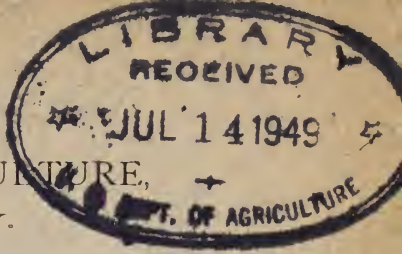


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TECHNICAL SERIES, No. 13.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY.

L. O. HOWARD, Entomologist and Chief of Bureau.

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A REVISION OF THE TYROGLYPHIDÆ
OF THE
UNITED STATES.

BY

NATHAN BANKS,
Assistant Entomologist.

ISSUED NOVEMBER 14, 1906.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., September 10, 1906.

SIR: I have the honor to submit herewith a manuscript entitled "A Revision of the Tyroglyphidæ of the United States," prepared by Mr. Nathan Banks, assistant entomologist. Mites belonging to the family Tyroglyphidæ are destructive to a variety of stored products and other commodities, certain species injure living plants, while others are useful because they destroy certain injurious insects. The group is therefore one of very considerable economic importance. This paper by Mr. Banks should prove a valuable contribution to the study of these mites and greatly facilitate the determination of the different species; I therefore recommend it for publication as Technical Series, No. 13, of this Bureau.

Respectfully,

F. H. CHITTENDEN,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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A REVISION OF THE TYROGLYPHIDÆ OF THE UNITED STATES.

HABITS AND ECONOMIC IMPORTANCE.

From an economic standpoint the Tyroglyphidæ are one of the most important groups of mites. But owing to their small size and pale color they have often been overlooked and the damage accredited to some larger insect which happened to be present. By their rapidity in breeding they make up for their minute size, so that articles, such as flour and sugar, are often so badly infested that the whole mass of the substance appears to be in motion. It is chiefly thru their ravages to stored foods that they are inimical to human effort. Dried fruits, dried meats, and grain in mills are perhaps most seriously affected by them. Their frequency in cheese and sugar has won them the names of "cheese mites" and "sugar mites," while the disease known as "grocer's itch" is due to their presence on the hands of persons handling infested products. A list of materials attacked by tyroglyphids would include cheese, flour, sugar, hams, dried meats, hair in furniture, mattresses, and pillows, grains in mills, cereal foods, many drugs, wine, dried fruits, seeds of all kinds, bulbs, roots of plants, mushrooms, feathers, hay, scale-insects, pinned insects of the entomologist's collection, and even the human corpse. Some species are, however, of little economic interest and occur in the nests of mice, moles, and ants, in decaying bark of trees, in sap from wounds in trees, and a few are attached to certain insects. The species of the genus *Monieziella* do some good by feeding on scale-insects. The "bulb mite" or "Eucharis mite," *Rhizoglyphus hyacinthi*, has long been a prominent enemy to hot-house cultivation. It burrows into the healthy tissue of bulbs and roots, thus giving entrance to destructive fungi and bacteria. This is the species infesting Bermuda lily bulbs; and it has lately been shown that an allied species does great damage to the roots of the vine in Europe. Another species has been described that caused injury to the stems of carnations. Still another *Rhizoglyphus* has been found to eat through the grafting wax on grafted plants, bore beneath the bark, and so prevent the union of graft and stock. The mushroom mites, both in this country and in Europe, are prominent obstacles to successful mushroom culture. Cellars apparently clean in the beginning of the season may be so badly infested by Christmas that crops are impossible.

STRUCTURAL CHARACTERISTICS.

The Tyroglyphidæ are pale-colored, soft-bodied mites, devoid of tracheæ; with small, appressed palpi; usually with prominent chelate mandibles; with moderately long legs, ending in one claw, and often a sucker or caroncle; and with a body about twice as long as broad, and broadest behind the middle. There is commonly a distinct suture between cephalothorax and abdomen. There are no eyes, unless certain spots on the front margin of certain Hypopi and on *Carpoglyphus* represent these organs. The dorsum bears a few, usually long, hairs, in size and arrangement constant for each species. The legs have bristles, fine hairs, and sometimes distinct spines, the more prominent of which are constant in position for each species. One long bristle near tip of the penultimate joint is especially prominent; another is a thickened or clavate hair near base of tarsi I and II, and is probably a sense organ. The latter is always upon this joint, altho several authors have figured it on the penultimate joint in some species. On the venter are two apertures; the genital is usually elongate and situate between hind coxæ, and there are often U-shaped marks each side of it known as the genital suckers, which can be protruded. The anal opening is toward the tip of the body, and is often but an elongate slit, with a sucking disk each side of it. In the genus *Glyciophagus* these openings are much larger, and the genital sometimes occupies the entire area between the coxæ.

There are but slight differences in structure between the sexes; but in some cases the male has one pair of legs enlarged, or there may be two forms of the male. In some species the male has two little suckers on the hind tarsi; in others there is a curved plumose bristle on the basal part of front legs. The males are smaller than the females, and have a less tumid abdomen.

TRANSFORMATIONS.

The transformations of the Tyroglyphidæ are among the most marvelous of the animal kingdom. All tyroglyphids lay eggs, often of large size, which are scattered haphazard over the infested material. The young on hatching have six legs and at molting obtain two more. Thenceforward their life history may take the simple and direct path to the adult condition, but often passes through a stage called the *Hypopus*. This *Hypopus* is a very different creature than that from which it developed—the octopod nymph. Its body is hard and chitinous, there is no mouth orifice, and no distinct mouth parts; the legs are short and ill adapted to walking. On its ventral surface near the tip is an area separated from the general surface and provided with

several circular marks or sucking disks. By means of these suckers the *Hypopus* attaches itself to an insect or other creature, and is transported to another locality, where it may find a suitable breeding place. The *Hypopus* is therefore a stage in the life of a tyroglyphid fitted for migration. The *Hypopus*, upon reaching a suitable locality, molts into an octopod nymph, which will feed and develop into an adult mite. The causes that will induce a nymph to transform to a *Hypopus* are yet unknown; Mégnin supposed that dryness of the air or a scarcity of food were necessary causes, but Michael has shown that *Hypopi* are developed in the absence of these conditions, and that this stage is a natural and normal means of distributing the species. The structure of the *Hypopus* is characteristic for each species; but it has not yet been found in all species, and in *Glyciphagus* the hypopial stage is only partially developed, so that species should not be described from this stage alone.

In the early days of acarology *Hypopus* stood for a separate genus, allied more to *Gamasus* than to *Tyroglyphus*. Dujardin, in 1850, concluded that *Hypopus* was the pupal stage of Gamasidæ. As investigation proceeded, *Hypopus* was so frequently found in association with *Tyroglyphus* that views were advanced as to their relationship. One was that *Hypopus* was a ferocious parasite, devouring the *Tyroglyphus* from within; another, that *Hypopus* was the male of *Tyroglyphus*; and a third, that *Hypopus* was the real adult of certain species of *Tyroglyphus*. The "Hypopus question" disturbed acarologists for a long time, but was finally settled by the work of Mégnin and Michael.

PREVIOUS WORK ON SPECIES OCCURRING IN THE UNITED STATES.

The Tyroglyphidæ of the United States have never been investigated in a systematic manner. The principal economic species have been called *Tyroglyphus siro* or *T. longior*, but without comparison with European specimens. Fitch, in his Third Report (1856), described a mite, *Acarus ribis*, which may be a tyroglyphid. In 1868 Shimer described a mite as *Acarus malus*; this was interpreted by Riley and some European authors as a tyroglyphid, but from the description it is evidently what Lignières describes as *Hemisarcoptes coccisugus*. Riley, in 1874, described a *Tyroglyphus phylloxeræ* as destroying the grape Phylloxera. I have identified as this a common species of *Rhizoglyphus*. Riley's opinion of the predaceous habit of this species was erroneous, as it undoubtedly feeds on the roots of infested plants. In 1884 Haller described *Tyroglyphus crassipes* and *T. curtus* from "Amerika." I have not recognized them, and do not know whether they were from the United States or not. In 1893 Osborn described a mite infesting mushrooms as *Tyroglyphus lintneri*. I have seen numerous specimens

of this species, which is allied to what Canestrini has called *Tyroglyphus siro*. In 1896 Felt described a mite injuring the roots of carnations as *Tyroglyphus heteromorphus*. This species I have seen also, and retain it in the genus *Tyroglyphus*.

OCCURRENCE OF EUROPEAN SPECIES IN THE UNITED STATES.

As regards the occurrence of European species in this country, I have had great difficulties in arriving at definite conclusions, owing to the fact that few European writers have appreciated the importance of minute characters in classification. They have identified as one species forms totally different and treated under different names forms closely allied or identical. The greatest trouble centers around *Tyroglyphus siro*, the type of the genus. Several European acarologists have figured this species. Michael is later than the others, and mentions the other figures in his references. Canestrini has figured more bristles than the others, and they are longer. The pair on dorsum of abdomen behind middle, according to Michael, are very short; with both Canestrini and Berlese they are long. Canestrini and Michael, however, agree and differ from Berlese in showing a pair of short bristles near the larger humeral bristles. Michael figures the male hind tarsus rather short and with the two suckers barely more than their diameter apart, while, according to Berlese, this joint is very much longer and the two suckers are very remote from each other. Canestrini's figure shows the peculiar thickened hair of the anterior tarsi as arising from the preceding joint. Several European writers (especially Robin, Pagenstecher, Karpelles, and Murray) have identified specimens of *Aleurobius farinæ* as *T. siro*, and Doctor Oudemans writes me that he does not know *T. siro*; that the specimens formerly placed by him in that species are *Aleurobius farinæ*. Berlese has suggested that these two species are one, the spurred male of *Aleurobius* being a dimorphic form. The habitat gives no clue to the species. Specimens of a *Tyroglyphus* are referred to elsewhere in this paper which were taken from Limburger cheese, and doubtless of European origin. These are not the *T. siro* of any author, but more related to *T. mycophagus* Mégn. In a collection of mites obtained by the Department of Agriculture from Doctor Berlese is a slide labeled by him as *T. longior*. The specimen seems to be *T. siro* as figured by Canestrini and himself; the hind tarsi are not nearly as long as they figure for *T. longior*, and I can not see any hairs or pectinations on the large bristles of the body. In the same collection is a slide labeled *T. krameri* by Berlese. Michael considers this form to be what he calls *T. mycophagus* Mégn. Their figures show a species with very short abdominal bristles, and the inner cephalic ones much shorter than the outer pair. The slide has three specimens, all females, with

four subequal bristles on the cephalothorax, and the bristles at tip of abdomen are as long as body; moreover, these bristles are provided with fine, short hairs. In fact, it agrees very well with Michael's figure of *T. longior*, except that the abdominal bristles are not quite so long. Michael, however, figures the tarsus of this species as much shorter than figured by Canestrini and in my specimens of *T. longior*.

Michael, in detail figure of *Aleurobius farinæ*, male leg I, shows the clavate hair arising from tip of tibia, whereas it should be from basal part of tarsus; at least it is so in my specimens and so figured by Berlese. Michael figures *Aleurobius farinæ* with but two long posterior bristles on the cephalothorax; Canestrini shows four of these, but no long humeral bristle, as in Michael. My specimens have the humeral bristle like Michael's figure and the cephalic as figured by Canestrini. Berlese figures six cephalic bristles, besides the frontal, on this species. Berlese figures the hind tarsi of male *Aleurobius farinæ* with suckers far apart. My specimens agree with Michael in this respect. Michael considers that his *Carpoglyphus anonymus* is the same as *Phycobius anonymus* of Canestrini and *Trichodactylus anonymus* of Berlese; yet Michael's figures show numerous differences from their figures. Michael, for example, shows short spines on the body, while they figure simple hairs.

In view of these and other discrepancies among European authors, I have been sorely tempted to abandon all attempts at identification and describe everything as new. However, I believe that we have *Tyroglyphus longior*, *T. (Aleurobius) farinæ*, and *Carpoglyphus pas-sularum* in this country, and I should like to think that what I have described below as *T. americanus* was the real *T. siro*, but it certainly is not the *T. siro* of Michael, the latest writer on the European fauna.

GENERA OF THE TYROGLYPHIDÆ.

The genera known to me as occurring in the United States may be separated by the following table. Various other genera are known in Europe, and some of them, and possibly new genera, will be found in our country when it is examined more thoroly for these mites. The forms thus far collected are mostly of economic value, and have been sent to this Department by various persons during the past twenty-five years.

TABLE OF THE GENERA.

- | | |
|---|---|
| 1. Dorsal tegument more or less granular; claws very weak, almost invisible; some hairs of body plainly feathered; ventral apertures very large. . . . <i>Glyciphagus</i> . | |
| Dorsal tegument not granular; claws distinct; no prominent feathered hairs; ventral apertures small. | 2 |
| 2. Mandibles not chelate, elongate and toothed below; body without long hairs; palpi enlarged at tip and provided with two divergent bristles. . . . <i>Histiostoma</i> . | |
| Mandibles chelate; palpi not enlarged at tip, nor with the two bristles. | 3 |

3. No clavate hair on base of tarsi I and II; no suture between cephalothorax and abdomen; living on bees or in their nests..... *Trichotarsus*.
 A clavate or thickened hair on base of tarsi I and II..... 4
4. The bristle on penultimate joint of legs arises from near the middle; no suture between cephalothorax and abdomen..... *Carpoglyphus*.
 The bristle on penultimate joint of legs arises from near tip; a suture between cephalothorax and abdomen..... 5
5. Cephalothorax with four distinct and long bristles in a transverse row; tarsi I and II about twice as long as preceding joint..... *Tyroglyphus*.
 Cephalothorax with but two long, distinct bristles (beside the frontal pair), but sometimes a very minute intermediate pair; tarsi I and II usually short and not twice as long as preceding joint..... 6
6. Tarsi with some stout spines..... *Rhizoglyphus*.
 Tarsi with only fine hairs..... *Monieziella*.

The hypopial stages are known for very few of our forms; it would therefore be of little use to tabulate them. These mites (excepting possibly *Trichotarsus*) should be studied solely from the mature adult and not described from the hypopial stages.

Genus HISTIOSTOMA Kramer.

Mandibles not chelate, but elongate, and toothed below; palpi enlarged at tip and bearing two distinct divergent hairs; a distinct suture between cephalothorax and abdomen; male without anal suckers; tarsi with distinct claws; cuticle not granulate; ventral apertures small; rarely with long bristles on body; no long prominent bristle at tip of penultimate joint of legs.

Type.—*H. rostroserratus* Mégn. (*pectineum* Kramer).

The peculiar mouth parts of this genus separate it rather sharply from all the other Tyroglyphidæ. It, however, has a well-developed hypopial stage, indicating affinity with *Tyroglyphus*. The species are variable in habits, but none, so far, has become of economic importance.

The three species which have been found in this country may be classified by the following table:

TABLE OF THE SPECIES.

1. Tarsi I four or five times as long as broad; very slender 2
 Tarsi I scarcely three times as long as broad; body broad, especially behind..... *brevipes*.
2. Body about twice as long as broad, with several humps above on the abdomen..... *americanum*.
 Body scarcely one and one-half times as long as broad, without humps on abdomen..... *gracilipes*.

Histiostoma gracilipes n. sp. (Pl. I, fig. 9.)

Body hardly one and one-half times as long as broad, sides of abdomen evenly rounded, and without humps above, emarginate behind; at posterior third of body there is a short curved hair, a similar hair at each posterior corner and on each humerus, and two or three sub-

median pairs on the dorsum; all of these hairs are very short, curved, and often invisible. Legs rather large and long; the tarsi very slender, tarsus I (Pl. I, fig. 12) nearly three times as long as penultimate joint, above with two short spines near base, and before middle one more, below with two rather beyond middle, and with several at tip, and a long curved hair about three-fourths the length of tarsus; hind tarsus fully three times as long as penultimate joint, with a short spine above near base, a pair below beyond middle, and several near and at tip, but no long hair. Hairs on tip of palpi much shorter than in other species.

Length, 0.30 to 0.35 mm.

Numerous specimens on decayed leaves, Washington, D. C., August.

Histiostoma brevipes n. sp.

Body about one and one-fourth times as long as broad, subpyriform in shape, broadly rounded behind, without very distinct humps, but the posterior margin undulate; behind with four simple bristles, each about as long as tarsus, and a pair of similar bristles on the posterior sides; a similar humeral bristle each side. Legs rather short, first pair heavy, provided with short spines; tarsus I (Pl. I, fig. 11) about two and one-half times as long as broad, with two spines below near middle, one above before middle, and near it is the sense hair (instead of at the base); at tip above is a spine, and near by is a fine apical hair, two-thirds the length of the joint; tarsus IV (Pl. I, fig. 10) is fully three times as long as the penultimate joint, with a spine above near base, and one below near middle, and a few at tip. The palpus (Pl. I, fig. 8) has the usual two bristles, the apical one very long, longer than tarsus I, and much longer than in allied species.

Length, 0.28 to 0.33 mm.

Several specimens from dead and diseased larvæ of *Cyllene robinix* Forst. in locust at Arlington, Va., July (Hopkins).

Very distinct by short tarsi, position of sense hair, and long hair to palpus. In appearance it is much like Michael's *H. pyriforme*, but without the long apical hairs to posterior tarsi.

Histiostoma americanum n. sp.

Cephalothorax divided into two parts, a broad posterior part and a narrow, elongate anterior portion, in some specimens almost broader in front than behind, and on its anterior margin are two long bristles; below are situated the mouth parts (Pl. I, fig. 7). Abdomen about twice as long as broad, rather broader in front than behind, rather rectangular in shape, almost straight across at base, weakly emarginate behind; above with three large rounded humps each side, two behind lower down on posterior surface, a median one at base above, and less prominent ones on the lower sides; each of the larger humps bears a short, stiff bristle. Legs quite short, with but few,

rather thickened, hairs; tarsus I (Pl. I, fig. 4) nearly four times as long as broad, with sense hair at extreme base, a spine slightly beyond and one near middle below, apical hair about one-half as long as joint; tarsus IV (Pl. I, fig. 6) four times as long as penultimate joint, with a spine above near base and one below near middle, apical hair not prominent.

Length, 0.20 mm.

Taken at Washington, D. C., in decaying matter, together with a species of *Rhizoglyphus*.

Genus **GLYCIPHAGUS** Hering.

Cuticle of body more or less granulate; claws very small and inconspicuous; some of the hairs of body plumose, or formed into foliaceous scales; the ventral apertures are very large and occupy all the space between the coxæ; mandibles chelate, usually with a suture between cephalothorax and abdomen; male without anal suckers; female with the bursa copulatrix projecting slightly at tip of the abdomen.

Type.—*G. domesticus* De Geer.

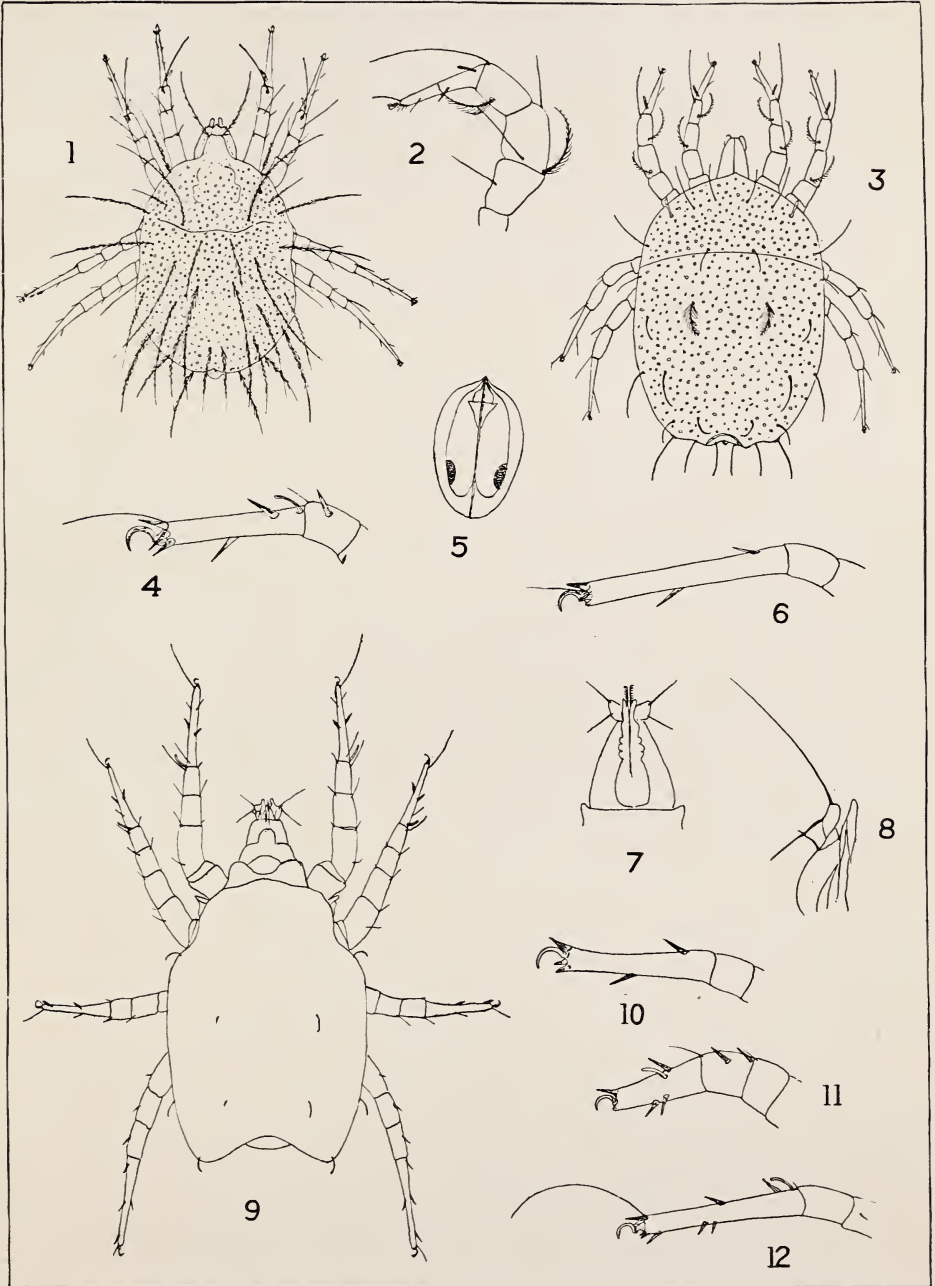
This genus is abundantly represented in Europe, but in this country I have seen but few species or specimens. The genus should form a tribe or subfamily in the Tyroglyphidæ on account of its wide divergence in structure from the typical *Tyroglyphus*. These mites have been found feeding on all sorts of substances, but the name indicates that they are the true "sugar mites," and cause the disease known as "grocer's itch." Two species are known to me.

Glyciphagus obesus n. sp. (Pl. I, fig. 3.)

Body about one and one-half times longer than broad, parallel-sided; pointed in front, broadly rounded behind. Dorsum with scattered, irregular granules. Cephalothorax with four pairs of short, simple bristles; two pairs in front, a submedian pair behind, and one in each posterior corner; and a short, broad hair or scale near margin over coxæ II. Abdomen with a submedian pair of plumose bristles on basal third, a pair of simple bristles nearer to margin on posterior third; three simple bristles each side, and five each side at and near the tip, the outer one the longest. Legs rather short and stout, I (Pl. I, fig. 2) and II with a curved, plumose bristle near base of third joint and near middle of fourth joint, the latter joint with a long, simple bristle at tip; tarsi I and II one and one-half times longer than preceding joint, tarsi III and IV twice as long as preceding joint. Venter minutely granulate, genital aperture (Pl. I, fig. 5) occupying all the space between coxæ and mouth parts.

Length, 0.33 to 0.38 mm.

Taken from a necktie that had been for some time in a drawer, at Berkeley, Cal. (E. J. Wickson.)



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Fig. 1.—*Glyciphagus robustus*. Fig. 2.—*Glyciphagus obsesus*, leg I. Fig. 3.—*Glyciphagus obsesus*.
 Fig. 4.—*Histiostoma americanum*, tarsus I. Fig. 5.—*Glyciphagus obsesus*, genital plate. Fig. 6.—*Histiostoma americanum*, tarsus IV. Fig. 7.—*Histiostoma americanum*, mouth parts.
 Fig. 8.—*Histiostoma brevipes*, palpus. Fig. 9.—*Histiostoma gracilipes*. Fig. 10.—*Histiostoma brevipes*, tarsus IV. Fig. 11.—*Histiostoma brevipes*, tarsus I. Fig. 12.—*Histiostoma gracilipes*, tarsus I.

Glyciphagus robustus n. sp. (Pl. I, fig. 1.)

Body short and broad, rather broader behind middle than elsewhere, broadly rounded behind. Dorsum with many large, rounded granules, irregularly arranged. A submedian pair of long, sparsely plumose bristles on front margin; a still larger pair near the hind margin of the cephalothorax, as near to side as to middle: one bristle in each posterior corner, and two shorter submarginal ones each side in front of the last. Abdomen with about six pairs of long, discal, plumose bristles, the subbasal pair not nearly as long as the others; and six submarginal bristles each side, the two on the posterior margin not nearly as long as the others. Legs rather short, but the tarsi are slender; tarsi I and II twice as long as preceding joint; tarsus IV more than three times as long as preceding joint; all with scattered, simple hairs, a longer hair near tip of third and fourth joints of legs I and II. Venter rather finely granulate; the large, broad genital aperture occupies all the space between coxæ II, III, and IV, but does not extend forward between coxæ I.

Length, 0.24 mm.

Specimens from Leetonia, Ohio, in a lot of seeds, from Mr. H. E. Wolfgang.

Genus TYROGLYPHUS Latreille.

A suture between cephalothorax and abdomen; mandibles chelate; tarsi with distinct claws; cuticle without granulations; ventral apertures small; four distinct posterior bristles on the cephalothorax; tarsi rather slender, in some species with spines; male with anal suckers; in some cases there is a dimorphic male, or the anterior legs of male may be thickened.

Type.—*T. siro* L.

Oudemans uses the name *Acarus* for this genus, but I think the application is strained and that Michael is right in this matter. I include in *Tyroglyphus* the genus *Aleurobius*, which is based on a male character of not more than specific value.

There are doubtless a number of species in the United States. From the materials at hand I separate the following nine species:

TABLE OF THE SPECIES.

- | | |
|--|------------------------|
| 1. Some bristles on tarsi I and II near middle are distinctly spine-like; the sense-hair about its length from base of joint | 2 |
| No spine-like bristles near middle of tarsi; sense-hair not its length from base of joint | 4 |
| 2. Hind tarsi with two long hairs, one as long as the joint | <i>terminalis</i> . |
| Hind tarsi without such long hairs | 3 |
| 3. Male with third legs enlarged | <i>heteromorphus</i> . |
| Male without enlarged third legs | <i>armipes</i> . |

4. Of the terminal abdominal bristles at least six or more are very long, nearly as long as the body 5
 Of the terminal abdominal bristles only two are about as long as the abdomen; leg I of male greatly thickened, and with a spine at apex of femur below *farinæ*.
5. Bristles of body distinctly plumose or pectinate; tarsi very long..... *longior*.
 Bristles of body not pectinate 6
6. Cephalothorax very short; legs I and II of male stouter than usual.... *breviceps*.
 Cephalothorax longer, legs normal..... 7
7. On living trees, usually with scale insects; third and fourth joints of hind legs more than twice as long as broad; abdominal bristles long..... *cocciphilus*.
 On mushrooms, or decaying matter; third and fourth joints of hind legs not twice as long as broad; abdominal bristles very long..... *lintneri*.
 In mills, stored foods, grains, etc.: third and fourth joints of hind legs scarcely twice as long as broad; abdominal bristles shorter..... *americanus*.

Tyroglyphus farinæ De Geer. (Pl. II, fig. 14.)

Cephalothorax with four long subequal bristles above in a transverse row, a short pair in front over the mandibles; one on each humerus, not as long as width of body, and a very short one near by; two pairs on the middle of dorsum, rather farther back than usual, the posterior pair the longer, but these not more than one-half the length of the abdomen; two hairs on each posterior side, not one-half the length of abdomen, and near the tip are two more pairs of bristles, one of which is nearly as long as the abdomen, the other pair being much shorter; a pair of short bristles near anus below (Pl. II, fig. 16). Legs rather short, and the front pair thickened; in the male very greatly so, and the femur provided with a sharp, apical process below at tip, and two small teeth on next joint. The long bristle on penultimate joint is as long as the tarsus in all legs; tarsus I (Pl. II, fig. 17) is scarcely twice as long as the preceding joint, tarsus IV (Pl. II, fig. 14) more than twice as long as penultimate joint; the third and fourth joints of the hind legs are about twice as long as broad; none of the hairs on the legs is spine-like.

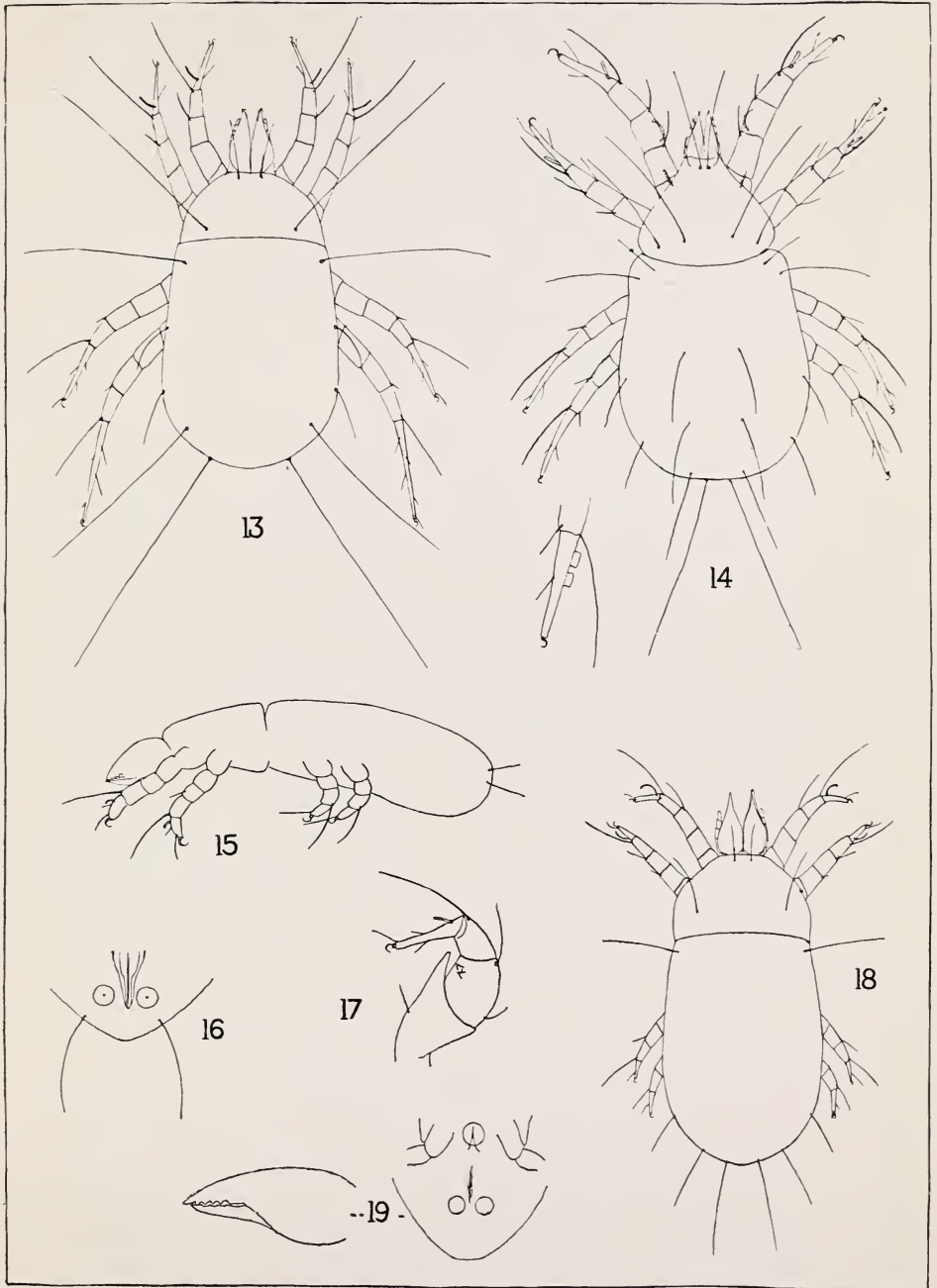
Length, 0.45 to 0.60 mm.

Specimens have been examined from various localities, all, however, in the North, as Marblehead, Mass., Lancaster, Pa., Adrian, Mich., and Minneapolis, Minn., in mills, granaries, and seeds.

I keep this species in the genus *Tyroglyphus*, since the genus *Aleurobius* is based on a secondary sexual character; in other respects it is a true *Tyroglyphus*. If this genus is used, then other genera should be made for *T. heteromorphus* and *T. armipes*, which is, I think, unnecessary.

Tyroglyphus longior Gervais.

Cephalothorax with four long, subequal bristles in a transverse row, and two shorter bristles on front margin; two long humeral bristles; two pairs of submedian bristles on dorsum, the anterior pair more than one half the length of abdomen, the posterior pair as long as the



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Fig. 13.—*Monieziella longipes*. Fig. 14.—*Tyroglyphus farinae* and tarsus IV of male. Fig. 15.—*Monieziella angusta*. Fig. 16.—*Tyroglyphus farinae*, venter of male. Fig. 17.—*Tyroglyphus farinae*, leg I of male. Fig. 18.—*Monieziella brevitarsis*. Fig. 19.—*Monieziella brevitarsis*, male venter and mandible.

entire body, behind toward tip are six pairs of bristles, most of them fully as long as entire body; all these bristles of body are seen to be hairy (Pl. V, fig. 44); the cephalic bristles show these hairs more distinctly toward tip. The basal joints of the legs are of the usual length, but the tarsi are extremely slender; tarsus I (Pl. V, fig. 44) is about as long as the three preceding joints together, while tarsus IV (Pl. V, fig. 44) is about as long as the rest of the leg; the bristles on legs are about as usual, fine and slender, but that at the tip of the penultimate joint of leg IV is scarcely half as long as the tarsus; the hair near tip of tarsus is rather short on all legs.

Length, 0.40 to 0.60 mm.

This species is readily known by the hairy bristles of body and by its extremely long tarsi. It has been received only a few times, but usually in great abundance and usually attended with some predaceous mites—*Cheyletus* or *Gamasus*. Specimens have been examined from grain in mill at Milwaukee, Wis.; from Winfield, Ontario, Canada, in house and barn in great numbers, and Doctor Oudemans writes me that he has seen it from California.

Tyroglyphus lintneri Osborn. (Pl. III, fig. 29.)

Cephalothorax with four long, subequal bristles in a slightly curved transverse row; a pair on front margin, longer than the mandibles; two long humeral bristles and a short one close by; two pairs of submedian bristles on the dorsum of abdomen, the anterior pair about one-half the length of the abdomen, the posterior pair as long as abdomen; and six each side near tip, all very long except the inner one, which is scarcely as long as abdomen, and a short pair on venter near the anus. The legs have the usual bristles, the long one at end of penultimate joint is plainly longer than the tarsi in all the legs; the hind tarsi (Pl. III, fig. 24) are fully as long as the two preceding joints together; there is a curved plumose bristle above on the third joint of legs I and II. (Male genitalia, see Pl. III, fig. 25.)

Length, 0.30 to 0.38 mm.

This mite is very similar in all respects to the *T. americanus*, but the bristles of abdomen are longer and somewhat differently arranged. In the male the tubercle-like suckers on hind tarsi (Pl. III, fig. 24) are farther apart than in *T. americanus*; in the female the vulva (Pl. III, fig. 23) shows a broader emargination behind than in that species. These differences, associated with the different habitat, demand some recognition in nomenclature; therefore I consider the mushroom mite as a distinct species. It differs at once from *T. longior* in the simple bristles of the body.

This species has been received from Freehold, N. J.; Hazelton and West Chester, Pa.; and from York Corner, Me. It does enormous damage to mushrooms, but appears to be a native species. Lintner records it from Jamesport, Suffolk County, N. Y.

Tyroglyphus americanus n. sp. (Pl. III, fig. 20).

Cephalothorax with four long, fine, equal bristles in a slightly curved transverse row, a pair of shorter bristles on front margin; two long humeral bristles, longer than width of body, a pair of submedian bristles each side on the dorsum, the anterior rather short, the posterior very long, as long as abdomen; on posterior margin and near the tip are six bristles each side, five of them about as long as abdomen, the other much shorter and near the median line. Legs of moderate length, like figures of *T. siro*, but the tarsi (Pl. III, fig. 22) are more elongate and slender than in Michael's figure of that species; the usual bristles are present, none spine-like; that at tip of penultimate joints is very long; there is a curved plumose bristle above on the third joint of legs I and II; the hair at tip of tarsus is not one-half the length of the joint; in the male the sucker-like tubercles on tarsus IV are but little more than their diameter apart. (Genitalia, Pl. III, fig. 21.)

Length 0.27 to 0.30 mm.

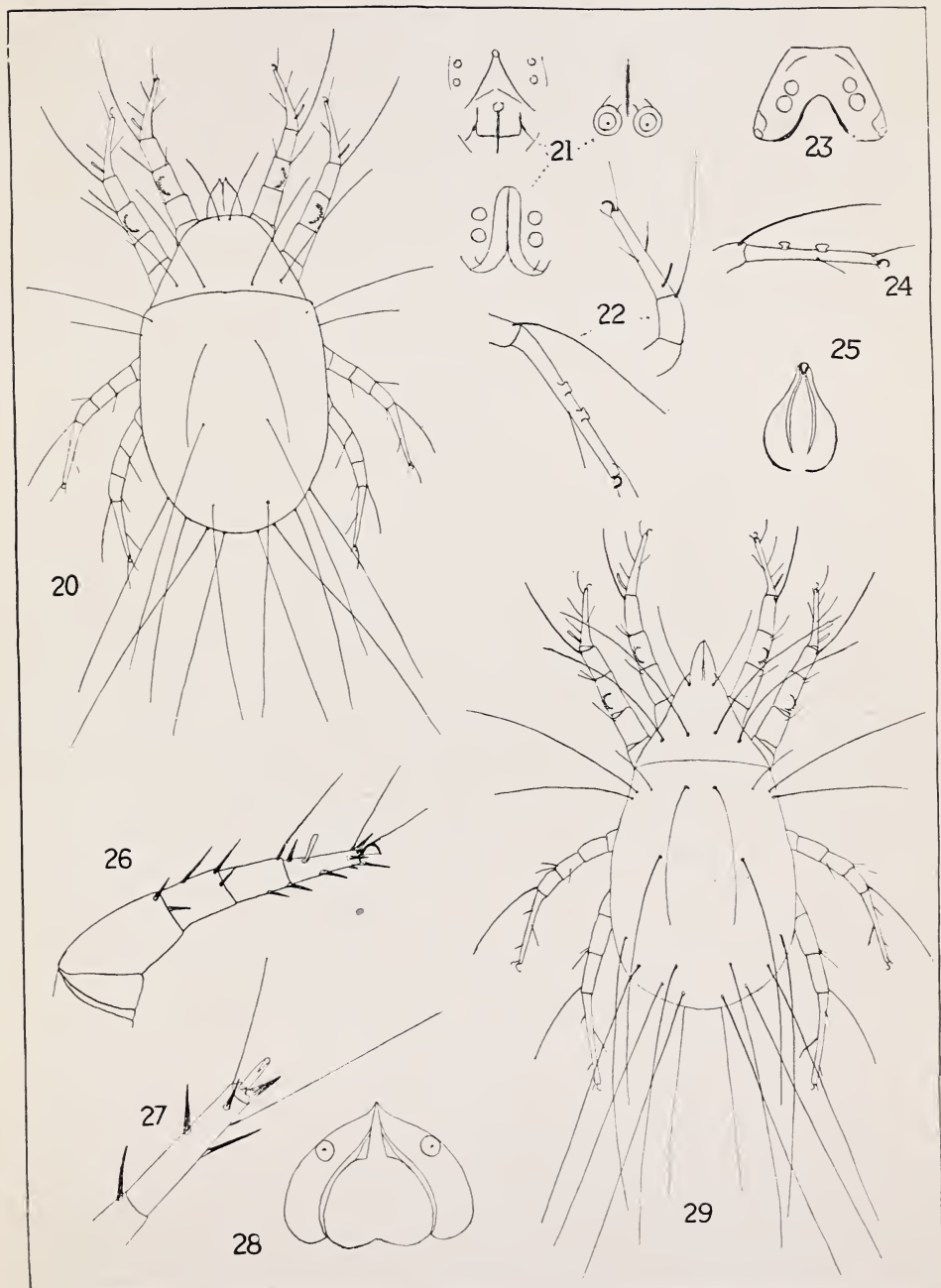
This species is close to Michael's identification of *T. siro*, but has much longer bristles and longer tarsi; indeed the hind tarsi are as long as the two preceding joints together; however, it can not be *T. longior*, since the bristles are not serrate. It may be that some European writers have mixt this species with *T. longior*, but I regard Michael's identification of *T. longior* as correct, that is, a mite with long serrate bristles, and the same as the form I regard as *T. longior* in this paper.

There are many specimens of this species in the collection of the Department of Agriculture, as follows: Washington, D. C., on rotten plums; Paola, Kans., in flaxseed; Minneapolis, Minn., in wheat; Savannah, Ga., in rice; College Station, Tex., in cotton seed; Racine, Wis., in flax mill, and on decaying orange at Washington, D. C.

Many of the references to *T. siro* and *T. longior* in our economic literature doubtless refer to this species.

Tyroglyphus cocciphilus n. sp.

Cephalothorax with four long bristles in a transverse row, the middle pair plainly longer than the outer pair, yet the latter is as long as width of body; a short pair on the front margin, longer than the mandibles; two pairs on dorsum, the basal pair about one-half the length of body, the posterior pair about as long as entire body; two long humeral bristles each side and a short one near by; behind and near tip are 12 bristles, 3 on each posterior side and 3 each side near tip in a vertical or longitudinal line, all about as long as abdomen or a little longer; a short pair below near anus. Legs of moderate length, with the usual bristles, none spine-like; the tarsus (Pl. IV, fig. 35) about as long as two preceding joints together in all the legs, the bristle at tip of



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Fig. 20.—*Tyroglyphus americanus*. Fig. 21.—*Tyroglyphus americanus*, genitalia. Fig. 22.—*Tyroglyphus americanus*, tarsi I and IV. Fig. 23.—*Tyroglyphus tintneri*, vulva. Fig. 24.—*Tyroglyphus tintneri*, tarsus IV of male. Fig. 25.—*Tyroglyphus tintneri*, genitalia of male. Fig. 26.—*Tyroglyphus terminatis*, leg I. Fig. 27.—*Tyroglyphus terminatis*, tarsus IV. Fig. 28.—*Tyroglyphus terminatis*, vulva. Fig. 29.—*Tyroglyphus tintneri*.

penultimate joint about as long as tarsus; third and fourth joints of hind legs more than twice as long as broad; in the male the suckers on hind tarsi (Pl. IV, fig. 35) are more than twice their diameter apart and nearly as close to each end of joint as to each other. (Vulva and anal suckers, Pl. IV, fig. 33; male aperture, Pl. IV, fig. 34.)

Length, 0.35 to 0.40 mm.

Specimens from Columbia, Pa., with *Lecanium* on plum; also with oyster-shell scale on osage orange (probably from Missouri), with mealy bug on guava at Rock Ledge, Fla., and on orange leaves at Sanford, Fla.

This species is very close to *T. lintneri* Osb., and might have been considered as only a variation of that species but for the totally different habitat. The legs are rather more slender, but the hind tarsi are no longer, and the hair at the tip of the penultimate joint is not as long as in *T. lintneri*, nor as heavy.

Tyroglyphus breviceps n. sp. (Pl. IV, fig. 30).

Cephalothorax very short, in proportion to the length of the body; four rather long, subequal bristles above in a transverse row, and a short pair in front over mandibles; two moderately long humeral bristles; two submedian pairs on the dorsum, the basal pair short, the other scarcely as long as abdomen; six bristles each side and near tip, rather widely separated at base, from two-thirds to fully the length of the body; a short pair below near anus; tarsus about twice as long as preceding joint, the bristle at tip of latter as long as tarsus on the front legs (Pl. IV, fig. 32), and three-fourths as long on the hind legs; each tarsus with a fine bristle beneath near middle; hind tarsus (Pl. IV, fig. 31), with apical hair not one-half the length of tarsus; the third and fourth joints in hind leg not twice as long as broad.

Length, 0.35 to 0.50 mm.

The hairs are a little shorter than in *T. americanus* and the legs rather stouter, and especially so in the front legs of the male.

Specimens from Victoria, Tex., taken from dead larvæ of the cotton boll weevil.

Tyroglyphus terminalis n. sp.

Cephalothorax with four bristles in a transverse row, the outer pair nearly twice as long as the inner pair, a pair of short bristles on anterior margin; two humeral bristles, about two-thirds the width of the body, two pairs of bristles above on abdomen, and five pairs near tip, all about one-half the length of the abdomen except one pair each side near tip, which are about as long as the abdomen; all are simple. Legs rather stout, especially the anterior pair (Pl. III, fig. 26), the bristles stout, and many of those on the tarsi are spine-like; tarsus I is not twice the length of the penultimate joint, while the hind tarsi (Pl. III, fig. 27) are about as long as two preceding joints together;

the hair near tip of tarsus is very long in all legs, but the hind tarsi have two long hairs near tip, one of them longer than the tarsus. (Vulva, Pl. III, fig. 28.)

Length, 0.50 mm.

Specimens from Limburger cheese. Washington, D. C. (Dr. G. Marx).

This species is near Michael's figure of *Tyroglyphus mycophagus*, but the mite is not so slender, the bristles are longer, and those on tarsi are longer. I am not certain that Michael has correctly identified Mégnin's species.

Tyroglyphus heteromorphus Felt.

Male (Pl. IV, fig. 39).—Cephalothorax with four long bristles in a transverse row, but the inner pair is not one-half as long as the outer pair; a pair of short bristles on anterior margin; two bristles on each humerus, one short, the other as long as width of body; two pairs of submedian bristles on dorsum, each about two-thirds the length of the abdomen; a rather long bristle on the middle each side, another long one behind this, then a short one, and three long ones each side near tip, each but little shorter than abdomen. Legs with the usual bristles, that at apex of penultimate joint scarcely as long as tarsus; the sense hair on tarsi I (Pl. IV, fig. 38) and II is about its length from the base; most of the tarsal bristles are distinctly spine-like; the hair at tip of tarsus IV (Pl. IV, fig. 36) is not one-half the length of the joint, the bristle at tip of penultimate joint of leg IV is not one-half as long as tarsus, the latter joint as long as two preceding joints together; leg III (Pl. IV, fig. 37) enlarged, as in figure, ending in a large claw and two very long bristles.

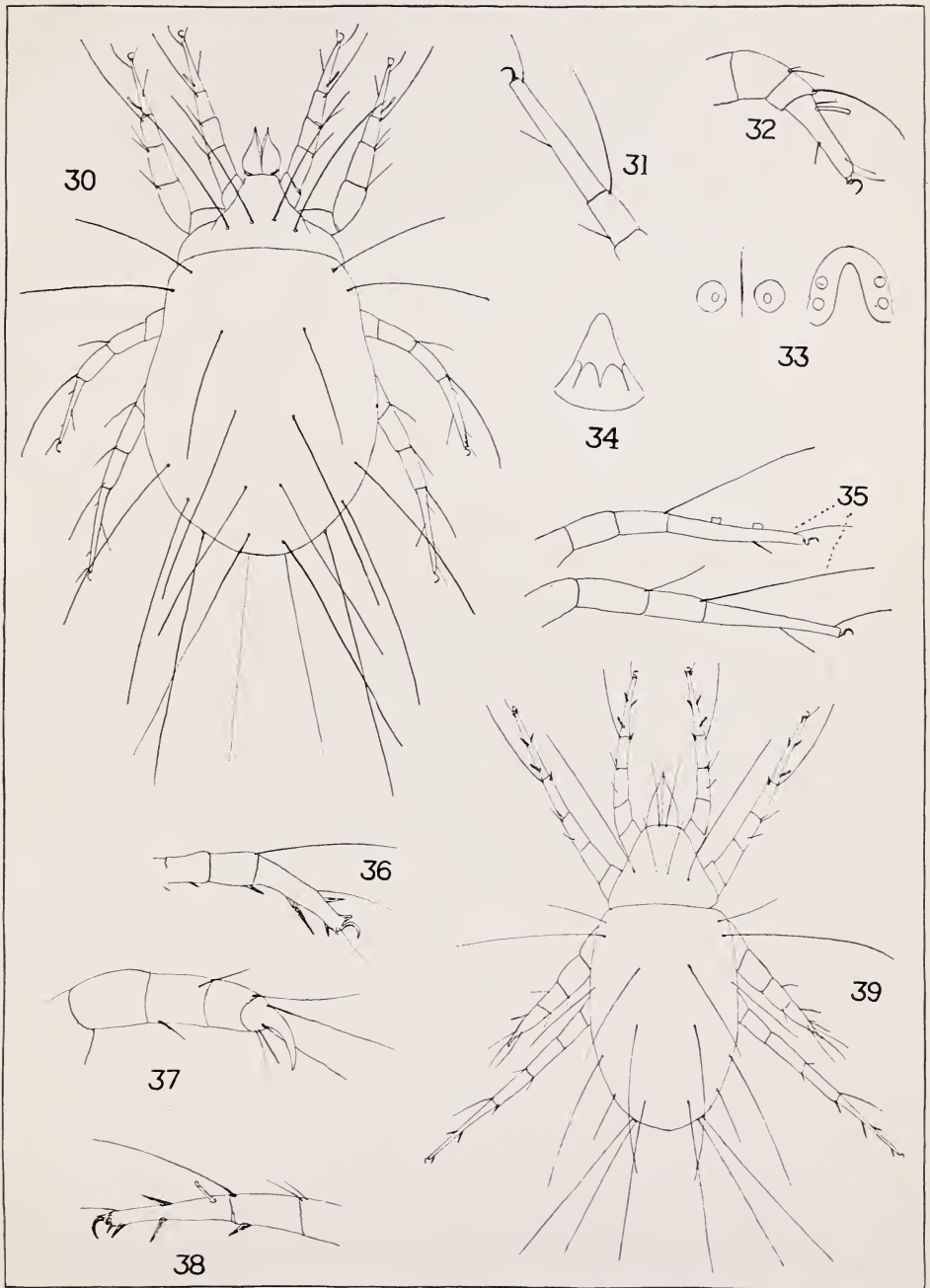
The female differs in having the bristles of body shorter, especially the abdominal ones; there are four at tip which are not one-half as long as width of body; the tarsi, especially the hind tarsi, are shorter than in the male. The abdomen is, of course, broader, and larger in proportion to the cephalothorax.

Length 0.60 to 1 mm.

A peculiar species, which I have seen only from decaying asparagus roots from near Washington, D. C. It was described as injuring the roots of carnations at Berlin, Mass. The *Rhizoglyphus agilis* Michael, 1903, may be a synonym; however, there are several minor differences which may possibly be due to Michael's inaccurate figures.

Tyroglyphus armipes n. sp.

Cephalothorax with four long bristles in a transverse row, but the inner pair is not half as long as the outer pair; a pair of short bristles on front margin. Male with two bristles on each humerus, one short, the other nearly as long as width of body; three pairs of bristles on dorsum, basal pair very short, the others long and reaching beyond tip



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Fig. 30.—*Tyroglyphus breviceps*. Fig. 31.—*Tyroglyphus breviceps*, tarsus IV. Fig. 32.—*Tyroglyphus breviceps*, leg I. Fig. 33.—*Tyroglyphus cocciphilus*, vulva and anal suckers. Fig. 34.—*Tyroglyphus cocciphilus*, male aperture. Fig. 35.—*Tyroglyphus cocciphilus*, tarsus IV—male and female. Fig. 36.—*Tyroglyphus heteromorphus*, tarsus IV. Fig. 37.—*Tyroglyphus heteromorphus*, leg III of male. Fig. 38.—*Tyroglyphus heteromorphus*, tarsus I. Fig. 39.—*Tyroglyphus heteromorphus*, male.

of abdomen; two on each posterior side, quite long, and behind are four each side, three of which are about as long as the abdomen, the inner pair much shorter. Legs rather slender, tarsi as long as two preceding joints together; most of the tarsal hairs are spine-like; the hair at tip of penultimate joint is rather shorter than tarsi, but in leg IV (Pl. V, fig. 41) it is about two-thirds as long as tarsus; the hair at tip of tarsus not one-half length of tarsus. (Tarsus I, Pl. V, fig. 42.) In the female the bristles are much shorter, the humeral bristle not nearly as long as width of body, those on dorsum not reaching to tip, the posterior lateral ones very short, and those behind near tip are scarcely one-half as long as width of body. (Vulva, Pl. V, fig. 43.)

Length. 0.75 to 1 mm.

Specimens from Lincoln Nebr. and from Atlanta, Ga., on dead larvæ of corn pyralid.

Genus **RHIZOGLYPHUS** Claparède.

A suture between cephalothorax and abdomen; mandibles chelate; tarsi with distinct claws; cuticle not granulate; ventral apertures small; only two distinct posterior bristles on the cephalothorax, but in some forms a minute intermediate pair is present; tarsi short and stout, provided with some stout spines; male with anal suckers, and in some cases there is a dimorphic male with the third pair of legs greatly enlarged and ending in a large curved claw. The species are vegetable feeders, and attack healthy living tissues, usually the part in the ground.

Type.—*R. hyacinthi* Boisd. (*echinopus* Robin).

This genus was based on the absence of a caroncle to tarsus, a character of variable value in allied genera. Michael uses the dimorphic male as a distinguishing character, but I would rather not use a sexual character for a genus, so base the genus on the two posterior cephalic bristles and spiny tarsi.

I distinguish six species in our fauna by the following table:

TABLE OF THE SPECIES.

1. Tarsus I with a large spine close to the sense hair.....	3
Tarsus I without a spine near the sense hair.....	2
2. Abdominal bristles as long as width of body; tarsi longer.....	<i>tarsalis</i>
Abdominal bristles much shorter than width of body; tarsi shorter....	<i>phyllovera</i>
3. Tarsus I fully two and one-half to three times as long as broad.....	<i>longitarsis</i>
Tarsus I not more than twice as long as broad.....	4
4. Body three times as long as broad; legs very short.....	<i>elongatus</i>
Body less than three times as long as broad.....	5
5. Hind tarsus two and one-half to three times as long as broad; abdominal bristles longer; no dimorphic male seen.....	<i>rhizophagus</i>
Hind tarsus about twice as long as broad; abdominal bristles very short; a dimorphic male is common.....	<i>hyacinthi</i>

Rhizoglyphus phylloxeræ Riley. (Pl. VI, fig. 61.)

Cephalothorax with a pair of frontal bristles and a pair of much larger posterior bristles, also a pair of minute intermediate bristles; one bristle on each humerus; in the female there are six short bristles near the tip of the abdomen, the longest pair not one-half the width of the body; a submedian pair of short ones behind the middle of the dorsum, and one short bristle on each posterior side. The male has eight bristles at tip of abdomen, some about as long as width of body; while the dimorphic male with the thickened leg III (Pl. VI, fig. 60) has these apical bristles about as long as the abdomen, and two pairs of long bristles on the dorsum. The legs are rather long; tarsus I (Pl. VI, fig. 59) has no spine above near the sense hair, but toward the middle is a stiff bristle; the other spines are present and are long, the apical hairs are shorter than the joint; the bristle from the penultimate joint is longer than the tarsus in all except the hind legs; tarsus IV (Pl. VI, fig. 57) is about as long as two preceding joints together, and in the male is still more elongate; it has two spines below near middle; the apical hairs are shorter than the joint. The enlarged leg III of the dimorphic male ends in a long claw; several bristles are near by, but no tooth. In life these mites are rather yellowish white, with chestnut-brown legs and a dark spot on each posterior side of the abdomen.

Length 0.75 to 1 mm.

I identify this with Riley's species, since his figures of the legs show a rather slender tarsus, and the other characters shown by his figure agree with this form.

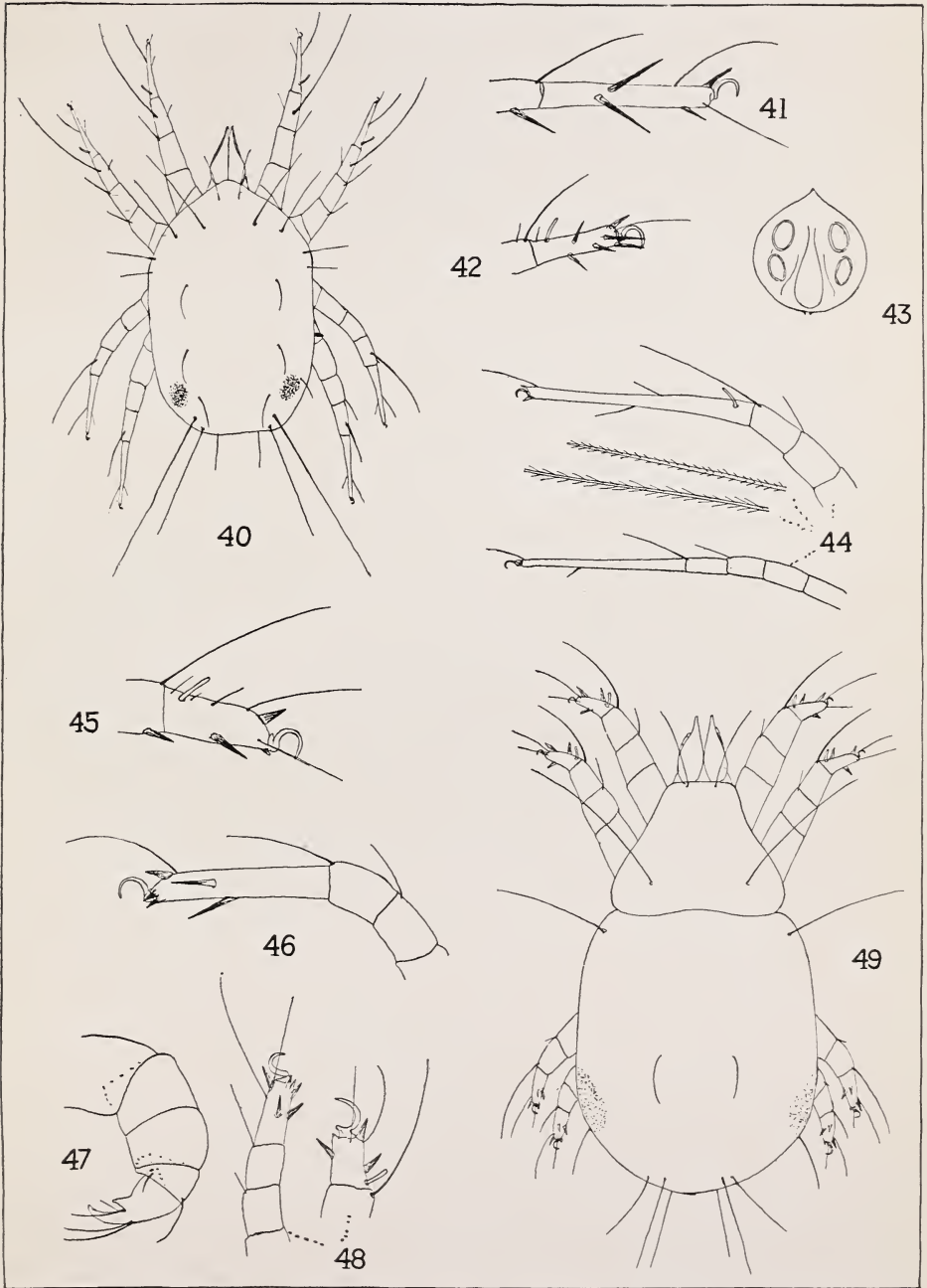
Specimens have been examined from the roots of cowpeas from Macon, Ga.; from Auburn, Ky., on scabby potatoes; from Lawrence, Mass., on young potato plants, and from Akron, Ohio, on rotten potatoes; also from Illinois, infesting pine cones.

Michael has considered that Riley's species was a synonym of *R. echinopus* Mégn. (*hyacinthi* Boisd.). This species is, however, abundantly distinct from the "bulb mite," and perhaps does not now occur in Europe, altho it was introduced into France. At that time it was supposed to feed on the Phylloxera.

Rhizoglyphus tarsalis n. sp.

This species is similar in nearly all respects to *R. phylloxeræ*; that is, there is no spine on tarsus I (Pl. V, fig. 45) near the sense hair, and the tarsi are long. I have not seen any males, but the female differs from *R. phylloxeræ* in having the bristles near tip of abdomen nearly as long as width of body, and in the plainly longer hind tarsi (Pl. V, fig. 46), which are longer than the preceding two joints together.

The specimens come from Spreckels, Cal., taken from sugar beets by Mr. E. S. G. Titus.



TYROGLYPHID MITES.

Fig. 40.—*Carpoglyphus passularum*. Fig. 41.—*Tyroglyphus armipes*, tarsus IV. Fig. 42.—*Tyroglyphus armipes*, tarsus I. Fig. 43.—*Tyroglyphus armipes*, vulva. Fig. 44.—*Tyroglyphus longior*, tarsi I and IV, and body hairs. Fig. 45.—*Rhizoglyphus tarsalis*, tarsus I. Fig. 46.—*Rhizoglyphus tarsalis*, tarsus IV. Fig. 47.—*Rhizoglyphus hyacinthi*, leg III of male. Fig. 48.—*Rhizoglyphus hyacinthi*, tarsi I and IV. Fig. 49.—*Rhizoglyphus hyacinthi*.

Rhizoglyphus hyacinthi Boisd. (Pl. V, fig. 49.)

Cephalothorax with a pair of frontal bristles, and a pair of large and long posterior bristles (intermediate bristles not visible); a rather long humeral bristle; a submedian pair of short bristles on the dorsum, one on each posterior side and six near the tip, all short, the longest scarcely one-half the width of body. Legs short and stout, the tarsus I (Pl. V, fig. 48, at right) but little longer than preceding joint, the spine above is close to the sense hair, and the apical hairs are longer than the joint; the bristle at tip of penultimate joint is longer than the tarsus in all except the hind legs; the hind tarsus (Pl. V, fig. 48, at left) is about twice as long as broad, with two spines below near middle, the usual apical spines, and the apical hairs are longer than the joint. In the male there are six hairs near tip of abdomen above, some nearly as long as width of body, and below are four rather long, subequal bristles in a straight transverse row; in the dimorphic male leg III (Pl. V, fig. 47) is enormously thickened, and ends in a stout claw, with a stout tooth at inner base. In color it is white with brownish head and legs, and a dark spot on each posterior side of the abdomen.

Length, 0.55 to 0.75 mm.

Specimens have been taken from the bulbs of Bermuda lilies shipped to this country.

Under the name of *R. echinopus* Mégn. several European authors have gathered various species; whether this form, which seems partial to bulbs, is the same as Mégnin's species I can not tell from descriptions; however, I think it identical with the *R. echinopus* of Michael. Its ravages in various bulbs and orchids have given it the name of "bulb mite" and "Eucharis mite." The damage caused by it to Bermuda lilies has been treated by Mr. A. F. Woods in 1897, in a paper entitled "Bermuda lily disease." (See bibliography, p. 27.) The *R. mégnini* of Haller appears to be a distinct species, with plainly shorter bristles.

Rhizoglyphus rhizophagus n. sp. (Pl. VI, fig. 50.)

Cephalothorax with a pair of frontal bristles, and a pair of long posterior bristles (no intermediate bristles visible); a humeral bristle fully one-half the width of body, two on each posterior side and six at tip in the female, all short, the longest about one-half the width of the body, and a submedian pair above on dorsum. Legs short, the anterior pairs very heavy, the tarsi I (Pl. VI, fig. 51) and II with a spine above near the sensory hair; and one below, rather before the middle; apical hairs longer than the joint; the bristle from penultimate joint longer than the tarsus in all legs, except the hind pair; hind tarsus (Pl. VI, fig. 52) two and one-half to three times as long as broad, two spines below near middle, and the usual spines at apex; the apical hairs as long as the joint. In the male the abdomen has eight bristles near tip, one pair rather more than one-half the width

of the body; and on the venter (Pl. VI, fig. 56) behind anus are four subequal bristles in a transverse row; the leg III of male is like that of IV and not thickened in the many males examined by me.

Length 0.65 to 0.80 mm.

This species differs from *R. hyacinthi* in several minute points, namely: the longer tarsi, especially hind tarsi; the position and size of certain bristles, and the proportionately larger front legs.

Specimens have been studied from Missoula, Mont., on roots of apple trees; from Missouri, under a cottonwood stump, and on onions, from Glenellen, Cal.

Rhizoglyphus elongatus n. sp. (Pl. VI, fig. 53).

Cephalothorax with a pair of long frontal bristles, and a pair of posterior bristles, barely longer than the others, no intermediate bristles visible; a humeral bristle each side no longer than cephalic bristles, and six short bristles near tip of abdomen, the superior pair the longest, but no longer than frontal bristles. Body very elongate, more than three times as long as broad, mandibles large. Legs very short and stout; tarsus I (Pl. VI, fig. 54), but little longer than penultimate joint, a spine above near the sense hair, one below beyond middle, and two near tip, apical bristles short; the bristle from tip of penultimate joint very large and prominent, and longer than tarsus in all legs; hind tarsus but little longer than front ones, and with short apical hairs.

Length 0.30 to 0.35 mm.

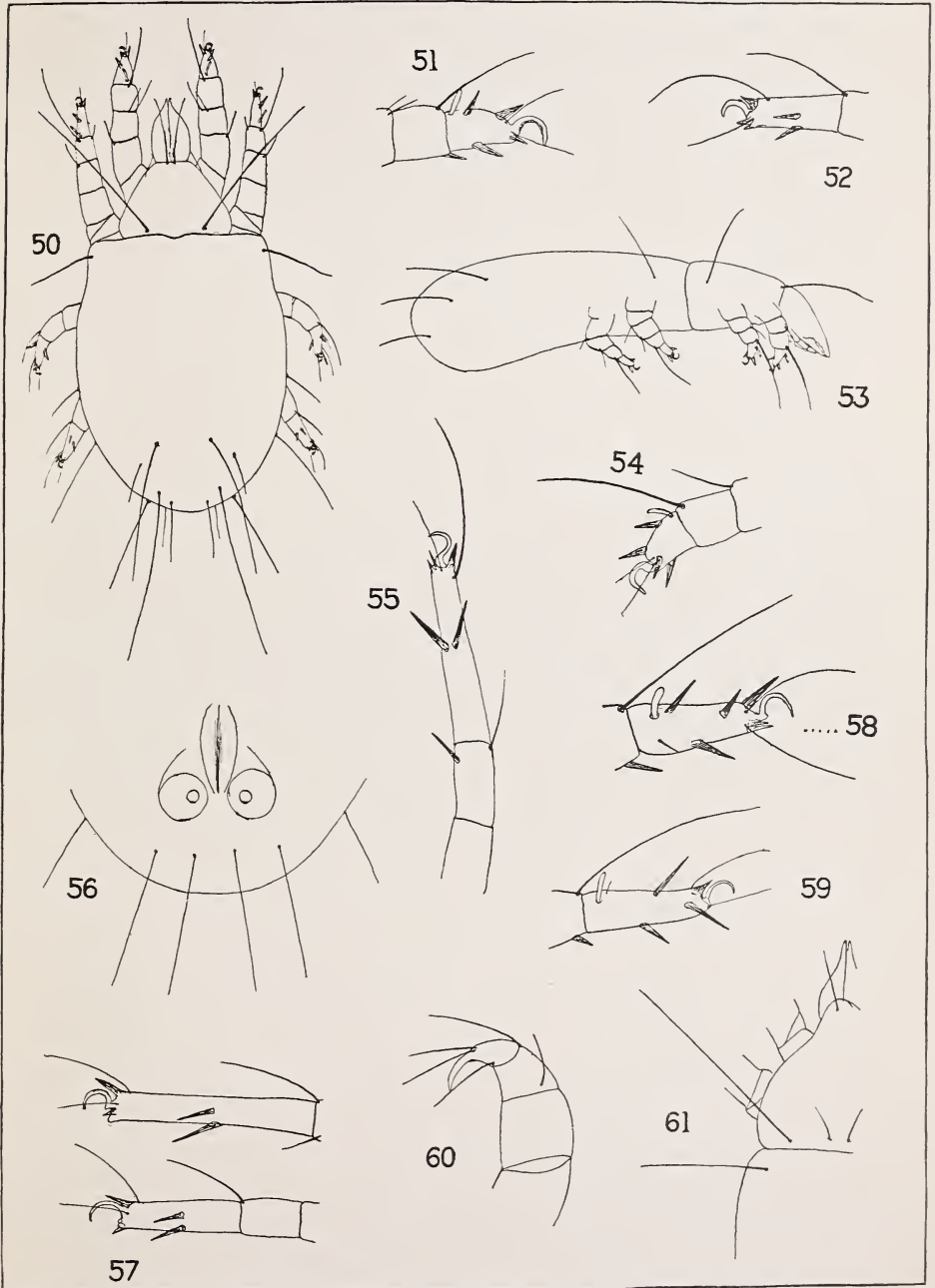
The only specimens seen were taken from the roots of clover in October, 1879, probably in Missouri. Distinct by elongate body, very short legs, and short posterior bristles of cephalothorax.

Rhizoglyphus longitarsis n. sp.

Cephalothorax with a pair of long frontal bristles, a pair of very long and large posterior bristles, and a pair of minute intermediate bristles; a long humeral bristle; the female with six bristles near tip of abdomen, none more than one-third the width of body; in the male the bristles are longer, some nearly as long as width of body, and on the venter, behind anus, are four bristles in a transverse row, but the outer pair is very much longer than the inner pair. The legs are rather long; tarsus I (Pl. VI, fig. 58) about two and one-half times as long as broad, and with a spine close to the sense hair, one below near middle and two others near tip; the apical hairs nearly as long as the joint; the bristle at tip of penultimate joint is longer than the tarsus in all legs, except the hind pair; the hind tarsus (Pl. VI, fig. 55) is very long and slender, with two spines beyond middle, and the apical hairs about two-thirds the length of the joint.

Length 0.75 mm.

I have seen specimens from Emporia, Kans., taken from the rotten bulbs of *Caladium esculentum*.



TYROGLYPHID MITES.

Fig. 50.—*Rhizoglyphus rhizophagus*. Fig. 51.—*Rhizoglyphus rhizophagus*, tarsus I. Fig. 52.—*Rhizoglyphus rhizophagus*, tarsus IV. Fig. 53.—*Rhizoglyphus elongatus*. Fig. 54.—*Rhizoglyphus elongatus*, tarsus I. Fig. 55.—*Rhizoglyphus longitarsis*, tarsus IV. Fig. 56.—*Rhizoglyphus rhizophagus*, male venter. Fig. 57.—*Rhizoglyphus phyllocevae*, tarsi IV—male and female. Fig. 58.—*Rhizoglyphus longitarsis*, tarsus I. Fig. 59.—*Rhizoglyphus phyllocevae*, tarsus I. Fig. 60.—*Rhizoglyphus phyllocevae*, leg III of male. Fig. 61.—*Rhizoglyphus phyllocevae*, half of front of body.

Genus **MONIEZIELLA** Berlese.

A suture between cephalothorax and abdomen; mandibles large, chelate; tarsi with distinct claws; cuticle without granulations; ventral apertures small; but two distinct posterior bristles on the cephalothorax; tarsi without spines; male with ventral suckers; abdomen usually more elongate than in *Tyroglyphus*. All the species so far known are predaceous or feed on recently killed animal matter.

Type.—*M. entomophagus* Lab.

The genus *Histiogaster* is based on *H. carpio* Kramer, a species with spiny tarsi, a peculiar male abdomen, and of very different habits; so that I retain *Monieziella* as distinct from it.

There are probably from five to ten species in our fauna. I have recognized the following three species:

TABLE OF THE SPECIES.

- | | |
|---|--------------------|
| 1. Body about three or four times as long as broad; apparently no cephalic nor humeral bristles | <i>angusta</i> |
| Body scarcely twice as long as broad; cephalic and humeral bristles distinct.. | 2 |
| 2. Tarsi barely longer than preceding joint..... | <i>brevitarsis</i> |
| Tarsi nearly twice as long as preceding joint..... | <i>longipes</i> |

Monieziella angusta n. sp. (Pl. II, fig. 15.)

Body three to four times as long as broad; apparently without any cephalic or humeral bristles, and only four short ones near the tip of abdomen. Legs very short; tarsi not longer than the penultimate joint; the bristle from this joint longer than tarsi, especially in the anterior legs, where it is very prominent.

Length, 0.30 to 0.35 mm.

Specimens taken from under scale insects (*Aspidiotus*) at Haywood, Cal., and stated to be feeding on the coccids and their eggs.

This is probably what Doctor Riley figures in the Fifth Missouri Report as *Tyroglyphus malus*; however, his figure shows some bristles on the head which I can not see in the specimens before me. Michael has identified Riley's species with the European *M. (Histiogaster) entomophagus*; but Michael's figures show a form very different; more elongate and with shorter bristles. The *Tyroglyphus malus* of Lignières is probably a *Monieziella*, but a different species, perhaps *M. entomophagus*, as asserted by Michael.

Monieziella longipes n. sp. (Pl. II, fig. 13.)

Cephalothorax with a pair of frontal bristles, and a pair of very long posterior bristles; a long, fine humeral bristle each side; two shorter bristles on the margin, and four rather long bristles near tip of body, the inner pair nearly as long as the abdomen. Legs rather slender, and the tarsi nearly as long as the preceding two joints

together, and in the hind pair still longer; the hair at tip of the penultimate joint is longer than the tarsus in all except the hind legs.

Length, 0.33 mm.

Specimens from among *Mytilaspis* scales at Crescent City, Fla. (Hubbard).

Monieziella brevitarsis n. sp. (Pl. II, fig. 18.)

Cephalothorax with a pair of short frontal bristles and a pair of longer posterior bristles; a humeral bristle each side rather more than one-half the width of body, and three bristles each side on posterior margin toward tip, the outer one very short, the next longer, and the inner pair about one-third the length of the abdomen. Body scarcely twice as long as broad; mandibles (Pl. II, fig. 19) large and prominent. Legs short, with only a few short bristles, but that at tip of the penultimate joint is rather longer than the tarsus; the latter joint is only a trifle longer than the preceding joint, but much more slender; the sense hair on tarsi I and II is much curved. (Male venter, Pl. II, fig. 19.)

Length, 0.35 mm.

What is evidently the *Hypopus* of this form has a projection on the anterior part of the cephalothorax, with a black eye-spot each side; the legs I and II are thick and heavy; leg III ends in a claw, as do I and II; but leg IV terminates in two long bristles, the outer one much the longer, but both longer than the leg, and there is also a short bristle near tip of the legs. The ventral sucking plate has six suckers—two in front, smaller than others, and four in a curved row behind.

Specimens have been taken from *Chilocorus* at Southern Pines, N. C., and Marshallville, Ga., and it evidently feeds on the San Jose scale.

Genus CARPOGLYPHUS Robin.

No suture between cephalothorax and abdomen; mandibles chelate; tarsi with distinct claws; cuticle without granulations; ventral apertures small; the epimera of the first two pairs of legs joined to each other and to the sternum, thus forming a sort of skeleton; tarsal claw arising from a clavate onychium; the bristle on penultimate joint of legs arises from near middle, not at tip of joint. The legs are rather slender, not thickened in the male; the male has no anal suckers. On the anterior margin of cephalothorax near base of mandibles there is each side a rounded eye-like spot or projection, very doubtfully an eye. No *Hypopus* is known.

Type.—*C. passularum* Robin.

There are doubtless several species; I have described one from Java; *C. anonymus* of Berlese and Michael has very short bristles on

cephalothorax, and Michael shows them spine-like, so that their figures probably represent a species different from that of Canestrini, and which I find in the United States. The species of this genus feed on a great variety of substances, perhaps favoring dried fruits.

Carpoglyphus passularum Hering. (Pl. V, fig. 40.)

Cephalothorax with a pair of short frontal bristles, apparently a little back from the front margin; four posterior bristles in a curved, transverse row, none very long; a humeral bristle each side, with a short one near by; two submedian pairs of short bristles on the dorsum; two short ones on each posterior side margin; a short pair near tip above, and three each side at tip, one pair very short, the others more than one-half length of body. Legs moderately long, tarsi long and tapering; the sense hair on tarsi I and II tapers to tip; the bristle above on penultimate joint is situated near the middle and not at tip, and is very large and prominent, and longer than the tarsus in all except the hind pair of legs. There are a number of hairs on legs, but no spines; the hair near apex of tarsus is long and rather farther from the tip than usual in tyroglyphids.

Length, 0.40 to 0.50 mm.

Specimens have been seen from Fresno, Cal., on figs; from St. Anthony Park, Minn., on dried figs and apples; from Albany, N. Y., on smoked ham, and on pollen of honey bees from Ohio.

Genus TRICHOTARSUS Canestrini.

No suture between cephalothorax and abdomen; mandibles chelate; legs ending in distinct claws; male without suckers on hind tarsus; no clavate or thickened hair on tarsi I and II; palpi not enlarged at tip; cuticle not granulate; male without anal suckers; vulva of female situated close to beak, between coxæ I; hypopial nymphs found upon bees, adults in nests of bees.

Type.—*T. osmiæ* Dufour.

The adult form is but little known; I have seen none from this country; the hypopial nymphs are more common, and two forms have been found in the United States. These agree well with the European species, but as the adults are not known, their identification is rather uncertain. They are of no economic value, and therefore I shall simply list the two species as the European forms until such time as mature specimens make possible a more exact identification and satisfactory description.

Trichotarsus xylocopæ Donn.

Prof. H. Osborn has recorded this European species as taken from a California *Xylocopa*, and sent to him by Mr. D. W. Coquillett. I have not seen it, and possibly some other species was concerned.

Trichotarsus osmiæ Duf.

I have taken specimens of a species of *Trichotarsus*, which agree with the European form, from a species of *Osmia* at Sea Cliff, N. Y.; however, the adult females may present some differences. This species differs from *T. xylocopæ* in having two claws at the tips of tarsi I, II, and III.

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