made of insects, are sometimes serviceable.



THE CLASSIFICATION
of the
HIGHER GROUPS OF ACARINA.

The group to which the mites belong is now considered by most authors to be an order, although several writers in the past have maintained that the group should be regarded as a class. Of recent years there has been much advance in the classification of the Acarina, due largely to our more thorough knowledge of the internal anatomy and the life histories of the various smaller natural groups into which the order seems to fall. It has only been in the last fifty years that a very satisfactory classification of the higher groups would have been possible. A classification based upon such works as C. L. Koch's "Deutschlands Crustaceen, Miriapoden und Arachniden" would be greatly in error, for in the days of that great acarologist practically nothing was known of either the internal anatomy, the physiology or the life histories of the acarids and indeed even little about the habits of these interesting creatures.

The first attempt at a classification of the Acarina was made by De Geer in 1778, who arranged them into seven divisions. As a basis for his classification he seems to have considered their habits exclusively. He divided them into the following subgroups:

- Mites found in provisions.
- Mites which attack men and quadrupeds.
- Mites which live on birds.
- Mites which live on other insects.
- Mites found on trees and vegetables.
- Wandering mites.
- Aquatic mites.

In 1806 Latreille gave an important classification of the genera



of Acarina, but unfortunately he often considered the larva as adults. His classification was a great advance over that of De Geer, for he took into account the morphology as well as the habits of the creatures.

C. von Heyden in 1828 divided the mites into three groups which he called Legions and these again into smaller groups called Phalanges. His classification was based upon morphology.

M. H. Nicolet in 1855 divided the whole group into two main divisions: the Terrestrial mites and the Water mites; today this division is commonly accepted, and indeed acarologists find themselves separated into two almost distinct schools, those who study the land mites and those who study the water mites, and seldom do their fields of labor overlap.

Owing to a greater advance in knowledge of the internal anatomy, Dr. P. Kramer, in 1877, gave a very interesting and indeed valuable classification of the Mites using the variations or the absence of the tracheal system as his chief criterion.

Extending this scheme somewhat and using the variations of the openings of the tracheae, Professor Canestrini[#] in 1899 gave us the following important classification.

I. ASTIGMATA.

1. VERMIFORMIA.

a. Phytoptidae.

2. SARCOPTINA.

a. Canestrinidae.

b. Tyroglyphidae.

II. HYDRACARINA.

Prospetto Dell' Acarofauna Italiana Padova. Part VIII. 1899.



III. PROSTIGMATA.

1. TROMBIDINA.

- a. Tarsonemidae.
- b. Cheyletidae.
- c. Erythraeidae.
- d. Tetranychidae.
- e. Raphignatidae.
- f. Eupodidae.
- g. Bdellidae.
- h. Alychidae.
- i. Rhyncholophidae.
- j. Trombididae.

IV. CRYPTOSTIGMATA.

- a. Oribatidae.
- b. Nothridae.

V. METASTIGMATA.

- a. Ixodidae.

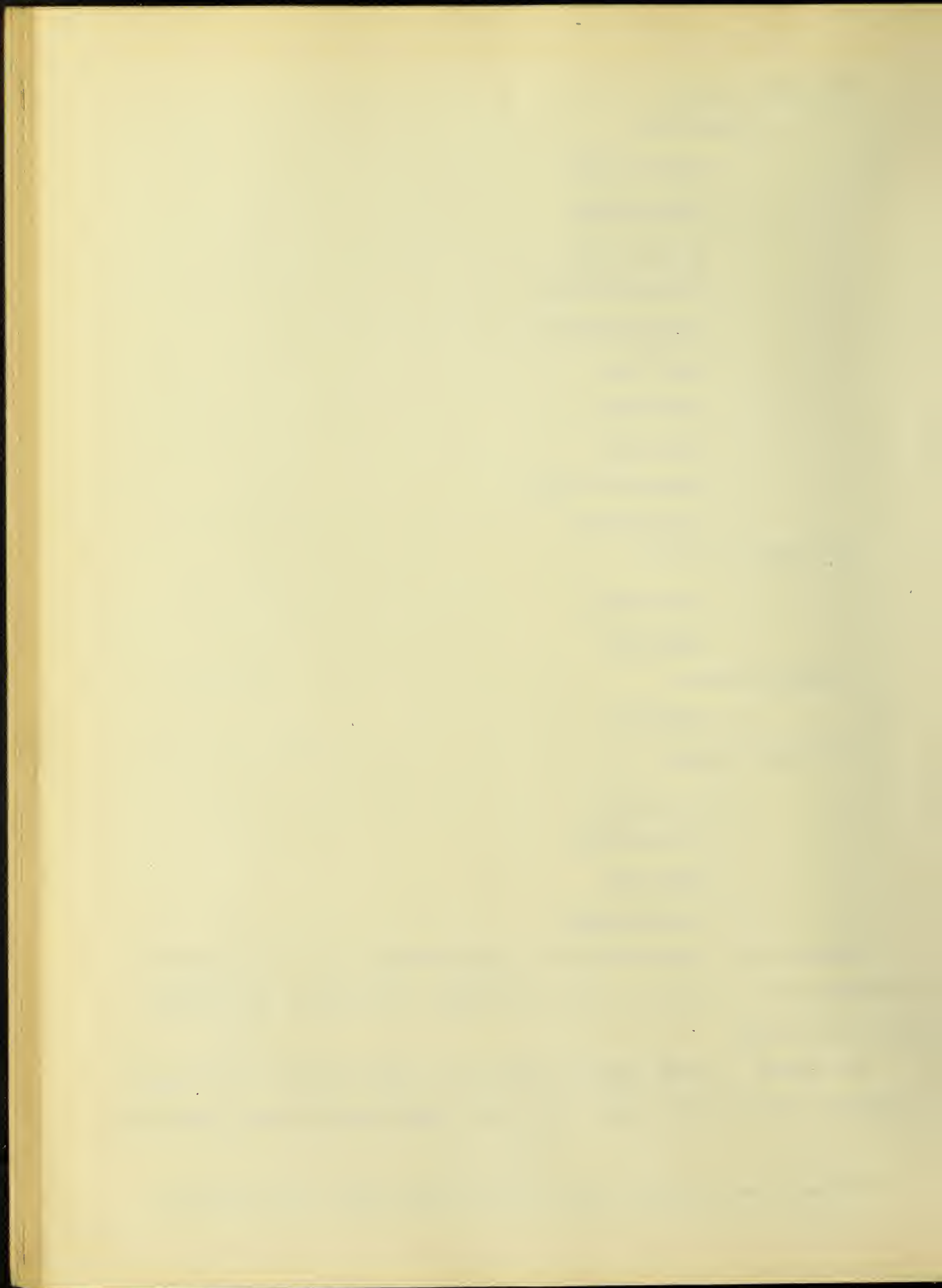
VI. MESOSTIGMATA.

- a. Uropodidae.
- b. Laelaptidae.
- c. Gamasidae.
- d. Dermanyssidae.

Canestrini's classification is undoubtedly one of the best of the modern writers and it forms the basis for much of our systematic work today.

Mr. Banks[#] in 1904 gave an excellent classification of the Acarina; he divides the order into eight superfamilies and these again

 # The Acarina or Mites. Proc. U.S.Nat.Mus., vol. 28, pp.1-114.

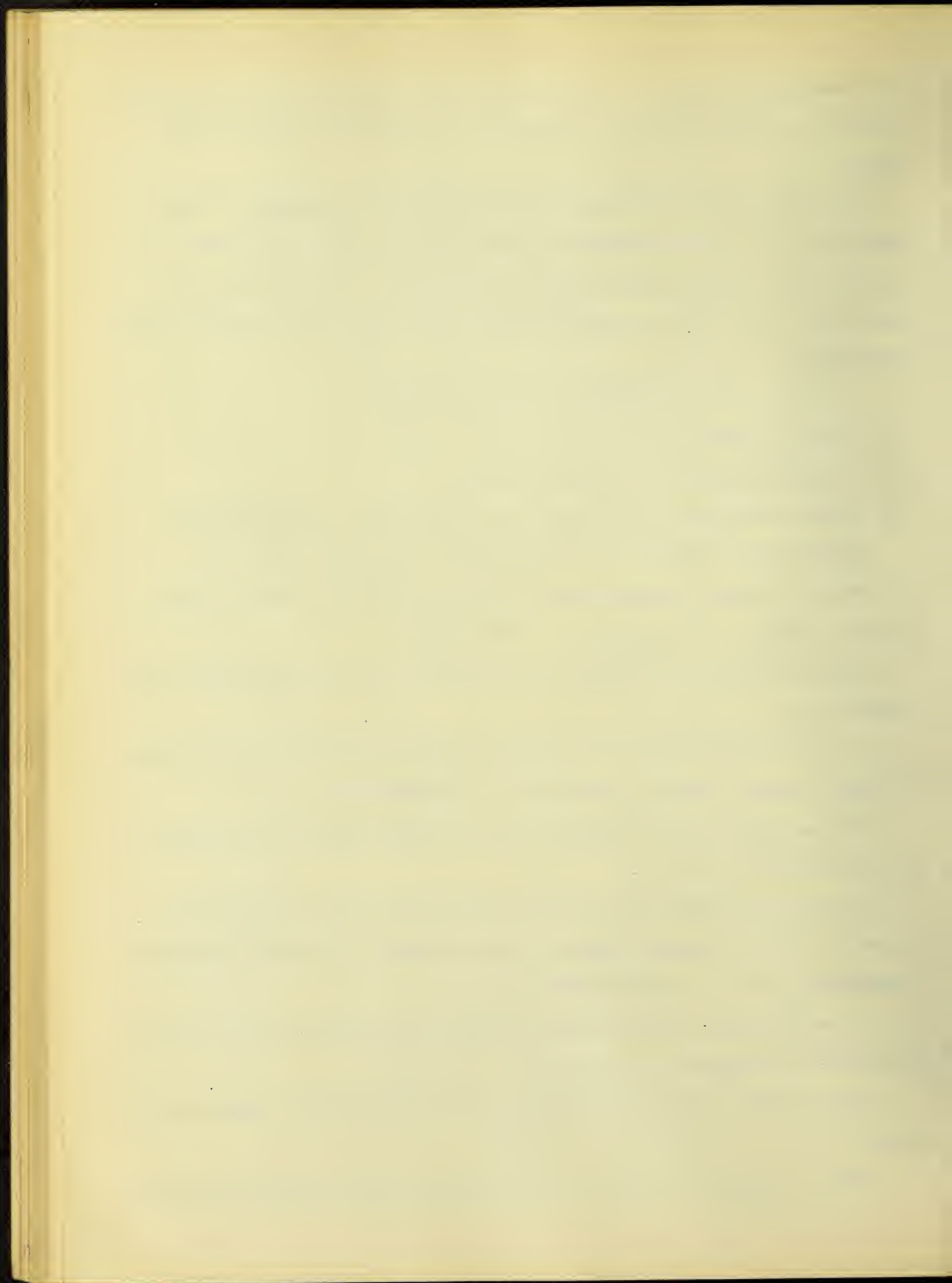


into twenty-six families. He has based his classification upon both biological and morphological characters, giving each about equal weight.

In giving the following classification of the Acarina, I have endeavored to be very conservative and also to give full weight to both biological and morphological characters. I have divided the order first into ten superfamilies and these again into twenty-seven families.

SUPERFAMILIES OF ACARINA.

1. Living on land----- 2.
Living in water ---- HYDRACHNOIDEA.
2. Abdomen annulate; often with but four legs--- DEMOD^ECOIDEA.
Abdomen not annulate; adults always with eight legs--- 3.
3. With a large, dentate hypostome; skin leathery; large forms, usually parasitic on mammals----- IXODOIDEA.
Hypostome small or absent; skin either soft or chitinized, not leathery---4.
4. A distinct spiracle on a lateral stigmal plate above the third or fourth coxae; usually parasitic----- GAMASOIDEA.
Without any distinct spiracle on a stigmal plate in this part of the body----- 5.
5. With specialized seta arising from a pore near each postero-lateral corner of cephalothorax; adults usually with hard chitinous integument----- ORIBATOIDEA.
No specialized seta on cephalothorax; integument soft or only chitinized in places ----- 6.
6. Palpi small, of three segments; body entire; adult forms often parasitic ----- 7.
Palpi composed of four or five segments; body usually divided



into cephalothorax and abdomen; adults rarely parasitic---- 8.

7. With tracheae; females possessing a prominent clavate organ between legs I and II; small forms.----- TARSONEMOIDEA.

Without tracheae; females without clavate organ between legs I and II; forms usually larger ----- SARCOPTOIDEA.

8. Palpi very large and either geniculate or ending in powerful claws for grasping prey; cephalothorax large; body with few hairs----- CHEYLETOIDEA.

Palpi usually smaller, never geniculate or fitted for grasping prey, usually bearing a free "thumb" near the distal end; cephalothorax usually smaller; body generally well clothed with hairs---9.

9. Coxae contiguous; arranged in radiate fashion --- ERYTHRAEOIDEA.

Coxae arranged in two groups, not radiate ---- TROMBIDOIDEA.

It may appear to some acarologists that the raising of the family of Tarsonemidae to a superfamily is unjustified; but considering the fact that they possess tracheae whereas the forms which are often closely associated with them (Sarcoptidae, Tyroglyphidae, etc.) do not possess tracheae; and also that they have such an amazing method of reproduction, make it, I think, fully justified.

I have chosen to associate the Cheyletidae with the Bdellidae for the following reasons. Both the Bdellidae and Cheyletidae are predaceous in their habits. The strong palpal claws of the Cheyletidae may be considered as comparable to the similar palpal claws found in the genera Scirus and Eupalus; furthermore in both these genera the mandibles end in a claw, which is a characteristic of the Cheyletidae.

Mr. Banks in his classification placed all those forms which have a distinct "thumb" to the palpus into one superfamily called Trombidoidea; I have divided this group into two groups based upon



the arrangement of the coxae.

I give the following as a classification of the families of the Acarina.

SYNOPSIS of FAMILIES.

DEMOD^E~~Z~~COIDEA.

With eight short legs, of three segments each ----- DEMOD^ECIDAE.

With four legs, of five segments each ----- ERIOPHYIDAE.

IDODOIDEA.

Scutum present and sometimes ventral shields ---- - IXODIDAE.

Scutum absent and no ventral shield present ----- ARGASIDAE.

GAMASOIDEA.

1. First pair of legs inserted within same opening as the mouth parts; dorsum of body extending forwards and hiding the mouth parts from above----- UROPODIDAE.

First pair of legs inserted at one side of mouth opening; no projecting of dorsum beyond the camerostome -----2.

2. Parasitic on vertebrates; mandibles fitted for piercing -----
DERMANYSSIDAE.

Rarely parasitic on vertebrates; mandibles usually chelate---
GAMASIDAE.

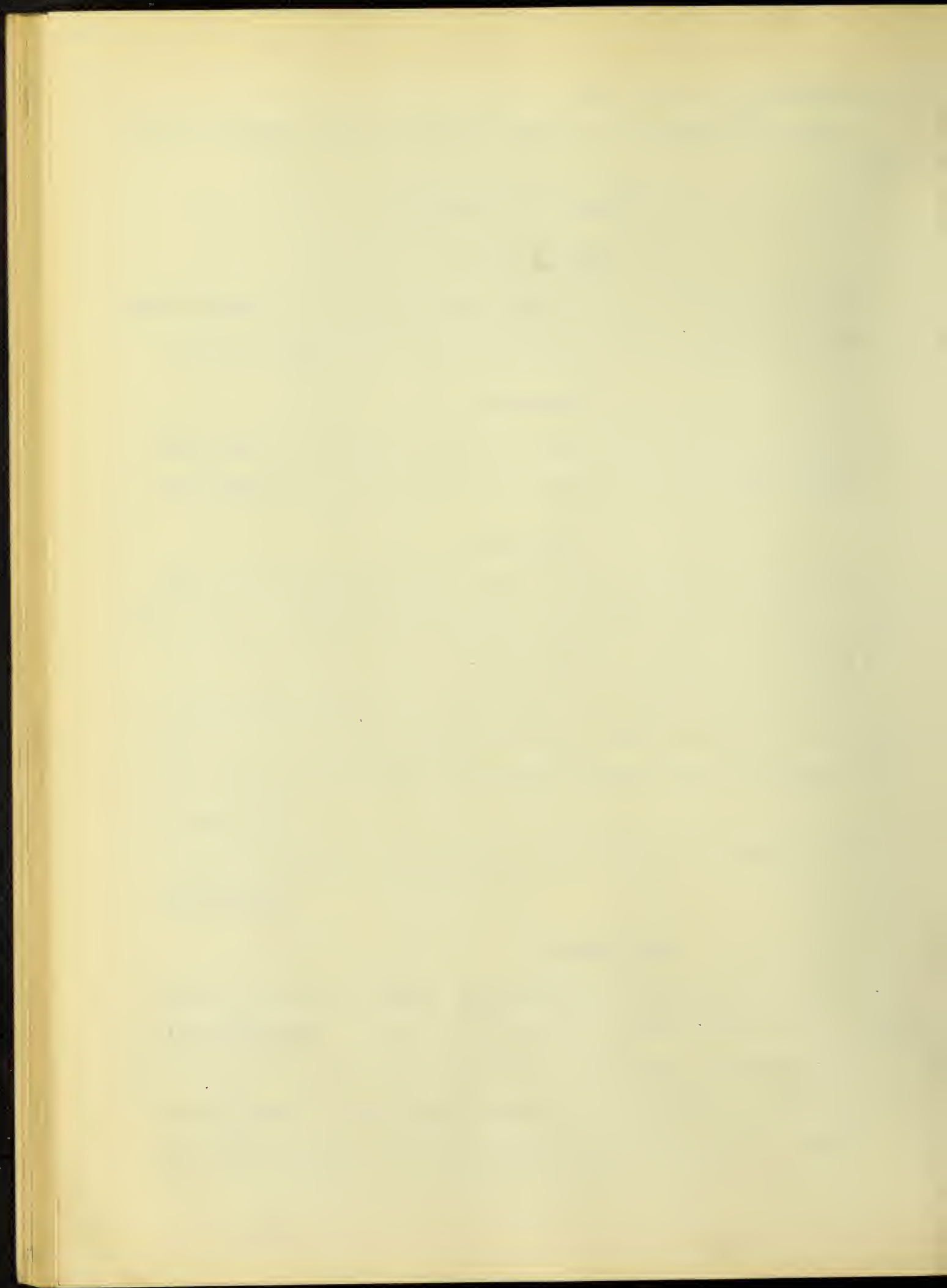
ORIBATOIDEA.

1. Cephalothorax hinged to abdomen and capable of being folded down on the ventral surface of the same ----- HOPLODERMIDAE.

Cephalothorax anchylosed to abdomen ----- 2.

2. Abdomen with chitinous wing-like expansions ---- ORIBATIDAE.

Abdomen without wing-like expansions ----- NOTHRIDAE.



TARSONEMOIDEA.

Hind legs of female ending in long hairs -----TARSONEMIDAE.

Hind legs of female ending in claw and caruncle -----
PEDICULOIDIDAE.

SARCOPTOIDEA.

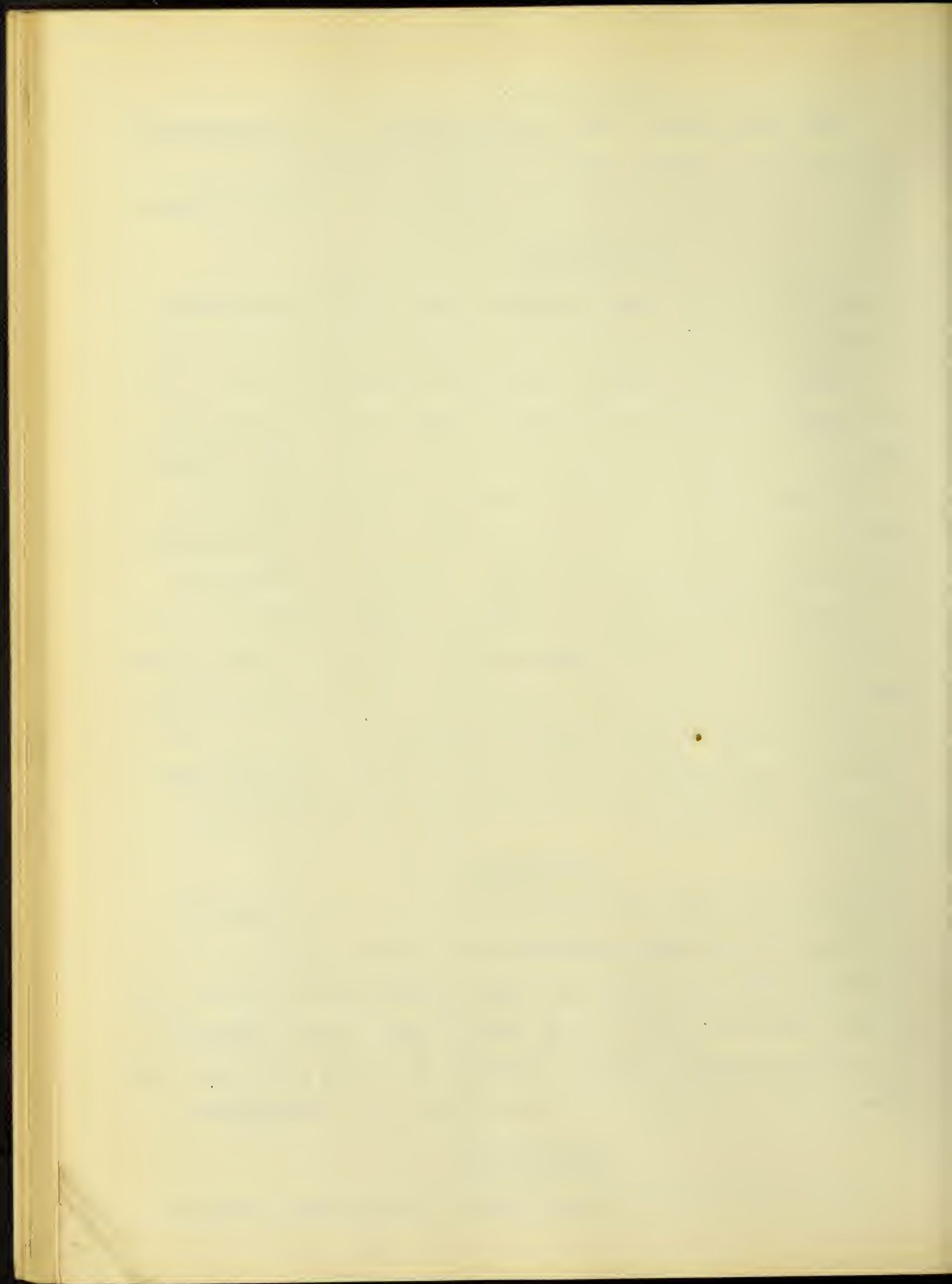
1. Genital suckers usually present; skin without fine parallel lines ----- 2.
Genital suckers absent; skin with fine parallel lines ---- 3.
2. Clavate hair present on tarsi of legs I and II; seldom parasitic ----- TYROGLYPHIDAE.
No clavate hair on tarsi of legs I and II; parasitic on insects -----CANESTRINIDAE.
3. Living on the feathers of birds ----- ANALGESIDAE.
Found in living tissue or clinging to hairs of mammals ----4.
4. With specially adapted apparatus for clinging to hairs of mammals -----LISTROPHORIDAE.
Without such specially adapted apparatus -----5.
5. Vulva longitudinal ----- CYTOLEICHIDAE.
Vulva transverse -----SARCOPTIDAE.

CHEYLETOIDEA.

1. Palpi geniculate; mandibles chelate ----- BDELLIDAE.
Palpi not geniculate; mandibles not chelate ----- 2.
2. Palpi small and ending in a claw; cephalothorax with four long bristles above, one pair in front and one pair behind---EUPALIDAE.
Palpi enormously enlarged, with several claws, and a small papilla ----- CHEYLETIDAE.

ERYTHRAEOIDEA.

Legs I and II with processes bearing large spines; integument



with several shields ----- CAECULIDAE.

Legs I and II without processes or spines; integument without shields ----- ERYTHRAEIDAE.

TROMBIDOIDEA.

1. Last segment of palpus never forming a thumb to the preceding segment ----- EUPODIDAE.

Last segment of palpus forming a distinct thumb to the preceding segment ----- 2.

2. Mandibles chelate (for biting) ----- TROMBIDIDAE.

Mandibles styliform -----3.

3. Body clothed with many fine hairs; tarsi usually swollen; a dorsal groove usually present ----- RHYNCHOLOPHIDAE.

Body with fewer long hairs; tarsi never swollen; no dorsal groove ----- TETRANYCHIDAE.

HYDRACHNOIDEA.

Mouth parts situated upon a distinct beak; marine forms ----- HALACARIDAE.

Mouth parts not situated upon a beak; generally found in fresh water ----- HYDRACHNIDAE.

The grouping of the first four families as given here is generally accepted at present. I have followed Banks' classification of the Gamasoidea, as I believe it cannot be improved upon with our present knowledge of the subject.

The superfamily Oribatoidea, I make equal to the old family of Oribatidae as described by Michael[#] and this superfamily I have divided into three families following both Mr. Banks' and Canestrini's

Das Tierreich, Lief. 3, 1898.



divisions. Mr. Banks divided the "beetle mites" (Oribatidae) into two families because of the difference in the way in which the cephalothorax joined the abdomen. Canestrini divided his Cryptostigmata (the Oribatidae of Michael and others) into two families, using as a basis for such a division the fact that some of the individuals had wing-like expansions to the abdomen and others did not have such expansions. Michael# recognized this division in his first works on this group and called those forms which possessed the abdominal wings the Pterogasterinae and those which did not, the Apterogasterinae. Later in 1898 he divided the latter subfamily into six subfamilies which division undoubtedly had much ground for justification because of the adding of many new genera to the group with very marked structural peculiarities.

Undoubtedly the fact that the Hoplodermidae (of this paper and other writers) have the cephalothorax movably attached to the abdomen, together with such other points as their compressed instead of depressed body; enormous instead of reduced mouth parts; imperfectly instead of well chitinized integument, would at once separate them from all other members of this group.

As regards the two divisions I have made of the forms which have the cephalothorax anchylosed to the abdomen, I realize that there is some objection due largely to the fact that some of the species of the genus Notaspis Herm. have the anterior corners of the abdomen slightly projecting, which projection some authors might make homologous to the true pteromorphae or wings.

British Oribatidae, vol. 1, p.64.



I believe that a further division of the Nothridae (of this paper) might be made with propriety; by separating those forms (the gen. Hypochthonius C.L.Koch) which have a transverse suture to the abdomen, and more important yet the cuticle very little chitinized, from the rest of the family; however, I have hesitated to do so in this paper.

By making a superfamily out of the old family Tarsonemidae, it appeared to me as legitimate to raise the two subfamilies Tarsone-minae and Pediculoidinae of some authors to the rank of families.

The divisions of the superfamily Sarcoptoidea have been left as given by Banks.

The reasons for creating the superfamily Cheyletoidea have been given (page). I have divided the Bdellidae of most authors into two families, the division being based upon a fundamental structural difference of the palpi; all the Bdellidae of this paper having geniculate palpi, not fitted for grasping prey; the Eupalidae not having geniculate palpi, but having palpi armed with strong claws for catching prey.

The association of the Eupodidae with the Tetranychidae and Trombididae is not entirely satisfactory to myself, but being unable to improve upon it I will let it stand. The division of the water-mites into the families Halacaridae and Hydrachnidae is now commonly accepted.

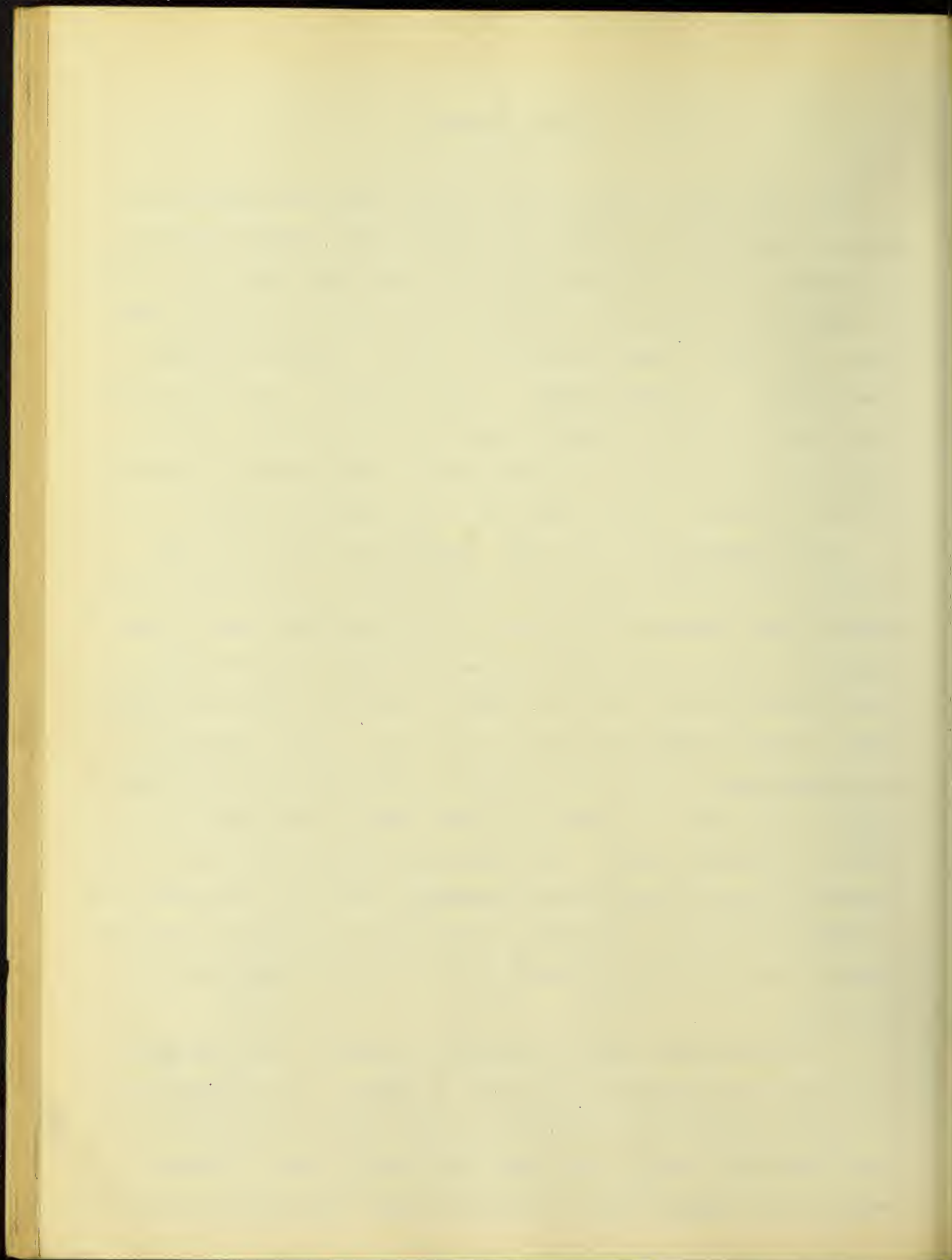


LIFE HISTORIES.

The life histories vary greatly in the different groups of Acarina. In most cases the offspring come from eggs, usually layed by the female, but in some cases they hatch inside the body of the mother. The larva after undergoing one or more molts usually reach the adult state, yet there are some exceptions to this. Beginning with the lowest forms, as the Eriophyidae, a short account of the life histories of some of the more important families will be given. In most cases the accounts given are based upon the observations of the writer, in a few cases they are based upon the studies of others.

The Eriophyidae are very small ^Aacarina, with only four legs, and for this and other reasons were regarded for a long while as immature forms. Dujardin in 1851 decided that they were mature forms because he found associated with them in the galls in which they lived objects which he took to be eggs. Dujardin's conclusions have been confirmed by many subsequent workers and the life history of the Eriophyidae is well known at present. The eggs of the Eriophyidae are laid upon the leaves of plants, and are large eggs to be laid by such small acarids. Upon hatching, the eggs give rise to the larvae which are without tarsal appendages. The larva then molts into a nymph which has the appendages to the tarsi and resembles the adult forms. The adult form is reached after four molts, beginning with the larva.

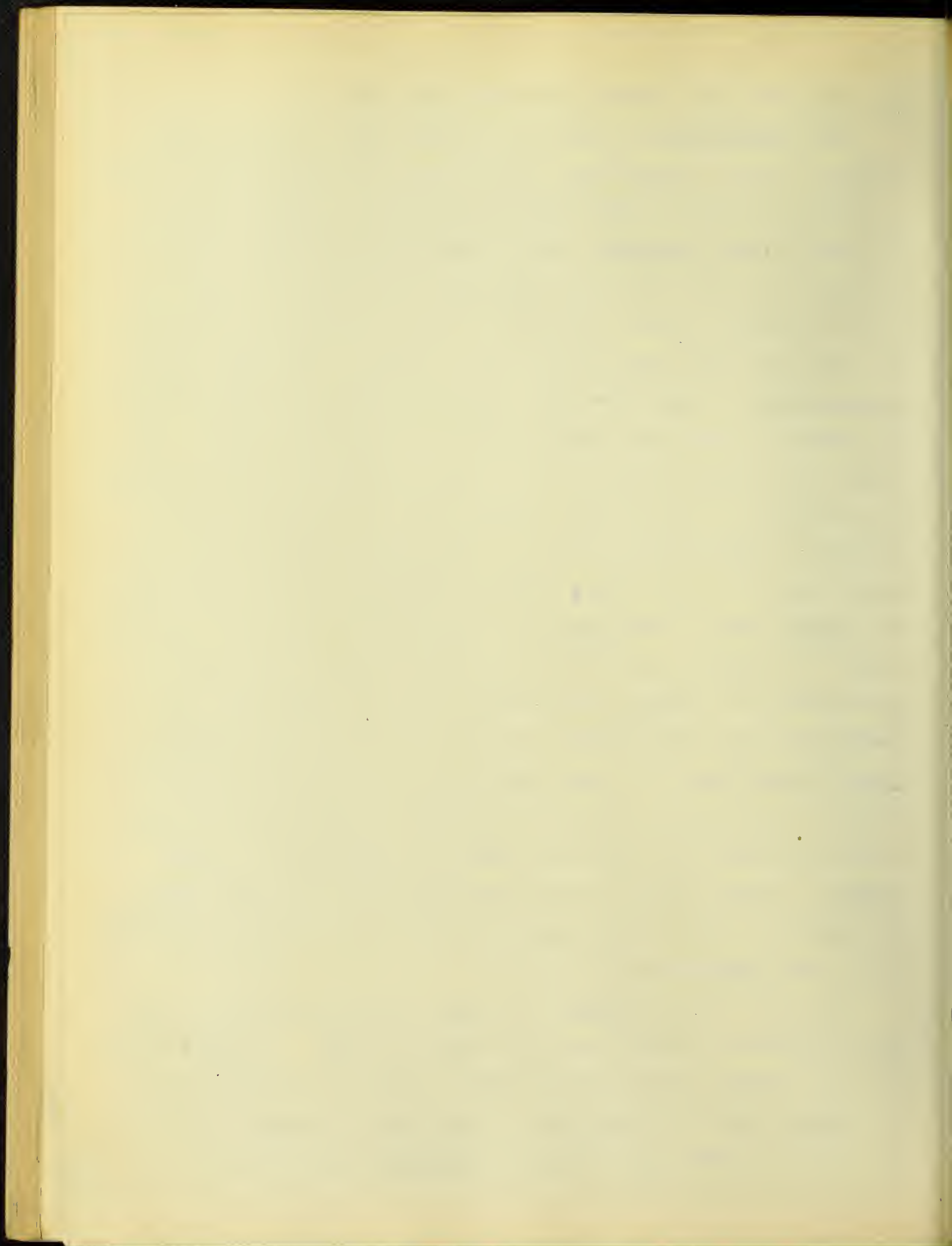
The Sarcoptidae, which are parasitic, deposit their eggs after burrowing into the dermis of the skin of mammals. The female after depositing her eggs dies in the skin of the animal and the eggs hatch into six-legged larvae. The larvae molt several times, sometimes as many as four, and give rise to the adult forms. The adults at once



pair and soon these females burrow into the skin.

The Tyroglyphidae, of which the "cheese mite" is a good representative, have a somewhat more interesting life history and are from a biological point of view perhaps as important a family as any in the entire class Arachnida. Some of these mites assuming a form remarkably different from either the nymph or the adult, in order to cling to passing beetles, flies, etc. This is a provision of nature for ensuring a wide distribution of the offspring. The adult female Tyroglyphidae lay eggs which upon hatching produce six-legged larvae. The larvae molt once and produce the first eight-legged nymph. The nymph thus produced may take one of the two following courses, depending, according to some authors, largely upon the dryness of the atmosphere: it may develop directly, with a series of molts, into the adult stage, or it may take a much more complicated course involving the Hypopus stage. The Hypopus is a form entirely different from the nymph. Its skin is hard and chitinous; its legs are short and not well adapted for walking, while at one end of the body there is a large area filled with suckers. By means of these suckers the Hypopus attaches itself to some insect and may be carried a long distance before becoming detached. I examined a large pile of rotting straw and weeds on the University farm and found scores of these Hypopi. A basket full of the material was taken to the laboratory and examined. Nearly every insect that was found in the material had one or more Hypopi attached to it.

The fact that the Hypopus is a stage in the life history of the Tyroglyphidae was finally settled as stated on page by Megⁿwin and Michael. Michael demonstrated by actual dissection the presence of the Hypopus inside the nymph case of Glyciphagus spinipes. But not all the first nymphs pass through the Hypopus stage and not all the



Hypopi emerge from the old nymphal cases; some may pass the whole stage therein and emerge after the next ecdysis as more adult nymphs. It would appear from this that the Hypopus stage is dying out. This supposition is further supported by the fact, as shown by Michael, that in Glyciphagus domesticus there is no complete formation of a Hypopus, but only of a protoplasmic mass, having the shape of a Hy-
popus but no legs and showing no movement.

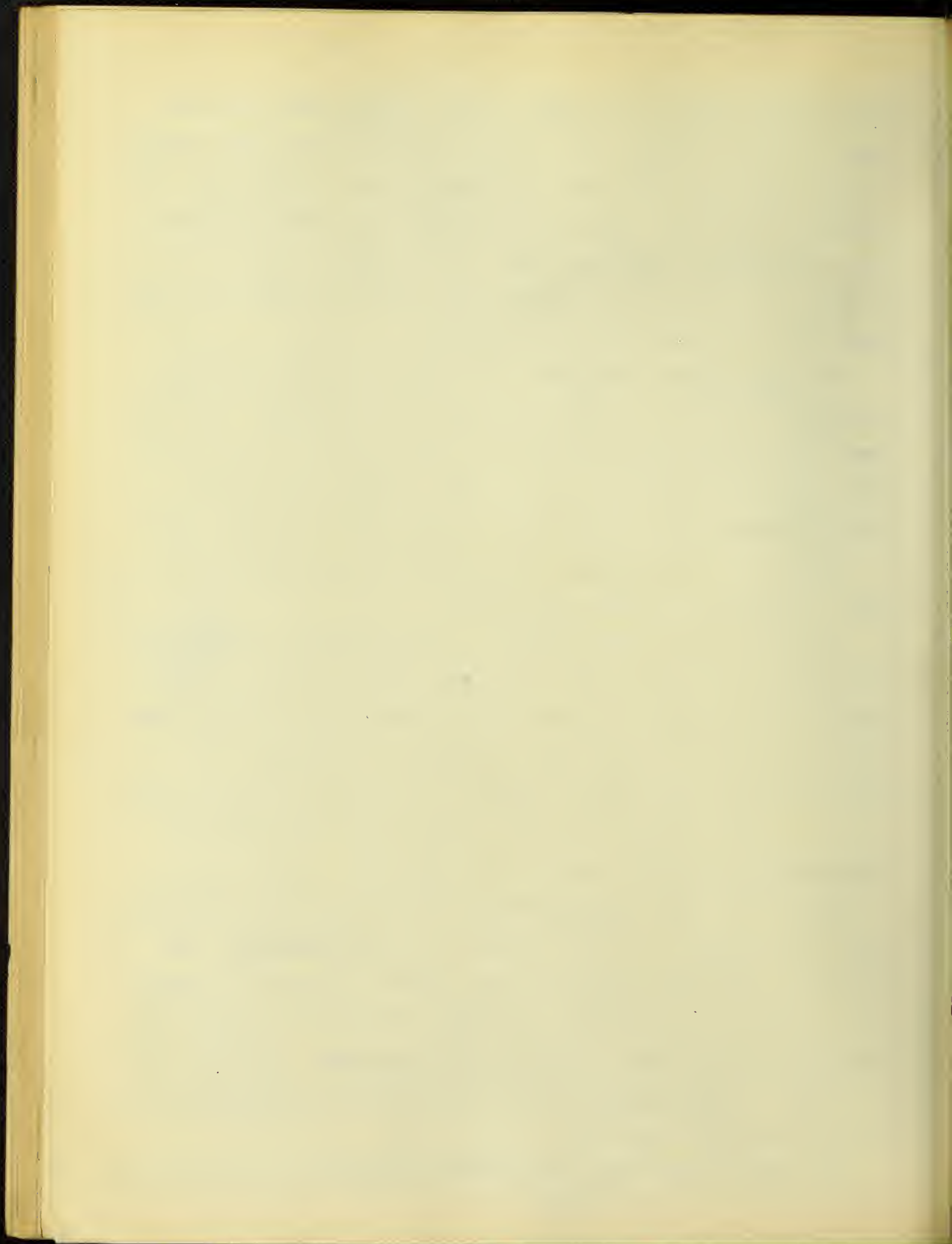
The Gamasidae are oviparous. The eggs upon hatching produce six-legged larvae as is usually the case with most mites. The first nymph which appears has shields on its body, but after one or more molts the nymph becomes more nearly like the adult form, which is usually attained after three molts beginning with the larval state.

Some of the Dermanyssidae are peculiar in that upon hatching there is produced an eight-legged nymph.

In the Uropodidae the nymphs are often attached to insects for the purpose of transportation. They are seldom parasitic, as was formerly supposed, but are attached by a small pedicel which arises from the region of the anus and is composed of excrement. Mr. C. A. Hart of the State Laboratory of Natural History has given me a small beetle which is entirely covered with these creatures, each adhering entirely by means of the pedicel.

None of the other Acarina present a life-history more interesting to the biologist than that of some of the Tarsonemidae. Two species of this family which are quite common in Europe, one being common in America also, have a remarkable life history. These are Pediculoides ventricosus and Pediculoides graminum. The adult male and female of Pediculoides are entirely different in form and structure, as previously described.

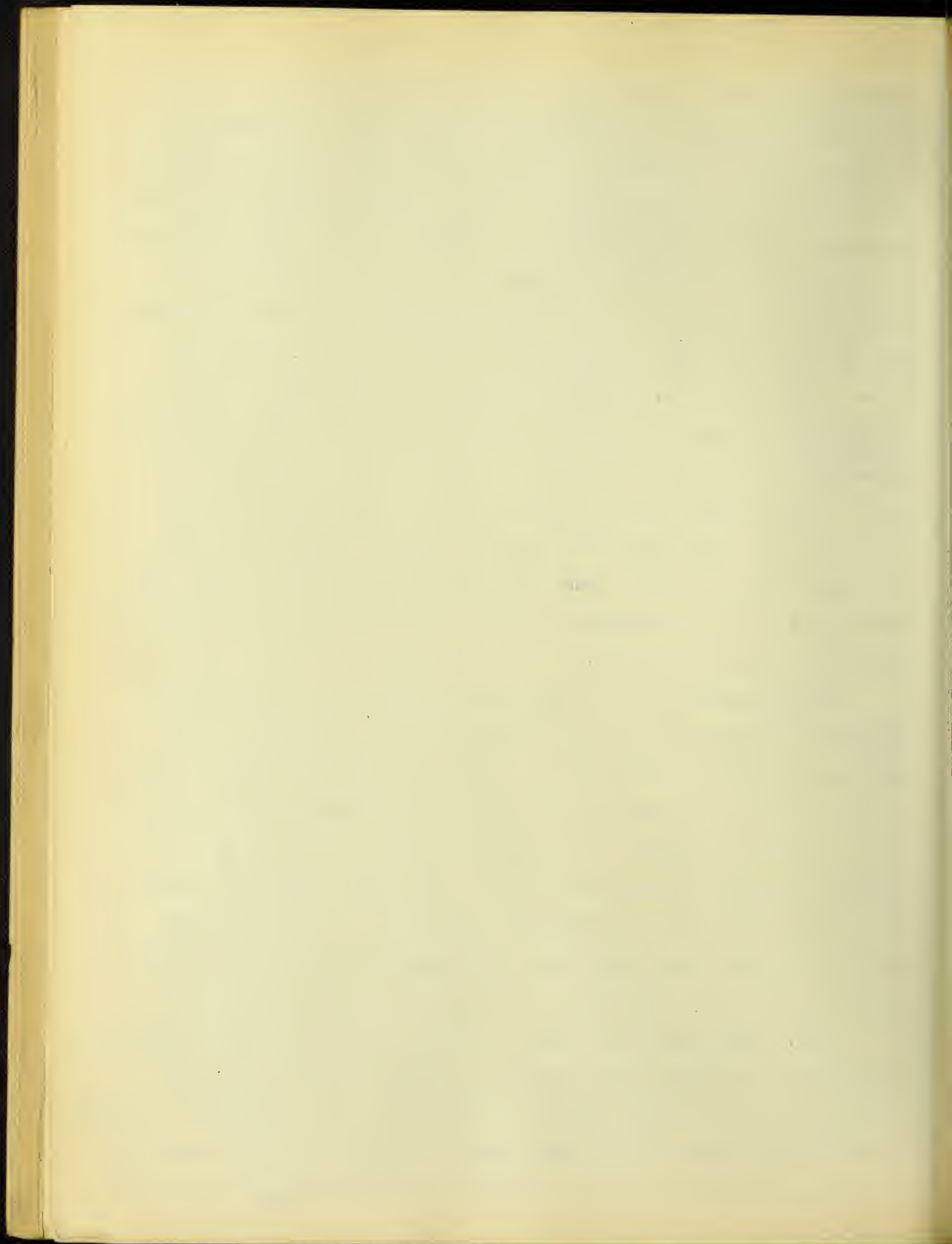
The unfertilized female of our American species is so small that



usually she cannot be seen with the naked eye, being about 0.22 mm. in length. The eggs of the female are never laid, but undergo development inside the abdomen. As this development goes on the abdomen becomes greatly distended; in time the female becomes so burdened with the developing eggs that she is unable to crawl. This condition is followed by an increasing expansion of the body walls until the death of the mother results and the integument of not only the abdomen but the whole body bursts loose from the internal tissues and forms a large sack containing the developing eggs. After this process of swelling has reached its greatest extent only the tips of the appendages of the parent mite can be seen projecting from the enormously enlarged mass which is many scores of times larger than the original mite. The eggs hatch inside the case formed by the body of the dead mother, and the young wander about in this shell until they attain their full development; it has been reported that they use the body of the mother for food.

Perhaps nowhere in the animal kingdom does the function of reproduction necessitate a greater sacrifice from the mother of offspring. We know of other cases in which it causes the death of the parent but here the death is slow and similar perhaps to that caused by the growth of a tumor; the abdomen is swollen; the organs of the body are displaced, and tissues torn. The mother leaves her corpse for the habitation of the ungrateful offspring. In it they reach maturity, select their mates and make a wedding feast from the flesh of the one who gave them birth at the expense of her own life.

In P. ventricosus (according to Brucker) when the female becomes swollen with developing eggs the male takes up his abode upon her back, living parasitically upon his unfortunate mate, awaiting the birth of young females which when born join with him in his cannibal-



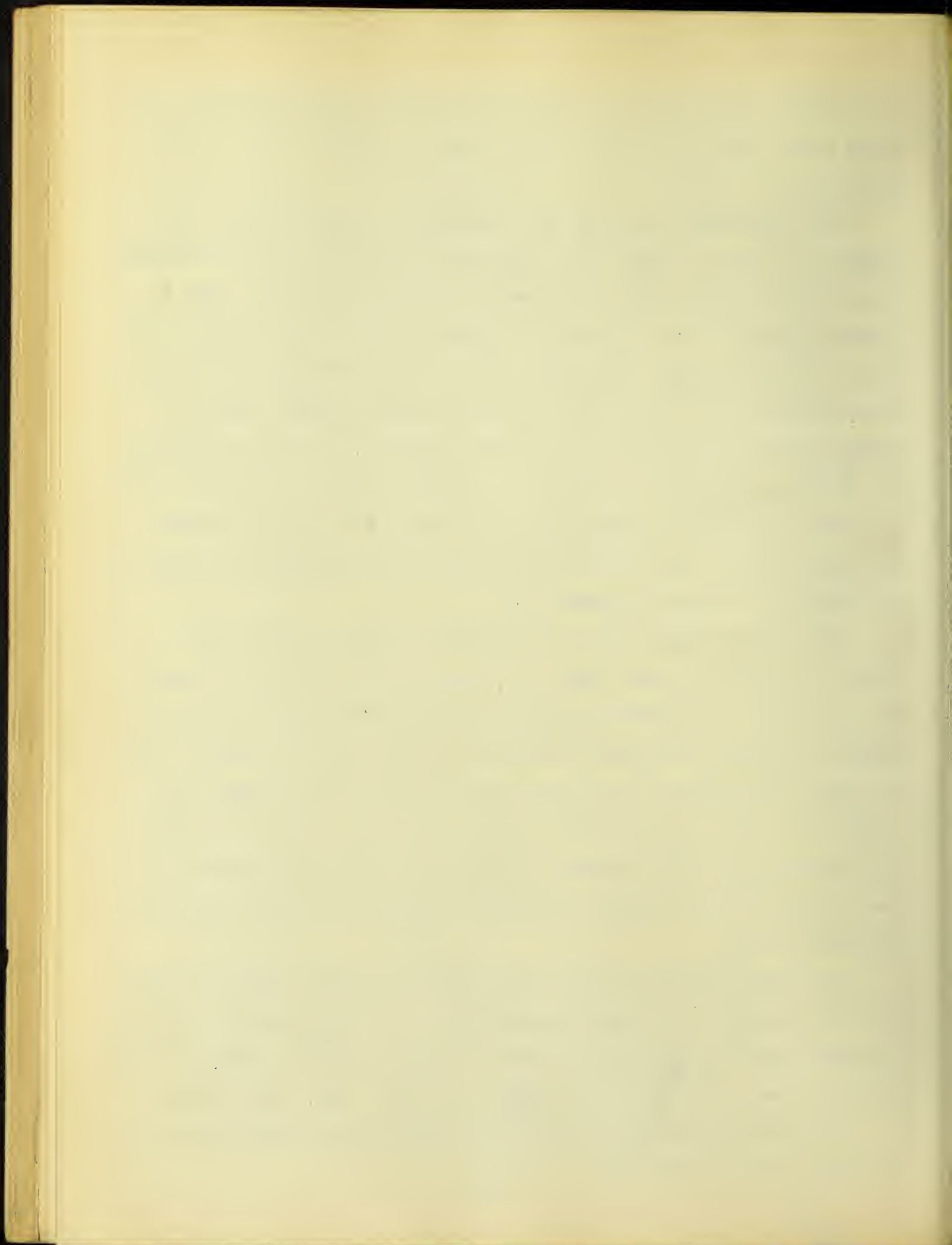
istic feast. After the male has fertilized the young females he too meets death, while they leave their mother, to share after a time a fate similar to hers.

The Oribatidae as a rule are oviparous, though some are ovoviparous and others viviparous. The young upon hatching are six-legged larvae and entirely different from the hard shelled adult. The nymphs of these "beetle mites" are among the prettiest and most decorated of the Acarina. They bear little or no resemblance to the mature forms and are often highly colored and may possess large, expanded, feather-like bristles arranged radially, producing a beautiful effect, in no way suggesting the common, homely, dark brown adult.

The larvae of the Bdellidae look remarkably like the nymphs and adults except they have only six legs. The nymphs are similar to the adults in size and appearance.

The Tetranychidae lay a great number of eggs, usually upon leaves of plants or under bark. The eggs are often about as large as the larvae. The larvae upon hatching are six-legged as usual and suggest somewhat the nymphal condition, but the body is shorter and the legs and mouthparts are less developed than in the nymph. The nymphs are similar to the adults except in color. Where the adults of a species are red or orange the nymph will often be greenish yellow. Several molts usually take place between the larval stage and the adult stage.

The Trombididae may lay a great number of eggs, which are usually stuck together in an agglutinated mass. The larva when it hatches attaches itself to the wings or body of some insect and gorges itself with food until it is several times its former size, when it drops to the ground and undergoes the final metamorphosis without molting, appearing soon as the adult.



The Ixodidae, or ticks, pair while living on their hosts. The female lays an enormous number of eggs, sometimes as many as 10,000, upon the surface of the ground. The young upon hatching find their way to some animal and attach themselves. After becoming distended with blood, they drop to the ground and after a few days are changed by molting into the nymph stage. The nymph crawls up some bush or other object and awaits the coming of a new host (often some domestic animal) and when the opportunity comes it attaches itself as did the larva and gets all the blood it can hold, when it lets go and falls to the ground. Again it seeks concealment and this time molts into the adult stage.

The larva of the Hydrachnidae are parasitic upon insects. The short, stout palpi are provided with hooks by which they attach themselves to their host. After becoming much swollen with food, the transformation into the pupa state is begun. The adult mites emerge and are free-swimming individuals.

EXTERNAL ANATOMY

GENERAL FORM.

The body in most Acarina is divided into two parts: an anterior part which bears the mouth parts, legs, and sometimes eyes, and other organs of unknown function and a posterior part which, in many cases, apparently bears the two posterior pairs of legs, and sometimes large shoulder bristles, and often shows some parts of the genital apparatus protruding from the ventral side. These parts are known as the cephalothorax and abdomen respectively. The demarcation between the cephalothorax and abdomen cannot be made out in all the genera. All the mites except the Eriophyidae bear four pairs of legs in the adult state.

THE CEPHALOTHORAX.

The cephalothorax usually occupies a considerable portion of the body, extending, in most cases, to between the second and third pairs of legs. It is largest in the Bdellidae, Cheyletidae, and Tetranychidae, where it often equals the abdomen in size. In the Trombididae the cephalothorax is small and is almost entirely hidden from above by the protruding anterior part of the abdomen. In the Gamasidae, Dermanyssidae and Uropodidae the cephalothorax is not demarcated from the abdomen. This is true of many genera found in other families. The cephalothorax is often divided into an anterior part termed the rostrum, or beak, and a posterior part, the dorso-vertex. The former is well developed in the Cheyletidae, and Bdellidae; the latter has no well defined boundaries and for this reason the writer has avoided using the term in connection with many

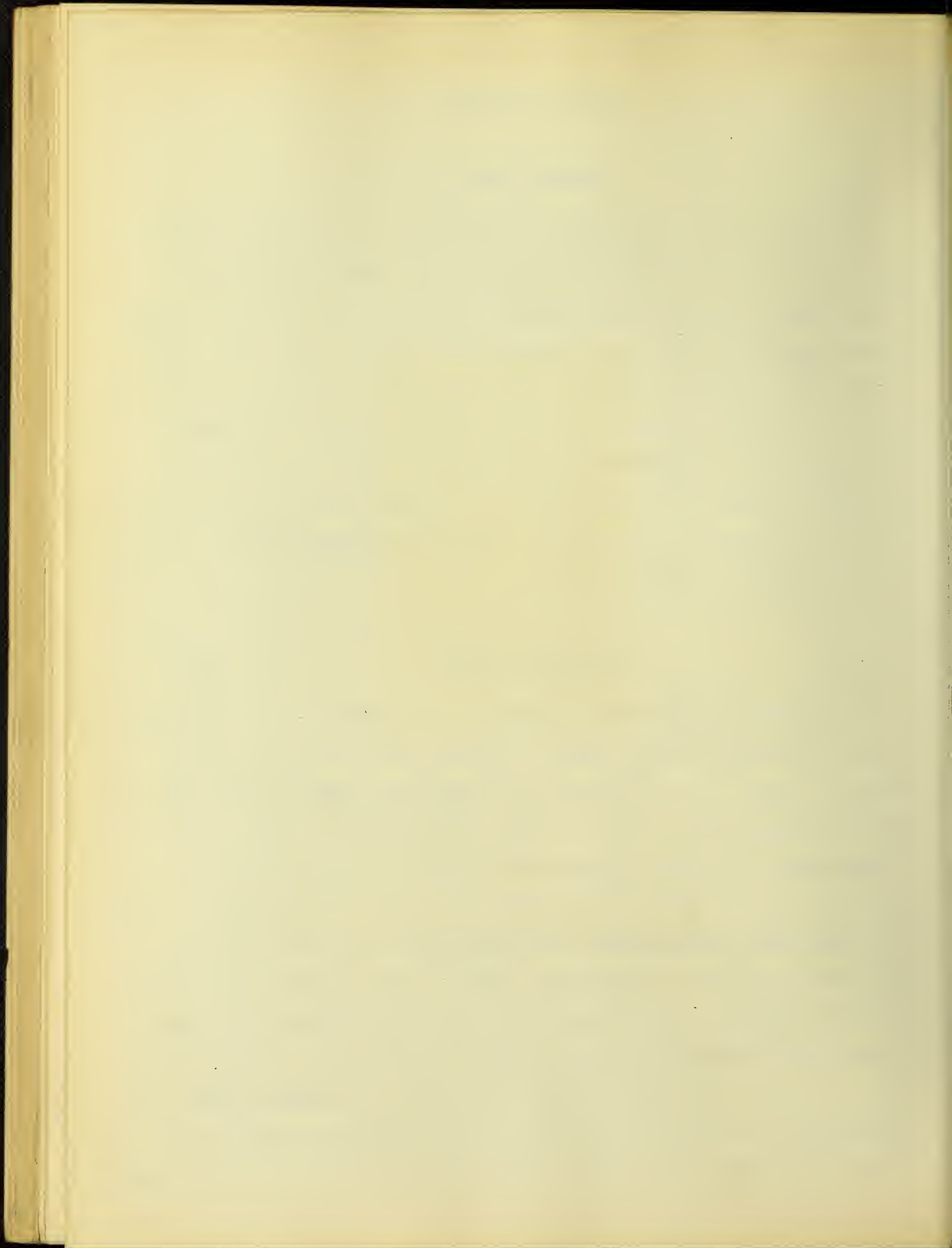
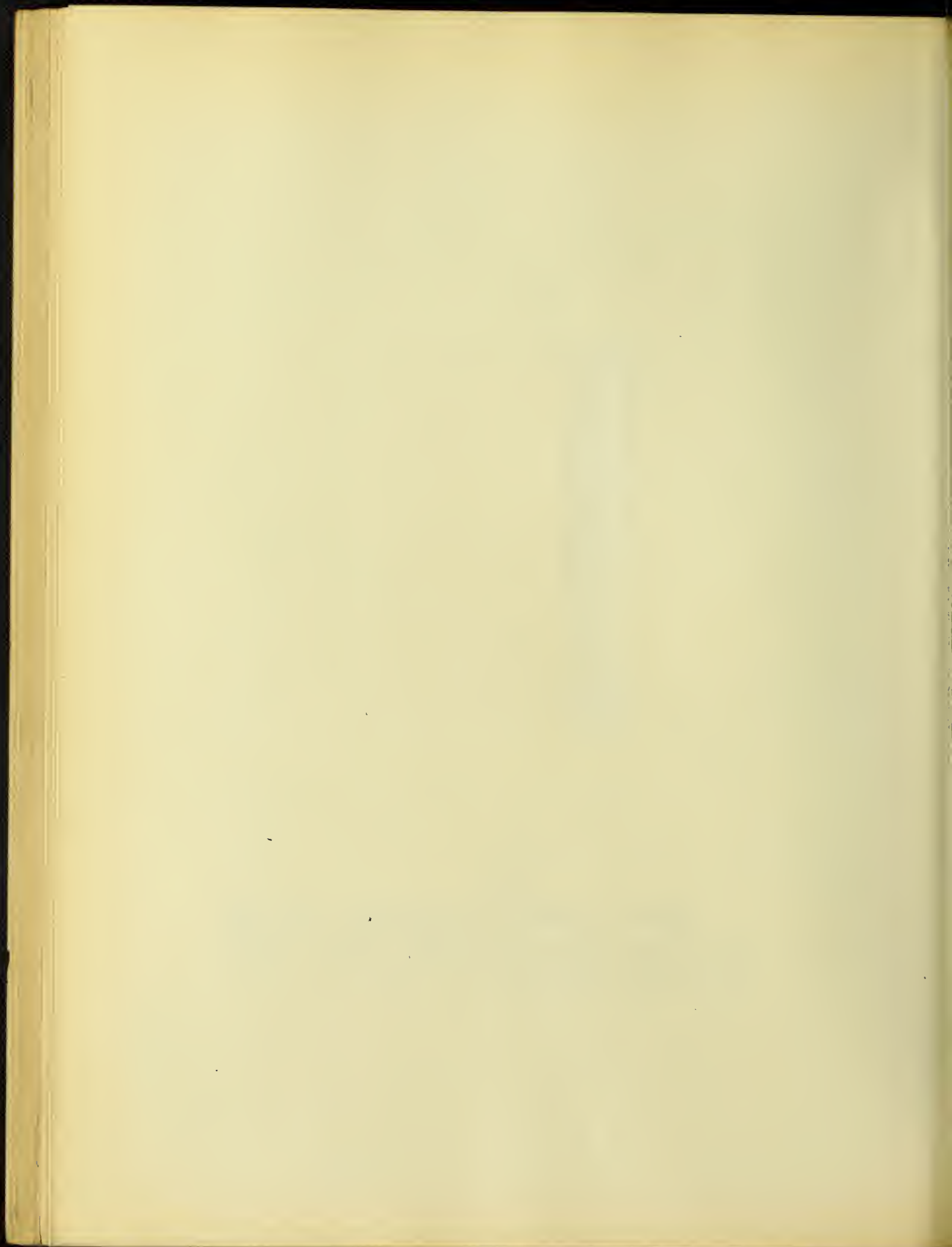


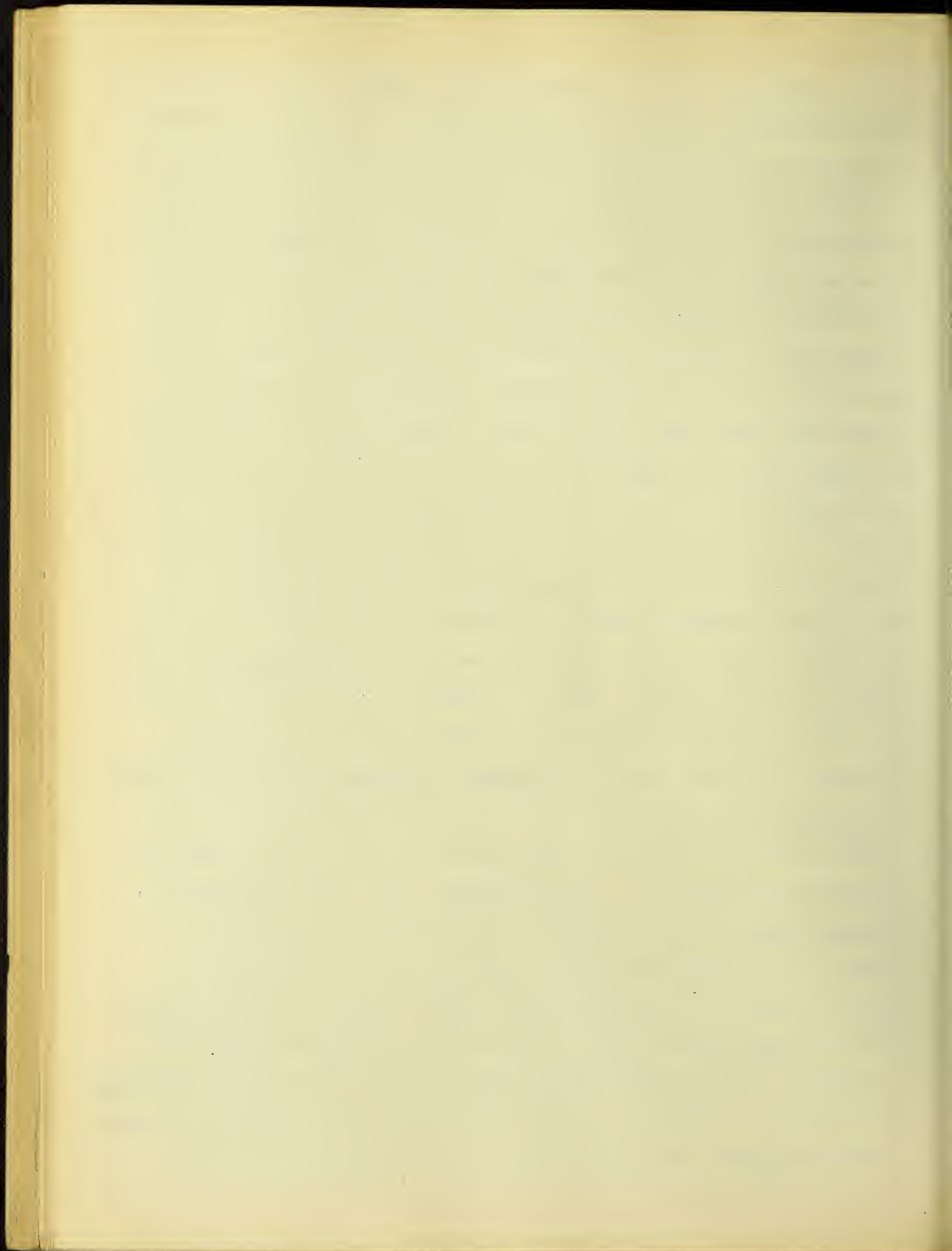


Fig. 2.

- *Seiulus hirsutus* (C.L.Koch). Dorsal view x 40.
Shows 4 large spines on posterior margin of abdomen
and bidactyle claws situated on long tarsal pedicels.
(Photo by the author).



of the families. On the underside of the cephalothorax is situated the oral cavity containing the mouth parts. It is often protected above or below by a chitinous projection from the wall of the cephalothorax. These projections are called the epistome and hypostome respectively. The former is well developed in the Gamasidae and its size and shape are very important characters which are used in the description of species; the latter is best developed in the Bdellidae where it forms a long shelf for the support of the enormous mandibles. Upon the dorsal surface of the cephalothorax may be found one or more pairs of eyes and in some species an extra median eye as in the genus Cyta. The position of the eyes varies greatly in the different groups. In the Bdellidae they are situated, as a rule, on the extreme postero-lateral aspect of the cephalothorax, while in other families, as Trombididae or Rhyncholophidae, they are situated farther forwards and inwards. Sometimes the eyes may be situated upon stalks or pedicels, as in the Trombididae, but generally they are sessile. Where two pairs of eyes are present they are usually situated very close together, sometimes approximate. In many of the families, as Oribatidae, Tyroglyphidae, Hoplodermidae, and Gamasidae, there are no eyes. Upon the dorsal surface of the cephalothorax may often be found long tactile hairs as in Bdellidae, Cheyletidae, Eupodidae, or Tyroglyphidae. The families Oribatidae, Hoplodermidae and Nothridae have a specialized seta arising from a large pore on each postero-lateral aspect of the cephalothorax, which is called the pseudostigmatic organ. Many of the Oribatidae and the Nothridae have one or more pairs of chitinous blade-like expansions upon the dorso-lateral part of the dorso-vertex, these are called the lamellae; besides these there may be similar chitinous expansions above the coxae of the first, or the first and second

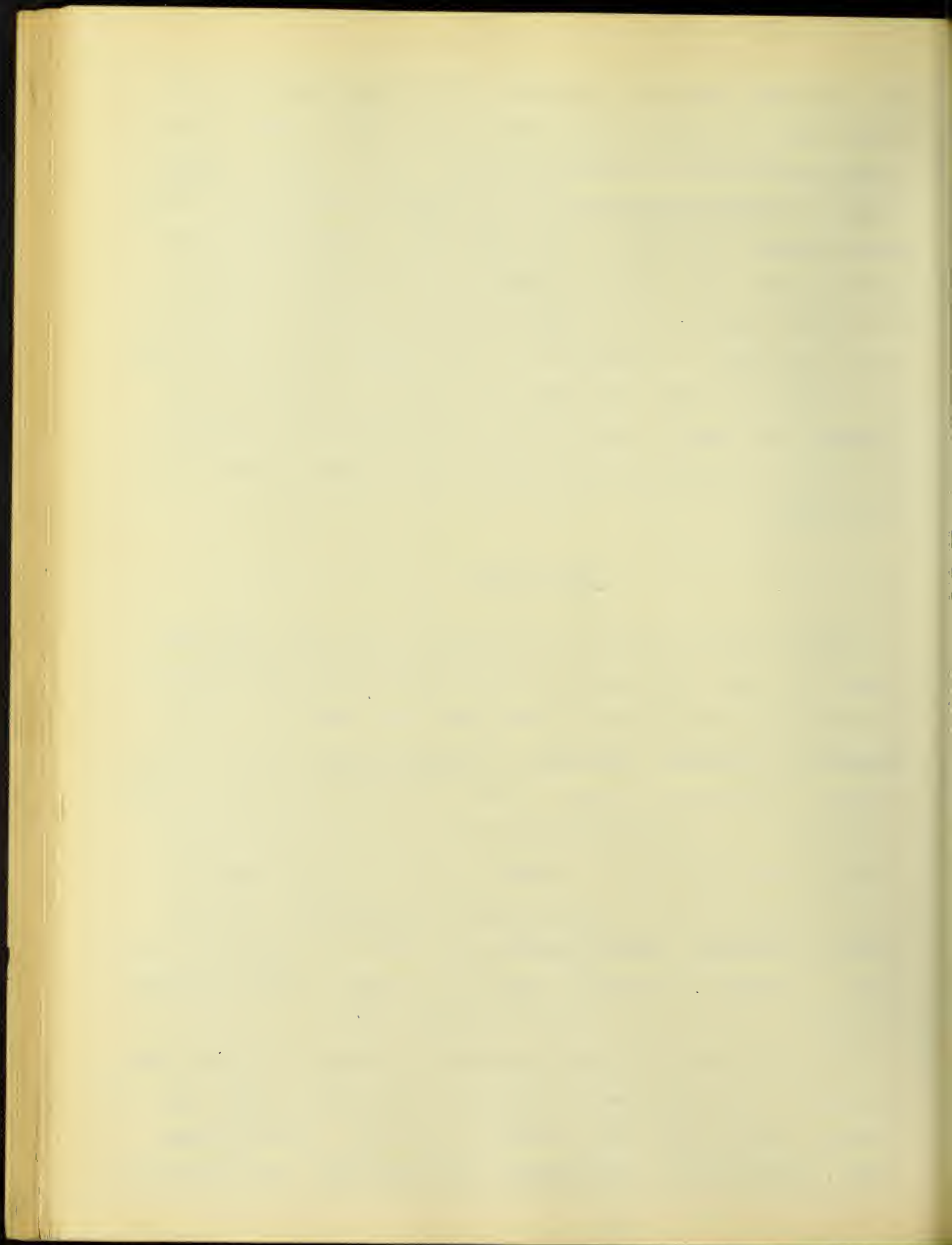


pairs of legs, called the tectopodia. In the Hoplodermidae sometimes there is a median ridge present on the dorsal surface of the cephalothorax known as the median carina. In the families Trombididae and Rhyncholophidae there is a prominent median groove which may be expanded at either or both ends; this is referred to as the median groove. Its function is unknown. At the anterior end of this groove there is often a small swelling or tubercle. Near the base of the beak or rostrum may be found in some species small horn-like projections which the author has referred to as horns. The Ixodidae have a hard, dorsal shield on the cephalothorax known as the scutum. A somewhat similar shield may be found in some of the other mites.

MOUTH PARTS.

The mouth parts consist of the mandibles, the palpi, and sometimes one or more other parts known as maxillae and maxillary lip. The mandibles vary greatly in size, shape, and function. In the Gamasidae, Uropodidae, Bdellidae, and Hoplodermidae they are large, chelate, and powerful and may be equal to one-half the entire length of the body. In the Rhyncholophidae they are large but styliform, being fitted for piercing. In many of the families the mandibles are very small, as in the Oribatidae and Tarsonemidae. The Gamasidae, Uropodidae, Rhyncholophidae, and some other groups have the power of drawing the mandibles partially or wholly within the mouth opening so that they are invisible from the exterior.

The palpi consist of several segments-- from three to five-- and may vary in size from almost rudimentary structures to large appendages equal to the entire length of the body. In the Tarsonemidae, Canestrinidae, Tyroglyphidae, Listrophoridae, and Sarcoptidae

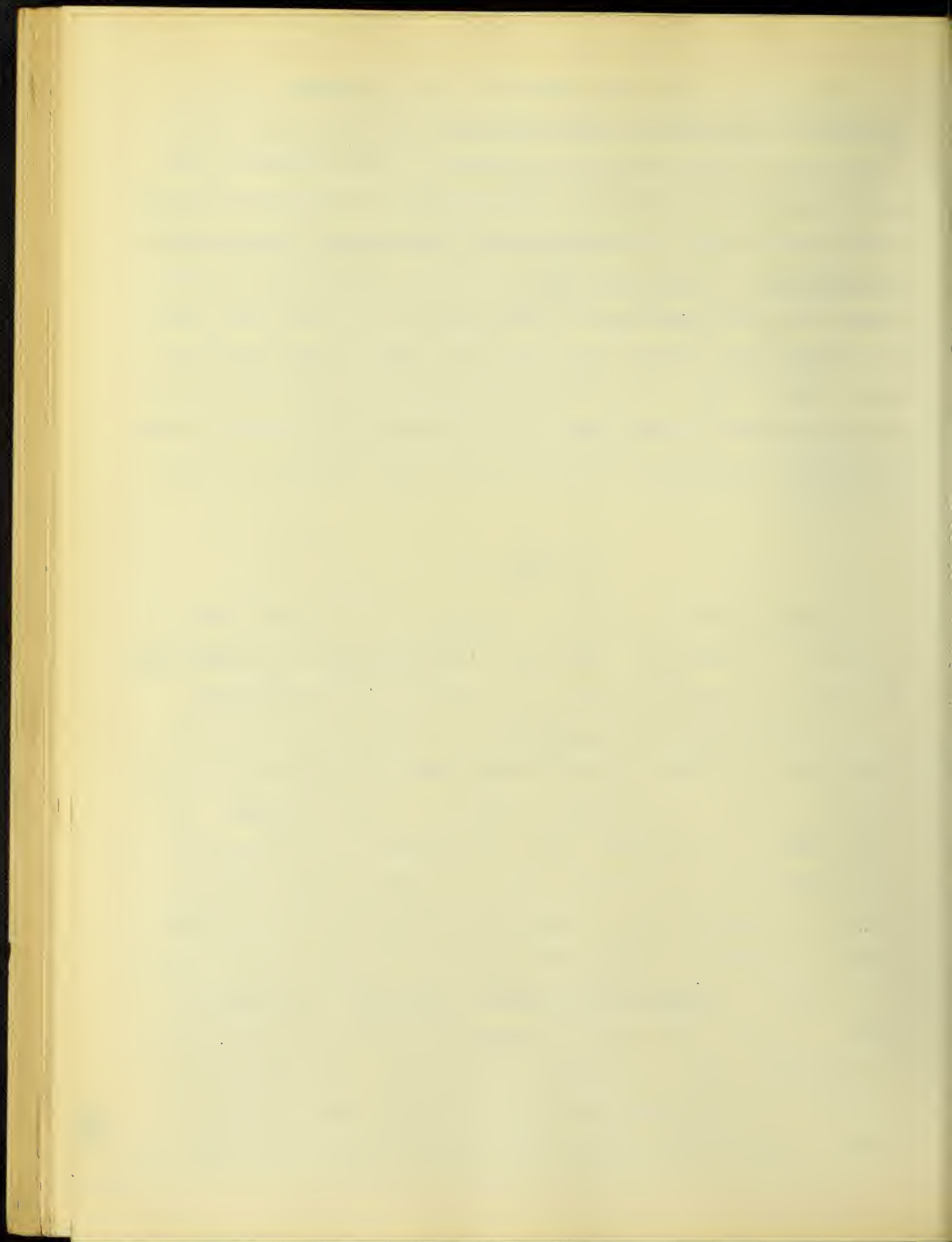


the palpi are small and composed of three segments. In the Bdellidae, Trombidiidae, Rhyncholophidae, and several other families they are large and usually composed of five segments. The last segment of the palpus may form a "thumb" to the preceding segment as in the case in the Caeculidae, Erythraeidae, Tetranychidae, Trombidiidae, and Rhyncholophidae. The last segment may in some cases, as in the Eupalidae and Cheyletidae, bear large claws used for grasping and holding prey. The penultimate segment may also have similar claws. Sometimes the palpi are geniculate, as in the Erythraeidae and the Bdellidae. Tactile hairs are frequently found on the palpi especially at the tip of the last segment as in the Bdellidae.

ABDOMEN.

The abdomen shows a variety of shapes in the different families. It may be very large and long, as in the Eriophyidae and Demodicidae or short and relatively small, as in some of the Tetranychidae.

In the Eriophyidae and Demodicidae the abdomen is peculiar in being annulate. There are many rings around the abdomen which apparently divide it into segments similar to those of Vermes. In these families the abdomen itself is developed out of proportion to the other parts of the body, for it is often several times as long as the cephalothorax. There are no divisions of the abdomen. Often the abdomen possesses hard, chitinous shields or plates, as in the families Gamasidae, Uropodidae, Oribatidae, and Hoploder-
midae. Sometimes the dorsum is completely covered by such a chitinous shield, which is called the dorsal plate. Upon the ventral surface in the Oribatidae and some of the other families may be found a large chitinous plate which encloses the anal and sometimes



the genital openings; this is called the ventral plate. Sometimes there are two plates on the ventral surface of the abdomen; the anterior being called the genital plate and the posterior the anal plate. In the Oribatidae, Nothridae and Hoplodermidae the genital and anal openings are each provided with a pair of hinged chitinous plates called the genital and anal covers respectively. Oribatidae differ from all other Acarina in having chitinous wing-like expansions to the abdomen, called pteromorphae. These wings are often capable of being folded down over the legs so as to conceal the latter. The abdomen may be well clothed with hairs or it may be hairless. In the Trombididae the abdomen is thickly clothed with many short, stout hairs. In many of the Oribatidae and some of the Uropodidae the abdomen is hairless. Often the abdomen bears several long, prominent hairs, as in the Tetranychidae. Sometimes there is a prominent pair of bristles situated on the shoulders, known as the shoulder bristles. In the females of some families, most noticeably Pediculoididae, the abdomen may become enormously swollen with eggs.

THE LEGS.

The legs of Acarina consist of from 3 to 7 segments. The author has followed the plan of always calling the most proximal segment the coxa, the distal segment the tarsus, and the penultimate segment the tibia. Where there are five segments to the leg, I have called the second segment the femur, and the middle segment the genual.

In most of the Acarina there are claws at the ends of the tarsi. I have called these the claws, or ungues, and speak of them as being monodactyle, bidactyle, tridactyle, or tetradactyle, accordingly

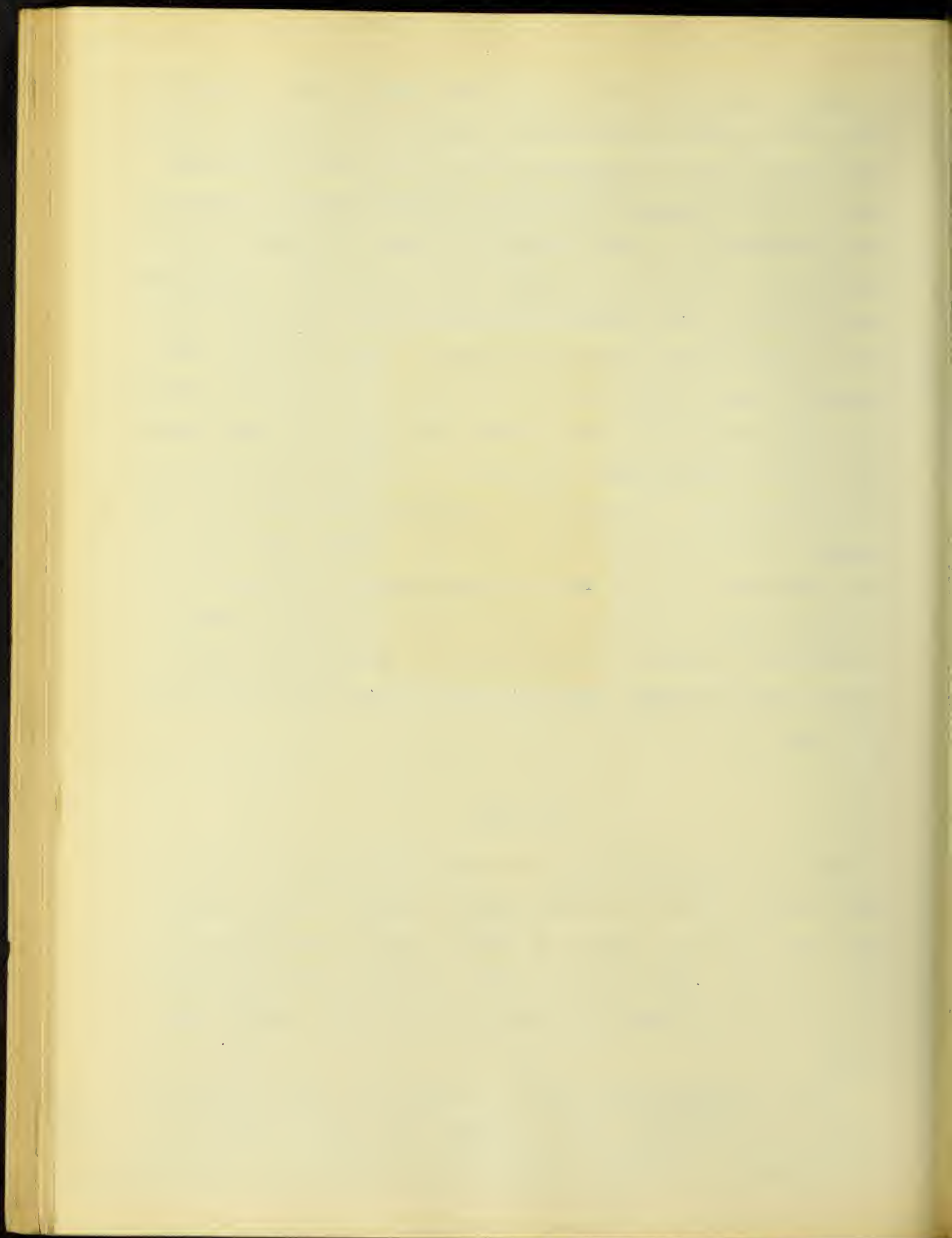
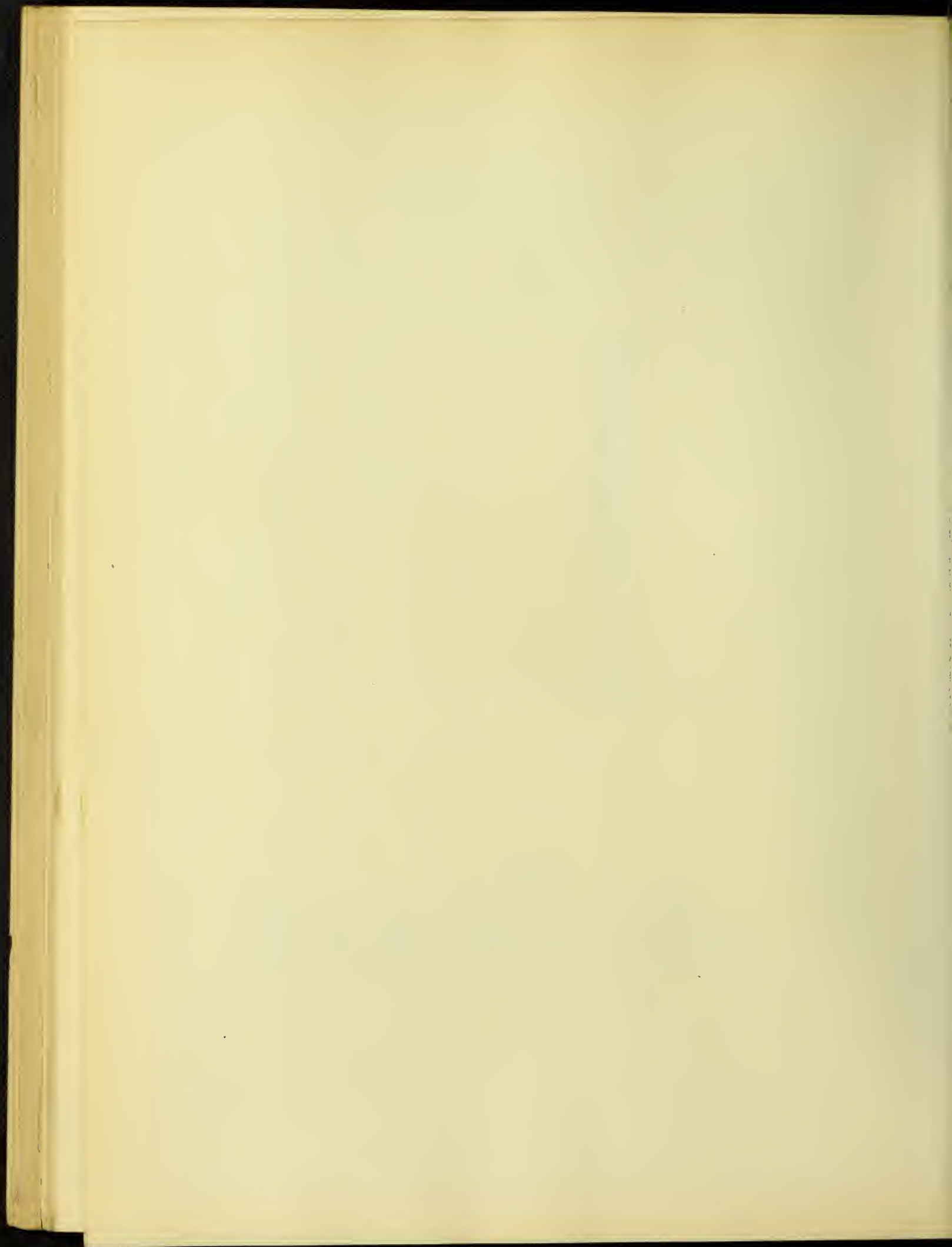




Fig. 3.

Lamachus (sp.). Dorsal view, x40. Shows large mouth parts, very slender anterior pair of legs and large spine on left hind femur. (Photo by the author).



as they are composed of one, two, three, or four separate elements. The claws may be situated upon a small pedicel which is a direct continuation of the tarsal segment and hence is known as the tarsal pedicel. Besides the claws there may be a small pad or flat projection called the caruncle. In some families some of the legs are without claws.

The simplest form of legs is found in the Demodecidae where they consist of three short, simple segments, are without claws, and extend scarcely beyond the lateral margins of the body.

The legs of the Sarcoptidae are short and stout and peculiar in that they possess besides a claw a long pedicel, bearing at its tip a sucker.

In the Tyroglyphidae the legs are, as a rule, subequal and consist of five segments. The tarsi of the first two pairs of legs are peculiar in that each possesses a specialized, clavate seta. The tibiae of Tyroglyphidae are each provided with a long tactile hair. In the genus Rhizoglyphus the legs bear stout, short spines also.

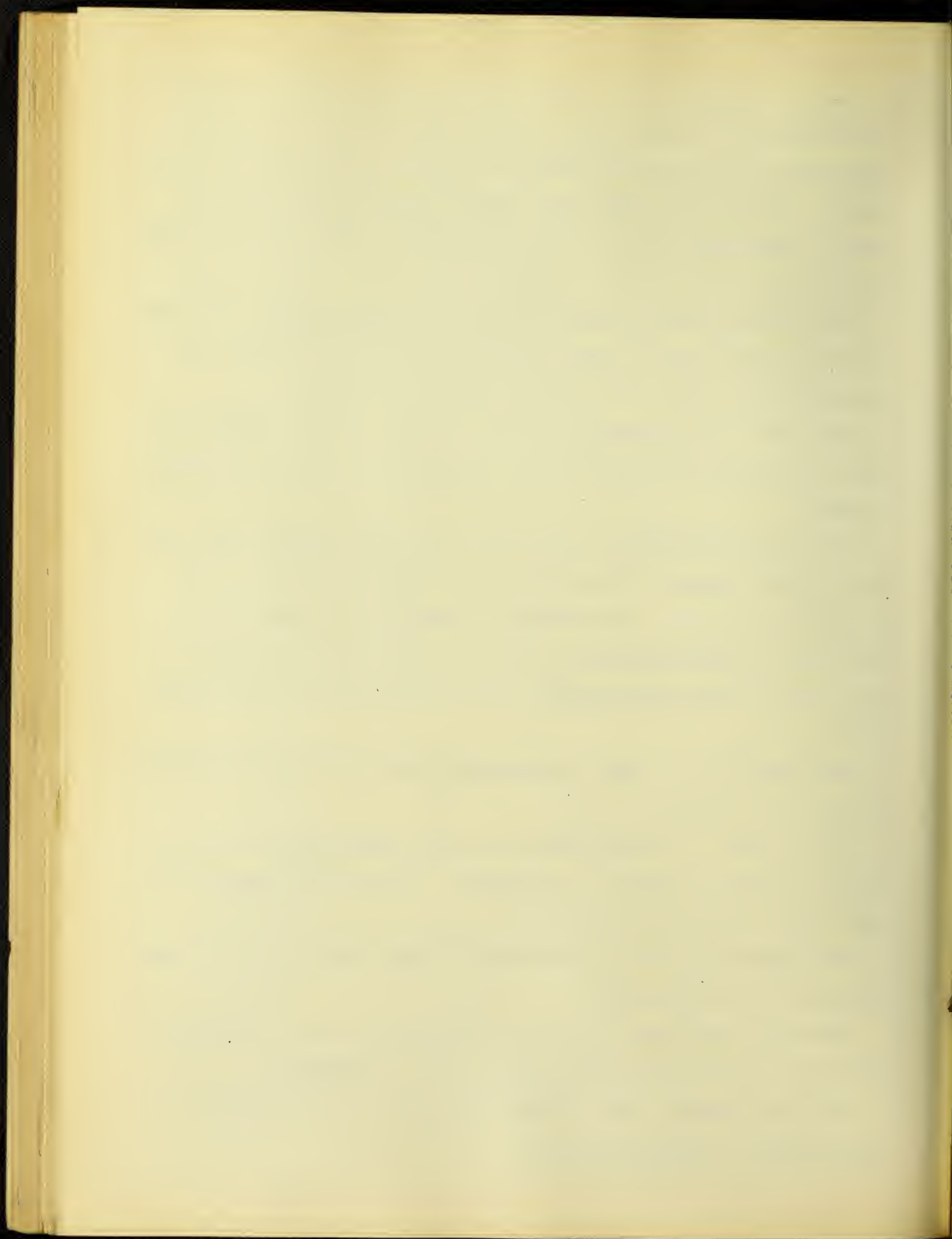
The females of the family Tarsonemidae have the hind legs ending in long hairs instead of claws.

In one genus of the Nothridae, the genus Zetorchester, the hind legs are large and adapted for jumping. In the genus Damaeus the legs are very long and moniliform.

The Uropodidae have the first pair of legs inserted in the same opening as the mouth parts.

The water mites have the legs provided with a row of long bristles on the inner side, which aid the mite in swimming.

The tarsal segments may be swollen in some of the families, as Trombidiidae and Rhyncholophidae.



In size and form the legs vary in the Tetranychidae. The mites of the genus Neophyllobius have very long legs, often three or four times as long as the body. The tarsi in the genus Tetranychus have tetradactyle claws with the dactyles united into a common base; also four long, straight, clavate bristles.

The anterior pair of legs is much longer than the rest, in the genus Linopodes of the family Eupodidae and the genus Bryobia of the Tetranychidae.

SECONDARY SEXUAL CHARACTERS.

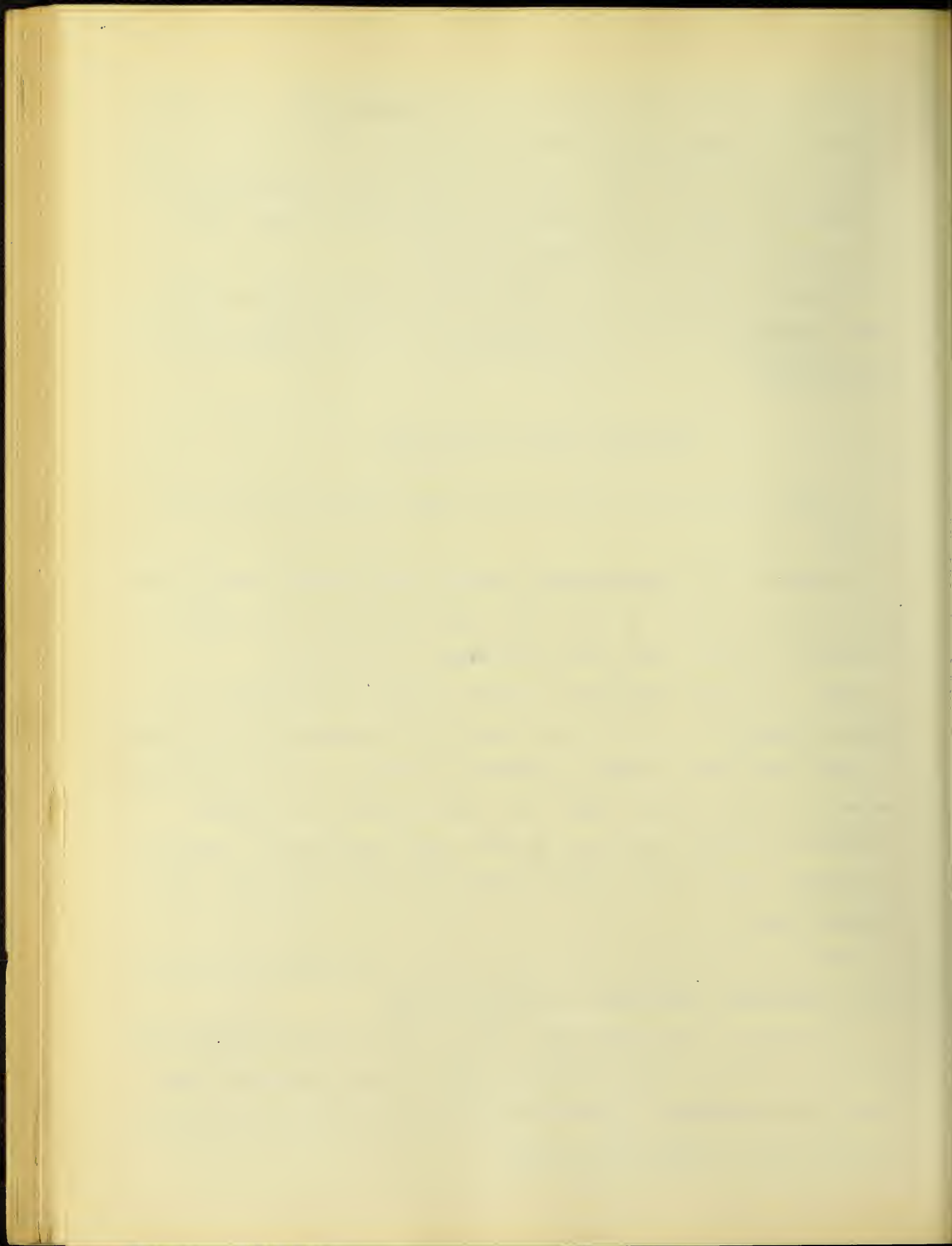
In some of the forms the secondary sexual characters are well marked.

The males of the Tyroglyphidae can be distinguished from the females by the presence of small disk-like suckers on the inside of the fourth tarsus. They show differences of size also.

There is little resemblance between the males and females of Pediculoididae and a person not acquainted with them would be likely to think that they belonged to different families, yet a close examination shows that they have very many characters in common. The males are much shorter and broader than the females. The legs are shorter and stouter, the hind pair being often bent for clasping the female.

There are no external differences between the sexes in the families Oribatidae, Nothridae and Hoplodermidae.

The females of the Uropodidae have an oval or shield-shaped plate between the coxae of the last three pairs of legs, which has been called the epigynium. The males have no such plate but the genital aperture opens through the sternum.

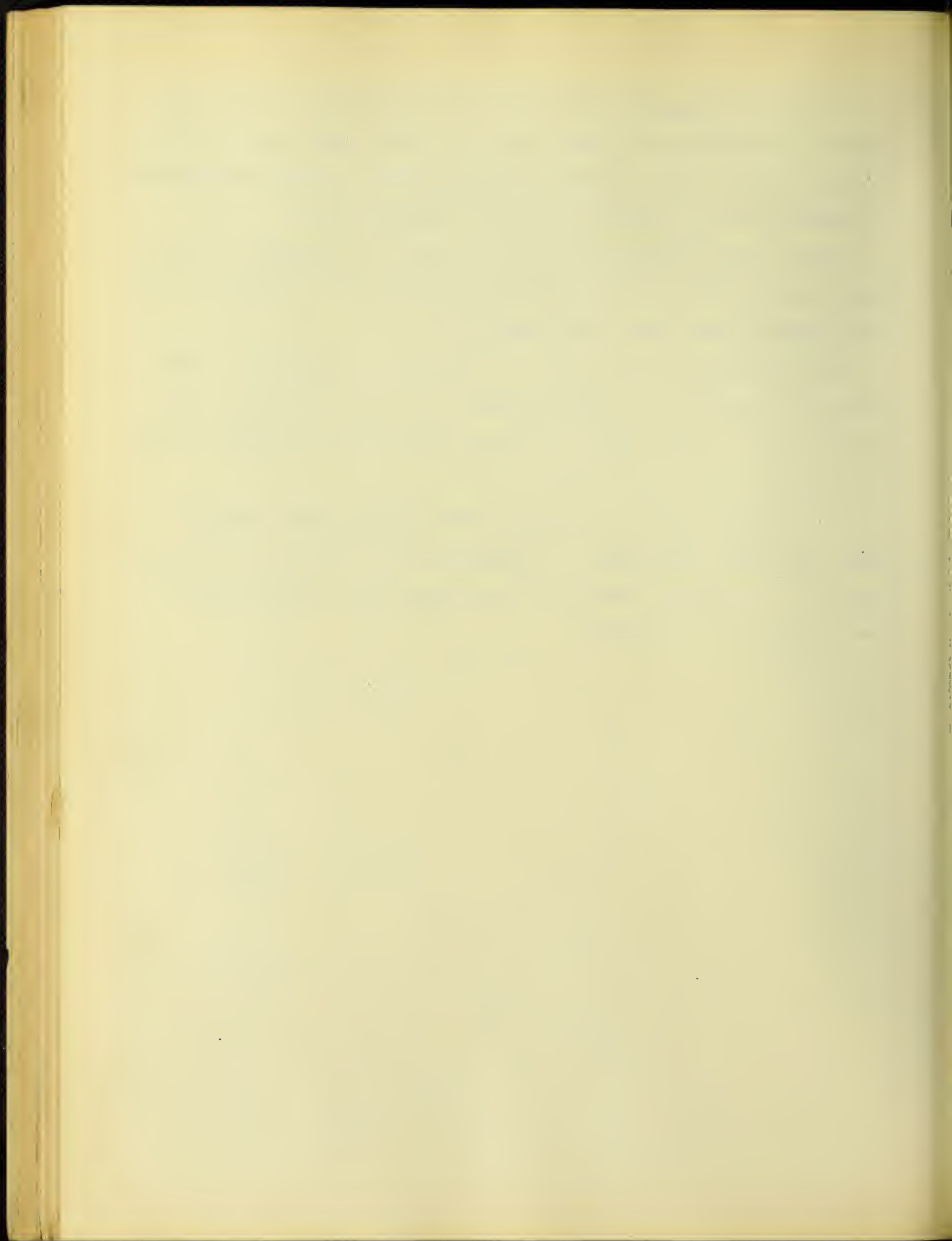


The males of Gamasidae often have the second pair of legs enormously enlarged (often as many as four or five times) and provided with one or more large chitinous hooks. Both of these modifications are adaptations for holding the female during coition.

The two sexes differ greatly in the ticks, or Ixodidae. The females usually have a much larger body than the male and a more oval form, besides many other differences.

There are slight differences in the external characters of the males and females of the Trombidiidae, but they are mostly in the size and shape of the body; the female being larger and having fewer irregularities of the dorsal surface.

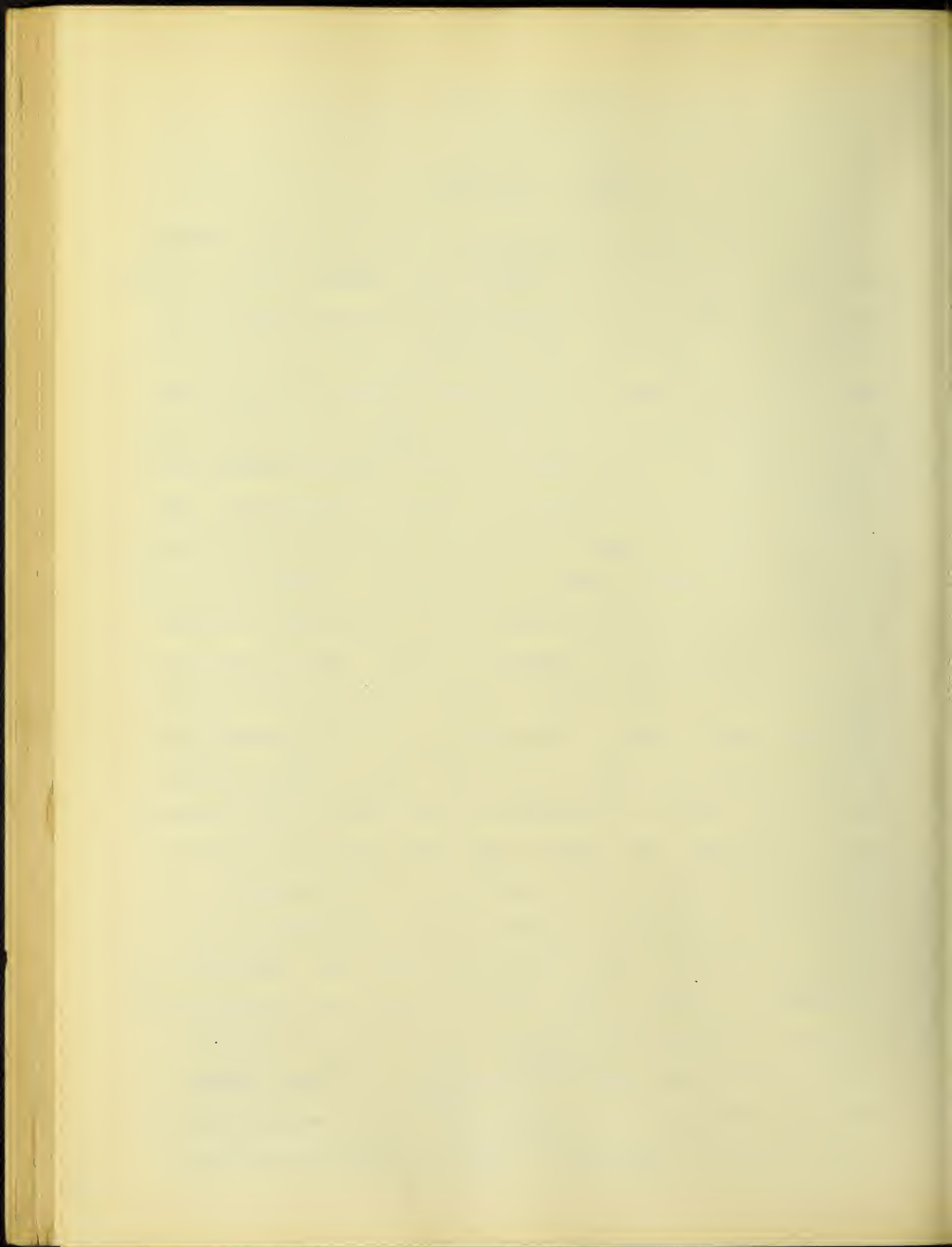
In the Rhyncholophidae, Tetranychidae, Erythraeidae, Cheyletidae, Bdellidae, Eupalidae and Eupodidae there are little differences in the external features of the sexes and in some genera of these families no difference.



INTERNAL ANATOMY

GENERAL CHARACTERS.

The internal organs of the Acarina are noted for their compactness, which is doubtless due largely to the compact form of the body itself. The digestive and reproductive systems are usually the largest and most important. The alimentary canal is peculiar in some of the larger forms, in that it ends blindly, having no connection with the anus. The reproductive organs in each sex often occupy a large part of the abdomen and are usually accompanied by accessory organs for the purpose of coition or oviposition. The respiratory system is comparatively well developed in some forms, but is entirely absent in others; respiration in these forms being effected directly through the skin which in such cases is always thin. In some families the nymphs are without tracheae while the adults have them. The tracheal system is much more elaborate in some forms than in others. The question as to the presence and function of excretory organs is one which has not been carefully investigated. Besides the malpighian vessels which occur occasionally in many forms, there exist organs which from their structure and relationships have all the appearance of being excretory organs but their function as such has not been sufficiently shown. The muscular system is well developed in some forms, especially in the predaceous mites; in other forms it is not very well developed. The nervous system is well developed for so low an order and is characterized in most cases by the presence of a large central ganglion surrounding the oesophagus. The nervous system, however, like the excretory organs has not been carefully worked out and



there is no doubt that when it is, much light will be thrown upon the functions of many of the well known organs whose use has been a mystery to acarologists.

ALIMENTARY CANAL.

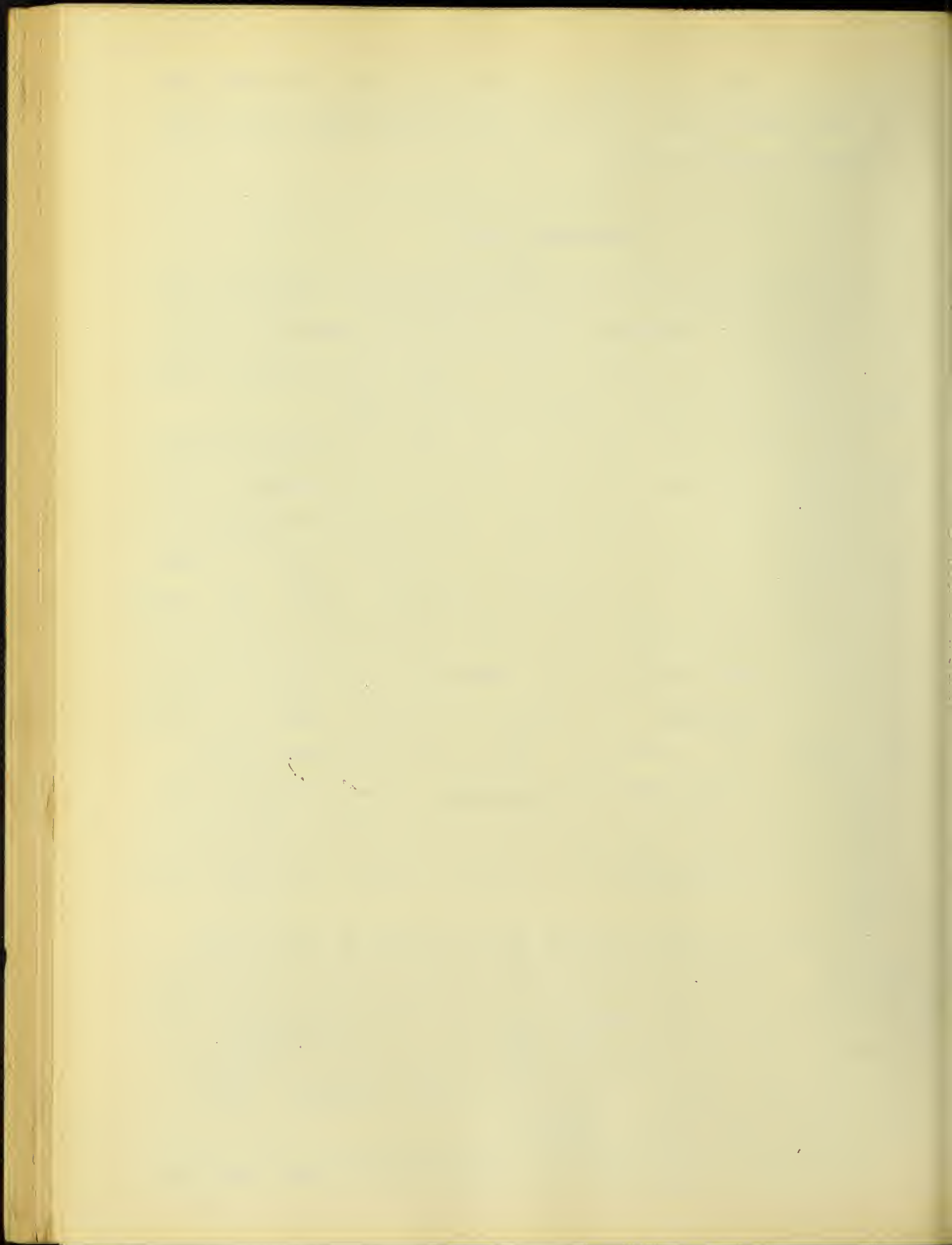
The alimentary canal in most of the Acarina is composed of the following parts: oesophagus, crop, stomach and intestine. As we go from one group to another, there is found varied forms of these parts and in some of the groups there is no crop.

The oesophagus is usually short and often the walls are partly chitinized. Sometimes the anterior part of the oesophagus is differentiated so as to form a pharynx. As a rule the oesophagus is surrounded for a part of its length by the brain, which is formed by the union of the sub- and supra-oesophageal ganglia. The oesophagus begins near the base of the smaller mouth parts, as the labium or maxillae, and passes directly backwards to the crop or the stomach. In the Gamasidae the oesophagus is long and rather narrow and may compose about one-half the length of the alimentary canal.

In most of the Oribatidae the ~~oesophagus~~ oesophagus is short and may be composed of rings which vary in number from about half a dozen to two dozen. In the Uropodidae the oesophagus is rather small and without rings.

The crop is a structure which may be present in some of the Acarina. It begins as an enlargement of the posterior end of the oesophagus and is very prominent in some of the Oribatidae. It is a smaller structure than the stomach and is often surrounded by circular bands similar to those seen on the oesophagus. Some authors call the crop the ingluvies.

The stomach is the largest and perhaps much the most important

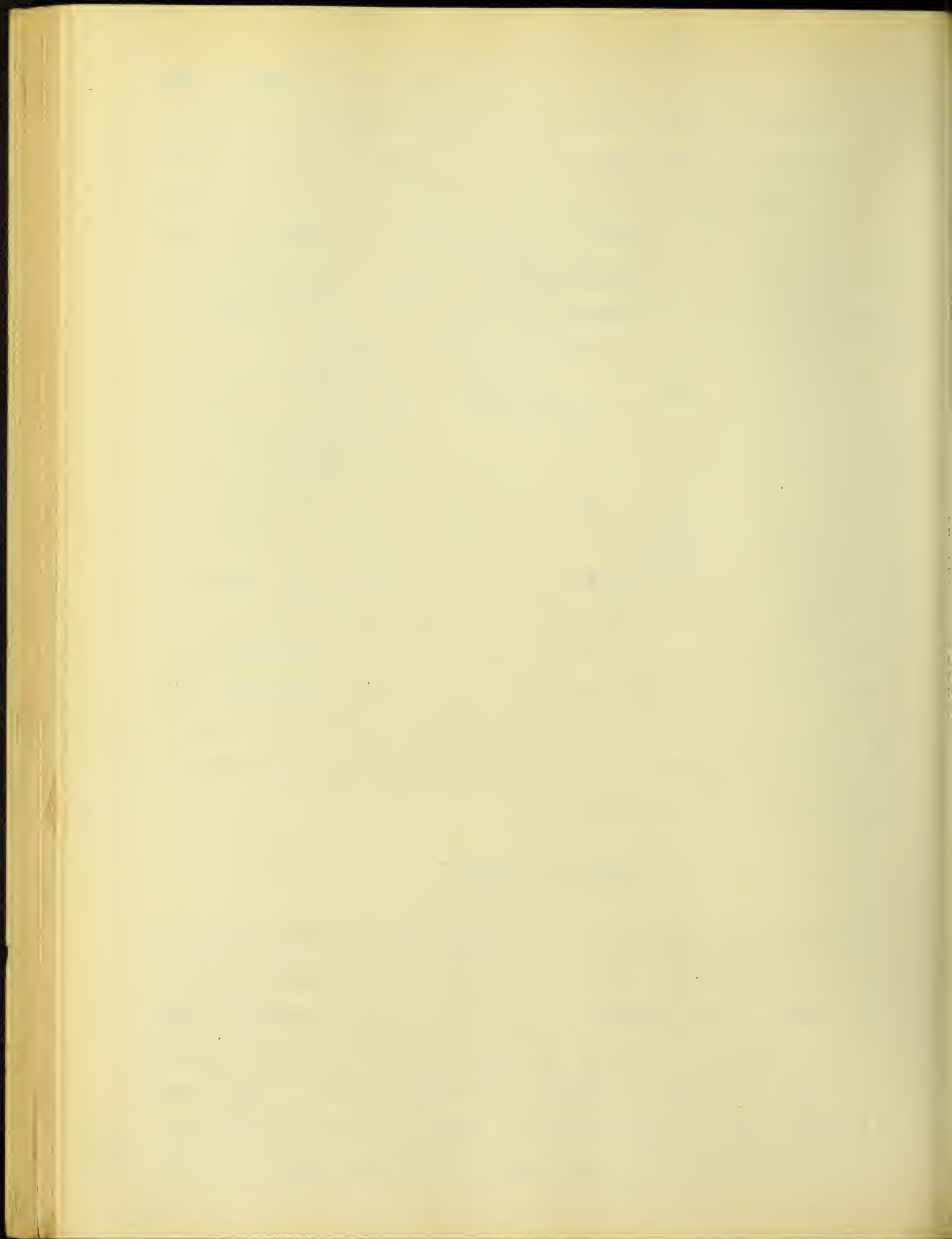


part of the alimentary canal. It is situated in the anterior part of the abdomen and may often be seen without dissection in specimens which have a thin integument. The stomach is often far from being a simple organ for it may contain large pocket-like structures or caeca which in some of the Uropodidae are larger than the stomach itself. In the Oribatidae the stomach usually has two such caeca which pass backwards from each side of the stomach. The caeca appear much more granular than the stomach.

The intestine, like the crop, is not always found, but in those forms in which the stomach is connected with the anus the intestine is usually found to be a short, thick tube of varying diameter. Some authors divide the intestine into three parts: the small intestine, the colon, and the rectum. With most forms these divisions are more or less arbitrary, but in some they represent well marked divisions. The colon and rectum are much greater in diameter than the small intestine, and are usually separated by a constriction of the intestinal wall. The rectum communicates with the anus, which in some species is situated dorsally, in others at the tip of the abdomen, and in most of the species on the postero-ventral aspect of the abdomen.

DIGESTIVE GLANDS.

The digestive glands are little understood. Around the anterior part of the oesophagus there are frequently found glands, some of which open into the pharynx and are called salivary glands. They are well developed in some of the Gamasidae. Mr. Michael describes a small pair of glands situated on the anterior wall of the stomach in Oribatid mites. They are almost spherical in shape and may be provided with a long duct which empties into the stomach.



In the Gamasidae, Sarcoptidae, Uropodidae and Oribatidae is found a thick layer of follicular cells which may coat over a large part of the stomach and its caeca. This tissue is regarded as the liver by some authors.

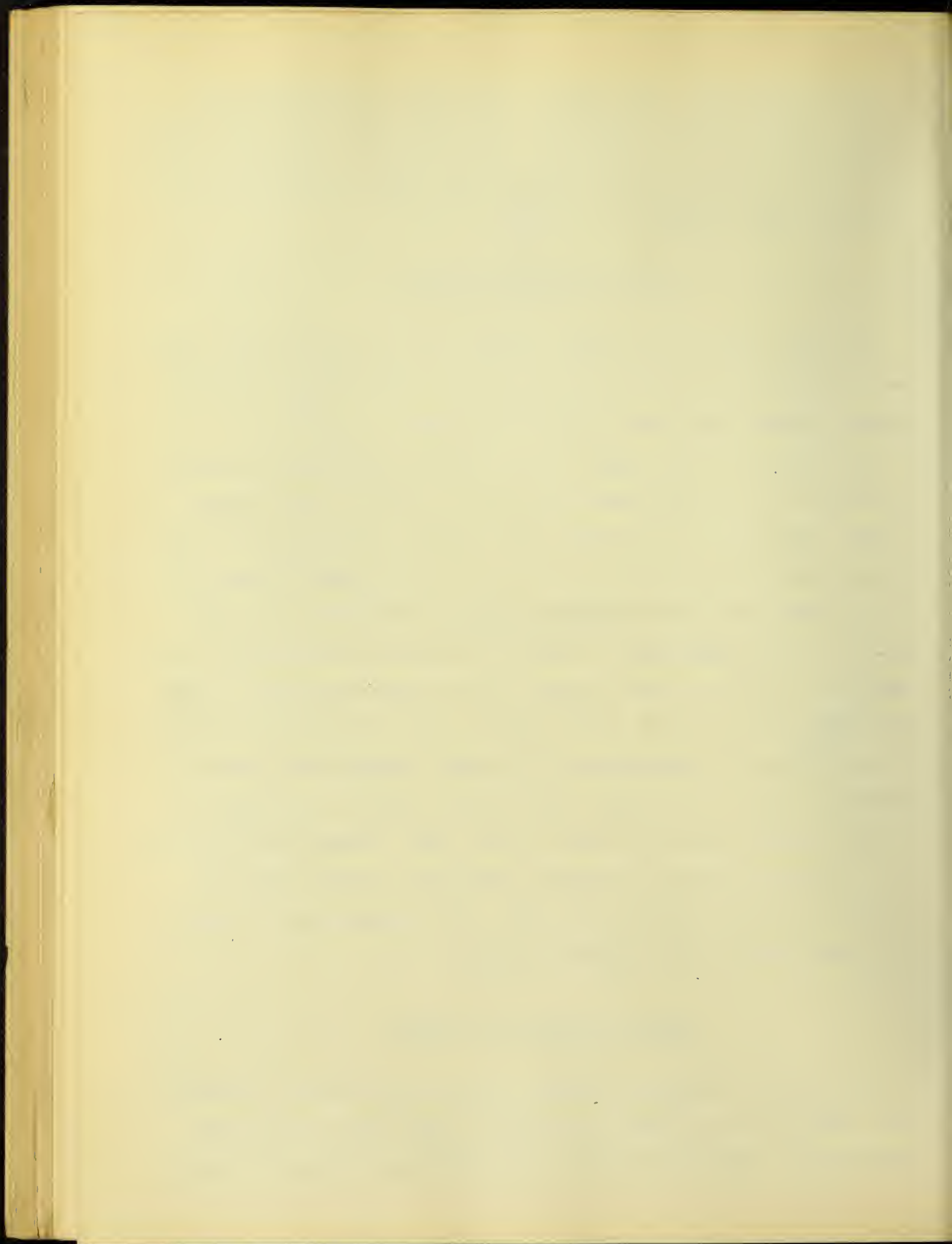
MALE REPRODUCTIVE ORGANS.

The male reproductive organs consist of one or more testes; the vasa deferentia; the ejaculatory duct and sometimes an extensible penis, besides one or more accessory glands.

The testes are very large in most forms and are often bilobed. In some mites the two testes are united to form a single median organ. From each of the testes there passes a duct the vas deferens which unites with its fellow to form the common ejaculatory duct. Some mites, as the Pediculoididae, have a well developed penis. In the Gamasidae the seminal elements are carried off in a small sac, which the male pierces with his mandibles after it has been applied to the vulva of the female, thus liberating the sexual elements into the spermatheca of the mate. Perhaps the most remarkable feature of the male reproductive system is the large accessory glands which are found in some forms. These may be four or five times as large as the testes themselves, in fact much the largest structures found in the body. The spermatozoa are nonmotile and usually oval or spindle-shaped.

FEMALE REPRODUCTIVE ORGANS.

The female reproductive organs consist of the ovaries, (which are sometimes united) and the oviducts, which unite to form the vulva; while sometimes there is a spermatheca and often an extens-



ible ovipositor.

The ovaries are often united into a single median organ. They are often somewhat smaller than the testes. The oviducts are rather large structures and when containing developing eggs may become the largest organs of the body. The ovaries with the enlarged oviducts containing eggs are often seen without dissection in gravid females. It is doubtful if the vulva is ever used as a bursa copulatrix in some families, as Oribatidae and Hoplodermidae. The "beetle mites" have never been found mating and the method of fertilization in this group is unknown.

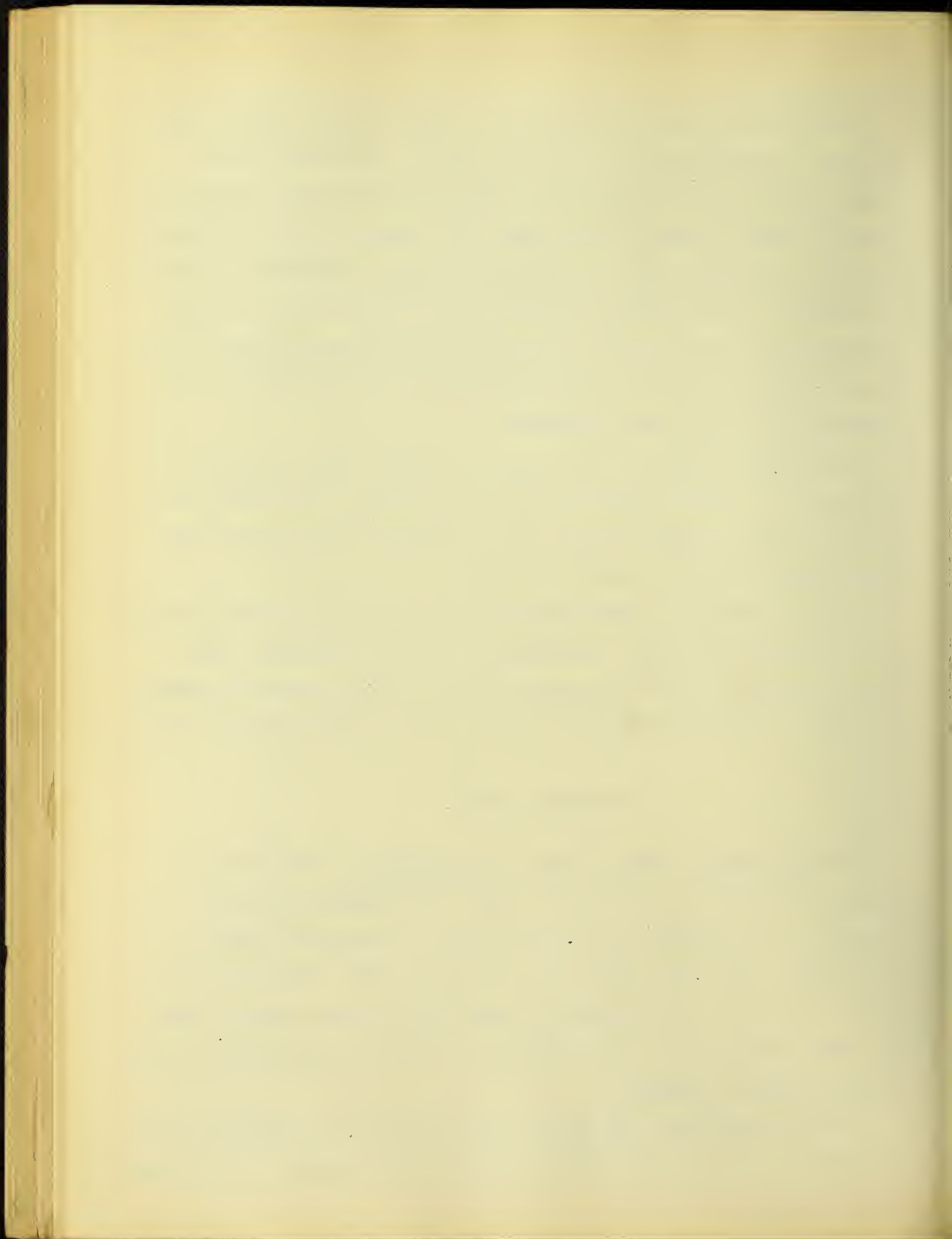
The females of some of the families possess large extensible ovipositors. These ovipositors may be as long as the entire mite. They are usually segmented and may be provided with prongs at the distal end as well as several bristles.

Both the males and females often possess genital suckers situated at the genital opening. They perhaps function in mating. The genital opening in the two sexes may vary in position and sometimes is protected by small ^{hi} winged chitinous plates called genital covers.

TRACHEAL SYSTEM.

The Eriophyidae, Canestrinidae, Tyroglyphidae, and some other families, as well as the young of many of the Acarina have no tracheae. The tracheae as a rule are long, coiled tubes which do not branch. As a rule there are one or more main trunks on each side of the body. The method by which the tracheae open is taken by some authors as the chief character for the classification of the higher groups of Acarina.

In the Trombididae, Eupodidae, and several of the families closely allied to these, the tracheae open through stigmata near the base



of the mandibles. In the Oribatidae, Hoplodermidae, and Nothridae the tracheae, which are long tubes extending the entire length of the body, open into the acetabula of the legs. The nymphs of these families have no tracheae. In the Gamasidae, Uropodidae, Dermanyssidae, Ixodidae and Argasidae, the tracheae open through a spiracle situated on a stigmal plate on each side of the body. In some cases the tracheae extend far into the legs; usually they are well distributed in the body with few extensions into the legs.

EXCRETORY ORGANS.

In some mites there are Malpighian vessels which open into the intestine. They are short and not found generally in the order. In the Uropodidae, they may be two-thirds as long as the entire digestive canal and are very large in diameter.

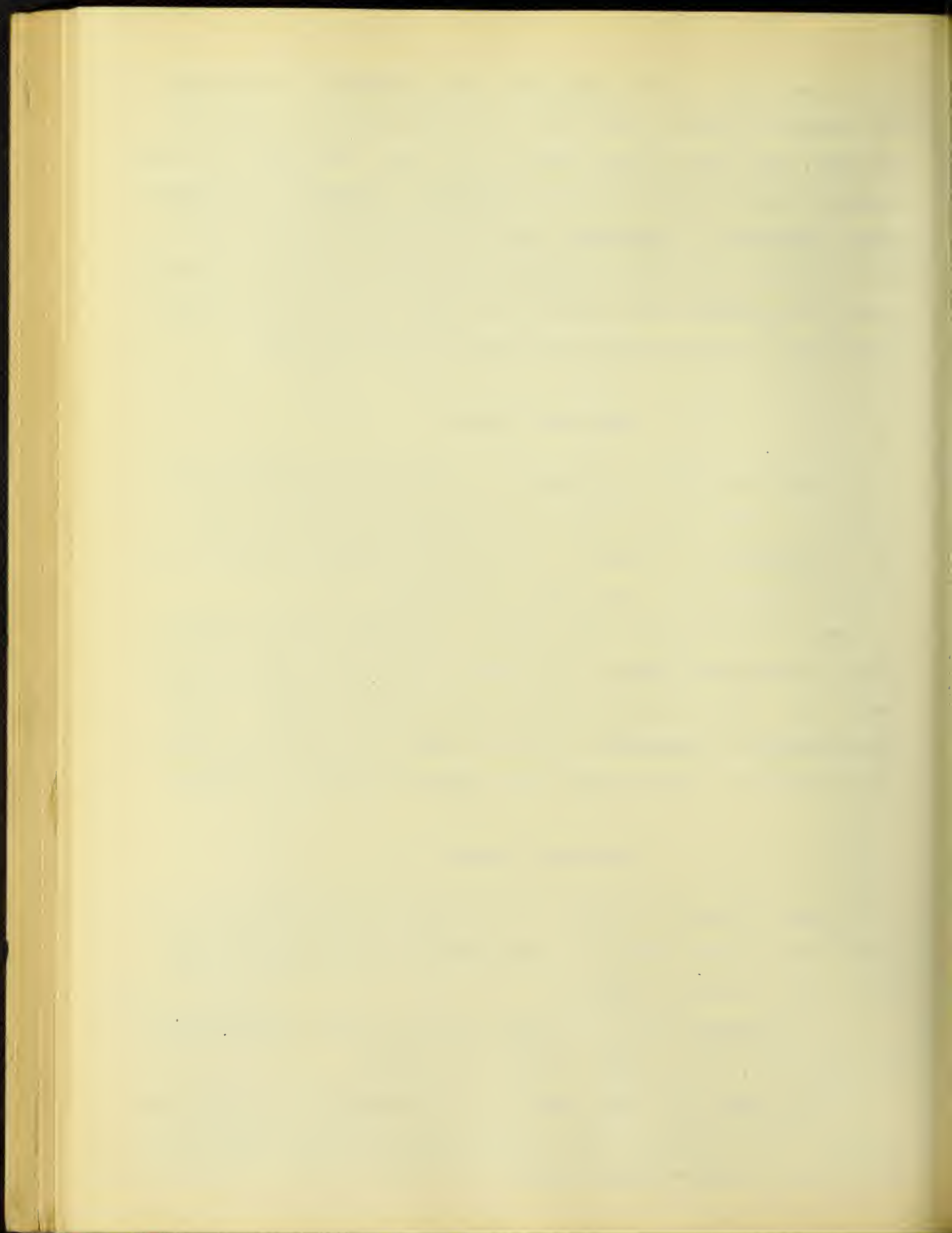
Some of the Oribatidae have a pair of sac-like organs situated in the abdomen which open to the exterior through an external chitinous tube. These have been regarded as excretory organs. The Tyroglyphidae and Gamasidae also have organs in the abdomen which open through the skin and have been regarded as excretory organs.

MUSCULAR SYSTEM.

The most prominent muscles in the body are those which move the legs. Besides these there are large muscles for the mandibles and often for the genital armature.

In the Gamasidae there are large muscles for the retraction of the mandibles, also a large levator ani muscle.

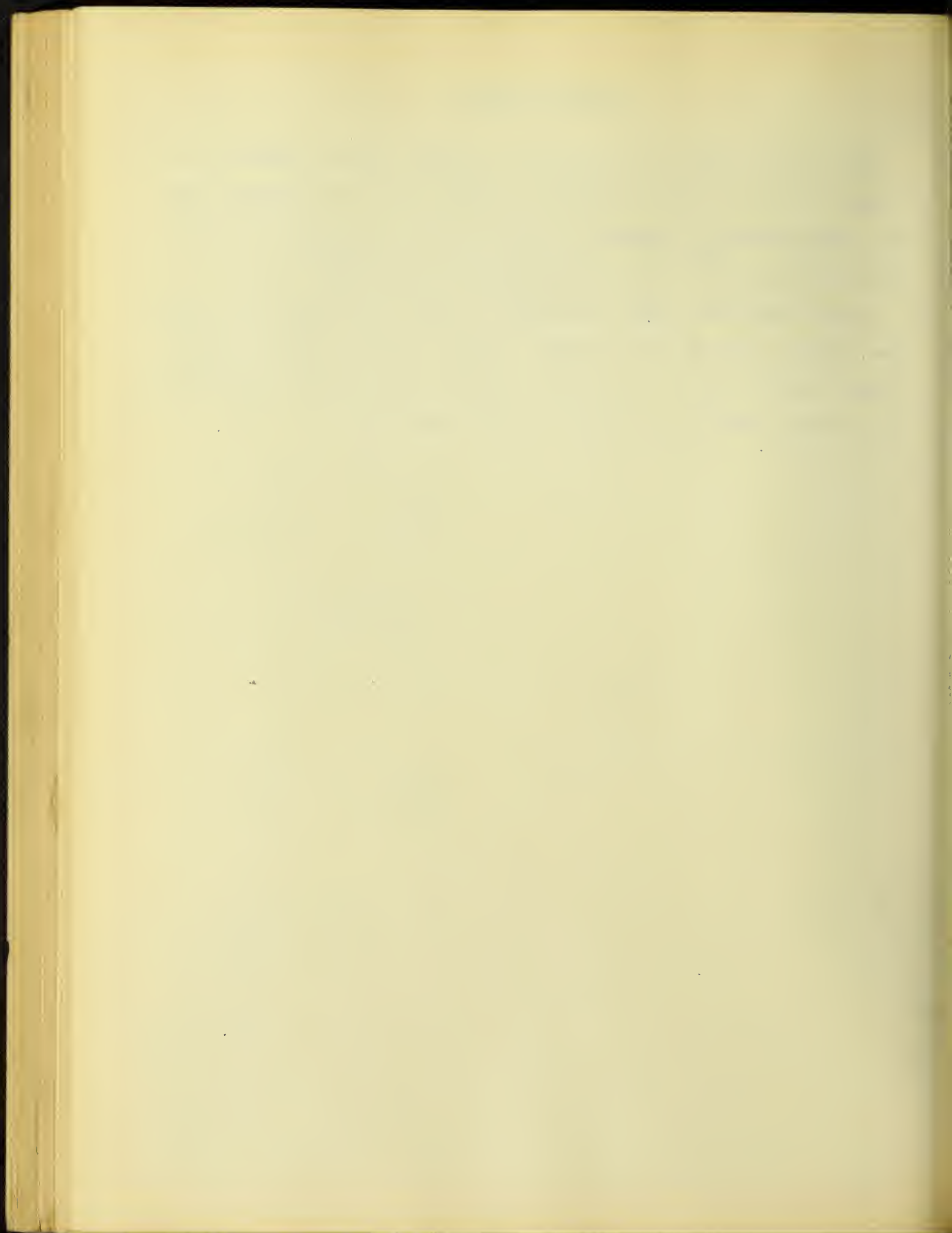
The Bdellidae have large muscles in the mandibles for moving the chelae. The interiors of the legs and palpi are almost completely filled with striated muscle fibres.



NERVOUS SYSTEM.

The nervous system is composed of a large central ganglion, or brain, which is really two ganglia united, the subœsophageal and the supraœsophageal ganglia. From this main ganglion or ganglia several nerves go to the different parts of the body.

Nerves have been found distributed to the eyes, mandibles, pharynx, palpi, legs and the internal organs. Michael reports having found a nerve going to the pseudostigmatic organ of the Oribatidae, but he was unable to trace its central connection.



HABITS.

The habits of the mites, though, in many cases, not well understood, are very interesting.

The mites live, as a rule, upon plant or animal substances, few having a mixed diet. The vegetable feeders may be divided into two classes: (1) those which go from plant to plant and live by sucking some of the juices from each and those which are plant parasites living inside of galls. Those living upon animal material may likewise be divided into two classes: the parasites and the predaceous mites.

Among the best known of the vegetable feeders of the first class are the popularly called "red spiders," the Tetranychidae, which live on plants, under bark and on fruits. These forms obtain their food by sucking the juice from the plants upon which they feed. The Rhyncholophidae have long styliform mandibles for piercing plant tissues and thus obtaining their food. Many of the Oribatidae and Tyroglyphidae live upon small fungi.

The gall mites are confined to a single family, Eriophyidae. These individuals live in small galls of various shapes but each species produces its own characteristic form of gall. The galls always have an opening to the exterior and usually are tipped with brown or black.

The best known parasitic mites are the Ixodidae, or ticks. These mites are strictly parasitic and when found upon the ground or upon bushes or on bark, are either preparing for an ecdysis or have transformed and are only awaiting a host. The Gamasidae are largely parasitic and may be found on insects as well as on birds or mammals.

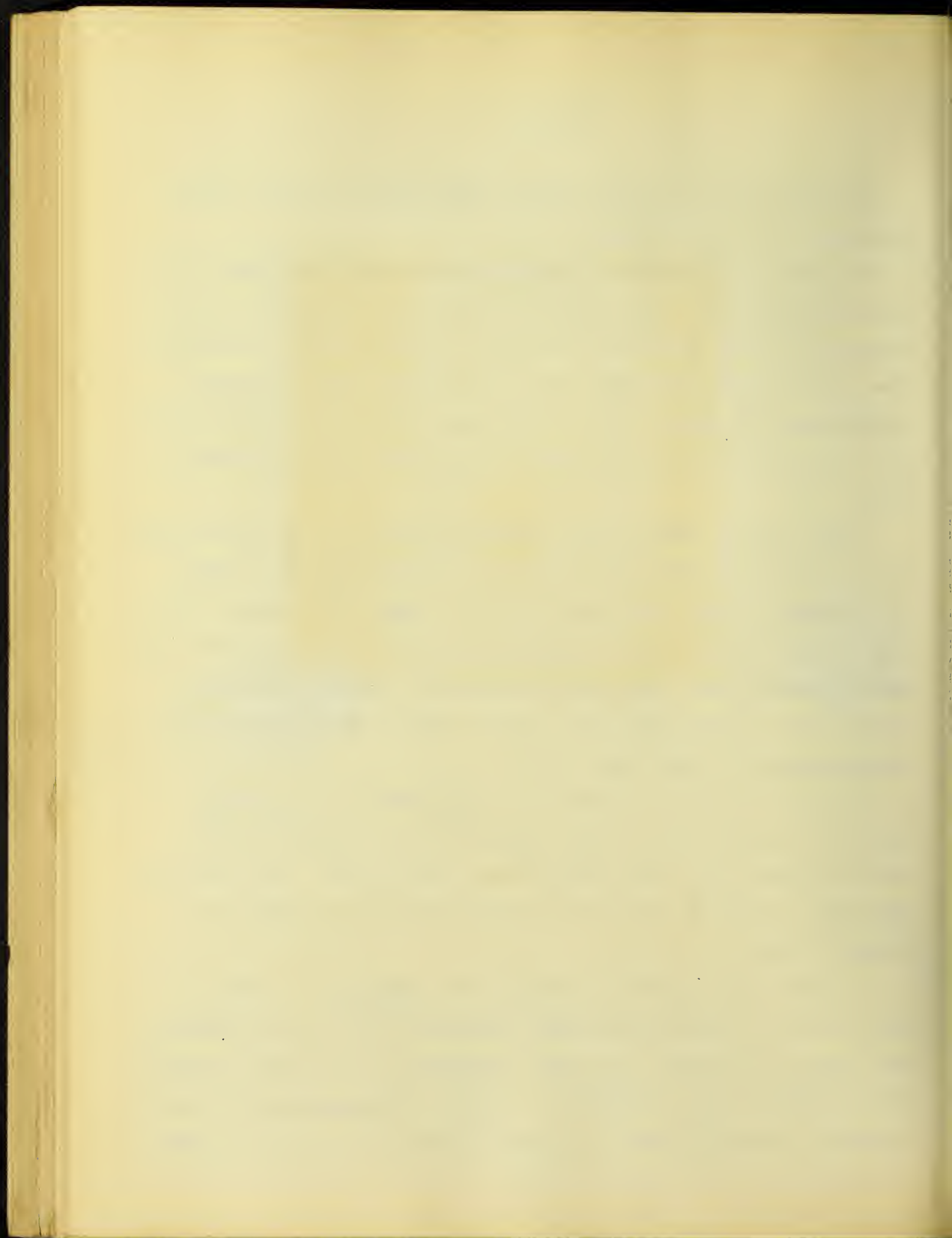
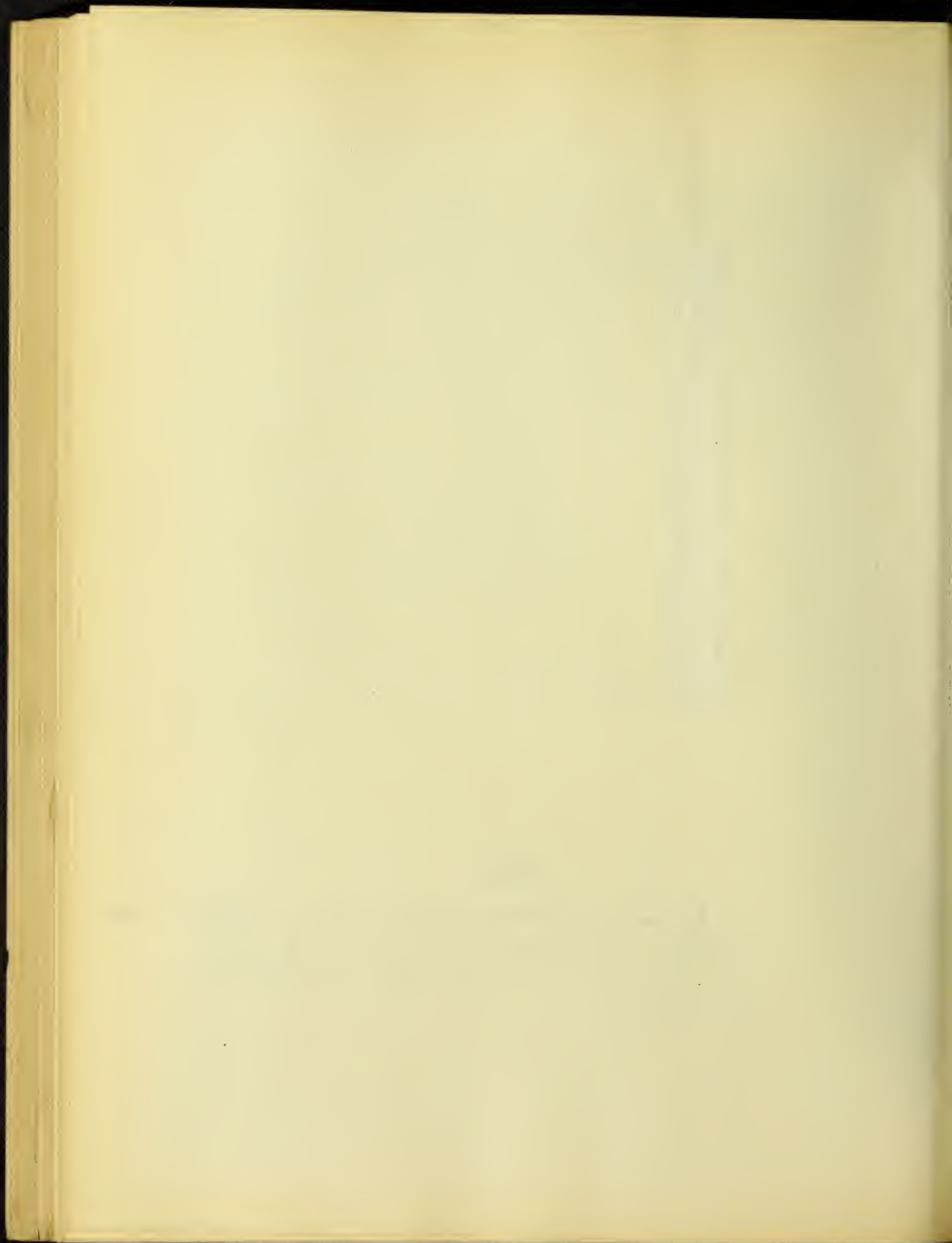




Fig. 4.

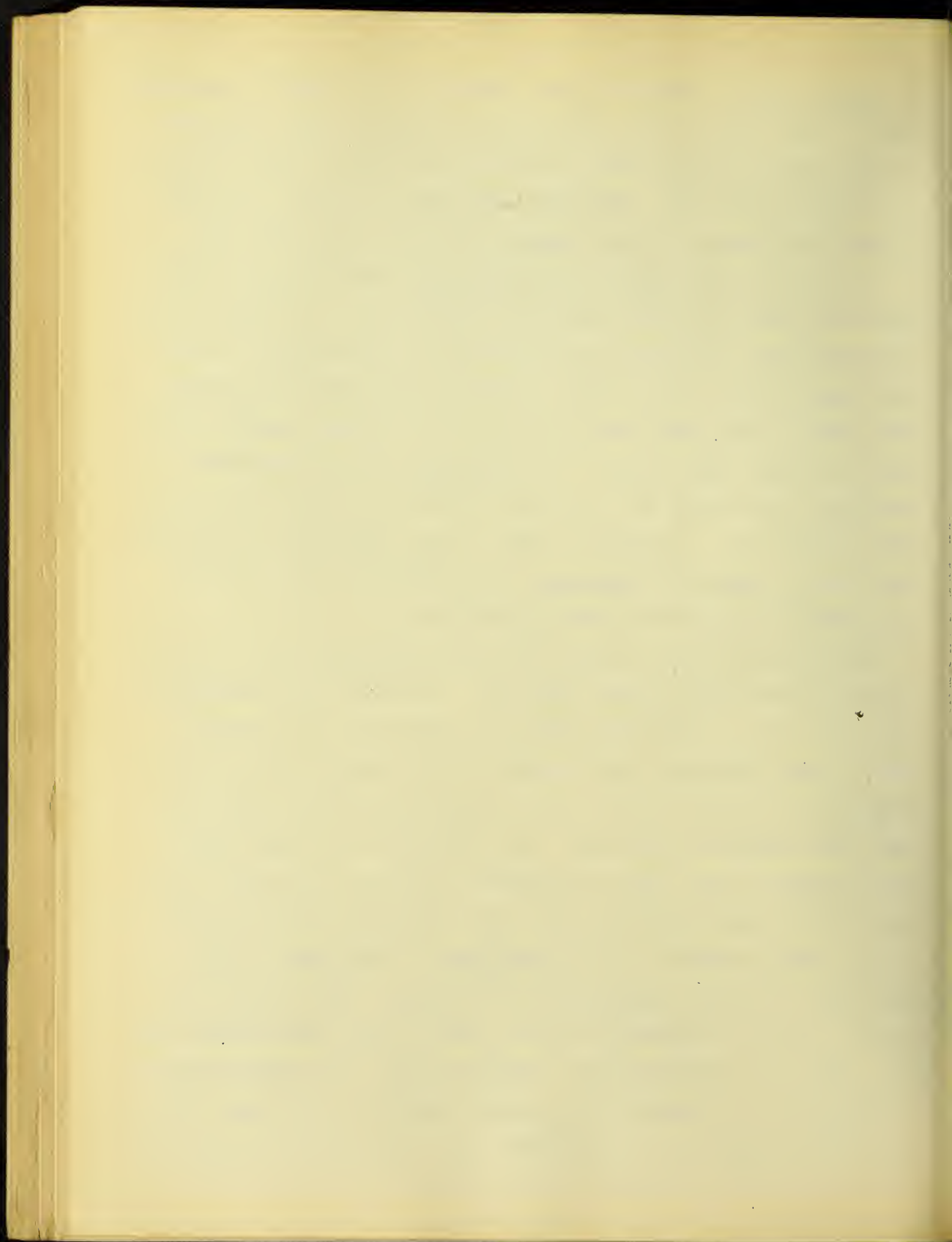
Gamasus (sp.) Dorsal view x 40. Between the bases of the palpi can be seen the tips of the large chelate mandibles. The mandibles are retractile and when fully extended often surpass the palpi. (Photo by the author).



The Sarcoptidae are among the most injurious of the parasitic Acarina. Many of these species live in the skins of mammals, where they burrow and lay their eggs; which processes often causes intense itching on the part of the host. The Demod^{eci}idae live in the hair follicles of man as well ~~as~~ as of other mammals and often cause tubercles.

Of the predaceous species, the Cheyletidae have by far the best structural adaptations for siezing and holding prey. In these mites the palpi become enormously enlarged and are armed with one or several large, stout, curved, claws, which in some cases are provided with teeth. With these weapons they catch and destroy smaller mites as well as some small insects. The Bdellidae have the mandibles enormously enlarged so that they form a beak at the end of which are pincer-like chelae. By means of these chelae they sieze and destroy their prey. Some of the Gamasidae are predaceous, being provided with powerful, retractile chelate mandibles.

The protective and defensive habits are naturally most noticeable in those forms which are not predaceous. In none of the groups can there be found as interesting defensive habits as in the "beetle mite^s." The "beetle mites" are vegetable feeders and are very poorly adapted for offensive warfare, as the mandibles and palpi are very small and sometimes rudimentary. But by having a very hard shell, and by means of their peculiar anatomical structure and habits they can protect themselves better than any of the other acarids. Many of the "beetle mites"-- all the Oribatidae of this paper-- have chitinous, wing-like expansions to the abdomen. These wings often extend forwards as far as the entire length of the cephalothorax and are generally capable of being folded down upon the ventral surface of the body so as completely to conceal and protect the legs. Thus when one of these mites is disturbed it at once lets go its hold with



its feet and falling to the ground, closes down the abdominal wings covering the legs, and in this attitude remains quiet for some time. Thus the pursuing enemy encounters a hard, chitinous ball, often about the size of a turnip seed, but presenting no exposed soft parts or protruding limbs. The Hoplodermidae have exactly the same habits as the Oribatidae but their structural adaptations are entirely different. In the members of this family the cephalothorax is movably attached to the abdomen and capable of being folded down over the ventral surface of the latter so as to completely cover the legs. In the Uropodidae many of the genera have impressed foveae on the ventral surface of the body for the reception of the legs, which, when drawn into this groove, are well protected from the attack of a predaceous enemy.

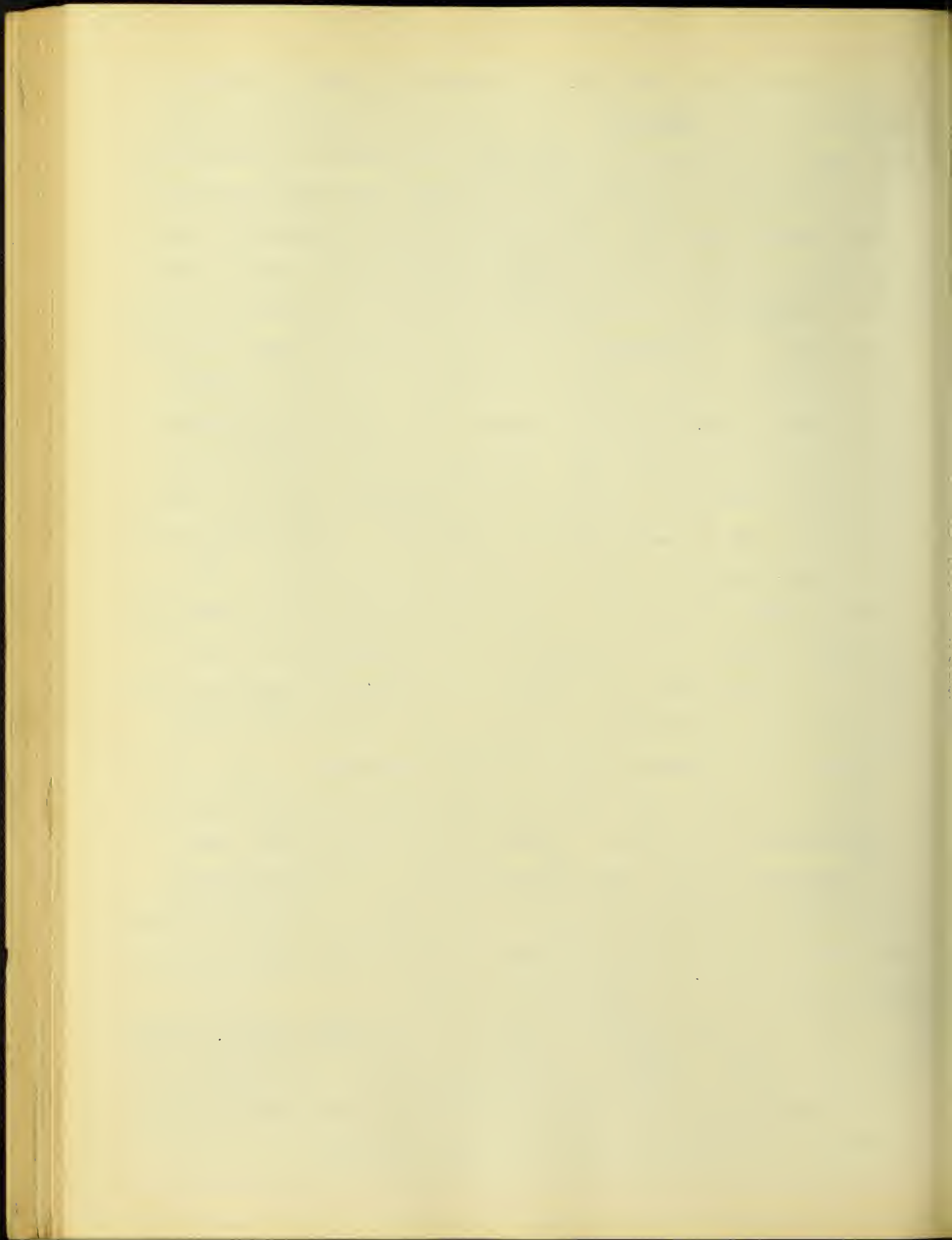
A great many of the Acarina "feign death" when disturbed. In all instances the legs are folded up as closely as possible to the body, although they are protected in no special way by the latter. Among those acarids which have this habit are found many of the Tetranychidae, Trombidiidae, and Rhyncholophidae.

Speed and manner of locomotion are methods of protection often resorted to by some mites. Among those which are especially active are some of the Gamasidae and the Eupodidae. A species of the Erythraeidae, Anystis agilis, has the power of avoiding its enemies by running rapidly in any direction, though most often in circles. It is very difficult to capture individuals of this species because of this habit. One of our common species of Linopodes has a peculiar habit of turning "about face" and running backwards with great rapidity, dragging after it its long anterior pair of antenna-like legs; this is almost always done when the individuals of this species are disturbed.

Mr. Michael first described the remarkable method of coition among some of the Gamasidae. For a long time it had been noticed that some of the males of the Gamasidae had mandibles provided with long, curved hooks or claws of various shapes, each form presenting a good specific character. This strong sexual dimorphism was long regarded as a purely secondary sexual characteristic, until it was shown by Michael that the mandibles were actually used during coition. In the males of the Gamasidae there is no extensible organ provided at the genital aperture, which is situated on the ventral surface at the base of the rostrum; but instead, the reproductive elements are carried off in a small sac. This sac is first blown out from the genital opening and is filled with sperm-mother cells and other secretions. ~~Now~~ ^The male applies the mandibles, one on each side of the sac, and pushes the latter into the vulva of his mate. Now either by means of pressure or by piercing a hole with the mandibles, the sperm elements are discharged into the spermatheca of the female. Mr. Michael was able to make a microscopical preparation which actually showed the mandible of the male cut out from the vulva of its mate-- the two having been killed while pairing.

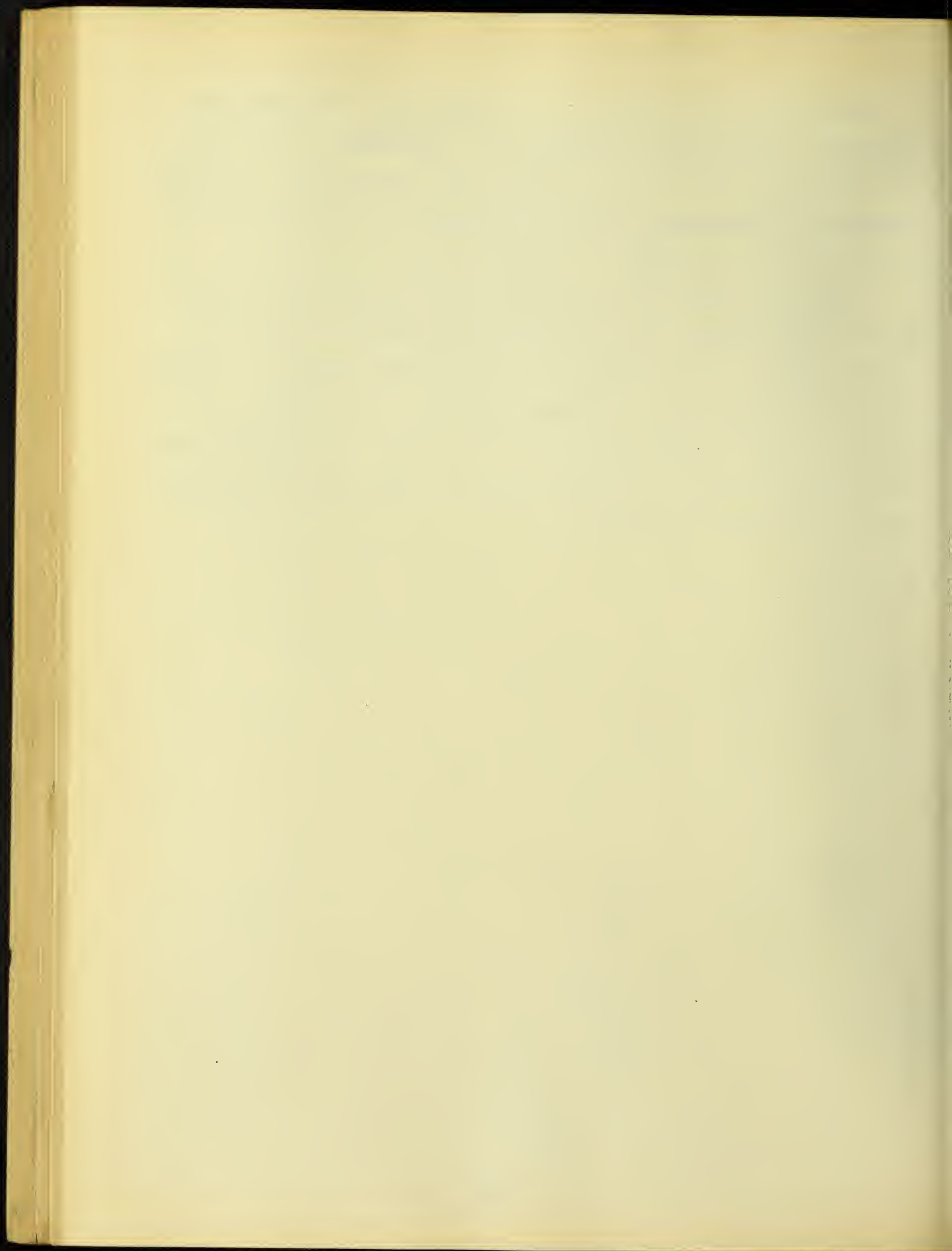
Many of the mites have been found associated with other species of Acarina and with insects. It was at first noticed that many of the Uropididae and the young migratory forms of the Tyroglyphidae were usually attached to other mites and insects. It was then thought that these forms were only parasites, but now we know that in nearly every case there is no parasitization at all.

Very often mites have been associated with certain plant diseases. At first they were thought to cause these diseases, but in most cases it now appears that the diseases are due to fungi and that the mites found with the diseases probably feed upon the fungi.



Many of the mites, as some of the Gamasidae, the Oribatidae, Nothridae, Hoplodermidae, Eupodidae, and Uropodidae, prefer moist, dark situations, as under logs, under bark, and in moss. The Trombididae, Tetranychidae, and the Bdellidae do not apparently avoid the light or dry atmosphere.

I made some observations upon the speed of different acarids. Of those experimented with, the Bdellidae proved to be the most active, some of the species of this family being capable of running over 600 mm. in a minute. The Oribatidae are very sluggish, some species moving not more than 10 mm. per minute. All the predaceous mites are very active, while the parasitic forms and the vegetable feeders are usually sluggish.



THE SENSE OF SMELL.

Experimental.

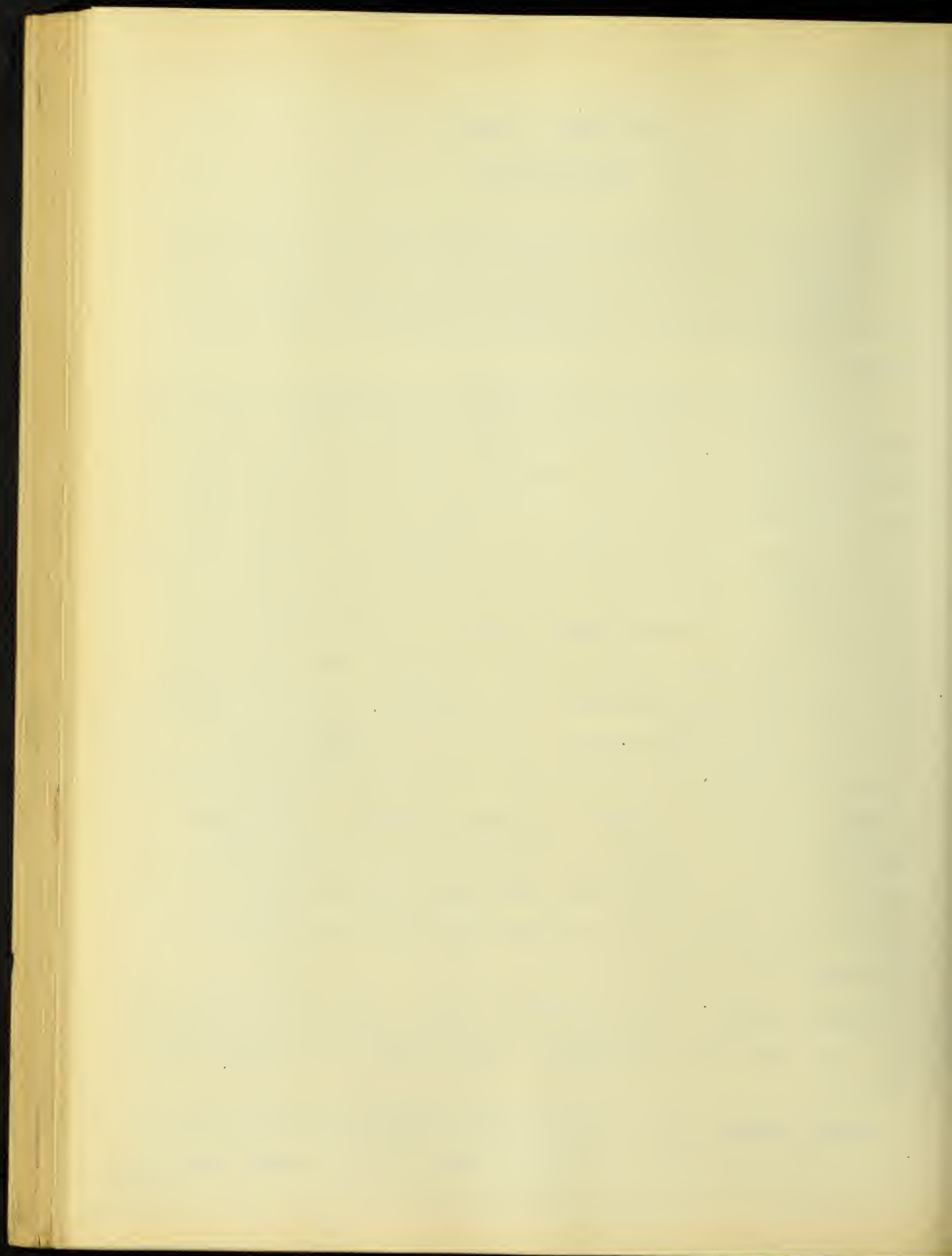
The object of the following simple experiments and observations was to ascertain if the mites had any sense of smell, and if so to find out in what groups or individuals it appeared to be best developed.

One of the Tetranychidae, Tetranychus tessellatus was placed upon the top of a flat table and after it had taken a definite course in walking, a small camel's hair brush saturated with ten per cent, acetic acid was held in front of the individual. The mite continued its course without hesitancy until it came into contact with the brush. When a drop of acetic acid was placed in the course of the traveling mite, it walked unhesitatingly on in the same direction until its front legs actually touched the acid. These experiments were repeated several times and in no instance did the mite avoid the acid, and it finally walked into the acid and was killed. A second individual was tried, but this also failed to avoid the acid.

The same test was applied to Bryobia pratensis. A great many individuals were tried with the acetic acid and in nearly every instance they would suddenly halt upon coming within an inch or so of the acid and without much hesitancy would turn around and walk in the opposite direction.

Oribata curva at first avoided the acetic acid, but soon got used to it and apparently did not avoid coming almost into contact with the brush.

Oribata banksi stopped abruptly upon coming within about half an inch of the acid, and after feeling around a little, walked away in



the opposite direction. In this case I followed the mite up with the brush and was able to turn it in any direction I wished by holding the brush on the opposite side of the mite. These tests were repeated, using oil of bergamot instead of acetic acid. One individual did not avoid the oil, but all the others did.

Next I tested Oribata lucasi with ammonia water on the brush. In every case the mites would face about, upon coming within two or three inches of the strong ammonia, and would walk rapidly away from it.

I next adopted another method. A large tube three-quarters of an inch in diameter and several feet long was laid upon the table along side a graduated scale (See Fig.). A small piece of cloth about

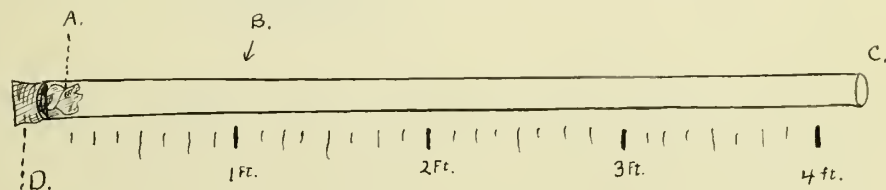
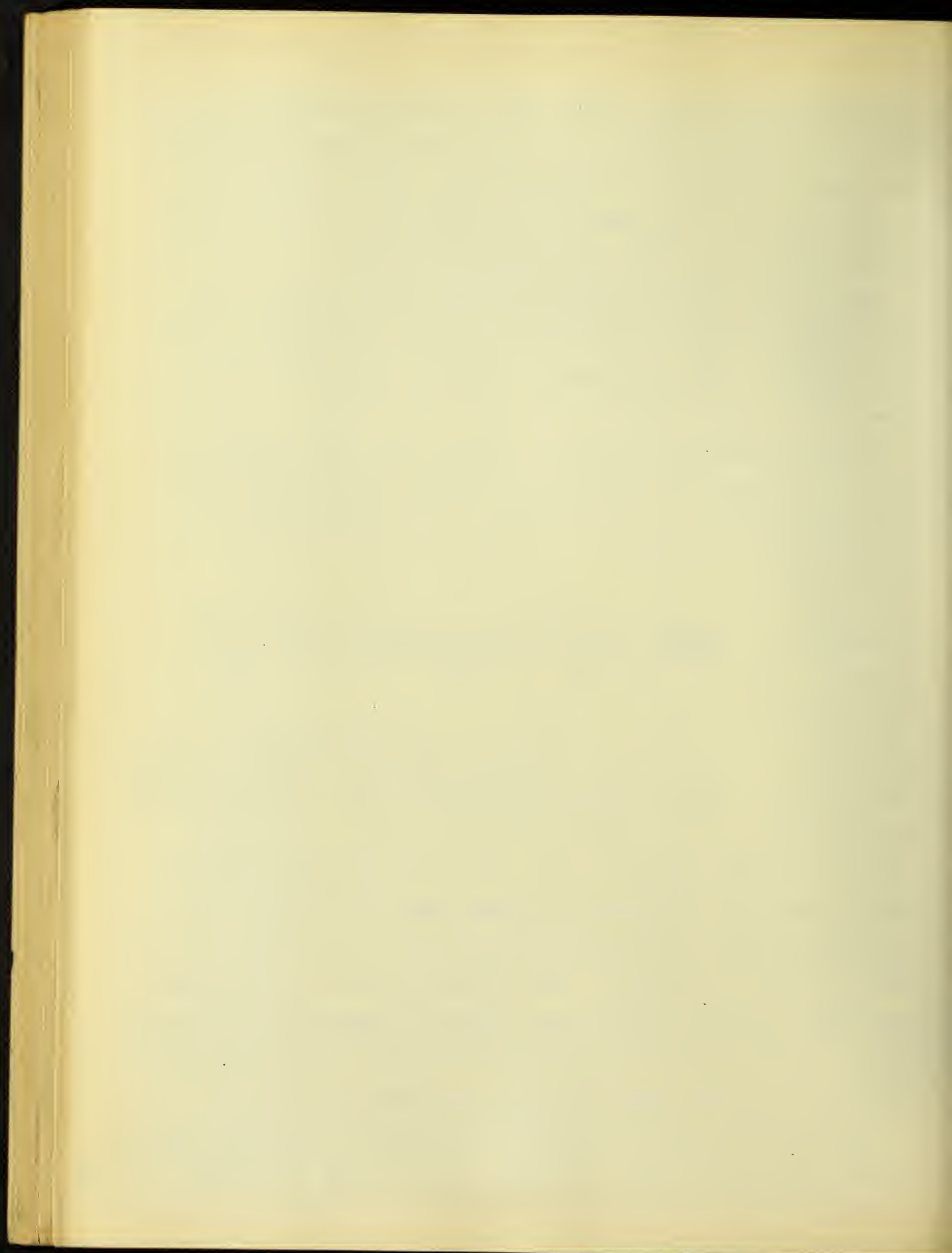


Fig 5 . Glass tube showing arrangement for test upon the sense of smell. A. A small piece of cloth soaked with dil. acetic acid. B. Point where the acarids were placed. C. Open end of tube. D. Cork to prevent escape of acetic vapors.

two inches square was soaked in acetic acid and a cork was procured which would

just fit into one end of the tube. Ten very lively specimens were now introduced into one end of the large glass rod by means of a long-handled spoon and were shaken out as near to one foot from the end of the tube as possible. Next the small piece of cloth soaked with acetic acid was placed in the end of the tube nearest the mites and the cork placed over it to prevent the acetic vapors from escaping at this end and compelling them to pass over the mites.

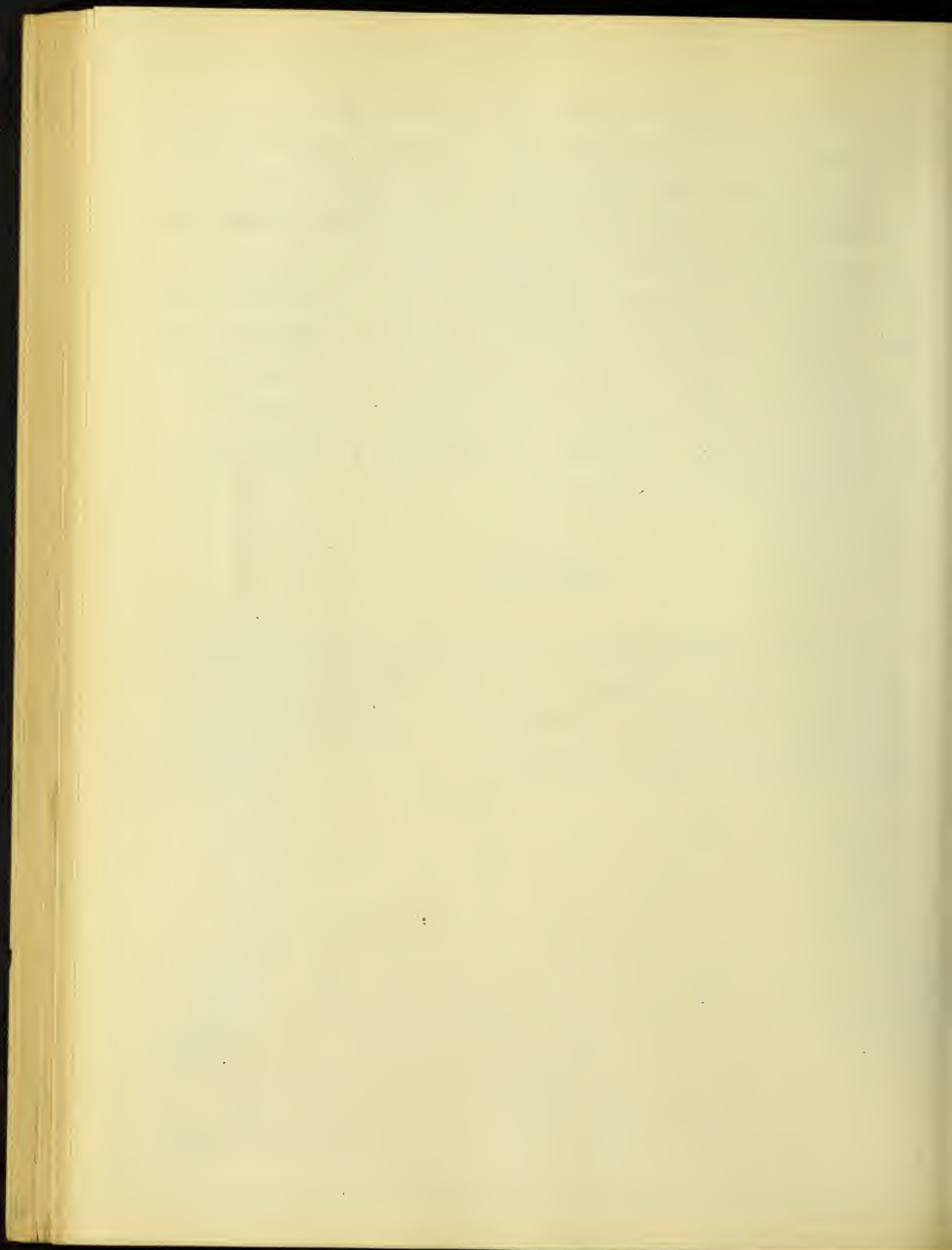
When the mites were thus placed in the tube the same number was on each side of the twelve inch mark. At the end of two minutes



seven were more than 1 foot away from the acetic acid. At the end of 10 minutes all the mites were quiet, apparently being stupified by the acetic acid vapors. By jarring the tube gently, all were roused again and to my astonishment, they began walking towards the acid until they became stupified again. Again the mites were aroused by jarring the tube, and as before, they walked nearer the acetic acid. At the end of fifteen minutes all the individuals except one were within one foot of the cloth soaked with acetic acid. At the end of twenty minutes all the individuals were quiescent. None were more than a foot away from the source of diffusion and six were less than 10 inches from it.

Conclusion.

From these simple observations it appears that some mites have the sense of smell, although probably poorly developed; also that after being subjected to certain odors for several times the power of detecting that odor is diminished.



DESCRIPTIONS OF GENERA AND SPECIES.

Fam. ERIOPHYIDAE.

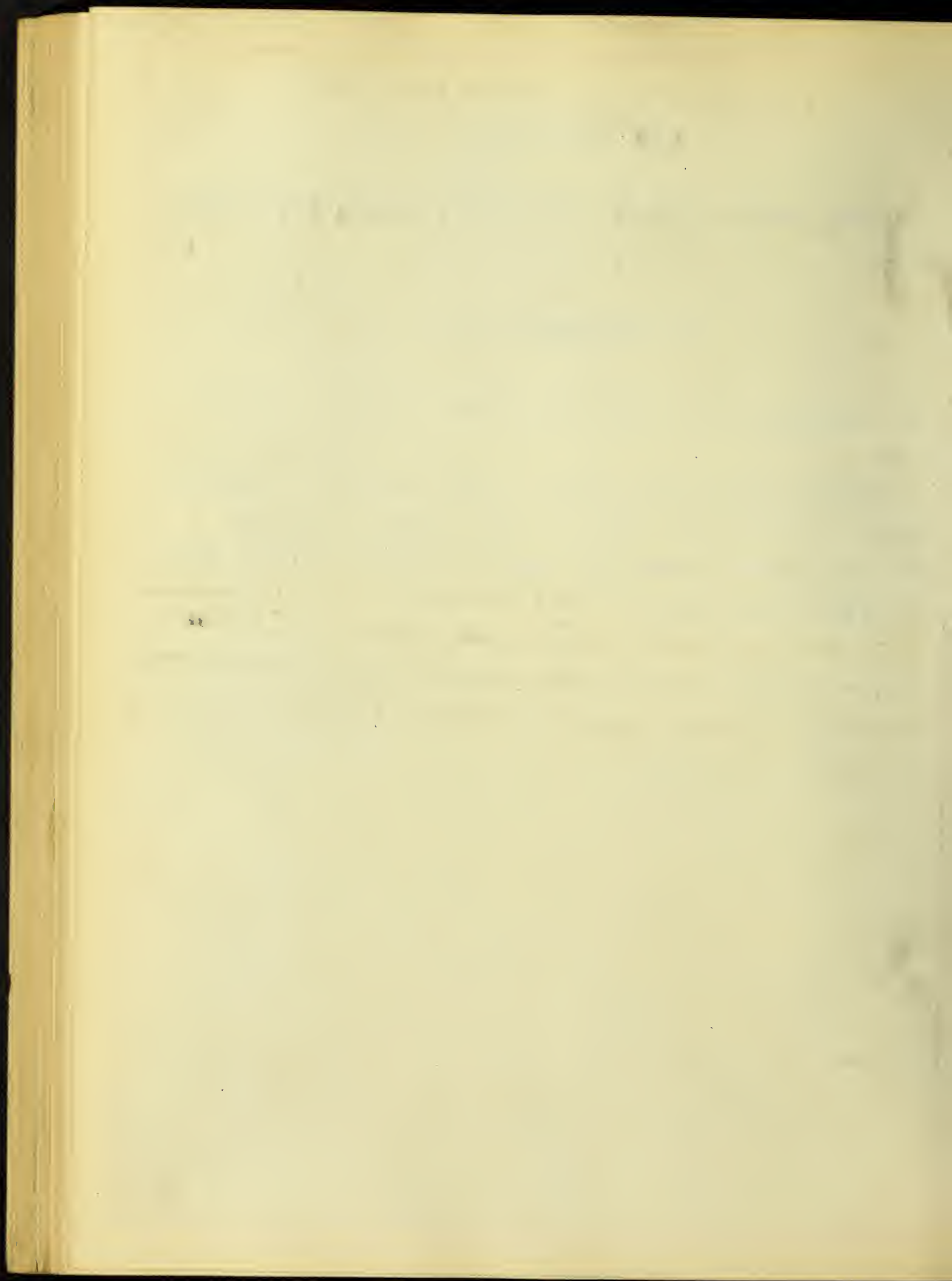
Abdomen annulate; with four legs of five segments each; living in galls.

Gen. Eriophyes Siebold.

1850. Eriophyes Siebold. Jahresber. Schles. Ges. Kult., vol. 28, p. 89.

Different from the other genera in that the number of abdominal rings on the dorsum and venter are nearly equal; in the other genera the number of abdominal rings on the venter is nearly twice the number on the dorsum.

Prof. Garman, in 1883, did considerable work upon this genus, and ~~his~~ ^{his} paper in the, Twelfth Report of the Ill. State Entomologist, is the most important one yet published upon the Illinois ^{acarid} fauna.



Eriophyes fraxini (Garman).

1883. Phytoptus fraxini Garman. App. 12th Ill.Rep.1883, p.136.

Body finely striated, the number of striae being about 80.

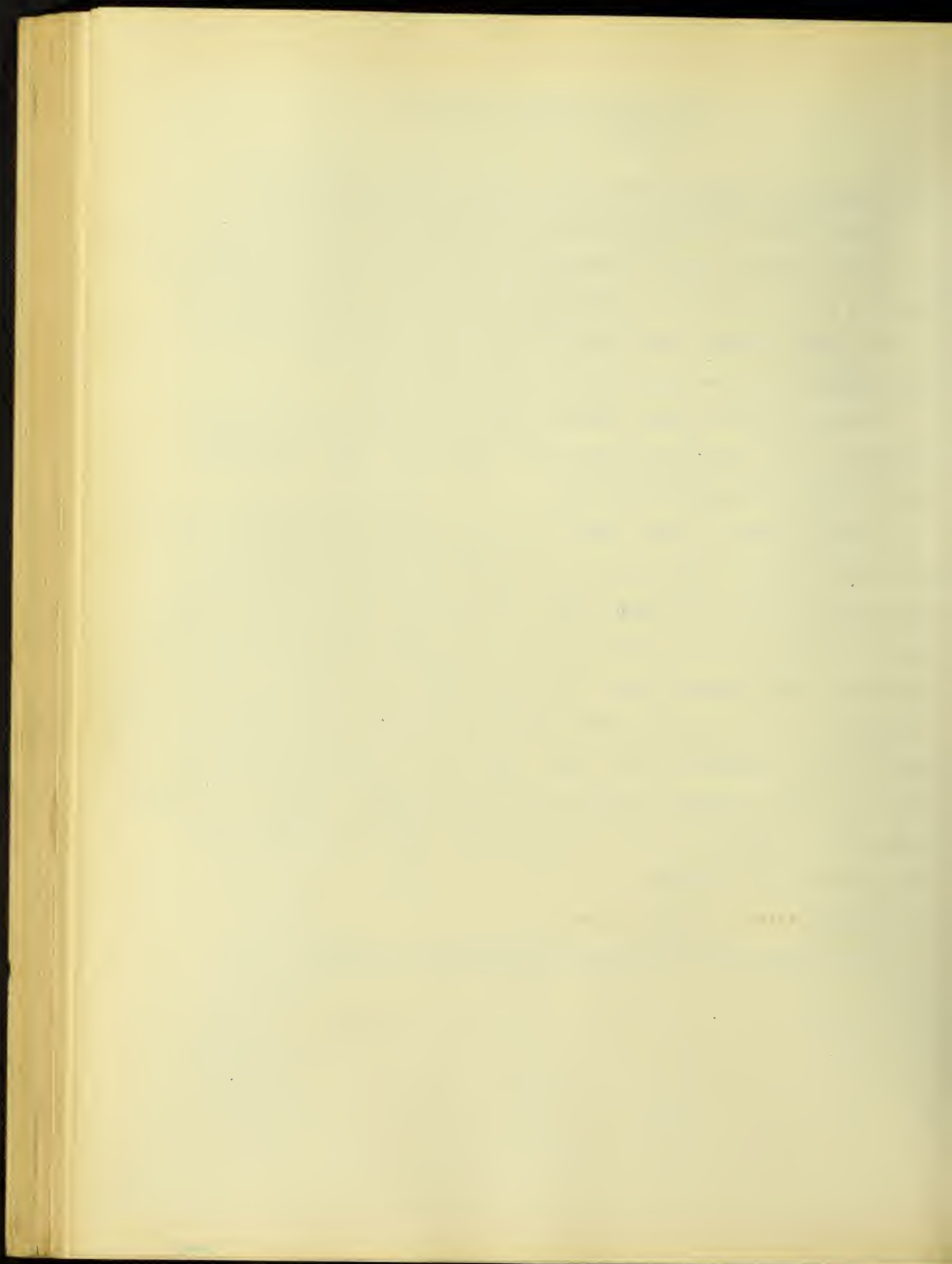
Cephalothorax about as broad as long and bearing at its posterior margin a pair of straight, simple bristles about one-third as long as the cephalothorax itself; an anterior pair of smaller bristles. Capitulum as broad as long; mouth parts small.

The two pairs of legs subequal, about as long as the cephalothorax and three times as long as the capitulum. Each leg bears several rather prominent bristles.

Abdomen three or four times as long as cephalothorax, one-third as broad as long. The first four striae are incomplete dorsally. The abdomen bears a prominent pair of bristles situated on the sides, near the anterior end. These bristles are longer than the posterior bristles of the cephalothorax. On the eighth ring from the rear is situated a pair of long bristles which are two-thirds as long as the width of the abdomen at this ring. There are two pairs of somewhat longer bristles situated at the tip of the abdomen. There is a small area at the posterior part of the abdomen, about as broad as long where there are no rings.

Length, 0.28mm; breadth, 0.06mm.

Ill. State Lab. Collections. From Normal, Illinois.



Fam. TYROGLYPHIDAE.

Palpi small, of three segments; without tracheae; females without clavate organ between legs I and II; genital suckers usually present, skin without fine parallel lines; a clavate hair present on tarsi of legs I and II; seldom parasitic.

But two Genera described in this paper:—

No sucker at tips of tarsi; tarsi with stout spines -----

Rhizoglyphus.

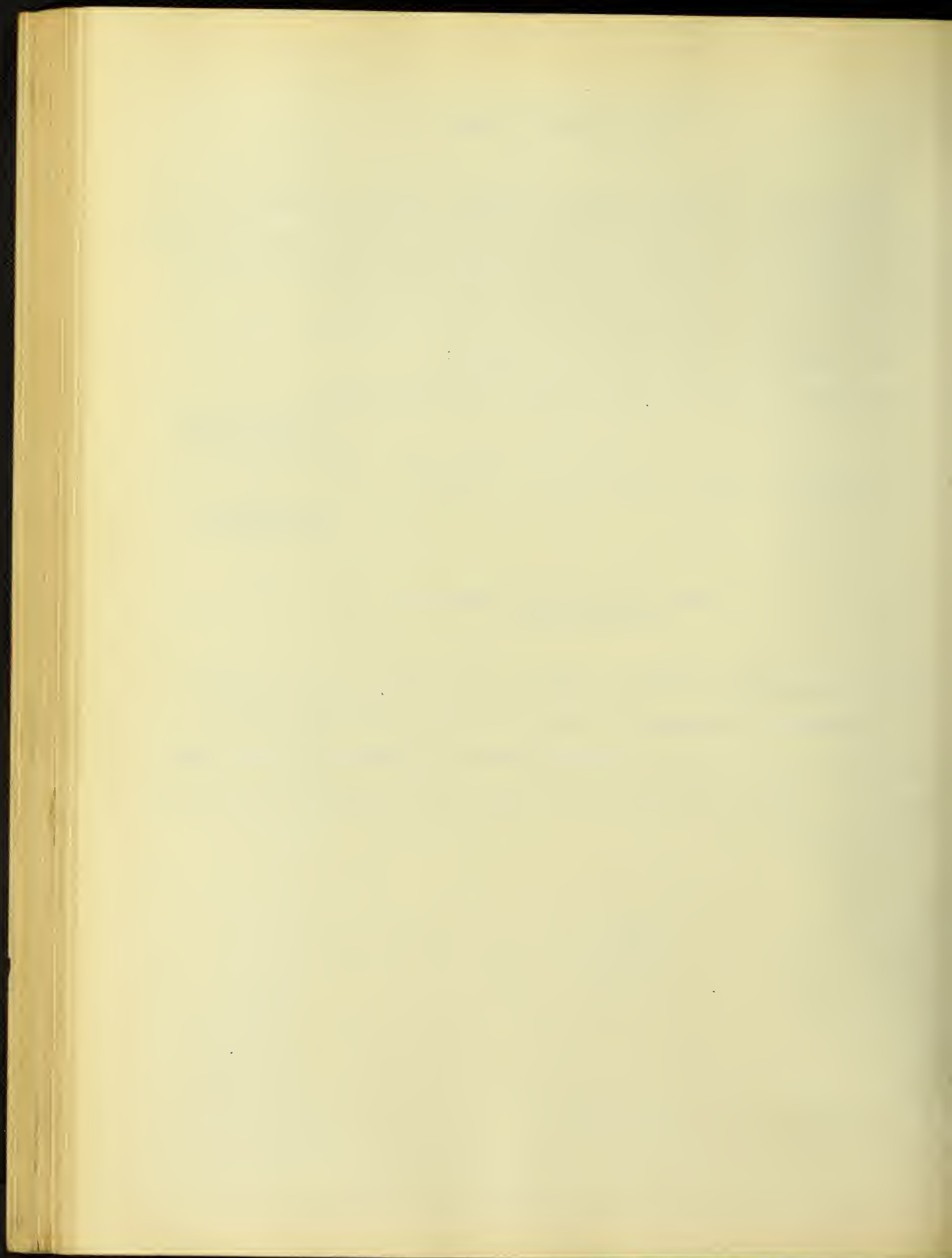
A sucker at tips of tarsi; no stout spines on tarsi -----

Tyroglyphus.

Gen. Rhizoglyphus Claparede.

1869. Rhizoglyphus Claparede. Zeits. wiss. Zool., vol.18, p.506.

Integument not granulate; claws distinct; mandibles chelate; a suture present between cephalothorax and abdomen; body not elongate; no sucker at tips of tarsi; leg I never thickened; tarsi with stout spines.

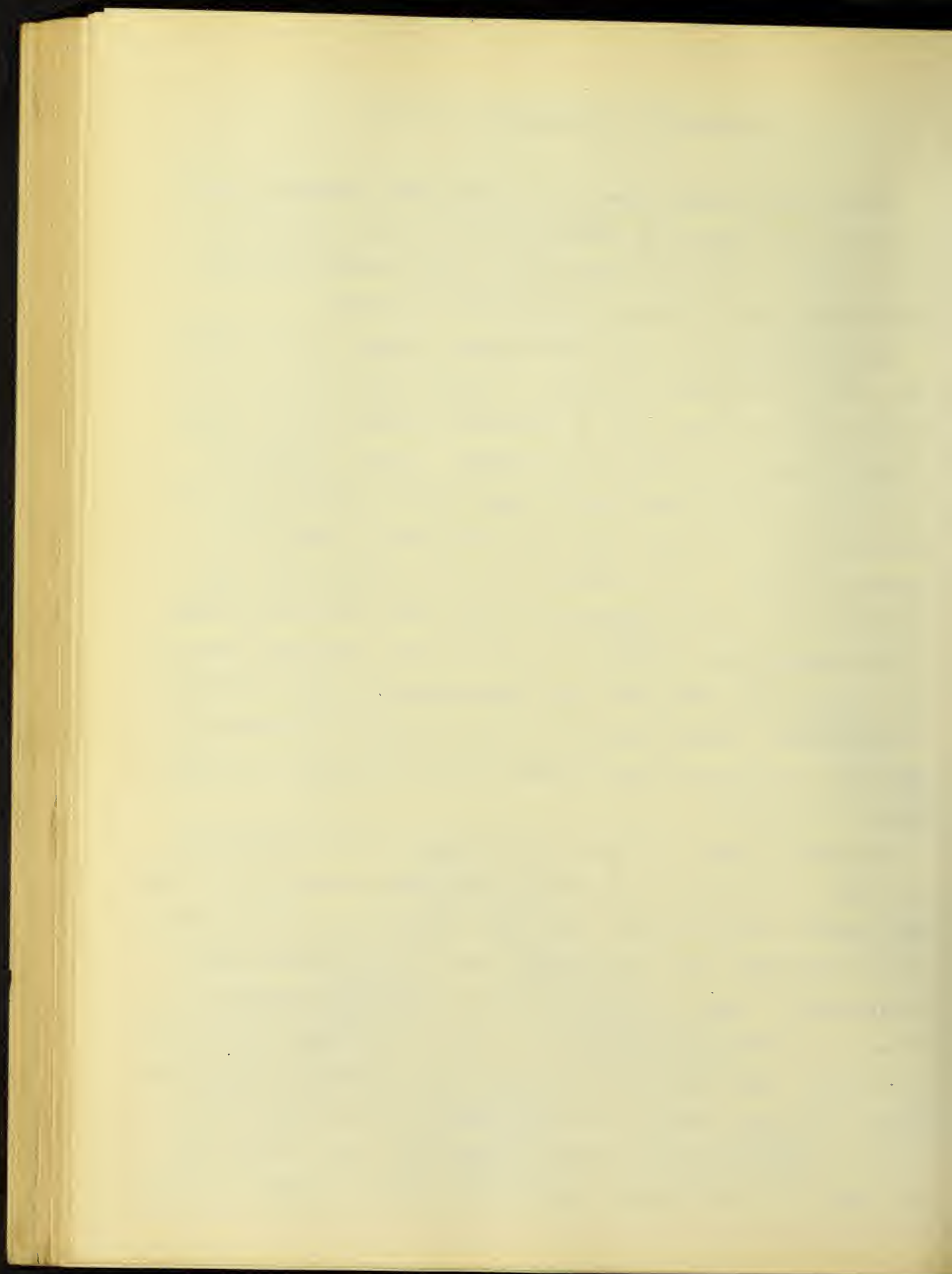


Rhizoglyphus robustispina n.sp.(?)

Cephalothorax broader than long; sides almost straight; posterior bristles as long as the cephalothorax, situated the width of tibia I from the posterior margin of the cephalothorax; anterior bristles two-thirds as long as the posterior bristles.

Abdomen broader than the cephalothorax, broadest at the middle, and rounded at the posterior margin. Abdomen about two-thirds as broad as long, bearing a pair of prominent shoulder bristles equal to about one-half the width of the abdomen. A pair of marginal bristles occur about one-third the length of the abdomen from the posterior end of the same; these are two-thirds as long as the shoulder bristles. At the posterior end of the abdomen are situated four pairs of long subequal bristles almost one-half as long as the abdomen itself. They are arranged in two transverse rows of four bristles each, the lower row being around the posterior margin of the abdomen; somewhat anterior to these marginal bristles is a small pair of bristles about one-half as long, situated on the postero-lateral margin.

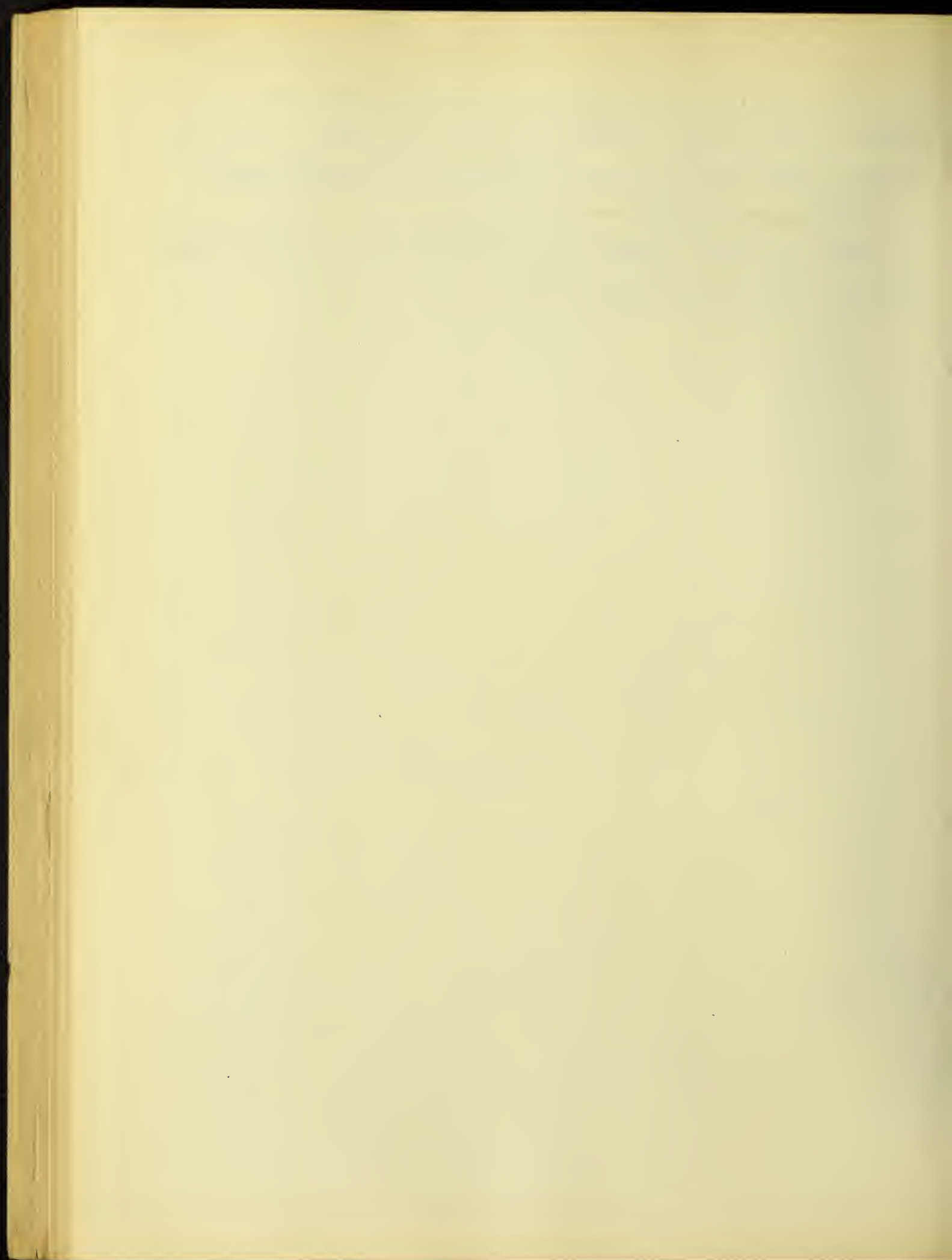
The anterior pair of legs is about equal to the cephalothorax in length. The tarsus is one and one-half times as long as the tibia and twice as long as broad. Sense-hair situated one-half its length from the proximal end of the segment; near it is situated a very stout bristle, equal to the sense-hair in length and one-half as broad at the base, as the bristle is long. Between this stout bristle and the sense-hair is a small hair about one-half as long as the latter. Near the claw on the dorsal side is a very stout bristle almost as long as the claw itself; between this stout bristle and the claw is a very long hair equal to the tarsus in length. A sim-



ilar, but inner, hair is situated at the end of the tarsus; also a short curved bristle one-half as long as the tarsus. The tarsus of leg I bears also two stout bristles near the ventral margin.

Length, 0.42 mm.; breadth, 0.24 mm.

Under the bark of a maple log. Collected by J. D. Hood, Urbana, Illinois. Several specimens.



Rhizoglyphus phylloxerae Riley.

1874. R. phylloxerae Riley. 6th Missouri Rept., 1874, p.52.

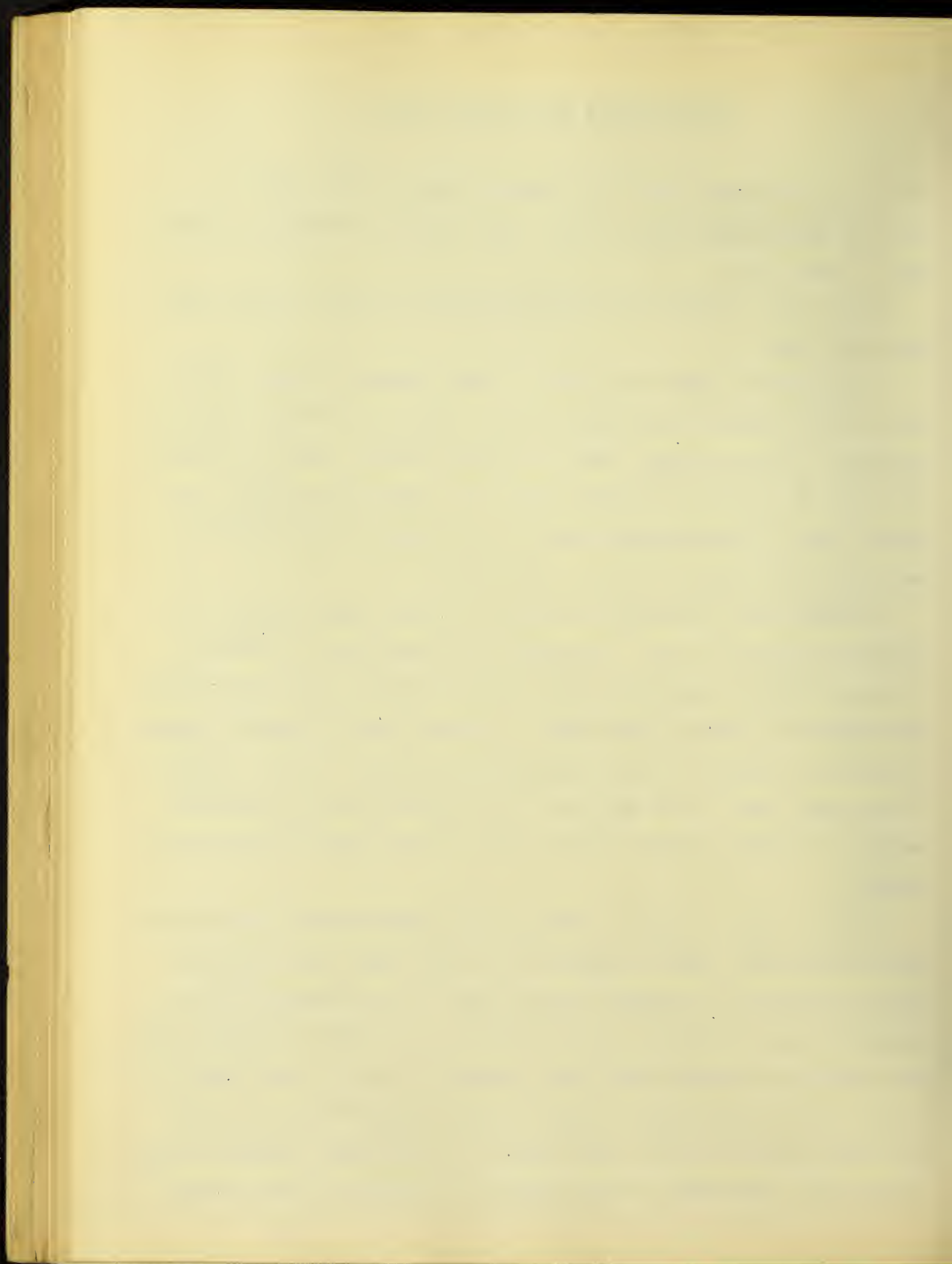
1906. R. phylloxerae Banks. Techn. Bull. No.13, Bur.Entom.,U.S.Dept. Agri., 1906, p.20.

Pale yellow; abdomen with two dark spots on each side near the posterior end.

Cephalothorax almost as broad as long; mandibles large, about one-third as long as the cephalothorax; posterior bristles long and straight, slightly longer than the cephalothorax; a small inconspicuous pair of hairs is situated between the posterior bristles; anterior pair of bristles approximate to the base of the mandibles and about two-thirds as long as the latter.

Abdomen about two-thirds as broad as long, being broadest towards the posterior end. The female has three pairs of subequal bristles near the posterior margin of the abdomen, about two-fifths as long as the width of the body. A similar pair of somewhat longer bristles is situated on the postero-lateral aspect of the abdomen. In the male there is an extra pair of bristles near the posterior margin of abdomen and the bristles are a little longer than in the female.

Anterior pair of legs as long as the cephalothorax; tarsus about one and one-half times as long as the tibia; sense hair situated about two-thirds its length from the base of the segment, with no adjacent stout bristles; a stout bristle is situated at the tip of the tarsus just outside the claw, one-half as long as the claw itself; tip of tarsus also bearing two long subequal hairs, one on the outer and one on the inner aspect; on the dorsal surface of the tarsus near the middle of the segment is situated a stout bristle



as long as the width of the segment from which it extends; almost opposite this bristle near the ventral surface is a similar but shorter and stouter bristle.

Length, 0.90mm. ; width, 0.60mm .

Under dead leaves and under boards. Several specimens.



Rhizoglyphus prasinimaculosus n.sp.

Almost white; usually with two large, brownish green spots at the posterior end of the abdomen.

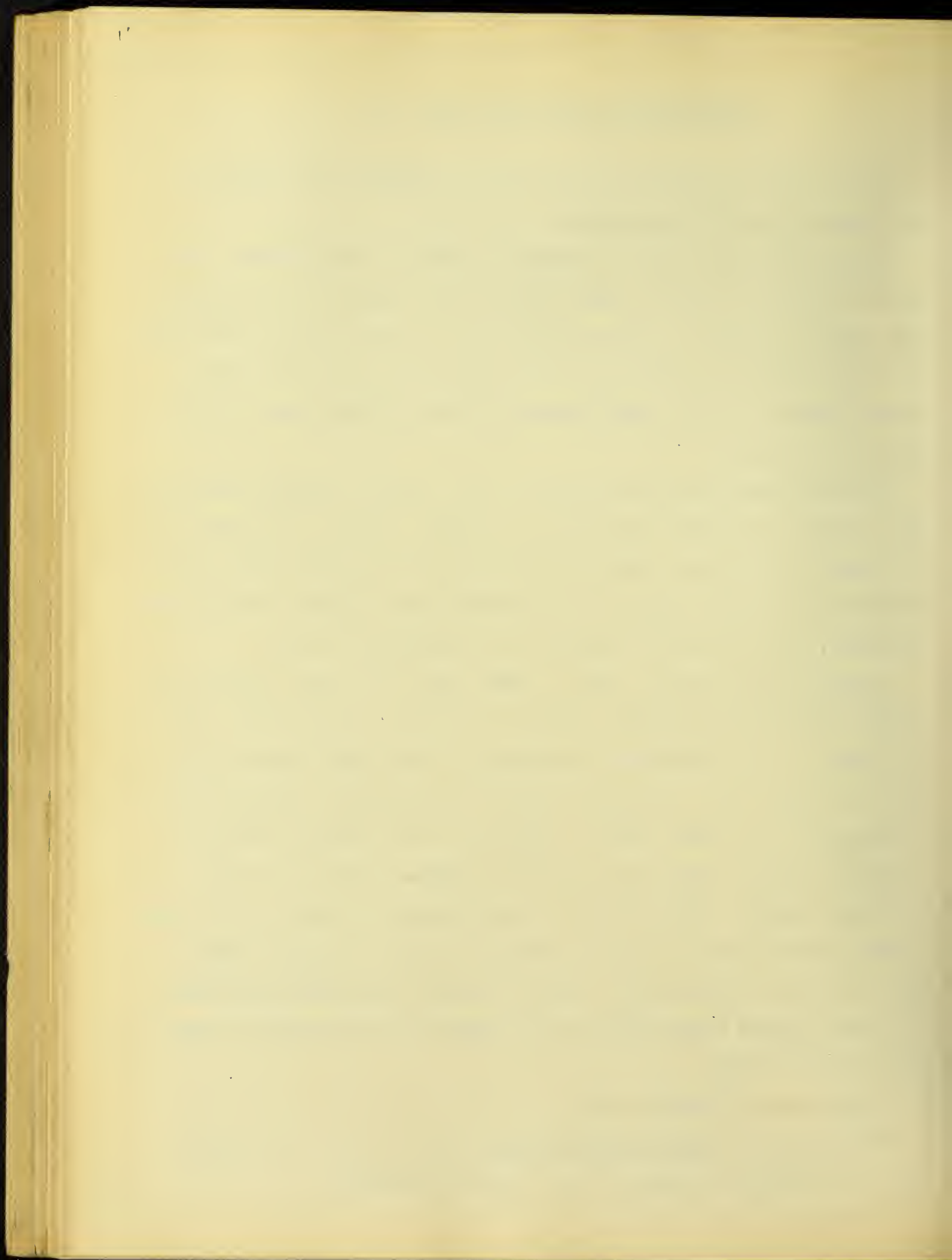
Cephalothorax pyramidal, one-half as long as the abdomen. Anterior bristles situated almost at the front margin of the rostrum and equal in length to the tarsus plus the tibia of leg I; posterior bristles situated at about equal distances from the lateral posterior margins of the cephalothorax and half as long again as the anterior bristles.

Abdomen three-fifths as broad as long, broadly rounded posteriorly. A pair of shoulder bristles is present, subequal in length to the anterior bristles of the cephalothorax, but stouter than these. Around the posterior margin of the abdomen are situated three pairs of small, short bristles similar to the shoulder bristles.

Sense hair of tarsus I equal to the claw of the same segment in length, curved and slightly enlarged distally. On the ventro-distal aspect of the tarsus are seven small, low, stout spines; very near the sense hair is a small clavate bristle about one-third as long as the sense hair itself. Tarsus of leg I one and one-half times as long as tibia; tibia slightly smaller than the antepenultimate segment. Tactile hair of leg I equal in length to the leg itself; tactile hair of leg II subequal to that of leg I. Third pair of legs situated their length from the second pair; hind pair of legs situated almost twice their length from the posterior margin of the abdomen.

Length, 0.42 mm.; breadth, 0.20 mm.

From cocoon of Sanninoidea exitiosa (peach borer). Collected by R. D. Glasgow at Urbana, Ill. Several specimens.



Gen. Tyroglyphus Latreille.

1796. Tyroglyphus Latreille. *Precis Caract. Ins.*, p. 185.

Integument not granulate; mandibles }chelate; suture present between cephalothorax and abdomen; male with sucking disks around anus; body not elongate; a sucker at tips of tarsi; no stout spines on tarsi; leg I of male not enlarged.



Tyroglyphus lintneri Osborn.

1893. T. lintneri Osborn. Science, 1893, p.360.

1895. T. lintneri Lintner. 10th N.Y. Rept., 1895, p.452.

1906. T. lintneri Banks. Tech. Bull. No.13, Bur.Entom.U.S.Dept.Agric.
1906, p. 15.

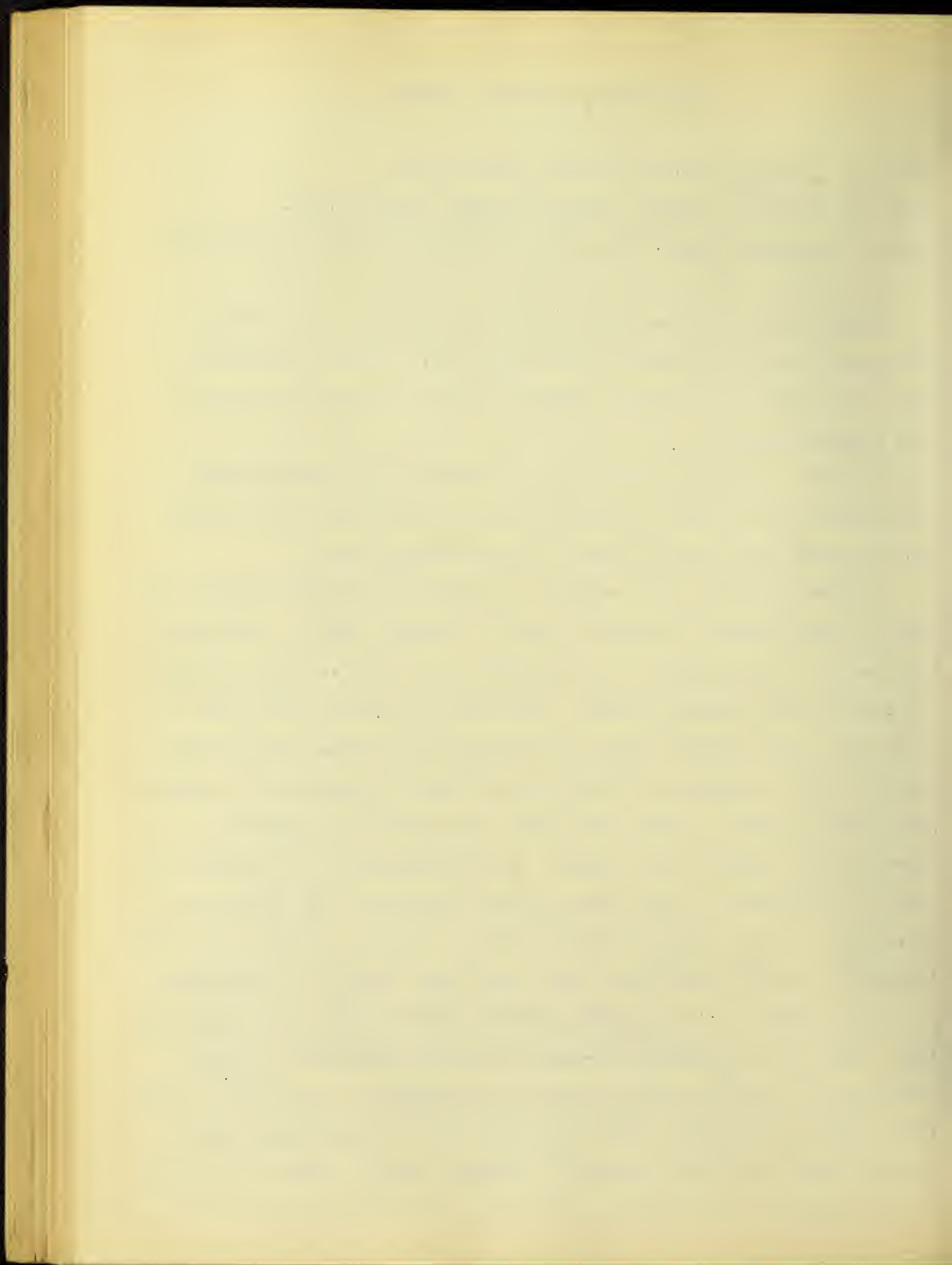
Cephalothorax three-fourths as broad as long; sides concave.

Posterior bristles situated in a curved row, with the convexity of the curve anterior; bristles subequal, about half as long again as the cephalothorax. →

(Anterior bristles situated at the apex of cephalothorax near the median line, about one-half as long as the posterior bristles and directed but slightly away from the median plane.

Abdomen slightly over one-half as broad as long and bearing long hairs, some of which are as long as the abdomen itself. There are two pairs of long hairs on the shoulders, the more dorsal of which is usually the longest; a small, short pair of hairs occur just inside the inner shoulder hairs; two hairs are situated on the dorsal surface of the abdomen not far from the anterior margin of the same and near the median plane; two others are lateral and posterior to these, about one-half the distance from the anterior to the posterior end of the abdomen; around the posterior margin of the abdomen are four pairs of very long, straight hairs; a similar shorter pair just dorsal to the marginal hairs; and a pair just ventral to the same.

Leg I about as long as the abdomen; tarsus half as long again as the tibia, but only about one-half as broad; sense-hair situated one-half its length from the base of the segment. The tibia of each leg bears at its distal end on the outer side a long hair, which is usually about twice as long as the segment itself. There is a short,



curved, serrate bristle near the base of the third segment of legs I and II.

Length, 0.48 mm.; breadth, 0.18 mm.

On rotting carnation stem. Collected by J. J. Davis, at Urbana, Illinois. A few specimens.



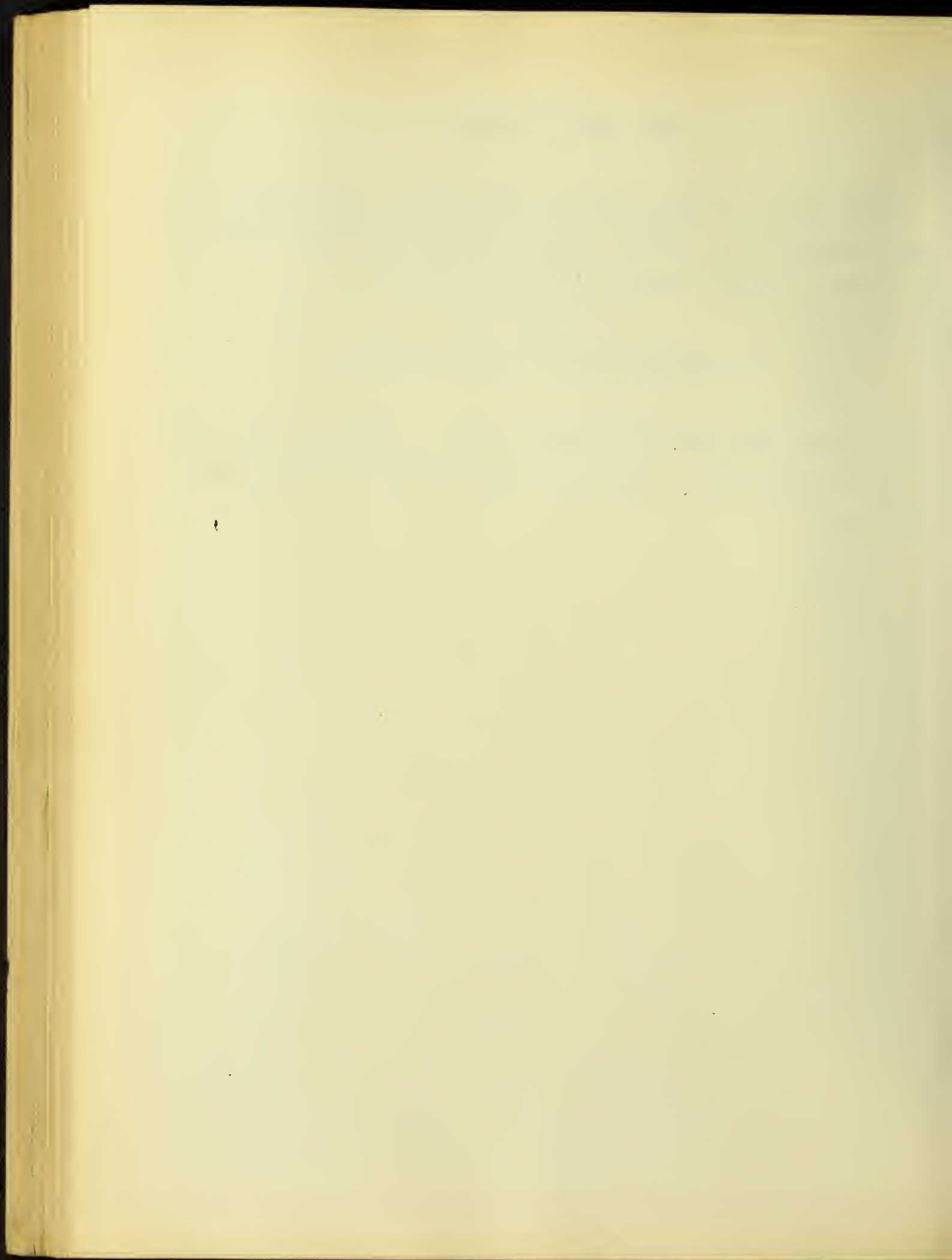
Fam. PEDICULOIDIDAE.

Palpi small, of three segments; body entire; with tracheae; females possessing a prominent clavate organ between legs I and II; hind legs of female ending in claws and caruncle.

Gen. Pediculoides Targioni-Tozzetti.

1878. Pediculoides Targioni-Tozzetti. Ann. d. Agric., I, p. 271.

Body oblong; females twice as long as males; no long pedic^els to tarsi.



Pediculoides graminum Reuter.

1908. Pediculoides dianthophilus Wolcott. Bull. Ag. Exp. Sta. Mo., No. 103.

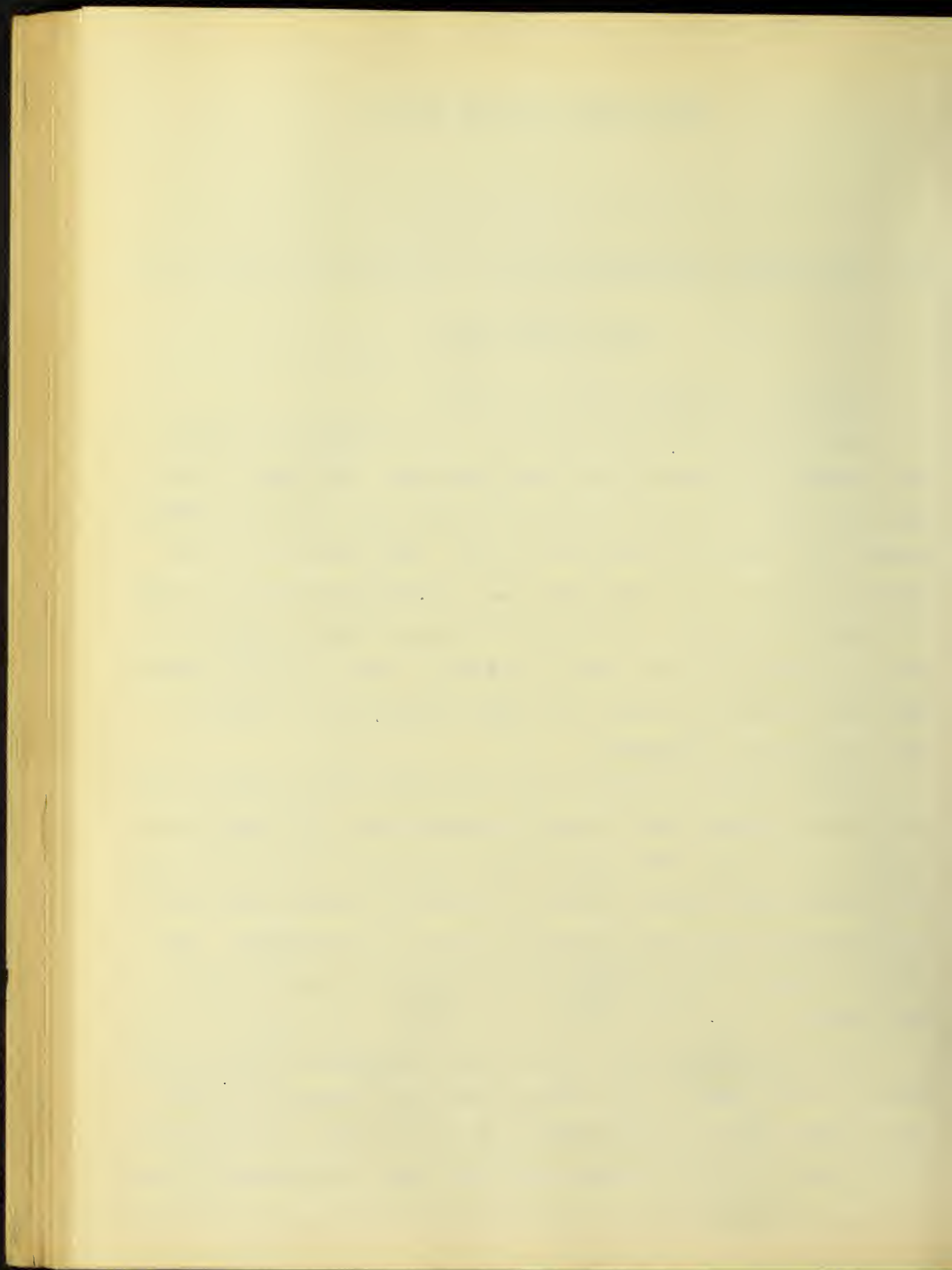
UNFERTILIZED FEMALE.

Pale white; integument thin and smooth.

Cephalothorax two-thirds as broad as long; clavate sex organ over one-half as broad as long, head subglobose. The organ is situated very near the lateral margin of cephalothorax and about midway between the first and second pair of legs. Just inside of the sex organ is situated a very long sense hair two-thirds as long as the entire length of the mite. There are two pairs of small bristles situated in front of the sex organs; the anterior pair being the smaller. Capitulum one-third as long as the cephalothorax and as broad as long; mouth parts rudimentary.

Abdomen elongate truncate posteriorly, about three times as long as broad and showing slight signs of segmentation; there being three slight constrictions. The abdomen bears dorsally a row of four large bristles near each lateral margin; the posterior bristle being twice as long as the others and situated at the end of the abdomen. Just inside of these posterior bristles are situated two pairs of very small hairs.

Legs short and subequal; anterior pair as long as cephalothorax. Tarsus of leg I equal to the tibia in length but slightly narrower; tibia longer than the genua which is as broad as long. Legs with bi-dactyle claws situated on tarsal pedicels; legs I with claws very much



reduced. The tarsi of all the legs bear a long tactile bristle; the femora of legs I and II with a similar bristle.

Length, 0.22 mm.; breadth, 0.07 mm.

FERTILIZED FEMALE.

The fertilized female may become enormously swollen with developing eggs. When the eggs first begin to develop, the swollen area is confined to the abdomen alone, but as development goes on it spreads over the entire body. Females thus distended with eggs may be many times as large as the unfertilized female and the swollen condition may exist to the extent that only parts of the appendages of the female protrude from the anterior end of the oval mass.

Length, from 0.22 mm. to 1.00 mm.

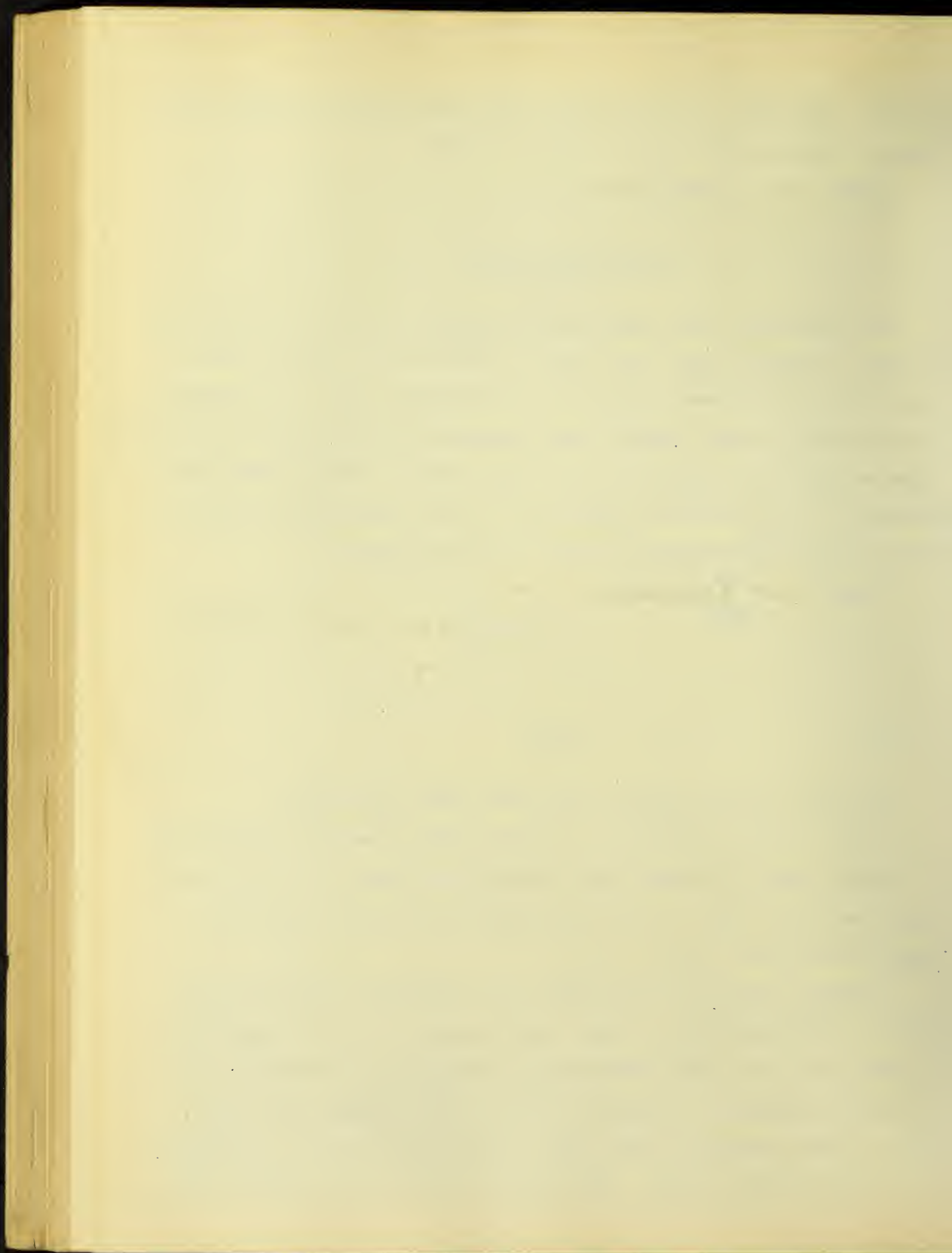
; breadth, from 0.07 mm. to 0.70 mm.

MALE.

The male is much shorter and broader than the female.

Cephalothorax pyramidal; as broad as long; bearing a single pair of bristles near the middle which are about as long as the capitulum. Capitulum larger than it is in the female and broader at the base than at the anterior end.

Abdomen divided into two parts by a transverse suture just in front of the third pair of legs; anterior part the larger, as broad as long; posterior part pyramidal and bearing at its posterior end the genital papilla. The anterior part of the abdomen bears two pairs of small hairs near the middle and a large pair of bristles at the postero-lateral aspect. The posterior part of the abdomen has

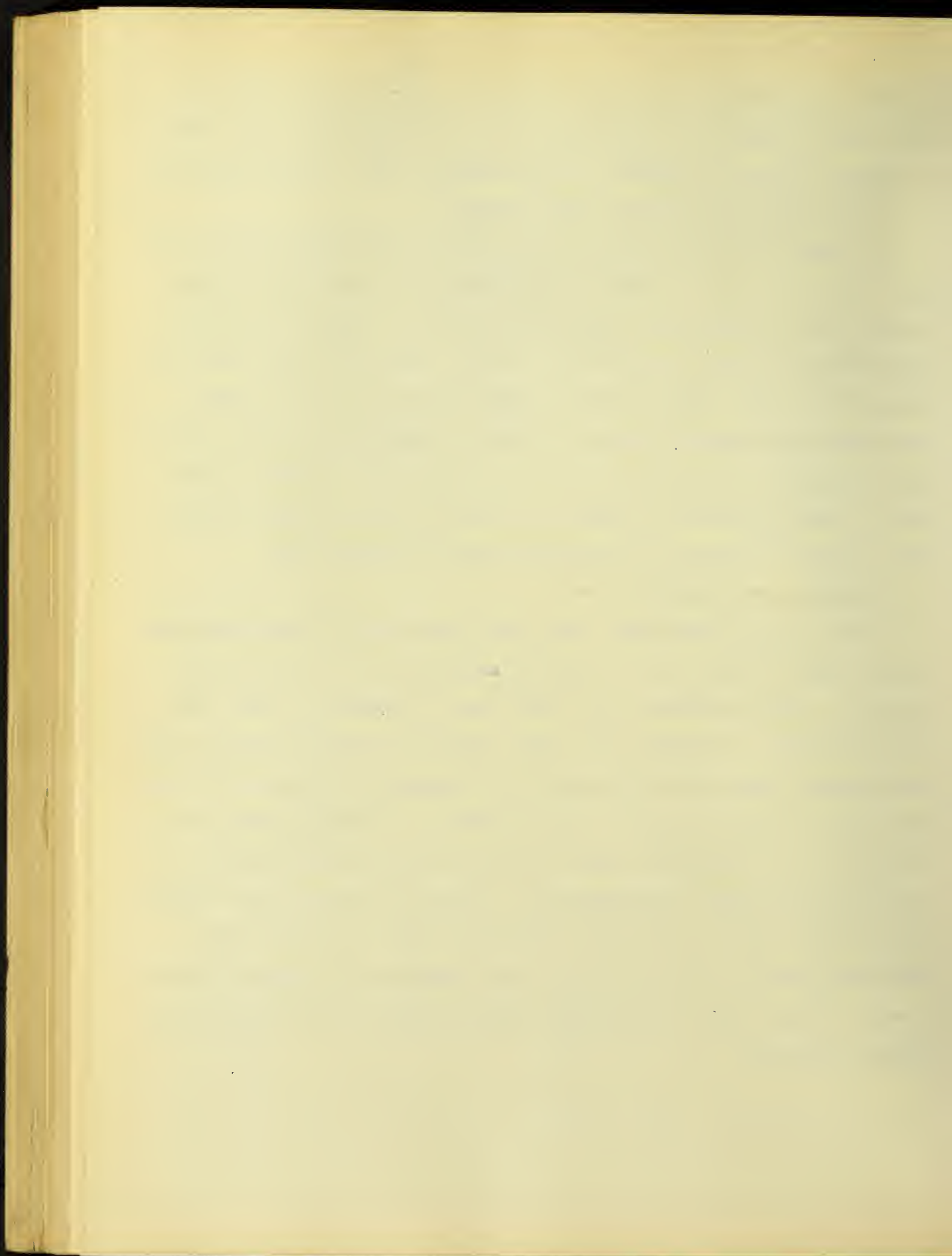


has two longitudinal rows of four bristles each, which decrease in size from the anterior to the posterior end, the anterior pair being as long as the posterior part of the abdomen itself. Genital papilla as broad as long and with four small hairs.

The legs are stouter than in the female, especially the anterior pair. Anterior pair of legs twice as long as the capitulum; tarsus reduced, about one-half as long and one-half as broad as the tibia; tibia longer but not so wide as the genua; femur wider and twice as long as the genua. First pair of legs apparently without claws; second and third pairs of legs with large, bidactyle claws and prominent caruncles, situated on stout tarsal pedicels. Claws on last pair of legs monodactyle. Each of the tarsi bears a long, tactile hair; femora of last pair of legs each with a similar hair.

Length, 0.14 mm.; breadth, 0.09 mm.

From rotting carnations. This mite was brought to my attention in the summer of 1907 by J. J. Davis, assistant to the State Entomologist. After studying it for some time, I happened to meet Professor Hodgkiss, of Geneva, N.Y., who showed me some work he had been doing upon a species of *Pediculoides*. We compared our work and found that the two species agreed in every detail. In January, 1908, Professor Wolcott of Nebraska described this species as new, giving it the name *Pediculoides dianthophilus*. Professor Hodgkiss has compared the specimens found in Nebraska with those found in New York and finds them exactly alike. He has kindly examined the specimens which I have and says that they are also exactly like the New York and Nebraska specimens.



Fam. Gamasidae.

With a distinct spiracle situated on a stigmal plate above the third or fourth coxae; first pair of legs not inserted in the same opening as the mouth parts; mandibles chelate; rarely parasitic on vertebrates.

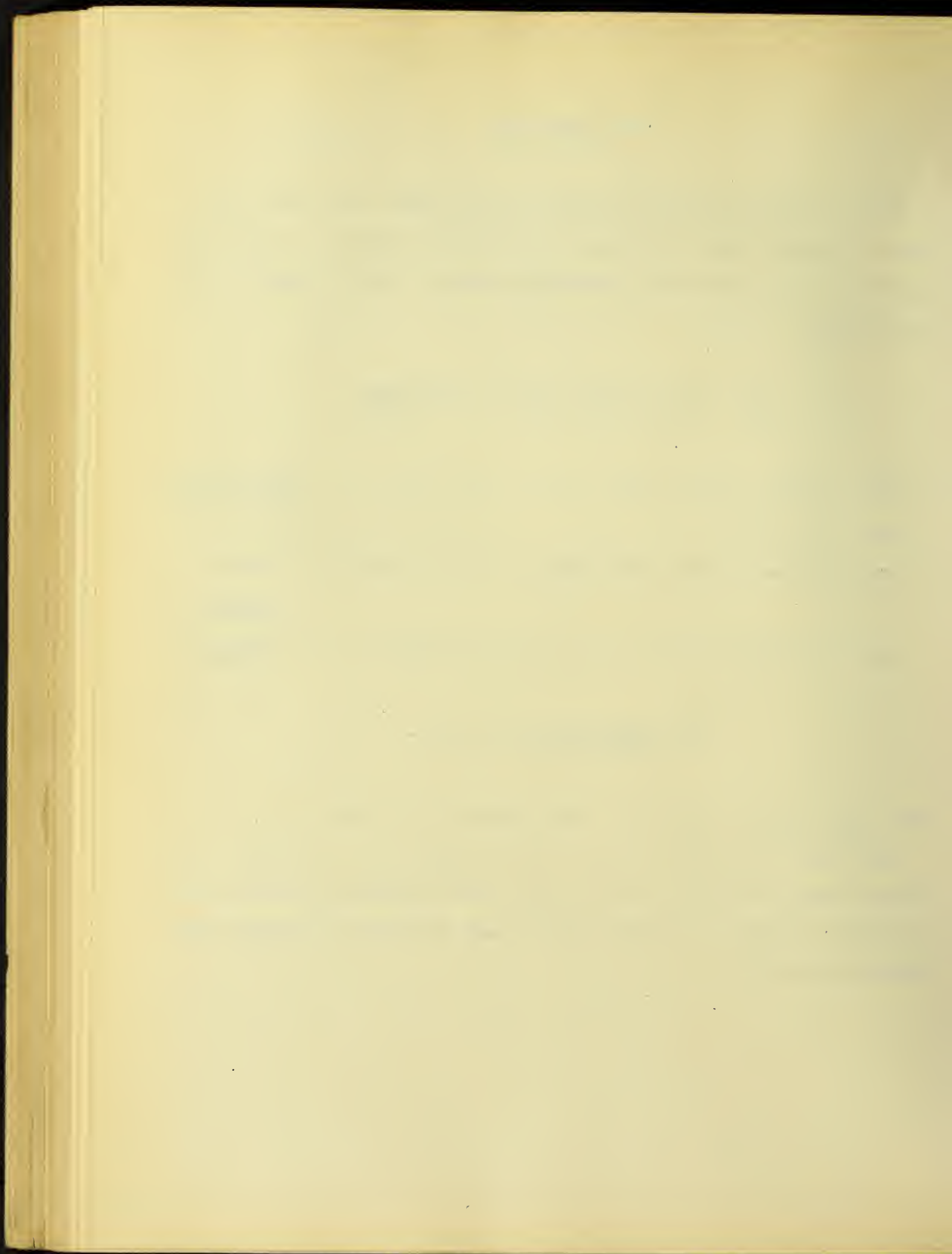
Key to Genera Described in this Work.

1. Leg I without claws; dorsal shield undivided ----- Macrocheles.
 Leg I with claws ----- 2.
 2. Leg II of male armed with teeth and usually greatly enlarged---
Gamasus.
 Leg II of male without teeth and not enlarged ----- Seiulus.

Gen. Macrocheles Latreille.

1829. Macrocheles Latreille. Regue Anim. IV, p. 282.

Peritreme more than twice as long as broad; leg I without claws; dorsal shield undivided; no post anal plate; male genital aperture on anterior margin of sternal plate; male with leg II enlarged and armed with teeth.



Macrocheles subniger n.sp.

Dorsal shield dark brown, almost black; the outside of the dorsal shield around the margin of the body is light brown; legs and palpi lighter than the dorsal shield.

Epistome oval, broader than long; anterior margin slightly concave in the middle. There is a pair of small bristles on the anterior margin of the epistome not far from the median plane. They are short, and much curved. Palpi large, three-fifths as long as the anterior pair of legs; distal segment three-fifths as long as penultimate segment and bearing a spine on the outer, distal aspect. In the male there is a prominent spine situated at about the middle of the inner aspect. Penultimate segment slightly longer than the antepenultimate. All the segments of the palpus are sparsely clothed with stout hairs.

Dorsum of body bearing curved clavate bristles. There is a pair of straight clavate bristles on the anterior margin of the dorsum very near the median plane; two pairs of curved, clavate, shoulder bristles; a row of about ten bristles on each lateral margin and about half a dozen other bristles near the middle of the dorsum.

Anterior pair of legs much narrower than the others, three-fifths as long as the body. Tarsus of leg I equal to tibia in length, but much narrower; tibia longer than antepenultimate segment. Second pair of legs about equal to the first pair in length; third pair of legs three-fourths as long as the second pair; hind pair of legs al-



most as long as the body. All the legs are sparsely clothed with simple spines. The second pair of legs is slightly larger in the male than in the female. Tarsi of last three pairs of legs with bi-dactyle claws, and caruncle situated on a long, narrow, chitinous pedicel, also with a few short, swollen spines almost as broad as long.

Length, 1.22mm.; breadth, 0.86mm.

Collected by the writer near Urbana, Ill. Two specimens.



Gen. Seiulus Berlese.

1887. Seiulus Berlese. Ac. Myr. Scorp. Ital. 41, 3.

Peregrine more than twice as long as broad; leg I with claws; dorsum with undivided shield; male genital opening on anterior margin of sternal plate; leg two of male not enlarged or armed with teeth; anal plate broad, separate in both male and female.



Seiulus hirsutus (C.L.Koch).

1839. Sejus hirsutus C.L.Koch. Crust.Myр.Arach. Heft.24.
1900. Seius hirsutus Berlese. Gli Acari Agrarii, p. 41.
1902. Seiulus hirsutus Oudms. New List Duch Acari, II. Tijdsch voor
Entom., vol. 45, p. 19.

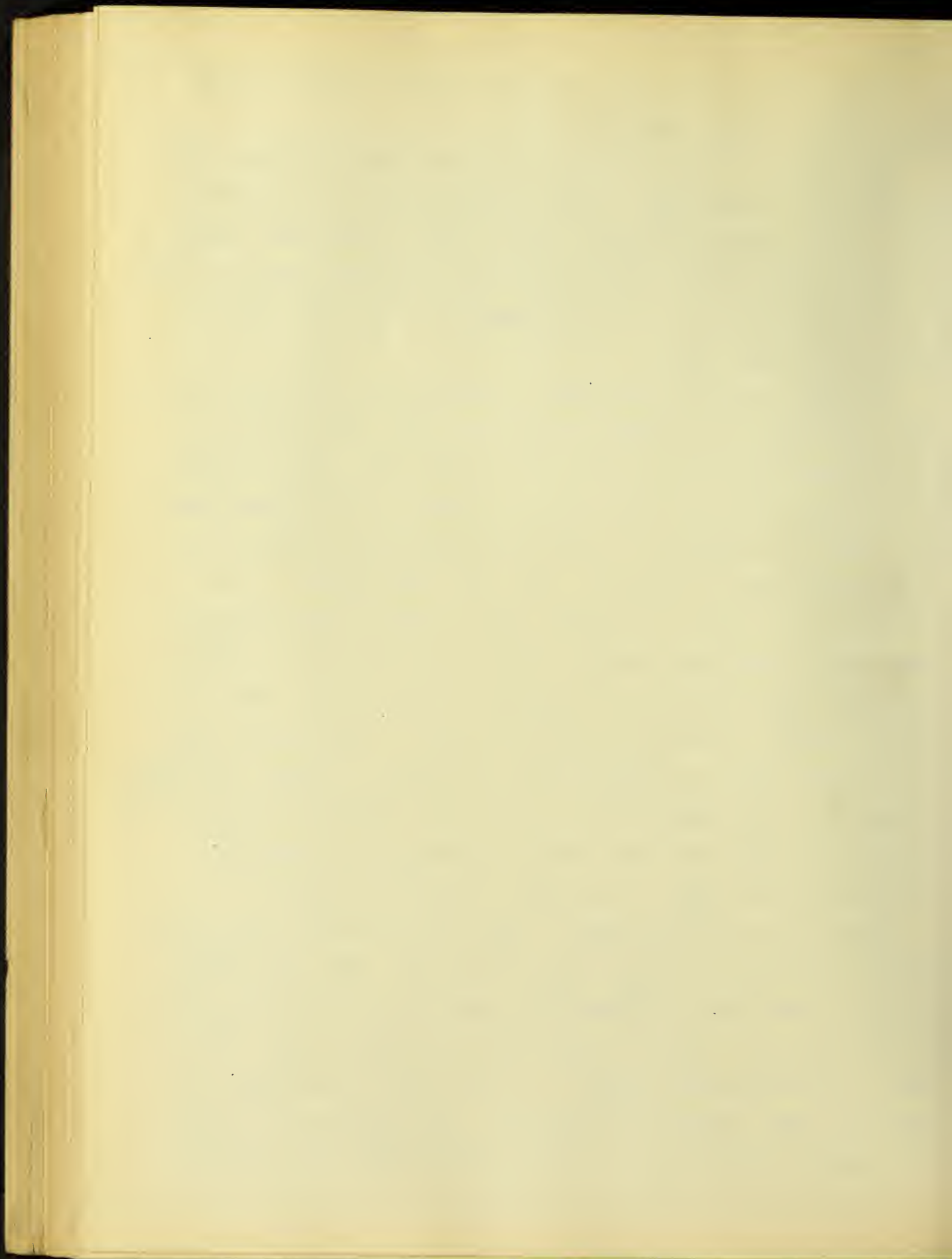


Dorsal surface with a thick chitinous network and bearing many large, stout, slightly pectinate spines.

From the tip of the rostrum there projects a pair of large, flat bristles with toothed edges. These bristles are about one-half as broad as long. Palpi as long as tibia of leg I, penultimate segment as broad as long; distal segment two-thirds as broad as long and with a spine on the inner side. All the segments of the palpus sparsely clothed with simple hairs.

The dorsal surface of the body is composed of a chitinous reticulate structure, in the meshes of which are pits. The pattern of the reticulate structure is bilaterally symmetrical. The bristles on the dorsal surface of the body are arranged in the following manner. There is a marginal row of bristles extending around the entire circumference of the body. There is a longitudinal ^{row} of ^r five bristles on each side of the median plane; between these longitudinal rows and the lateral margins of the body are found on either side about eight bristles, not arranged in a row; a stout pair of almost straight, shoulder bristles are present. Counting the shoulder bristles, there are a dozen pairs of marginal bristles; the first two pairs are short and markedly curved; those behind the shoulder bristles are longer and less curved. The two pairs of posterior bristles are about equal to the femur of leg IV in length.

Anterior pair of legs slightly longer than the body; second pair of legs two-thirds as long as the anterior pair; third pair of legs slightly longer than the second pair; last pair of legs about equal to the first pair. Tarsus of leg I twice as long as tibia; tibia equal to antepenultimate segment. All the tarsi are provided with bidactyle claws, situated upon pedicels. All the legs are clothed with spines, which are stout near the proximal end of the appendage,



though on the tarsi they may become hair-like.

Length, 0.54mm; breadth, 0.33mm.

Under logs and in rubbish. Collected by the writer at Galesburg and Urbana, Ill.



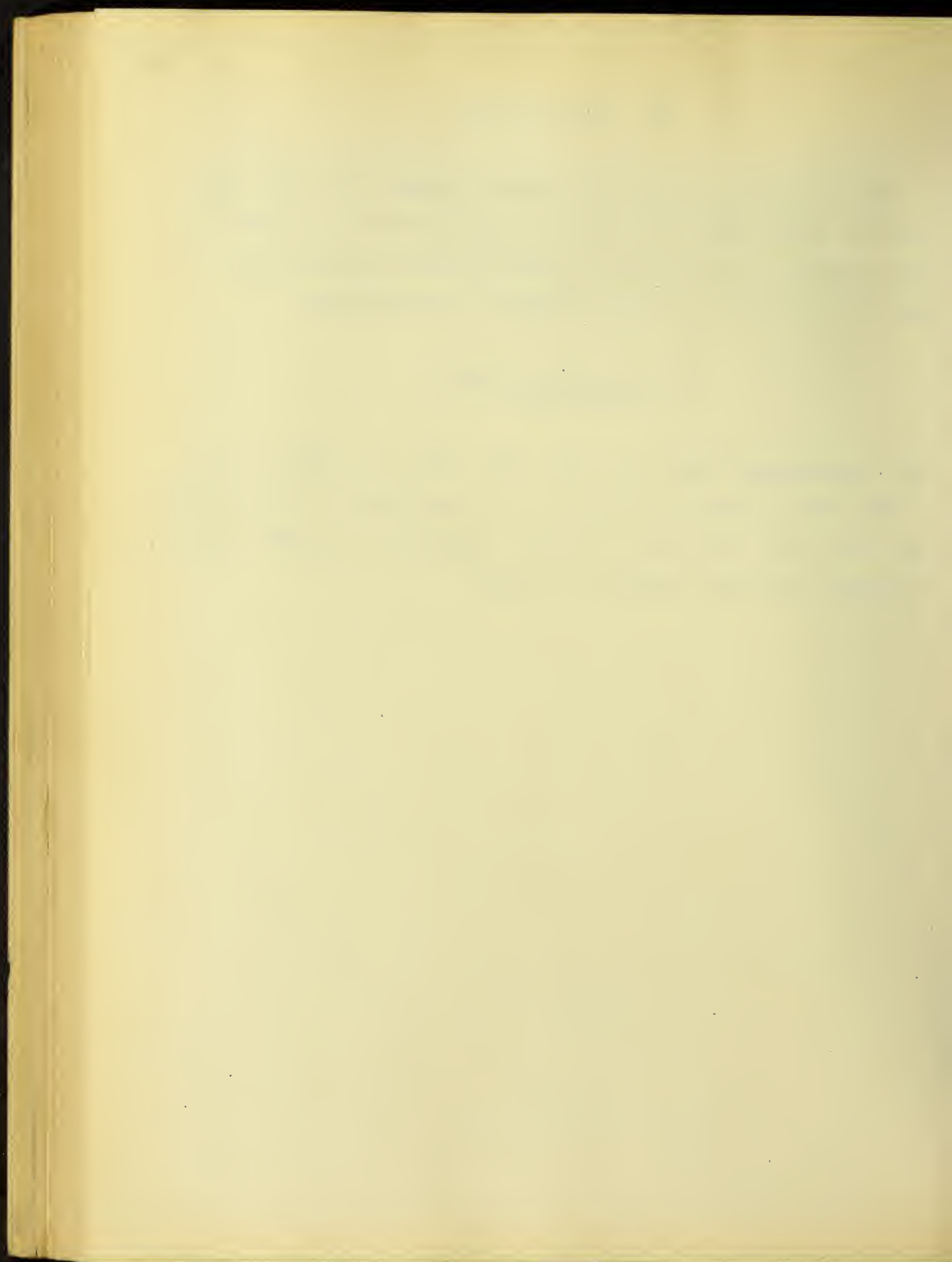
Fam. DERMANYSSIDAE.

With a distinct spiracle on a lateral stigmal plate above the third or fourth coxae; first pair of legs inserted at one side of mouth opening; no projecting of dorsum beyond the camerostome; mandibles fitted for piercing; parasitic on vertebrates.

Gen. Dermanyssus Duges.

1834. Dermanyssus Duges. Ann. Sci. Nat. (Zool.) I, 1834, p.18.

Anal plate present; hind pair of legs reaching but little beyond the tip of body; peritreme on venter; mandibles in the male chelate, in female styliform; parasitic on birds.



Dermanysus gallinae Redi.

1668. D. gallinae Redi. Esper. Int. Insetti., 1668, pl. II.
 1880. D. gallinae Megnin. Paras. et les Mal. Paras., p. 115.
 1896. D. gallinae Osborn. Bull. 33, Iowa Exp. Sta., p. 595.
 1902. D. gallinae Herrick. Bull. 78, Miss. Agri. Exp. Sta.

Dark; brownish flesh color with a few blotches of black.

Beak as broad as long; pointed. Palpi about one-third as long as the anterior legs and twice as long as the beak; basal segment the longest. Mandibles of female styliform, twice as long as the palpus.

Mandibles of male with basal half stout, cylindrical; distal half flagelliform; tip of the basal half with stout claw.

Dorsal surface covered with fine parallel striations and sparsely clothed with equal, short, simple bristles. Body three-fifths as broad as long, broadly rounded posteriorly. Sternal plate of male one-third as broad as long, truncate posteriorly and extending one-third its length beyond the hind coxae. Anal plate of male broader anteriorly than posteriorly; anal opening situated about its length from the posterior margin of the anal plate. Between the sternal and anal plates of the male are about ten fine striations parallel to

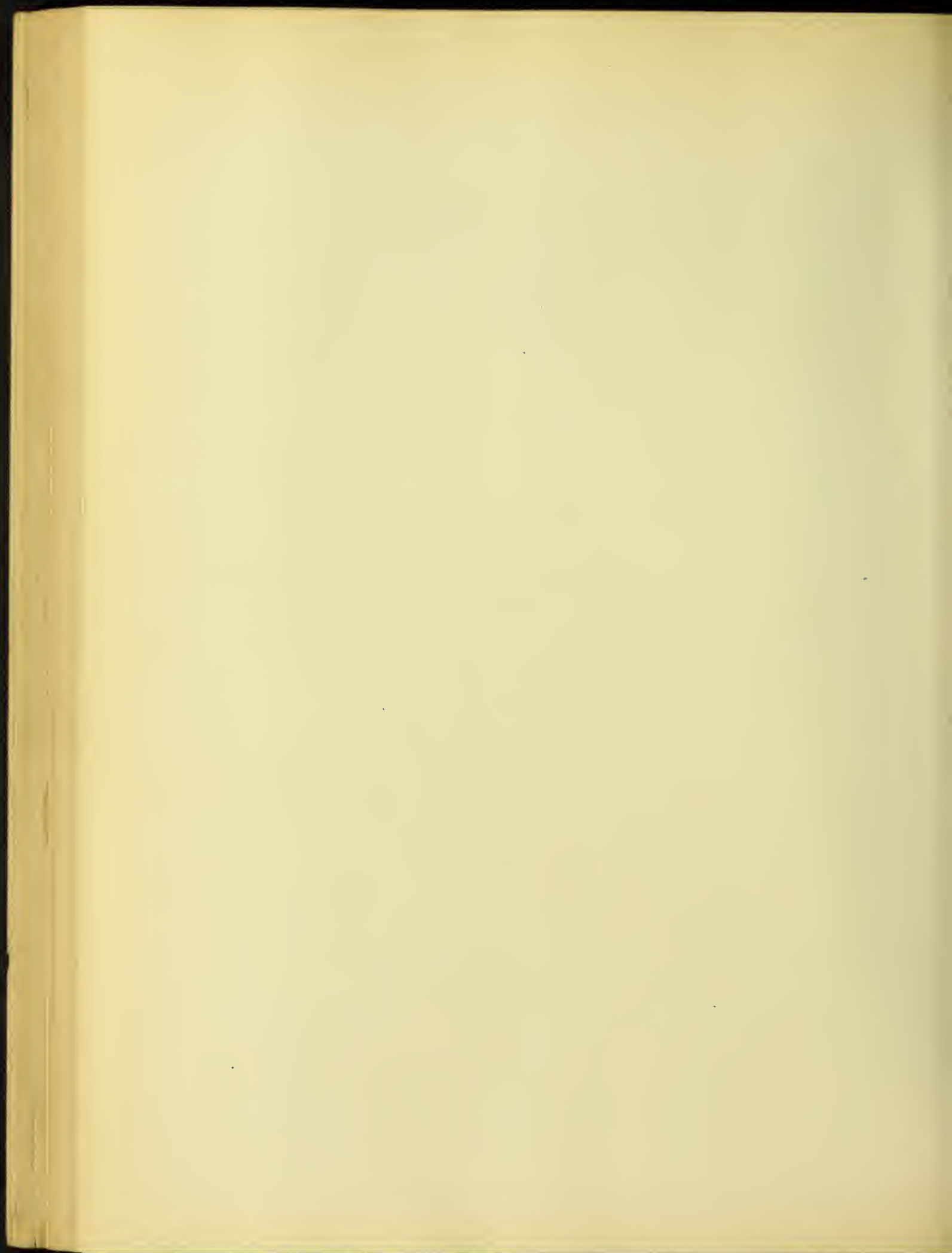


the posterior margin of the sternal and anterior margin of the anal plates. Anal plate of female triangular, the anus being situated at the posterior apex.

Anterior pair of legs as long as the body and equal to the posterior pair; second and third pairs of legs slightly shorter than the other two pairs. Tarsus of leg I about one and one-half times as long as the tibia. I find that the tarsus is truncate distally and bears at this end several subequal bristles (as shown in Megnin's figures) and is not tapering as in the figures of Osborn and Herrick. Tibia of leg I subequal to antepenultimate segment. The tarsi of the last three pairs of legs are not truncate. There are stout claws with caruncle, to all the legs; claws situated on narrow pedicels.

Length, 0.70mm.; breadth, 0.38mm.

This species is popularly known as a "chicken louse." I have taken specimens of "lice" from the English sparrow which appear to be very like the young of the D. gallinae.



Fam. UROPODIDAE.

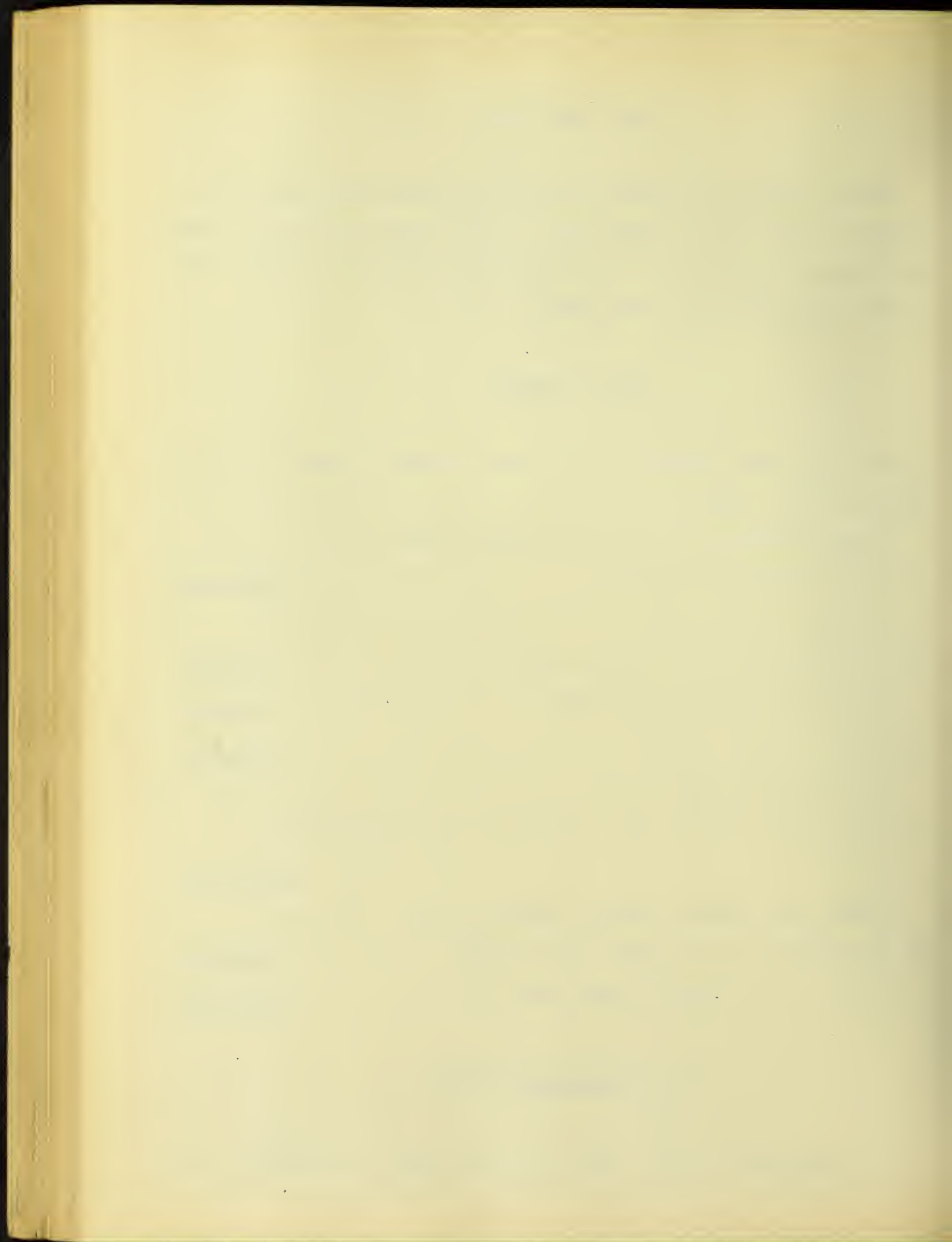
With a distinct spiracle on a lateral stigmal plate above the third or fourth coxae; first pair of legs inserted within the same opening as the mouth parts; dorsum of body extending forwards and hiding the mouth parts from above.

Key to Genera.

- 1. With impressed foveae on the ventral surface of body for the reception of the legs ----- 2.
 Ventral surface of body without such foveae ----- 4.
- 2. Dorsum of body sculptured ----- Glyphopsis.
 Dorsum of body smooth ----- 3.
- 3. First pair of legs without claws ----- Cilliba.
 First pair of legs with claws ----- Uropoda.
- 4. Without ventral plate ----- Urose^{iu}s.
 With ventral plates ----- 5.
- 5. Female with genital plate fused with the sternal plate -----
 ----- Uropodella.
 Female with distinct genital plate ----- 6:
- 6. No ambulacra on the first pair of legs ----- Polyaspis.
 First pair of legs with ambulacra ----- Trachytes.

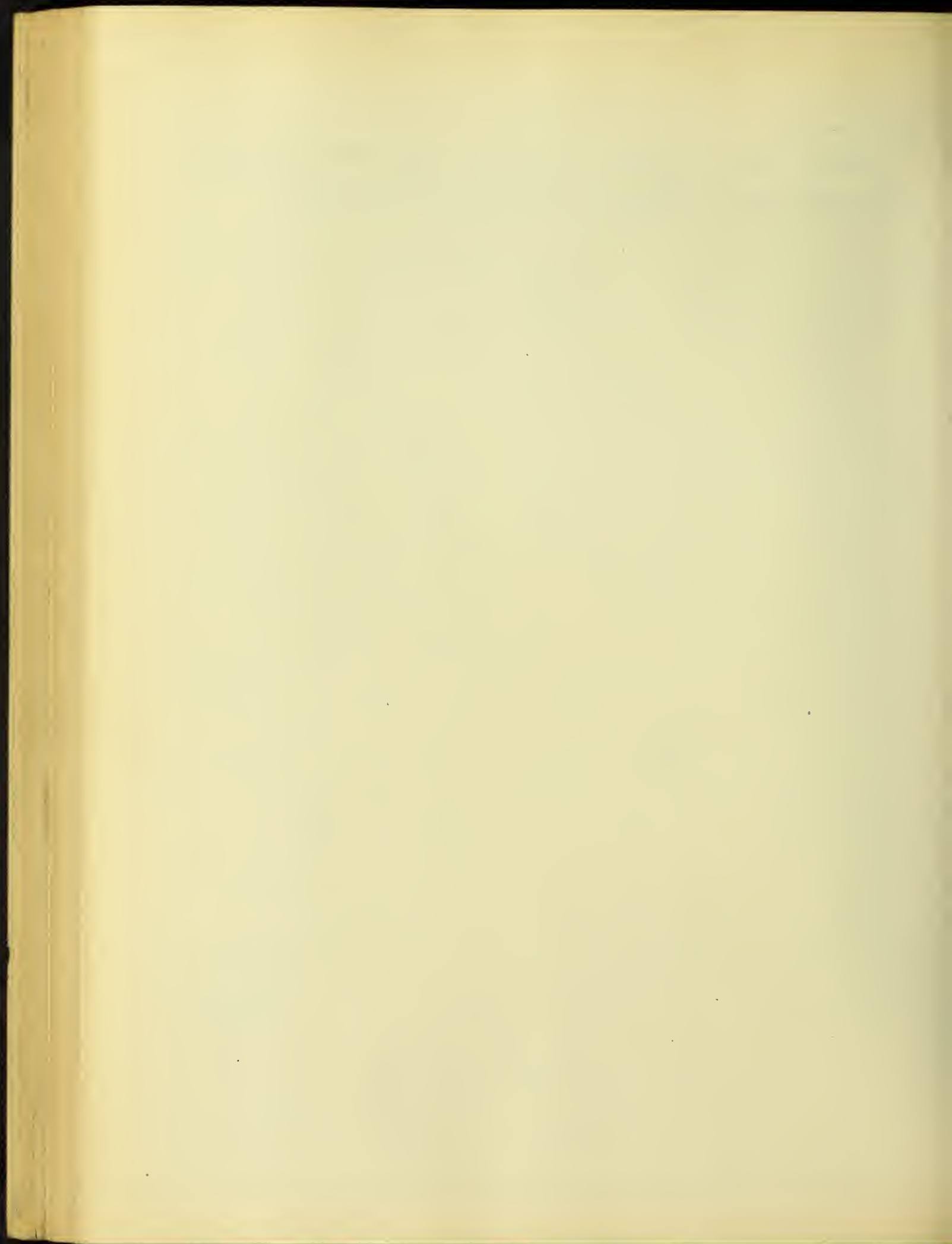
Gen. Glyphopsis Michael.

1894. Glyphopsis Michael. Notes on Uropodinae. Jour. Roy. Micro. Soc.,



1894, p. 295.

Ventral surface of body provided with foveae for the reception of the legs; body irregular in form; dorsum sculptured.



Trachyropoda bostocki (Michael).

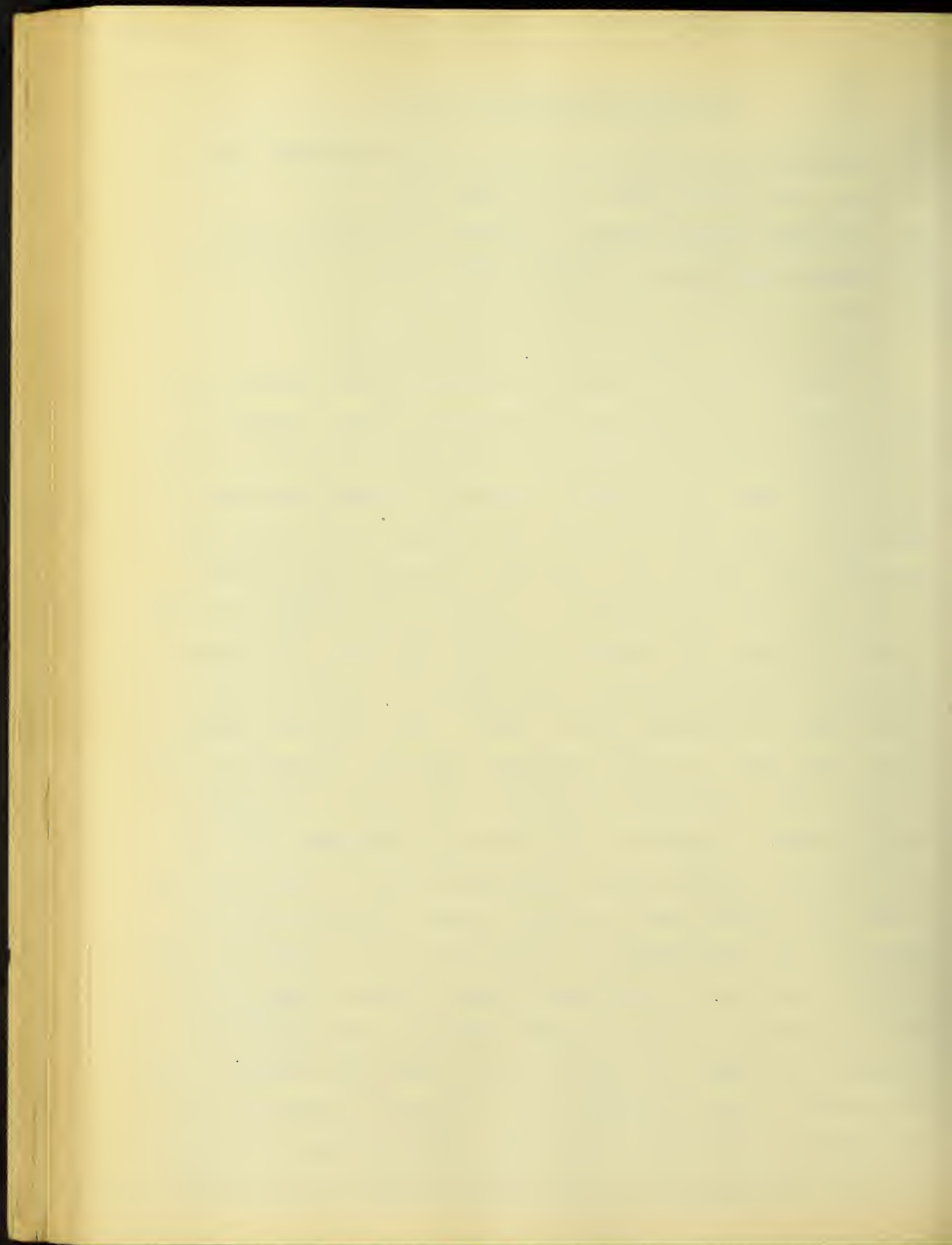
1894. Glyphopsis bostocki Michael. Notes on the Uropodinae. Jour. Roy. Micro. Soc., 1894, p.301, pl. 6, figs. 1-4.

1899. Glyphopsis bostocki Wasmann. Tijdschr. voor Entom., vol. 42.

1903. Trachouropoda bostocki Berlese. Redia, vol.1, p. 366, pl.II, figs. 65-66, and pl. 12, fig. 73.

Reddish brown, of almost uniform color throughout.

The dorsal surface is rough and sculptured and has several prominent ridges of a peculiar and characteristic design. Around the entire outer margin of the body, excepting a very short space at the anterior end, there is a prominent, somewhat irregularly-notched, tuberculate ridge; just inside this outer ridge is a similar, less prominent ridge which is not tuberculate. Rostrum fully as broad as long, and not so much triangular in shape as Mr. Michael describes it, but more nearly like Berlese's figure; from above, the rostrum appears to be notched in front; this appearance being due to the curving down of the pointed anterior part. Just behind the rostrum on each side there is a small triangular expansion; posterior to this is a much larger rectangular expansion. The ridges on the dorsum are as follows: at the base of the rostrum on the median line is a small tubercle, just lateral and slightly posterior to this tubercle on each side begins a long, internally concave ridge which extends backwards about three-fifths the length of the body, ending in a much broadened area; between the broadened ends of each of these ridges there is a transverse ridge; from the transverse ridge there extend backwards four ridges about equal distances apart and enclosing three sunken areas, or pits; these pits are all similar in shape and size, the middle one being median in position. Running forward from the transverse ridge is a pair of rather smaller ridges very near the



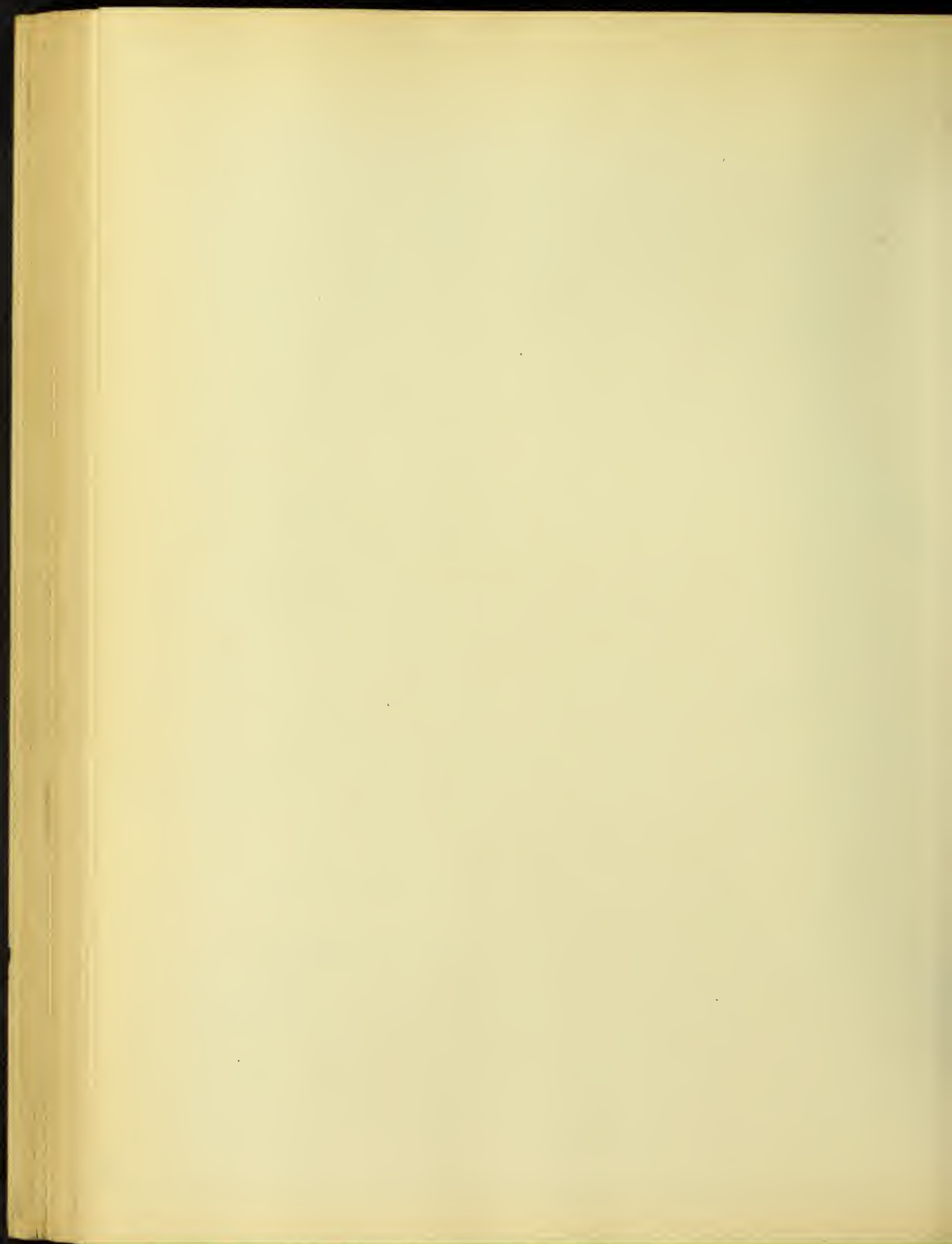
median plane.

The ventral surface shows deep pits for the reception of each of the last three pairs of legs, the two posterior pits being the largest. The genital plate of female extends from the base of the coxae of the first pair of legs to between the coxae of legs III; it has an oval anterior margin and a straight posterior edge. Genital aperture of male almost circular, situated between the coxae of the third pair of legs. Mandibles commonly retracted, but when extended they can be easily seen from above as well as from below; they are almost as long as the first pair of legs, of uniform width, and end in powerful chelae.

Legs all of about the same size; the tarsus of leg I is somewhat broader at the distal end than the other tarsi are; in this respect they differ from Michael's figure and are ^{fully} as broad, if not broader, than they are represented to be in Berlese's figure. I find that the tip of tarsus I has several more hairs than are shown in either of these author's figures, which point I consider of no great importance. Tarsus I about twice as long as the penultimate segment. Each of the tarsi of the legs ends in a rather long, bidactyle claw and a small caruncle.

Length, ^{1.02mm.} ~~1.02mm.~~; breadth, 0.66mm.

In an ant's nest, under a rotten log. Collected by H. Glasgow, Urbana, Ill. Several specimens.



Fam. ORIBATIDAE.

Cephalothorax with a specialized seta arising from a pore situated on the postero-lateral aspect of the dorsovertex. Integument hard, well chitinized. Abdomen with chitinous wing-like expansions termed pteromorphae.

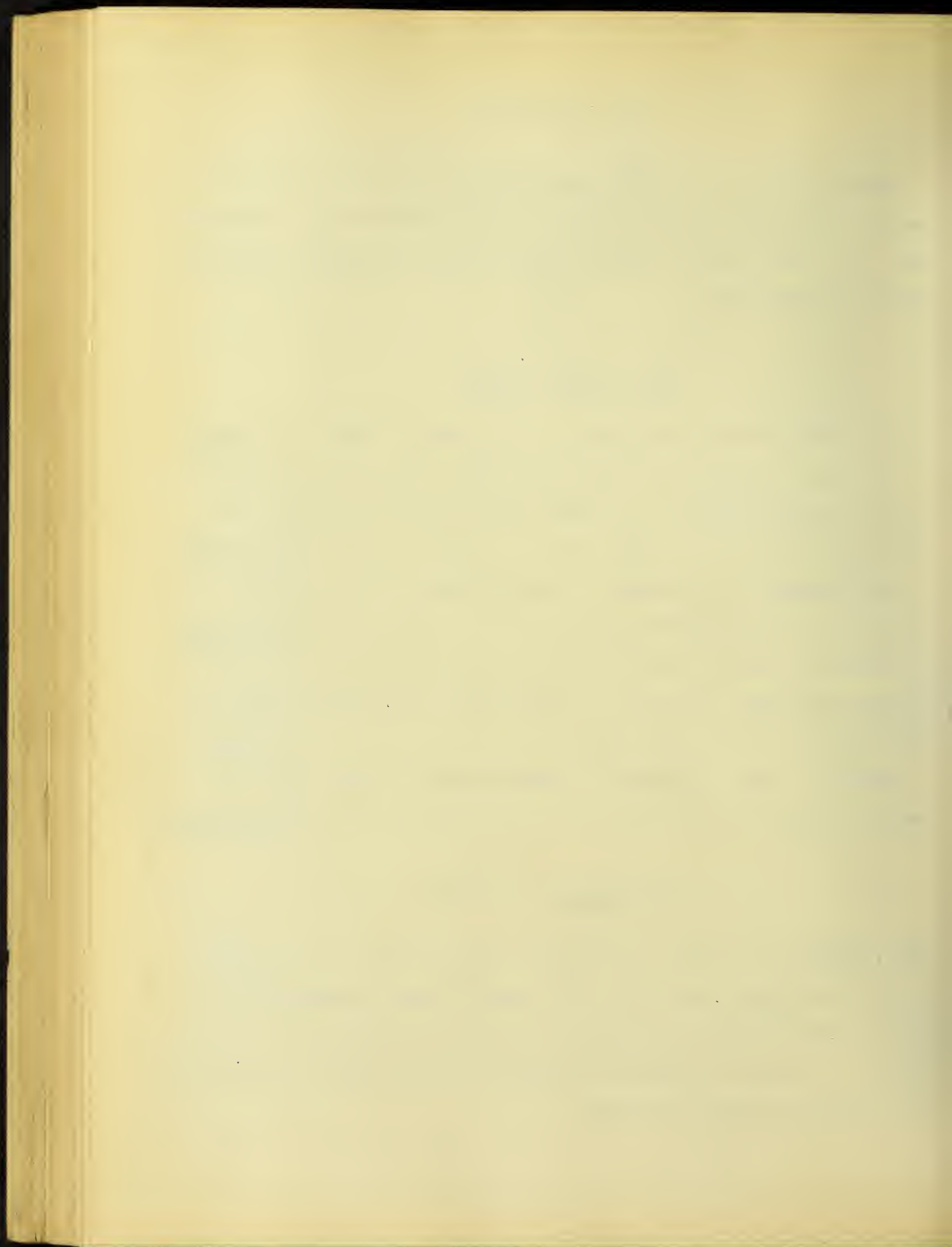
Key to Known Genera.

1. Bristles of abdomen spatulate; body usually rough ----- Pelops.
 Bristles of abdomen not spatulate; body with smooth integument-2.
2. Pteromorphae attached to cephalothorax as well as to abdomen;
 tarsi of legs I broad at the tip ----- Gymnobates.
 Pteromorphae not attached to cephalothorax ----- 3
3. Claws of tarsus monodactyle ----- Oribatodes.
 Claws of tarsus tridactyle ----- 4.
4. Lamellae small; attached to cephalothorax for nearly their entire length, by the inner margin ----- Oribata.
 Lamellae large; attached to cephalothorax by their posterior margins only ----- Oribatella.

Gen. Pelops C. L. Koch.

1835. Pelops C. L. Koch. Crust. Myr. Arach., fasc. 2, 3.

Bristles large, spatulate; body usually rough; mandibles broad at the base but suddenly becoming narrow, and terminated by minute chelae. A large rectangular projection from the anterior margin of the abdomen is usually present.



Pelops latipilosus n.sp.

Chestnut brown; integument slightly rugose.

Cephalothorax small, the posterior part hidden by a rectangular projection from the anterior margin of the abdomen. Lamellae almost as long as the cephalothorax, about one-half as broad as long, the outer margin strongly convex, the inner free margin strongly concave; translamella a mere ridge; lateral lamellae present, similar to the lamellae in shape but longer. There is a large, stout pair of tectopodia present for the protection of the first pair of legs. The cephalothorax bears two pairs of prominent bristles; a large, long, lanceolate pair situated on the posterior dorso-lateral aspect, which are almost as long as the cephalothorax itself, directed forwards and curved towards the median plane; and a much smaller, slightly curved, serrate pair situated on the sides of the rostrum; directed outwards. Pseudostigmatic organs about as long as tibia of leg I, clavate with rugose heads.

Abdomen fully two-thirds as broad as long; pteromorphae one-half as long as abdomen, truncate in front. When the mite is walking the pteromorphae are so expanded as to present a view of their whole



external surface from above, but upon the slightest provocation they are instantly drawn in close to the body and then entirely hide the legs. There is a broad, rectangular projection extending from the anterior margin of the abdomen, from each anterior corner of which projects an enormous, spatulate bristle, fully as long as the cephalothorax and projecting beyond the tip of the rostrum; at its broadest part it is broader than the width of the femur of leg I. The abdomen bears at least eight other pairs of spatulate bristles, but they are of about the usual size. There are two bristles situated just above each pteromorpha; two on each side of the median line at the posterior margin of the abdomen, one pair on the posterolateral margin just in front of these; two situated almost touching each other at the middle of each lateral half of the dorsum and a single bristle situated about one-half the distance from these two to the anterior margin of the abdomen. Genital and anal covers subequal; genital covers situated approximate to the anterior margin of ventral plate; anal covers situated their length from the genital covers and three-fourths their length from the posterior margin of the ventral plate.

Legs rather short; tarsus and tibia of leg I subequal. Each leg bears several large, stout, slightly curved, serrate bristles. Unguis tridactyle; dactyles unequal.

Length, 0.54mm; breadth, 0.42mm.

Under hickory bark. Collected by H. Glasgow at Urbana, Illinois. Three specimens.



Gen. Gymnobates.

1902. Gymnobates Banks. Can. Entom. for 1902. p. 175.

Pteromorphae long, extending beyond the anterior margin of the abdomen, and attached to the cephalothorax; claws tridactyle; tarsi of legs I broad at the tip.

78

Gymnobates longus n.sp.

Pale, yellowish brown; integument of medium thickness, surface smooth.

Cephalothorax long and narrow. The situation of the lamellae is peculiar in this species. The true lamellae are situated laterally. They are very long and narrow, about two-thirds as long as the cephalothorax, and their posterior ends, or the bases of the lamellae, are situated below the attachment of the pteromorphae to the cephalothorax. The median lamellae are indicated by two very short ridges situated at the posterior part of the cephalothorax; a very long, narrow translamella connects their anterior ends. There is a posterior pair of very long, simple bristles situated just in front of the translamella. The lateral, true lamellae each bear a long, slightly curved, pectinate bristle, about as long as the lamella from which it extends. Pseudostigmatic organ with a small, short peduncle and a large, globose head.

Abdomen about one-half as broad as long; pteromorphae very long, about as long as abdomen and extending from behind the middle of abdomen to almost the middle of cephalothorax. Genital opening almost round; situated about three times its length in front of the much larger anal opening. Anal opening broader posteriorly than anteriorly, situated almost approximate to the posterior margin of ventral plate.

Anterior pair of legs about two-thirds as long as abdomen; distal end of tarsus broad, this is only true, however, in the case of tarsus I; tarsus two-thirds as long as tibia. Femur of leg II bearing laterally a long, chitinous blade, the anterior cusp of which is as long as the genua of same leg. Legs bearing three equal claws.



Length, ~~0.24~~ 0.48 mm.; breadth, 0.14 mm.

Under a log. Collected by the writer, Arcola, Illinois. Two specimens.



Gen. Oribata Latr.

1802. Oribata Latreille. Buffon, Hist. nat., ed Sonnini, Ins.
vol. 3, p. 65.

Body with smooth integument; pteromorphae attached to abdomen only; claws tridactyle; lamellae attached to the cephalothorax for almost the entire length of the inner margin.



Oribata albida n. sp.

Very pale yellowish brown; integument finely punctate, especially on the pteromorphae.

Cephalothorax two-thirds as broad as long; lamellae long and narrow, two-thirds as long as cephalothorax; without cusps, broadest in the middle; no translamella. Lateral lamellae present; very narrow and about two-thirds as long as lamellae, each bearing a long, stout, curved, pectinate bristle. Lamellar hairs rather short, one-half as long as lamellae, and extending almost to the tip of rostrum. Interlamellar hairs situated in approximation to the base of the lamellae and slightly longer than the lamellar hairs. Pseudostigmatic organ strongly recurved, with long peduncle and slightly pectinate, clavate head.

Abdomen two-thirds as broad as long; pteromorphae not extending beyond the anterior margin of abdomen; triangular, anterior free edge concave. Genital covers small, about two-thirds as long as anal covers, situated about two and one-half times their length in front of the latter. Abdomen hairless.

Anterior pair of legs almost as long as abdomen. Unguis tri-dactyle.

This species resembles O. clavipectinata somewhat, but it is of a much lighter color; the pseudostigmatic organs are very slightly pectinate, instead of being strongly pectinate, and the interlamellar hairs are approximate to the base of the lamellae, instead of being in the normal position.

Length, 0.44 mm. ; breadth, 0.28 mm .

Under old boards. Collected by writer at Tuscola, Illinois.

Many specimens.



Oribata clavata. n.sp.

Light brown; integument of medium thickness, surface smooth.

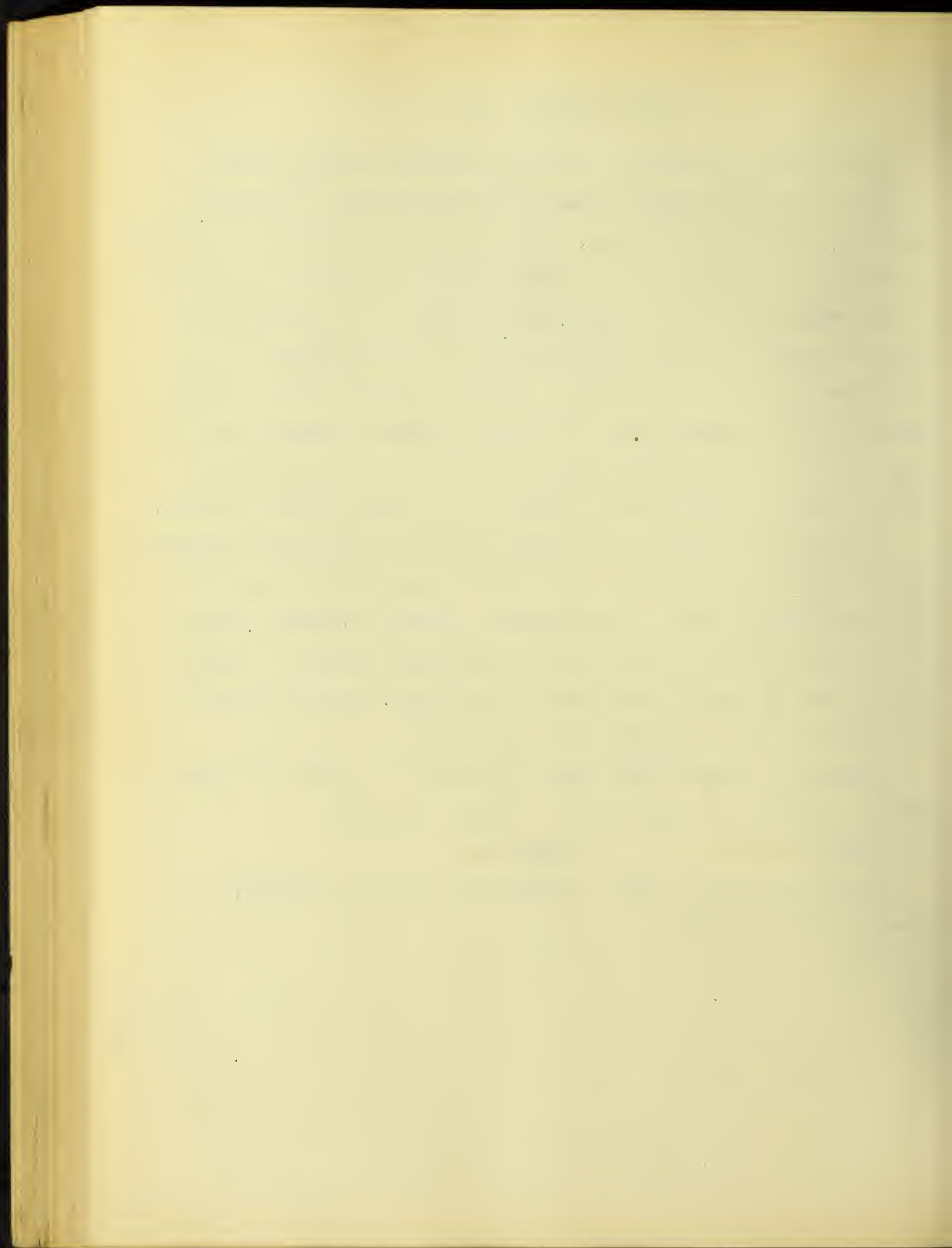
No demarcation between cephalothorax and abdomen. No median lamellae, but a pair of narrow, lateral lamellae which arise at the pseudostigmata and extend about two-thirds the distance to the tip of the cephalothorax. Lateral lamellae broadest at the posterior end and gradually narrowing anteriorly until they disappear. No translamella. No lamellar hairs or anterior lateral hairs. Interlamellar hairs situated almost in front of pseudostigmata, about as long as the pseudostigmatic organ and pectinate. Pseudostigmata funnel-shaped; pseudostigmatic organs clavate and slightly recurved.

Abdomen about two-thirds as broad as long; pteromorphae triangular and not extending beyond the base of the cephalothorax; they are about one-third as long as the abdomen. Dorsum of abdomen bearing about a dozen stout, slightly curved, pectinate bristles. Genital covers twice as long as broad and situated about one and one-half times their length in front of the anal covers.

Legs short; anterior pair about three-fifths as long as the abdomen. Tarsus and tibia subequal. Unguis tridactyle.

Length, 0.56 mm. ; breadth, 0.42 mm.

Under old pieces of wood. Collected by author at Arcola, Illinois. A few specimens.



Oribata depressa Banks.

1895. Oribata depressa. Banks. Trans. Amer. Entom. Soc. vol. 22, p. 6.

Light brown; surface of integument almost smooth.

Cephalothorax two-thirds as broad as long; median lamellae absent; a small pair of lateral lamellae present, one-half as long as cephalothorax and lying against the same. Lamellar hairs long, slightly curved and slightly pectinate; interlamellar hairs situated almost approximate to the posterior margin of dorso-vertex, of moderate length; anterior lateral bristles stout, curved, and pectinate.

Pseudostigmatic organ long, clavate, pectinate and slightly recurved.

Abdomen two-thirds as broad as long; pteromorphae very large, about as long as abdomen, rounded in front and extending almost to the tip of cephalothorax. Genital covers three-fourths as long as anal covers and situated almost twice their length in front of the latter. Anal covers subrectangular and situated almost approximate to the posterior margin of ventral plate. Abdomen hairless.

Anterior pair of legs almost as long as the abdomen; tibia and tarsus subequal; genua over one-half as long as tibia; femur over twice as long as genua. Tactile hair on tibia I twice as long as the segment itself. Each leg bears several stout, curved, pectinate hairs. Femora of legs III and IV somewhat enlarged and each bearing on their posterior margin about the middle of the segment a stout, curved, pectinate bristle almost as long as the segment on which it is situated. Unguis tridactyle.

Length, 0.51mm; breadth, 0.31mm.

Under bark. Collected by the writer at Urbana, Illinois. Several specimens.



Orilata figurata n.sp.

Light brown; surface of integument smooth.

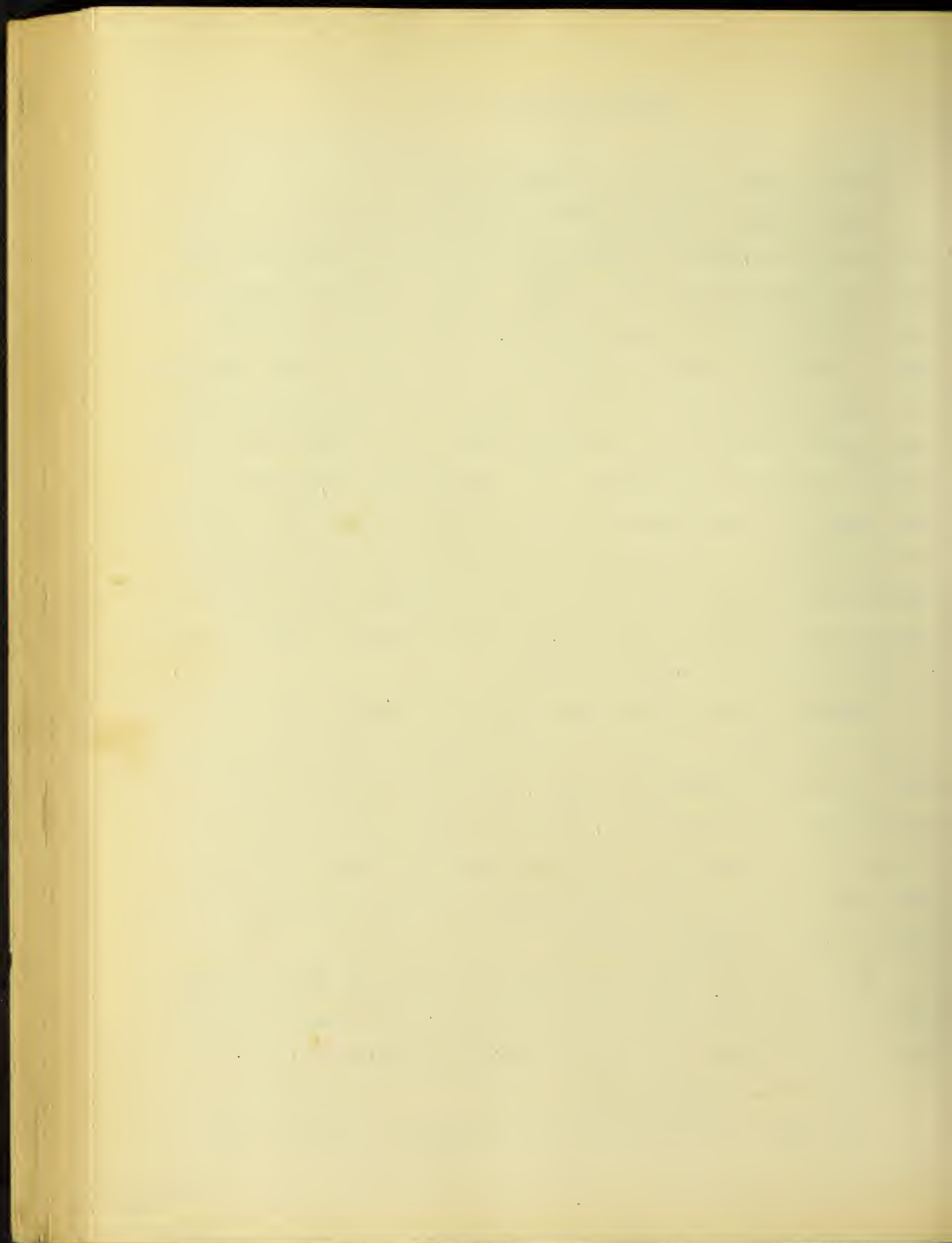
Cephalothorax as broad as long; lamellae three-fourths as long as cephalothorax, about the same width, throughout; lamellar cusps prominent; translamella a mere ridge. Lateral lamellae present, about three-fifths as long as cephalothorax, curved towards the median plane. Prominent, stout tectopodia for first pair of legs. Lamellar hairs straight, pectinate, about as long as the lamellae from which they extend; interlamellar hairs approximate to the posterior margin of the dorso-vertex and similar to the lamellar hairs, but half as long again, directed forwards; anterior lateral hairs stout, curved, and pectinate, about as long as the lamellar hairs. Pseudostigma funnel-shaped, projecting about one-half its length above surface of cephalothorax; pseudostigmatic organ about as long as tibia of leg I, strongly clavate and directed forward.

Abdomen globose; pteromorphae attached to the anterior two-thirds of the lateral line; truncate in front and not extending beyond the anterior margin of abdomen, anterior free edge concave. Genital covers subrectangular, almost as large as anal covers and situated one and one-half times their length in front of the latter. Anal covers situated almost approximate to the posterior margin of the ventral plate. Abdomen hairless.

Anterior pair of legs three-fourths as long as abdomen; tarsus slightly longer than tibia. Legs bearing prominent pectinate bristles. No tactile hair on tibia I. Unguis tridactyle.

Length, 0.39mm; breadth, 0.30mm.

Under logs. Collected by author at Urbana, Illinois. One specimen.



Oribata lamirata n. sp.

Light brown; surface of integument smooth.

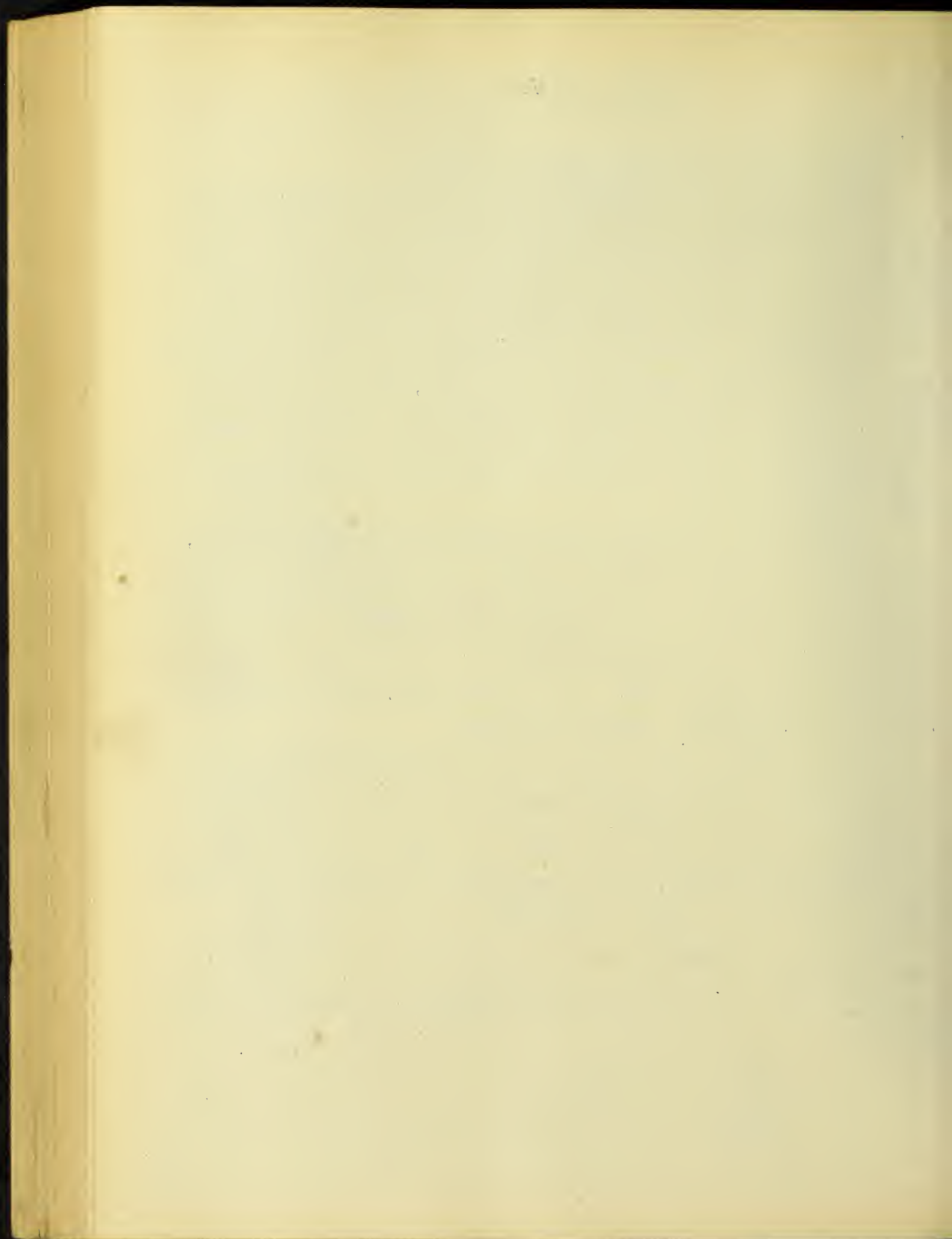
Cephalothorax long and narrow; lamellae about three-fifths as long as cephalothorax, without cusps and very narrow; translarellae absent. There is a large pair of tectopodia for the protection of coxa I. Lamellar hairs somewhat longer than lamellae, straight and directed forwards; interlamellar hairs similar to lamellar hairs but more erect. Anterior lateral hairs pectinate, about as long as lamellae, curved markedly towards the median plane. Pseudostigmatic organ with short, slightly recurved peduncle and enlarged, oblong head. Palpi prominent.

Abdomen almost twice as long as broad; pteromeryxae truncate, not extending beyond the anterior margin of abdomen and attached to the anterior one-half of the lateral line of abdomen. Genital covers twice as long as broad, situated about twice their length in front of the larger anal covers. Anal covers almost approximate to posterior margin of ventral plate. Abdomen hairless.

Anterior pair of legs almost as long as abdomen, tarsus and tibia subequal. This species is remarkable in that all the femora possess a chitinous, blade-like expansion. This chitinous blade is slightly crescent shaped, without cusps and is attached to the whole length of the femur. Unguis tridactyle.

Length, 0.44mm; breadth, 0.22mm.

Under bark. Collected by author at Urbana, Illinois. A single specimen.



Oribata lucasi Nic.

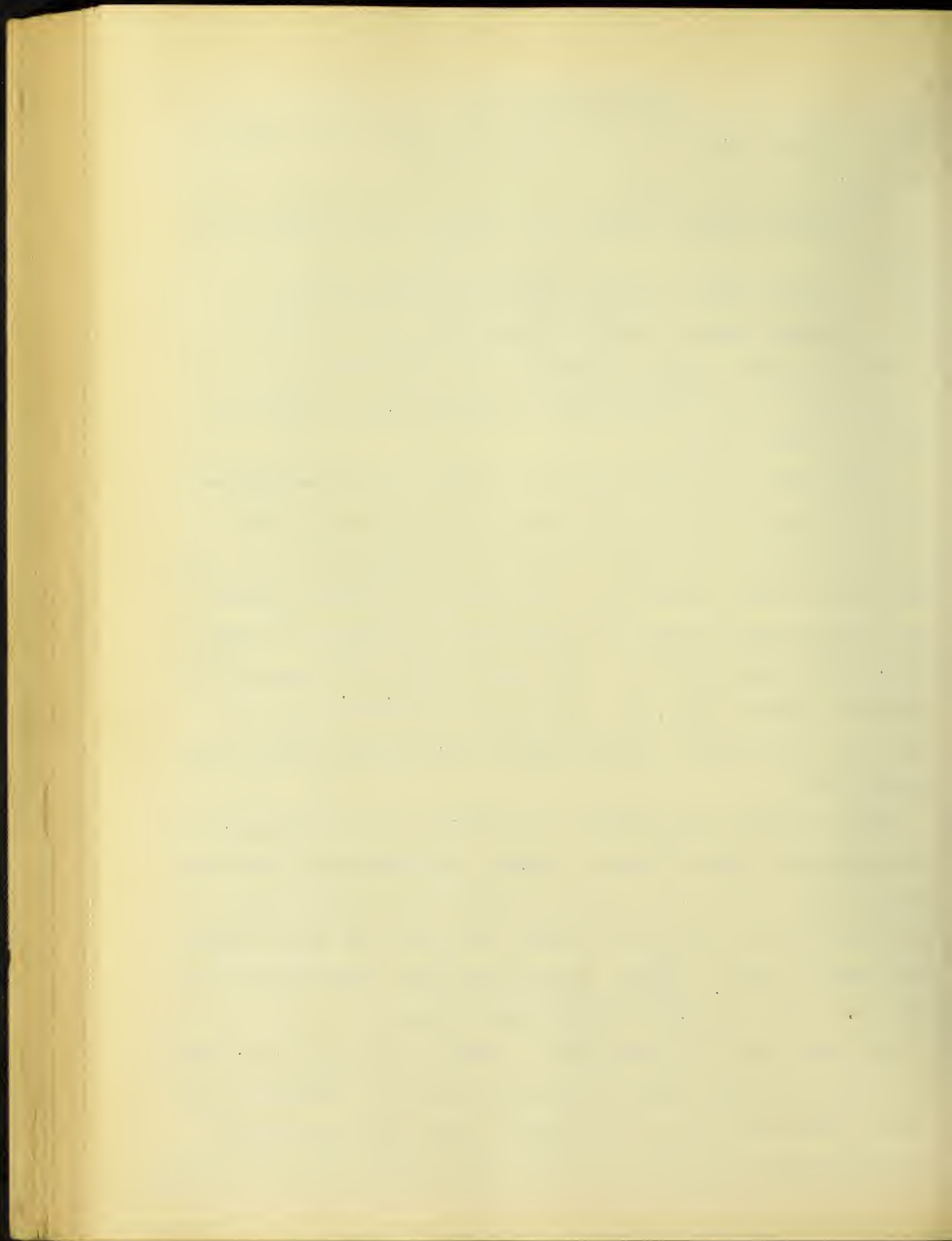
1855. Oribata lucasi. Nicolet. Arch. Mus. Paris., t.7, p.432, pl.4, fig. 2.
1884. Oribata lucasi. Michael. Brit. Orib., vol.1, p.462, pl.11, figs. 1-5.
1898. Oribata lucasi. Michael. Das Tier., lief. 3, p.22.
1901. Oribata lucasi. Tragardh. Arach. Agypt. Sud., p.122.
- (?)1904. Oribata lucasii. Tragardh. Mon. Arkt. Acar., p.19.

Very dark brown; anterior part of abdomen black; integument thick, surface smooth.

Cephalothorax pyramidal in form; lamellae about two-thirds as long as cephalothorax and about one-fourth as broad as long, truncate in front. Two pairs of rostral hairs present, both pairs being denticulate; anterior pair shortest and directed forward, but curved slightly toward the median plane; hind pair straight and directed almost forward. Interlamellar hairs as long as the posterior rostral hairs, denticulate and slightly curving away from the median plane. Pseudostigmatic organ clavate and as long as the femur.

Abdomen oblong; pteromorphae not extending beyond the margin of the abdomen and cephalothorax, truncate. Abdomen with a few small hairs; anal covers twice as long as broad, and situated near the posterior margin of the ventral plate and twice its length behind the genital covers. Genital covers about three-fifths as long as the anal covers. Ventral plate of medium size.

Legs short and stout, subequal in length; first pair two-thirds as long as the body; tarsus, tibia and femur all of about the same length; femur over one-half as broad as long; genua very small, being about one-third as long as the femur; tibia broad and truncate



at its distal end, where arises a long bristle twice as long as the segment itself. A similar bristle occurs also on each tibia of the second pair. (Length 0.60 mm.; breadth 0.40 mm.)

← Under boards and in rubbish. ~~Algeria, France, England, Egypt,~~

~~Illinois.~~ Collected by myself, Urbana, Ill. Three specimens.



Oribata maxima n. sp.

Rather dark brown; surface of integument smooth.

Cephalothorax about one-half as long as abdomen; lamellae a little over one-half as long as cephalothorax, narrow, without cuspis, and of about equal width throughout their length; translamella similar to lamella but only about one-half as broad and two-thirds as long as lamella. Lateral lamellae a mere ridge. A small pair of tectopodia present. Lamellar hairs long, straight, and pectinate, a little longer than the lamellae from which they extend; interlamellar hairs situated in front of pseudostigmata and near the base of the lamellae. They are equal to the lamellar hairs; anterior lateral hairs two-thirds as long as lamellar hairs, slightly curved and very slightly pectinate, instead of being strongly pectinate, as is usually the case. Pseudostigma short, funnel-shaped, and projecting slightly from the surface of the dorso-vertex; pseudostigmatic organ clavate, recurved, very slightly pectinate, and about one-half as long as the lamella.

Abdomen globose; pteromorphae small, triangular, about one-fourth as long as abdomen, truncate in front and not extending beyond the anterior margin of abdomen. Genital covers slightly broader anteriorly than posteriorly, situated one and one-half times their length in front of the larger anal covers. Abdomen hairless.

Anterior pair of legs about as long as abdomen; tibia and tarsus subequal; genua less than one-half as long as tibia; femur three times as long as genua. Femora of legs III and IV somewhat enlarged. Unguis tridactyle, dactyles equal.

Length, ⁰0.87mm; breadth, 0.58mm.

Under bark and in moss. Collected by J. D. Hood, Urbana, Illinois. Several specimens.



Orilata subaquila n.sp.

Chestnut brown; integument of medium thickness, surface almost smooth.

Cephalothorax about two-thirds as broad as long; lamellae prominent, about two-thirds as long as cephalothorax, narrow at the posterior part, the anterior part being about one-fourth as broad as the lamellae are long; lamellae with prominent cusps; translamellae incomplete being interrupted medially. Lateral lamellae present, three-fifths as long as cephalothorax, very narrow. A rather prominent tectonidium for leg I is present. Lamellar hairs slightly pectinate, straight, directed forwards and somewhat longer than the lamellae from which they extend. Interlamellar hairs situated approximate to posterior margin of cephalothorax, similar to lamellar hairs. The anterior lateral hairs spring from the lateral lamellae. They are stout, pectinate, almost straight and about as long as the lamellae. Pseudostigma funnel-shaped, extending one-third its length above the surface of cephalothorax; pseudostigmatic organ two-thirds as long as lamellae, clavate, dentate, directed forwards and away from median plane.

Abdomen about three-fifths as broad as long; pteromorphae attached to the anterior two-thirds of the lateral line of abdomen, truncate in front and not extending quite to the anterior margin of abdomen; anterior free edge of pteromorphae straight. Genital covers almost rectangular, slightly broader anteriorly than posteriorly, situated about one and one-half times their length in front of the larger anal covers. Anal covers half as long again as genital covers, triangular and situated almost approximate to the posterior margin of ventral plate. Abdomen hairless.



Anterior pair of legs a little longer than the cephalothorax; tarsus and tibia subequal. Tactile hair of tibia I, situated at the dorsal, distal aspect of segment, about three times as long as the segment itself. The femur of leg II bears on its lateral surface a small, narrow blade with a large cusp at its distal end. This blade is represented in the femur of leg I by a small chitinous ridge with a small process at its distal end. The legs each bear several stout, curved, pectinate bristles. Unguis tridactyle.

Length, 0.41mm; breadth, 0.26mm.

Under bark and in moss. Collected by author at Urbana, Illinois.

Many specimens.



Oribata texana Banks.

1906. ^ Banks. Proc. Acad. Nat. Sci. Phil. Nov., 1906. p. 494,
pl. 17, fig. 24

Dark reddish brown; integument thick, resistant, dorsum of abdomen finely punctate, venter roughly rugose.

Cephalothorax as broad as long; central lamellae absent; lateral lamellae present, but indistinct. There are no lamellar or inter-lamellar hairs. Anterior lateral pair of bristles stout, curved, and pectinate. There is a posterior lateral pair of bristles, very similar to the anterior lateral pair, though not so stout, but longer. Pseudostigmatic organ with long recurved peduncle and clavate head.

Abdomen globose; pteromorphae large, almost as long as abdomen, rounded in front, and extending forward two-thirds the length of the cephalothorax. Genital covers two-thirds as long as anal covers, and situated about one and one-half times their length in front of the latter. Anal covers much broader posteriorly than anteriorly and situated one-third their length from the posterior margin of the abdomen. Abdomen hairless.

Legs small, with a few hairs. Unguis tridactyle.

Length, 0.56 mm. ; breadth, 0.37 mm.

Under old pieces of lumber. Collected by the writer, Arcola, Illinois. Several specimens.



Oribata badia n.sp.

Chestnut brown; integument granulate.

Cephalothorax three-fifths as long as abdomen; lamellae long and narrow, two-thirds as long as the cephalothorax and of almost uniform width; lateral lamellae very small. There is a pair of tectopodia for the first pair of legs. Lamellar hairs about as long as the lamellae, straight, pectinate and directed forwards; inter-lamellar hairs equal to the lamellar hairs, but curved and directed outwards; anterior lateral hairs three-fifths as long as the lamellar hairs and slightly curved. Pseudostigmatic organ almost as long as femur of leg I, recurved, with pointed, clavate head. The palpi may be seen from above extending out from under the rostrum.

Abdomen almost as broad as long; pteromorphae attached to the anterior half of the abdomen, truncate and not extending beyond the anterior margin of the abdomen; anterior free margin of pteromorphae straight. Genital covers each almost twice as long as broad,



and much broader at the posterior than at the anterior end, and situated approximate to the anterior margin of ventral plate; anal covers much larger than genital covers, almost rectangular in shape and situated almost approximate to the posterior margin of the ventral plate and more than their length from the genital covers. Abdomen hairless.

Anterior pair of legs about as long as abdomen; tarsus and tibia subequal, genua one-half as long as tibia, femur one and one-half times as long as tibia. All the legs are well clothed with stout, curved, pectinate bristles. Unguis tridactyle; dactyles unequal.

Length, 0.55 mm.; breadth, 0.38 mm.

Under rubbish. Collected by the writer at Urbana, Illinois.

A few specimens.



164.
Gen. Oribatella Banks.

1895. Oribatella Banks. Trans. Amer. Ent. Soc., vol.22, 1895, p.8.

Integument smooth; pteromorphae attached to abdomen only; claws tridactyle; lamellae large, attached to cephalothorax by their posterior margins only.

1881
1882
1883

Oribatella dentaticornis n. sp.

Light brown; surface of integument smooth.

Cephalothorax almost as broad as long; lamellae very large, almost completely hiding the cephalothorax, very deeply bifid in front; outer cusps almost twice as long as inner cusps, each of the former possessing two teeth on their outer margins. Lamellae contiguous at their bases. Lateral lamellae present, almost as long as the cephalothorax, curved towards the median plane and extending to tip of rostrum. Two pairs of tectopodia present; anterior pair large, thick, about two-thirds as long as the lateral lamellae; posterior pair small, about one-third as long as the anterior pair. Lamellar hairs arise from the lamellae a little behind the base of the deep anterior notch of the same; stout, about as long as lamellae, strongly pectinate and directed forwards; interlamellar hairs dissimilar to lamellar hairs; situated near the posterior margin of cephalothorax, about as long as the lamellae, curved and very slightly pectinate; anterior lateral hairs stout, curved and with very long, lateral barbs. Pseudostigma funnel-shaped and projecting about one-half its length above the surface of the cephalothorax; pseudostigmatic organ clavate, very large and rather short, directed forwards and towards the median plane. Palpi prominent.

Abdomen as broad as long with a light spot at its base. Pteromorphae lying close to sides of abdomen, truncate in front and not extending beyond the anterior margin of abdomen; anterior free, edge convex above and concave below. Genital covers rectangular, almost as broad as long, situated about one and one-half times their length in front of the anal covers. Anal covers triangular, slightly longer than genital covers and situated about one-half their length from the



posterior margin of ventral plate. The dorsum of the abdomen bears about eight pairs of short, stout, curved bristles.

Anterior pair of legs about as long as abdomen; tarsus slightly longer than tibia; genual about one-half as long as tibia; femur, genual, tarsus and tibia each bearing a large, stout, curved, pectinate spine. Unguis tridactyle.

Length, 0.37mm; breadth, 0.24mm.

Under bark. Collected by author at Urbana, Ill. One specimen.



Oribatella magnilamellata n.sp.

Dark chestnut brown; integument thick, surface smooth.

Cephalothorax rather small, triangular and almost entirely hidden by the broad, long lamellae; lamellae very large, extending the entire length of the cephalothorax and projecting slightly beyond the tip of the rostrum, one-third as broad as long, notched in front. From the lateral corner of the lamella extends a sharp curved cusp; from the median corner extends a very stout, slightly pectinate bristle, curving slightly towards the median plane, and as long as the lamella is broad. One pair of tectopodia present which are one-half as long as the lamella. Interlamellar hairs long, curved, slightly pectinate, as long as the lamellae themselves and situated at the base of the lamellae; anterior lateral hairs about two-thirds as long as interlamellar hairs, strongly curved and pectinate. Pseudostigmatic organ somewhat longer than femur I, strongly clavate, directed forwards and towards the median plane.

Abdomen two-thirds as broad as long; pteromorphae about one-half as long as abdomen, truncate in front and not projecting beyond the anterior margin of abdomen. Anterior free margin of pteromorphae convex. Genital covers subrectangular, of equal breadth throughout, somewhat smaller than the anal covers, and situated twice their length in front of the latter. Anal covers subtriangular in shape, much broader posteriorly than anteriorly and situated one-half their length from the posterior margin of ventral plate. Abdomen with a few fine hairs.

Anterior pair of legs as long as abdomen; tarsus slightly longer than tibia; genua two-thirds as long as tibia; femur almost three



times as long as genual. Tactile hair almost twice as long as tarsus.
Unguis tridactyle; dactyles unequal.

Length, 0.52mm; breadth, 0.34mm.

Under bark. Collected by writer, Urbana, Illinois. Many specimens.



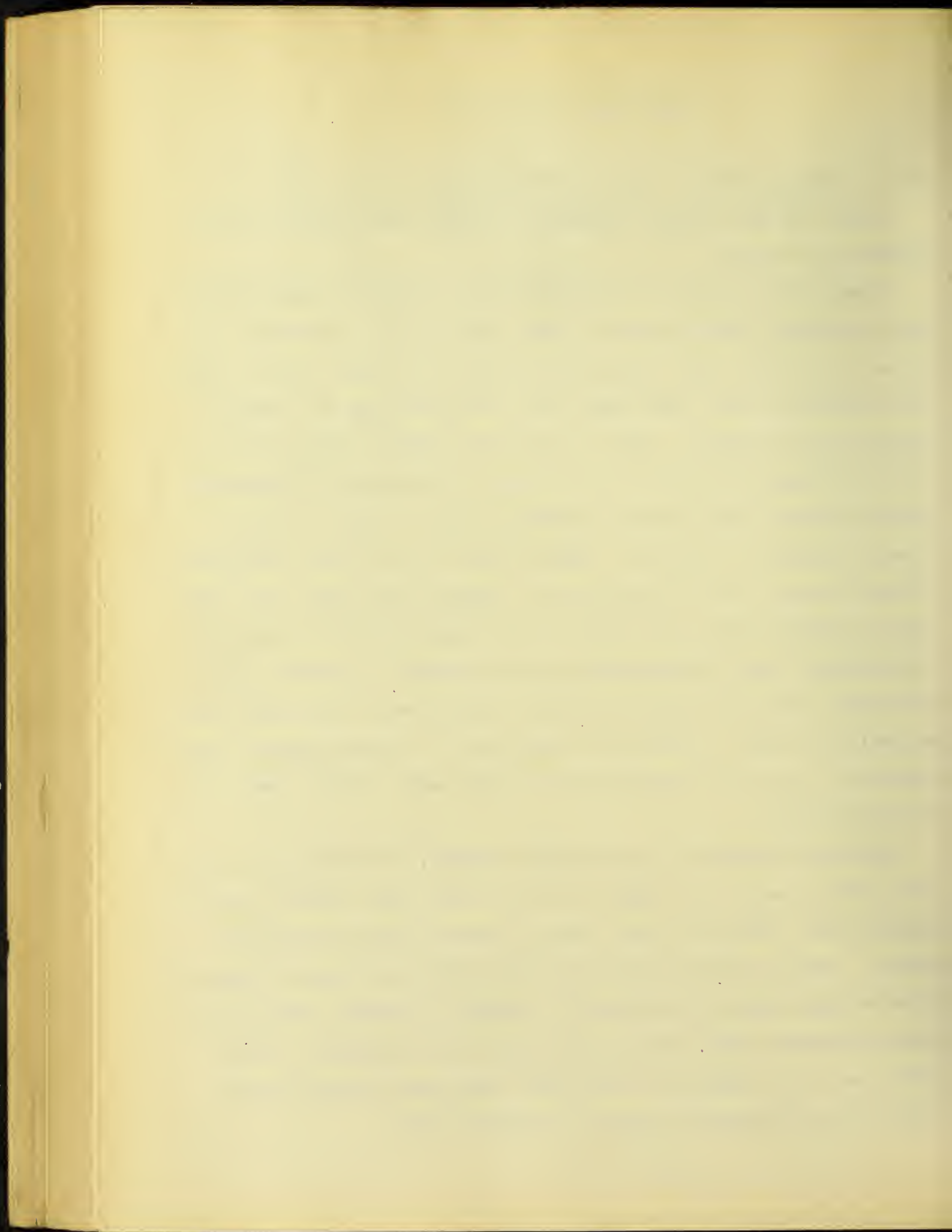
Oribatella minuta Banks.

1896. O. minuta Banks. Trans.Amer.Entom.Soc., vol.23, p.76.

Light chestnut brown; integument of body almost smooth; pteromorphae reticulate.

Cephalothorax almost as broad as long, and mostly hidden by the large lamellae, which extend to about the tip of the rostrum. Lamellae very broad, each ending anteriorly in two long, narrow cusps, one arising from the inner aspect and the other from the lateral aspect of the lamellae. The two cusps are subequal and project slightly beyond the tip of the rostrum; lateral margin of lamellae almost straight; inner margin markedly convex. A pair of short, broad tectopodia is present. Lamellar hairs very stout, pectinate, situated between the two cusps of the lamellae but nearer the inner cusps, extending about one-fourth their length beyond the tips of the lamellar cusps; interlamellar hairs similar to lamellar hairs, but longer and not so stout; anterior lateral hairs very stout, and markedly pectinate on the lateral edge only. Pseudostigmatic organ almost as long as the lamellae with a very large clavate head, directed forwards.

Abdomen subglobose; pteromorphae truncate, not extending beyond the anterior margin of abdomen; anterior free edge slightly concave. Abdomen with a whorl of eight, short, curved bristles around the margin. Genital covers each about three-fifths as broad as long and situated approximate to the anterior margin of ventral plate; anal covers somewhat larger than genital covers and situated a little more than their length from the latter, and about one-half their length from the posterior margin of ventral plate.



110.

Anterior pair of legs about as long as abdomen; tarsus and tibia subequal; gennal about one-half as long as the tibia. The gennal and tibia of legs I and II each bear a large, stout, slightly curved bristle on the outer margin. Unguis tridactyle; dactyles unequal.

Length, 0.34mm.; breadth, 0.16mm.

In moss and under bark of soft maple. Collected by the writer at Arcola, Illinois, also by J. D. Hood at White Heath, Illinois. Several specimens.



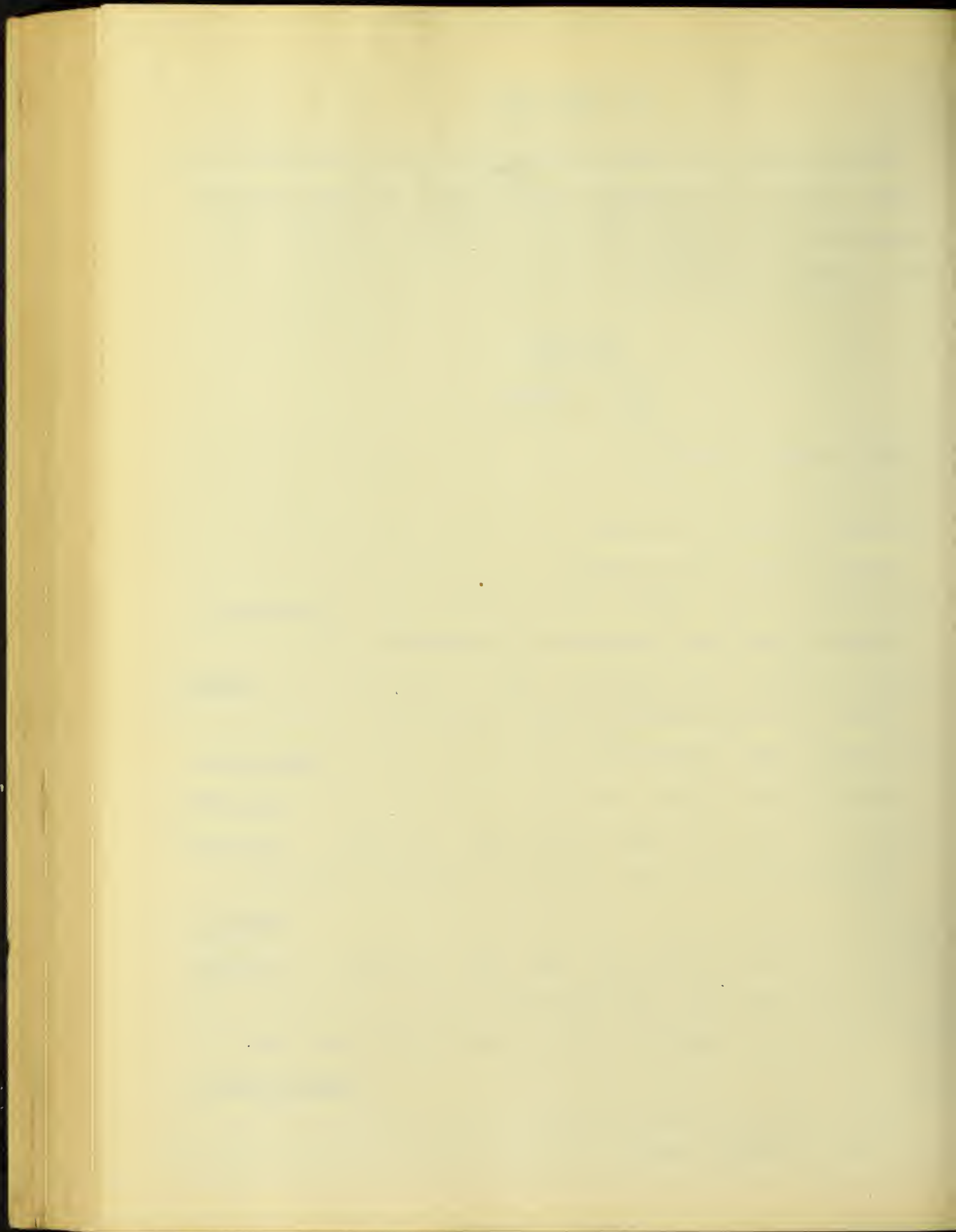
Fam. Nothridae.

Cephalothorax with a specialized seta arising from a pore on the dorsal surface of the abdomen; abdomen without chitinous wing-like expansions; adults usually with hard, chitinous integument; body often rugose or sculptured.

American

Key to Genera.

1. Body rugose or sculptured ----- 2.
Body smooth ----- 6.
2. Cephalothorax with lamellae ----- 3.
Cephalothorax without lamellae ----- 7.
3. Cephalothorax and abdomen fused dorsally ----- Scutovertex.
Cephalothorax plainly demarcated from abdomen ----- 4.
4. Femora without thin peduncles; unguis tridactyle ----- Cepheus.
Femora with thin peduncles; unguis monodactyle ----- 5.
5. Lamellae large, blade-like ----- Tegeocranus.
Lamellae solid ridges ----- Carabodes.
6. Last three pairs of legs inserted under the body ----- Liacarus.
Last three pairs of legs inserted at the edge of the body-----
Notaspis.
7. Legs thin, moniliform, much longer than the body ----- Damaeus.
Legs short and stout; not moniliform ----- 8.
8. Abdomen with a transverse suture; adults with a soft skin-----
Hypochthonius.
Abdomen without transverse suture ----- 9.
9. Dorsum of abdomen convex ----- 10.

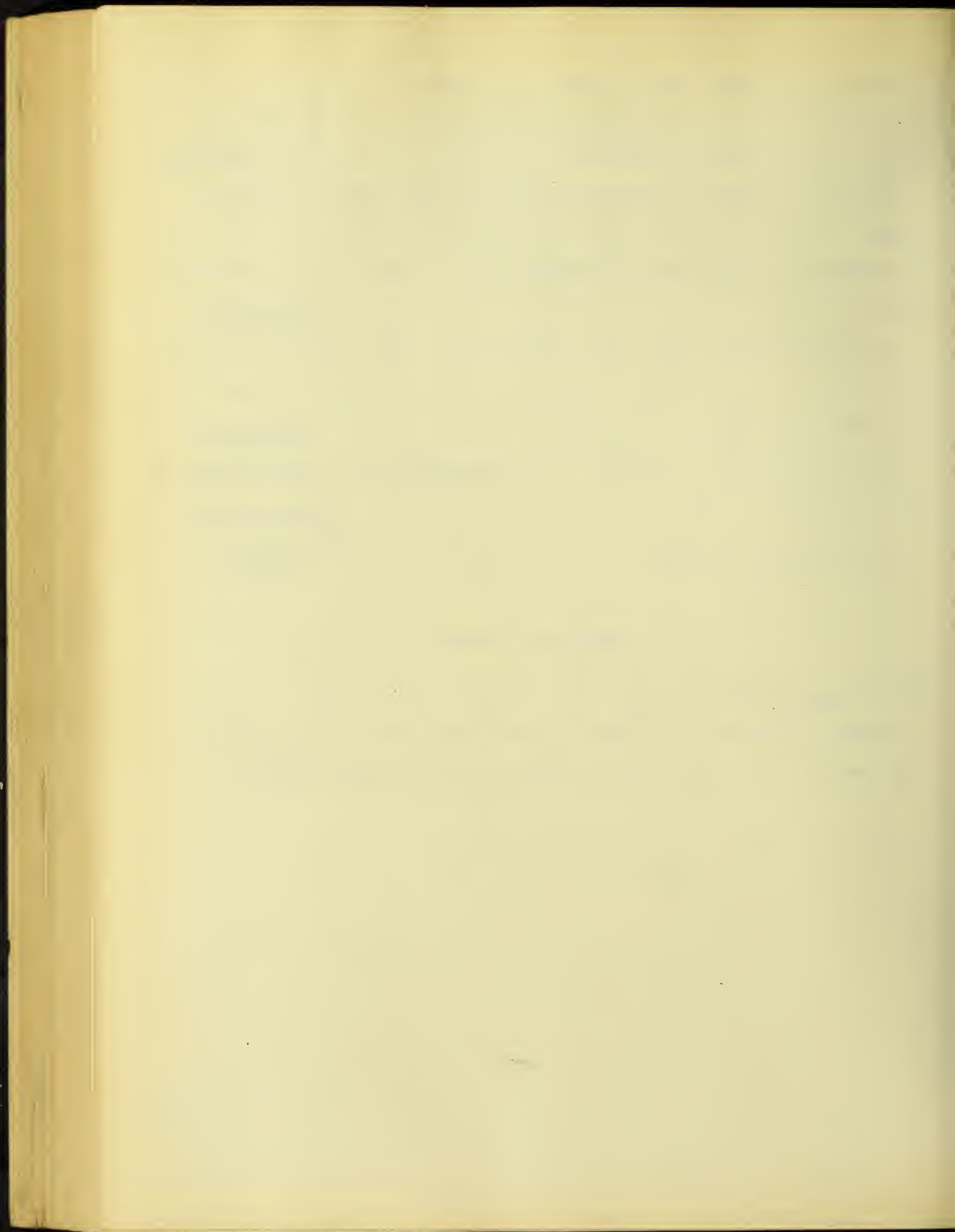


- Dorsum of abdomen flat, concave, or uneven ----- 13.
- 10. Dorsum of abdomen carrying cast nymphal skins which show concentric rings; unguis tridactyle. ----- Neoliodes
- Dorsum of abdomen not carrying nymphal skins showing concentric rings ----- 11.
- 11. Genital and anal covers separate and inserted in a large ventral plate ----- Hermannia.
- Genital and anal covers only separated by common rim; no ventral plate ----- 12.
- 12. Body cylindrical; unguis monodactyle ----- Lohmannia.
- Body oval; unguis tridactyle ----- Tumidalvus.
- 13. Tectopedia present for legs II ----- Cymbaeremaeus.
- No tectopedia for legs II ----- Nothrus.

Gen. Liacarus- Michael.

1898. Liacarus Michael. Das. Tier., Lief 3. 1898, p.40.

Cephalothorax with lamellae, plainly demarcated from abdomen; body smooth; last three pairs of legs inserted under the body.



Gen. Notaspis Herm.

1804. Notaspis Hermann. Mena. Apt., p. 87.

Cephalothorax with lamellae and plainly demarcated from the abdomen; body smooth; last three pairs of legs inserted at the edges of the body.



Notaspis aequalis Mich.

1890. Notaspis aequalis. Michael. Proc. Zool. Soc. Lond., pl.37, fig. 5.

1898. Notaspis aequalis. Michael. Das Tier., lief.3, p. 46.

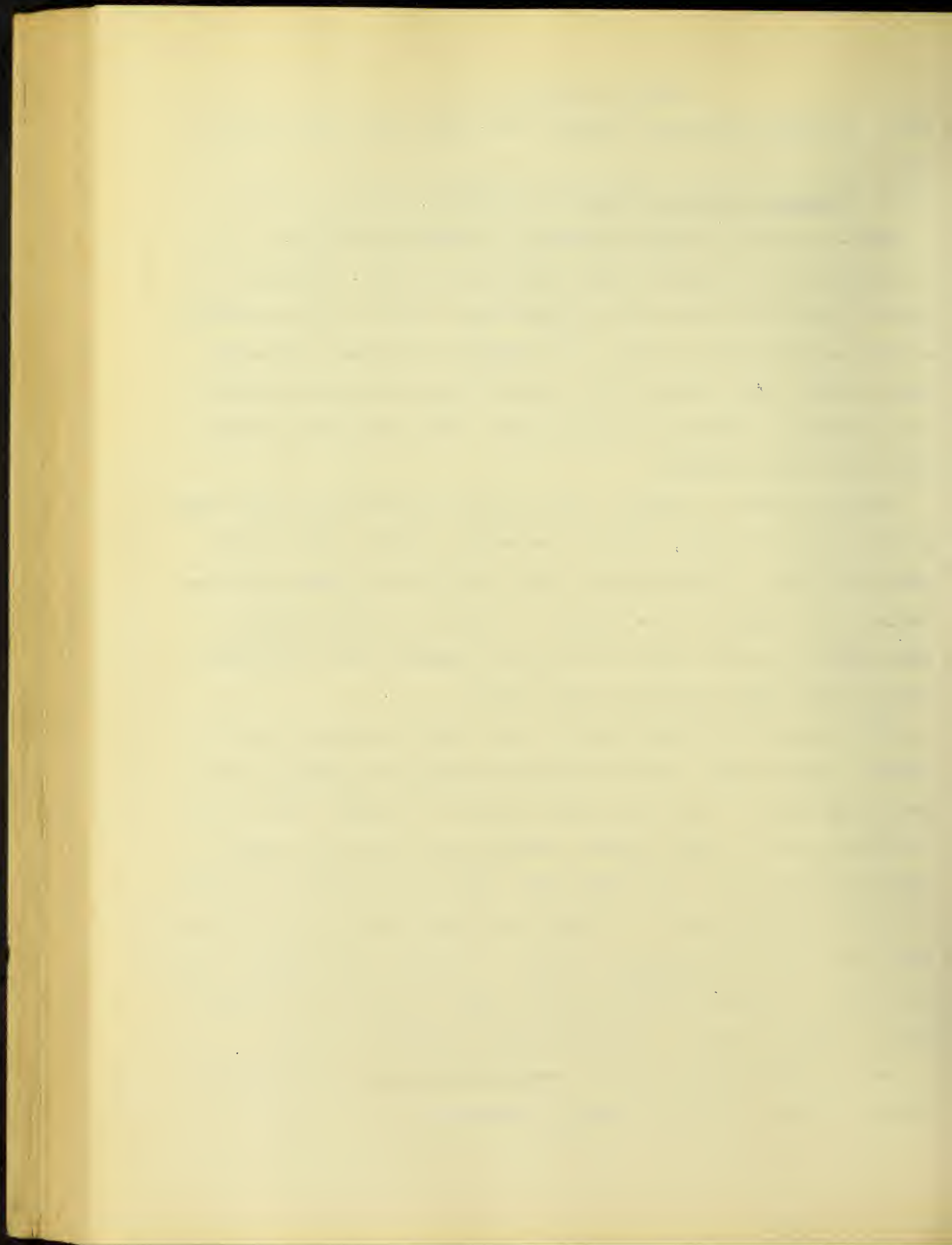
Uniform brown; integument smooth and moderately tough.

Cephalothorax broad and rather pointed in front. Lamellae narrow and continuous with the translamellae; lamellar hairs straight, as long as the femur of leg 1, and slightly inclined toward the median plane; hairs denticulate; rostral hairs long, denticulate and converging towards the median plane. Pseudostigmatic organ short and thick, clavate.

Abdomen globose; progaster with a boss on each side, which bears a large curved bristle, pointing backward. Abdomen with a very few short hairs. Ventral plate large; anal covers almost approximate to the margin of the abdomen. They are one-half as long again as the genital covers, which are situated twice the length of the anal covers in front of the latter.

Posterior pair of legs longest, being about as long as the abdomen. Anterior pair three-fourths as long as the posterior pair. Femur and tarsus of the first pair subequal in length; femur two-thirds as broad as long; genua one-third as long as the femur; tibia as long as the tarsus and three times as broad at the distal end as at the proximal end. There is a long bristle on the tibia of leg 1, as long as the segment itself. A similar but somewhat shorter bristle is present on the anterior edge of the femur of leg 3 and the tibia of leg 4. (Length 0.40 mm.; breadth 0.26 mm.)

← Under boards and in rubbish. ~~Algeria Illinois~~. Collected by myself, Urbana, Illinois. Several specimens.



Notaspis berlessei new name.

1900. Oppia lucorum. Berlese. Gli, Acari Agrari, p.100.

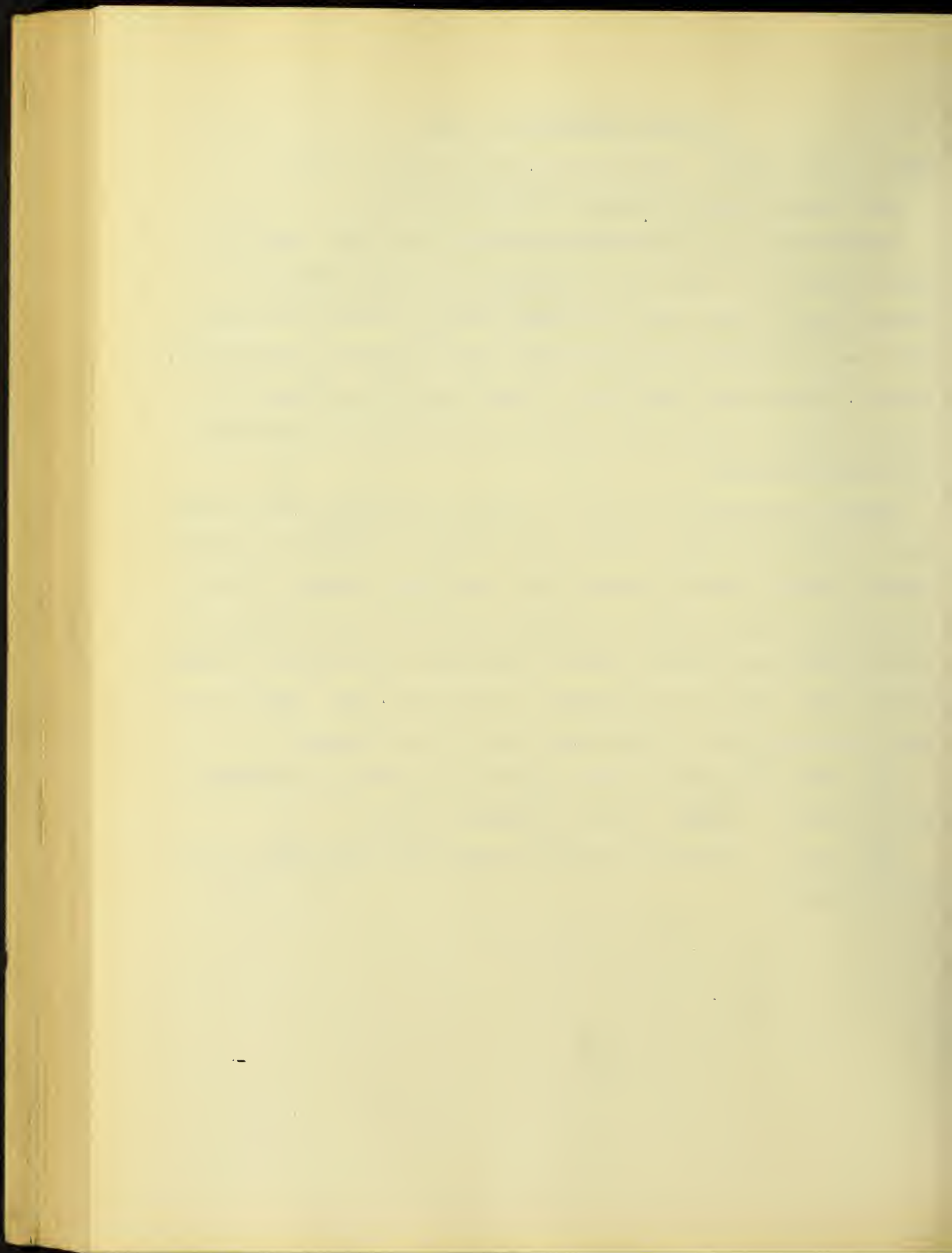
Dark reddish brown; integument thick and hard.

Cephalothorax about one-third as long as the body. Lamellae small, each a mere ridge about as long as the cephalothorax; lamellar hairs longer than the cephalothorax, straight and pectinate; pseudostigmata low, cylindrical; pseudostigmatic organ short, clavate, with a spherical head; interlamellar hairs subequal to lamellar hairs; rostral hairs almost equal to lamellar hairs and but slightly curved.

Abdomen circular in outline from above; dorsum with three light spots on each side; anal covers almost twice as long as the genital covers; genital covers situated about twice their length in front of the anal covers; dorsum of abdomen with four rows of prominent, curved, pectinate bristles, there being about six bristles in each of the outer rows and four in each of the inner rows. There is a long, straight bristle on the "shoulder" of the abdomen.

Legs subequal; posterior pair not extending beyond the margin of the abdomen. Length 0.80 mm.; breadth 0.52 mm.

Under bark. Collected by myself, Arcola and Homer, Ill. Several specimens.



116.

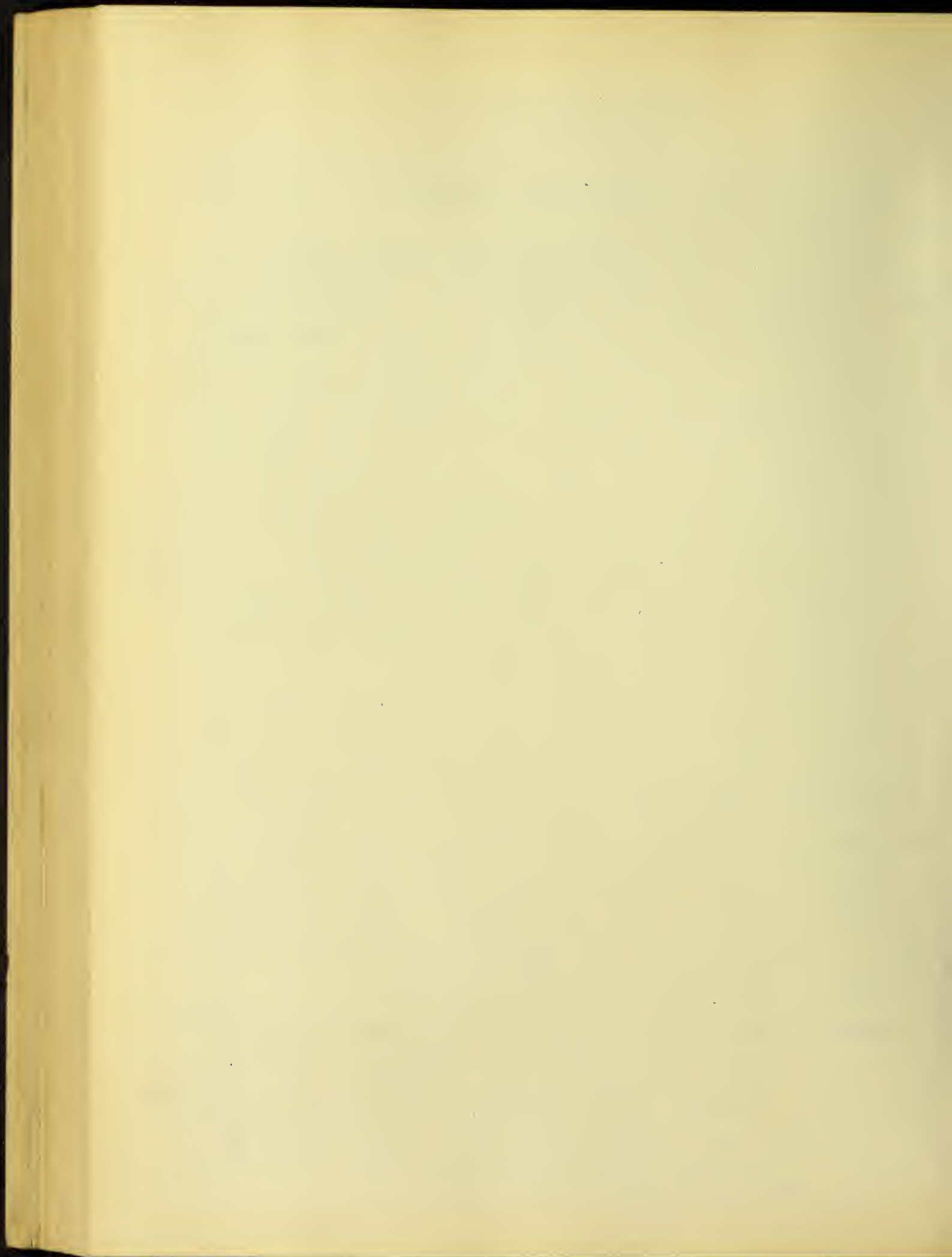
Notaspis curviseta n. sp.

Dark brown tinged with pea green; integument of abdomen tuberculate, otherwise smooth.

Cephalothorax almost as broad as long; lamellae very narrow blades on edge, of equal width throughout their length, without cusps and about one-half as long as the cephalothorax; no translamella. A small pair of tectopodia present. Lamellar hairs long, straight, simple, about two-thirds as long as the cephalothorax; interlamellar hairs similar to lamellar hairs, but about half as long again and situated near the base of the middle part of the lamellae; anterior lateral hairs two-thirds as long as lamellar hairs, slightly curved and slightly pectinate. Pseudostigma short, cylindrical, projecting over one-half their length, approximate to the posterior margin of dorso-vertex; pseudostigmatic organ short, clavate, about three-fifths as long as lamellae. Palpi prominent.

Abdomen two-thirds as broad as long, the shoulders bearing a pair of short, stout bristles, about half as long again as the pseudostigmatic organ; abdomen bearing about a dozen pairs of prominent, long, simple, curved bristles. Genital covers each about twice as long as broad and situated over twice their length in front of the larger anal covers. Anal covers similar to genital covers, but larger, situated one-third their length from the posterior margin of the ventral plate. Ventral plate shield-shaped.

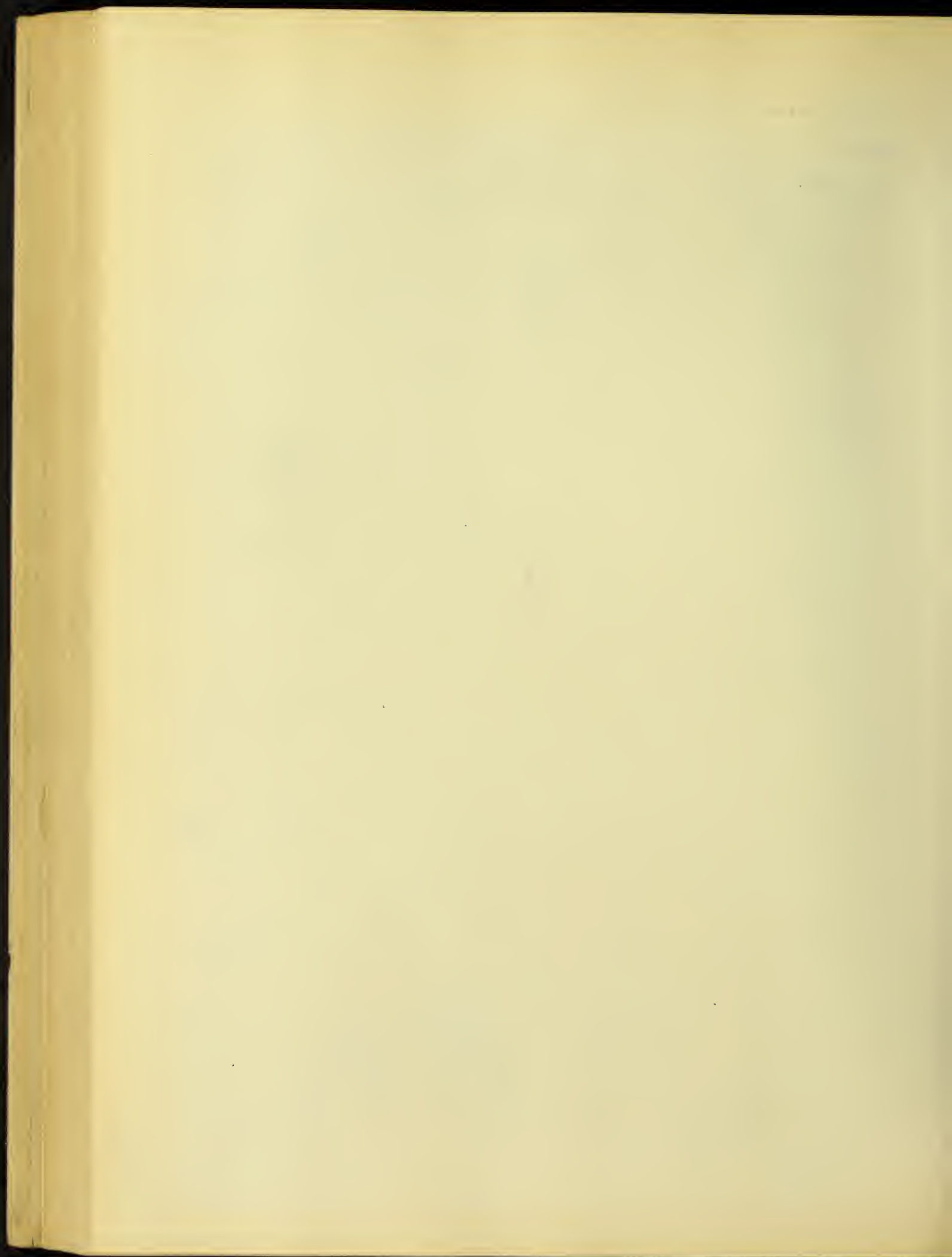
Anterior pair of legs as long as abdomen; tarsus and tibia subequal; genua almost one-half as long as tibia; femur about four times as long as genua, femur I largest, all the femora enlarged. Each of the legs bears several short, stout, curved, pectinate bristles. Unguis tridactyle; dactyles almost equal.



Length, 0.68mm; breadth, 0.43mm.

Under bark. Collected by J. D. Hood at Urbana, Illinois.

One specimen.



Notaspis oblonga (C.L.Koch)

1835. *Eremaeus oblongus*. C.L.Koch. *Crust. Myr. Arach.*, fasc. 3, t. 24.
1855. *Eremaeus oblongus*. Nicolet. *Arch. Mus. Par.* vol. 7, p. 451, t. 10, fig. 1.
1882. *Eremaeus oblongus*. Haller. *Jahresch. Ver. Württemb.*, vol. 38, p. 306.
1884. *Eremaeus oblongus*. Berlese. *A.M.S.*, fasc. 15, no. 10.
1888. *Notaspis oblonga*. Michael. *Brit. Orib.* vol. 2, p. 375, t. 30, figs. 6-11.
1898. *Notaspis oblonga*. Mich. *Das Tier.* Lief. 3, 1898.

Light brown; integument smooth.

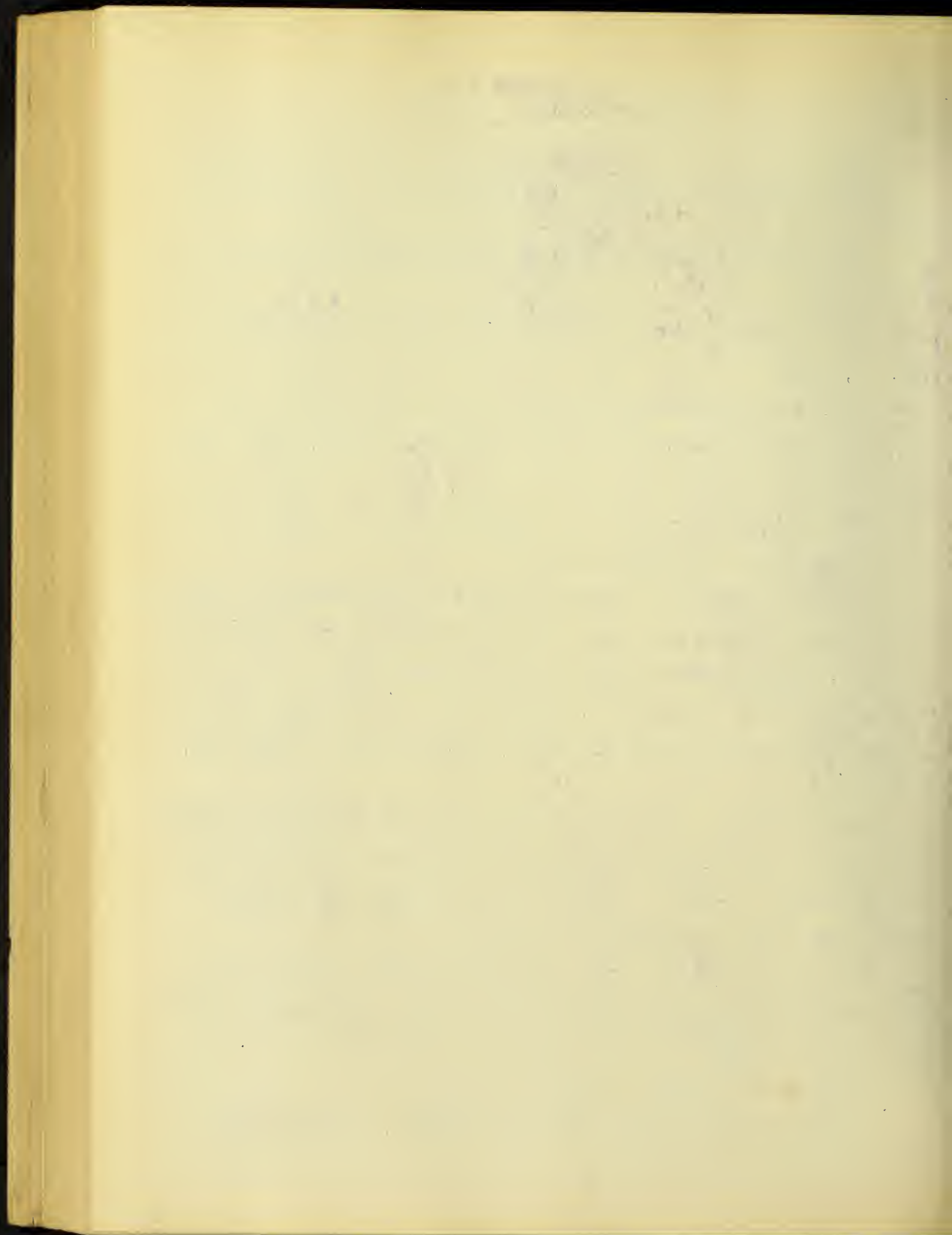
Cephalothorax large, one-half as long as the abdomen; no lamellae, only a very low chitinous ridge. Dorso-vertex bearing a single pair of small, inconspicuous bristles situated almost approximate to the pseudostigmata at the anterior, median aspect of the same. Pseudostigmata cylindrical, erect and short; pseudostigmatic organ long, clavate.

Abdomen oblong. Anal covers large, over twice as long as broad and situated approximate to the posterior margin of ventral plate; genital covers one-half as long as the anal covers and situated about their length in front of the latter.

Legs of medium size. Coxa and femur subequal. Tibia about two and one-half times as long as tarsus. Legs clothed with many fine hairs.

Length, 0.61 mm.; breadth, 0.37 mm.

In moss. Collected by the author at Homer, Illinois. One specimen.



Notaspis sculptilis Warb. and Pearce.

1905. N. sculptilis Warburton and Pearce. Proc. Zool. Soc. Lond.,
vol. 2, p. 567, pl. 20, fig. 2.

This mite, as was suggested by the original describers of the species, can be easily distinguished by the peculiar design of the chitinous ridges on the cephalothorax and the dorsum of the abdomen.

Light brown; integument somewhat granular, but thin, brittle, and smooth.

Cephalothorax three-fifths as long as abdomen and two-thirds as broad as long. The cephalothorax has several chitinous ridges which make the following design: from each pseudostigma a ridge runs forwards and inwards for a distance equal to about one-half the length of the pseudostigmatic organ, thence they extend directly forwards for a somewhat shorter distance. There is a transverse ridge joining



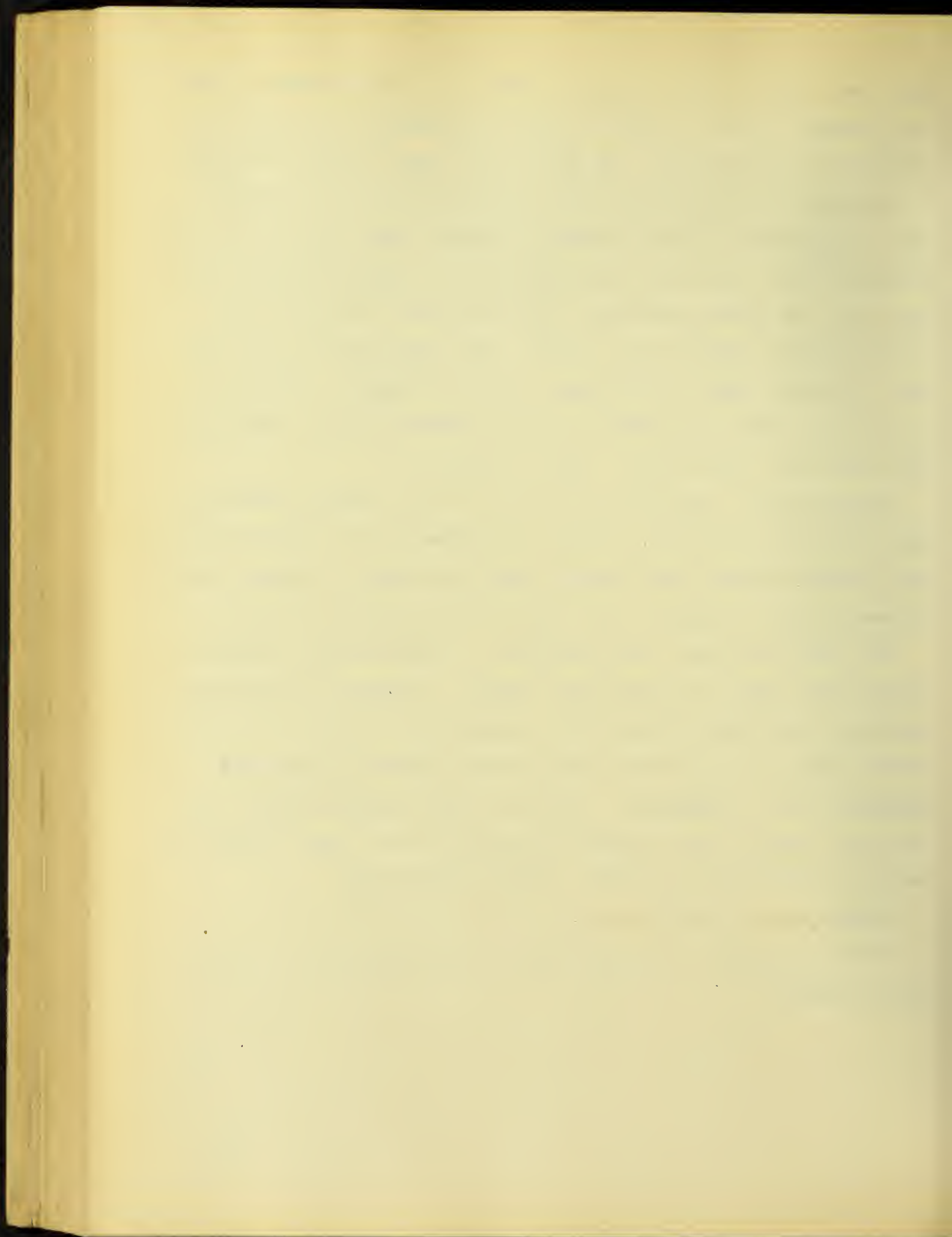
these two ridges at their angles. Between the pseudostigmata there is a U-shaped ridge, the base of the U lying against the posterior margin of the dorsovertex and each of the legs extending forwards to the angle of the lateral ridges. On the dorsum of the abdomen there is a similar but much broader U-shaped ridge, but in this case the base of the ridge lies along the anterior margin of the dorsum while the legs extend backwards. Pseudostigmata circular, low; pseudostigmatic organs long, recurved, with thin peduncle and clavate, pectinate head. I find that the pseudostigmatic organs are not quite so stout as in Warburton's and Pearce's figure, but agree well with their description. Palpi prominent.

Abdomen oval, two-thirds as broad as long. Genital covers almost rectangular in shape, situated approximate to the anterior margin of ventral plate; anal covers similar in shape to genital covers but much longer, situated their length from the genital covers.

The legs are rather short; subequal in length except the posterior pair, which is slightly the longest. Segments of the legs swollen or moniliform; which fact, together with the fact that this species has no true lamellae would put the species in the genus Damaeus as well as Notaspis. Tarsus of leg I somewhat longer than the tibia; genua fully one-half as long as tibia; femur as long as tarsus and tibia taken together. Unguis monodactyle.

Length, 0.30 mm.; breadth, 0.17 mm.

Under an old log. Collected by the writer at Urbana, Illinois.
Two specimens.



Gen. Damaeus C. L. Koch.

1835. Damaeus C. L. Koch. Crust. Myr. Arach. fasc. 3.

Cephalothorax without lamellae; legs very long, moniliform,
not stout.



Damaeus tecticola Mich.

1888. Damaeus tecticola. Michael. Brit. Orib., vol.2, p.416,
pl. 35, fig. 1.

1893. Belba mirabilis. Karpelles. Math.naturw. Ber. Ungarn.,vol.2,
p. 85.

1895. Belba tecticola. Berlese. Acar. Mir. Scor., fasc,77, nr.9.

1898. Damaeus tecticola. Michael. Das Tier., lief.3, p.58.

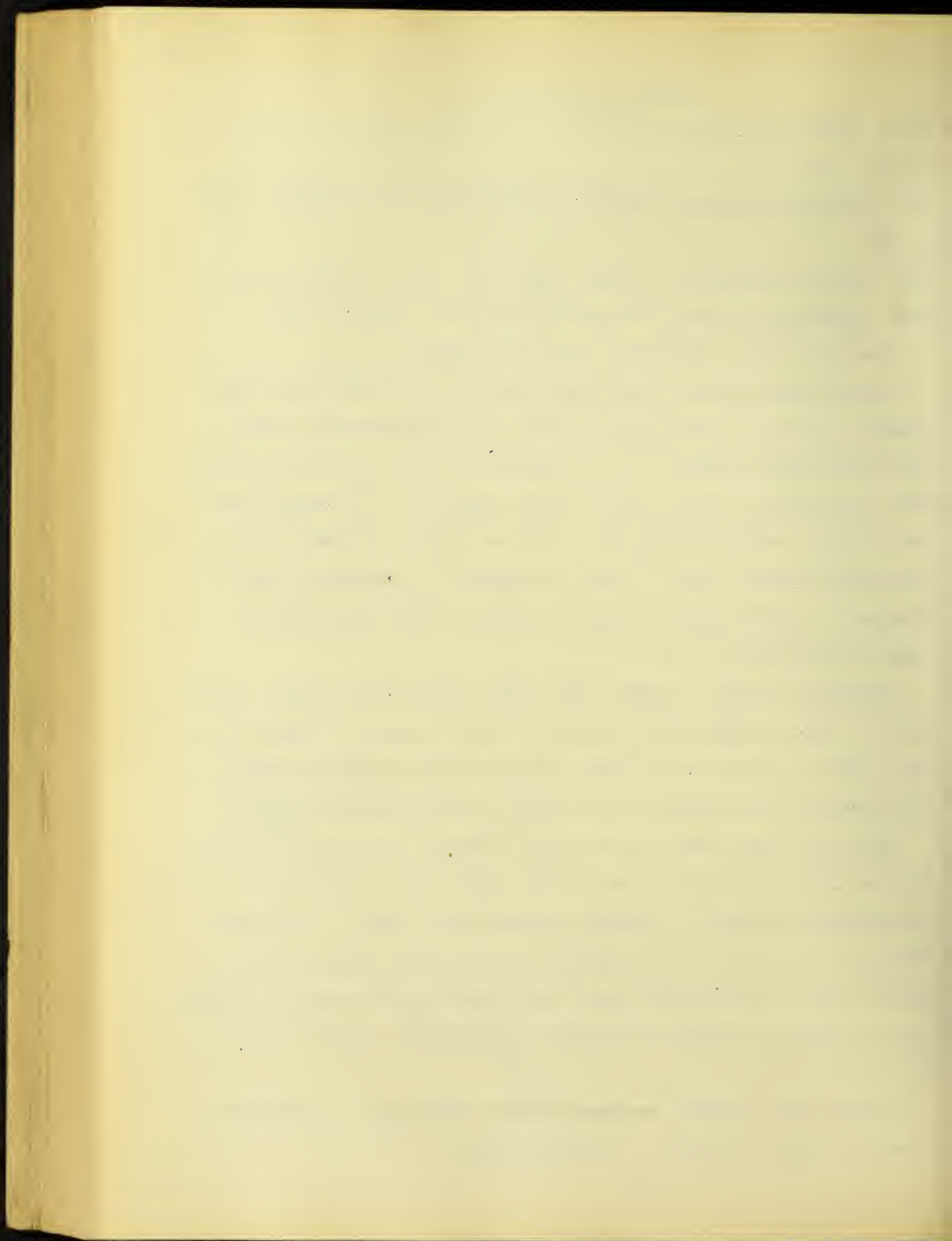
Chestnut brown; integument thick and tough.

Cephalothorax broader than long; rostrum of medium length and rounded in front; rostral hairs stout, curving strongly toward the median plane; palpi of five segments and as long as the genual, each terminating in two spines; basal segment of the palpus much the longest; second segment one-third as long as segment 1 and three and one-half times as long as segment 2; segments 4 and 5 subequal. Pseudostigmatic organ setiform, denticulate and as long as the femur of leg 1.

Abdomen globular, broader than long, with about a dozen, short, thick, curved, denticulate bristles; ventral plate of medium size; anal covers situated about their length from the dorsal margin of the abdomen, and one-half their length from the genital covers.

Legs very long; hind pair much the longest; first pair of legs half as long again as the body; femur and tarsus subequal in length; genual small and short, scarcely one-third as long as the femur; tibia twice as long as the genual; tarsus almost globular at its distal end. The legs bear many stout, curved, denticulate bristles. All the segments except the genual are clavate. Length 0.54 mm.; breadth 0.42 mm.

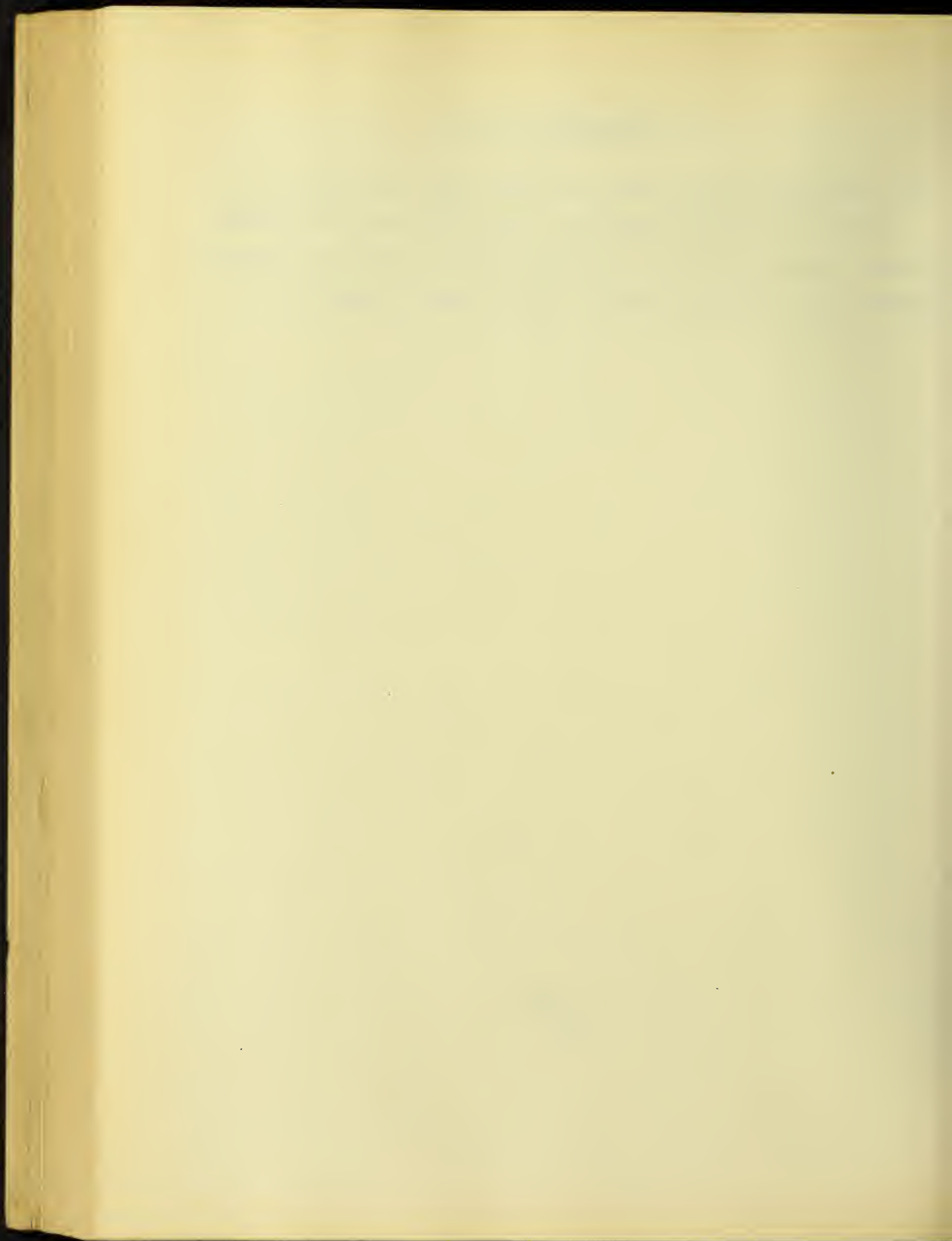
In moss and rubbish. ~~England, Italy, Illinois.~~ Collected by myself, Urbana, Illinois. A few specimens.



Gen. Neoliodes Berlese.

1888. Neoliodes Berlese. Bull. Soc. Ent. Ital., vol.20, p. 47.

Cephalothorax without lamellae; legs short and stout; abdomen without transverse suture; dorsum of abdomen convex, and carrying nymphal skins showing concentric rings; unguis tridactyle.



Neoliodes hoodi n.sp.

Dark brown; integument thick, leathery rough, tuberculate.

Cephalothorax triangular, about three-fifths as broad as long, dorso-vertex very rough, the integument being thickened in places so as to form ridges. There is a pair of stout, short, curved, clavate anterior lateral bristles which extend upwards and towards the median plane. Pseudostigma low, cylindrical, situated at the extreme, posterior laterodorsal aspect of cephalothorax; pseudostigmatic organ short, strongly clavate, about as long as femur I is broad.

Cephalothorax about three-fifths as broad as long; elongate and pointed posteriorly; dorsum has four areas concentrically arranged and at different levels in a stair-step fashion, the outer area being at the bottom and the inner at the top; areas of same shape which is that of the abdomen itself. Three pairs of stout, clavate, bristles are situated on the posterior margin of the abdomen near the median plane. The inner pair is very large, being longer than the tarsus of leg IV, middle pair not quite one-half as long as the median pair, the outer pair is the smallest, being not quite as long as the middle pair; abdomen otherwise hairless. Ventral plate triangular a little longer than broad; genital covers larger than anal covers, each about twice as long as broad and with a straight median margin and a convex lateral margin; genital covers situated almost approximate to the anterior margin of ventral plate and the anterior margin of the anal aperture; anal covers about three times as long as broad, much broader anteriorly than posteriorly.

Legs short and stout; anterior pair not quite as long as abdomen; tibia a little longer than tarsus; each leg with several short,



stout, usually slightly curved, clavate bristles. The tarsus of each leg has several small, straight, simple hairs, and the tibia a few of such hairs. Unguis stout, strong, tridactyle; dactyles equal.

Length, 1.04mm.; breadth, 0.52mm.

Under hickory bark. Collected by J. D. Hood, Urbana, Illinois. Two specimens. One other individual was seen but Mr. Hood was unable to capture it.



Gen. Nothrus C. L. Koch.

1835. Nothrus C. L. Koch. Crust. Myr. Arach., fasc. 2.

Cephalothorax without lamellae; legs short and stout; abdomen without transverse suture; dorsum of abdomen flat or concave; no tectopodia for legs II.



Nothrus biverrucatus C. L. Koch.

1840. N. biverrucatus C. L. Koch. Crust. Myr. Arach., fasc. 29, t. 15.

1888. N. biverrucatus Michael. Brit. Orib., vol. 2, p. 510, pl. 47A, figs. 6-10.

1898. N. biverrucatus Michael. Das Tier., lief. 3, p. 71.

Dark yellowish brown; integument granulate.

Cephalothorax broader than long. Two small tubercles project from the apex of the rostrum, each ending in a stout, curved, pectinate bristle, about twice as long as the tubercle from which it extends, and inclined very much towards the median plane. Pseudostigmata cylindrical. Their height is about equal to their diameter; pseudostigmatic organ short, capitate and slightly pectinate.

Abdomen almost twice as long as broad, the upper surface slightly concave. The abdomen has about sixteen small, curved, pectinate bristles situated close to the margin; posterior bristles somewhat larger than the anterior bristles. From the posterior margin of the abdomen near the median line project two large cylindrical tubercles from each of which extends a small, curved, pectinate bristle. Genital covers almost rectangular in shape, but broader anteriorly



than posteriorly; anal covers much narrower than genital covers, but somewhat longer; and triangular in shape.

Leg I almost as long as the body; tarsus about twice as long as tibia; tibia three-fifths as broad as long. Legs clothed with stout, short, curved bristles. Unguis tridactyle; dactyles equal.

Length, 1.00mm.; breadth, 0.54mm.

In moss. Collected by the writer at Arcola, Illinois. Several specimens.



Fam. HOPLODERMIDAE.

With a specialized setae arising from a pore near each posterolateral corner of cephalothorax; cephalothorax hinged to abdomen and capable of being folded down over the ventral surface of the same; body compressed; integument not fully chitinized.

Key to Genera.

Unguis monodactyle; genital and anal covers separate -----

Hoploderma.

Unguis tridactyle; genital and anal covers joined. -----

Phthiracarus.

Gen. Hoploderma Michael.

1898. Hoploderma Michael. Das Tier., Lief.3, 1898, p. 77.

Unguis monodactyle; genital and anal covers separated from each other.



Hoploderma lurida n.sp.

Light brown, with a pea-green tinge; integument of abdomen and cephalothorax finely pitted.

Cephalothorax about one-half as long as abdomen and one-half as high as long. Pseudostigma round, flat, with radiating ridges, its diameter equals the width of femur I, situated approximate to the posterior ventral margin of dorso-vertex; pseudostigmatic organ long, narrow, slightly clavate, as long as femur of leg I. When the cephalothorax is extended, the dorsum of abdomen projects but slightly over the posterior margin of the former. Mandibles and palpi large and prominent. Cephalothorax hairless.

Abdomen about two-thirds as high as long, rounded at its posterior end, anterior margin somewhat concave; dorsum of abdomen bearing about a dozen pairs of rather long, straight, simple bristles. Genital and anal covers large and close together.

Legs all about the same length, but the anterior pair is stouter than the rest; tibia of leg I slightly over one-half as long as tarsus; genual almost as long as tibia; femur more than twice as long as genual. The tarsus and tibia, especially of the first pair of legs, bear rather prominent straight hairs. Unguis monodactyle and almost as long as the tarsal segments from which they extend.

Length, 0.82mm; height, 0.46mm.

Under bark. Collected by the writer at Urbana, Illinois. One specimen.



Gen. Phthiracarus Perty.

1841. Phthiracarus Allg. Naturg., vol.3, p. 874.

Unguis monodactyle; genital and anal covers anchylosed or joined.



Phthiracarus rotundus n.sp.

Brown; integument granulate.

Cephalothorax fully one-half as long as the abdomen and about one-half as high as long. There is a small chitinous ridge around the ventral edge of the cephalothorax; this ridge projects forwards and laterally about as far as the width of one of the dactyles of tarsus I. The cephalothorax bears two pairs of very fine hairs, those of the anterior pair being shorter than those of the posterior pair. Pseudostigmata round, disk-like; in diameter each equal to the width of tibia I; pseudostigmatic organ about twice as long as the diameter of the pseudostigma. Palpi very prominent.

Abdomen almost as high as long; the upper half of the anterior margin concave, the lower half of the anterior margin straight. The posterior part of the abdomen is rounded; ventral margin of abdomen convex. The abdomen bears about six pairs of small hairs on the dorsal aspect.

Legs two-thirds as long as cephalothorax; all subequal; tarsus longer than tibia; unguis large and stout, about as long as the tarsus from which it extends, and tridactyle, dactyles equal.

Length, 0.76mm.; height, 0.52mm.

Under a log. Collected by the author at Eola Junction, Ill.

One specimen.

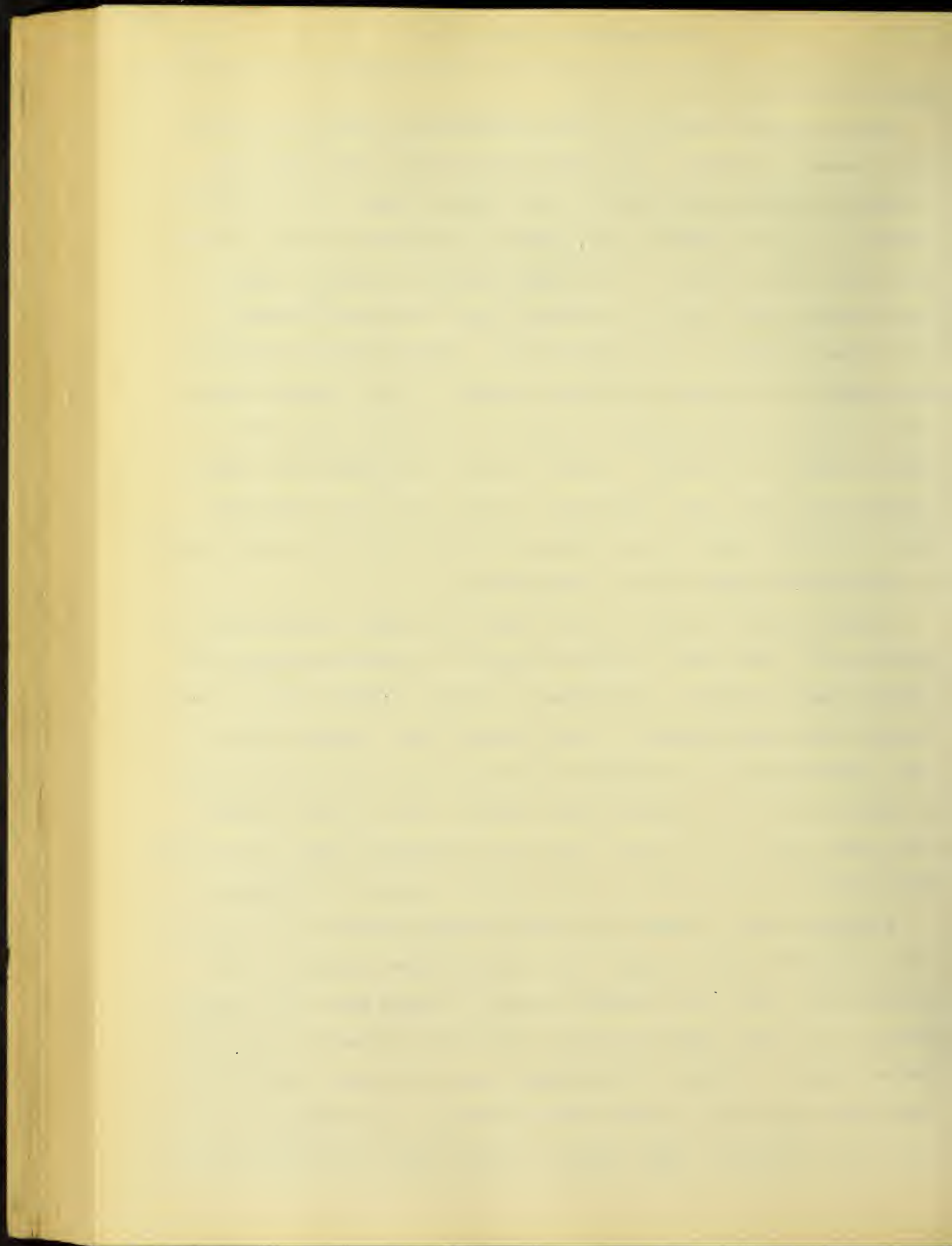


Light yellow, darker parts light yellowish brown; integument of cephalothorax and abdomen pitted.

Cephalothorax one-half as long as abdomen and twice as long as high, rounded in front. The cephalothorax bears three pairs of prominent bristles; the anterior pair about as long as the cephalothorax is high; the middle pair, which is situated at about the middle of the dorsal surface of the cephalothorax, slightly larger; the posterior pair, which is situated above the pseudostigmata, two-thirds as long as the cephalothorax. Pseudostigmata situated approximate to the posterior ventral surface of the cephalothorax, oval in shape; pseudostigmatic organ two-thirds as long as the posterior pair of bristles. Without head, but slightly pectinate towards the distal end. Mouth parts large, stout, and prominent. There is a very slight ridge running forwards from the pseudostigmata to the anterior margin of the cephalothorax.

Abdomen pointed behind; ventral margin strongly convex, anterior margin with a deep notch to allow room for the pseudo-stigmata and pseudostigmatic organs. The abdomen is deeply pitted; pits of about the same size and arranged in longitudinal rows. Abdomen with at least fourteen pairs of prominent bristles; a row of five bristles on either side of the median plane; another row of three bristles just below this row on either side of the abdomen; a pair of bristles just posterior to the notch in the anterior margin of the abdomen;

a similar pair situated about their length posterior to this pair; a pair situated about one-half the distance from the anterior to the posterior end of the abdomen and their length above the ventral margin of the same; and three pairs of bristles situated around the ventral margin of dorsum. The genital and anal covers together extend almost the entire length of the abdomen; inner margin of genital covers straight; inner margin of anal covers slightly convex;



genital covers each with a few very minute hairs; anal covers each with six prominent subequal bristles, somewhat longer than the width of one of the anal covers.

Anterior pair of legs equal in length to the cephalothorax, somewhat stouter than the others; tarsus of leg I fully one and one-half times as long as the tibia. All the legs are well clothed with rather long, simple bristles. Unguis tridactyle; dactyles unequal.

Length, 0.78 mm.; height, 0.42 mm.

In moss. Collected by H. Glasgow at Urbana, Illinois. One specimen.



Fam. EUPODIDAE.

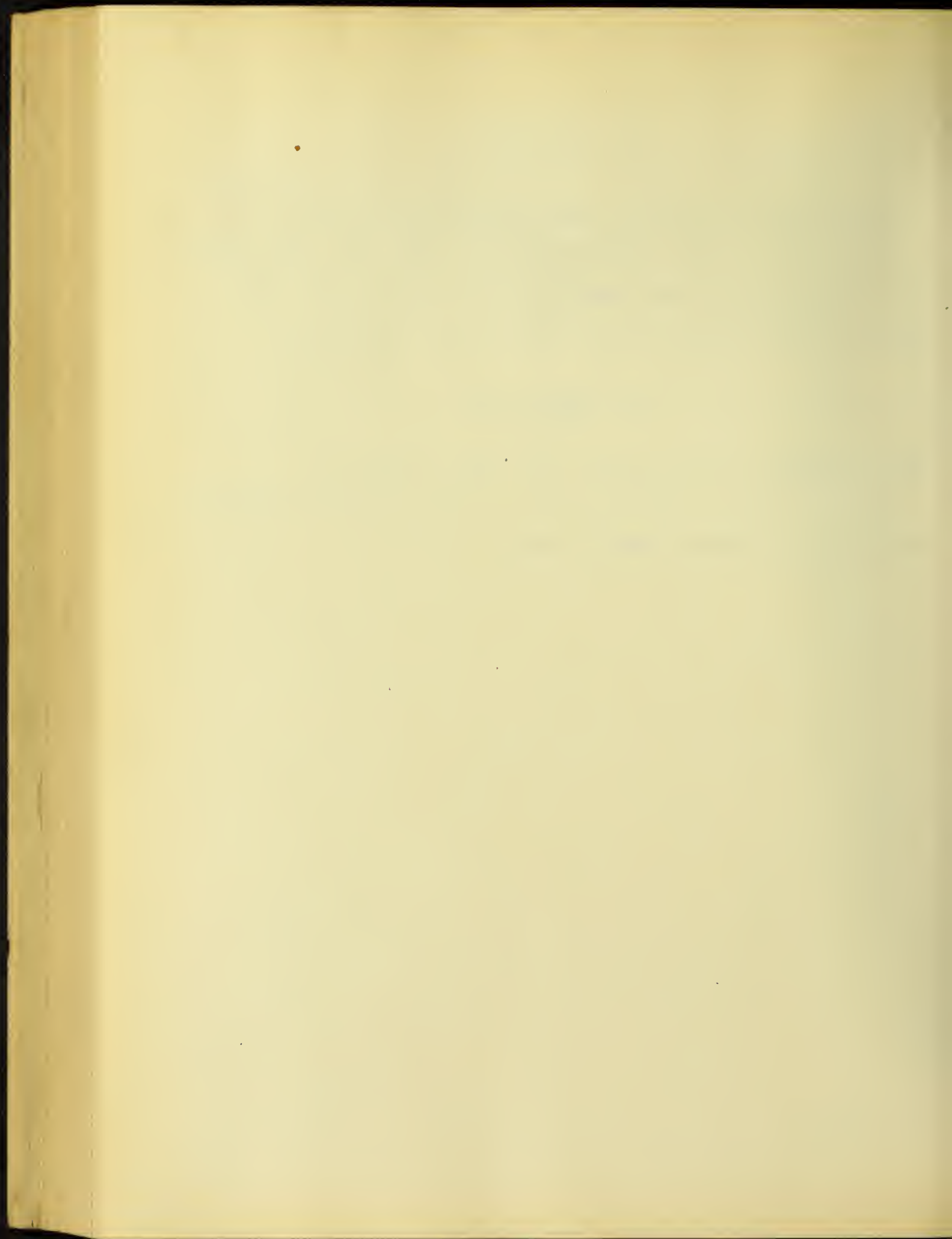
Body plainly divided into cephalothorax and abdomen.

Palpi without thumb, never geniculate; beak small; last segment to the first pair of legs usually shorter than the penultimate segment; tarsi without suckers. Eyes usually present.

Gen. Tydeus Koch.

1836. Tydeus C. L. Koch. Crust. Myr. Arach., fasc. 4.

Anterior pair of legs about equal to the other pairs; femora of hind legs not swollen; mandibles small.



Tydeus cardinalis n.sp.

Bright red; legs somewhat paler than the body.

Cephalothorax small and almost twice as broad as long. Beak about as long as the cephalothorax. The cephalothorax bears a single pair of prominent, recurved bristles, about as long as the cephalothorax itself, at the anterior margin near the median line. There is a single pair of eyes situated at the extreme postero-lateral aspect of the cephalothorax. Beak hairless. Mandibles sharp, pointed, each with two subequal bristles near the middle of the outer margin. Palpi large, about twice as long as the beak; second segment much the longest; third segment three-fifths as long as segment two; fourth segment two-thirds as long as third; distal segment very small, rudimentary. All the segments of the palpi bear a few simple bristles except the proximal one; segment IV has on its inner distal margin a small, chitinous hook; segment V is armed at its distal end with two large, stout bristles, which are inclined inwards and apparently are adapted for grasping and holding prey.

Abdomen almost twice as long as broad; bearing two prominent, slightly curved, simple, shoulder bristles, somewhat longer than the width of leg I; two pairs of somewhat longer, sharply recurved bristles are situated at the anterior margin of abdomen; the inner pair being about one-half its length from the median plane; the outer pair being just between the eyes; a pair of bristles is situated near the middle of the dorsal surface of the abdomen and very near the median plane. There is a row of five bristles on each side of the abdomen about one-half the distance from the median plane to the lateral margin; two pairs of bristles are situated near the tip of the abdomen; the inner straight, and situated slightly above the



lateral margin; the outer curved and situated slightly below the lateral margin. Anus at the tip of the abdomen and slightly ventral in position; just behind it are two small short, stout bristles.

Legs subequal in length; first pair of legs slightly shorter than the length of the body; distal segment of leg I, one and one-half times as long as penultimate segment. All the segments of the legs have approximately the same width, excepting the basal segment, which is somewhat broader than the rest. Claws of legs bi~~tr~~dactyle, with a small narrow caruncle between the dactyles. Tarsus of each leg terminating in a few long, simple bristles; tarsi of legs I and II broad at the tip; tarsi of legs III and IV not broadened at the tip.

Length, 0.38mm; breadth, 0.20mm.

In moss. Collected by the writer at Urbana, Illinois. A single specimen.



Fam. TETRANYCHIDAE.

Palpus with thumb; body well clothed with hairs; legs I and II without large, spine-like processes; coxae not radiate; legs usually in groups of two each; no dorsal groove to cephalothorax; tarsi not swollen; mandibles piercing; hairs of body usually arranged in four longitudinal rows.

Key to American Genera.

1. Four prominent tubercles extending from the anterior margin of cephalothorax; anterior pair of legs much longer than the rest ----

Bryobia.

No projecting tubercles on the front margin of cephalothorax ---2

2. All the legs much longer than the body; body short -----

Neophyllobius.

Few legs but slightly longer than the body ----- 3.

3. Body twice as long as broad and constricted near the middle; legs very stout ----- Stigmaeus.

Body not twice as long as broad; legs usually slender ----- 4.

4. Palpi ending in a distinct thumb ----- Tetranychus.

Palpi not ending in a distinct thumb ----- 5.

5. Eyes present; legs short; palpi small and slender ---- Geniupalpus

Eyes absent or indistinct; legs long; palpi of moderate size---

Tetranychoides.

Gen. Bryobia Koch.



Body with four prominent projections extending from the anterior margin of cephalothorax and each bearing a scale-like bristle; anterior pair of legs much longer than the rest; integument with five striations.



Bryobia pratensis Garman.

1885. Bryobia pratensis Garman. 14th Rep. State Entom. of Ill., 1885, p. 73.

1885. Bryobia pallida Garman. 14th Rep. State Entom. of Ill., 1885, p. 74.

1890. Bryobia pratensis Marlatt. Insect Life, III, 1890, p. 45.

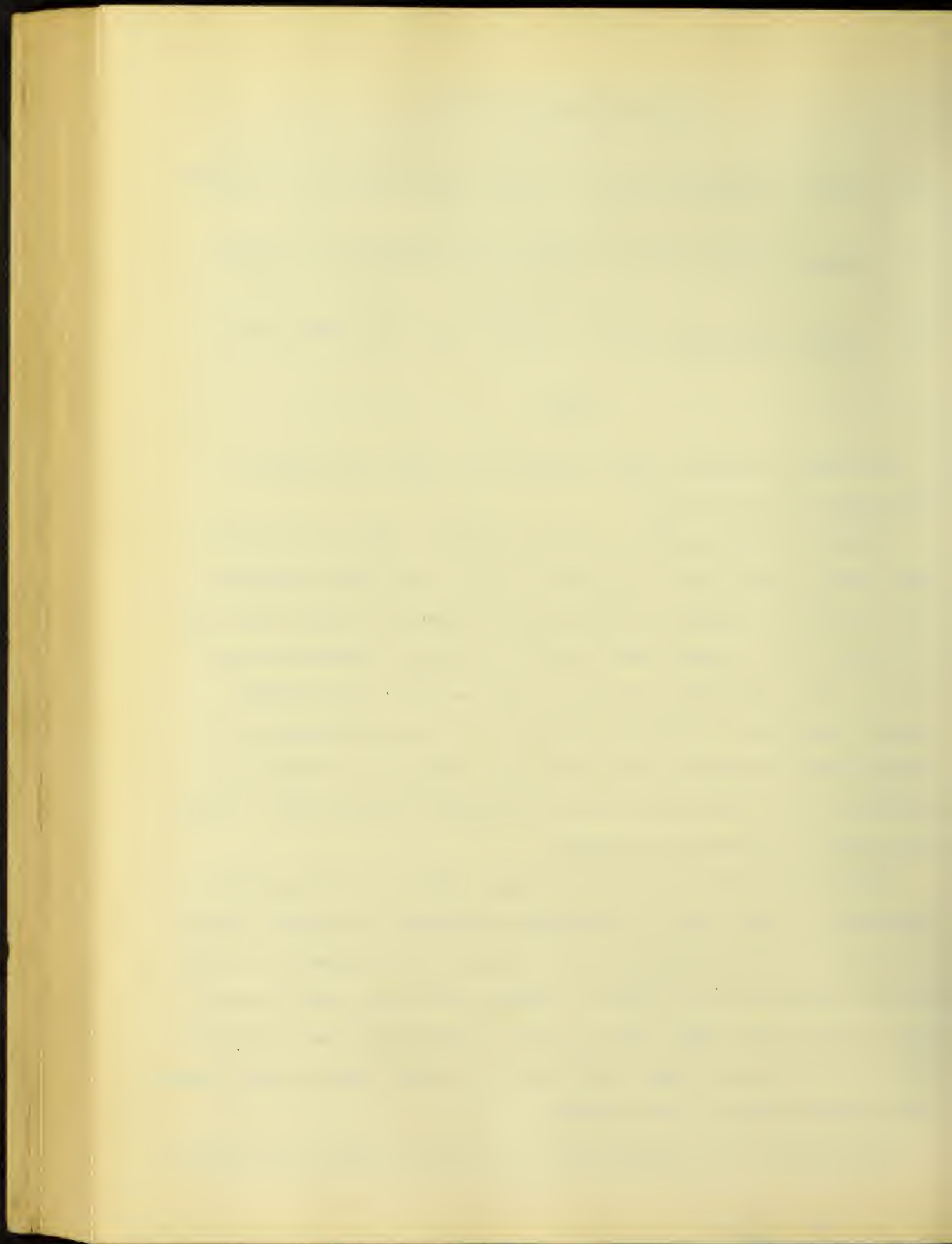
ADULT.

Body dark, reddish brown, blotched with black; legs paler. Integument finely striated.

Cephalothorax one-half as long as abdomen, oval in front; two small eyes on each side near lateral margin, very close together. From the anterior margin of the abdomen extend four long tubercles all united into a common base and each bearing a prominent scale. The two inner tubercles are not so stout as the outer and bear smaller scale-like bristles. Striations in the central part of cephalothorax transverse but curved, the convexity of the curve being anterior; striations on the sides nearly longitudinal. Mouth parts small, invisible from above.

Abdomen two-thirds as broad as long. There is a longitudinal depression on each side of the abdomen extending the entire length of the same. The striations on the abdomen are transverse in their general direction but are wavy. Abdomen with four rows of scale-like bristles: two inner rows of three bristles each and two outer rows of four bristles each. There are six scale-like bristles around the posterior margin of the abdomen.

Anterior pair of legs longer than the body; the other legs shorter.



Tarsus of leg I two-thirds as long as tibia and about equal to the antepenultimate segment; bearing at its distal end two rather long tactile bristles. All the legs are rather sparsely clothed with stout, slightly curved, pectinate bristles. Claws small.

Length, 0.75mm.; breadth, 0.48mm.

LAST NYMPHAL STAGE.

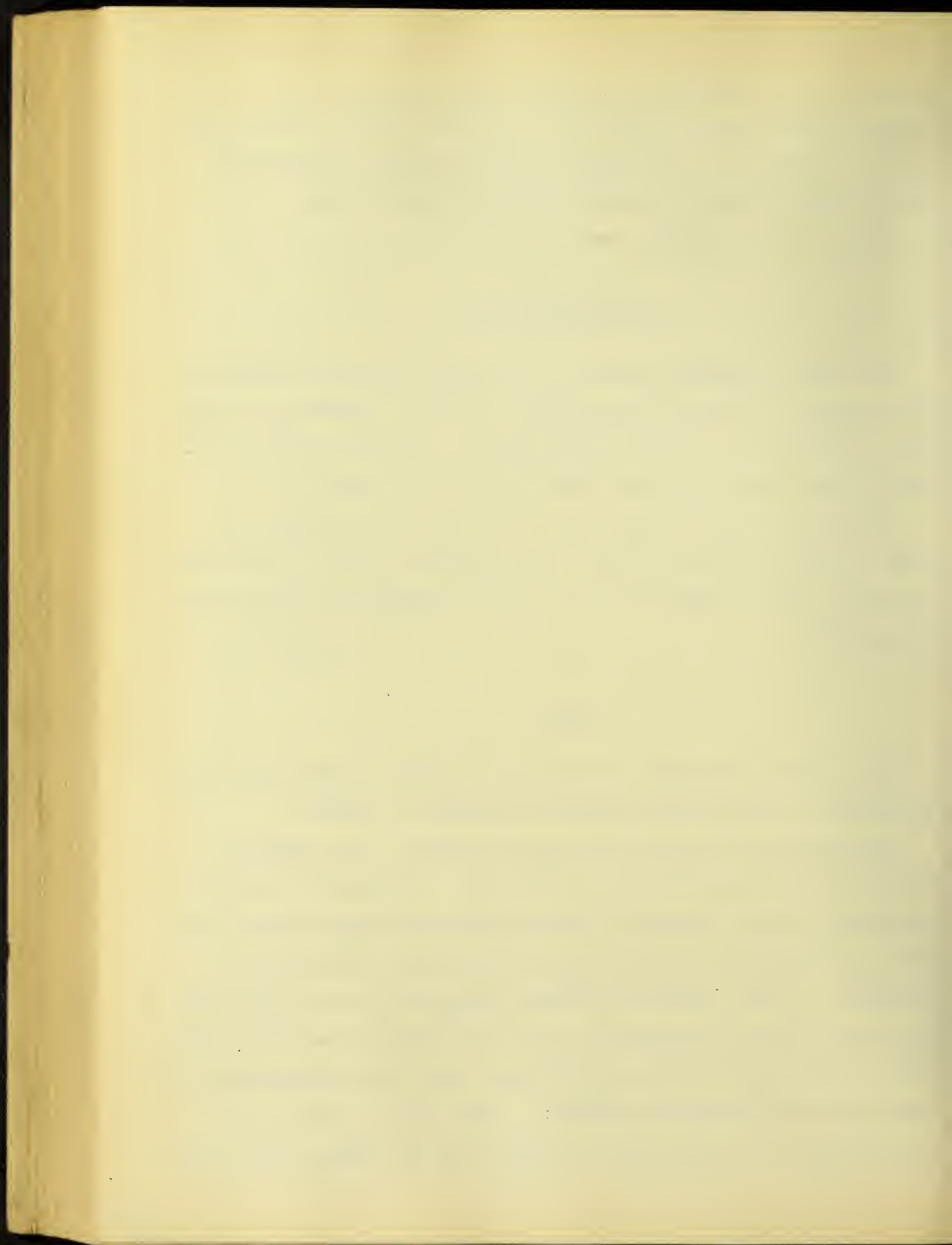
The young of Bryobia pratensis just before the last ecdysis are very similar to the adult forms except in color. Instead of being dark, reddish brown, they are greenish, with the body showing dark granulations, due in part at least to the food contents.

The anterior pair of legs are shorter than in the adult: the body is smaller and not so flat; the integument is not so thick and the middle pair of tubercles at the anterior margin of the abdomen are narrower.

LARVA.

Bright red; body almost circular but slightly longer than broad; integument of cephalothorax smooth, of abdomen striated.

Cephalothorax two-thirds as long as abdomen; eyes prominent, two on each side, approximate to each other. Epistome as broad as long, oval in front; mandibles three-fourths as long as palpi; segment two of palpus as broad as long, much broader distally than proximally. Distal segment of palpus ending in a stout claw; thumb as broad as long, not extending to tip of palpus and bearing a long, stout spine almost as long as the palpal claw. The cephalothorax bears six large pectinate bristles: a large pair at the anterior margin equal to the mandibles in length, and two smaller pairs, one



in front of the eyes and one behind the eyes. On each side of the epistome not far from its base is situated a short horn almost as broad as long.

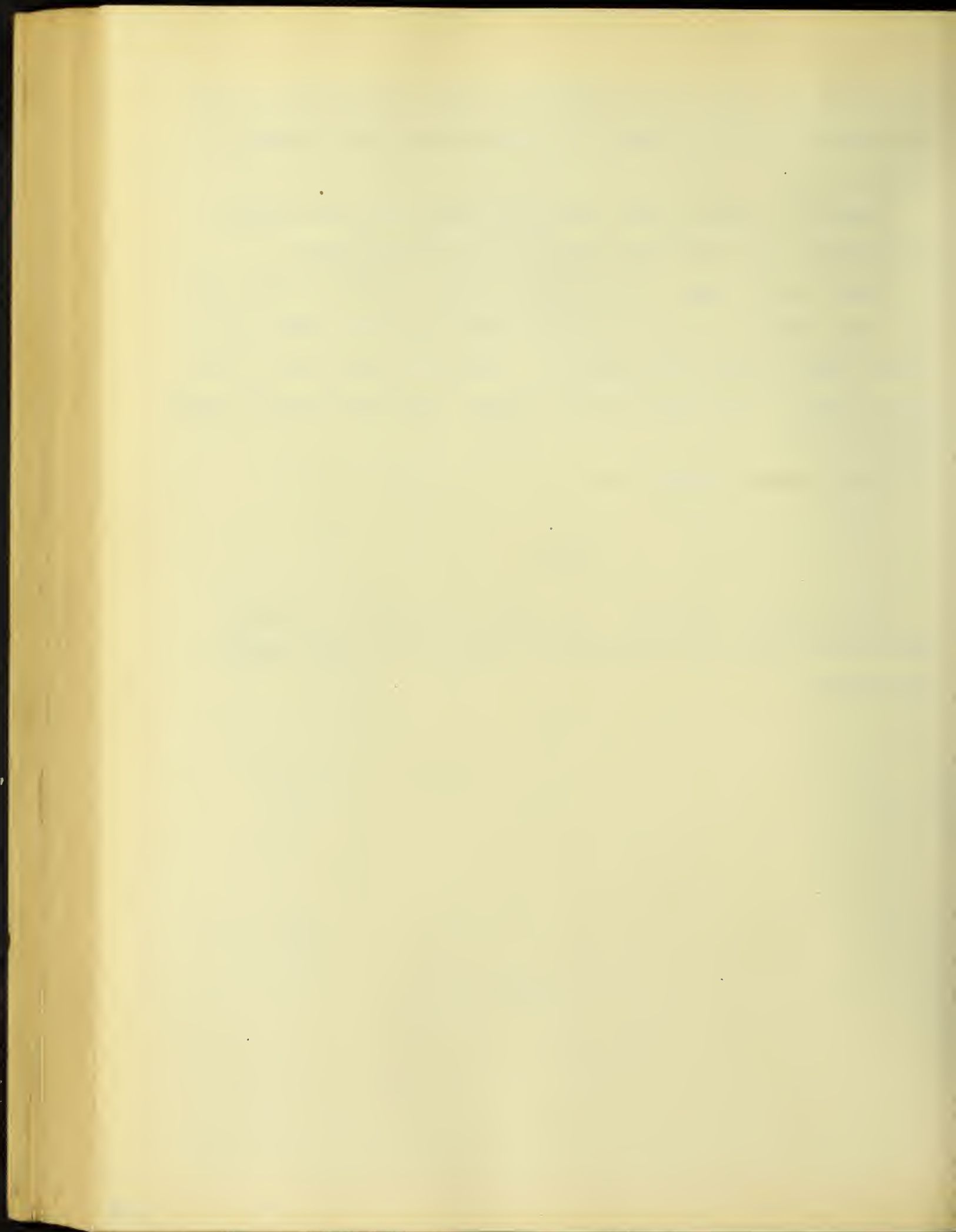
Abdomen as broad as long, bearing dorsally fourteen marginal bristles and two longitudinal rows of four bristles each.

Three pairs of legs, the anterior pair but slightly longer than the rest. Tarsus of leg I, slightly longer than the tibia; tibia longer than antepenultimate segment. Claws of tarsus stout, much more so than in the nymph or adult stages. Legs with several rather long bristles.

Length, 0.26 mm; breadth, 0.20 mm.

EGGS.

Red, granular, spherical. The eggs are commonly laid under bark and may often be found under the bark of soft maple, apple, or hickory.



Gen. Neophyllobius Berlese.

1886. Neophyllobius Berlese. Acari dann. piante Colt., p. 20.

Cephalothorax without extensions at the anterior margin; body broad, short, and bearing very large bristles; all the legs much longer than the body.



Neophyllobius ^h~~h~~arti n.sp.

Body brownish red blotched with patches of black; legs and palpi pale red; integument finely striated.

There is apparently no division between the cephalothorax and the abdomen. From the anterior part of the body projects a shelf-like expansion which partially conceals the mouthparts; this may be called the epistome. The epistome is about three-fifths as broad as long, being broadest at the base and oval in front. The mandibles project slightly beyond the epistome; palpi one and one-half times as long as the epistome and extending beyond the mandibles. Each palpus ends in a stout claw and has also a thumb, which is about as long as the palpal claw. Each palpus bears about a half dozen bristles of varying length.

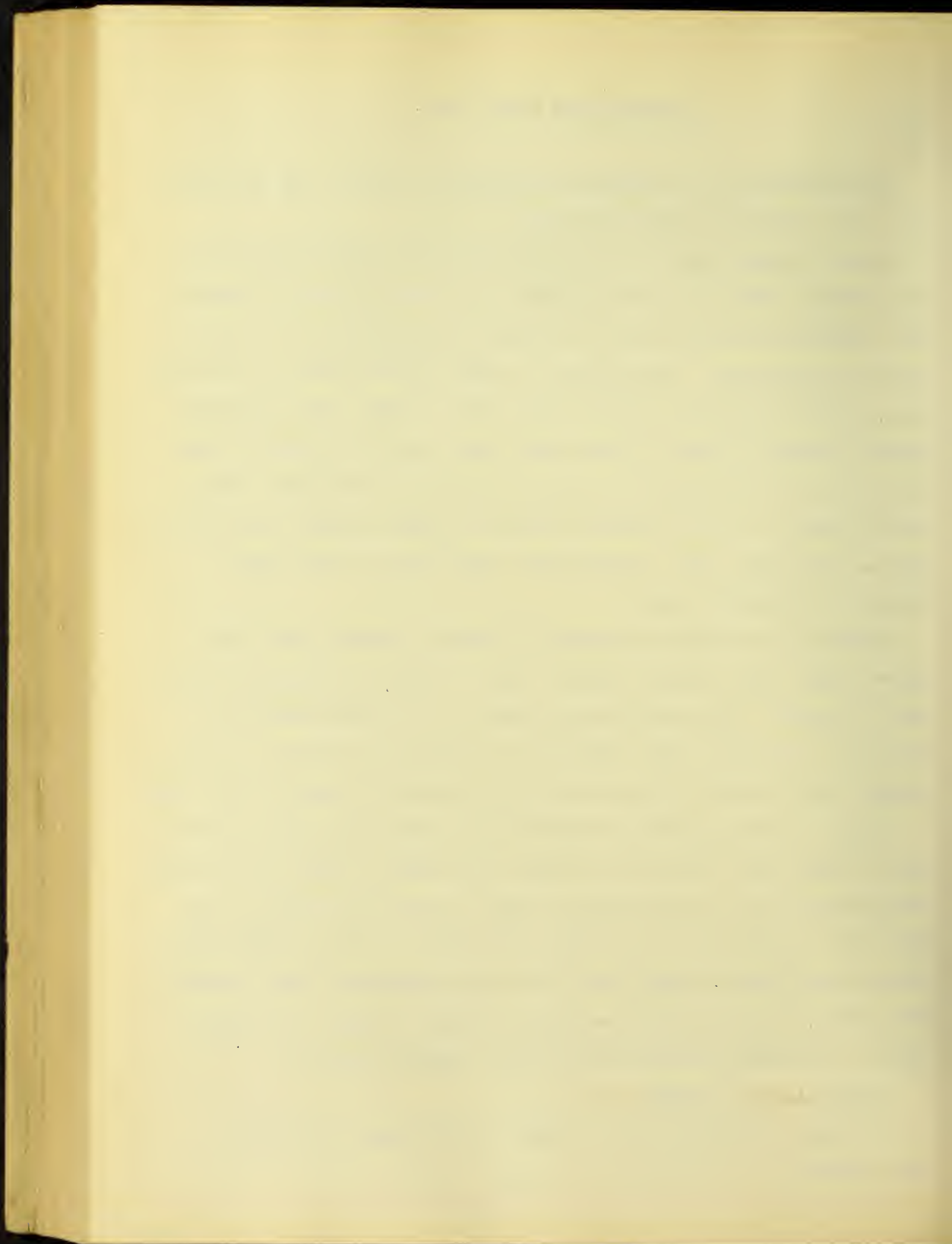
Body oval; two-thirds as broad as long and bearing about two dozen large, stout plumose spines, each of which is situated upon a small tubercle. From the anterior margin of the body extend two bristles, one along either side of the epistome and equal to it in length; six bristles are situated at the posterior margin of the body

Legs very long; anterior pair twice as long as the body; second pair of legs about one-half as long as the anterior pair; third pair two-thirds as long as the anterior pair; fourth pair equal to the first pair. Tarsus of leg I about two-fifths as long as the tibia; tibia two-fifths as long as the entire leg; antepenultimate segment very short, about one-third as long as tarsus. Each of the legs bears a few short bristles; none of the segments swollen.

Length, 0.64mm.; breadth, 0.44mm.

In moss. Collected by C. A. Hart at Carbondale, Illinois.

One specimen.



This species differs from N. americanus Banks in many ways. The second pair of legs instead of being equal to the anterior pair are not over one-half as long! None of the tarsi are swollen in this species as in N. americanus and none of the legs have a long tactile bristle.

Gen. Tetranychus Dufour.

1832. Tetranychus Dufour. Ann. Sci. Nat., vol. 25, p.276.

Cephalothorax without projections from the anterior margin; legs usually subequal; body not twice as long as broad; palpi ending in a distinct thumb; hairs of abdomen arranged in four longitudinal rows.



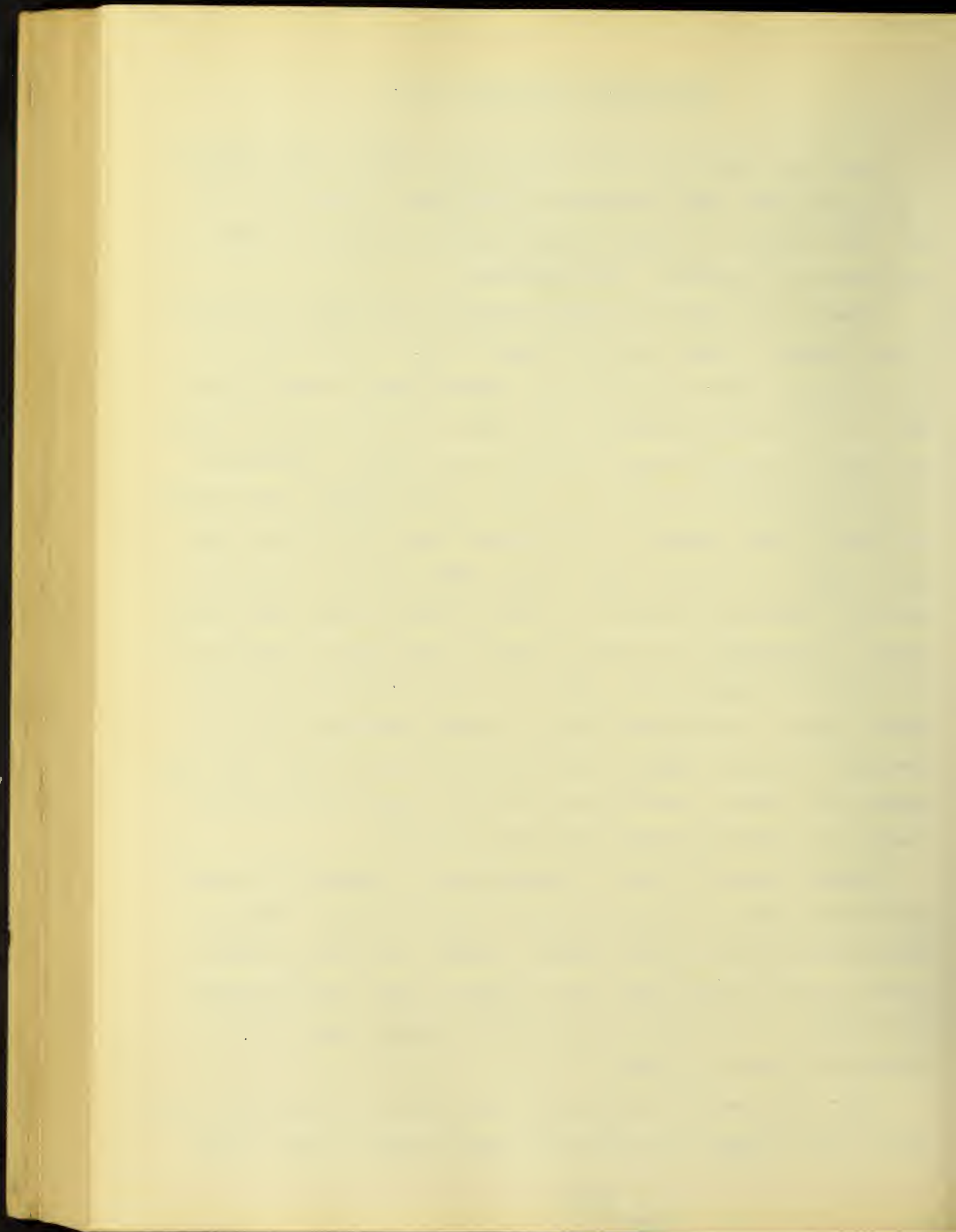
Tetranychus tessellatus n.sp.

Red; body completely covered with small, darker, areas arranged like mosaic work. These areas are all of about the same size but are very irregular in shape; between them is a network of light, yellowish red integument. Legs granulate.

Cephalothorax composing almost one-half of the body and similar to the abdomen in shape; anterior margin oval. A single pair of eyes is present near the side of the cephalothorax, between legs I and II. The cephalothorax bears four pairs of stout, stiff, slightly clavate bristles arranged around the outer margin. Mandibles less than one-half as long as the palpi; second segment three-fifths as broad as long, broader at the proximal than at the distal end; third segment as broad as long; fourth segment half as long again as third segment and ending in a stout, slightly curved claw; thumb short, cylindrical, two-thirds as broad as long and not extending to the tip of the palpal claw. Palpi apparently hairless from below; above, segment two bears two large, slightly curved and slightly pectinate bristles; segment three with a very long bristle near its middle and ^{also} a small, curved lateral bristle; segment four with at least three bristles; thumb with several bristles.

Abdomen similar in shape to cephalothorax, excepting the middle part of the posterior margin, which is almost straight. Abdomen bearing seven stout, stiff, slightly clavate bristles: two inner rows of three bristles each; two bristles on each lateral margin; and two pairs of bristles on the posterior margin, those of the outer pair being the largest.

Legs short; anterior pair about three-fifths as long as the body; second pair of legs three-fourths as long as anterior pair; third



pair of legs equal to second pair; last pair of legs subequal to the anterior pair. All the legs are sparsely clothed with stout, slightly curved spines; tarsus and tibia of leg I each with a rather long tactile bristle. Tarsi with stout claws about one-third as long as the tarsal segments.

Length, 0.46mm.; breadth, 0.31mm.

In moss. Collected by the writer at Mahomet, Illinois. Four specimens.



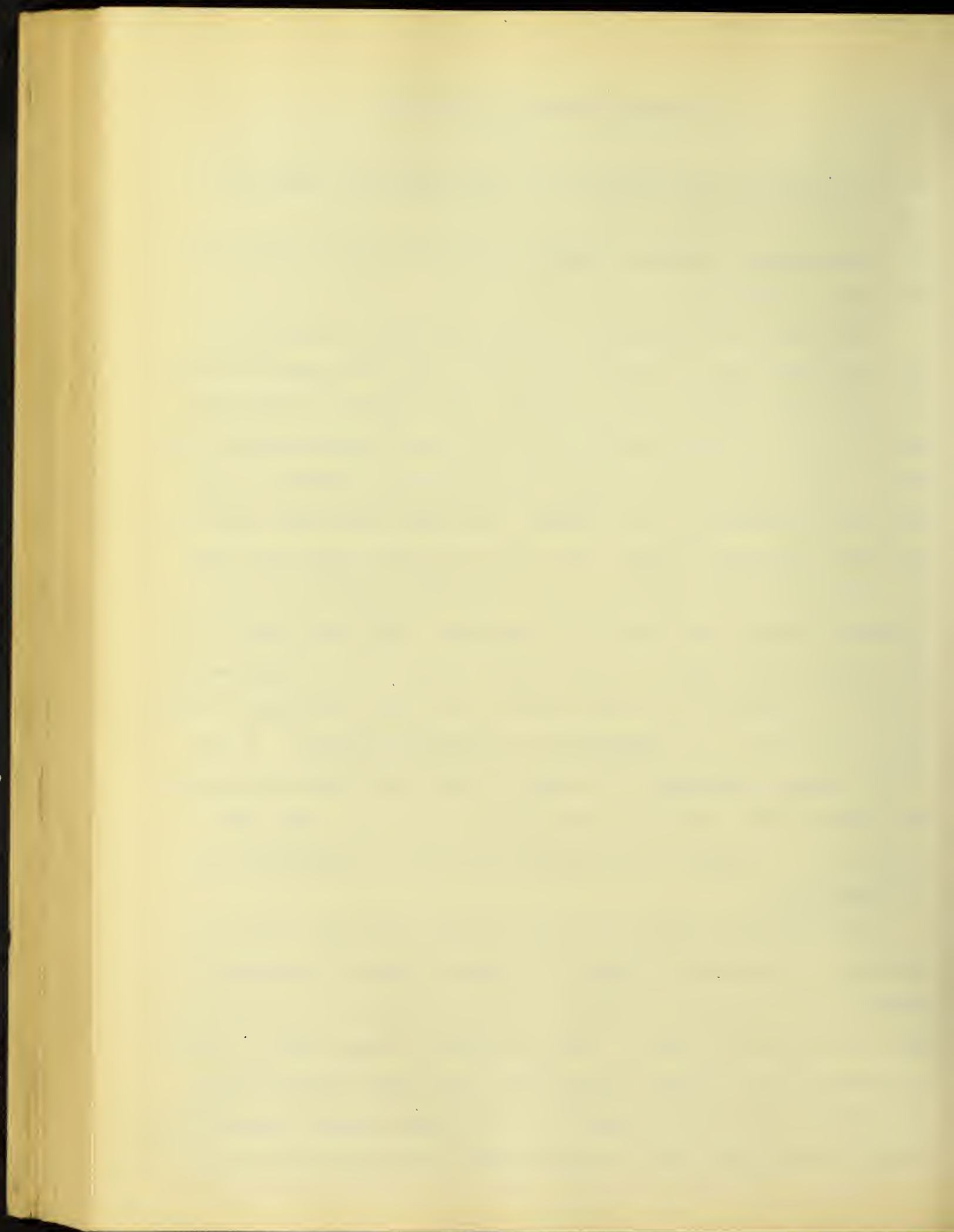
Tetranychus bimaculatus Harvey.

1892. Tetranychus bimaculatus Harvey. Rept. Maine Agri. Exp. Sta., 1892, p. 133, pl. III.

1900. Tetranychus bimaculatus Banks. Tech. Bull. No. 8, Div. Ent., U.S. Dept. Agri., 1900, p. 73.

This species varies greatly in color, as stated by Harvey. I have specimens which are pale green with a large black patch extending over about one-half of the abdomen. The majority of the specimens are pale red with irregular areas of black granulations on each side. This variation in color is due, according to Harvey, to age and the food contents of the abdomen. He found that young individuals free from food contents were a pale yellowish green and that the older mites were orange or red. The black granulations, according to Harvey, are due to food contents. He states that in full fed specimens the body is entirely dark colored. It is interesting to note in connection with this subject the close resemblance in the color variations of T. bimaculatus and Bryobia pratensis. In the case of Bryobia pratensis the young are pale green while the adults are brownish red; the food contents may in this case cause dark granulations to appear in the abdomen but not so prominently as in T. bimaculatus.

Cephalothorax in most specimens not well demarcated from the abdomen. In specimens in which the division between the cephalothorax and the abdomen is evident I find the former to be about one-half as long as the latter. Two eyes present on each side of cephalothorax not far from the lateral margin and about midway between the anterior and posterior margins of the cephalothorax. Mandibles almost as long as the palpi; second segment of palpus two-thirds as



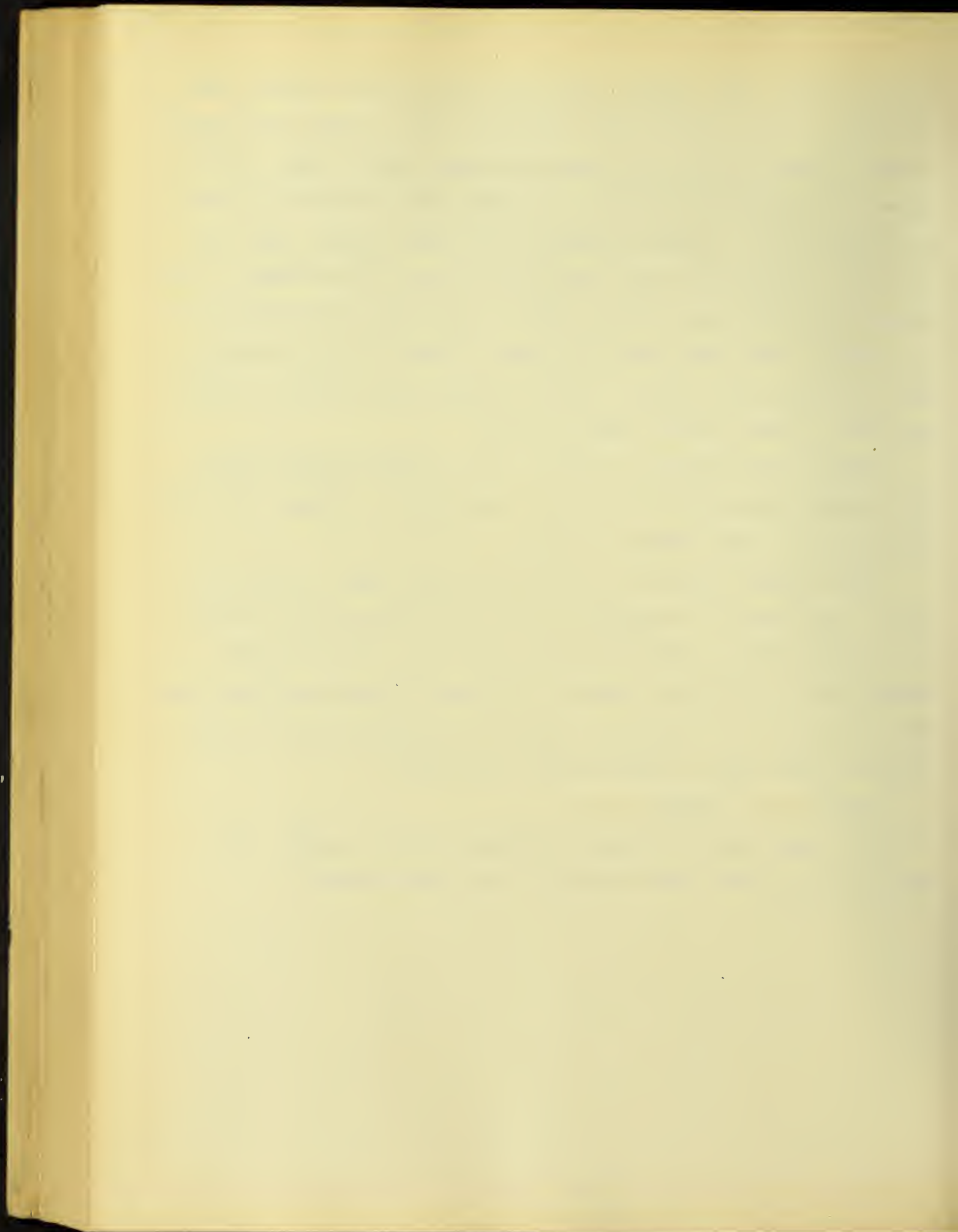
broad as long; third segment broader than long; fourth segment equal in length to third segment and ending in a stout, curved claw; thumb almost as broad as long, not extending beyond tip of claw. A stout, spine is situated at the tip of the thumb, about one-third as broad as long and about one-half as long as the thumb itself. Near this spine are situated two small hairs, and not far from the base of the thumb is a second stout spine, similar to the one at the distal end but smaller. The thumb bears also near its base a bristle which is about as long as the segment itself. Segments two, three, and four each bear a long, curved, simple bristle.

Abdomen three-fourths as broad as long, rounded behind except for a small median projection at the anal region. Abdomen with about eight pairs of long, curved bristles.

Legs subequal; sparsely clothed with rather long, curved bristles. The claws are tetradactyle but the dactyles are all united into a single base. Extending above and beyond the claw of the tarsus are four straight, subequal bristles with swollen distal ends. Near the base of the claw are situated two slightly curved, simple bristles about twice as long as the claw itself.

Length, 0.44 mm.; breadth, 0.24 mm.

Very common under bark and on leaves of various plants. This species is generally distributed over the United States.



Gen. Tetranychoides Banks.

1904. Tetranychoides Banks. Jour. N.Y. Entom. Soc., p. 54.

No projections at the anterior margin of cephalothorax; palpi not ending in a distinct thumb; eyes absent or indistinct; legs long; palpi of moderate size.



Tetranychoides nigra n.sp.

Body black; legs and palpi pale red.

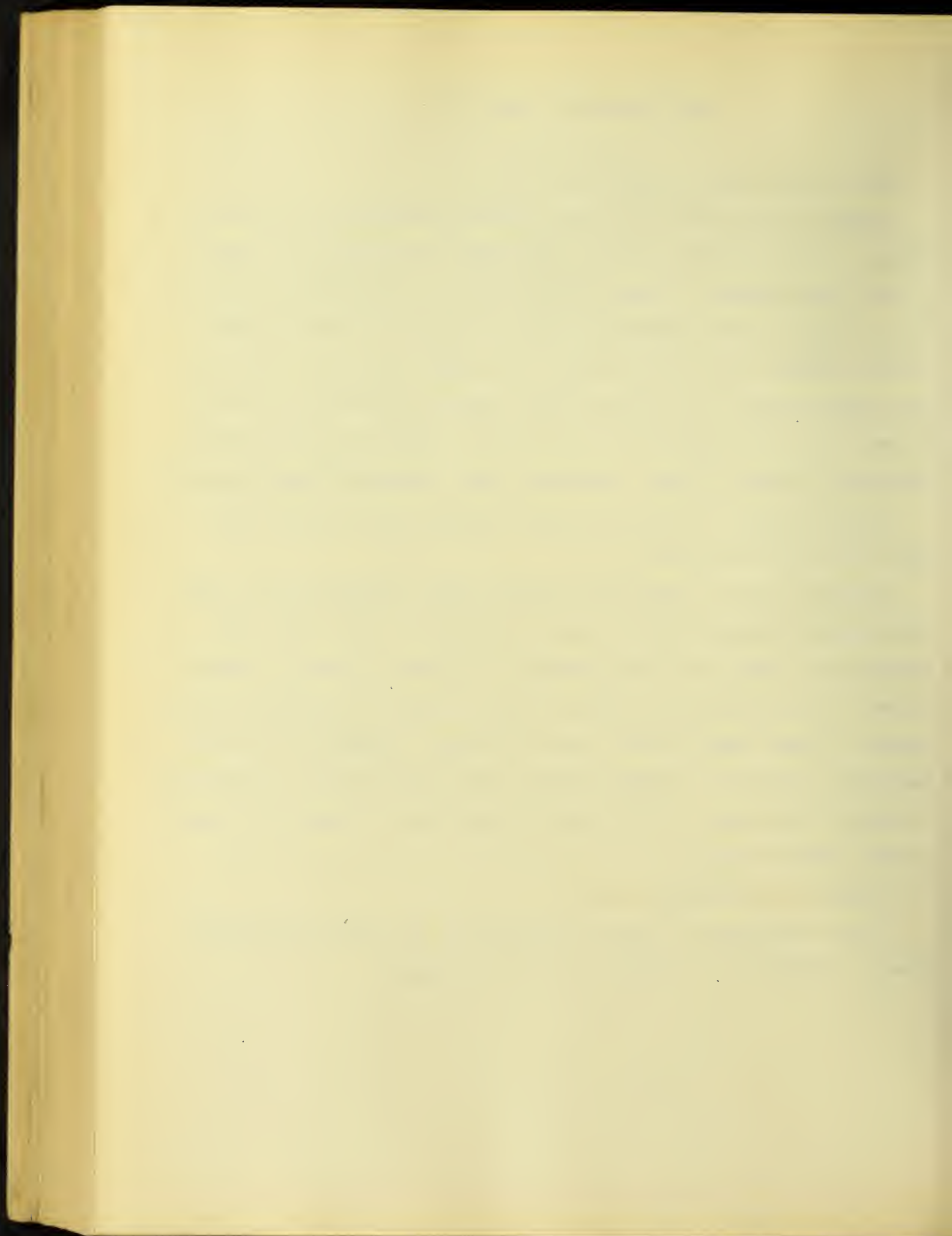
Cephalothorax broader than long, about one-third as long as the abdomen. There are about half a dozen small bristles on the apex of the cephalothorax. Palpus about as long as the tarsus of leg I, without thumb; distal segment of palpus arising from end of penultimate segment and ending in about six small, straight bristles; penultimate segment as long as distal segment and nearly as broad as long. All the segments of the palpi are sparsely clothed with bristles of medium length. Mandibles about one-half as long as palpi.

Abdomen almost as broad as long, rounded behind; with a few small, very short bristles.

Anterior pair of legs longer than the body; second pair of legs two-thirds as long as anterior pair; third pair longer than the second pair; last pair of legs equal to the anterior pair. Tarsus of leg I three-fourths as long as tibia and equal to antepenultimate segment. Claws sharp, stout; those of tarsus I almost as large as the others; caruncle situated between the claws and about two-thirds as long as the same. All the legs are sparsely clothed with slightly curved, simple bristles.

Length, 0.94 mm; breadth, 0.62 mm.

Under old boards and logs. Collected by the author at Arcola, Urbana, and Mahomet, Illinois. Several specimens.



Fam. Rhyncholophidae.

Palpus never geniculate or fitted for grasping prey, but provided with a thumb at the distal end; body well clothed with hairs; coxae arranged in groups; cephalothorax on the same plane with the abdomen; mandibles styliform.

Key to American Genera.

Palpi of four segments; mouth parts retractile ----- Smaris.

Palpi of five segments; mouth parts not retractile ---Rhyncholophus.

Gen. Rhyncholophus- Duges.

1834. Rhyncholophus Duges. Ann. Sci. Nat., (2). I, 1834, p.31.

Palpi large, composed of five segments; mouth parts not retractile; dorsal groove prominent; tarsus of leg I sometimes swollen.



Rhyncholophus latisquamosus n. sp.

Bright red; ends of legs white.

Cephalothorax not separated from abdomen; median groove very long, about one-third as long as the entire body, enlarged at both ends. From the enlarged posterior end extends two bristles about three times as long as the bristles which cloth the body. There is a single pair of eyes situated on the sides of the cephalothorax above the second pair of legs. Palpus two-thirds as long as the tarsus of leg I, penultimate segment fully twice as long as broad, distal segment as broad as long and ending in a stout claw which is situated on the inner side; thumb small, cylindrical, equal to palpal claw in length.

The dorsal surface of the body is well clothed with short, broad, scale-like bristles. The legs are clothed with similar bristles. The bristles on the body are irregularly arranged; those on the legs are arranged in rows. The body is broadest between the second and third pairs of legs, and is rounded posteriorly.

Anterior pair of legs as long as the body; tarsus three-fourths as long as tibia and slightly broader; tibia longer than antepenultimate segment. The posterior pair of legs equal to the anterior pair; tarsus not swollen, about one-half as long as tibia; tibia two-thirds as long as antepenultimate segment. Claws, bidactyle, the dactyles being spread apart. Claws of tarsi of legs I are not situated upon pedicels, claws of the other tarsi situated on small, narrow tarsal pedicels.

Length, 1.34 mm; breadth, 0.64 mm.

Under bark. Collected by the writer at Urbana, Illinois. Two specimens.



Rhyncholophus niger n.sp.(?)

Body black; legs and palpi yellowish green; body well clothed with rather short, stiff bristles.

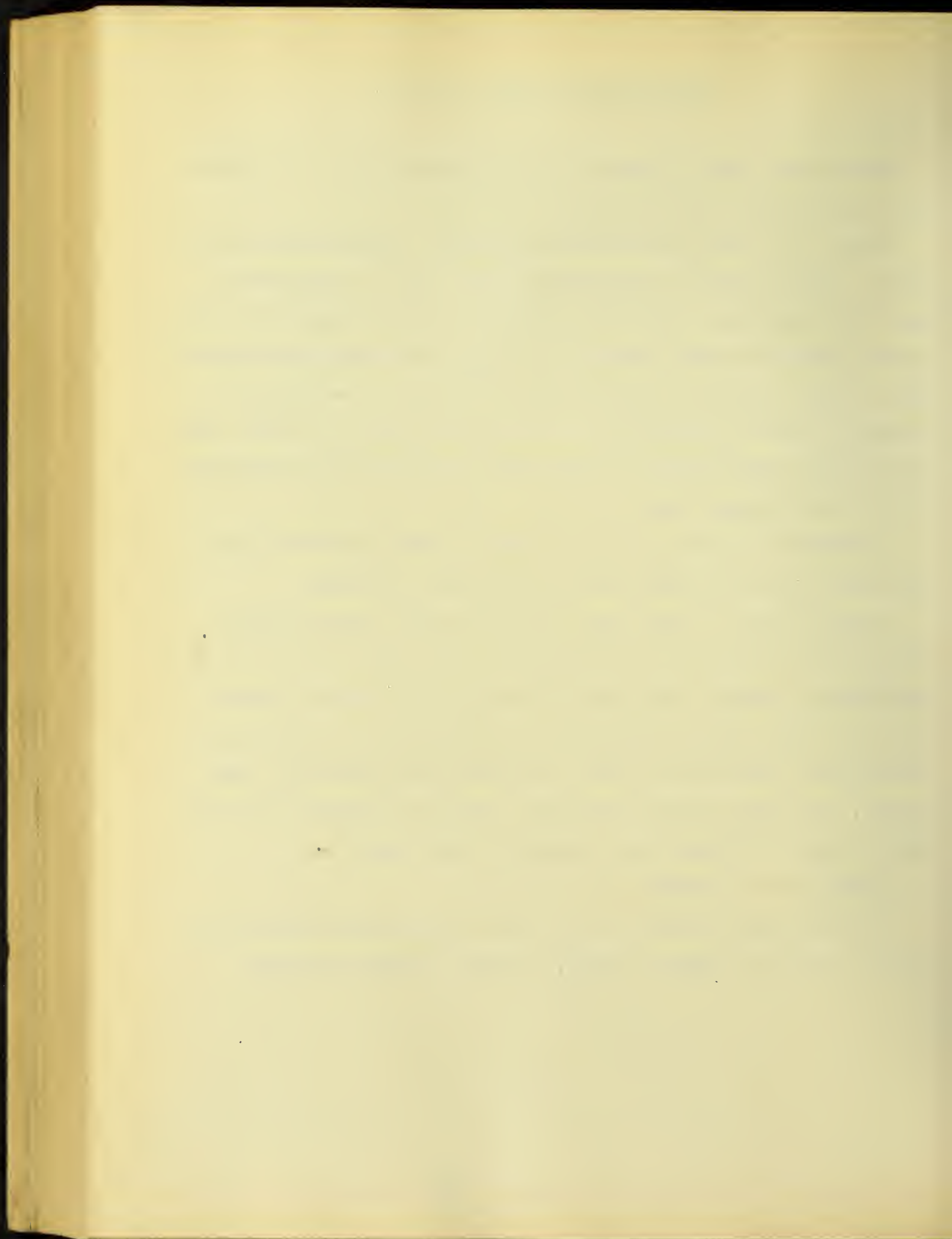
There is no sharp demarcation between the cephalothorax and abdomen. Cephalothorax is narrowed in front until it has almost a beak-like appearance. Mandibles almost as long as palpi; piercing organ of mandible about one-half as long as the body of the mandible. Next to last segment of palpus broader than long; last segment of palpus as broad at its base as it is long and bearing a stout claw on its inner distal aspect; thumb small cylindrical not extending to the end of palpal claw.

Abdomen two-thirds as broad as long; rounded posteriorly and sometimes showing a slight constriction near its middle.

Anterior pair of legs longer than the body; tarsus slightly swollen, three-fifths as long as tibia; tibia about equal to ant^e-penultimate segment. The tarsi of the last two pairs of legs are very short and swollen, being about three-fifths as broad as long; each bears a thick row of stout, straight spines along the inner border, the spines being one-half as long as the width of the segment. Claws of medium size, situated on small pedic^els.

Length, 1.00 mm.; breadth, 0.74 mm .

Crawling upon the bark of elm trees. Collected by the writer at the University campus, Urbana, Illinois. Three specimens.



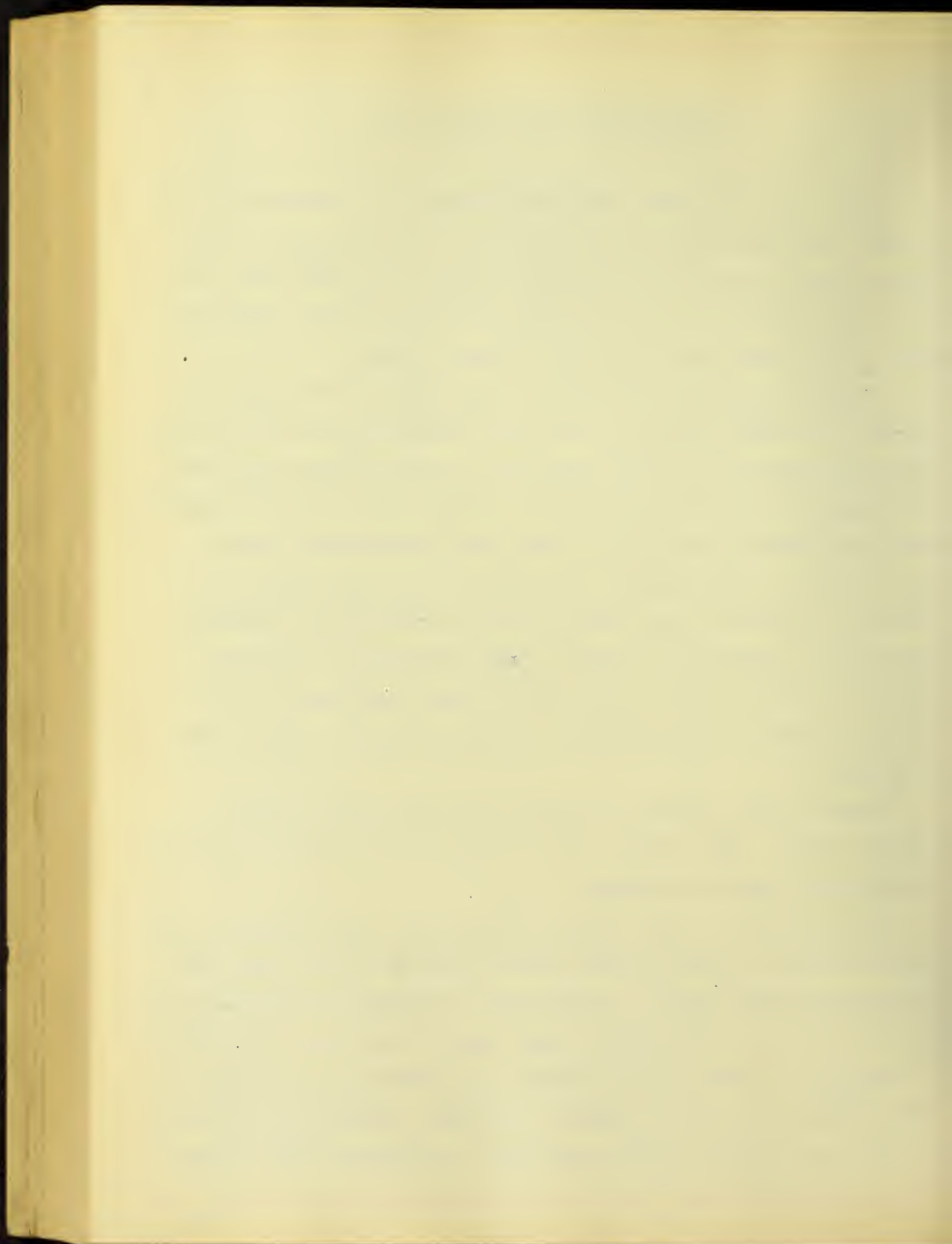
Rhyncholophus magnitarsus n.sp.

Light red; legs paler. The body and legs are clothed with rather short, pectinate hairs of uniform size. These hairs when viewed from the side, as they are around the margins of the body when looking at the specimen from above, give a beautiful echinate appearance and reflect violet and purple light of various hues.

Cephalothorax almost as broad as long; median groove extending one-half its length beyond the eyes, not expanded anteriorly but ending posteriorly in a circular expansion; two large eyes on each side of cephalothorax situated approximate to each other and above legs II. Mandibles two-thirds as long as palpi; palpi one-half as long as anterior pair of legs; segment one broader than long, segment two one-half as broad as long, segment three as broad as long, segment four half as long again as segment three and ending in two stout claws, the outer of which is much the stouter; thumb small, three-fifths as broad as long, and about one-half as long as segment four of palpus.

Abdomen oval, broadest in front of the third pair of legs, rounded behind. Anus situated about midway between the hind coxae and the posterior margin of abdomen.

Anterior pair of legs almost as long as the body; tarsus of legs I much swollen, one and one-half times as long as tibia; tibia equal to antepenultimate segment. Second pair of legs three-fourths as long as the first pair; third pair of legs equal to the second; last pair of legs about as long as the first pair and extending one-third their length beyond the posterior margin of abdomen; tarsus of leg IV equal to tibia, not swollen; tibia longer than the antepenultimate segment.



Claws of tarsi stout, not situated on pedicels.

Length, 0.94mm.; breadth, 0.43mm.

Under bark of ash. Collected by H. Glasgow at Urbana, Ill.

One specimen.



Rhyncholophus tumidus n.sp.

Uniform bright red; body sparsely clothed with short clavate bristles; legs clothed with longer, simple bristles.

Cephalothorax not demarcated from abdomen; median groove extending as far as the eyes, expanded into a small triangular area posteriorly, from which extends two simple bristles fully one-half as long as the entire length of the groove; anteriorly the groove is continued into a small tubercle as broad as high, from which extends four prominent bristles each about one-third as long as the mandibles. A single pair of eyes are present above the second pair of legs. Mandibles as long as the palpi. Second segment of palpus one-half as broad as long; third segment broader than the second, about two-thirds as broad as long; distal segment scarcely equal to the third in length and ending in a weak claw; thumb rather small.

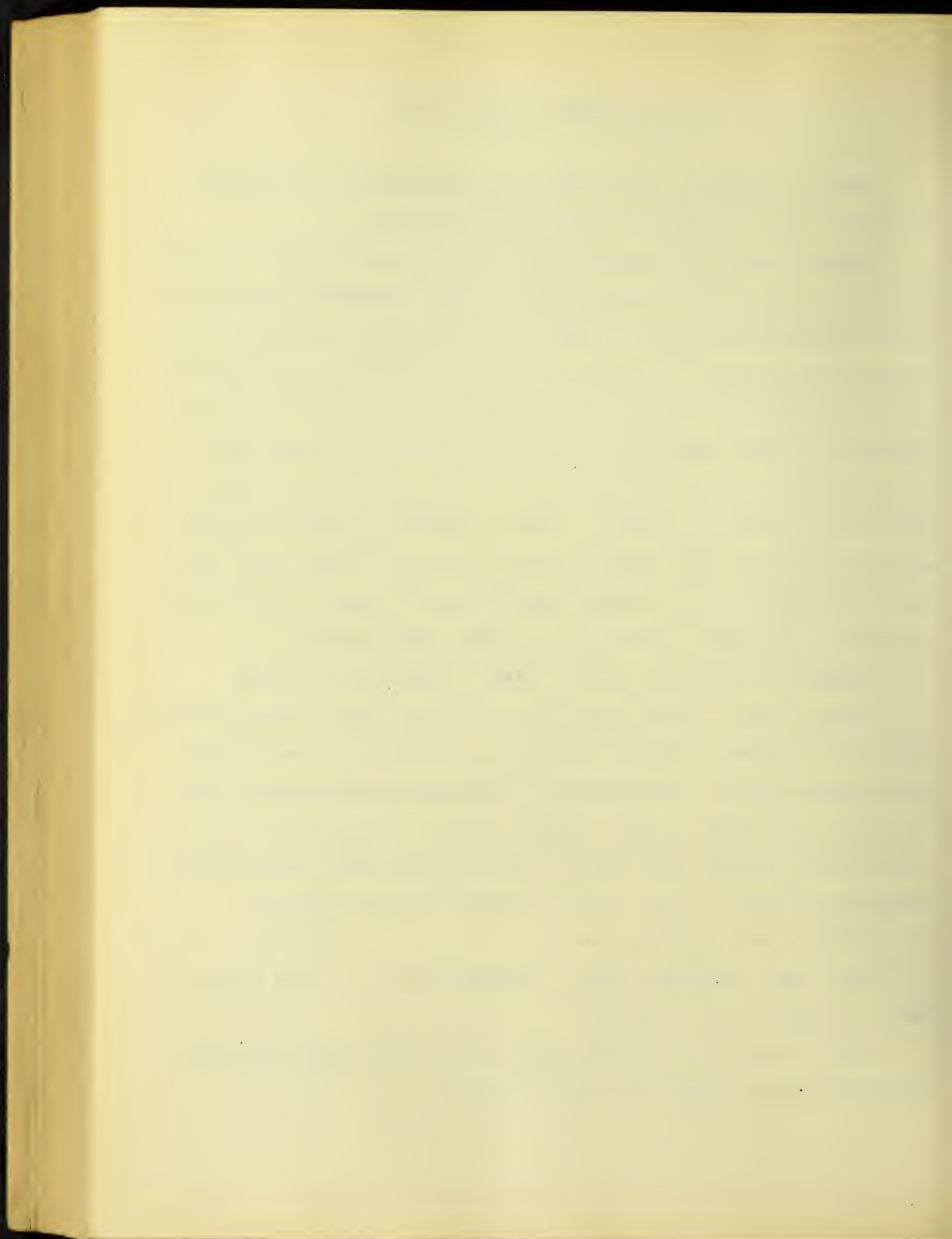
Abdomen two-thirds as broad as long, rounded posteriorly.

Anterior pair of legs almost as long as the body; tarsus swollen, two-thirds as long as tibia; tibia not so long or as broad as antepenultimate segment. Second pair of legs about two-thirds as long as the anterior pair; tarsus slightly swollen. The tarsus of leg IV is very much swollen, about three-fifths as broad as long and about one-half as long as tibia. Claws situated on short pedicels.

Length, 1.22mm.; breadth, 0.80mm.

Under dead clover and grass. Collected by J. D. Hood at Urbana, Illinois. Two specimens.

This is one of the species that I used for my experiments upon locomotion and also upon the sense of smell.



Rhyncholophus gracilipes Banks.

Body clothed with many short and almost clavate hairs; legs sparsely clothed with simple hairs.

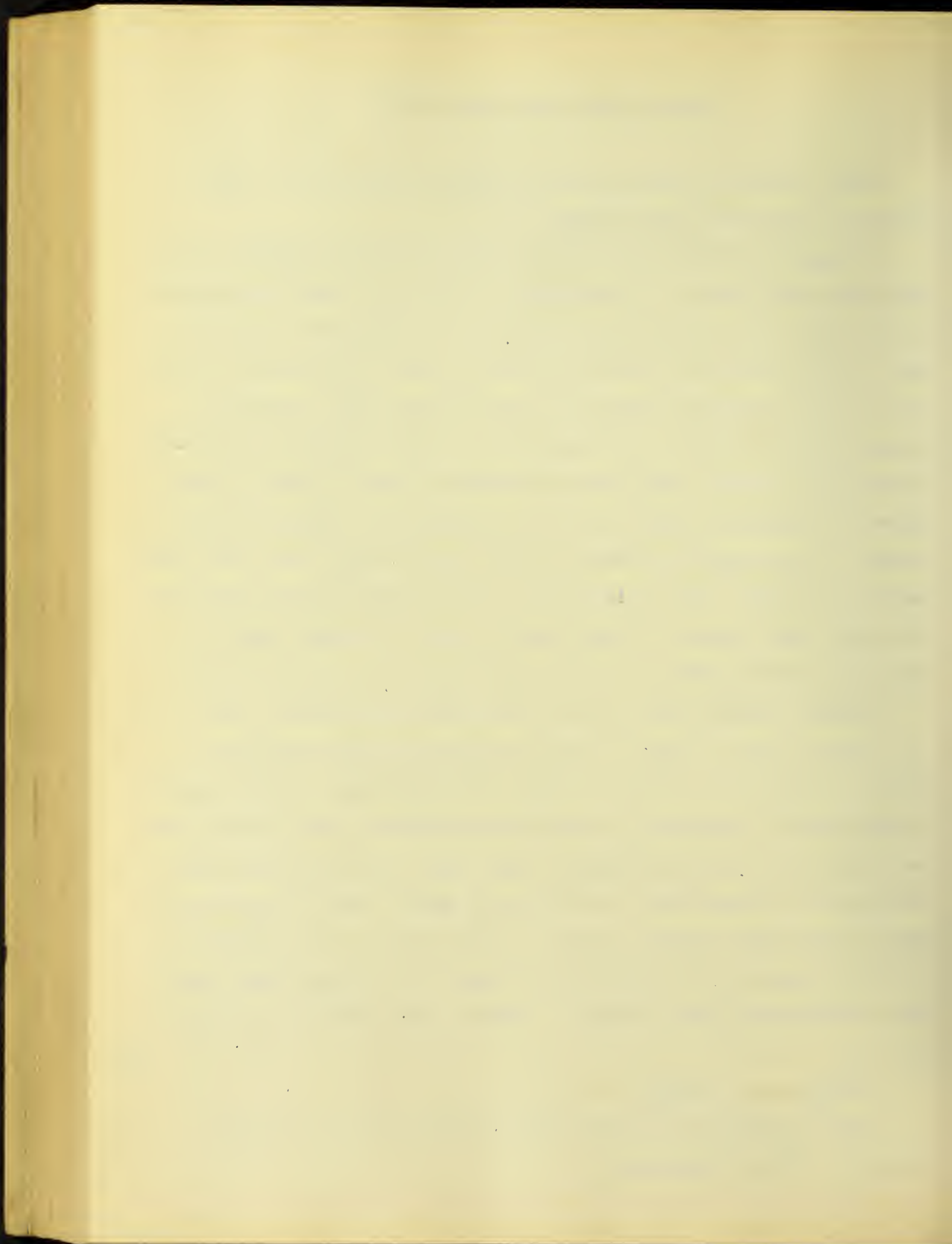
No apparent demarcation between cephalothorax and abdomen. Median groove very short, not extending as far as the eyes and expanded at both ends; from the posterior expansion of the groove arises two long bristles, each as long as the groove itself. The groove is continued into a broad low tubercle at its anterior end, from which arises several bristles. A single pair of eyes is present above the second pair of legs. Mandibles two-thirds as long as palpi; second segment of palpus one-half as broad as long; third segment slightly broader, being almost as broad as long; fourth segment very small and bearing the palpal claw on its inner, distal aspect and the thumb on its outer distal aspect. Thumb clavate, equal to palpal claw in length and bearing several bristles as long as the segment itself.

Abdomen rounded posteriorly; three-fifths as broad as long.

Anterior pair of legs as long as the body; tarsus slightly swollen, equal to the tibia in length; antepenultimate segment longer than tibia. Second pair of legs three-fifths as long as the first pair; third pair of legs slightly longer than the second pair; posterior pair of legs equal to the anterior pair. Tarsi of last three pairs of legs much swollen; tarsus of last pair of legs one-half as broad as long and about one-third as long as the tibia; tibia longer than the antepenultimate segment. Tarsal claws situated on slender pedicels.

Length, 1.10mm.; breadth, 0.60mm.

Found crawling over plowed ground, by the writer at Arcola, Illinois. Several specimens.



Rhyncholophus longipalpus n.sp.

Body red with dark blotches; legs and palpi paler than the body.

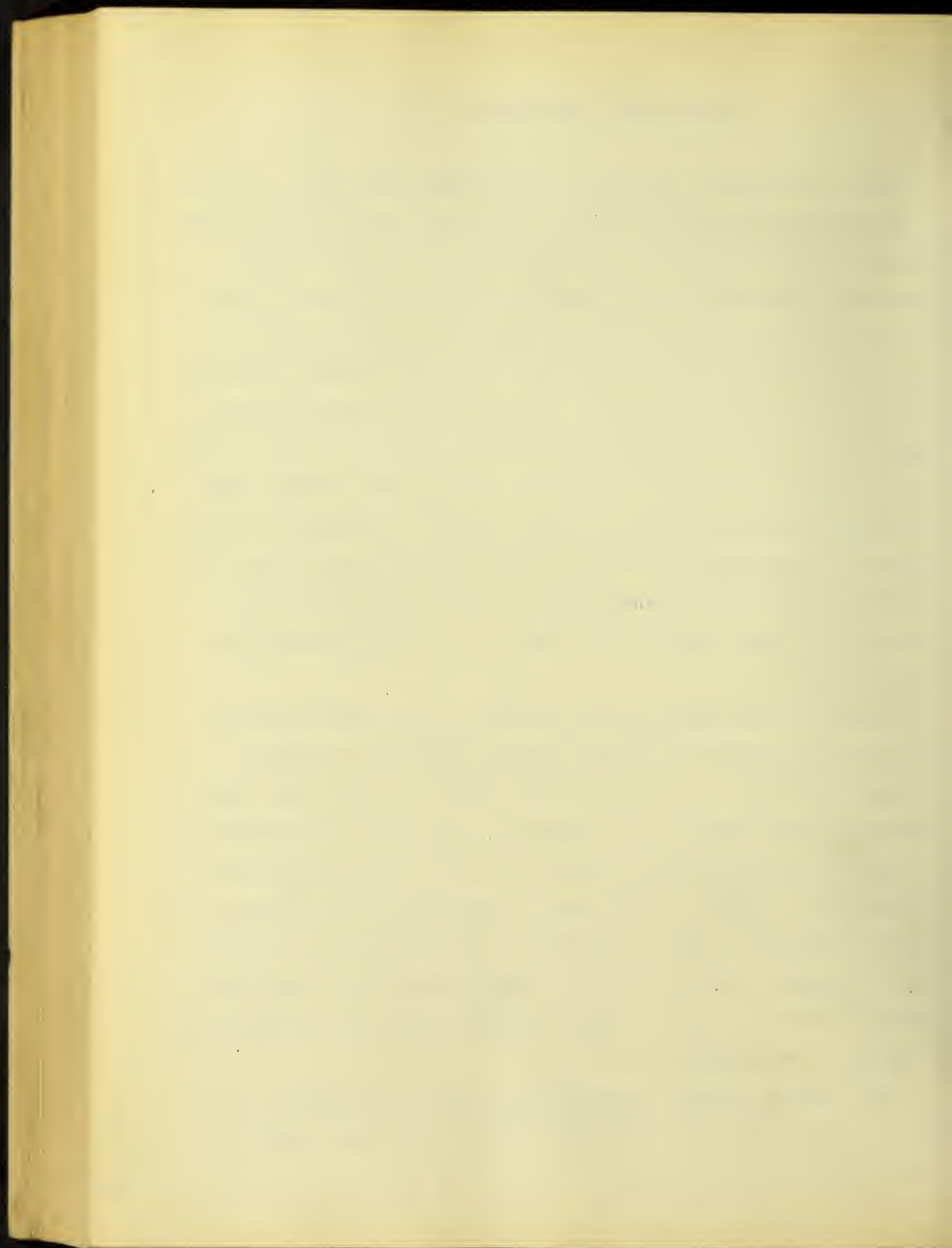
Cephalothorax truncate in front, as broad as long; dorsal groove extending beyond the eyes. At the posterior end of the dorsal groove are two long bristles, each about three-fifths as long as the cephalothorax. At the anterior end of the dorsal groove is a broad, low tubercle from which extend five long, subequal bristles. A single pair of eyes is present, situated on the postero-lateral aspect of the dorso-vertex about an equal distance from the lateral and the posterior margins of the same. Palpi large, longer than the cephalothorax and nearly twice as long as the mandibles; second segment of palpus twice as long as broad; third segment about two-thirds as long as the second segment; fourth segment ending in a single stout claw. Thumb cylindrical, not extending beyond the palpal claw.

Abdomen truncate posteriorly, broadest at the anterior margin and sparsely clothed with almost straight pectinate bristles.

Legs very long; anterior pair about twice as long as the body; second and third pairs of legs subequal, being about three-fourths as long as the anterior pair; posterior pair of legs equal to the anterior pair. Tarsus of leg I much swollen, one-half as broad as long and almost as long as the tibia; tibia subequal to antepenultimate segment. Tarsus of leg IV slightly swollen and about one-half as long as the tibia. Legs II and III also have swollen tarsi.

Length, 0.38mm.; breadth, 0.26mm.

Under bark of willow. Collected by the writer at Urbana, Ill. One specimen. One other individual was seen but I was unable to capture it.



Rhyncholophus rutilus n. sp.

Red; integument granulate.

Cephalothorax scarcely one-half as long as abdomen; dorsal groove extending almost to the eyes and with two prominent bristles at its posterior end, each about one-half as long as the groove itself.

A single pair of eyes is situated about twice as far from the lateral margin of the cephalothorax as from its posterior margin.

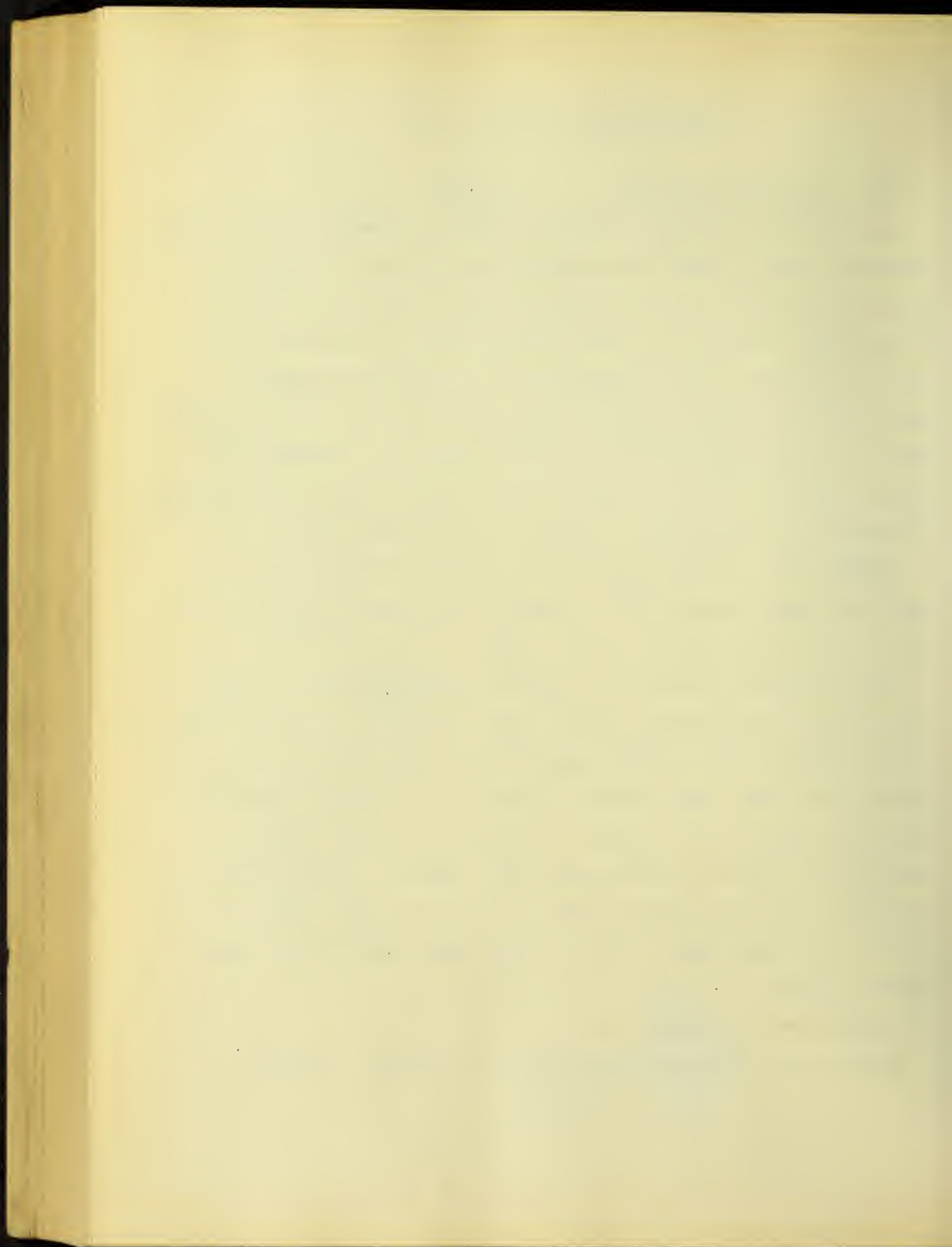
Palpi equal to cephalothorax in length and twice as long as the mandibles; second segment twice as long as broad; third segment slightly shorter than the second segment; thumb cylindrical and not surpassing the palpal claw. Palpi with a few simple hairs.

Abdomen oval, rounded posteriorly; leg III situated about one-half its length behind leg II. Abdomen very sparsely clothed with short, stiff, slightly pectinate bristles.

Anterior pair of legs as long as the body; second pair of legs two-thirds as long as the anterior pair; third pair almost as long as the anterior pair of legs; last pair of legs slightly longer than the anterior pair, and extending one-half their length beyond the posterior margin of the abdomen. Tarsus of leg I two-thirds as long as the tibia and slightly swollen. Tarsus of leg IV one-third as long as the tibia and two-thirds as broad as long; tarsi of legs II and III slightly swollen also. Legs rather well clothed with simple bristles.

Length, 1.04mm.; breadth, 0.68mm.

Under bark. Collected by the writer at Urbana, Illinois.



Rhyncholophus quadrirubripes n.sp.

Body, anterior and posterior legs red. The second and third pairs of legs are white.

Cephalothorax pyramidal, about one-half as long as the abdomen. Dorsal groove extending as far as the eyes, expanded at the posterior end. At the anterior end of the dorsal groove is a prominent tubercle bearing about eight subequal bristles. A single pair of eyes is present, situated on the lateral margin of the cephalothorax, about one-third the distance from the posterior to the anterior margins. Palpi about one-fourth as long as legs I and half as long again as the mandibles; segment two half as broad as long; segment



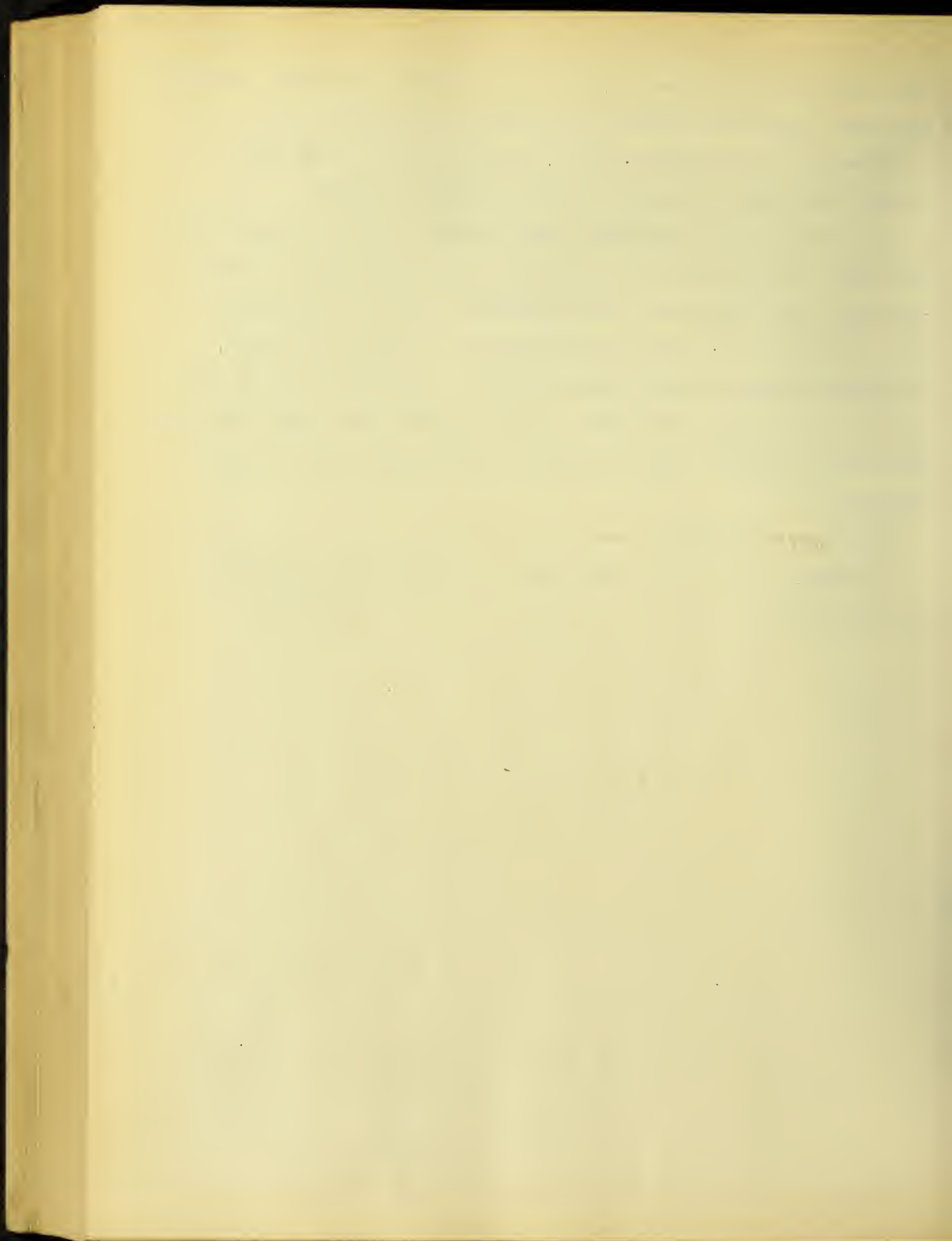
three about two-thirds as broad as long; palpal claw almost straight, not large; thumb not swollen but surpassing the palpal claw.

Abdomen slightly constricted at the third pair of legs and clothed with short pectinate bristles of uniform length.

Anterior pair of legs longer than the body; posterior pair slightly longer than the anterior pair; second and third pairs of legs subequal, each being about three-fifths as long as the anterior pair. Tarsus of leg I swollen and almost as long as the tibia, tibia and antepenultimate segment subequal. Tarsus of leg IV about one-fourth as long as the tibia; tibia slightly longer than the antepenultimate segment. All the legs are well clothed with simple bristles.

Length, 0.98 mm.; breadth, 0.55 mm.

In a gall of the clover leaf midge. Collected by J. D. Hood at Urbana, Ill.



Fam. Trombidiidae.

Palpi never geniculate or fitted for grasping prey, but provided with a thumb at the distal end; coxae arranged in groups; body thickly clothed with short hairs; tarsi often swollen; cephalo-thorax small and almost completely hidden by the projecting anterior part of abdomen.

Key to Genera.

Distal segment of palpus terminated with a single stout claw---

Trombidium.

Distal segment of palpus with two stout claws ----Microtrombidium

Gen. Trombidium Fabricius.

1776. Trombidium Fabricius. Gen. Insect., p. 151.

Distal segment of palpus with a single stout claw.



Trombidium sca^brum Say.

1821. Trombidium sca^brum Say. Jour. Acad. Nat. Sci. Phil., vol. 2, part 1, p. 69.

1859. Le Conte. Edit., II, 1859, p. 16.

1894. Trombidium sca^{a b}rum Banks. Trans. Amer. Entom. Soc., vol. 21, p. 212.

Bright red; legs and palpi paler; body thickly clothed with clavate hairs; legs and palpi sparsely clothed with much longer, pectinate hairs.

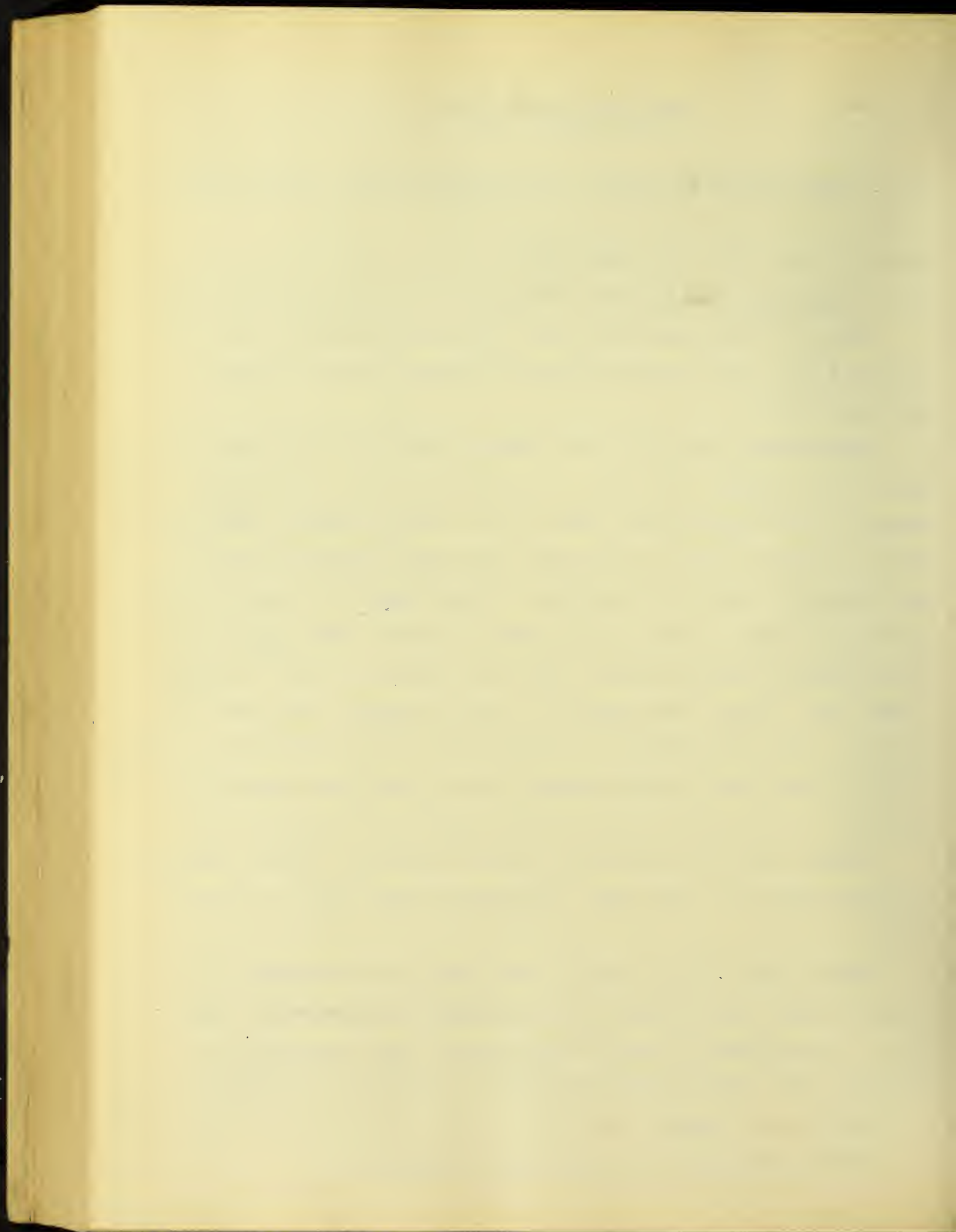
Cephalothorax almost entirely hidden from above by the anterior part of the abdomen. One pair of eyes, situated near the lateral margin of the cephalothorax; These are on clavate stalks. Mandibles about one-half as long as the palpi; piercing organ about one-third as long as the body of the mandible. Second segment of palpus about one-half as broad as long; third segment slightly longer than broad; fourth segment longer than the third and ending in a stout claw; thumb large, clavate, and almost as long as segments three and four combined. All the segments are clothed with pectinate bristles; segment four has a few bristles longer than the rest and situated near the base of the claw; bristles on the thumb shorter than the rest.

Abdomen pyriform; covered with large tubercles. Genital opening situated behind the hind coxae, its opening almost twice as long as broad.

Anterior pair of legs equal to the body plus the mandibles in length; legs II and III about three-fourths as long; ~~as what?~~ hind pair of legs almost as long as the front pair and extending over one-half their length beyond the posterior margin of the abdomen.

Length, 2.25 mm.; breadth, 1.80 mm.

Collected by the writer near Urbana, Illinois.



Gen. Microtrombidium Haller.

1882. Microtrombidium Haller. J. H. Ver. Wirtb., vol.38, p.322.

Distal segment of palpus ending in two stout claws, the inner usually the smaller.



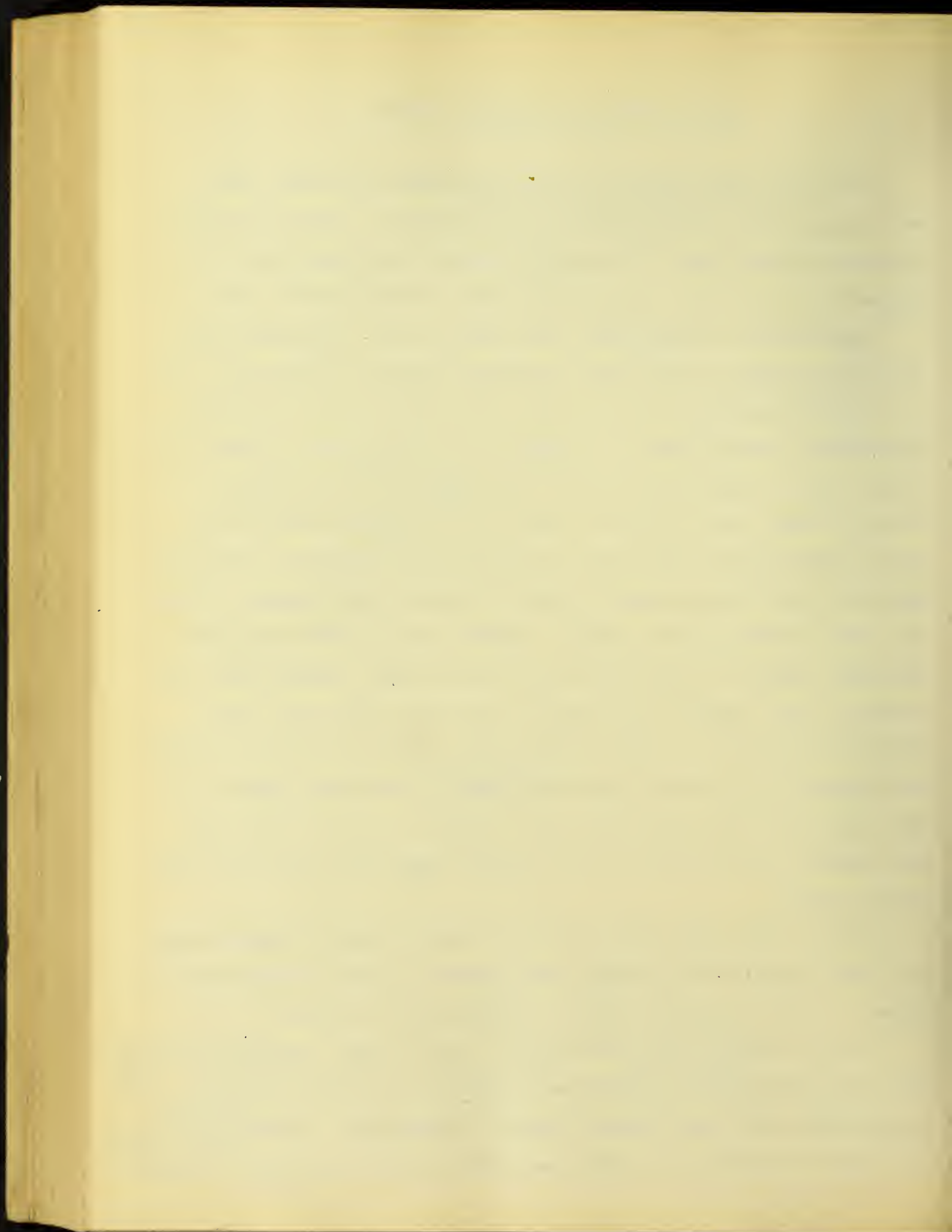
Microtrombidium muscarum (Riley).

Bright red; body sparsely clothed with short pectinate hairs, which appear tuberculate under high magnification. With low magnification the hairs have a beautiful echinulate appearance and with transmitted light give a purple color when viewed from the side.

Cephalothorax broader than long; dorsal groove extending almost the entire length of the cephalothorax and expanded posteriorly into a circular area having two tubercles, from each of which extends a long, simple bristle almost as long as the groove itself. There is a single pair of eyes on cylindrical pedicels about two-thirds as broad as long, near the lateral margin of the cephalothorax, and about midway between the anterior and posterior margins of the same. Mandibles two-thirds as long as palpi; each with one simple, curved hair near the base of the chelae. Segment one of palpus as broad as long; segment two fully twice as long as broad; segment three as broad as long; segment four ending in two stout claws, the outer being much the larger; thumb rather short, about two-thirds as broad as long and not extending beyond the base of the palpal claws. All the segments of the palpi have hairs similar to those of the body, and segment four has three or four longer simple hairs near the base of the claws.

Abdomen oval; almost two-thirds as broad as long; no impressions or other irregularities on the dorsal surface; genital depression almost circular, situated between the hind pair of coxae.

Anterior pair of legs two-thirds as long as body; tarsus swollen, twice as long as broad; penultimate segment two-thirds as long as tarsus; antipenultimate segment equal to penultimate. Second pair of legs three-fourths as long as the anterior pair; third pair of legs



smaller than the second pair and about three-fifths as long as the posterior pair. All the legs sparsely clothed with hairs similar to those of the body. The tarsi of the last three pairs of legs bear rather stout claws; those of the anterior pair of legs bear much smaller claws.

Length, 0.88 mm.; breadth, 0.53 mm.

Under an old log. Collected by the writer at Mahomet, Illinois.



Microtrombidium magnum n.sp.

Red; body thickly clothed with small, pectinate bristles of about uniform size; legs and palpi more sparsely clothed with similar but usually longer bristles.

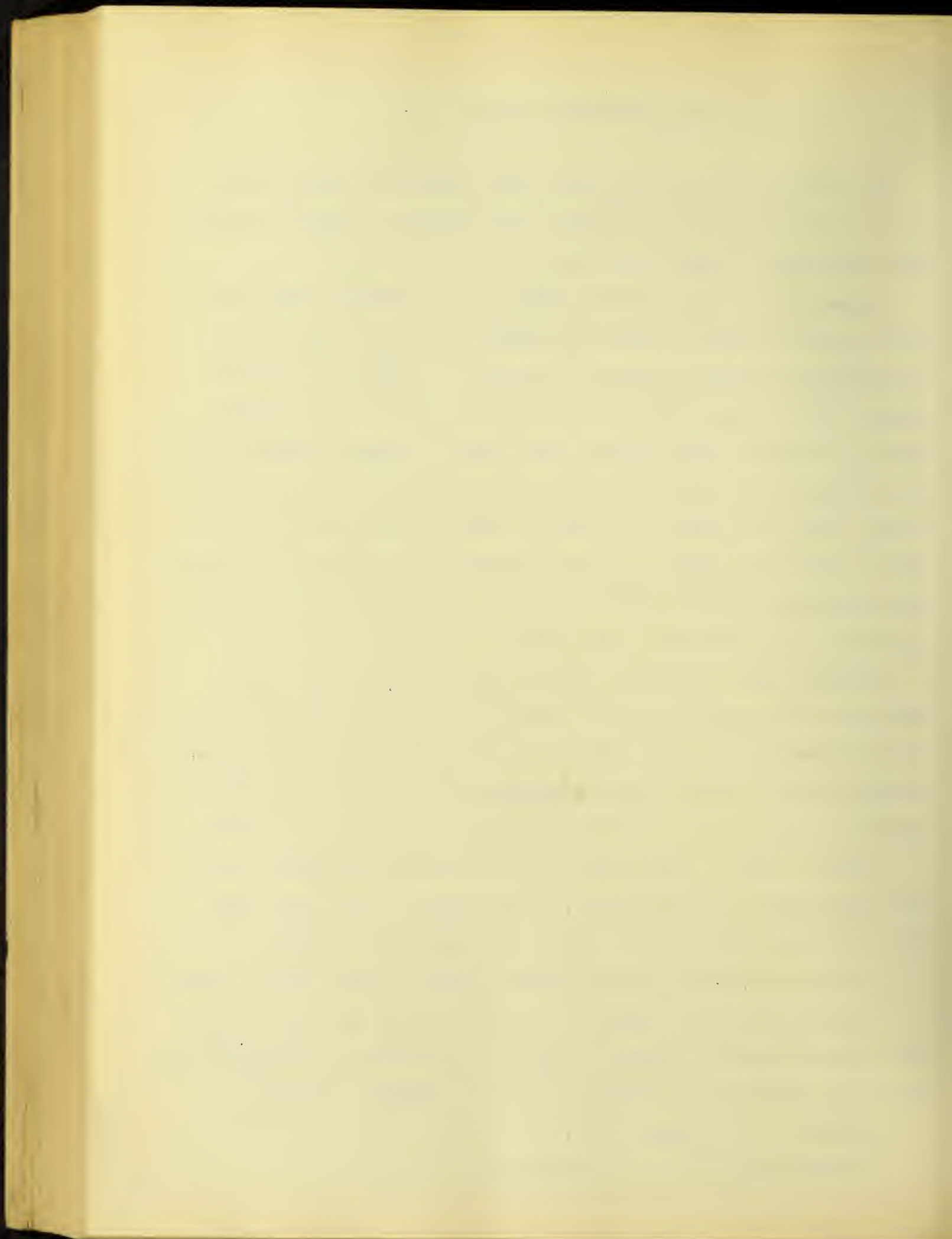
Cephalothorax small; almost hidden by the abdomen from above; median groove present, small, extending the entire length of the cephalothorax; mandibles scarcely one-half as long as the palpi; segment two of palpus about one-third as broad as long; segment three as broad as long; segment four twice as long as segment three and ending in two stout claws the outer of which is slightly the larger; thumb of palpus long, swollen and extending almost to the tip of the palpal claws. All the segments of the palpi are clothed with pectinate bristles, which on the fourth segment are somewhat enlarged around the base of the claws.

Abdomen almost twice as long as broad; pointed posteriorly. There are a few small, irregular impressions on the dorsal surface of the abdomen and at the posterior end is an elevated oval area, similar to that found in M. ^{CU}longistarium Riley. The hairs on the posterior margin of this elevated area are very small and numerous.

Anterior pair of legs three-fourths as long as abdomen; second and third pairs of legs smaller; fourth pair of legs about equal to the first pair and extending beyond the end of the abdomen. Tarsus of leg I very slightly swollen; tarsus equal to penultimate segment in length; penultimate segment one and one-third times as long as the antipenultimate segment. Claws of tarsus arising directly from the end of the segment; claws of tarsus I somewhat reduced.

Length ; breadth .

Collected by the writer near Urbana, Illinois.



Microtrombidium nigrum n.sp.

Body black, clothed with pectinate bristles; legs and palpi red; abdomen constricted at about one-third its length from the cephalothorax.

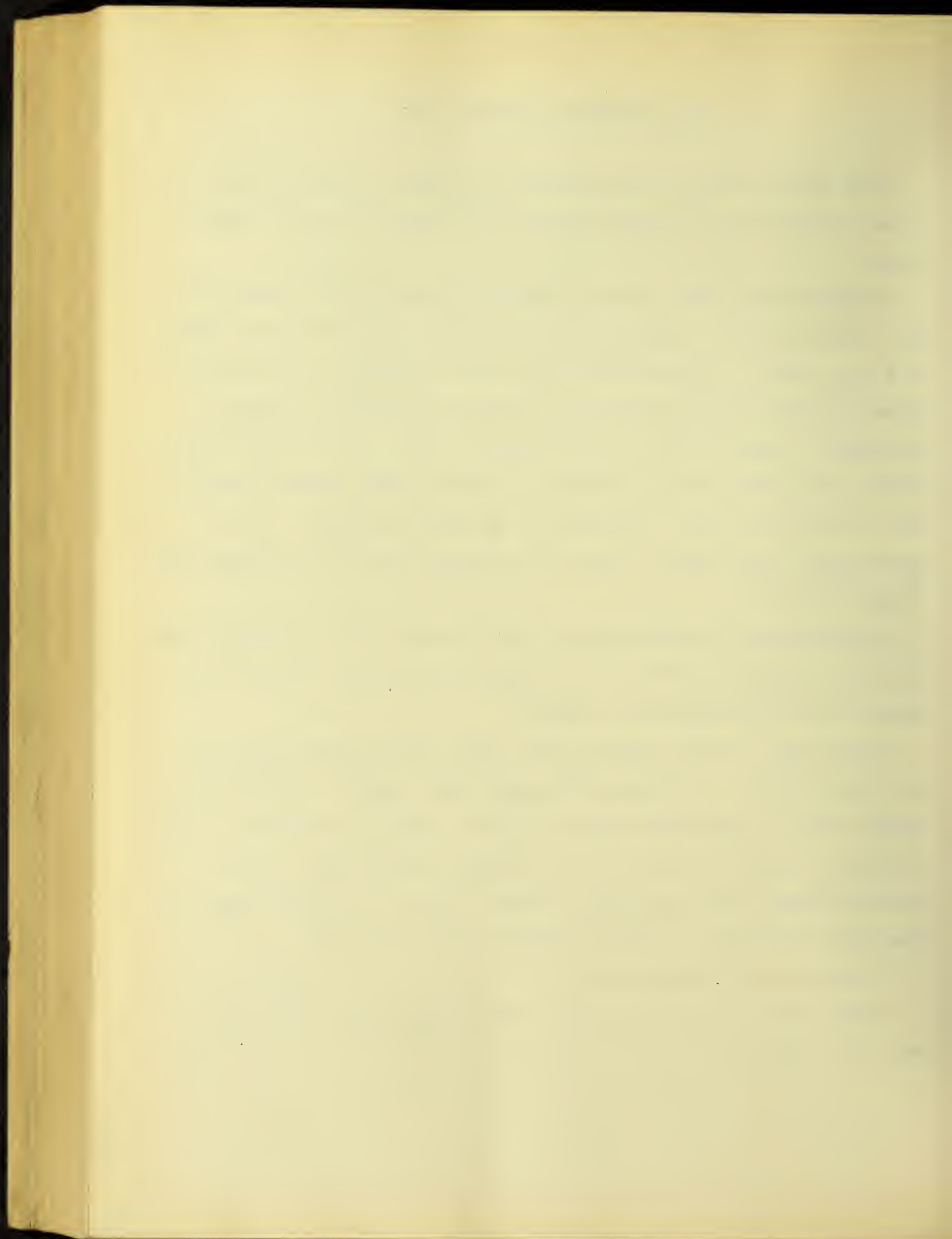
Cephalothorax small, narrow; two-thirds as broad as long; two eyes on each side of cephalothorax, situated on a short stalk common to both. Hairs on cephalothorax fewer and longer than those on the abdomen; median groove prominent. Mandibles one-half as long as the palpi. Segment two of palpus almost as long as the mandibles; segment three about three-fifths as broad as long; segment four ending in two black claws, the outer being much the larger. This species has large thumbs, longer than segment four of the palpus and slightly swollen.

Abdomen almost as broad posteriorly as anteriorly; strongly constricted slightly in front of the middle; no elevated area on the dorsal part of the posterior region.

Legs long; anterior pair as long as the entire body; tarsus of leg I not swollen, as long as the penultimate segment; penultimate segment equal to antipenultimate. All the legs are sparsely clothed with hairs similar to those of the abdomen but somewhat longer. Claws of tarsi large and rather slender; those of the first pair of legs about one-half as long as those of the other legs.

Length, 1.90mm.; breadth, 1.12mm.

Under bark of a hickory tree. Collected by James Zetek at Danville, Illinois.



Microtrombidium locustarum (Walsh).

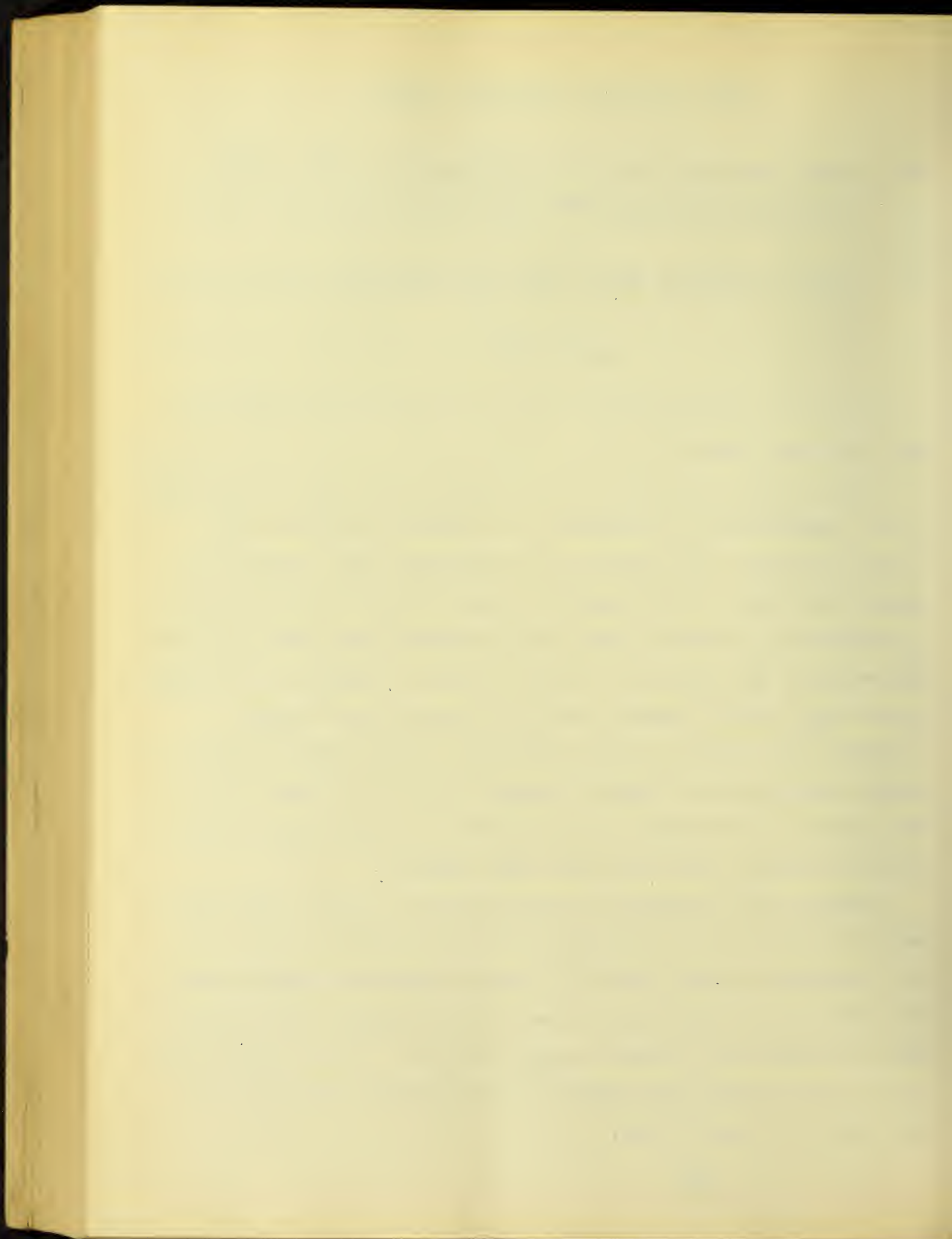
1866. Astoma locustarum Walsh. Pract. Entom., vol. 1, 1866, p. 126.
 1877. Trombidium locustarium Riley. Rep. U.S. Entom. Com., 1877. p. 311,
 figs. 39, 40.
 1894. Ottonia locustarum Banks. Trans. Amer. Entom. Soc., vol. 21, p. 213.

ADULT MALE.

Bright red, becoming darker with age; body thickly clothed with fine, pectinate hairs.

Cephalothorax rather narrow for the genus; two eyes on each side of the cephalothorax, both placed on a common, low pedicel^e; anterior eye larger than posterior eye; mandibles about one-half as long as the palpi; second segment of palpus twice as long as broad; third segment as broad as long; fourth segment longer than the third and ending in two large, stout claws, the outer of which is the larger. On the inner side of segment four are situated three subequal, slightly curved spines; on the outside are two very short, stout spines; thumb equal in length to segment four, cylindrical. All the segments of the palpus are well clothed with pectinate hairs; thumb with smaller hairs than the other segments.

Abdomen broad, expanded in front and narrow behind. The broad expanded anterior part is separated from the narrow posterior part by a transverse groove. There is a deep transverse groove at about the middle of the broad anterior part of the abdomen, which extends about two-thirds the distance across the body. At the posterior end of the dorsal side of the abdomen is a well marked oblong area almost twice as long as broad.



Anterior pair of legs equal to the length of the body; second pair of legs two-thirds as long as the anterior pair; third pair of legs equal to the second pair; hind pair of legs extending beyond the tip of the abdomen. Claws large and sharp, except those on the anterior pair of legs, which are much reduced in size.

Length, 2.50 mm.; breadth, 1.20 mm.

ADULT FEMALE.

Similar to the male but larger; the body is not so much constricted behind and there is a single broad, transverse groove.

Cephalothorax broader than in the male and much more hidden from above by the projecting anterior part of the abdomen, especially in old females.

Abdomen pear-shaped, without the transverse groove in the anterior broad part; anal plate broader than in the male; posterior end of abdomen not so sharply constricted. The abdomen becomes larger and the transverse groove shallower with age.

Legs of about the same length as in male but relatively shorter.

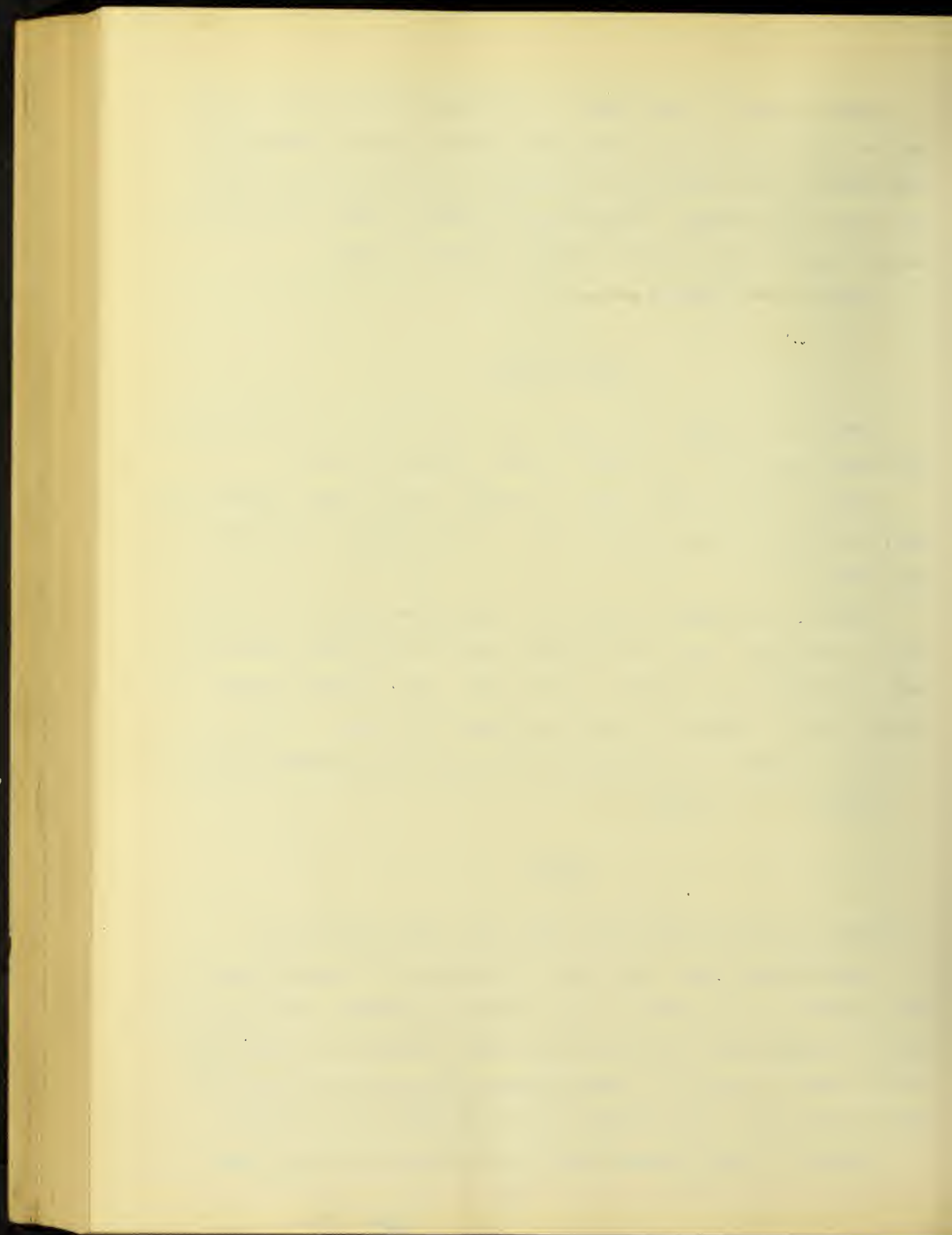
Length, 3.00 mm.; breadth, 1.75 mm.

LARVA.

When just hatched pale red; when full grown bright red.

Cephalothorax small and rather indistinct but characterized by the presence of four large, long, straight, pectinate bristles, which in the newly hatched individuals are about one-half as long as the entire body of the mite. Cephalothorax entirely obscured in the adult larva when it has become gorged with food from its host.

Abdomen of newly hatched larva two-thirds as broad as long;



in older individuals which are gorged with food it may be two or three times as long as broad. From a ventral view the fourth pair of legs can be seen in process of development inside the body.

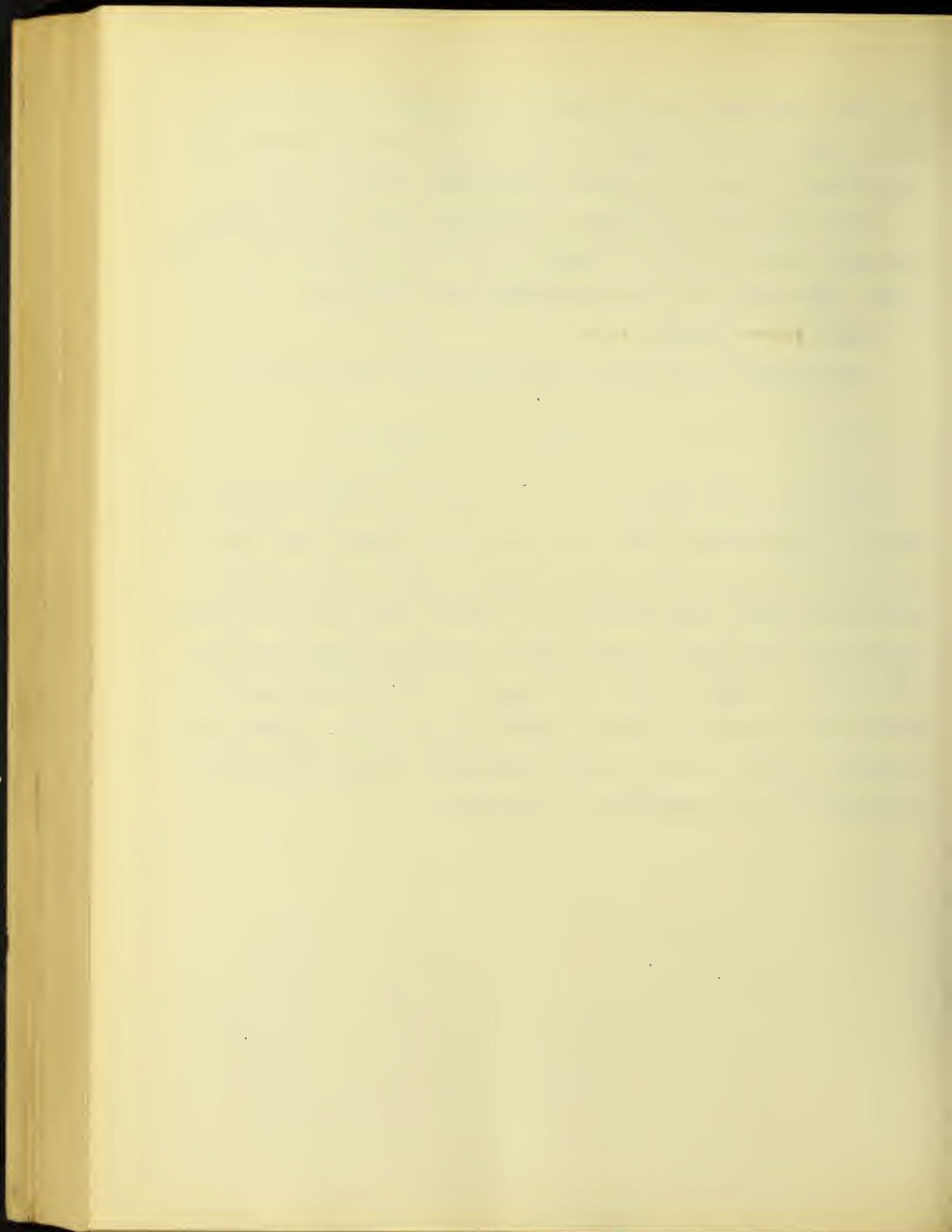
Legs relatively very large in the young larva, the third pair being the largest. Tarsi of legs attenuated and bearing long, sharp claws. Legs with very few straight pectinate bristles.

Length, 0.18mm; breadth, 0.13mm.

I have raised the larva from eggs laid by a female in captivity.

EGGS.

Spherical, pale red color; full of granules. I kept a female in a small cell, partially filled with dirt. She burrowed into the dirt much like an ant and laid several hundred eggs all in a slightly agglutinated mass, as described by Riley who states that the number varies from 300 to 400. These eggs all hatched at about the same time (within 2 days of each other) and the young larvae came out in scores and crawled all over the interior of the cell. Riley gave an extensive account of the economic importance of this mite in connection with his description of the species.



Fam. ERYTHRAEIDAE.

Palpi never geniculate or fitted for grasping prey, body clothed with large hairs; coxae arranged in radiate fashion; legs I and II without processes or spines; integument without shields.

Key to American Genera.

1. Attached to reptiles and supposedly parasitic ----- Gekobia.
 Free; predaceous ----- 2.
2. Palpi composed of four segments; body triangular ----- Anystis.
 Palpi composed of five segments; body usually oval.-- Erythraeus.

Gen. Anystis Heyden.

1826. Anystis Heyden. Isis, p.612.

Not attached to reptiles, but free and predaceous; palpi composed of four segments; body triangular.

Anystis agilis (Banks).

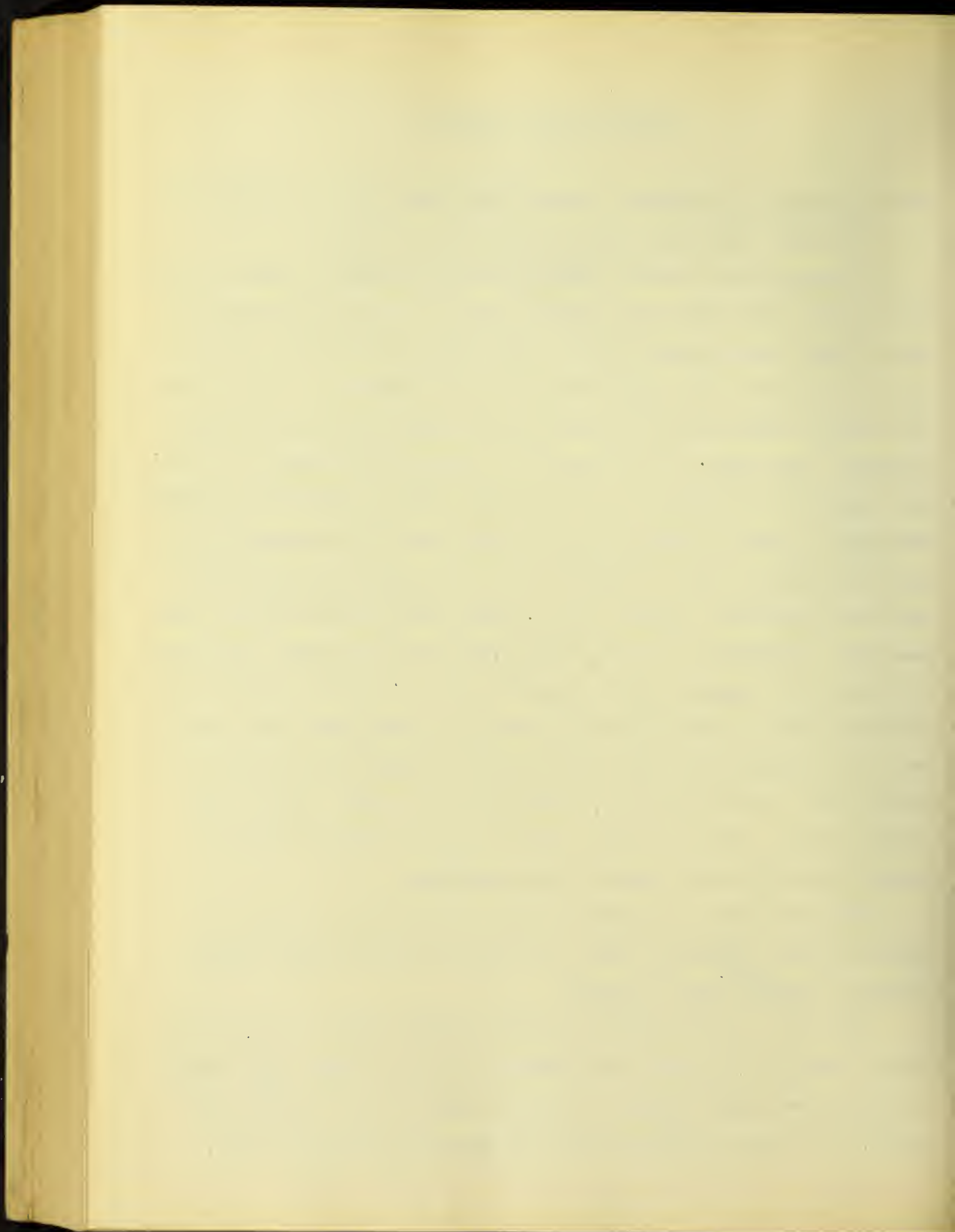
1894. Actineda agilis Banks. Trans. Amer. Entom. Soc., vol.21,p.211.

Yellowish, sometimes faintly red; color variable.

No demarcation between cephalothorax and abdomen. There are two eyes on each side above and slightly posterior to the second pair of legs; almost touching each other. Cephalothorax with four prominent pairs of bristles: two long, narrow bristles situated on the rostrum, two similar long, narrow bristles situated near the middle of cephalothorax; just posterior and lateral to this pair two pairs of large and very stout bristles, the anterior pair being slightly the largest. Mandibles as long as tibia of leg I, stout and with no large hairs; palpi geniculate, with the distal part of the palpus directed backwards and downwards; segment two of palpus two-thirds as long as the mandibles and bearing several large, stout bristles about two-thirds as long as the segment itself; segment three situated at the knee and about as broad as long with many prominent bristles and three short, very stout ones on the inner distal aspect; segment four almost as long as two, but not so stout, bearing near its outer, distal part several large, stout bristles. The knee of the palpus extends to about three-fifths the length of the mandibles.

The whole body of the mite is about as broad as long and is pointed behind. Dorsally there are about two dozen large, stout, slightly curved, simple bristles.

Legs large; anterior pair one and one-half times as long as the body. Tarsus of leg one three-fifths as long as tibia; tibia longer than antepenultimate segment. All the legs are well clothed with small, fine hairs of uniform size and sparsely clothed with big,



stout bristles about two or three times as long as the small hairs.
Claws rather small situated upon tarsal pedicels.

Length, 0.94mm.; breadth, 0.72mm.

Under logs and rubbish. Common at Arcola and Urbana, Illinois.



Fam. CHEYLETIDAE.

Palpi composed of four or five segments; body divided into cephalothorax and abdomen; palpi very large and ending in powerful claws for grasping prey and a small papilla situated inside of the large claws; cephalothorax large; body with few hairs.

Key to American Genera.

1. Anterior pair of legs adapted for clasping hairs; hind legs with one claw ----- Myobia.
 Anterior legs not modified for clasping hairs ----- 2.
2. Palpi without distinct papilla, not swollen at base -Syringophilus
 Palpi with a papilla on distal segment ----- 3.
3. Legs short and stout; palpi not swollen on outside at the base; parasitic ----- 4.
 Legs usually slender; palpi swollen on outside at the base; not parasitic ----- 5.
4. Hind legs with claws ----- Psorergates.
 Hind legs without claws ----- Harpyrhynchus.
5. Papilla of palpus with pectinate bristles ----- Cheyletus.
 Papilla of palpus with simple bristles ----- Cheyletiella

Gen. Cheyletus Latreille.

1796. Cheyletus Latreille. Prec. Caract. Ins., p.179.

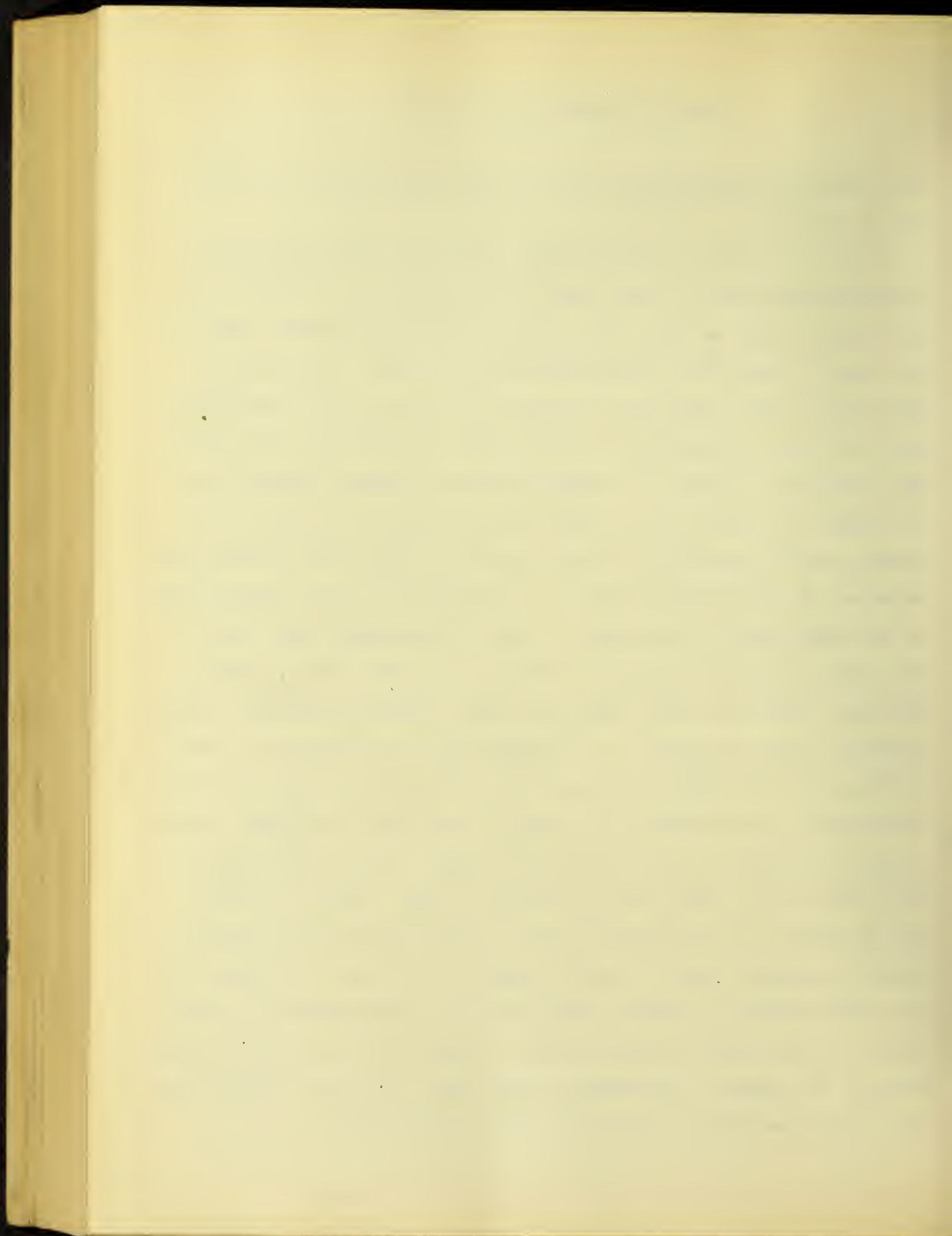
Anterior legs not modified for grasping hairs; palpi with papilla and swollen on outer side at the base; papilla with pectinate bristles.



Cheyletus seminivorus Packard.

1869. Cheyletus seminivorus Packard. Guide Study Insects, p. 665, pl. 13, fig. 6.

Body two-thirds as broad as long, broadest at the middle and truncate posteriorly. Beak large; at its base it is slightly over one-half as broad as the greatest width of the body; palpi equal to the beak in length; the large basal segment almost two-thirds as long as the whole palpus and one-half as broad as long; second segment very short, being about one-third as long as broad; third segment peculiar in shape; it is about twice as long as segment two; its base is as broad as the width of the segment from which it extends; but the distal half of the segment is only about one-half as broad as the base and consists of a continuation of the lateral half of the basal part of the segment. From the expanded inner base of the segment arises the papilla. Papilla with two, stout, curved, pectinate claws; the outer much the longer and bearing about a dozen straight spines arranged in a row along the inner margin; the inner claw about three-fifths as long as the outer, not so much curved and with about a dozen spines. The papilla bears also two long, curved, simple bristles, the outer half as long again as the larger pectinate claw and the inner about one-half as long. From the distal end of segment III extends the large terminal claw of the palpus, which is slightly longer than the segment from which it extends and is curved markedly inwards. Mandibles stout and ending in a needle-like, piercing organ, which is about one-half as long as the terminal claw of the palpus. The mandibles each bear a bristle, not far from the distal end that is longer than the piercing organ.

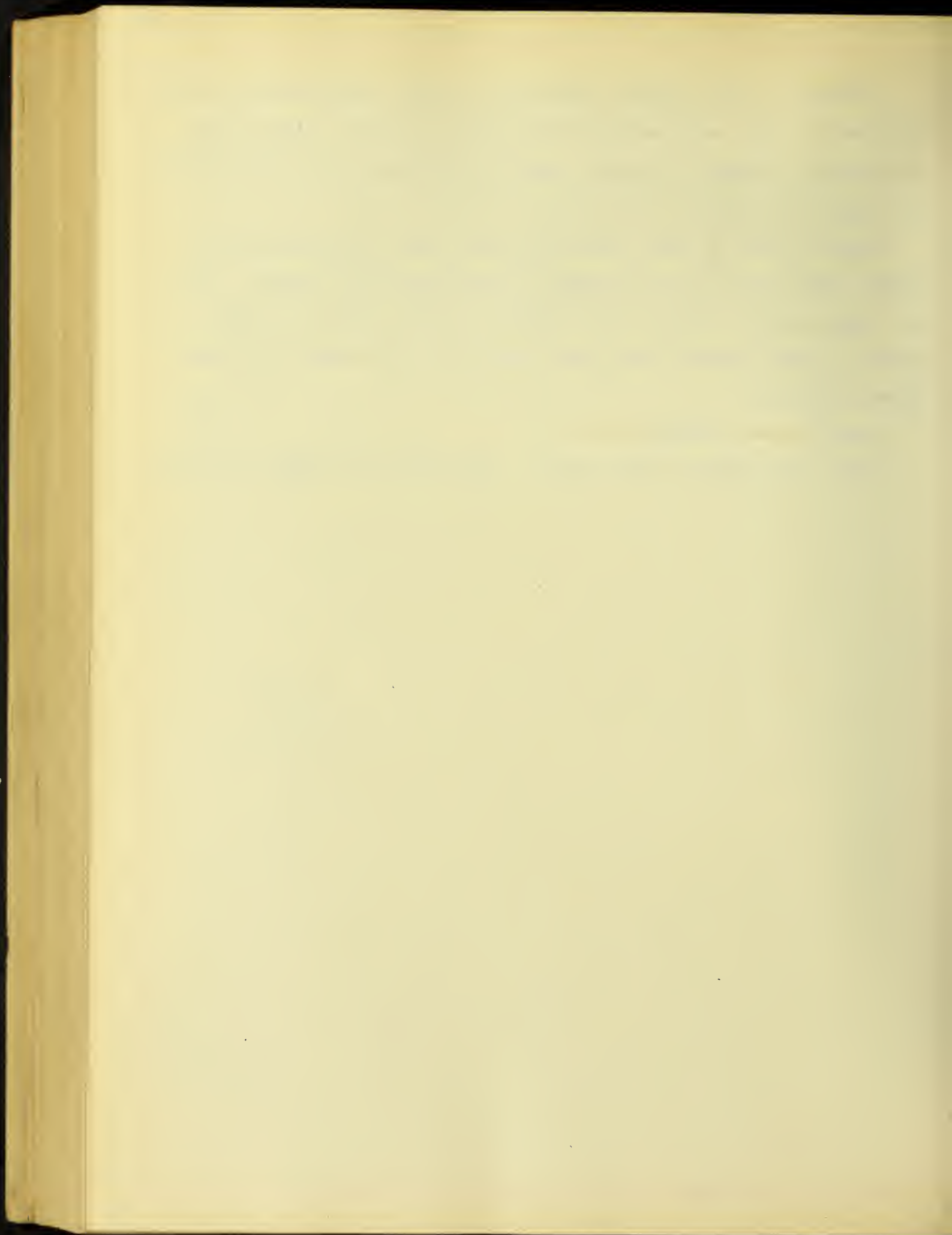


Abdomen not very sharply separated from the cephalothorax, about as broad as long, and bearing several pairs of short, simple bristles; about six pairs of small, simple bristles are situated around the posterior margin of the abdomen.

Anterior pair of legs longer than the rest; tarsus one-fourth longer than tibia; tibia subequal to antipenultimate segment. All the legs sparsely clothed with slightly curved, simple bristles. Claws of legs bidactyle with small caruncle, and joined to a long, tarsal peduncle.

Length, 0.60mm.; breadth, 0.38mm.

From refuse matter among grain. Collected at St. Johns, Illinois.



Gen. Cheyletiella Canestrini.

1886. Cheyletiella Canestrini. Prosp. dell' Acar. Ital., vol.2, p.175.

Anterior legs not modified for clasping hair; palpi swollen on outer side at base and with a distal papilla; hind legs with claws; papilla with simple bristles.



Cheyletiella americana n.sp.

Bright red; legs paler than the body and palpi paler than the legs; integument finely striated.

Cephalothorax subequal to the abdomen in length, and not very clearly separated from the same; beak large, two-thirds as long as cephalothorax and about two-thirds as broad as long; palpi large, stout, about as long as the beak from which they extend; the large basal segment of the palpus two-thirds as long as the whole palpus, and more than one-half as broad as long; second or middle segment of palpus very short and disc-shaped, being about one-fourth as long as broad; distal segment slightly over one-half as long as the large basilar segment, ending in a powerful claw, and having on its inner surface two powerful, stout bristles. The proximal segment has five prominent, simple hairs above; second segment hairless above; distal segment with three prominent hairs on the dorsal surface. Mandibles slightly longer than the palpi, about one-fourth as broad as long and ending in a short, stout, chitinous, piercing organ; mandibles each with two bristles; a long, straight bristle at about one-third the distance from the anterior end, and a much shorter one situated just above the piercing organ. On each side of the base of the mandibles and not far from the same is a prominent, curved horn about as long as the width of the mandibles; cephalothorax with a single pair of eyes situated above the anterior pair of legs; also with several short, simple hairs.

Abdomen about two-thirds as broad as long, broadest at the anterior margin, rounded behind. Abdomen sparsely clothed with simple, straight bristles of almost uniform size. Anal aperture oval, situated about its greatest diameter from the posterior margin of the

abdomen. The coxae of the ¹last two pairs of legs arise apparently from the anterior ventral surface of the abdomen; coxae III and IV are contiguous; ventral surface of abdomen bearing several pairs of short, simple, straight bristles.

Anterior pair of legs three-fourths as long as the body; second pair of legs scarcely over one-half as long as the anterior pair; third pair of legs about two-thirds as long as the anterior pair; fourth pair longer than the third. Distal segment of leg I, one and one-half times as long as the penultimate segment; at its distal end it bears about half a dozen large, long, simple bristles; penultimate segment subequal to the antipenultimate. All the legs bear small claws and a small caruncle on the end of a long tarsal pedicle.

Length, 0.94 mm.; breadth, 0.42 mm.

Under the bark of a hard maple tree. Collected by H. Glasgow, Urbana, Illinois. Two specimens.

Fam. BDELLIDAE.

No specialized seta on cephalothorax; integument not chitinized or leathery; palpi composed of four or five segments; cephalothorax large and clearly separated from abdomen; palpi large, geniculate, and bearing distally long tactile bristles; mandibles chelate.

Key to Genera.

Without median eye; tarsus with one or more plumose hairs-----

Bdella.

A median eye present on front margin of cephalothorax; tarsus
without plumose bristles ----- ^CZyta.

Gen. Bdella Latreille.

1796. Bdella Latreille. Precis Caract. Ins., p.180.

No median eye present; tarsus with one or more plumose hairs.

Bdella peregrina Banks.

1894. Bdella peregrina Bks. Trans.Amer.Entom.Soc., vol.21, p.219.

Red; abdomen darkened in places with black, legs much paler than the body.

Cephalothorax about three-fifths as long as the abdomen and about two-thirds as broad as long, the sides slightly concave. Mandibles about equal in length to the rest of the cephalothorax; each mandible has two subequal, slightly curved, simple bristles, one about one-third the distance from the tip of the mandible and one about the same distance from the base of the mandible. The entire length of the palpus is somewhat more than one and one-half times the length of a mandible; segment two is about three-fourths as long as one of the mandibles; segments three and four subequal, each about as broad as long and both together a little less than one-half as long as segment five; segment five subequal in length to segment two and of uniform width. Segment two bears about ten subequal bristles, each is about as long as the width of the segment on which they are situated; segment three has a single pair of similar bristles; segment four has a rather prominent median bristle, about twice as long as the segment itself, also a dorsal and lateral bristle, each of which is about one-half as long as the median bristle; segment five has two large terminal bristles, the outer about three-fourths as long as the segment itself, the inner slightly shorter than the outer; near the tip of the segment on the outside there are two bristles, each of which is about one-half as long as the inner terminal bristle. A similar bristle is situated on the inner side of the segment about twice as far from the end of the segment as are the bristles on the outside and longer than these bris-

tles; segment five bears about half a dozen other but smaller bristles. The cephalothorax bears two pairs of eyes, both situated laterally and near the abdomen, the anterior pair being more prominent than the posterior pair. The cephalothorax bears five dorsal pairs of bristles; a small anterior pair on the neck of the cephalothorax not very far from the base of the mandibles; a rather large pair situated about one-half the distance from the base of the mandibles to the abdomen and not far from the median plane; a smaller pair, situated just laterally to these; a pair situated inside between the eyes and about an equal distance from each of the same; and a similar pair of bristles median and posterior to the last pair of eyes.

Abdomen almost twice as long as broad, rounded posteriorly and bearing about a dozen short bristles dorsally and two pairs at the posterior margin near the median plane; the inner pair being inclined strongly away from the median plane.

The anterior pair of legs are about as long as the abdomen, and three-fourths as long as the posterior pair; tarsus of leg I about twice as long as the tibia; tibia much stouter than tarsus and about two-thirds as long as the femur; the femur is the broadest segment. All the legs are clothed with many rather fine hairs. The claws of the posterior pair of legs are slightly stouter than the rest.

Length, ~~1.20~~^{1.20} mm.; breadth, 0.62 mm.

Under old pieces of lumber. Collected by the writer at Urbana, Illinois. A few specimens.

Bdella cardinalis Banks.

1894. Bdella cardinalis Bks. Trans.Amer.Entom.Soc., vol.21, p.219.

Red; legs paler than the body.

Cephalothorax fully as broad as long; sides convex; mandibles about as long as the rest of the cephalothorax; each with four simple, curved bristles, the anterior of which are the largest, and situated a little more than one-third the length of the mandibles from the apex of the same. The palpi are slightly longer than the mandibles; segment two about two-thirds as long as the entire palpus; segments three and four subequal in length, but three is broader than four; segment five about one and one-half times as long as three and four taken together, and apically swollen and truncate. Segment two of palpus bears about a dozen small hairs, each about one-half as long as the width of the segment on which it is situated; segment three bears a single small hair; segment four has three similar hairs; from the tip of segment five extend the long tactile hairs; the outer of these is fully as long as the mandibles; the inner is slightly shorter than the outer; slightly anterior to the middle of the outer margin of segment five is situated a stout bristle about as long as the segment itself; a small bristle about one-half as long is situated close to the outer tactile hair. There are two pairs of eyes, both lateral, the anterior pair being above leg I and the posterior near the margin of abdomen. The cephalothorax bears four pairs of bristles, one pair not far from the base of the mandibles, another pair about one-half the distance from that pair to the anterior pair of eyes; there are two pairs of bristles inside of the posterior pair of eyes, the bristles of the inner pair being shorter and stouter than those of the outer.

Abdomen a little over one-half as broad as long, rounded posteriorly. It bears a prominent stout pair of shoulder bristles; also about six bristles near the posterior margin and a few bristles on the middle part.

The anterior legs are about as long as the body of the mite; the second legs are somewhat shorter; the third pair equal to the first; the posterior legs are the largest, being almost as long as the body of the mite plus the mandibles. Tarsus of leg I one-fourth longer than the tibia; tibia slightly stouter than tarsus; femur four-fifths as long as tibia and much stouter. All the legs are clothed thickly with hairs; the tarsus and tibia of leg IV each bear on their outer margins a prominent, straight bristle; the bristle on the tibia is situated slightly posterior to the middle of the segment and is equal to the segment itself in length; the bristle on the tarsus is equal to that of the tibia and is situated very near the proximal end of the segment; the tarsus also bears a prominent bristle about one-third as long as the segment itself on the outer side near the distal end. The claws of the hind pair of legs are larger than those of the other legs.

Length, 1.08 mm.; breadth, 0.58 mm.

Under old scraps of lumber. Collected by the writer at Urbana and Arcola, Illinois. Several specimens.

Bdella tenella Banks.

1896. Bdella tenella Bks. Trans. Amer. Entom. Soc., vol. 23, p. 75.

Red; body with blotches of black; legs much paler.

Cephalothorax broader than long. In this species there is no narrowed region to the cephalothorax just behind the base of the mandibles; sides of the cephalothorax strongly convex. Mandibles one-third longer than the cephalothorax, each bearing a stout, slightly curved bristle near the middle of the lateral margin, which is about one-third as long as the mandibles; a similar smaller bristle is situated just posterior to this large one and another not so far back but more ventral. Palpi about as long as the mandibles; segment two slightly more than one-half the length of the palpi; segments three and four subequal in length, but three is broader than four; distal segment broadened apically and almost half as long again as segments three and four combined. Segment two bears about a dozen very fine hairs; segment three apparently a single hair; segment four has three small hairs; distal segment with two long tactile bristles at the apex; the outer about as long as the mandibles; the inner three-fourths as long; a prominent bristle is situated near the end of the segment, just outside and above the outer large tactile bristle; it is as long as the segment itself; distal segment with two or three other small bristles or hairs. There is a single pair of eyes situated above and posterior to the first pair of legs. The cephalothorax bears two pairs of very long bristles which vary in length in the different specimens. They are of nearly the same length.

The anterior pair is situated about one-third the distance from the base of the mandibles to the posterior margin of the cephalotho-

rax and the posterior pair is situated just above the eyes; a small inconspicuous pair of bristles occurs about midway between the two large pairs.

Abdomen three-fifths as broad as long and about one-fourth broader than the cephalothorax, with the sides either straight or concave, and the posterior end rounded. There is a prominent pair of shoulder bristles present about one-half as long as the mandibles; around the posterior margin of the abdomen are about six bristles equal in length to the shoulder bristles; a few smaller bristles occur on the dorsum of the abdomen above these posterior bristles.

Anterior pair of legs equal to abdomen in length; tibia three-fourths as long as tarsus; femur equal to the tibia in length, but slightly stouter. All the legs are well clothed with hairs. The tarsus and tibia of the last two pairs of legs each bear a large bristle on the outer margin, the bristle being fully as long as the segment on which it is situated; tibia of leg I with a similar bristle. The claws of this species are large and stout, considering the size of the mite.

Length, 0.52 mm; breadth, 0.30 mm.

In moss. Collected by the writer at Arcola, Illinois. A few specimens.

Bdella lata n.sp.

Dark red with granulation of irregular dark brown and blackish spots; legs and palpi paler than body.

Cephalothorax triangular; length and breadth about equal; sides slightly convex; anterior bristles situated near base of beak and about one-half as long as the cephalothorax; posterior pair of bristles similar to anterior pair and situated just above the eyes. Two eyes present on each side of cephalothorax near the posterolateral aspect. Beak as long as the cephalothorax; mandibles and palpi equal in length; mandibles each bearing two prominent, slightly curved bristles, one situated near the base and a larger one near the middle. Second segment of palpus three-fifths as long as mandibles; three and four equal in length, but the third is broader than the fourth; distal segment equal to the third plus fourth. Segments two, three and four with a few fine hairs; distal segment with two long apical bristles, the outer of the two almost equal to the entire palpus in length, and the inner slightly shorter; immediately behind the outer bristle is situated two smaller bristles about as long as the distal segment itself.

Abdomen about three-fifths as broad as long, rounded posteriorly, bearing two prominent shoulder bristles and about twenty similar but smaller bristles.

Anterior pair of legs about as long as the body excluding the beak; tarsus about one and one-third times as long as tibia; tibia fully twice as long as antipenultimate segment. All legs well clothed with short hairs; tibia of leg I, tarsus of leg III, and tibia and tarsus of leg IV each with a long, tactile bristle. Claws moderate, caruncle as long as the dactyles.

Length, 0.61mm.; breadth, 0.32mm.

In moss. Collected by the author at Mahomet, Illinois. Several specimens.

Bdella virgata n.sp.

Body crossed with irregular red and black patches; integument finely striated.

Cephalothorax not well demarcated from abdomen; anterior pair of bristles situated at base of beak, two-thirds as long as cephalothorax; posterior bristles situated near the posterior margin of the cephalothorax about midway between the median line and the lateral margin; two eyes present on each side at the extreme posterolateral aspect of the cephalothorax. Mandibles broad at base, the anterior half slender; each with two bristles, one situated about one-fourth the distance from the base of the mandible and a smaller one situated slightly in front of the middle of the mandible. Palpi about as long as mandibles; segment two fully two-thirds as long as the palpus; segment three somewhat larger than four; distal segment about equal to three plus four. Segments two, three, and four have a few very small hairs; distal segment with two large terminal bristles; the outer as long as the palpus, the inner about three-fifths as long. Situated just behind the outer bristle is a small bristle as long as the distal segment itself; distal segment with a similar but smaller bristle near its inner margin.

Abdomen almost twice as long as broad with a pair of short, pectinate shoulder bristles about as long as the width of tarsus I, and two pairs of similar bristles situated at the tip of the abdomen; abdomen otherwise hairless.

Tarsus of leg I, one and one-third times as long as antipenultimate segment; antipenultimate segment as broad as long. All the legs are sparsely clothed with small, simple hairs. Tibia of leg I, and tarsi of legs III and IV each with a long, tactile bristle.

Claws small.

Length, 0.55mm.; breadth, 0.25mm.

Under bark. Collected by the author at Mahomet, Illinois. A few specimens.

Bdella subnigra n.sp.

Body black; beak dark reddish, brown; legs and palpi paler.

Posterior margin of Cephalothorax markedly narrower than the anterior margin of the abdomen. Two eyes on each side of cephalothorax, situated at lateral margin not far from the base of cephalothorax; posterior bristles situated above the eyes, about three-fifths as long as the broadest width of cephalothorax. Beak large, longer than cephalothorax. Mandibles and palpi subequal in length; mandibles each bearing two bristles, the smaller of the two situated near the base, and the larger near the middle. Segment two scarcely more than half as long as the mandibles, segment three larger than four; distal segment fully as long as three and four taken together. Segment two has about half a dozen small, simple hairs; segment three apparently hairless; segment four with three small hairs; distal segment with two large bristles and one small bristle, the middle one almost as long as the total length of the palpus, the inner somewhat shorter, and the outer scarcely as long as the distal segment itself.

Abdomen broadest near the anterior margin; rounded posteriorly. It bears a large pair of shoulder bristles about as long as segment two of the palpus, and four pairs of bristles at the posterior end.

Anterior pair of legs somewhat longer than abdomen. The posterior two pairs of legs are stouter than the two anterior pairs of legs. Legs sparsely clothed with hairs of various lengths.

Length, 0.62mm; breadth, 0.32mm.

In moss. Collected by the author at Mahomet, Illinois. A simple specimen.

Bdella illinoensis n.sp.

Cephalothorax about one-half as long as abdomen; two eyes on each side at the lateral margins about one-third the distance from the posterior end of the cephalothorax; anterior bristles situated at the anterior margin of the cephalothorax, about as long as the second segment of the palpus; posterior bristles situated midway between the eyes and the middle of the body, and about as long as the anterior bristles. Beak very large; palpi longer than the mandibles. Mandibles with at least three bristles. Second segment of palpus scarcely more than one-half as long as the mandibles; segment three one-half as long as segment four; distal segment longer than three and four taken together. Segments two and three apparently hairless; segment four with a bristle on its outer margin near the distal end of the segment; distal segment with four bristles; two large terminal bristles, the outer almost twice as long as the segment from which it extends, the inner somewhat shorter; and two bristles situated close together on the outer margin of the segment near its middle, the anterior being the larger.

Abdomen oval, with a small pair of shoulder bristles about as long as the width of the tibia of leg I; dorsum of abdomen bearing several other and similar bristles including about half a dozen around the posterior margin.

Legs large; anterior pair as long as body exclusive of the beak. Tarsus of leg I, one and one-third times as long as tibia; tibia almost three times as long as antepenultimate segment. All legs well clothed with similar rather small hairs. None of the legs bear large tactile bristles. Claws weak and situated on long tarsal pedicels.

Length, 1.00 mm.; width, 0.52 mm.

Under lumber from an old barn. Collected by the writer at Urbana, Illinois. A few specimens.

Bdella viridis n.sp.

Abdomen, yellowish green with a few blotches of red; cephalothorax red; legs salmon color.

Cephalothorax with two eyes on each postero-lateral corner. The anterior bristles are as long as the mandibles and situated about one-third their length from the base of the same; two pairs of posterior bristles, approximate, situated above the eyes. There is a smaller bristle about one-half as long as the anterior bristles situated between the latter and the posterior bristles. Mandibles and palpi subequal in length. The mandibles bear dorsally two large bristles; the posterior of the two is situated near the base and is about one-fourth as long as the mandible itself; the anterior bristle is situated near the middle of the mandible and is somewhat longer than the posterior one. Second segment of palpus two-thirds as long as the mandibles; distal segment as long as three and four taken together. Two terminal bristles to palpus; the outer as long as the palpus itself; the inner three-fourths as long. There is a bristle about three-fourths as long as the distal segment, on the outer margin of the same. A similar but smaller bristle is situated about midway between this bristle and the outer terminal bristle.

Abdomen oval, about two-thirds as broad as long; sparsely clothed with similar, simple bristles.

Anterior pair of legs as long as the body exclusive of beak; second pair of legs a little more than three-fourths as long as the first pair; last pair of legs slightly larger than the third pair, and extending one-half their length beyond the posterior end of the abdomen. Legs clothed with bristles of different lengths; no long tactile hairs on either of the two anterior pair of legs; tarsus of

leg III and both tarsus and tibia of leg IV each with a long tactile bristle. Claws situated on tarsal pedicels, which are about as long as the claws themselves.

Length, 0.80mm.; breadth, 0.42mm.

Collected by the writer near Urbana, Illinois. A single specimen.

Bdella anguinisetosa n.sp.

Pale, blotched with yellow and pink.

Cephalothorax long with two eyes situated near its posterolateral corners. The anterior bristles are situated near the base of the beak and are about as long as the second segment of the palpus; posterior bristles longer than the anterior bristles and situated above the anterior eyes. Mandibles slightly shorter than the palpi; each with two bristles: one situated near the base and one near the middle of the mandible. The anterior bristle is the larger. Second segment of palpus about three-fifths as long as mandibles; third segment larger than the fourth; distal segment equal to three and four taken together. Segment two has several small bristles. The outer terminal bristle of segment five is equal to the entire length of the palpus. The inner terminal bristle is peculiar in this species in that it is spiral in form. The distal segment of the palpus has two or three other very small bristles.

Abdomen twice as long as broad; shoulder bristles about one-half as long as the second segment of the palpus. The abdomen has several other similar bristles, about half a dozen of which are situated at the tip. Anus surrounded by a swelling or papilla which shows from above as well as from below.

Anterior pair of legs as long as abdomen; tarsus almost one and one-half times as long as tibia; tibia one and one-half times as long as the antipenultimate segment. Legs poorly clothed with bristles; tibia of leg I, tarsus of leg III, tibia and tarsus of leg IV, each with a long tactile bristle. Claws equal in length to the pedicel from which they extend.

Length, 0.64mm.; breadth, 0.28mm.

Collected by the writer near Urbana, Illinois. One specimen.

Gen. Cyta Heyden.

1826. Cyta Heyden. Isis, p. 612.

A median eye present on the front margin of cephalothorax; tarsus without plumose bristles.

Cyta brevipalpa n.sp.

Body red, legs and palpi paler; integument finely striated.

Cephalothorax almost as broad as long; a single pair of eyes situated near the lateral margin about midway between the anterior and posterior margins of the cephalothorax. There is a small, dark spot on the median, anterior part of the cephalothorax, but apparently no median eye. Anterior bristles situated respectively at about equal distances from the median line, the anterior margin of the cephalothorax and the lateral margin of the cephalothorax. They are over one-half as long as the cephalothorax. There is a pair of large, straight, simple bristles which arise from small tubercles situated behind and between the eyes; just inside of this large pair of bristles is a small pair of bristles about one-half as long. The beak of this species has, not far from the base, a transverse suture which divides it into a basal and distal part. The basal part (the part behind the transverse suture) is about four times as long transversely as longitudinally. Mandibles distinctly longer than the palpi, and arising from the distal end of the basal part of the beak; each bearing near the middle a single long, curved bristle. Palpi very short; second segment about one-third as long as the mandibles and twice as broad ~~as~~ distally as proximally, segment three as broad as long; segment four one-half as broad as segment three; distal segment longer than segments three plus four. Segment two with two small bristles above; segments three and four apparently hairless; distal segment bearing three terminal bristles, the inner and middle bristles subequal and about twice as long as the segment from which they extend. The outer terminal bristle is about one-half as long as the other two terminal bristles. The distal

segment has also another bristle on its outer margin.

Abdomen broadest in front; the striations of the integument form a peculiar pattern as follows. There is a large median area about five times as long as broad and extending almost the entire length of the abdomen in which the striations are transverse; posterior to this area the transverse; posterior to this area the transverse striations extend entirely across the abdomen. In the anterior part of the two lateral areas the striations are longitudinal, while in the remaining part of the lateral areas the striations have no one definite direction. The abdomen bears a pair of rather small shoulder bristles, and two rows of bristles near the median line, each containing five bristles; lateral to these bristles at the posterior end of the abdomen are three pairs of bristles.

Legs short, with very few hairs; anterior pair one and one-half times as long as palpi; tarsus and tibia subequal.

Length, 0.41 mm.; breadth, 0.21 mm.

Under bark, on soft maple tree. Collected by J. D. Hood at Urbana, Illinois. One specimen.

Fam. EUPALIDAE.

No specialized setae on cephalothorax arising from a pore on the postero-lateral aspect; integument not leathery or chitinized; palpi composed three or five segments, not geniculate but ending in a large, stout claw; mandibles ending in one claw; eyes absent or only a single pair present.

Key to Genera.

Palpi composed of three segments ----- Eupalus.
 Palpi composed of five segments ----- Scirus.

Gen. Eupalus Koch.

1836. Eupalus Koch. Crust. Myr. Arach., fasc. 4.

Palpi composed of three segments, without spine-like bristles; one pair of eyes present.

Eupalus pectinatus n. sp.

Pale red.

Cephalothorax not distinctly demarcated from abdomen. Anterior bristles simple, situated about one-half their length from the anterior margin of the cephalothorax. They are about as long as segment two of palpus; posterior bristles small, almost erect, in the usual position. This species is peculiar in that it possesses a long, pectinate, specialized seta arising from a pore situated in a funnel-shaped organ at the postero-lateral aspect of abdomen. This structure is apparently the same as that found in the Oribatidae! Mandibles slightly longer than the palpi, hairless from above and ending in a claw. Segment one of palpus small, disc-shaped; segment two about two-thirds as long as mandibles; segment three rudimentary and ending in a powerful, stout, outer claw and a stout inner spine. Segment two bears four similar, simple bristles on its dorsal surface; segment three has two outer bristles and one inner bristle; of the outer bristles the posterior is much the longer. The inner bristle is about equal to the outer posterior bristle.

Abdomen pyriform; posterior end truncate. The abdomen has several small bristles, including about half a dozen at the posterior margin.

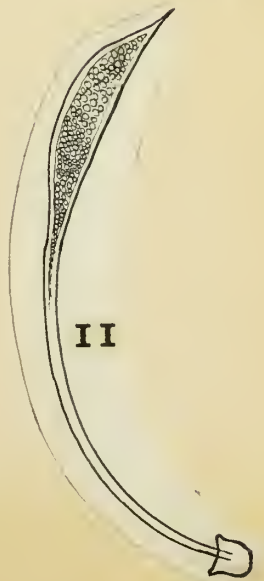
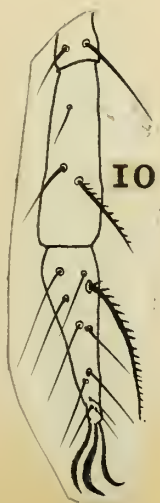
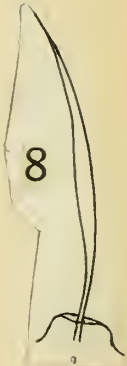
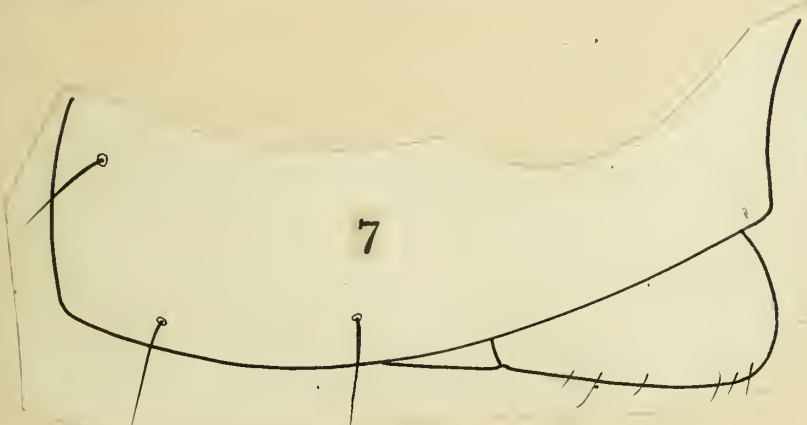
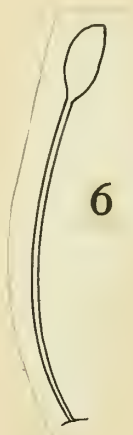
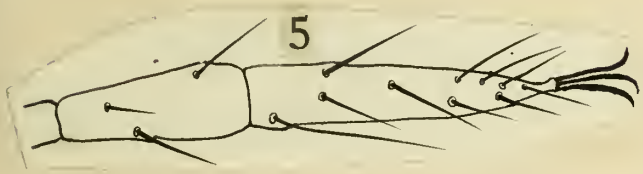
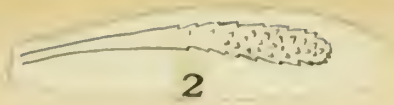
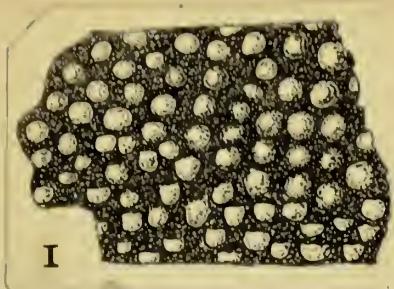
Leg I about as long as abdomen; tarsus three times as long as the tibia. The last two pairs of legs are much stouter than the first two pairs. Claws of last two pairs of legs twice as long as those of the two anterior pairs of legs. The tarsi have at their tips, besides the claws, caruncles, which are peculiar in consisting of three subequal prongs. Legs all sparsely clothed with hairs of different lengths.

Length, 0.38 mm.; breadth, 0.25 mm.

In moss. Collected by the writer at Mahomet, Illinois.

EXPLANATION OF PLATE.

- Fig. 1. Tumidalyus americanus Ewing, piece of integument from abdomen, x 385.
- Fig. 2. Pelops americanus Ewing, seta from posterior, dorsal part of cephalothorax, x 300.
- Fig. 3. Pelops americanus, posterior margin of abdomen, x 200.
- Fig. 4. Pelops americanus, lateral lamella, x 200.
- Fig. 5. Oribata curva Ewing, tibia and tarsus of leg I, x 500.
- Fig. 6. Oribata curva, pseudostigmatic organ, x 500.
- Fig. 7. Phthiracarus magnus Ewing, ventral margin of abdomen, x 65.
- Fig. 8. Phthiracarus magnus, pseudostigmatic organ, x 140.
- Fig. 9. Oribata clavilanceolata Ewing, pteromorphae, x 260.
- Fig. 10. Oribata clavilanceolata, leg II, x 200.
- Fig. 11. Oribata clavilanceolata, pseudostigmatic organ, x 400.







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